HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Prepared For

Shelter Island Irrigation Committee

June 2014

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive, Suite 175
White Plains, NY 10604
(914) 694-5711
www.lbgweb.com

TABLE OF CONTENTS

LIST OF TABLES
(at end of report)

Table

LIST OF FIGURES
(at end of report)

Figure

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

INTRODUCTION

Background

Leggette, Brashears & Graham, Inc. (LBG) was retained by the Town of Shelter Island (the Town) to assist in evaluating the use of irrigation systems on the Island. The Town's Irrigation Regulations were adopted in August 1995 and amended in 2003. Under these regulations, construction of new underground irrigation systems and alterations to existing systems, other than new permitted cistern systems which do not use well water, are prohibited. Existing permitted systems, in place as of 2003, were allowed to continue operating until September 1, 2013 to allow owners to amortize their investments. After that date all underground irrigation system use, other than permitted cistern systems, was to be prohibited. The Irrigation Regulations were implemented as a water conservation measure aimed at safeguarding the Island's groundwater derived water supply. The specific concerns were water availability and saltwater intrusion.

Prior to enforcement of the 2013 prohibition, the Town Board adopted a moratorium and formed an Irrigation Committee. The Committees purpose was to research advances in irrigation technology and the use of irrigation systems, relative to the Islands water resources, and to re-evaluate the existing irrigation regulations. LBG was retained to assist the Town and Irrigation Committee by providing technical support related to the charged tasks. Specifically, LBG's scope of work included; compiling and reviewing existing studies and available geologic and hydrogeologic information for the Island; reviewing available groundwater level and water-quality data; completing a water-budget evaluation and, conducting groundwater sampling from existing monitoring wells on the Island.

Existing Studies and Data Sources

Compiling and reviewing existing studies and data was one of the primary tasks completed as part of this evaluation. The water resources of Shelter Island have been the subject of several previous studies dating back to the 1970s. Relevant information was also reviewed from numerous other studies pertaining to regional water resources, saltwater intrusion and groundwater recharge in this area. In addition to the studies, groundwater level and precipitation data for the Island were also compiled and reviewed. The United States Geological Survey (USGS) has been monitoring groundwater levels on the Island at different intervals since the early 1970s. There are approximately 68 USGS monitor wells located throughout the Island that were installed beginning in 1974. Historical precipitation data for the area was obtained from the National Climatic Data Center (NCDC) for nearby stations in Greenport, Bridgehampton and Riverhead, New York.

The list of studies and data sources compiled as part of this evaluation is attached in Appendix I. A list of USGS monitor wells including a summary of available construction data and a well location map are included in Appendix II. In addition to the above, a map of existing irrigation systems (including cistern systems) on the Island was compiled by the Irrigation Committee and is included herein as figure 1. Much of the information contained in the following sections is based on review of the listed resources and they are referenced throughout the text.

SHELTER ISLAND GEOGRAPHY

General Setting

Shelter Island is located between the north and south forks of eastern Long Island in Suffolk County, New York. The Island is approximately 7,613 acres or about 12 square miles in area (Nelson, Pope & Voorhis, 2013) and is surrounded by saline water bodies including Shelter Island Sound and Gardiners Bay. In addition, several inland water bodies occur in the form of inlets, bays and tidal creeks, creating a series of peninsulas around the Island. The topography of most of the Island is characterized by elevations of less than 80 feet above sea level. The peak elevation is approximately 180 feet in the northwest part of the Island near Shelter Island Heights. Elevations of 10 feet and less occur along the coastlines and peninsula areas.

The Island is accessed by ferry from either Greenport or North Haven Long Island and approximately 53 percent of the homes on the Island are second (seasonal) homes (Nelson, Pope & Voorhis, 2013). Most of the homes on the Island (approximately 2,755) are served by individual water-supply wells and septic systems. A small part of the population is served by one of three community water supplies whose water is derived from on island supply wells. Most of the island is developed with the exception of the Mashomack Nature Preserve which occupies approximately 3 square miles (2,100 acres) of the southeastern part of the Island.

Geology/Hydrogeology

The sediments that comprise Shelter Island are the result of glacial deposition that occurred during the Pleistocene epoch which dates back approximately 2 million years. The surficial sediments are mapped as glacial till (Jensen and Soren, 1974) and contain a mix of sand, gravel, cobbles, boulders and clay. These sediments extend beneath the land surface and comprise the Upper Glacial aquifer, which supplies the Island with fresh water. Within the aquifer, pore spaces between the sediment grains are saturated with water. A series of borings drilled during a 1974 USGS study show that the bottom of the Upper Glacial aquifer extends from 85 feet below land surface (57 feet below sea level) in the southern portion of the Island (at Route 114 and Cartwright Road), to as much as 130 feet (100 feet below sea level) in the northern portion of the Island (at Cobbetts Lane and Manhanset Road) (Appendix III) (Soren, 1978).

Beneath the Upper Glacial sediments lie two Pleistocene clay units, a gray green clay of marine origin, which lies on top of a reddish brown clay of non-marine origin. The marine clay is believed to extend beneath the entire Island and the non-marine clay beneath the majority of it (Soren, 1978). The clay units were found to extend to a depth of 300 feet below sea level (approximately 340 feet below land surface) in one boring near the center of the Island (at Smith Street and School Street). This was the only boring out of three deep exploratory borings that penetrated the bottom of the lower clay unit. These borings also showed that the combined thickness of the clays is at least 200 feet beneath most of the Island and that they lie in horizontal beds like a layer cake (Appendix III). Beneath the clay units, in descending order, are the Magothy formation, Raritan Clay, Lloyd Sand and Bedrock. The top of bedrock beneath the Island ranges between 700 and 1,000 feet below sea level, sloping downward from north to south (Jensen and Soren, 1974).

All of the geologic units beneath the Island are saturated, however fresh groundwater only occurs within the Upper Glacial aquifer. Chloride sampling has shown that water in the marine clay and underlying formations is brackish to saline and that concentrations increase rapidly with depth (Soren, 1978). This creates a freshwater–saltwater mixing or diffusion zone between the fresh water and surrounding saline water bodies. As a result, the bottom of the Upper Glacial aquifer is generally considered the lower boundary of fresh groundwater beneath the Island.

The Upper Glacial aquifer extends beneath the entire Island and ranges in thickness between approximately 60 and 100 feet. However, several studies (Soren, 1978 and Simmons, 1986) have shown that the freshwater-saltwater diffusion zone extends up into the Upper Glacial aquifer beneath certain parts of the Island, limiting the vertical extent of the fresh groundwater within the aquifer. The thickness of fresh water within the aquifer also naturally decreases in the near shore areas where the land surface meets the surrounding saline water bodies. This results in fresh water within the aquifer occurring as a lens beneath the Island with the thickest part at the center of the Island. The horizontal extent of fresh water within the aquifer is also limited by inland waterways including but not limited to; Coecles Harbor, West Neck Bay and West Neck Harbor. As a result, the horizontal extent of fresh water beneath peninsulas like Little Ram Island, Big Ram Island and Silver Beach is limited to the areal extent of those peninsulas.

<u>Groundwater Levels</u>

Groundwater levels on Shelter Island have been monitored in different wells at varying frequencies by the USGS since 1974. Since 2002 a set of 10-14 wells have been monitored monthly. Historical groundwater level elevation data for the monitored wells are presented on hydrographs in Appendix IV along with a well location map. As shown on the hydrographs, groundwater level elevations on Shelter Island generally range between less than 1 and 8 feet above mean sea level. Groundwater elevation contour maps showing the configuration of the water table on Shelter Island in the spring of 1974, December 1983 and March 1995, are attached in Appendix V (Soren, 1978; Simmons, 1986 and Schubert, 1999). All three maps show that the highest elevations tend to occur center island and in the Shelter Island Heights area, with the lowest elevations occurring in coastal and peninsular areas including Shorewood, Little Ram, Big Ram and Silver Beach.

The hydrographs in Appendix IV also show seasonal groundwater level fluctuations and that from year to year, water levels tend to fluctuate within a normal range. Groundwater levels fluctuate seasonally in response to the addition and removal/discharge of water from the aquifer in relation to recharge, natural discharge and pumping. Groundwater levels generally peak during the late spring and reach lows in the late fall/early winter. The amount of seasonal fluctuation on Shelter Island varies from well to well and in most cases falls within a range of 1-3 feet over the course of a year. Occasional extreme high and low water levels occur in response to periods of above or below normal precipitation and extreme weather events. This is most evident during 2010 for which almost all of the graphs show a record high water level in the early part of that year (Appendix IV). These highs can be correlated to precipitation that was 2-3 times greater than normal during February and March of that year (NCDC).

In addition to short-term fluctuations, the graphs also show long-term trends. Graphs for wells with data going back approximately 40 years all show that average groundwater levels have risen several tenths of a foot on average and up to as much as one foot since that time (Appendix IV). This increase in average groundwater levels is consistent with increased precipitation that has been documented over the same period (figure 2). For three wells, including 75433 on Little Ram Island, 75435 in Dering Harbor and 90279 in Shorewood, the graphs show declining water-level trends up to about three tenths of a foot. However the period of record for these wells is much shorter. The Dering Harbor and Little Ram wells have only been monitored consistently since 2008 and 2009. The declining trends in these wells are most likely related to precipitation that was between 10 and 15 percent below normal during two of the last five years (2012 and 2013) (NCDC). The Shorewood well has been monitored since 2003 and shows the least amount of decline of the three wells. Other wells monitored since 2002 or 2003 in different parts of the Island show increasing water-level trends including 73974 at the Shelter Island Golf Course, 75438 on South Menantic Road and 75432 on Big Ram Island (Appendix IV).

Groundwater Flow

Groundwater flows by gravity from areas of high groundwater elevation to areas of low elevation similar to the way precipitation falling on the ground flows downhill, although at a much slower rate. On Shelter Island groundwater flows outward from the areas of high groundwater elevation towards the shorelines, eventually discharging to the surrounding surface-water bodies. The configuration of Shelter Island and the areas of high groundwater elevation create different groundwater flow regimes or sub-watersheds throughout the Island. A sub-watershed is generally defined as an area within which all water flows towards a common discharge point i.e., West Neck Harbor, Gardiners Bay, Coecles Harbor. Figure 3 illustrates the different sub-watersheds and groundwater flow directions on Shelter Island. The sub-watersheds are delineated by groundwater flow divides which are groundwater elevation high points and areas of divergent flow. As illustrated by the flow arrows on figure 3, groundwater flows away from the groundwater divides similar to the way water flows in different directions off the top of a hill. For example, on Big Ram Island a groundwater flow divide representing a groundwater elevation high point runs along the center separating it into two sub-watersheds. Groundwater north of the divide flows towards and discharges to Gardiners Bay and groundwater south of the divide flows towards and discharges to Coecles Harbor (figure 3). As a result, groundwater beneath Big Ram Island cannot physically flow to any other part of Shelter Island. Groundwater flow within the other sub-watersheds on the Island behaves the same way as it is governed by groundwater flow divides and associated surface-water discharge points.

GROUNDWATER BUDGET

Groundwater Recharge

Groundwater within the Upper Glacial aquifer is replenished or recharged by precipitation that falls on the local watershed. Under natural conditions, the aquifer is in a state of equilibrium and the volume of groundwater stored within the aquifer generally remains consistent from year to year. When recharge occurs, it causes water levels to rise and the aquifer to "overflow" and discharge into surrounding surface-water bodies. Under these conditions the volume of discharge is equivalent to the volume of recharge as what goes in must come out. When an aquifer is used for water supply, its volume will fluctuate in response to pumping withdrawals and recharge from precipitation. In these cases the volume discharged will be less than the volume recharged, with the difference accounted for by what is used for water supply. For this reason it is important that groundwater recharge exceed the water-supply demand otherwise aquifer storage volumes would begin to decline. In the case of Shelter Island, maintaining aquifer storage volumes and sufficient groundwater discharge is also important relative to preventing landward migration of the freshwater–saltwater diffusion zone.

To estimate the volume of recharge that occurs on Shelter Island, 30 year precipitation averages (normals) for 1981–2010 for gauging stations in Riverhead, Greenport and Bridgehampton, New York were reviewed. The data shows normals for these stations ranging between 47.30 and 50.14 inches per year for an average of 48.40 inches (table 1). This figure is consistent with the annual average for all of Suffolk County of 48 inches (Camp Dresser & McKee, 2010). However, not all precipitation that falls on a watershed infiltrates the sediments to become groundwater recharge. On Long Island, groundwater recharge averages approximately 50 percent of the mean annual precipitation that falls on the watershed, with the balance lost through runoff, evaporation and transpiration (Cohen et. al, 1968; Peterson, 1987 and Schubert, 1998).

With average annual precipitation of about 48 inches, an average of 24 inches per year (50 percent) becomes groundwater recharge. Over the 12 square mile area of Shelter Island, this results in average recharge of approximately 5 billion gallons per year or 13.7 million gallons per day. This figure is consistent with other published recharge estimates for Shelter Island. A 1998 USGS study calculated that recharge to Shelter Island averaged 1.72 million cubic feet per day or 4.7 billion gallons per year (Schubert, 1998). This figure was based on a long-term precipitation average of 45.2 inches per year (through 1994) and a 50 percent (22.6 inches) recharge factor. The precipitation data used in this study was also from the Bridgehampton, Greenport and Riverhead stations. An earlier USGS study estimated average recharge at 23 inches or 4.4 billion gallons per year, based on average annual precipitation of 47 inches (Simmons, 1986). However, this estimate uses a total land area for the Island of 11 square miles as opposed to 12 as was used by LBG and Schubert (1998). The land surface area of the Island is 7,613 acres or 11.9 square miles (Nelson, Pope & Voorhis, 2013). When the Simmons estimate is adjusted for a total area of 12 square miles, his average recharge for the Island comes to 4.8 billion gallons per year.

The difference in these three estimates, which range from 4.7 to 5 billion gallons per year, is directly related to the total precipitation used in the calculations. The current average rate of 48 inches per year is higher than those used by Simmons (1986) and Schubert (1998) and reflects the fact that long-term precipitation rates, and consequently recharge, have been increasing. A review of historical data shows that long-term precipitation normals for the Bridgehampton, Greenport and Riverhead stations, between 1961 and 2010, have increased by an average of approximately 3 inches (table 1, figure 2). This trend is also confirmed in a recent Watershed Management Plan for Shelter Island which documents that precipitation has been increasing since as far back as 1930 (Nelson, Pope & Voorhis, 2013).

One published value of recharge on Shelter Island is higher than the estimates cited above. The 2010 Draft, Suffolk County Comprehensive Water Resources Management Plan (Camp Dresser & McKee, August 2010) estimates recharge to Shelter Island averages 17.6 million gallons per day, or 6.4 billion gallons per year. This estimate was computed using a groundwater model and precipitation records from Riverhead New York. The higher recharge rate would suggest a higher precipitation rate. However data for the Riverhead station (table 1) show that between 1961 and 2010 the precipitation normal for Riverhead did not exceed the 48 inches per year used by LBG.

It is possible there were other factors considered in the model, which were not highlighted in the Camp Dresser & McKee report, that account for the higher recharge rate. For the purpose of calculating a water budget in this report, the average recharge rate of 5 billion gallons per year is used, which is more conservative and consistent with previous estimates.

Groundwater Demand

There are several published estimates of the groundwater or water-supply demand for Shelter Island. Soren (1978) estimated the demand at 198 million gallons per year, assuming a year round population of 2,000 and a summer population of 8,000. To these figures Soren applied per capita water use rates of 100 gallons per day from September–May and 200 gallons per day from June–August. Simmons (1986) estimated the demand two different ways resulting in estimates of 239 and 260 million gallons per year. In both cases Simmons updated the population estimates to 2,200 year round and 10,000 in the summer. For the lower estimate Simmons used the same per capita water use as Soren (100 and 200 gallons per day). The higher estimate was based on 1983 pumping records for the Shelter Island Heights and Dering Harbor water districts. More current estimates include 256 million gallons per year based on an average demand of 0.7 million gallons per day (Camp Dresser & McKee, June/July 2010) and 212 million gallons per year, based on an average demand of 0.58 million gallons per day (Nelson, Pope & Voorhis, 2013).

In all cases the estimated demand is based on the average population or number of households on the Island. Complicating any estimate of demand on Shelter Island is the summer population increase. According to the 2010 US Census, the year round population on the Island was 2,392 and there were 2,755 households of which 1,459 or 53 percent were seasonal (Nelson, Pope & Voorhis, 2013). The summer population is not quantified by the Census Bureau. The current consensus estimate by several Town officials is an average of about 10,000. With 2,755 households and an estimated population of 10,000, the average household size on Shelter Island during the summer would be 3.6. Data from the Suffolk County Department of Planning shows that the average household size in Suffolk from 1990 to 2007 was approximately 3.0 people (Suffolk County Department of Planning, 2008). Based on this, the current summer population estimate of 10,000 seems reasonable and consistent with known demographics for the County.

With an average year round population of approximately 2,500 (rounded up) and an average summer population estimated at 10,000, the total annual demand for the Island is estimated to be about 252 million gallons per year. Similar to previous estimates by Soren (1978) and Simmons (1986), this estimate is based on average water use rates of 200 gallons per person per day during the summer (92 days) and 100 gallons per person per day during the remainder of the year (273 days). This results in an average annual per capita water use rate of about 157 gallons per person per day. In our experience these figures are conservative and other published data support this. The Suffolk County Comprehensive Water Resources Management Plan cites average annual per capita water use on Shelter Island at 92 gallons per person per day (Camp, Dresser & McKee, June/July 2010).

Consumptive Use

With groundwater recharge to the Upper Glacial aquifer estimated to average 5 billion gallons per year, the estimated demand (water removed from the aquifer) of 252 million gallons per year is about 5 percent of the average recharge. This figure is consistent with previous estimates of 5 percent (Soren, 1978) and 6 percent (Simmons, 1986) and indicates that the ratio of recharge to demand has remained virtually the same over the last 35 years. However, not all of the water pumped from the aquifer is lost from the system. Much of the water is returned to the aquifer through septic systems, which are used throughout the Island to manage wastewater. Water which is not returned to the aquifer through septic systems is considered consumptive use and lost from the system. Consumptive use on Shelter Island has been calculated to average 19 percent of the total demand including lawn irrigation (Camp Dresser & McKee, June/July 2010).

With the total demand estimated to average 252 million gallons per year, 19 percent consumptive use is about 48 million gallons per year. However, the consumptive use factor of 19 percent only applies to that portion of the population that uses septic systems. The consumptive use for water pumped by the Shelter Island Heights Water district (the Heights) is

100 percent as their wastewater is handled by a wastewater treatment plant and discharged to surface water. The Heights has an average water use of 241 gallons per day per household, or a total of 14 million gallons per year, based on 2008 pumpage data (Camp Dresser & McKee, June/July 2010; Nelson, Pope & Voorhis, 2013).

When a 100 percent consumptive use factor is applied to the Heights water use (14 million gallons per year) and a 19 percent factor is applied to the remaining water use for the Island (252 million gallons per year less 14 million) we get an average total consumptive use of about 60 million gallons per year. This means of the 5 billion gallons per year of recharge that occurs on Shelter Island, 60 million gallons, or 1.2 percent, goes to replenish groundwater removed from the aquifer for consumptive use while the remainder, over 4.9 billion gallons or 98.8 percent, is discharged to the surrounding surface-water bodies.

With only 1.2 percent of average annual recharge used for consumptive use there are sufficient water resources available to support the water-supply demands of Shelter Island. In addition Simmons (1986) estimated that an average of 4.4 billion gallons per year discharged to surrounding surface-water bodies at that time. Based on this his report states that, "From an islandwide perspective, significant landward movement of saline groundwater would be unlikely under these conditions". With the current discharge estimate at 4.9 billion gallons per year, this conclusion remains valid today.

Irrigation System Water Use

As stated above, consumptive use for all water users on the Island is estimated to average 60 million gallons per year. A portion of this amount can be attributed to the existing 109 permitted irrigation systems. A map showing the locations of the known permitted systems is presented on figure 1.

In accordance with the Towns' Irrigation Regulations, Chapter 82 of the Town Code, irrigation systems are only allowed to be operated once every three days with a maximum run time of 20 minutes per zone and at a maximum rate of 12 gallons per minute. Assuming an average of 4 zones per system, each system uses a total of 960 gallons of water every three days or 320 gallons per day on average. The peak watering months are June through

September which total 122 days. With 109 systems using an average of 320 gallons per day for 122 days, their total water use is estimated to average 4.3 million gallons per year. This means that 4.3 million gallons or about 7 percent of the Islands' estimated annual average consumptive use (60 million gallons) can be attributed to the permitted irrigation systems with the remaining 93 percent attributed to other users. The 4.3 million gallons per year attributed to the irrigation systems is about 9 hundredths of a percent, or less than one tenth of one percent of the average recharge of 5 billion gallons per year.

Although there are 109 permitted systems, it is suspected that additional unpermitted systems exist. If we assume there are 50 percent more systems on the Island than those currently permitted, than consumptive use attributed to the irrigation systems would be 6.5 million gallons per year. This is about 11 percent of the estimated average consumptive use of 60 million gallons per year and one tenth of one percent of the average annual recharge of 5 billion gallons.

FRESHWATER-SALTWATER DIFFUSION ZONE

Defining the Diffusion Zone

As previously discussed, fresh groundwater beneath Shelter Island is limited to the Upper Glacial aquifer. The bottom of the aquifer has been shown to extend to a maximum of about 100 feet below sea level (Soren, 1978). Because of the density difference between fresh groundwater and saline water, fresh groundwater floats on top of saline water. The head pressure created by the fresh groundwater and groundwater discharge keep the saline water from migrating inland. The transition from fresh groundwater to saline water within the aquifer is not a sharp boundary but rather a diffusion zone within which fresh groundwater and saline water mix. Within the diffusion zone, chloride concentrations increase rapidly until they reach the concentration of the surrounding saline water bodies, which is approximately 19,000 mg/l (milligrams per liter) (Van Der Leeden, 1990). In this area, the naturally occurring concentration of chlorides in fresh groundwater is generally considered to be less than 10 mg/l (Cohen, et al., 1968; Lusczynski and Swarzenski, 1966). Chloride concentrations between

10 and 40 mg/l are considered indicative of impact from human activity (septic systems), and in an Island setting, concentrations above 40 mg/l are considered indicative of saltwater intrusion (Lusczynski and Swarzenski, 1966; Perlmutter and DeLuca, 1963). As a result, a chloride concentration of 40 mg/l is considered to be indicative of the upper boundary or top of the freshwater-saltwater diffusion zone. Although this concentration is below the current drinking water-quality standard of 250 mg/l for chlorides, it is considered significant because in this case it is indicative of saltwater intrusion and a potential that concentrations could rapidly exceed 250 mg/l by a large margin.

Movement of the Diffusion Zone Boundary

The position of the upper boundary of the diffusion zone beneath Shelter Island is maintained by the pressure of overlying fresh groundwater and groundwater discharge (excess recharge). In addition, the two clay layers beneath the Upper Glacial aquifer prevent upward migration of saline water from underlying formations. However, the boundary does fluctuate in response to changes in groundwater levels caused by recharge, discharge and pumping. When groundwater levels are at their lowest (late fall, early winter), the boundary moves landward, when groundwater levels are at their highest (late spring) it is pushed seaward. Similarly, periods of lower or higher than normal precipitation result in the boundary moving further landward or seaward than normal. This seasonal landward–seaward movement of the boundary can sometimes result in large fluctuations of chloride concentrations in near shore and peninsular area wells. As stated previously however, average annual groundwater recharge (and hence discharge) is high enough that significant landward movement of the boundary does not occur. This is evidenced by the continued availability of fresh groundwater throughout the Island from year to year.

