Geographic Information System(GIS) studies of the Geology of Staten Island, NY.

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Using a GIS, this author was able to "georeference" the following to the base map of Staten Island, NY: (1) selected topographic maps from 1911(scale 1:1800); (2) the bedrock geologic map from the 1902 USGS Folio 83;(4) the surficial geologic map from the 1902 USGS Folio 83; (5) Sites of former Iron mines; (6) the geologic map of Staten Island from the Newark 2 degree sheet of Lyttle and Epstein(1987); (7) NYC DEP bluebelts; (8) sites of (NOA) Naturally Occurring Asbestos as reported by Van Gosen (2006); (9) present day wetlands as reported by the NYSDEC and (9) SLOSH Model Hurricane Inundation Zones. The above is useful in the studies of hillslopes, past drainage patterns relative to the present day and the effect of sea level rise on Staten Island. In addition data from the NYC PLUTO database in is utilized in order to study the effects of the urbanization of Staten Island. This information is very useful in studying the environmental geology of Staten Island, and will be very useful in future land use and environmental issues(Benimoff 2011). The slopes of Staten Island were mapped(Benimoff et al. (2016) using a LiDAR 1m digital elevation model. Staten Island, NY, has slopes that range from gentle to very steep. The steep slopes of Staten Island are underlain by Staten Island serpentinite and many of the steep slopes face southeast.

One specific GIS study(Benimoff, 2007) involves the flooding in the Sweetbrook Drainage Basin during the summer storm of 1988. Extensive flooding occurred as a result of an intense rainstorm in the 7.56km^2 Sweetbrook drainage Basin on the afternoon of July 26, 1988. Newspaper accounts of the storm indicate that the total rainfall for the 24hr period was 66.04mm with 50.8mm of rain falling between 1PM and 5PM. Effects of this urban flooding included eighteen parked cars in an apartment complex's parking lot that were swept up by the flood and piled in the front parking lot on top of one another. Using a GIS this author integrated topographic map data from 1899, 1955, 1966 and 1981 topographic maps to study the evolution of this drainage basin in order to determine the causes of this extreme flooding event. A comparison of these GIS topographic maps show increased urbanization in the drainage basin. They also reveal that the apartment complex described above was built directly on a second order tributary of the Sweetbrook sometime between 1955 and 1981. Between 1966 and 1981 there was further urbanization. Recently, the NYCDEP has mitigated future flooding in this basin with BMP's(Best Management Practices) of their bluebelt programs. However, this GIS study clearly illustrates that urbanization of a drainage basin is the main cause of this extreme flooding.

Another specific GIS study(Benimoff, 2010) involves using SLOSH model Hurricane Inundation Zones data and "land use" data obtained from the New York City Department of City

Planning to study urbanization in these hurricane vulnerable zones of Staten Island, New York. GIS analysis shows that before 1900 there were only 46 buildings in what is now SLOSH zone 1. Further GIS analysis for what is now SLOSH zone 1 shows: (1)from 1900 and through 1910, 22 buildings were built; (2)from 1911 and through 1920, 65 buildings were built; (3)from 1921 and through 1930, 737 buildings were built; (4)from 1931 and through 1940, 408 buildings were built; (5) from 1941 and through 1950, 242 buildings were built; (6)from 1951 and through 1960, 163 buildings were built; (7)from 1961 and through 1970, 445 buildings were built; (8)from 1971 and through 1980, 835 buildings were built; (9)from 1981 and through 1990, 1178 buildings were built; (10) from 1991 and through 2000, 830 buildings were built and (11) from 2001 and through 2008, 693 buildings were built. Maps produced from this study, showing progressive urbanization, are very useful in analyzing the development in SLOSH zones on Staten Island.

Furthermore, GIS maps show the extent of the maximum storm surge from superstorm Sandy and are very useful in learning from the impact of superstorm Sandy(Benimoff et al. 2015).

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