Final Report Summary

The immediate objectives of this project are the maintenance and refinement of the data acquisition system aboard the passenger ferry P.T. Barnum belonging to the Bridgeport-Port Jefferson ferry company which operates along a central Long Island Sound (LIS) transect from Bridgeport, CT to Port Jefferson, NY. The environmental variables being collected by the ferry observing system are surface-to bottom current profiles and quantities necessary to derive research quality estimates of the surface momentum flux, surface mass flux, and all four major components of the surface heat flux (short wave, infrared, latent and sensible). Descriptions of instruments are provided on the project web site: http://www.stonybrook.edu/soundscience. Funding for the initial development of this system was provided by NOAA through NY Sea Grant.

The primary motivation for this project was the continued decline of bottom dissolved oxygen in central and western, and the necessity of distinguishing the influence anthropogenic and natural climatic factors which contribute to the development of summertime hypoxia. This is especially important in light of the imposition of Total Maximum Daily Load (TMDL) nitrogen restrictions for LIS. Results from recent analyses of historical meteorological and water column data have identified a specific scenario of meteorological forcing associated with major summertime hypoxia in western LIS. This scenario is characterized by the early onset of persistent southwesterly winds causing enhanced thermal and haline stratification followed by Fig. 3. Inter-annual variations in summertime bottom DO in western LIS an absence of destratifying north-easterly winds. With reference to Fig. 3, analyses of land-based wind observations, such as those available at LaGuardia, point to persistent south-westerly winds during summer months as the prime factor responsible for summertime hypoxia in 1988, 1998, 2003 and 2004. They also point to the sensitivity of density stratification during those years to wind direction and persistence. These findings highlight the importance of obtaining timely high quality over-water meteorological observations, especially winds, to diagnose hypoxia development and to distinguish the effects of climatic and anthropogenic forcing.

The over-water ferry-based observations can be used to make important and critical refinements in LIS surface heat and momentum flux time series developed from land-based observations. These flux time series are appropriate to force regional hydrodynamic and water quality models. The ferry ADCP observations are used to quantify the magnitude and variability in estuarine exchange flow through the ferrytransect. This exchange flow contributes to the renewal of bottom waters in central and western LIS. The ferry ADCP observations are also available for use in assimilation and validation in hydrodynamic models.

The ferry observing system is highly complementary to other LIS observation programs which include moored buoys and monthly ship surveys; it provides capabilities not offered by either buoys or ship surveys including the support of instruments requiring periodic maintenance. In addition to maintaining and refining the BPPJ ferry observing system, the objectives of the present project include providing both the real-time and archived historical data to the research and management communities via the project’s web page. Both of these objectives have been met.