Location of the Diffusion Zone Boundary

Two USGS studies discussed previously, Soren (1978) and Simmons (1986), focused on identifying the upper limit of the diffusion zone and extent of freshwater beneath Shelter Island. When the sediments within an aquifer are consistent and uniform, freshwater is generally estimated to extend to a depth of 40 feet below sea level for every foot in elevation above sea level. If the top of the water table is 4 feet above sea level at a particular point, then fresh water would theoretically extend down to 160 feet below sea level beneath that point. This is based on what is known as the Ghyben-Herzberg principle. However, this principle has been shown not to be completely applicable in the case of Shelter Island because of the marine clay that lies beneath the Upper Glacial aquifer at about 100 feet below sea level. The clay, which is an aquitard, limits the vertical extent of fresh water beneath the Island.

In 1974 Soren installed 17 monitor wells around the Island (51169–51183, 52050 and 52084) approximately 20 feet into the water table (Appendix II). During drilling at 3 well locations, exploratory test borings were advanced to a maximum of 348 feet below grade (about 300 feet below sea level) before the wells were installed at shallower depths. These borings were drilled at well locations 52084 (Manhanset and Cobbetts), 52050 (School and Smith Street) and 51178 (South Cartwright and Foxen Creek) (Appendix III). During drilling of the borings, water samples were collected from various depths for analysis of chlorides. Chloride results for samples collected from the clays and underlying Magothy aquifer ranged between 600 and 10,000 mg/l (Appendix III). Between late February and early June 1974 Soren sampled the 17 wells and analyzed the samples for chlorides in addition to other general water-quality parameters. The monitor well sampling results showed chloride levels ranging between 10 and 25 mg/l (Appendix III).

The results of Soren's study showed that chlorides increased rapidly with depth within the clay units and that water in the clays and underlying Magothy aquifer is brackish to saline. The study also showed that fresh groundwater beneath the Island is limited to the Upper Glacial aquifer and with the exception of near shore areas, the top of the upper clay unit defines the lower boundary of the freshwater reservoir. From his data, Soren created a cross section through Shelter Island depicting the geology and approximate location of the top of the diffusion zone from Hay Beach down through the Shorewood area (Appendix III).

The Simmons study (1986) was completed between 1983 and 1984 as a follow up to the Soren study. Simmons installed ten additional monitor wells (75432–75441) between 12 and 15 feet into the water table (Appendix II). These wells were installed primarily in near shore and peninsular areas including but not limited to Big Ram Island, Little Ram Island, Silver Beach and Dering Harbor Village.

Similar to Soren, Simmons collected chloride samples from various depths during drilling, up to a maximum of 74 feet below sea level, before setting the wells at shallower levels. At several locations including Big Ram (75432), Little Ram (75433), Silver Beach (75437) and South Menantic Road (75438), chloride levels increased rapidly with depth to over 20,000 mg/l, generally between 20 and 40 feet below sea level. At other locations including near Shorewood (75439), South Ferry Hills (75440) and Mashomack (75441), chlorides ranged between 14 and 27 mg/l down to 70 feet below sea level, with no significant increase with depth (Appendix VI). These results showed that when chloride concentrations were above 40 mg/l (considered the leading edge of the diffusion zone) they increased rapidly with depth.

Between September 1983 and April 1984 Simmons sampled his wells and Soren's (27 total) 2 to 3 times. In 22 of the 27 wells chlorides were below 28 mg/l for all sampling rounds. Results for 24 wells showed little to no variation between sampling rounds. Wells at four near shore and peninsular areas showed chloride levels ranging between 14 and 310 mg/l with as much as 290 mg/l of variation between sampling rounds. These wells include 75435 in Dering Harbor, 75437 in Silver Beach, 75438 on South Menantic Road and 75433 on Little Ram (Appendix VI).

Simmons results confirmed that chloride levels within the diffusion zone, indicated by levels above 40 mg/l, increase rapidly with depth. Wells with chloride levels below 40 mg/l showed stable concentrations with depth and between sampling rounds. The results also confirmed that in several near shore and peninsular areas, the top of the diffusion zone rises above the marine clay into the Upper Glacial aquifer. As a result, the vertical extent (thickness) of fresh groundwater in these areas is less compared to inland areas and, therefore, wells in these areas are more susceptible to fluctuating chloride levels and saltwater intrusion.

Groundwater Sampling 2014

As part of this evaluation, two rounds of groundwater sampling were completed for comparison to previous data, which is between 30 and 40 years old. A comparison to current data would show if there have been any significant changes in chloride levels and the position of the diffusion zone since that time. The sampling was conducted in January and June 2014 and included 16 of the existing USGS monitor wells throughout the Island. Thirteen of the sampled wells are part of the current water-level monitoring program. Three additional wells were added to provide data for areas not covered by the other wells. These include Well 75437.2 in Silver Beach, 51183 in Mashomack and 51178 on South Cartwright Road (figure 4).

For each sampling round the wells were sampled over two consecutive days by either the low flow sampling method or bailing. Water levels were measured in each well prior to sampling. Wells with a depth to water of 30 feet or less, which was the majority, were sampled by the low flow method. Wells with a depth to water greater than 30 feet, which exceeds suction limits, were evacuated of 3 well volumes and were then sampled with a bailer. The samples collected during both rounds were analyzed for chlorides by a New York State certified laboratory. In addition measurements of pH, conductivity and temperature were collected in the field during sampling.

Groundwater Sampling Results

Analytical results for the 2014 sampling rounds are summarized on table 2. In addition, the chloride data are presented on figure 5 and are compared to chloride results from the most recent previous sampling event in the mid-1980s. Copies of the laboratory reports are attached in Appendix VII.

As shown on table 2, chloride results from 2014 ranged between Not Detected (ND) and 44.2 mg/l. In general, chloride levels were lower in wells located in the north–northwestern half of the Island (figure 5). In these areas chlorides ranged between 5 and 19 mg/l. Several wells had levels of 10 mg/l or less, which is consistent with naturally occurring levels (Cohen et al., 1968; Lusczynski and Swarzenski, 1966). Lower chloride levels in this part of the Island are also consistent with previous studies which show that in the north and northwestern parts of the Island the vertical extent of fresh water is greatest (about 100 feet below sea level) (Soren, 1978; Simmons, 1986).

Chloride levels in wells in the south and southeastern parts of the Island generally ranged between 20 and 44 mg/l, with a few exceptions that were lower (figure 5). The highest concentrations were detected in Wells 75438 on South Menantic Road, 75437.2 in Silver Beach, 75433 on Little Ram and 75432.2 on Big Ram Island. The highest chloride levels in these wells ranged between 37 and 44.2 mg/l, which essentially represent the upper boundary or top of the freshwater-saltwater diffusion zone. As a result, the thickness of freshwater in these areas, which is roughly equivalent to the bottom elevations of these wells, ranges between 10 and 20 feet, respectively (table 2; figure 5).

Between the January and June sampling rounds, chloride concentrations in most wells were consistent varying only a few milligrams per liter or less, however there were a few exceptions. Well 75437.2 in Silver Beach went from 7.11 mg/l in January to 40.8 mg/l in June. Historical data for this well are not available for comparison as it had not been sampled previously. However, 40.8 mg/l is considered to be the more representative result based on this wells' location, its depth and the results for other wells in similar areas (figure 5). The January result (7.11 mg/l) is considered anomalous and not representative. Well 73974 in Shelter Island Heights also showed an increase between the two rounds going from 3.27 to 19.1 mg/l. This well also has not been sampled previously making it difficult to discern which of these results are representative as both are consistent with other wells in this part of the island. The results for well 51177 on South Ferry Road were consistent between January and June but they were uncharacteristically lower than historical results and results for other wells in the area (table 3; figure 5). For all three of these wells the variability in the data suggests they may not be yielding representative samples. Considering the age of the wells (30-40 years) this is not uncommon. Additional sampling would be needed to determine the reliability of water quality data generated from these wells.

Table 3 compares current chloride sampling results to historical data primarily from the 1970s and 1980s. In comparison to historical results, data from 2014 were generally consistent or fell within a previously established range. In Well 51183 in the Mashomack Preserve chlorides were detected at 9.6 mg/l in 1986 and in 2014 they were 11.6 and 13.2 mg/l. In 1985, chlorides were detected at 5.6 mg/l in Well 51182 in Hay Beach and in 2014 they were 5.06

and 8.6 mg/l. Other locations show minor fluctuations with no significant increase or decrease (less than 4 mg/l over 30-40 years) including Wells 75435 in Dering Harbor and 51170 off Brander Parkway.

More significant fluctuations in chloride concentrations were observed in Wells 75438 on South Menantic Road, 51178 on South Cartwright, 75432.2 on Big Ram Island and 75433 on Little Ram Island. In the South Menantic well, chlorides went from 20 mg/l in 1984 to 39.9 and 44.2 mg/l in 2014. This well is known to have widely varying chloride levels and they were as high 180 mg/l in 1983 (table 3) (Simmons, 1986). The chlorides in Well 51178 on South Cartwright went from 12 mg/l in 1984 to 20.1 and 20.6 mg/l in 2014. However, chlorides were also detected at 20 mg/l in this well in 1975 (table 3). In Well 75432.2 on Big Ram Island, chlorides were detected at 22 mg/l in 1984. In January and June 2014 they were detected at 22.1 and 37.7 mg/l respectively. These results show virtually no change between 1984 and January 2014, but a significant variation between January and June 2014. In Well 75433 on Little Ram Island chlorides went from 110 mg/l in 1984 to 37.7 and 38.5 mg/l in 2014. Chloride levels in both these wells have also been shown to be subject to significant fluctuations consistent with their locations in peninsular areas (table 3) (Simmons, 1986).

Based on a comparison of recent and historical chloride data to well bottom elevations, an approximate vertical extent of fresh water at each well location has been estimated and is presented on table 2. In addition, an updated estimate of the vertical extent of fresh water along the north–south cross section originally presented by Soren (1978) and Simmons (1986) is shown on figures 6 and 7. The vertical extent (thickness) of fresh water is least in near shore and peninsular areas including the areas around South Menantic Road, Little Ram Island, Big Ram Island and Silver Beach where it is estimated to range between 10 and 20 feet, respectively. Areas where the extent of fresh water is greatest are in the center and north–northwestern portions of the Island (table 2; figure 6) which is consistent with results presented previously by Soren (1978) and Simmons (1986).

With respect to the existing irrigation systems on the Island (excluding cistern systems), the sampling results show no correlation between chloride levels and the presence of irrigation systems. The highest chloride concentrations were detected in wells on South Menantic Road

(75438) and in Silver Beach (75437.2). However there is only one irrigation system mapped in each of those areas. In contrast, Well 51182 in the Hay Beach area, where there are approximately 25 irrigation systems, had some of the lowest chloride concentrations at 5.06 and 8.6 mg/l. This well also shows no significant change in chlorides over the last 30-40 years (table 3).

Overall, comparison of chloride data from 2014 to that from the 1970s and 1980s shows no evidence of significant landward migration of the diffusion zone boundary over that time. With a few exceptions, chloride concentrations have remained relatively stable or decreased slightly. Some wells in near shore and peninsular areas, where the top of the diffusion zone is known to be shallower, show wide variations in chloride concentrations consistent with their locations and historical results, but a significant increasing trend is not apparent at any location. Additional chloride data from all of these wells would be beneficial for establishing a baseline for future comparison and identifying long term trends.

SUMMARY AND CONCLUSIONS

- The only fresh groundwater beneath Shelter Island occurs as a lens within the Upper Glacial aquifer, which is the uppermost geologic formation beneath the Island. The Upper Glacial aquifer extends to a maximum depth of approximately 100 feet below sea level beneath the north–northwestern parts of the Island. Underlying the Upper Glacial aquifer are two clay layers that have a combined thickness of up to 200 feet. Water within these clays and underlying formations is brackish to saline. Inland waterways including Coecles and West Neck Harbors limit the horizontal extent of fresh water beneath peninsula areas like Little Ram Island, Big Ram Island, and Silver Beach to the areal extent of those peninsulas.

- Groundwater level elevations beneath Shelter Island generally range between 1 and 8 feet above sea level. The highest elevations tend to occur center island and in the Shelter Island Heights area and the lowest occur in near shore and peninsular areas. Groundwater flow is outward from areas of higher elevation toward the surrounding surface-water bodies resulting in different sub-watersheds or flow regimes throughout the Island. Long-term water-level monitoring shows that groundwater levels normally fluctuate between 1 and 3 feet seasonally and that over the long term they have risen several tenths of a foot on average. The rise in water levels is consistent with a documented long-term trend of increasing precipitation.

- Average groundwater recharge to Shelter Island is estimated to be 5 billion gallons per year, based on average precipitation of 48 inches per year and a 50 percent recharge rate. Average annual groundwater demand on the Island is estimated at 252 million gallons per year or approximately 5 percent of the annual recharge. Previous estimates of the ratio of recharge to demand of 5 and 6 percent date back to the 1970s indicating there has been little change over the last 40 years.

- Total consumptive use, or water lost from the system is estimated at 60 million gallons per year or 1.2 percent of the average annual recharge of 5 billion gallons. Consumptive use attributed to the 109 permitted irrigation systems is estimated at 4.3 million gallons per year or about 7 percent of the total consumptive use and less than one tenth of one percent of the average annual recharge. With consumptive use at 1.2 percent of total recharge, there are sufficient water resources available to support the water-supply demands of Shelter Island. With more than 98 percent of average annual recharge discharging to surrounding surface-water bodies, significant landward movement of saline groundwater is considered unlikely.

- The upper boundary or top of the freshwater–saltwater diffusion zone is defined by a chloride concentration of 40 mg/l. Once at this concentration, chloride levels increase rapidly with depth. Throughout most inland portions of the Island the top of the marine clay, which underlies the Upper Glacial aquifer, marks the beginning or top of the diffusion zone. From the top of the marine clay downward, chloride concentrations increase significantly. The top of the marine clay ranges between 50 and 100 feet below sea level sloping downward from south to north across the Island. In near shore and peninsular areas, including but not limited to Little Ram Island, Big Ram Island

and Silver Beach, the top of the diffusion zone extends upward beyond the top of the clay into the Upper Glacial aquifer, reducing the thickness of fresh water in those areas to between 10 and 20 feet. As a result, wells in near shore and peninsular areas are more susceptible to saltwater intrusion than wells in other parts of the Island. Although individual incidents of saltwater intrusion have reportedly occurred, there is no evidence of widespread saltwater intrusion occurring in these areas.

- Chloride sampling completed in 2014 shows concentrations ranging between Not Detectable and 44 mg/l across the Island. The lowest levels were generally found in wells in the north–northwestern parts of the Island where the thickness of fresh water is expected to be the greatest and the diffusion zone boundary the deepest. The highest concentrations of 37 to 44 mg/l were detected in wells on Little Ram Island, Big Ram Island, South Menantic Road and Silver Beach confirming the limited thickness of fresh water in these areas. No correlation was observed between elevated chloride levels and the location of permitted irrigation systems on the Island.

- A comparison of recent chloride sampling results to historical data shows no evidence of increasing chloride trends or significant landward migration of the diffusion zone boundary over that time. This is likely attributed to an increasing precipitation trend and the high ratio of recharge to consumptive use for the Island, which results in a high quantity of groundwater discharge.

- Based on the available information, there is no evidence that operation of permitted irrigation systems, in accordance with the current irrigation regulations, has adversely impacted groundwater resources on Shelter Island. This is attributed to several factors including; only about 4 percent of the homes on the Island have systems; the Island has high ratio of recharge to consumptive use; the distribution of irrigation systems around the Island and, the existing irrigation restrictions.

RECOMMENDATIONS

- A regular ongoing chloride monitoring program should be implemented to establish a database of chloride concentrations throughout the Island. This will allow identification of normal fluctuations and long-term trends. Monitored wells should include a representative set (to be determined) of existing monitor wells around the Island, as well as select residential wells associated with irrigation systems, primarily in near shore and peninsular areas. To mitigate the cost of sampling, the Town could consider reducing the frequency of water-level monitoring between the months of October and May from monthly to quarterly and combining sampling with a water-level monitoring event.

- Additional monitor wells should be installed to the bottom of the Upper Glacial aquifer at several locations around the Island to allow better monitoring of the diffusion zone boundary. Most existing monitor wells do not extend more than 45 feet below sea level and the majority is less than 30. The bottom of the Upper Glacial aquifer, where increasing chlorides would be detected first, ranges between 50 and 100 feet below sea level.

- If operation of existing irrigation systems is allowed to continue, the irrigation regulations should be revised to allow (or require) users in near shore and peninsular areas to spread their irrigation demand out over several days instead of having it occur all on one day. Under the existing regulations all zones of an irrigation system are watered once every three days. With a maximum allowable run time of 20 minutes per zone and maximum rate of 12 gallons per minute, a well serving a system with three zones would operate for 60 minutes and produce 720 gallons during the irrigation cycle. If the three zones could be irrigated on separate days, the well in this scenario would operate 20 minutes and produce 240 gallons a day with each zone still irrigated once every three days. If a system has more than three zones they could be allowed to irrigate up to two zones a day, as long as no zone is irrigated more than once every three days. The total volume of water used in three days is the same, but the demand is spread out over several days instead of occurring all on one day. Reducing the pumping time and volume of water produced during the irrigation cycle reduces the stress on the well and the potential for an individual well to cause localized saltwater intrusion.

- The Town should investigate the possibility of using gray water (treated effluent) from the Shelter Island Heights wastewater treatment plant to fill cistern systems on the Island used for irrigation. The Shelter Island Heights treatment plant has a maximum discharge limit of approximately 53,000 gallons per day. Currently, this water is discharged to surface water near the North Ferry area. Treated effluent contains nitrates (a fertilizer component) among other things, and is known to contribute to algal blooms and other problems in receiving water bodies. Although cistern based irrigation systems do not use groundwater, they are currently required to be filled with water from off island, which makes them costly to operate and thus not an attractive option. Cistern systems are required to have a minimum capacity of 8,000 gallons. At 53,000 gallons per day, there would be enough gray water available to fill approximately six, 8,000 gallon cisterns a day. Currently, there are only 14 cistern systems mapped on the Island. Additional treatment of the gray water would be required before it could be used for this purpose. However using gray water for irrigation, which is a common practice, would reduce the amount of effluent discharged to surface water, reduce the need to truck in off island water and, reduce the cost of operating a cistern system. This would potentially make cistern systems a more attractive option. The cost for operating cistern systems could also be mitigated by diverting storm water runoff from roof drains into the cisterns. There is an average of 3.8 inches of precipitation per month in June, July and August. This results in approximately 2,300 gallons of runoff per month, per 1,000 square feet of a structures footprint. This water would otherwise be lost through evaporation, transpiration or overland runoff as very little groundwater recharge occurs during the growing season. As a result, capturing it would not affect groundwater recharge to the island but it would reduce the amount of water pumped for irrigation.

LEGGETTE, BRASHEARS & GRAHAM, INC.

John Benvegna, CPG
Vice President

dmd
June 27, 2014
f:\reports\shelter island\report\hydro eval rpt.doc

TABLES

TABLE 1

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Precipitation Normals 1961 to 2010 [1)]

Station Name	Precipitation Normals (inches)			Net Change
	1961 to 1990	1971 to 2000	1981 to 2010	
Bridgehampton	45.66	47.92	50.14	4.48
Greenport Power House	44.95	45.91	47.30 [2)]	2.35
Riverhead Research Farm	45.27	46.82	47.75	2.48
Average	45.29	46.88	48.40	3.11

1) Data from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center; Normals are averages for the indicator 30-year periods, which are updated at 10-year intervals.

2) Precipitation data for the Greenport Power House is not available after June 2000.

TABLE 2

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Groundwater Sampling Results
January and June, 2014

USGS Well ID	Chloride Concentrations		Groundwater Level Elevations		Bottom of Well Elevations	Approximate Thickness of Fresh Water 1/	Approximate Diffusion Zone Boundary Elevation 1/	Well Locations
	January	June	January	June				
(see figure 4)	mg/l	mg/l	ft above msl	ft above msl	ft below msl	feet	ft below msl	(see figure 4)
S 38461	15.20	10.8	4.42	6.22	29.28	40 - 45	36 - 41	Congdon & Ferry Rd
S 51169	10.00	9.34	1.48	2.18	20.92	65 - 75	64 - 74	Rocky Pt & Belvedere Ave
S 51170	29.40	30.4	1.8	2.14	20.23	30 - 35	28 - 33	Brander Pkwy & Lilliput Ln
S 51176	9.45	19.8	2.95	4.77	14.38	40 - 50	37 - 47	N. Ferry & Manwaring Rd
S 51177	2.17	ND	2.64	3.52	15.88	35 - 40	32 - 37	S. Ferry & Deer Pk Ln
S 51178	20.10	20.6	2.94	4.61	16.80	30 - 35	27 - 32	N. Cartwright & S. Ferry
S 51182	5.06	8.6	1.81	2.77	18.83	60 -70	58 - 68	Westview & Hay Beach Rd
S 51183	11.60	13.2	NM	3.37	10.00	40 - 50	37 - 47	Mashomack Preserve
S 52084	8.96	8.0	2.17	3.62	42.95	90 - 100	88 - 98	Manhanset Rd & Cobbetts Ln
S 73974	3.27	19.1	5.83	6.63	0.85	NC	NC	Shelter Is Golf Course
S 75432.2	22.10	37.7	0.73	0.70	7.65	18 - 20	17 - 19	Big Ram Island
S 75433	37.70	38.5	0.22	1.59	16.60	18 - 20	18 - 20	Little Ram Island
S 75435	17.70	18.2	1.3	2.07	15.20	35 - 40	33 - 38	Locust Rd & Dering Ln
S 75437.2	7.11	40.8	0.42	0.73	21.80	15 - 20	14 - 19	White Birch & N. Silver Bch
S 75438	39.90	44.2	1.02	1.29	9.26	10 -12	9 - 11	South Menantic Rd
S 90279	20.40	18.7	1.15	1.75	15.25	30 - 35	29 - 34	Osprey & Shorewood Rd

1/ Extrapolated from historic chloride data (table 3) and hydrogeologic data from Soren (1978) and Simmons (1986)
mg/l - Milligrams per liter

ND - Not Detected
NM - Not measured.
NC - Not calculated - insufficient data for determination.

TABLE 3

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

Historical Groundwater Quality
1969 - 2014

USGS Well ID (See Figure 2)	Bottom of Well Elevation ft bsl 1)	Sample Collection Date	Chloride mg/l 2)	Specific Conductance (field measured) uS/cm 3)	Nitrate as N mg/l	Orthophos-phate as P mg/l
S 38461	31.0	01/09/2014	15.2	227	0.264	<0.100
Congdon Rd and Ferry Rd		06/04/2014	10.8	249	NS	NS
S 51169	23.7	10/22/1969	12	155	1.4	0.005
Rocky Point Ave and Belvedere Ave		03/07/1974	10	161	1.9	--- 4)
		04/18/1975	---	155	1.8	< 0.010
		10/22/1979	12	155	1.4	0.005
		02/25/1980	13	146	1.5	0.003
		05/06/1980	12	138	---	---
		04/06/1981	10	126	1.2	0.01
		03/10/1982	11	137	1.3	0.01
		07/06/1982	11	114	1.1	---
		09/22/1982	12	114	1.1	---
		09/28/1983	13	131	0.86	---
		11/29/1983	12	95	0.9	---
		04/02/1984	14	97	1.1	---
		04/23/1984	13	115	0.66	---
		07/11/1984	19	102	0.83	0.01
		01/09/2014	10.0	120	<0.050	<0.100
		06/04/2014	9.3	180	NS	NS
S 51170	24.2	02/28/1974	22	108	0.28	< 0.010
Brander Parkway and Lilliput Ln		10/22/1979	26	135	0.19	0.003
		02/25/1980	26	125	0.32	0.003
		05/06/1980	23	118	---	---
		04/02/1981	22	106	< 0.40	---
		03/10/1982	23	120	0.07	< 0.002
		06/02/1982	24	112	< 0.40	---
		09/22/1982	25	108	0.4	---
		09/28/1983	28	129	0.4	---
		11/29/1983	28	106	0.1	---
		04/02/1984	27	96	< 0.100	---
		04/23/1984	25	110	0.05	---
		05/21/1984	26	115	0.09	---
		07/16/1984	26	110	0.13	---
		01/08/2014	29.4	295	<0.050	<0.100
		06/04/2014	30.4	292	NS	NS

TABLE 3

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Historical Groundwater Quality 1969 - 2014

USGS Well ID (See Figure 2)	Bottom of Well Elevation ft bsl 1)	Sample Collection Date	Chloride mg/l 2)	Specific Conductance (field measured) uS/cm 3)	Nitrate as N mg/l	Orthophos-phate as P mg/l
S 51176	19.4	03/05/1974	13	125	1.2	< 0.010
N Ferry Rd and Manwaring Rd		04/15/1975	10	105	1.75	< 0.010
		10/26/1979	36	210	1.3	< 0.002
		02/21/1980	33	190	1.2	< 0.002
		04/30/1980	52	233	---	---
		04/07/1981	43	200	1.5	< 0.002
		09/27/1983	18	124	1.17	---
		12/07/1983	15	136	1.1	---
		04/04/1984	17	102	1.5	---
		05/09/1984	16	135	1.5	---
		07/10/1984	14	123	1.1	---
		11/17/2003	---	140	1.46	< 0.02
		01/08/2014	9.45	293	0.205	<0.100
		06/04/2014	19.8	199	NS	NS
S 51177	21.5	02/28/1974	13	111	0.53	< 0.010
S Ferry Rd and Deer Park Ln		04/14/1975	20	125	0.15	< 0.010
		10/29/1979	17	120	0.04	0.004
		02/29/1980	15	118	0.1	< 0.002
		04/28/1980	15	109	---	---
		04/14/1981	21	124	< 0.05	---
		06/02/1982	20	134	0.4	---
		09/20/1982	16	109	0.2	< 0.002
		09/29/1983	15	84	< 0.070	---
		12/14/1983	23	117	0.9	---
		04/03/1984	17	90	< 0.090	---
		05/21/1984	22	112	< 0.50	---
		07/03/1984	18	100	0.06	---
		01/08/2014	2.17	48	<0.050	<0.100
		06/04/2014	ND	32	NS	NS

TABLE 3

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Historical Groundwater Quality 1969 - 2014

USGS Well ID (See Figure 2)	Bottom of Well Elevation ft bsl 1)	Sample Collection Date	Chloride mg/l 2)	Specific Conductance (field measured) uS/cm 3)	Nitrate as N mg/l	Orthophos-phate as P mg/l
S 51178	19.0	06/12/1974	14	200	---	---
N Cartwright Rd and S Ferry Rd		04/14/1975	20	175	1.15	< 0.010
		10/18/1979	14	160	0.68	0.003
		02/14/1980	11	150	0.86	< 0.002
		04/28/1980	12	135	---	---
		04/01/1981	11	155	1.5	---
		05/26/1982	12	120	0.3	---
		06/01/1982	10	136	0.8	---
		09/20/1982	13	123	0.6	---
		09/29/1983	11	104	0.58	---
		12/16/1983	11	125	0.7	---
		04/03/1984	13	111	0.8	---
		05/16/1984	9	135	0.4	---
		07/15/1984	12	132	0.7	---
		01/08/2014	20.1	297	<0.500	<0.100
		06/04/2014	20.6	286	NS	NS
S 51182	20.9	02/28/1974	10	80	0.29	< 0.010
Westview Rd and Hay Beach Rd		04/15/1975	10	64	0.37	---
		10/19/1979	7.9	68	---	< 0.002
		02/15/1980	6	61	---	< 0.002
		05/05/1980	6	58	---	---
		03/30/1981	5.3	57	0.2	< 0.002
		02/03/1982	3.5	29	0.2	---
		06/03/1982	< 4.0	29	< 0.04	---
		09/21/1982	11	66	< 0.40	---
		09/28/1983	9.1	55	< 0.070	---
		12/08/1983	7.8	145	< 5.90	---
		04/04/1984	8.2	42	< 0.100	---
		07/17/1984	10	65	< 0.05	< 0.002
		08/26/1985	5.6	58.2	0.08	---
		01/09/2014	5.06	143	0.140	<100
		06/04/2014	8.6	151	NS	NS

TABLE 3

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

Historical Groundwater Quality
1969 - 2014

USGS Well ID (See Figure 2)	Bottom of Well Elevation ft bsl 1)	Sample Collection Date	Chloride mg/l 2)	Specific Conductance (field measured) uS/cm 3)	Nitrate as N mg/l	Orthophos-phate as P mg/l
S 51183	10.0	03/12/1974	13	---	1.2	---
Mashomack Preserve		09/27/1974	17	100	0.52	0.01
		04/18/1975	---	104	0.54	< 0.004
		10/18/1979	12	115	0.49	0.003
		02/14/1980	12	110	0.38	0.003
		05/07/1980	11	98	---	---
		04/01/1981	9	89	0.12	0.01
		05/26/1982	11	88	< 0.20	---
		09/23/1982	18	100	< 0.40	---
		09/29/1983	12	54	0.1	---
		12/08/1983	12	88	0.09	---
		04/03/1984	14	66	0.1	---
		04/18/1984	5	88	< 0.04	---
		07/23/1986	9.6	103	0.1	0.01
		01/09/2014	11.6	113	<0.050	<0.100
		06/04/2014	13.2	158	NS	NS
S 52084	45.6	06/11/1974	14	160	---	---
Manhanset Rd and Cobbetts Ln		04/15/1975	14	135	0.45	0.01
		10/18/1979	12	120	0.37	0.003
		02/19/1980	11	112	0.37	0.003
		05/05/1980	10	108	---	---
		03/31/1981	9.7	93	0.07	---
		08/05/1981	12	100	0.48	---
		02/10/1982	9.8	100	0.2	0.01
		06/01/1982	10	110	0.7	---
		09/21/1982	12	97	0.6	---
		09/28/1983	15	133	1.16	---
		12/08/1983	13	120	1.4	---
		04/03/1984	14	98	1.5	---
		05/10/1984	12	115	1.5	---
		07/09/1984	14	111	1.1	---
		01/09/2014	8.96	221	<0.050	0.178
		06/04/2014	8.0	203	NS	NS

TABLE 3

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

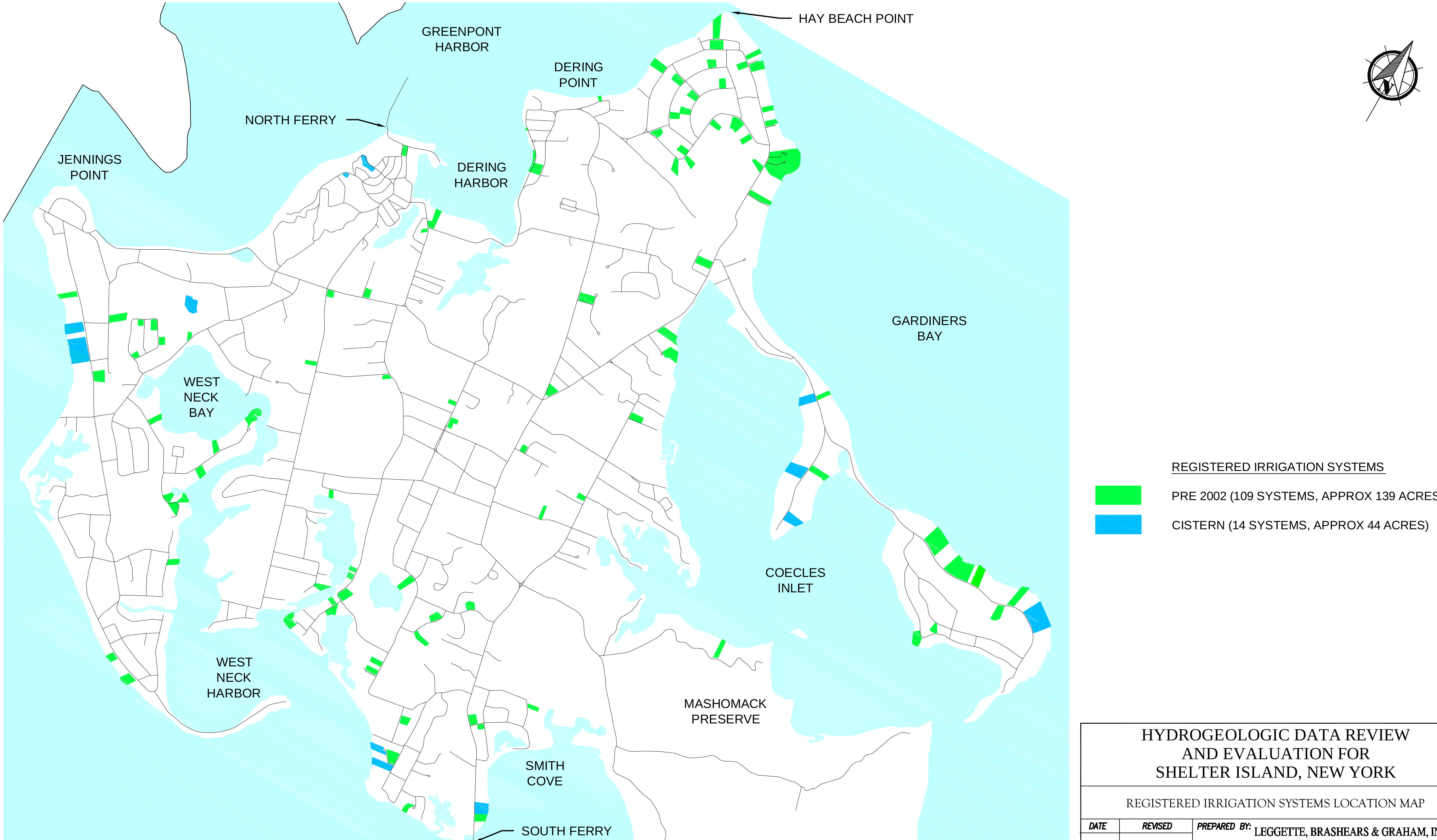
Historical Groundwater Quality 1969 - 2014

USGS Well ID (See Figure 2)	Bottom of Well Elevation ft bsl[1)]	Sample Collection Date	Chloride mg/l[2)]	Specific Conductance (field measured) uS/cm[3)]	Nitrate as N mg/l	Orthophos-phate as P mg/l
S 73974	3.5	01/09/2014	3.27	37	0.154	<0.100
Shelter Island Golf Course		06/04/2014	19.1	184	NS	NS
S 75432.2	8.0	12/15/1983	25	131	<0.10	---
Big Ram Island		03/26/1984	22	128	<0.10	---
		01/09/2014	22.1	131	0.134	<0.100
		06/04/2014	37.7	185	NS	NS
S 75433	17.0	12/15/1983	23	128	< 0.100	---
Little Ram Island		03/26/1984	110	476	< 0.100	---
		01/09/2014	37.7	183	0.183	<0.100
		06/04/2014	38.5	183	NS	NS
S 75435	15.3	12/14/1983	64	338	1.38	---
Locust Rd and Dering Ln		04/05/1984	14	118	1.5	---
		01/09/2014	17.7	210	2.84	<0.100
		06/04/2014	18.2	207	NS	NS
S 75437.2	21.5	01/08/2014	7.11	67	0.576	<0.100
White Birch Rd and N Silver Beach Rd		06/04/2014	40.8	172	NS	NS
S 75438	12.0	12/19/1983	180	663	0.4	---
Menantic Rd and Conrad Rd		04/06/1984	20	112	0.2	---
		01/08/2014	39.9	485	1.11	1.19
		06/04/2014	44.2	399	NS	NS
S 90279	2.5	01/08/2014	20.4	211	5.39	<0.100
Osprey Rd and Shorewood Rd		06/04/2014	18.7	172	NS	NS

1) Feet below mean sea level
2) Milligrams per liter
3) Microsiemens per centimeter

--- Indicates no data available
NS - Not sampled
ND - Not Detected

FIGURES



HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

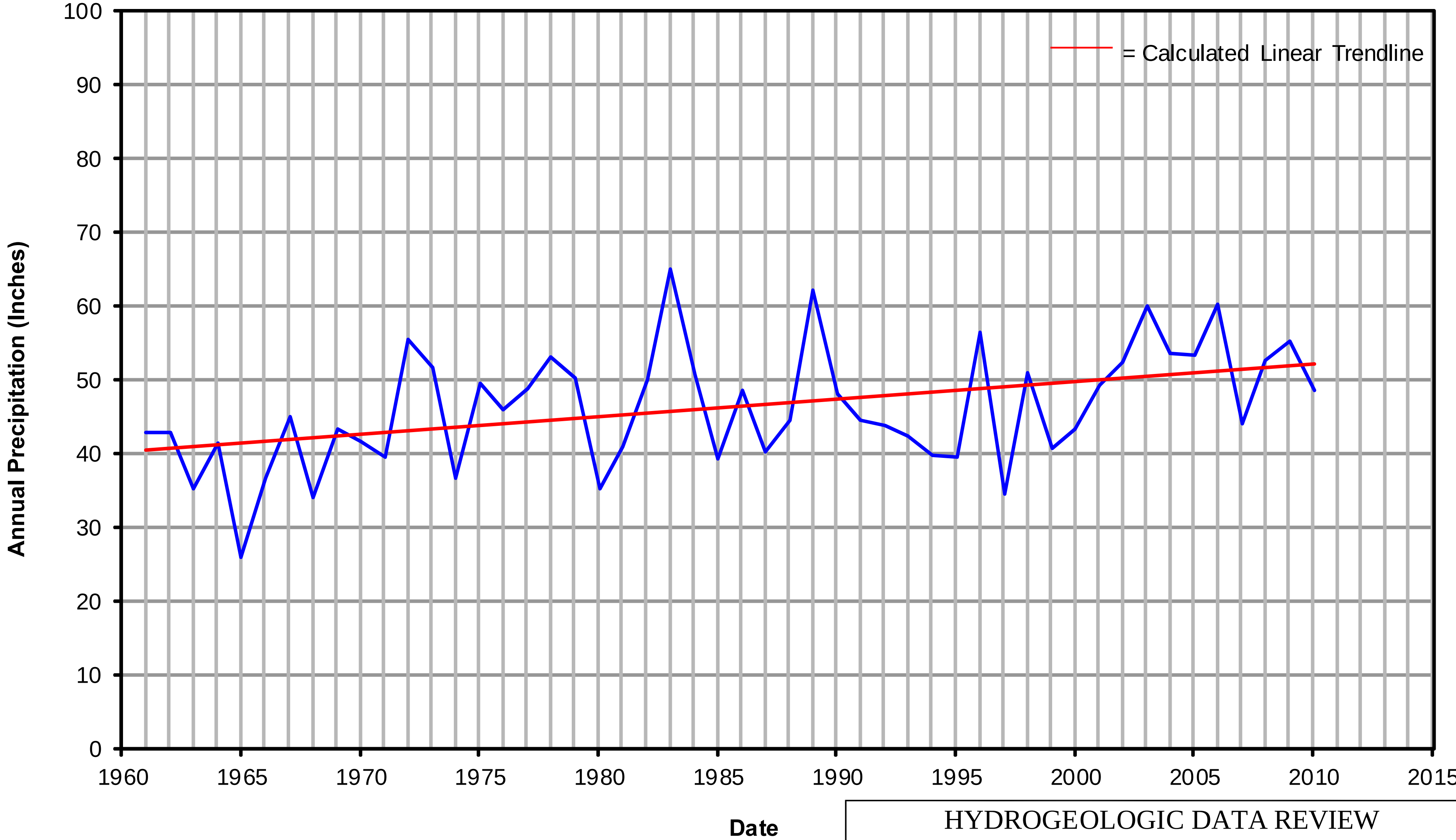
REGISTERED IRRIGATION SYSTEMS LOCATION MAP

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

DRAWN:	RAC	CHECKED:	JB	DATE:	06/27/14	FIGURE:	1

SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.



NOTE:
DATA FROM NCDC GREENPORT AND BRIDGEHAMPTON, NEW YORK STATIONS.

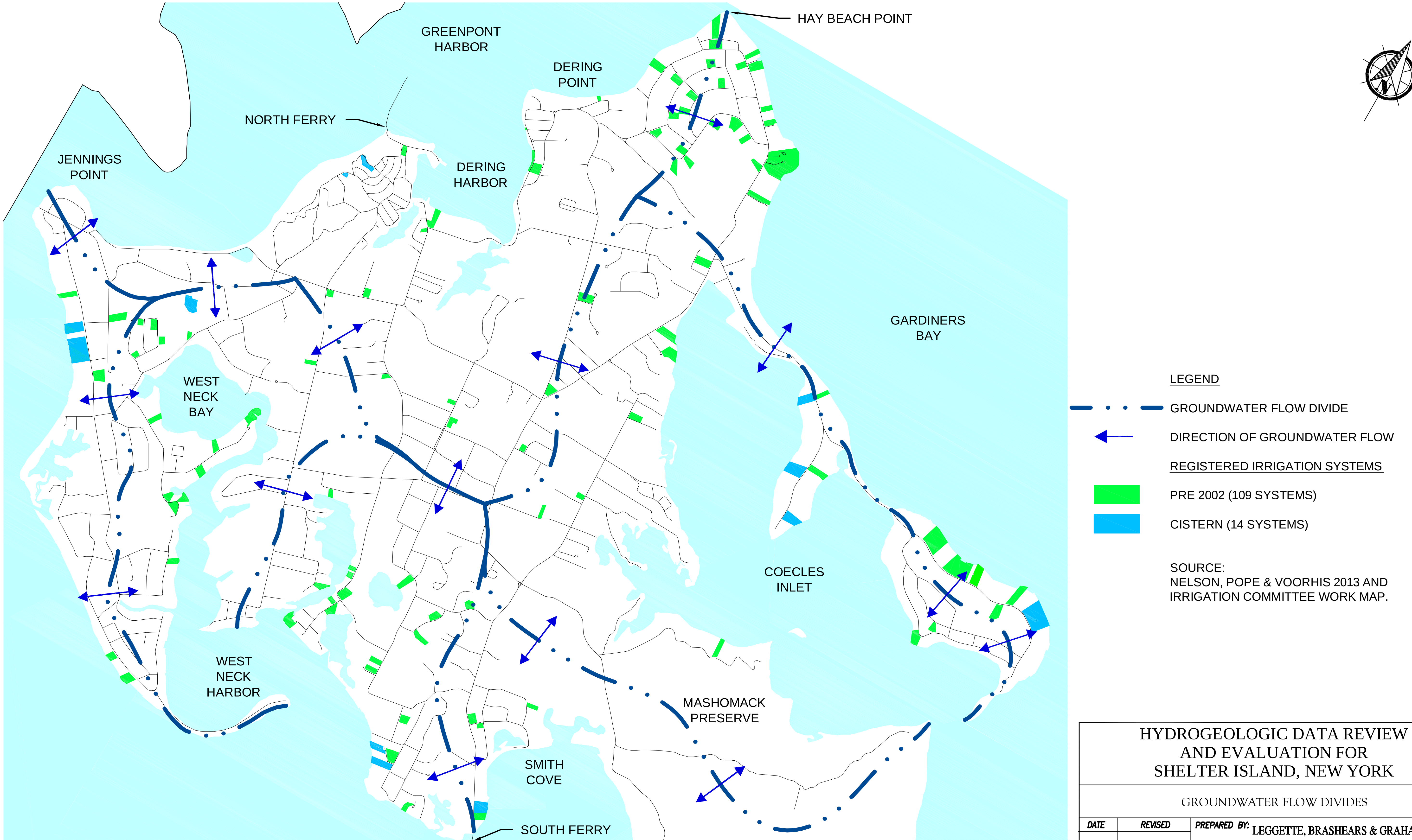
HYDROGEOLOGIC DATA REVIEW
AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

HISTORICAL PRECIPITATION DATA: 1961 TO 2010

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

DRAWN:	RAC	CHECKED:	JB	DATE:	06/27/14	FIGURE:	2



0 2500
SCALE IN FEET

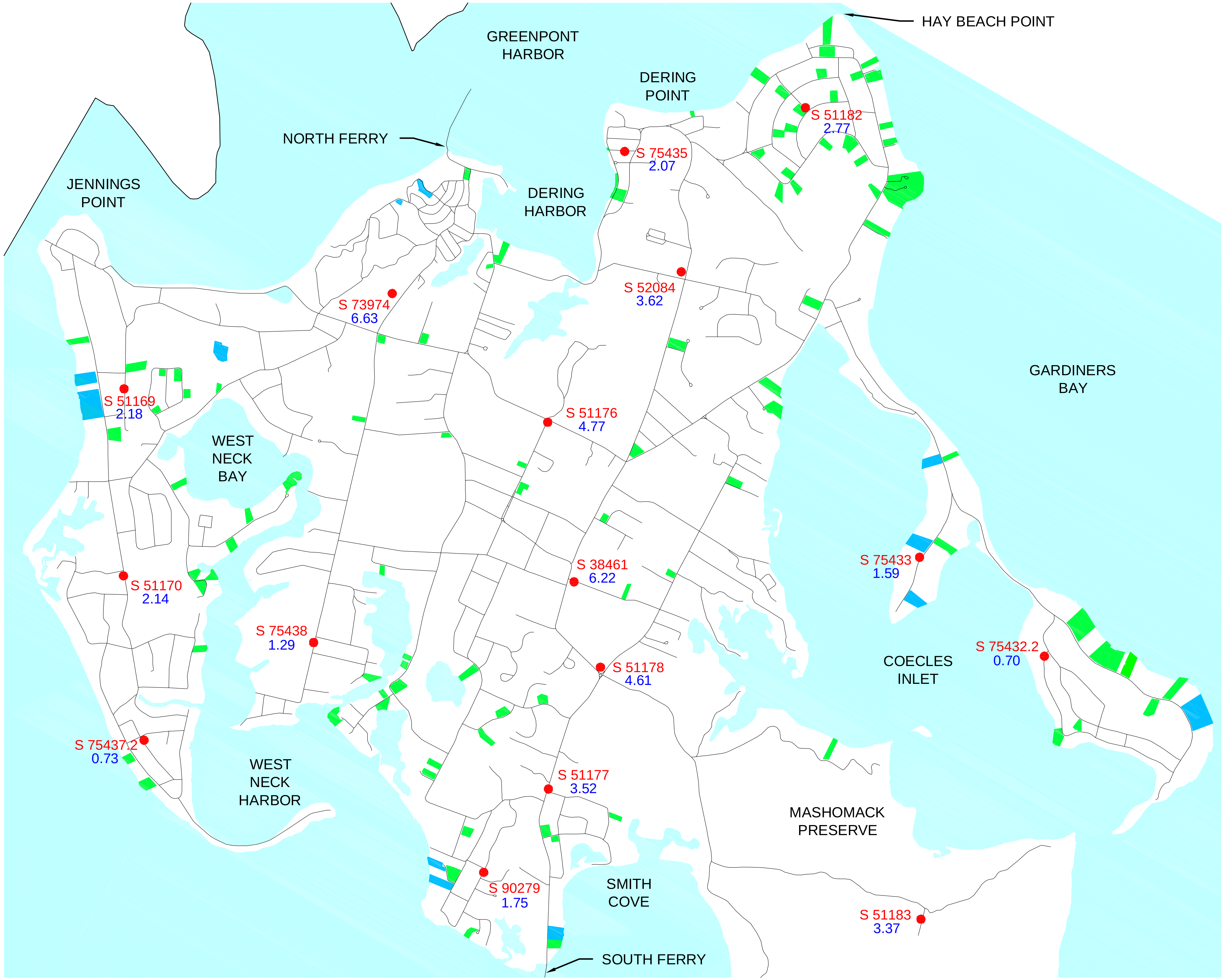
SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.

HYDROGEOLOGIC DATA REVIEW
AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

GROUNDWATER FLOW DIVIDES

DATE	REVISED	PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
		Professional Groundwater and Environmental Engineering Services
		4 Westchester Park Drive
		Suite 175
		White Plains, NY 10604
		(914) 694-5711

DRAWN: RAC | CHECKED: JB | DATE: 06/27/14 | FIGURE: 3



LEGEND

S 51170 — USGS MONITORING WELL

2.14 — GROUNDWATER LEVEL ELEVATION IN FT ABOVE MEAN SEA LEVEL ON JUNE 4 & 5, 2014

REGISTERED IRRIGATION SYSTEMS

PRE 2002 (109 SYSTEMS)

CISTERN (14 SYSTEMS)

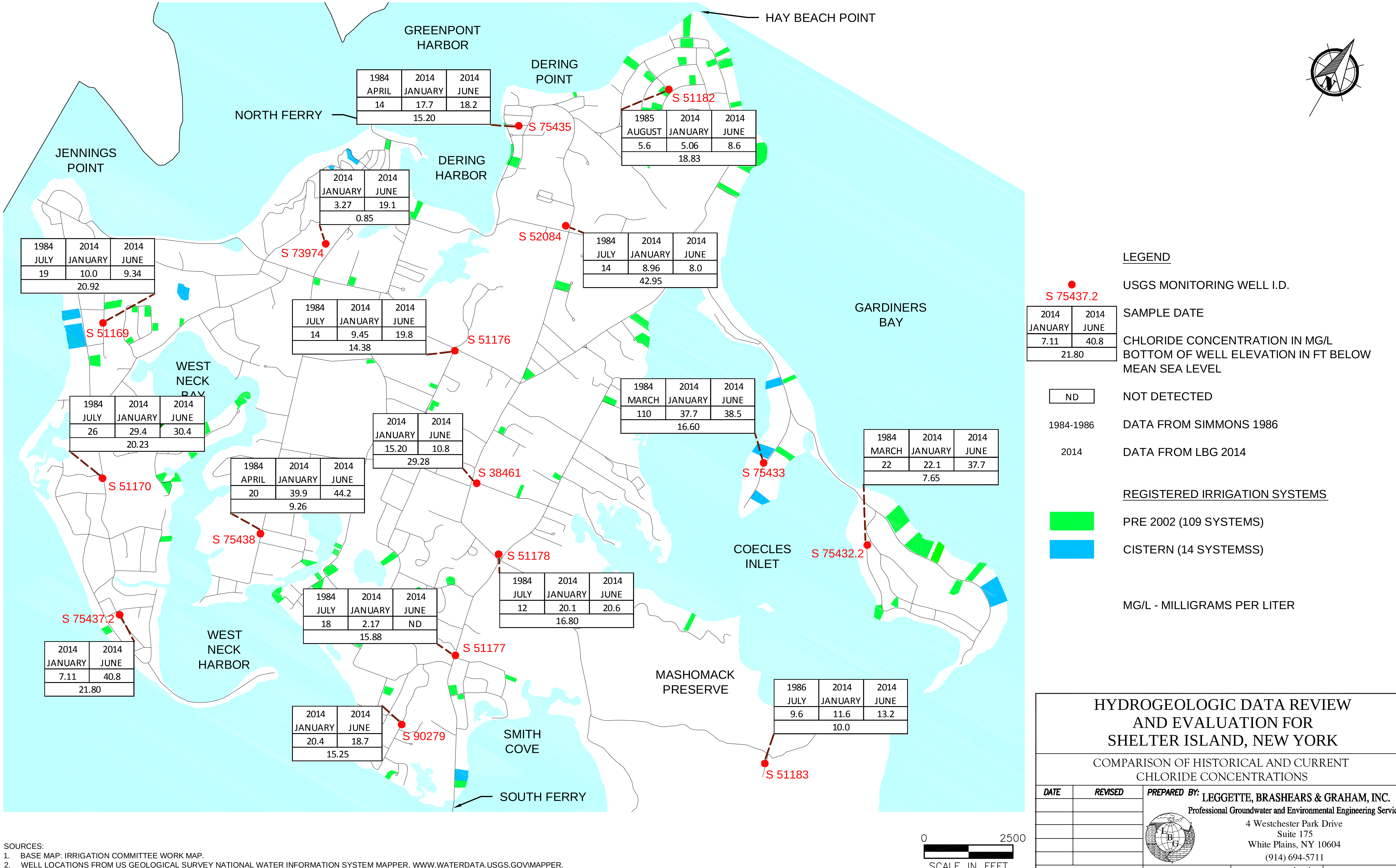
HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

WELLS SAMPLED IN JANUARY AND JUNE 2014

DATE	REVISED	PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
		Professional Groundwater and Environmental Engineering Services 4 Westchester Park Drive Suite 175 White Plains, NY 10604 (914) 694-5711

DRAWN: RAC | CHECKED: JB | DATE: 06/27/14 | FIGURE: 4

SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.
2. WELL LOCATIONS FROM US GEOLOGICAL SURVEY NATIONAL WATER INFORMATION SYSTEM MAPPER, WWW.WATERDATA.USGS.GOV\MAPPER.



HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

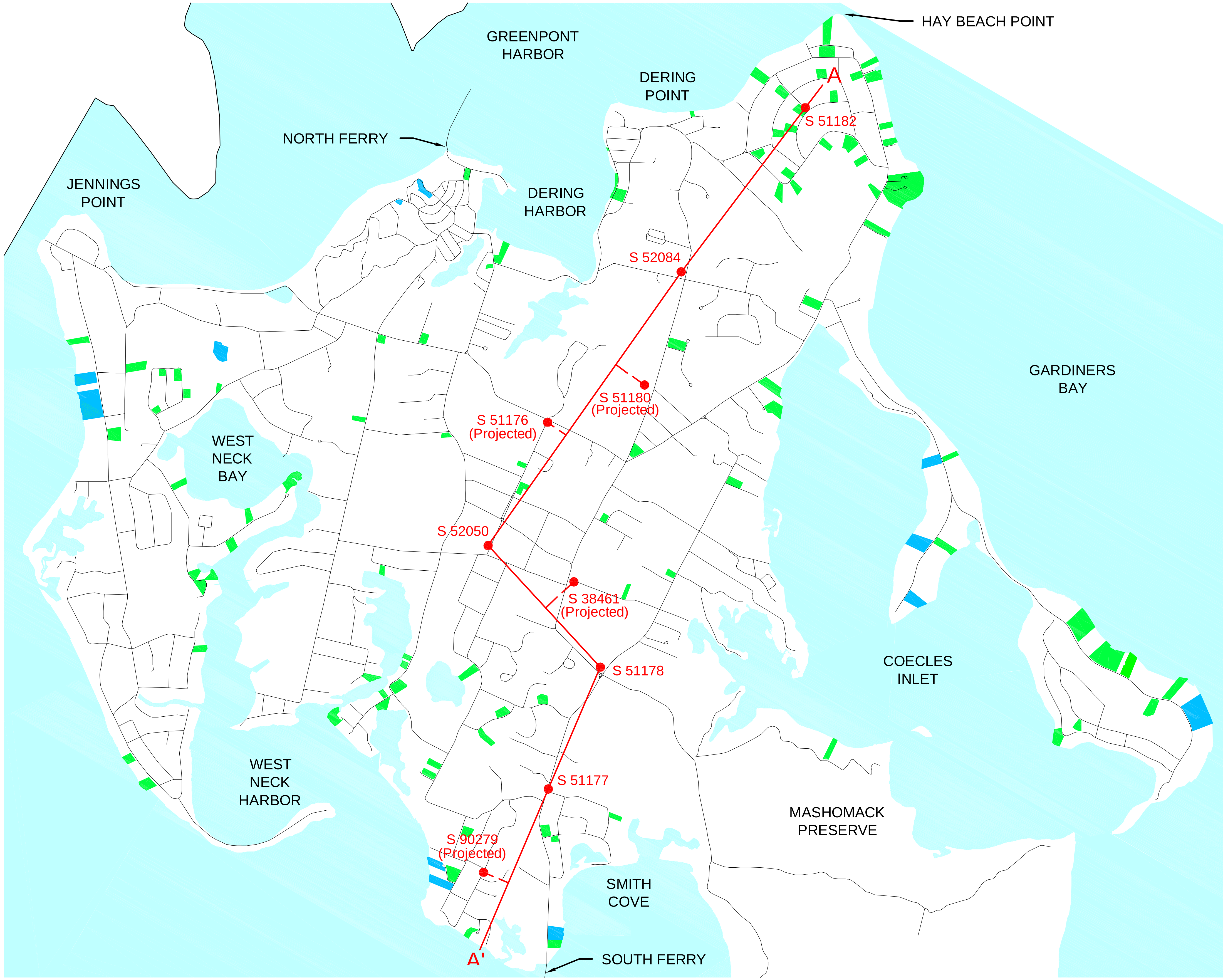
COMPARISON OF HISTORICAL AND CURRENT CHLORIDE CONCENTRATIONS

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

DRAWN: RAC | CHECKED: JB | DATE: 06/27/14 | FIGURE: 5

SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.
2. WELL LOCATIONS FROM US GEOLOGICAL SURVEY NATIONAL WATER INFORMATION SYSTEM MAPPER, WWW.WATERDATA.USGS.GOV\MAPPER.



LEGEND

● S 52084 — USGS MONITORING WELL

REGISTERED IRRIGATION SYSTEMS

PRE 2002 (109 SYSTEMS)

CISTERN (14 SYSTEMS)

SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.
2. WELL LOCATIONS FROM US GEOLOGICAL SURVEY NATIONAL WATER INFORMATION SYSTEM MAPPER, WWW.WATERDATA.USGS.GOV\MAPPER.
3. SECTION SOURCE: A-A' MODIFIED FROM SOREN JULIAN, 1978 "HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND, SUFFOLK COUNTY, LONG ISLAND, NEW YORK, US GEOLOGICAL SURVEY WRI 77-77.

0 2500
SCALE IN FEET

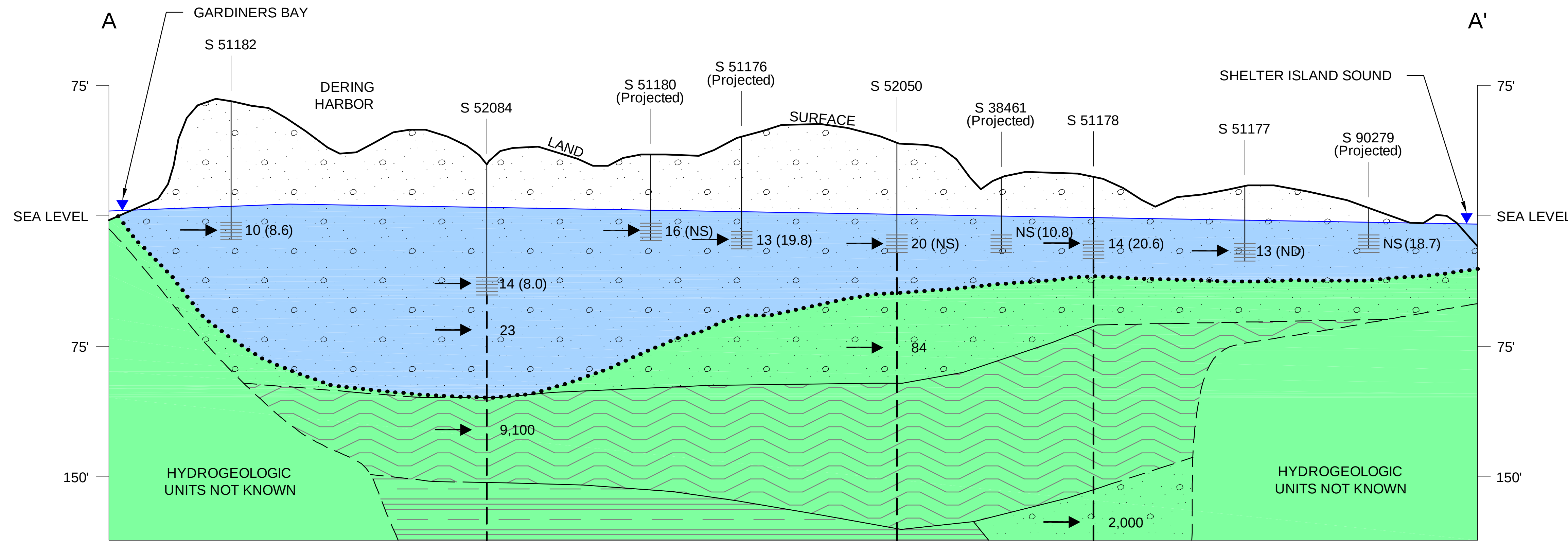
HYDROGEOLOGIC DATA REVIEW
AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

LOCATION OF HYDROGEOLOGIC SECTION A-A'

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

DRAWN: RAC | CHECKED: JB | DATE: 06/27/14 | FIGURE: 6



LEGEND

S 51178	USGS (WELL NUMBER)
	WELL SCREEN SETTING
	DASHED VERTICAL LINE INDICATES EXPLORATION BOREHOLE DRILLED IN 1974 BY SOREN
14	CHLORIDE CONCENTRATION IN mg/L (DATA FROM SOREN 1978)
(8.96)	CHLORIDE CONCENTRATION IN mg/L (BRACKETS INDICATE DATA FROM JUNE 2014)
(ND)	NOT DETECTED
(NS)	NOT SAMPLED
	SAMPLE COLLECTION DEPTH
	WATER TABLE ELEVATION
	APPROXIMATE LOCATION OF 40 mg/L CHLORIDE BOUNDARY (BASED ON JUNE 2014 DATA)

FRESH GROUNDWATER - CHLORIDE LESS THAN 40 mg/L

GROUNDWATER - SALTWATER DIFFUSION ZONE CHLORIDE GREATER THAN 40 mg/L

UPPER PLEISTOCENE DEPOSITS
SANDY AND GRAVELLY GLACIAL DRIFT CONTAINING MUCH SILT AND CLAY

PLEISTOCENE MARINE DEPOSITS
GRAY-GREEN AND GRAY CLAY

PLEISTOCENE NONMARINE DEPOSITS
BROWN AND REDDISH BROWN CLAY

SOURCE:
MODIFIED FROM SIMMONS, DALE L., 1986 "GEOHYDROLOGY AND GROUNDWATER QUALITY ON SHELTER ISLAND, SUFFOLK COUNTY, NEW YORK, 1982-84" USGS WRIR 85-41E5.

0 2500
HORIZONTAL SCALE IN FEET

0 75
VERTICAL SCALE IN FEET

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

HYDROGEOLOGIC SECTION A-A' AND APPROXIMATE LOCATION OF THE DIFFUSION ZONE BOUNDARY IN JUNE 2014

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

DRAWN: RAC CHECKED: JB DATE: 06/27/14 FIGURE: 7

APPENDIX I

List of Existing Studies, Maps and Data Sources

EXISTING STUDIES, MAPS AND DATA SOURCES RELATIVE TO THE WATER RESOURCES OF SHELTER ISLAND

Studies of Shelter Island

Nelson, Pope & Voorhis, LLC and Nelson & Pope, May 2005, "Town of Shelter Island, Water Supply Alternatives Study".

Nelson, Pope & Voorhis, LLC, September 2013, Draft "Town of Shelter Island Watershed Management Plan".

Simmons, Dale L., 1986, "Geohydrology and Ground-Water Quality on Shelter Island, Suffolk County, New York, 1983-84", U. S. Geological Survey, Water-Resources Investigations Report 85-4165.

Soren, Julian, 1978, "Hydrogeologic Conditions in the Town of Shelter Island, Suffolk County, Long Island, New York", U. S. Geological Survey Water Resources Investigations 77-77.

Regional Water Resource Investigations

Camp Dresser & McKee (CDM), June 29, 2010, revised July 26, 2010, "Comprehensive Water Resources Management Plan for Suffolk County, Task 7.6/7.7, Groundwater Pumpage and Consumptive Use".

Camp Dresser & McKee (CDM), August 2010, Draft "Suffolk County Comprehensive Water Resources Management Plan".

Jensen, H. M. and Soren, Julian, 1974, "Hydrogeology of Suffolk County, Long Island, New York", U. S. Geological Survey Hydrologic Investigation Atlas HA-501.

Schubert, Christopher E., 1999, "Ground-Water Flow Paths and Traveltime to Three Small Embayments within the Peconic Estuary, Eastern Suffolk County, New York", U. S. Geological Survey, Water-Resources Investigations Report 98-4181.

Groundwater Recharge Rates

Cohen, Philip, Franke, 0. L., and Foxworthy, B. L., 1968, "An Atlas of Long Island's Water Resources", New York State Water Resources Commission Bulletin 62, 117 p.

Nemickas, Bronius, and Koszalka, E. J., 1982, "Geohydrologic Appraisal of Water Resources of the South Fork, Long Island, New York", U.S. Geological Survey Water-Supply Paper 2073, 55 p.

Peterson, D.S., 1987, "Ground-Water Recharge Rates in Nassau and Suffolk Counties, New York", U.S. Geological Survey Water-Resources Investigations Report 86-4181, 19 p.

Schubert, Christopher E., 1998, "Areas Contributing Ground Water to the Peconic Estuary, and Ground-Water Budgets for the North and South Forks and Shelter Island, Eastern Suffolk County, New York", U. S. Geological Survey, Water-Resources Investigations Report 97-4136.

Salt Water Intrusion and the Freshwater-Saltwater Diffusion Zone

Lusczynski, N. J., and Swarzenski, W. V., 1960, "Position of the Saltwater Body in the Magothy(?) Formation in the Cedarhurst-Woodmere Area of Southwestern Nassau County, Long Island, New York", Economic Geology, v. 55, p. 1739-1750.

Lusczynski, N. J., and Swarzenski, W. V, 1966, "Salt-Water Encroachment in Southern Nassau and Southeastern Queens Counties, Long Island, New York", U.S. Geological Survey Water-Supply Paper 1613-F, 77 p.

Perlmutter, N. M., and DeLuca, F. A., 1963, "Availability of Fresh Ground Water, Montauk Point Area, Suffolk County, Long Island, New York", U.S. Geological Survey Water-Supply Paper 1613-B, 39 p.

Perlmutter, N. M., Geraghty, J. J., and Upson, J. E., 1959, "The Relation Between Fresh and Salty Ground Water in Southern Nassau and Southeastern Queens Counties, Long Island, New York", Econ. Geology, v. 54, no. 3, p. 416-435.

Miscellaneous Data Sources

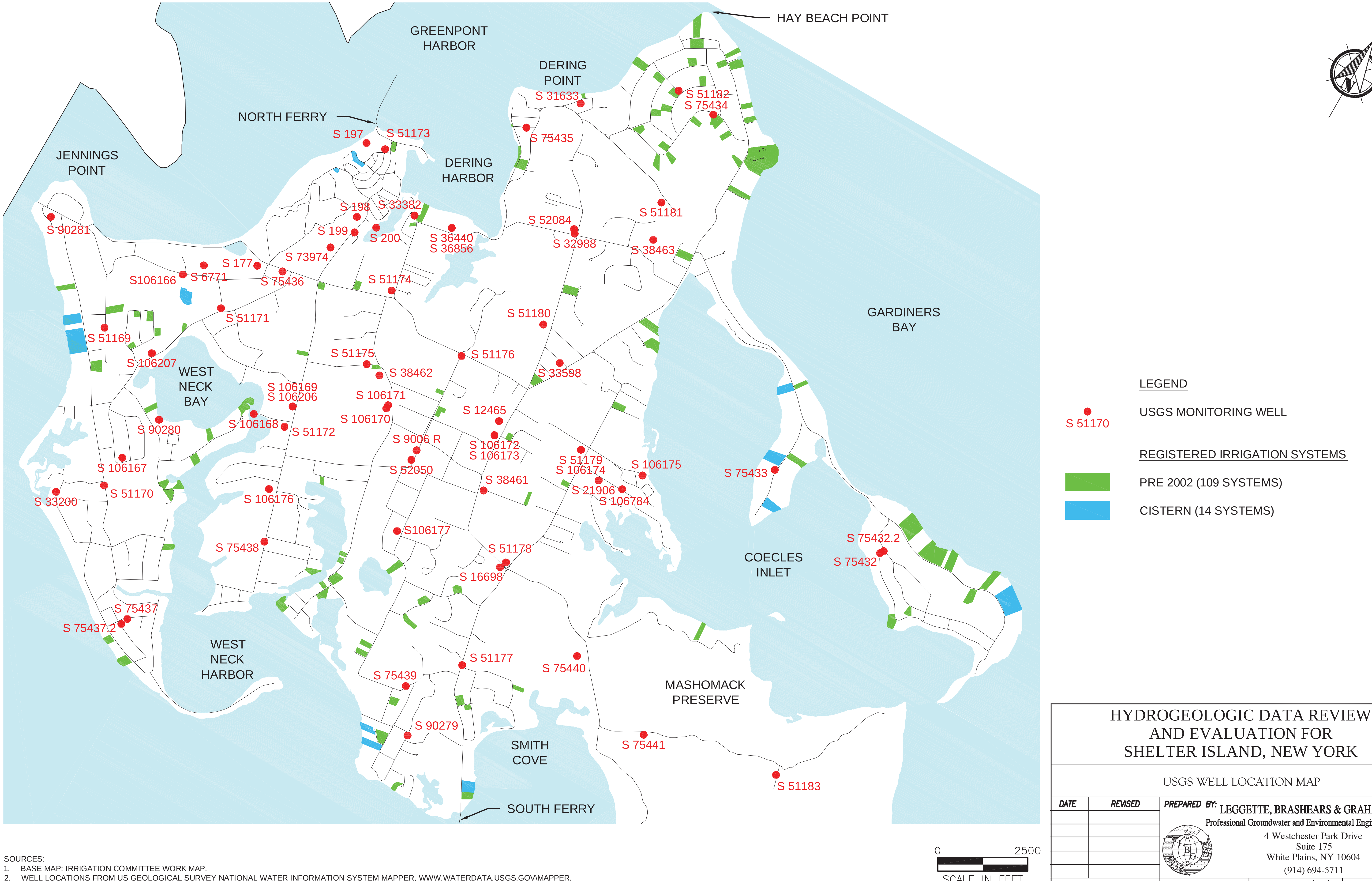
Precipitation Data
National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration
Climate Data Online: http://www.ncdc.noaa.gov/cdo-web/

Monitor Well Data, Water Quality and Groundwater Level Elevation Data
U. S. Geological Survey National Water Information System Mapper
http://maps.waterdata.usgs.gov/mapper/

dmd
June 26, 2014
f:\reports\shelter island\report\appendix i - studies and data sources.docx

APPENDIX II

USGS Monitoring Wells on Shelter Island



HYDROGEOLOGIC DATA REVIEW
AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

USGS WELL LOCATION MAP

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

DRAWN:	RAC	CHECKED:	JB	DATE:	06/27/14	FIGURE:	–

SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.
2. WELL LOCATIONS FROM US GEOLOGICAL SURVEY NATIONAL WATER INFORMATION SYSTEM MAPPER, WWW.WATERDATA.USGS.GOV\MAPPER.

APPENDIX II

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR
SHELTER ISLAND, NEW YORK

Summary of United States Geological Survey (USGS) Groundwater Monitoring Wells On Shelter Island [1)]

USGS Well ID (See Fig 1)	Land Surface Elevation ft above sea level	Well Depth ft bg [2)]	Well Bottom Elevation ft above(below) sea level	Upper Casing Diameter inches	Top of Screen ft bg	Bottom of Screen ft bg	Latitude	Longitude	Location
S 177	--- [3)]	60	---	---	---	---	41 04' 25"	72 21' 43"	Southwest of the intersection of Shore Rd and Stearns Point Rd
S 197	18.0	27	(9.0)	---	---	---	41 05' 09"	72 21' 30"	North side of Bevin Rd (at the dead end)
S 198	26.0	50	(24.0)	---	---	---	41 04' 50"	72 21' 20"	West side of New York Ave (pump house)
S 199	9.0	16	(7.0)	---	---	---	41 04' 46"	72 21' 18"	East side of New York Ave; southwest end of Chase Creek
S 200	20.0	33	(13.0)	---	---	---	41 04' 50"	72 21' 12"	Chase Creek
S 6771	100.0	81	19.0	---	---	---	41 04' 18"	72 22' 00"	East end of Carlton Rd
S 9006 R	---	---	---	---	---	---	41 04' 02"	72 20' 20"	Shelter Island School well
S 12465	53.0	96	(43.0)	---	---	---	41 04' 20"	72 19' 59"	West side of St Marys Rd, north of Ginny Rd, south of Burns Rd
S 16698	35.0	57	(22.0)	---	---	---	41 03' 45"	72 19' 33"	Southwest of the intersection of Route 114 and S Carthwright Rd
S 21906	20.0	50	(30.0)	---	---	---	41 04' 19"	72 19' 17"	South side of Burns Rd
S 31633	42.0	64	(22.0)	---	---	---	41 05' 47"	72 20' 29"	Between Sylvester Rd, Nichol Rd and Havens Rd
S 32988	32.0	90	(58.0)	---	---	---	41 05' 15"	72 20' 08"	Northeast of the intersection of Cobbetts Ln and Manhanset Rd
S 33200	17.0	32	(15.0)	---	---	---	41 03' 04"	72 22' 07"	East side of Peconic Ave
S 33382	35.0	63	(28.0)	---	---	---	41 04' 58"	72 21' 02"	Northwest of the intersection of N Ferry Rd and Winthrop Rd
S 33598	48.0	79	(31.0)	---	---	---	41 04' 42"	72 19' 50"	South side of Johnston Rd, west of Ram Island Rd
S 36440	35.0	98	(63.0)	---	---	---	41 05' 00"	72 20' 48"	North side of Winthrop Rd
S 36856	32.0	54	(22.0)	---	---	---	41 05' 00"	72 20' 48"	North side of Winthrop Rd
S 38461	12.0	43	(31.0)	6	---	---	41 04' 01.3"	72 19' 51.7"	South side of Congdon Rd and east side of Ram Island Rd; stick up within the fire hydrant
S 38462	54.0	30	24.0	---	---	---	41 04' 15"	72 20' 45"	West side of N Midway Rd, north of Jaspa Rd
S 38463	59.9	56	3.9	---	---	---	41 05' 24"	72 19' 42"	Southeast of the dead end of Island Way
S 51169	32.3	56	(23.7)	6	44	54	41 03' 49.8"	72 22' 20.5"	West side of Rocky Point Avenue, 400 ft south of Belvedere Avenue, West Neck
S 51170	8.8	33	(24.2)	4	21	31	41 03' 11.9"	72 21' 52.9"	West side of Nostrand (Brander) Parkway, 100 ft south of Lilliput Lane, West Neck
S 51171	27.8	55	(27.2)	---	---	---	41 04' 10"	72 21' 47"	Northeast of the intersection of Behringer Ln and W Neck Rd
S 51172	17.2	37	(19.8)	4	25	35	41 03' 50"	72 21' 06"	West side of N Menantic Rd, south of Daniel Lord Rd

APPENDIX II

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Summary of United States Geological Survey (USGS) Groundwater Monitoring Wells On Shelter Island [1)]

USGS Well ID (See Fig 1)	Land Surface Elevation ft above sea level	Well Depth ft bg [2)]	Well Bottom Elevation ft above(below) sea level	Upper Casing Diameter inches	Top of Screen ft bg	Bottom of Screen ft bg	Latitude	Longitude	Location
S 51173	32.1	51	(18.9)	---	---	---	41 05' 10"	72 21' 23"	Northwest of the intersection of Grand Ave and Bay Ave
S 51174	45.5	63	(17.5)	6	51	61	41 04' 37"	72 20' 56"	Southeast side of the intersection of Route 114 and Quail Hedge
S 51175	39.5	60	(20.5)	---	---	---	41 04' 16"	72 20' 51"	South side of Bowditch Rd, west of N Midway Rd
S 51176	39.6	59	(19.4)	6	47	57	41 04' 30.6"	72 20' 22.4"	Southeast corner of Ferry Rd (Route 114) and Manwaring Rd
S 51177	17.5	39	(21.5)	4	27	37	41 03' 16.5"	72 19' 27.8"	East side of Route 114, 58 ft north of Valley Rd
S 51178	28.0	47	(19.0)	4	---	---	41 03' 47"	72 19' 32"	East side of North Cartwright Rd,apx 400 ft south of private driveway
S 51179	17.0	67	(50.0)	---	---	---	41 04' 24"	72 19' 28"	Southwest of the intersection of Burns Rd and S Cartwright Rd
S 51180	32.5	51	(18.5)	6	39	49	41 04' 49"	72 20' 02"	West side of Manhanset Rd, across from Wade Rd
S 51181	48.7	74	(25.3)	6	62	72	41 05' 34"	72 19' 46"	South side of Dinah Rock Rd in Gardiners Bay County Club
S 51182	55.1	76	(20.9)	6	64	74	41 06' 03.1"	72 20' 00.2"	North side of Westview Road, 99 ft west of Crescent Drive
S 51183	41.0	51	(10.0)	6	39	49	41 03' 32"	72 17' 29"	West side of main trail in Mashomack Preserve
S 52050	44.0	64	(20.0)	6	52	62	41 03' 59"	72 20' 20"	East side of School St, north of Smith St
S 52084	28.4	74	(45.6)	6	62	72	41 05' 16"	72 20' 09"	East side of Manhanset Rd, 143 ft north of Cobbets Lane
S 73974	38.5	42	(3.5)	2	40	42	41 04' 39.2"	72 21' 23.0"	Shelter Island Country Club & Golf Course, west side of 6th green fairway, edge of woods, 3,000 ft north of West Neck Rd
S 75432	20.5	85	(64.5)	---	---	---	41 04' 39"	72 17' 35"	West side of Tuthill Dr, apx 130 ft south of South Ram Island Dr
S 75432.2	21.0	29	(8.0)	2	24	29	41 04' 40.0"	72 17' 34.2"	South side of South Ram Island Dr, east of intersection with Tuthill Dr
S 75433	---	35	---	2	---	---	41 04' 45"	72 18' 23"	East side of Little Ram Island Dr; utilty pole marked on west side of Little Ram Island Dr
S 75434	---	62	---	---	---	---	41 06' 02"	72 19' 45"	South side of Country Club Dr across from Haybeach Rd
S 75435	21.7	37	(15.3)	2	32	37	41 05' 34"	72 20' 42"	Southwest of the intersection of Locust Rd and Dering Ln
S 75436	57.4	62	(4.6)	---	---	---	41 04' 27"	72 21' 34"	South side of Shore Rd, west of W Neck Rd
S 75437	12.7	25	(12.3)	---	---	---	41 02' 43"	72 21' 22"	North of White Birch Rd, east side of N Silver Beach Rd at dent in curb line
S 75437.2	8.5	30	(21.5)	2	---	---	41 02' 41"	72 21' 23"	East side of N Silver Beach Rd, apx 75 ft from intersection with White Birch Rd
S 75438	11.0	23	(12.0)	2	18	23	41 03' 19.8"	72 20' 52.2"	East side of Menantic Rd, apx 140 ft south of Conrad Rd, in front of 36 S Menantic Rd
S 75439	14.0	29	(15.0)	---	---	---	41 03' 04"	72 19' 42"	Between S Midway Rd and Shorewood Rd

APPENDIX II

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

Summary of United States Geological Survey (USGS) Groundwater Monitoring Wells On Shelter Island 1)

USGS Well ID (See Fig 1)	Land Surface Elevation ft above sea level	Well Depth ft bg 2)	Well Bottom Elevation ft above(below) sea level	Upper Casing Diameter inches	Top of Screen ft bg	Bottom of Screen ft bg	Latitude	Longitude	Location
S 75440	---	53	---	---	---	---	41 03' 34"	72 18' 53"	West side of the southern portion of Foxen Ceek Rd in Mashomack Preserve
S 75441	---	33	---	---	---	---	41 03' 24"	72 18' 18"	Western side of Mashomack Preserve
S 90279	20.0	23	(2.5)	2	20.5	22.5	41 02' 52.4"	72 19' 32.7"	East side of Osprey Rd, apx 87 ft south of Heron Lane
S 90280	22.0	---	---	---	---	---	41 03' 35"	72 21' 47"	North side of Westmoreland Dr
S 90281	49.0	65	(16.0)	2	62	65	41 05' 11"	72 22' 56"	Southwest of the intersection of Nostrand Pky and Rocky Point Ave
S 106166	76.2	112	(35.8)	2	92	102	41 04' 13"	72 22' 05"	South side of Stearns Point Rd, apx 40 ft west of Crescent Beach Rd
S 106167	18.8	40	(21.2)	---	---	---	41 03' 21"	72 21' 52"	North Side of ole Buck Run, southwest of Penny's Path
S 106168	5.4	80	(74.6)	---	---	---	41 03' 49"	72 21' 18"	South side of Daniel Lord Rd on the shoreline
S 106169	29.6	135	(105.4)	---	---	---	41 03' 56"	72 21' 07"	West side of N Menantic Rd, between Burro Hill Ln and Daniel Lord Rd
S 106170	49.8	120	(70.2)	---	---	---	41 04' 08"	72 20' 37"	West side of N Midway Rd, south of W Thmoas St
S 106171	49.8	75	(25.2)	2	65	70	41 04' 09"	72 20' 37"	Southeast of the intersection of N Midway Rd and W Thomas St
S 106172	35.5	155	(119.5)	---	---	---	41 04' 16"	72 19' 58"	West side of St Marys Rd aross from Ginny Dr
S 106173	35.8	70	(34.2)	---	---	---	41 04' 16"	72 19' 58"	West side of St Marys Rd aross from Ginny Dr
S 106174	17.0	130	(113.0)	---	---	---	41 04' 24"	72 19' 28"	Southwest of the intersection of Burns Rd and S Cartwright Rd
S 106175	7.2	47	(39.8)	---	---	---	41 04' 26"	72 19' 04"	South side of Burns Rd at the dead end
S 106176	12.0	25	(13.0)	2	15	20	41 03' 33"	72 21' 00"	West side of N Menantic Rd across from Hager Rd
S 106177	30.3	70	(39.7)	2	55	60	41 03' 40"	72 20' 12"	West side of Baldwin Rd, apx 80 ft north of Shelterlands Path
S 106206	29.6	40	(10.4)	---	---	---	41 03' 56"	72 21' 07"	West side of N Menantic Rd between Burro Hill Ln and Daniel Lord Rd
S 106207	---	32	---	---	---	---	41 03' 50"	72 22' 01"	W Neck Rd
S 106784	17.0	85	(68.0)	---	---	---	41 04' 20"	72 19' 08"	South side of Burns Rd, few hundred feet of the road to the south

1) Data from USGS National Water Information System website (http://maps.waterdata.usgs.gov/mapper/index.html)
2) Feet below grade
3) Indicates no data available

APPENDIX III

Data From Soren, 1978

HYDROGEOLOGIC CONDITIONS IN THE TOWN OF SHELTER ISLAND,
SUFFOLK COUNTY, LONG ISLAND, NEW YORK

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 77-77

Prepared in cooperation with the
Suffolk County Department of Environmental Control

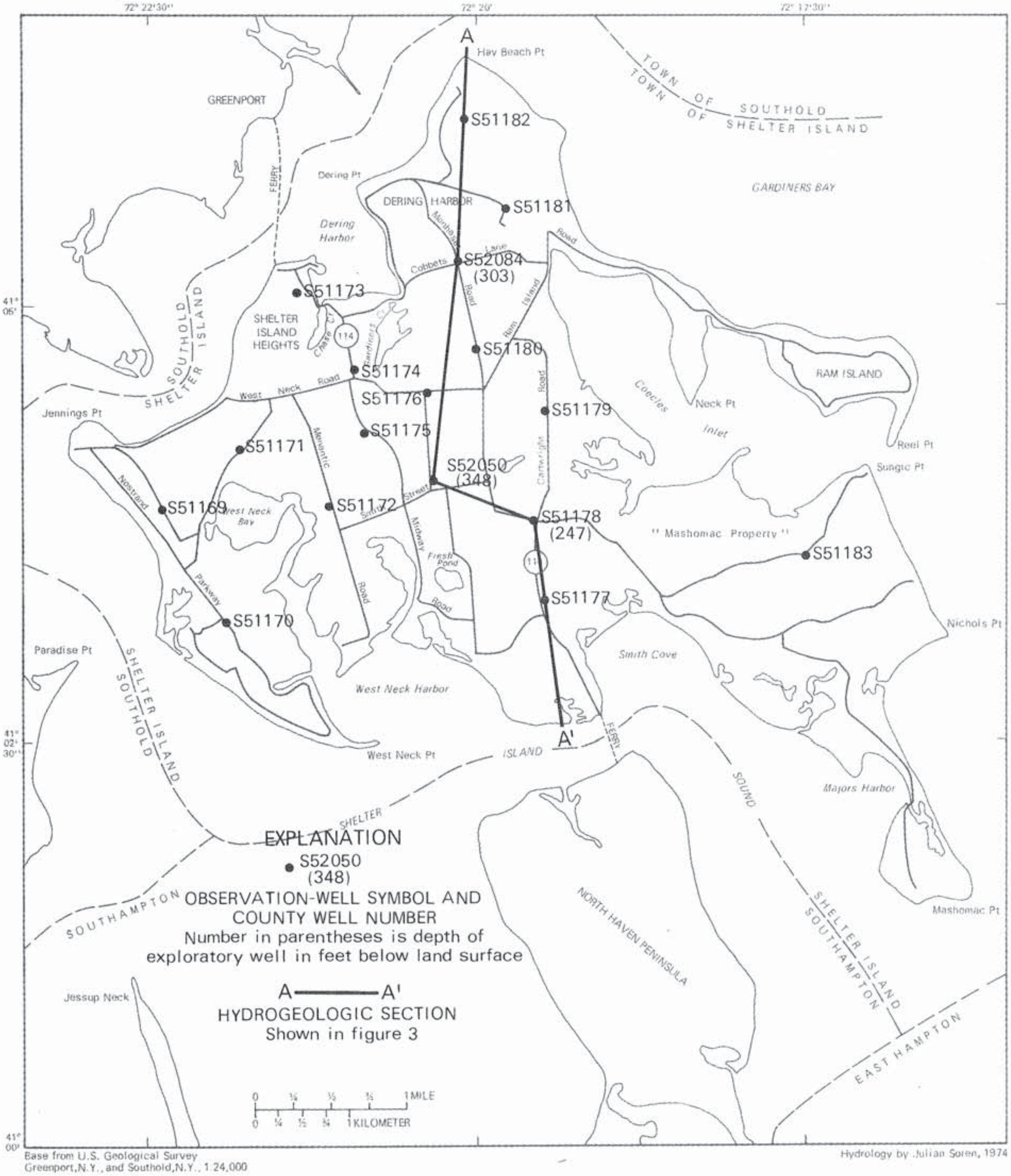


Figure 2.--Location of observation and exploratory wells.

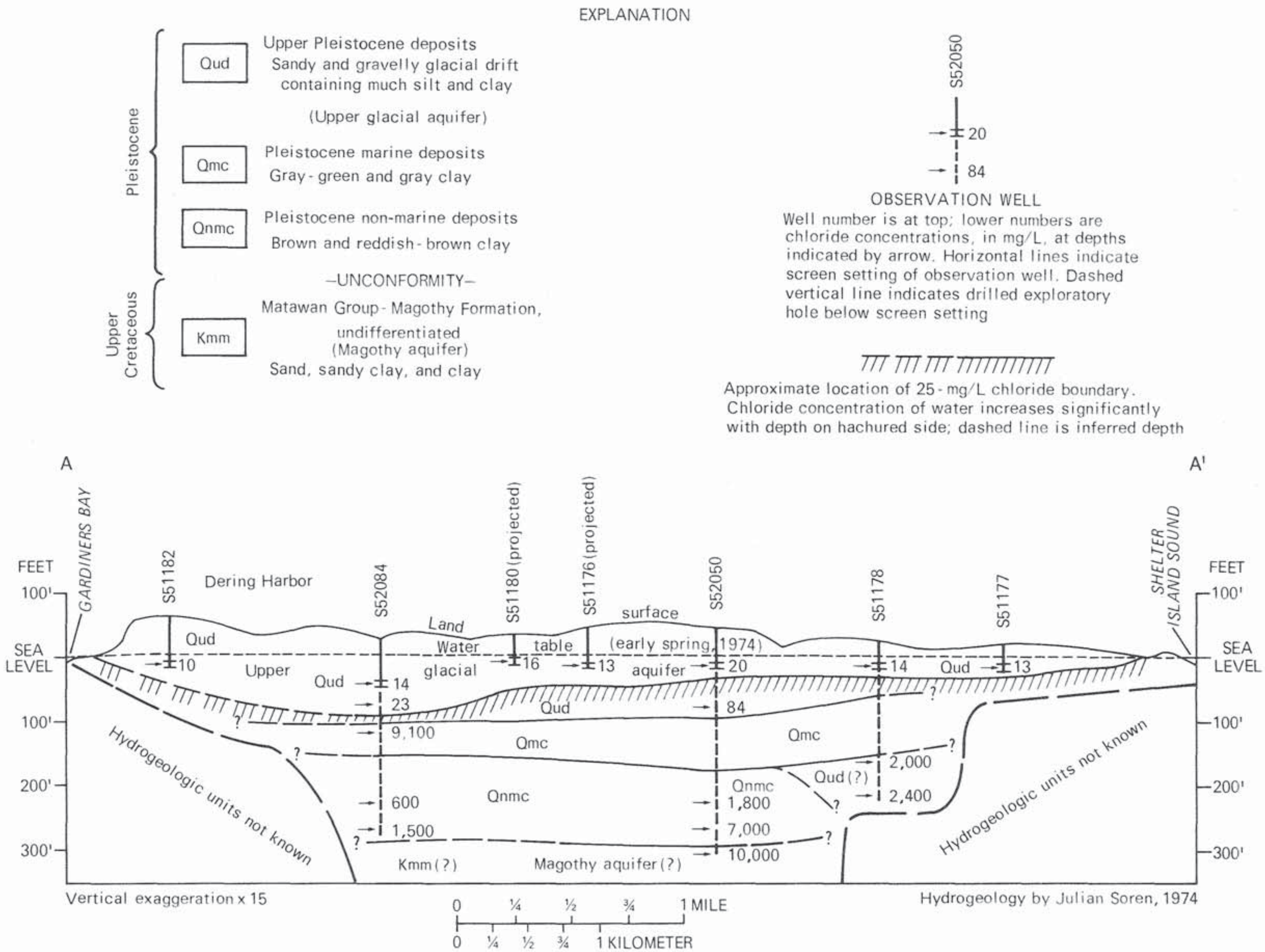


Figure 3.--Hydrogeologic section through Shelter Island.

Table 1.--Logs of exploratory drilling on Shelter Island
[Well locations shown in fig. 2]

WELL S51178

Northeast corner of intersection of New York State Highway 114 and Cartwright Road, lat 41°03'50" N., long 72°19'31" W. Percussion (cable-tool) hole drilled to depth of 145 ft by Harold McMahon, Inc.; hole completed by standard-rotary method to depth of 247 ft by Layne-New York Co., Inc., June 1974. Altitude of land surface about 28 ft above mean sea level. Geologist's log based on examination of driller's log; bailer, flume (mud-ditch), and core samples; and gamma-ray log.

Description	Thickness (ft)	Depth (ft)
PLEISTOCENE		
Upper Pleistocene deposits		
Sand, very fine to very coarse, mostly coarse, brown, and granule to very large-pebble gravel up to 2.5-in diam; a few small to large cobbles up to 5-in. diam; much interstitial clay and silt.	85	85
Pleistocene marine deposits		
Clay, dark grayish-green and dark-gray; some laminae and thin beds of sand and granule gravel	95	180
Upper Pleistocene(?) deposits		
Sand, very fine to coarse, mostly fine to medium, light-gray, and granule to very large-pebble gravel up to 2.4 in. diam	67	247

WELL S52050

Northeast corner Smith Street and School Road, lat 41°04' N., long 72°20'20" W. Percussion (cable-tool) hole drilled to depth of 70 ft by Harold McMahon, Inc.; hole completed by standard-rotary method to depth of 348 ft by Layne-New York Co., Inc., June 1974. Altitude of land surface about 44 ft above mean sea level. Geologist's log based on examination of driller's log; bailer, flume, and core-samples; and gamma-ray log.

Description	Thickness (ft)	Depth (ft)
PLEISTOCENE		
Upper Pleistocene deposits		
Sand, very fine to medium, grayish-brown; many laminae and thin beds of sandy clay and silt; some gravel and small cobbles up to 4-in. diam	5	5
Sand, very fine to very coarse, mostly coarse, brown, and granule to very large-pebble gravel up to 2.5-in. diam; many traces of interstitial clay and silt.	75	80
Clay, sandy, brown.	20	100
Sand, very fine to very coarse, mostly medium to coarse; some granule to small-pebble gravel up to 0.30-in. diam.	39	139

Table 1.--Logs of exploratory drilling on Shelter Island--Continued

WELL S52050 (continued)

Description	Thickness (ft)	Depth (ft)
Pleistocene marine deposits		
Clay, dark-grayish-green and dark-gray.	79	218
Pleistocene non-marine deposits		
Clay, brown and reddish-brown	123	341
UPPER CRETACEOUS(?):		
Matawan Group-Magothy Formation (?)undifferentiated		
Sand, fine, gray.	7	348

WELL S52084

Northeast corner of Cobbets Lane and Manhanset Road, lat 41°05'16" N., long 72°20'09" W. Percussion (cable-tool) hole drilled by Harold McMahon, Inc., April 1974. Altitude of land surface 29 ft above mean sea level. Geologist's log based on examination of driller's log, bailer samples, and gamma-ray log.

Description	Thickness (ft)	Depth (ft)
PLEISTOCENE:		
Upper Pleistocene deposits		
Sand, very fine to coarse, mostly medium, tan and brown, and some granule gravel.	10	10
Sand, very fine to very coarse, mostly coarse, tan and brown, granule to very large-pebble gravel up to 2.5-in. diam; a few small cobbles up to 4-in. diam; some traces of silt	95	105
Sand, very fine to very coarse, mostly coarse, brown; much interstitial clay and silt; some granule gravel . .	10	115
Clay, sandy, brown.	5	120
Sand, very fine to very coarse, mostly coarse, brown; much interstitial clay and silt; some granule gravel . .	10	130
Pleistocene marine deposits		
Clay, dark-grayish-green and dark-gray; many large shell fragments; some laminae and thin beds of sand and granule gravel.	50	180
Pleistocene non-marine deposits		
Clay, brown and reddish-brown; some laminae and thin beds of silt and fine sand	20	200
Clay, greenish-brown; much interstitial sand and some granule gravel.	3	203

Table 2.--Chemical analyses for selected ground-water constituents, Shelter Island, Suffolk County, N.Y.

(Analyses by U.S. Geological Survey, Albany, N.Y., 1974)

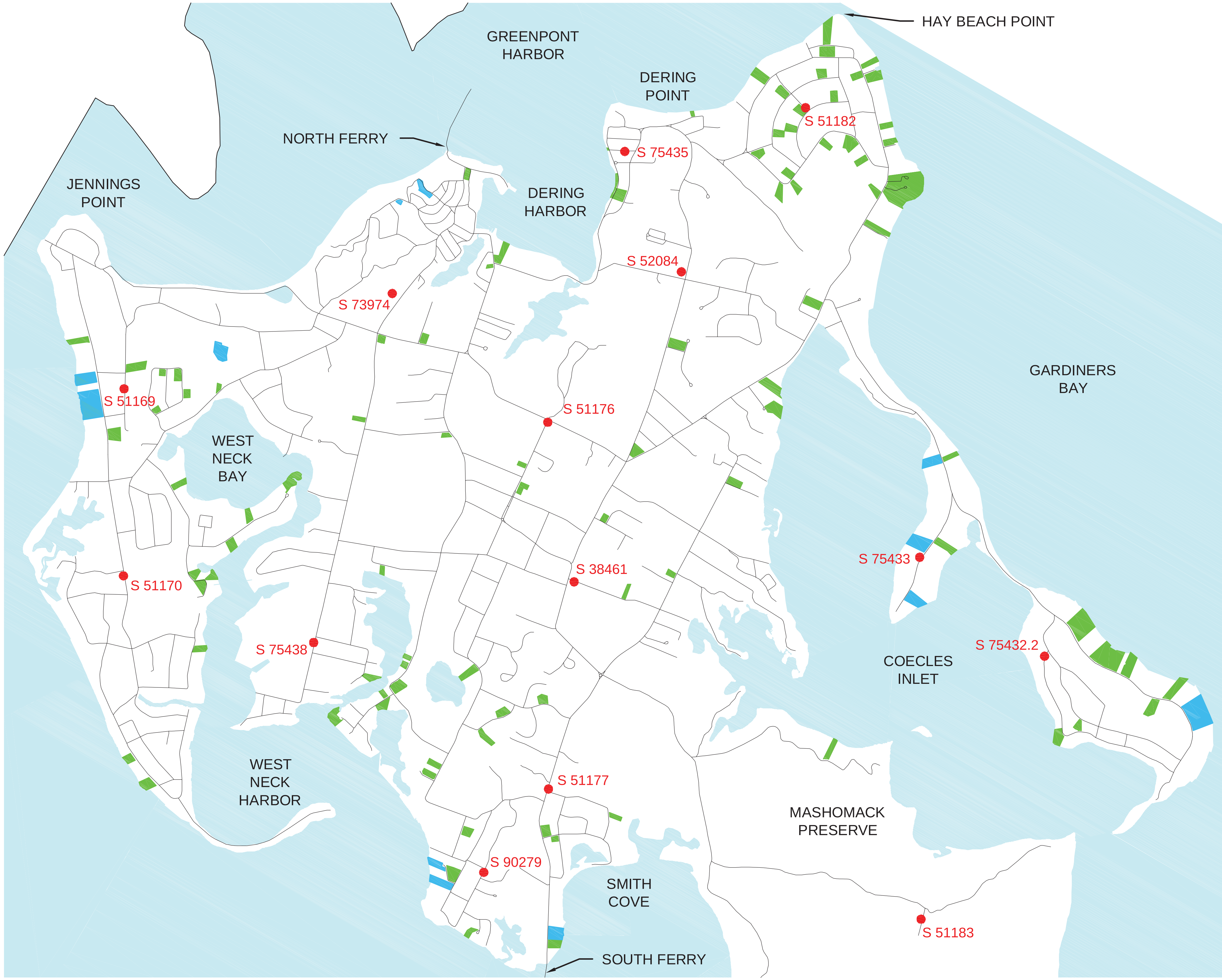
[Concentrations in milligrams per liter]

Well number	Depth below land surface (ft)	Date sampled	Constituent or characteristic: Chloride (Ci)	Iron (Fe)	Manganese (Mn)	Nitrate (NO_3,as N)	MBAS	Dissolved solids	Hardness (as $CaCO_3$): Total	Noncarbonate	pH	Temperature (°C)
S51169	31	3-07-74	10	0.06	0.04	1.9	0.0	93	59	44	6.2	11.0
S51170	28	2-28-74	22	.07	.02	.3	.0	59	16	9.0	5.8	12.5
S51171	53	3-08-74	22	.16	.03	5.8	.0	98	51	40	5.7	11.5
S51172	35	3-04-74	25	.09	1/.12	6.	.01	115	55	45	5.7	11.5
S51173	48	4-23-74	22	.17	1/.15	1.7	.03	95	41	22	6.5	13.5
S51174	52	3-08-74	23	.12	.04	2.4	.0	96	44	28	5.9	12.5
S51175	58	3-06-74	19	.09	.0	3.1	.0	86	40	25	5.8	11.0
S51176	56	3-05-74	13	.15	.02	1.2	.0	69	29	14	5.7	11.0
S51177	37	2-28-74	13	.12	1/.06	0.5	.0	60	22	5.0	5.9	11.5
S51178	47	6-12-74	14	1/.31	.04	--	.01	--	--	--	--	12.0
S51179	58	4-23-74	11	.29	1/.07	.3	.01	137	85	72	6.9	12.5
S51180	49	3-04-74	16	.16	.01	1.4	.0	78	35	9.0	6.0	11.0
S51181	72	3-01-74	22	.10	.01	1/11.	.02	144	110	100	6.0	11.0
S51182	74	2-28-74	10	.07	.03	.3	.01	46	14	6.0	5.9	10.5
S51183	49	3-12-74	13	.05	.03	1.2	.0	60	26	11	6.1	10.5
S52050	64	6-13-74	20	1/.38	1/.13	--	.11	--	--	--	5.7	13.0
S52084	75	6-11-74	14	.14	.05	--	.02	--	--	--	6.1	11.5

1/ Exceeds U.S. Public Health Service drinking-water standards (U.S. Public Health Service, 1962)

APPENDIX IV

Water-Level Monitoring Wells and Hydrographs



LEGEND

S 51170 USGS MONITORING WELL

REGISTERED IRRIGATION SYSTEMS

PRE 2002 (109 SYSTEMS)

CISTERN (14 SYSTEMS)

0 2500
SCALE IN FEET

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

CURRENT AND HISTORICAL WATER LEVEL MONITORING WELL LOCATION MAP

DATE	REVISED

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Westchester Park Drive
Suite 175
White Plains, NY 10604
(914) 694-5711

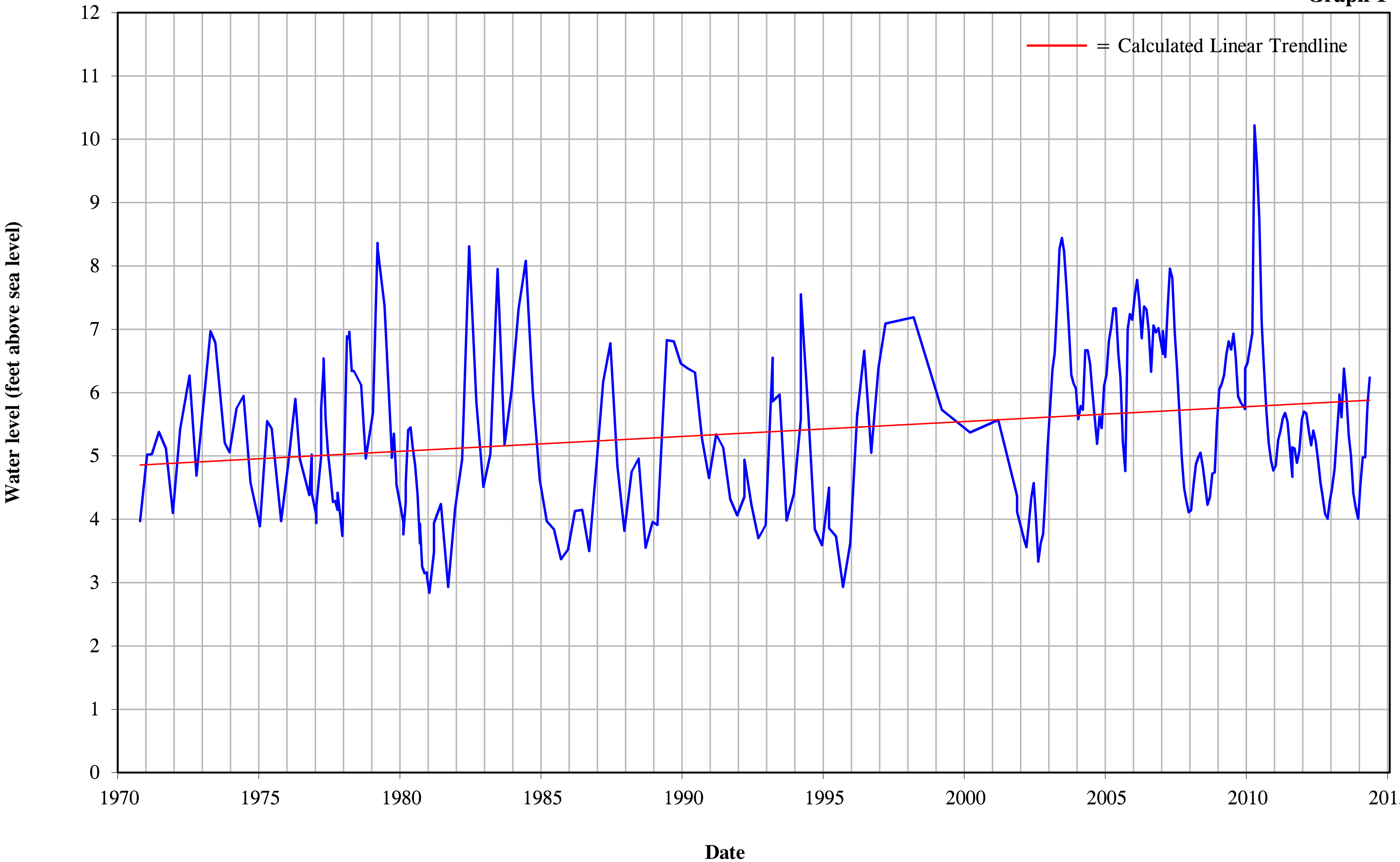
DRAWN:	RAC	CHECKED:	JB	DATE:	06/27/14	FIGURE:	–

SOURCES:
1. BASE MAP: IRRIGATION COMMITTEE WORK MAP.
2. WELL LOCATIONS FROM US GEOLOGICAL SURVEY NATIONAL WATER INFORMATION SYSTEM MAPPER, WWW.WATERDATA.USGS.GOV\MAPPER.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 38461
(Congdon Rd and Ferry Rd)
Historical Water Level Data: 1970 to 2014

Graph 1



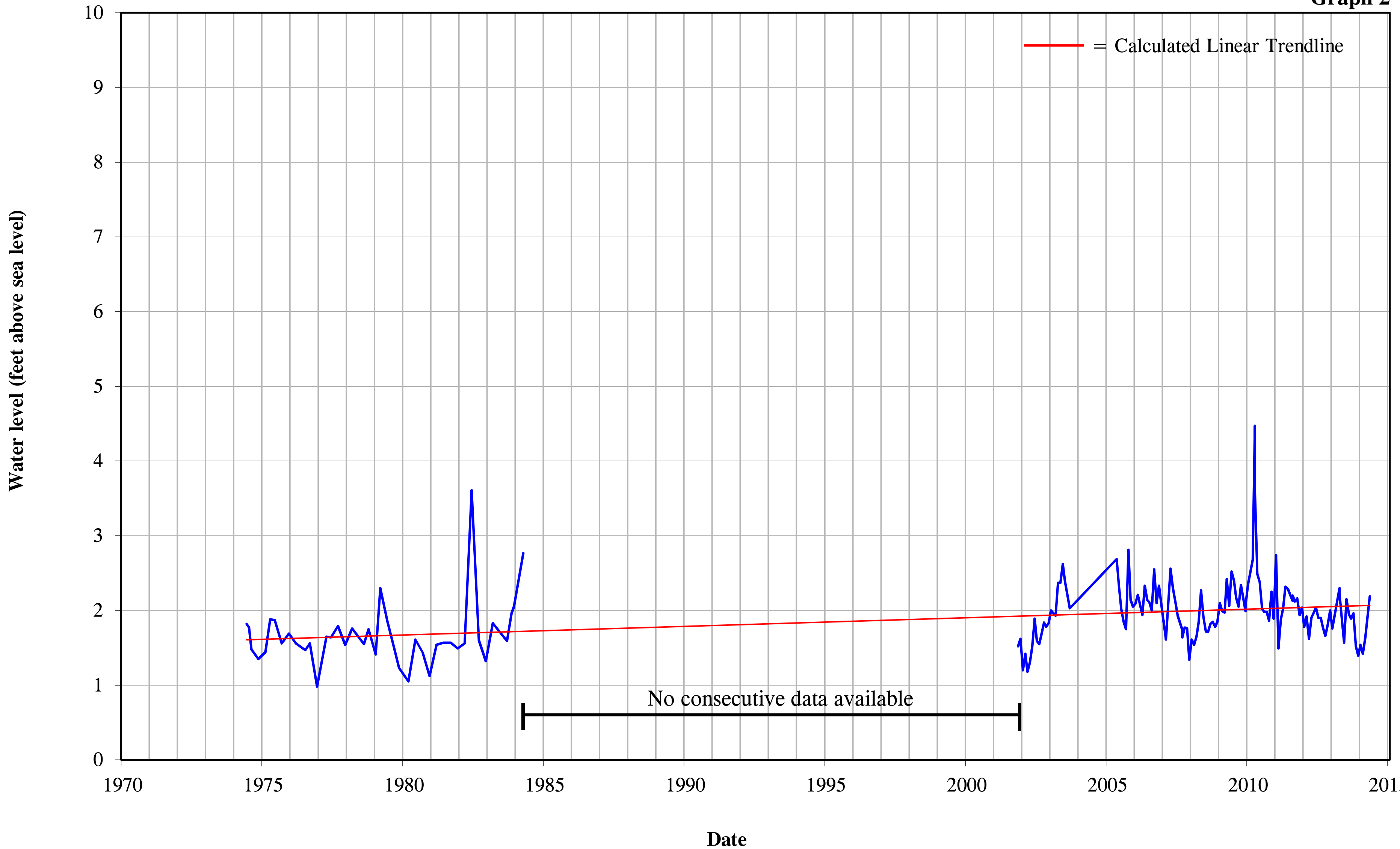
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\38461

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 51169
(Rocky Point Ave and Belvedere Ave)
Historical Water Level Data: 1974 to 2014

Graph 2



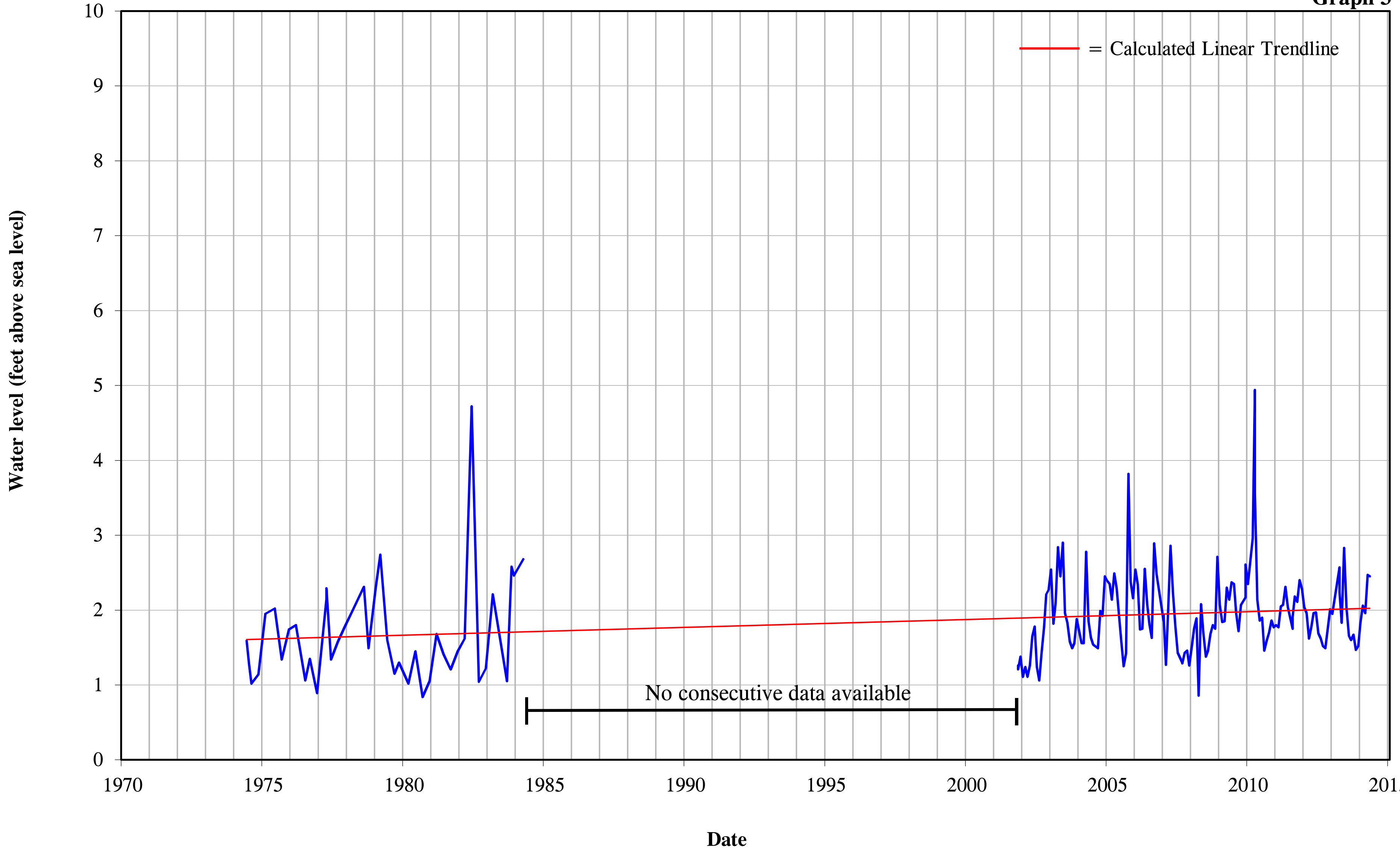
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\51169

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 51170
(Brander Parkway and Lilliput Ln)
Historical Water Level Data: 1974 to 2014

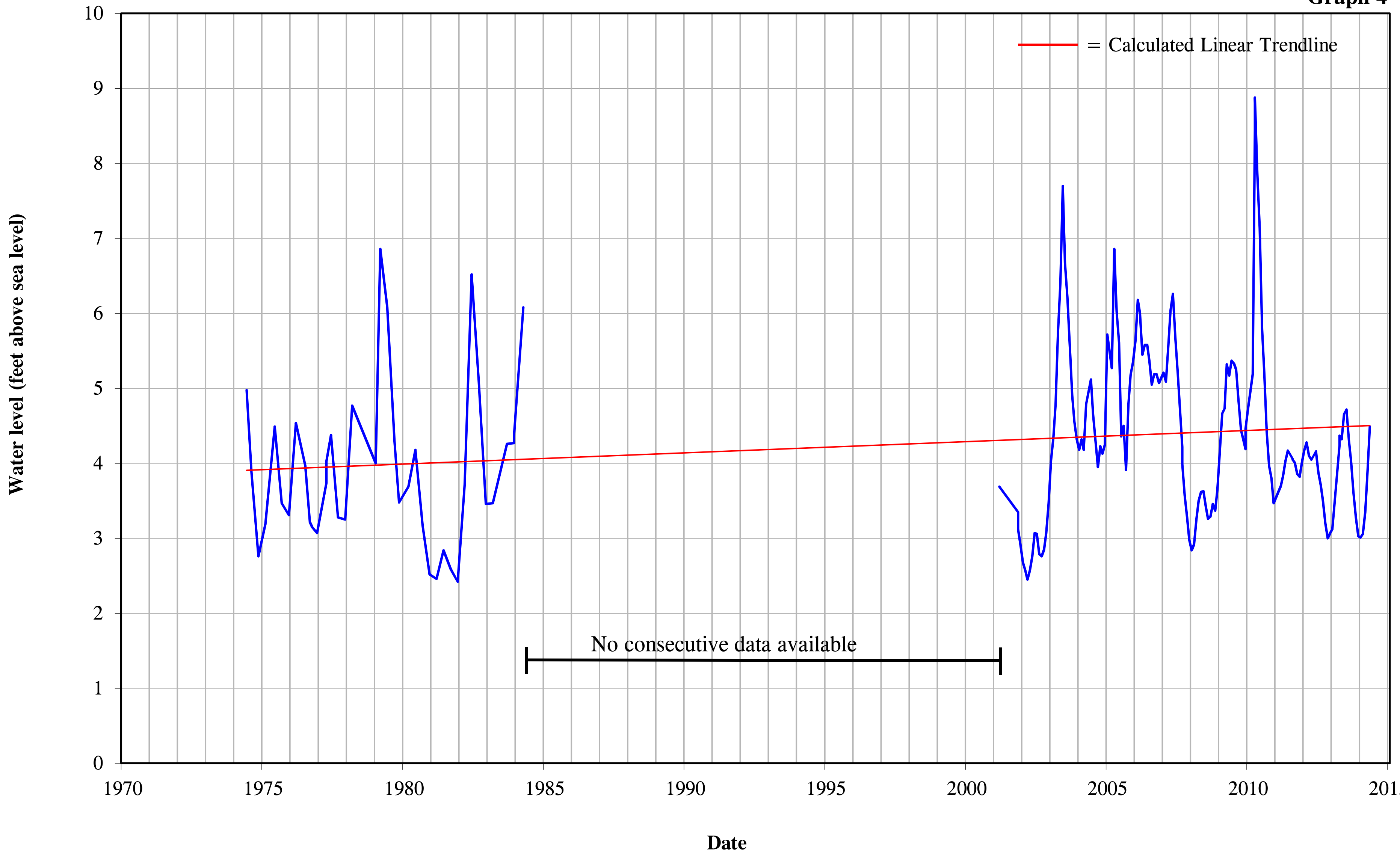
Graph 3



HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 51176
(N Ferry Rd and Manwaring Rd)
Historical Water Level Data: 1974 to 2014

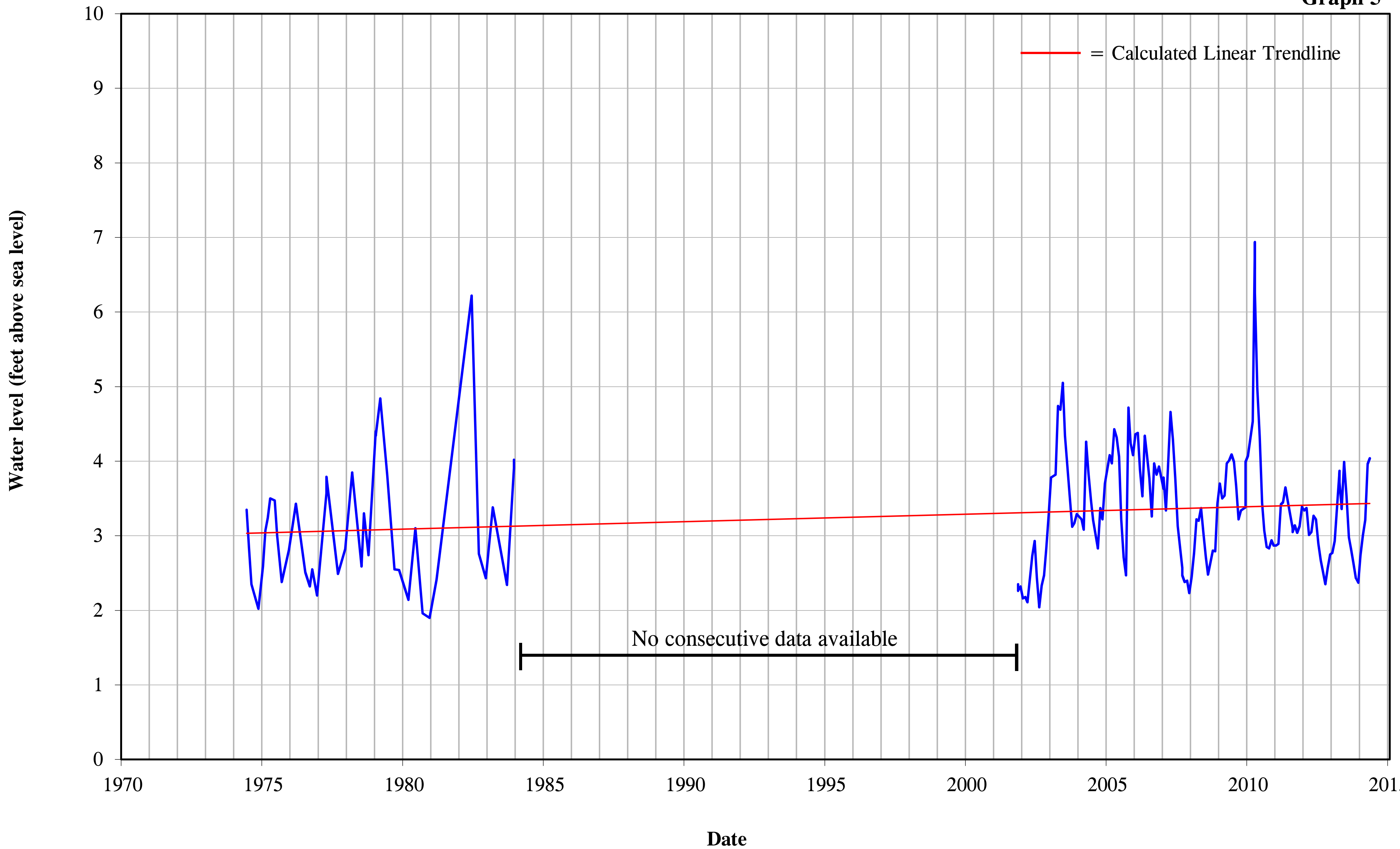
Graph 4



HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 51177
(S Ferry Rd and Deer Park Ln)
Historical Water Level Data: 1974 to 2014

Graph 5



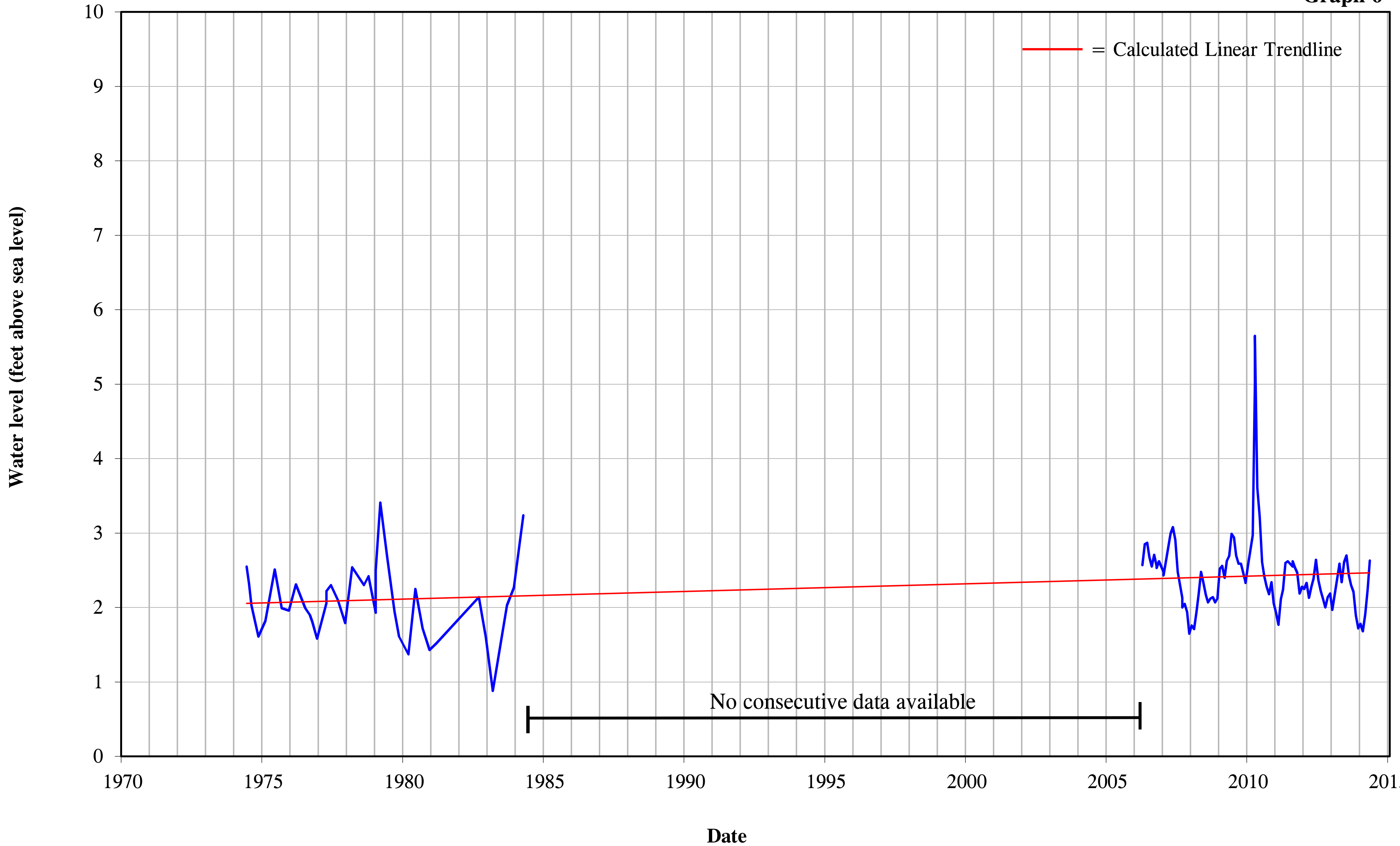
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\51177

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLIGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 51182
(Westview Rd and Hay Beach Rd)
Historical Water Level Data: 1974 to 2014

Graph 6



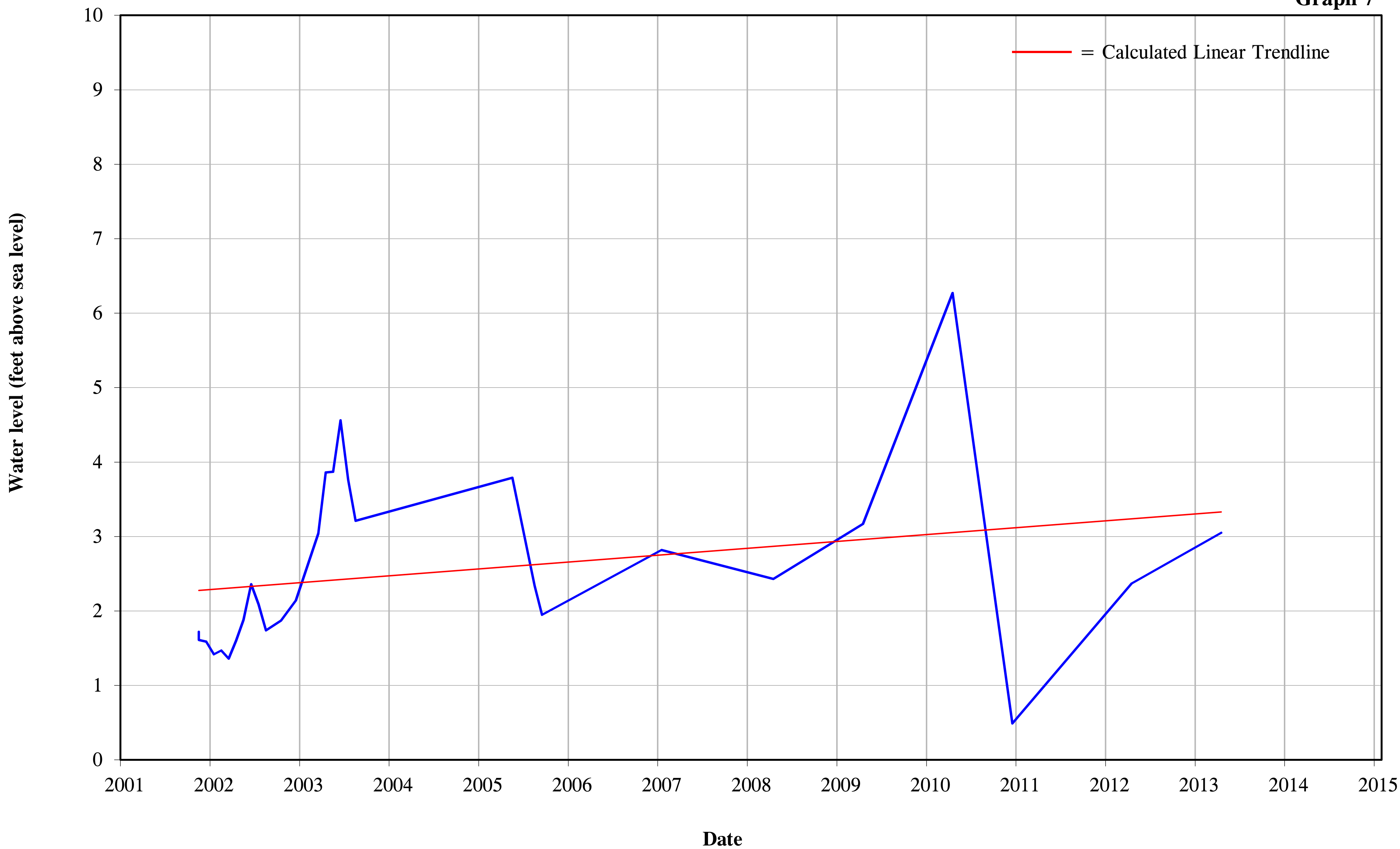
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\51182

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 51183
(Mashomack Preserve)
Historical Water Level Data: 2001 to 2013

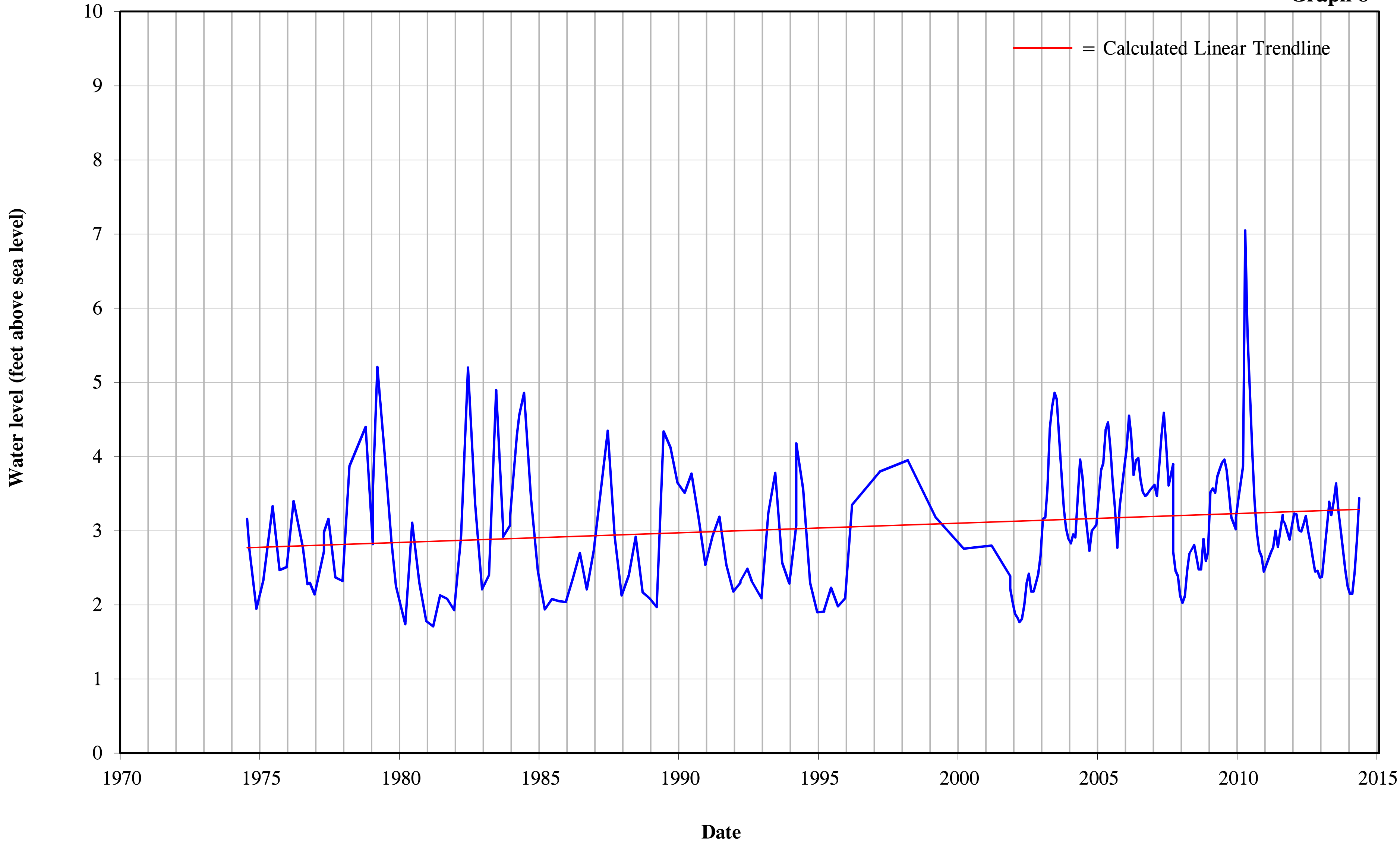
Graph 7



HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 52084
(Manhanset Rd and Cobbetts Ln)
Historical Water Level Data: 1974 to 2014

Graph 8



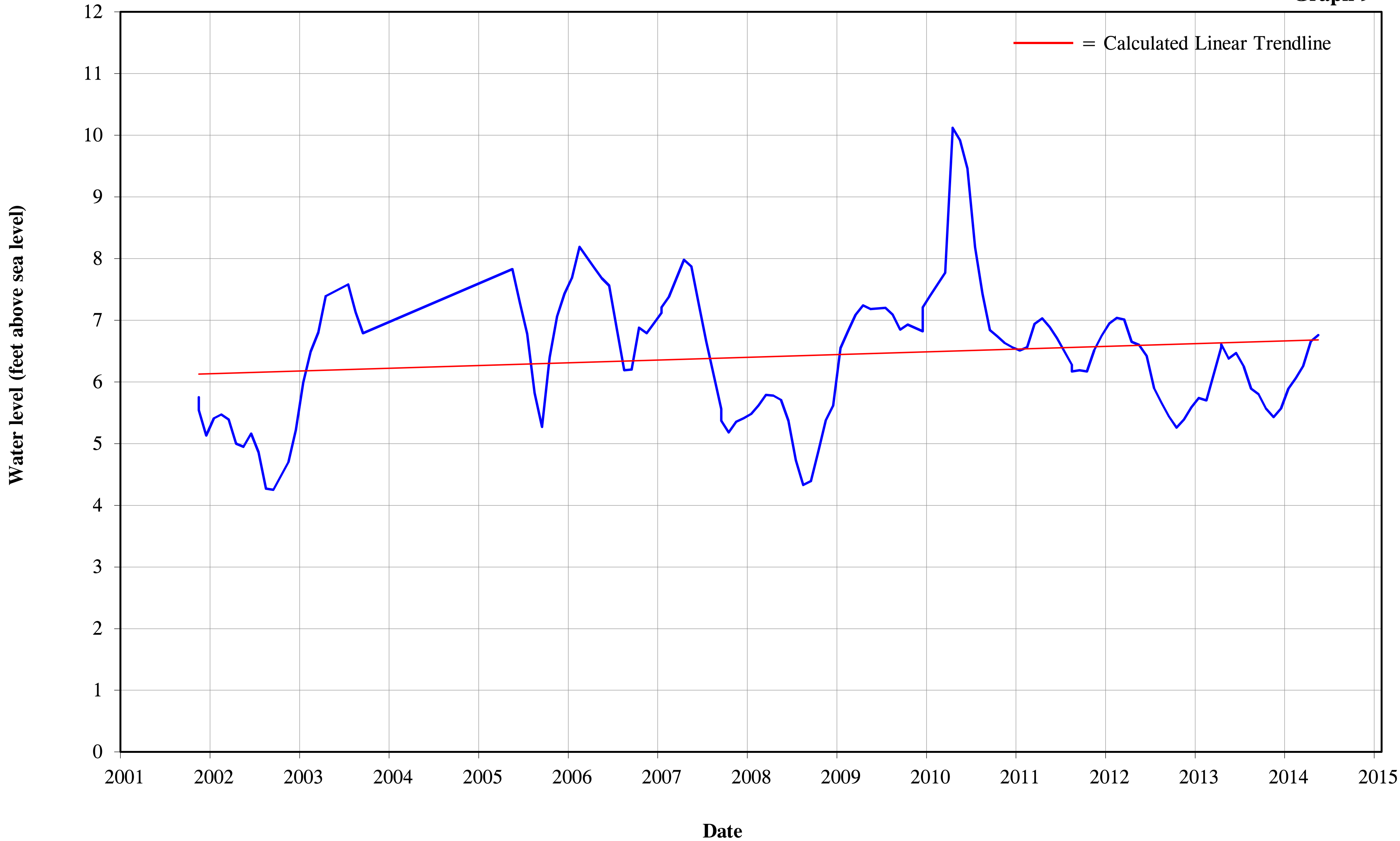
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\52084

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 73974
(Shelter Island Golf Course)
Historical Water Level Data: 2001 to 2014

Graph 9



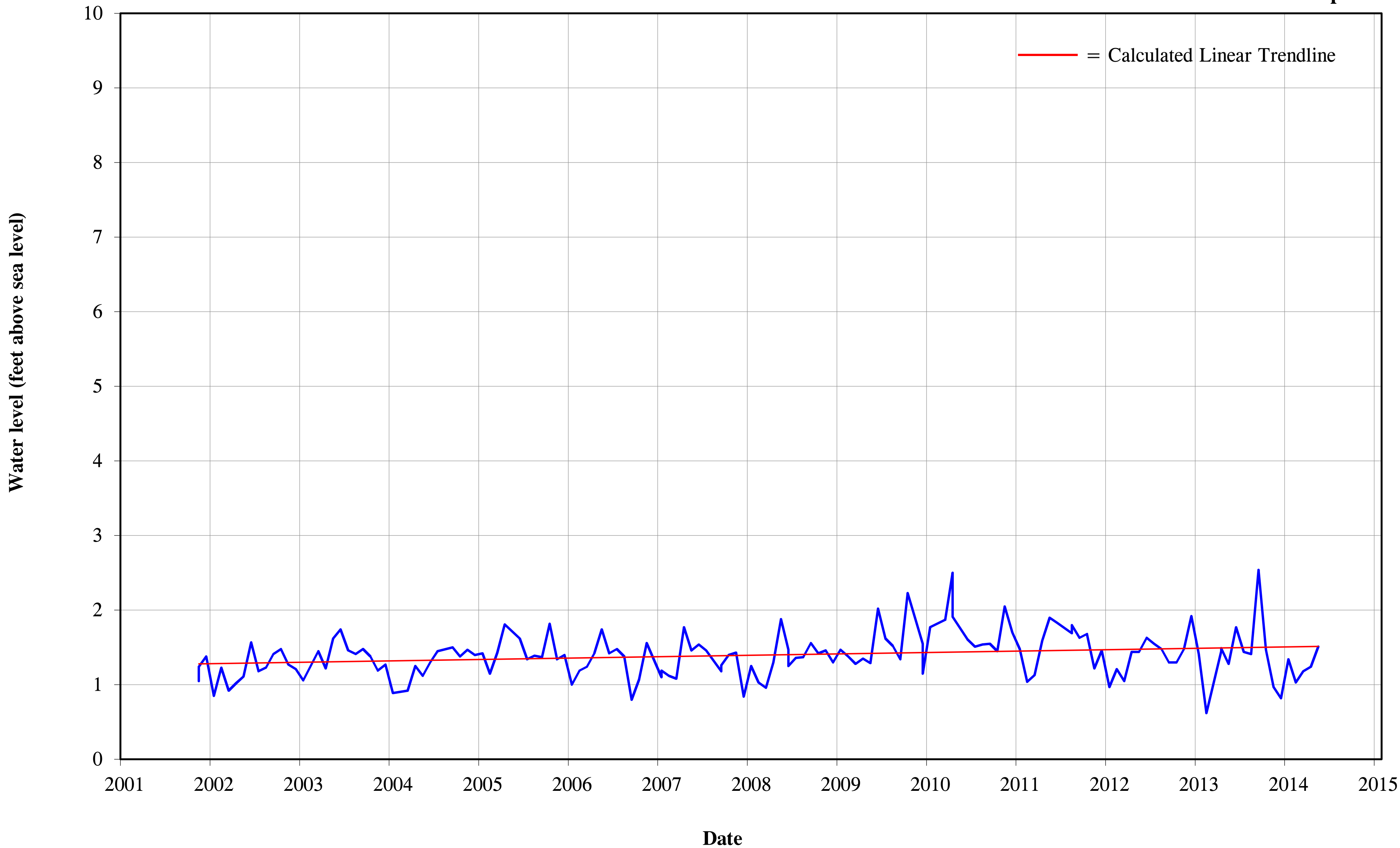
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\73974

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 75432.2
(Big Ram Island)
Historical Water Level Data: 2001 to 2014

Graph 10



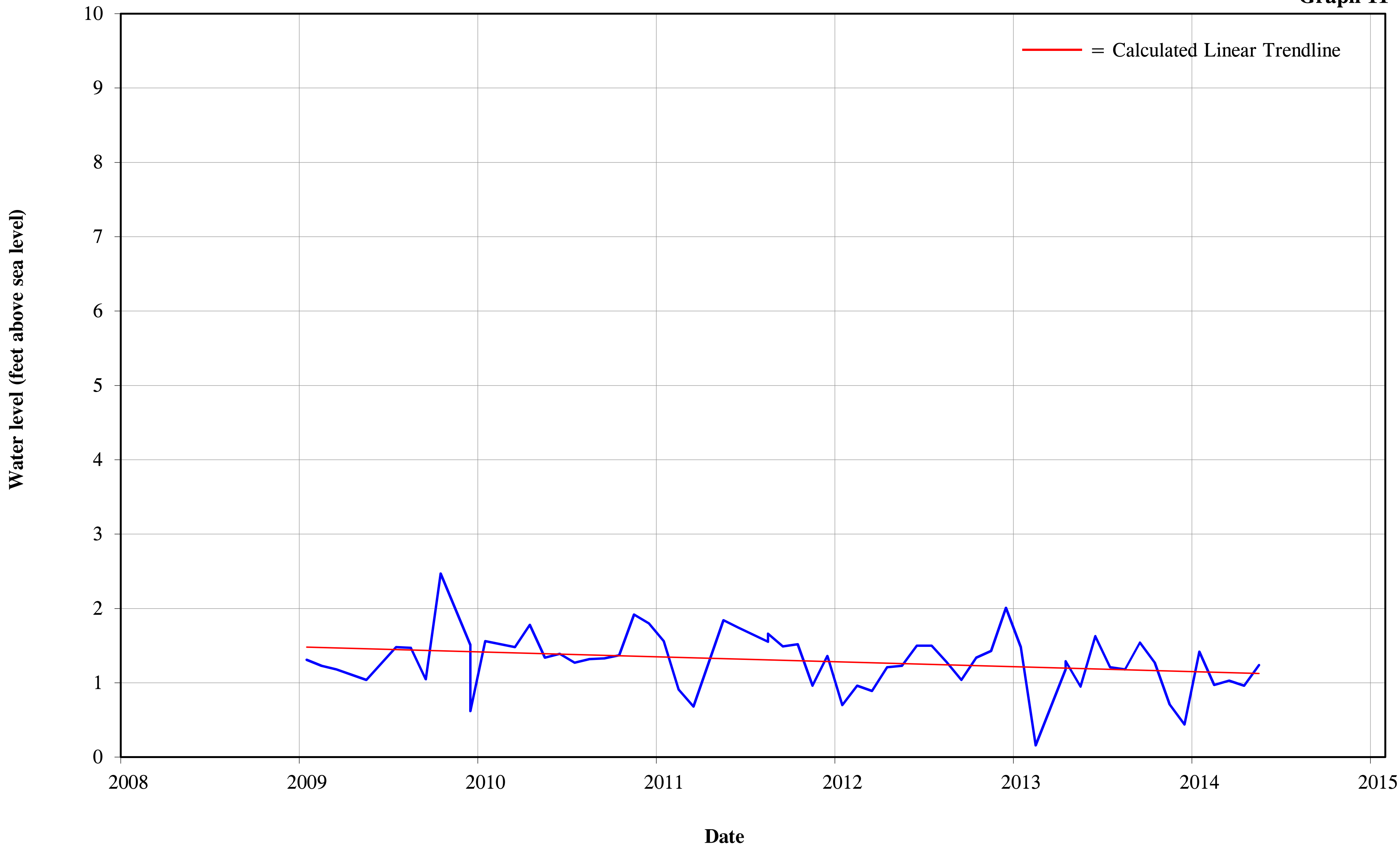
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\75432.2

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 75433
(Little Ram Island)
Historical Water Level Data: 2008 to 2014

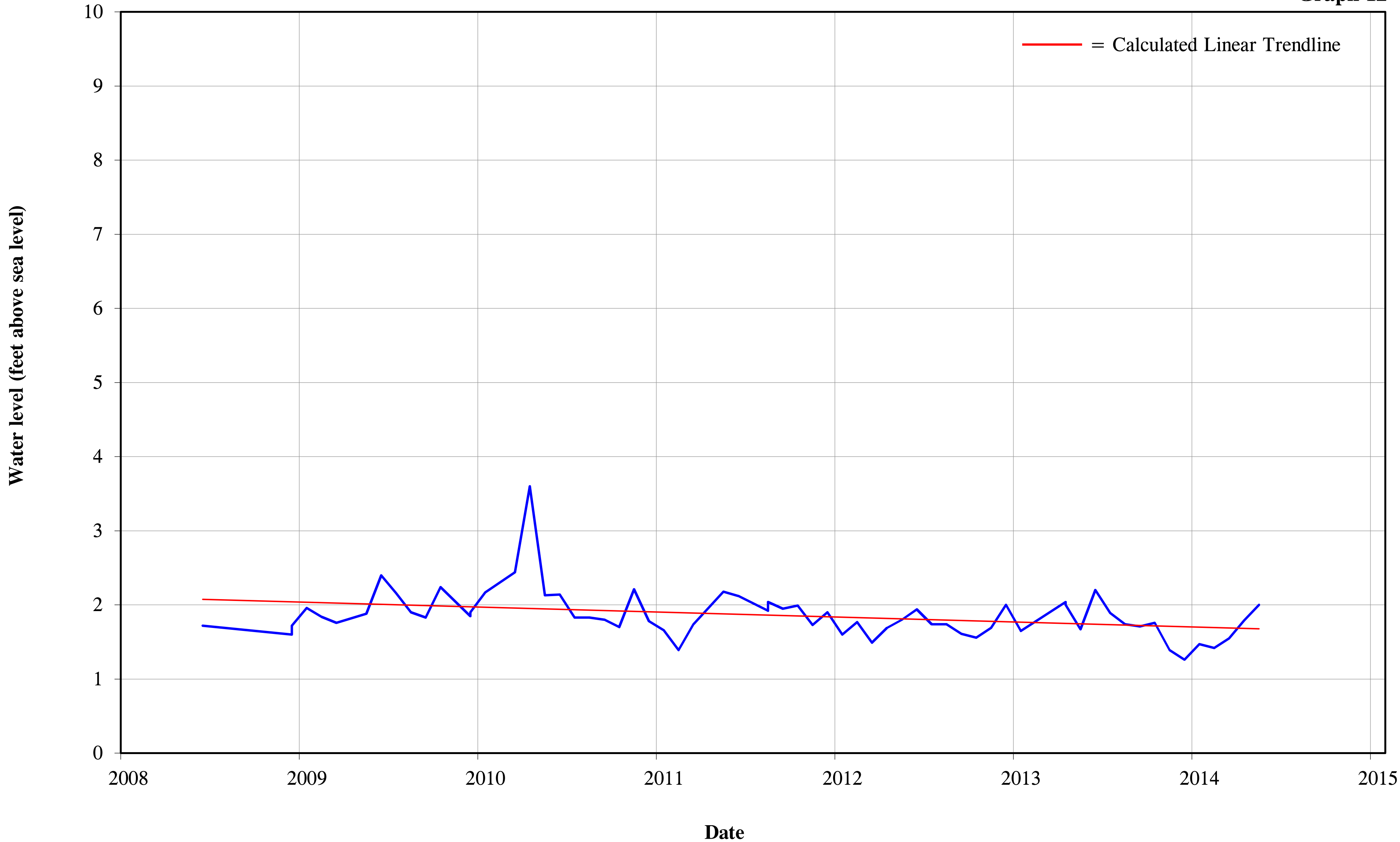
Graph 11



HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 75435
(Locust Rd and Dering Ln)
Historical Water Level Data: 2008 to 2014

Graph 12



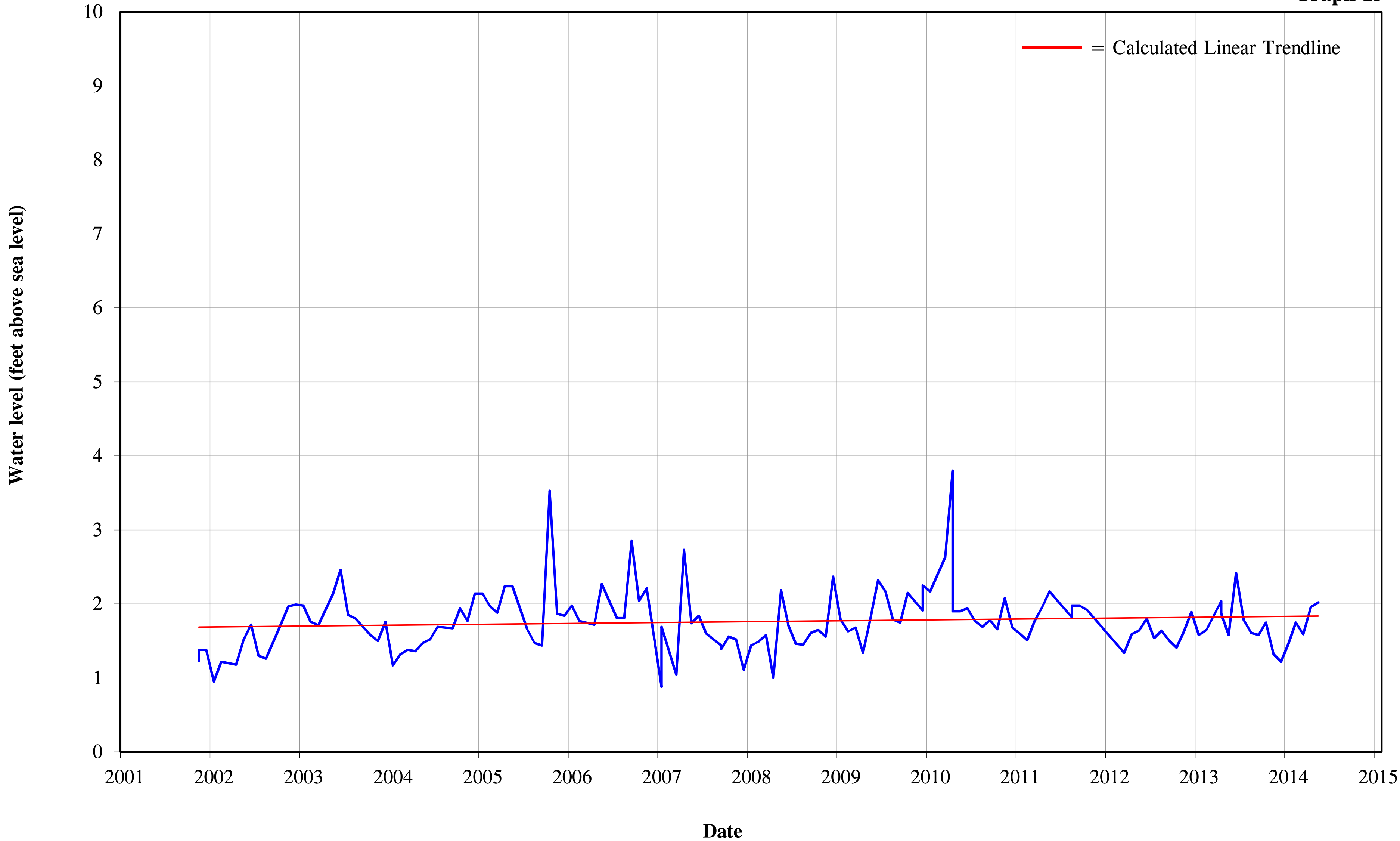
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\75435

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 75438
(South Menantic Rd)
Historical Water Level Data: 2001 to 2014

Graph 13



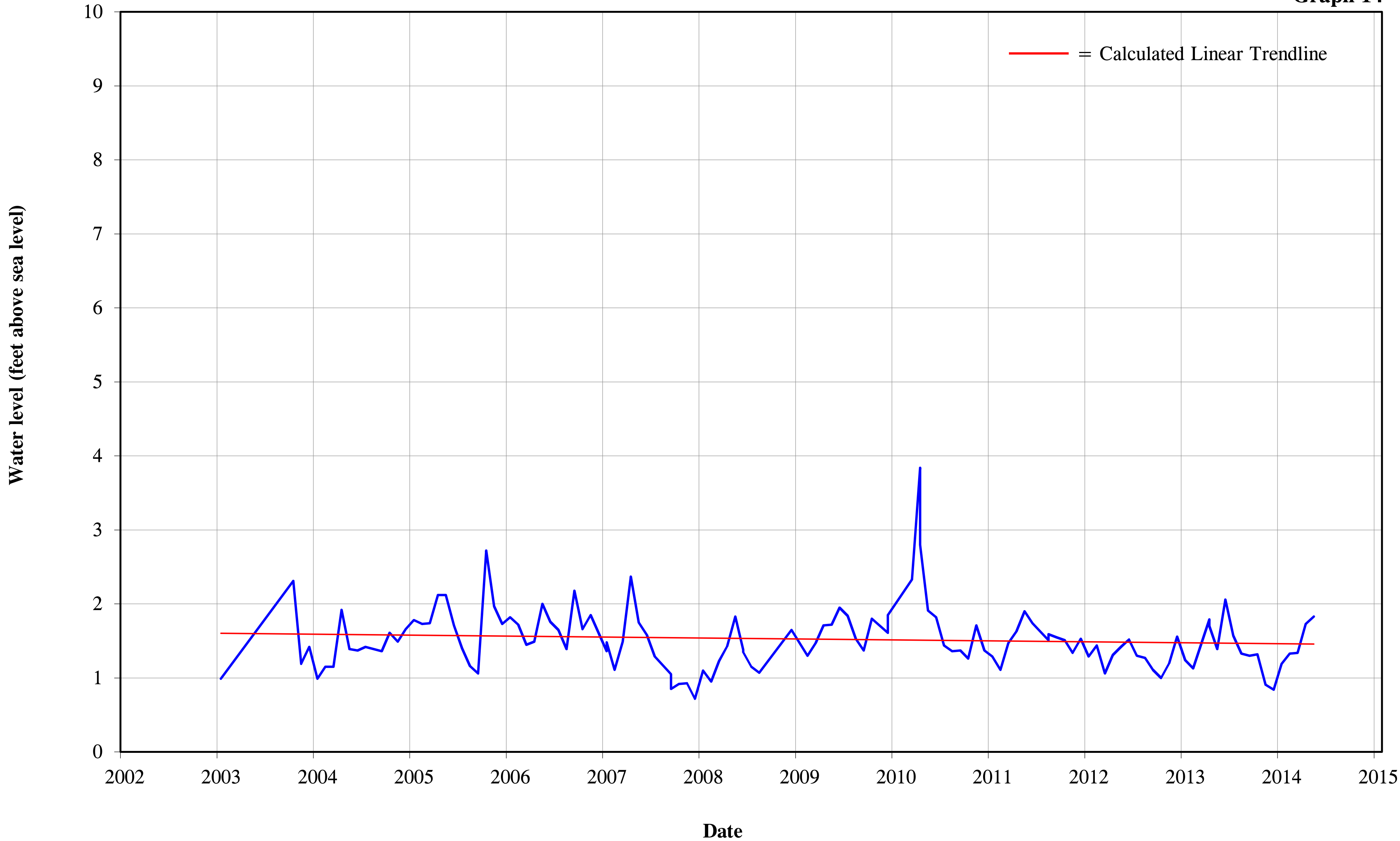
F:\REPORTS\Shelter Island\USGS Well Data\Groundwater Level Graphs\75438

LEGGETTE, BRASHEARS & GRAHAM, INC.

HYDROGEOLOGIC DATA REVIEW AND EVALUATION FOR SHELTER ISLAND, NEW YORK

USGS Well S 90279
(Osprey Rd and Shorewood Rd)
Historical Water Level Data: 2003 to 2014

Graph 14



APPENDIX V

Historical Groundwater Contour Maps
1974 (Soren, 1978)
1983 (Simmons, 1986)
1995 (Schubert, 1998)

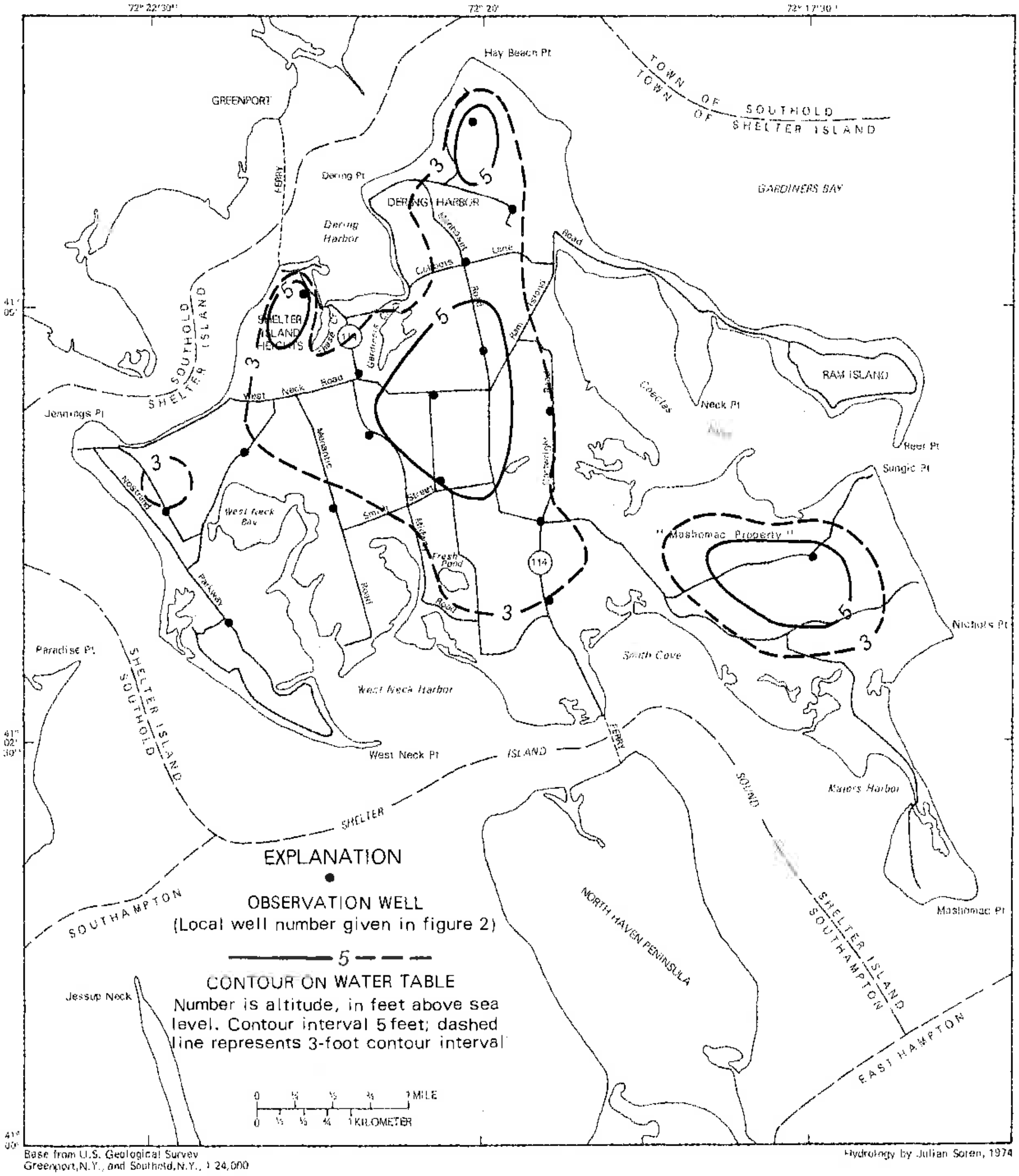


Figure 4.--Approximate position of water table in early spring 1974 on Shelter Island, Suffolk County, New York.

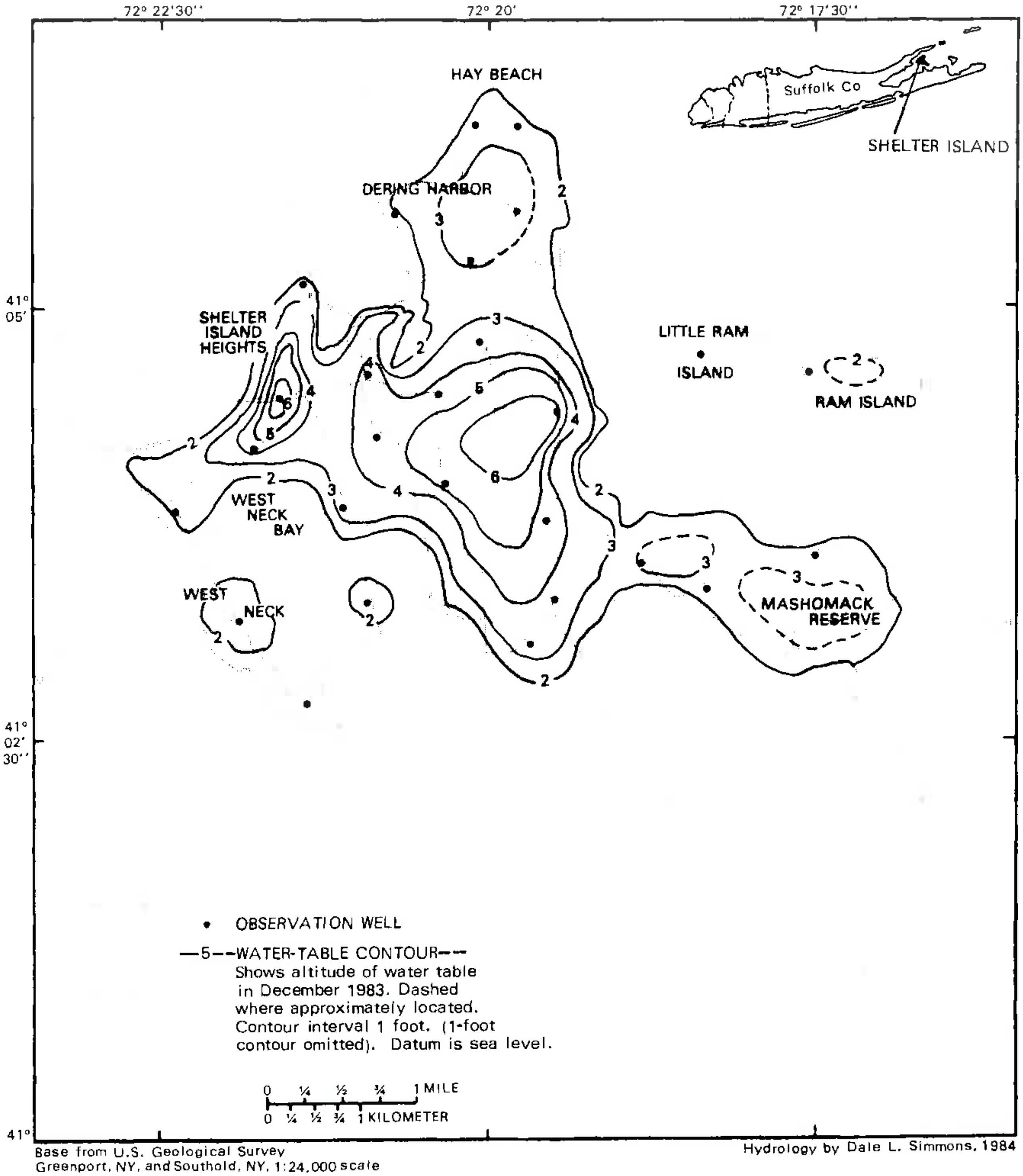
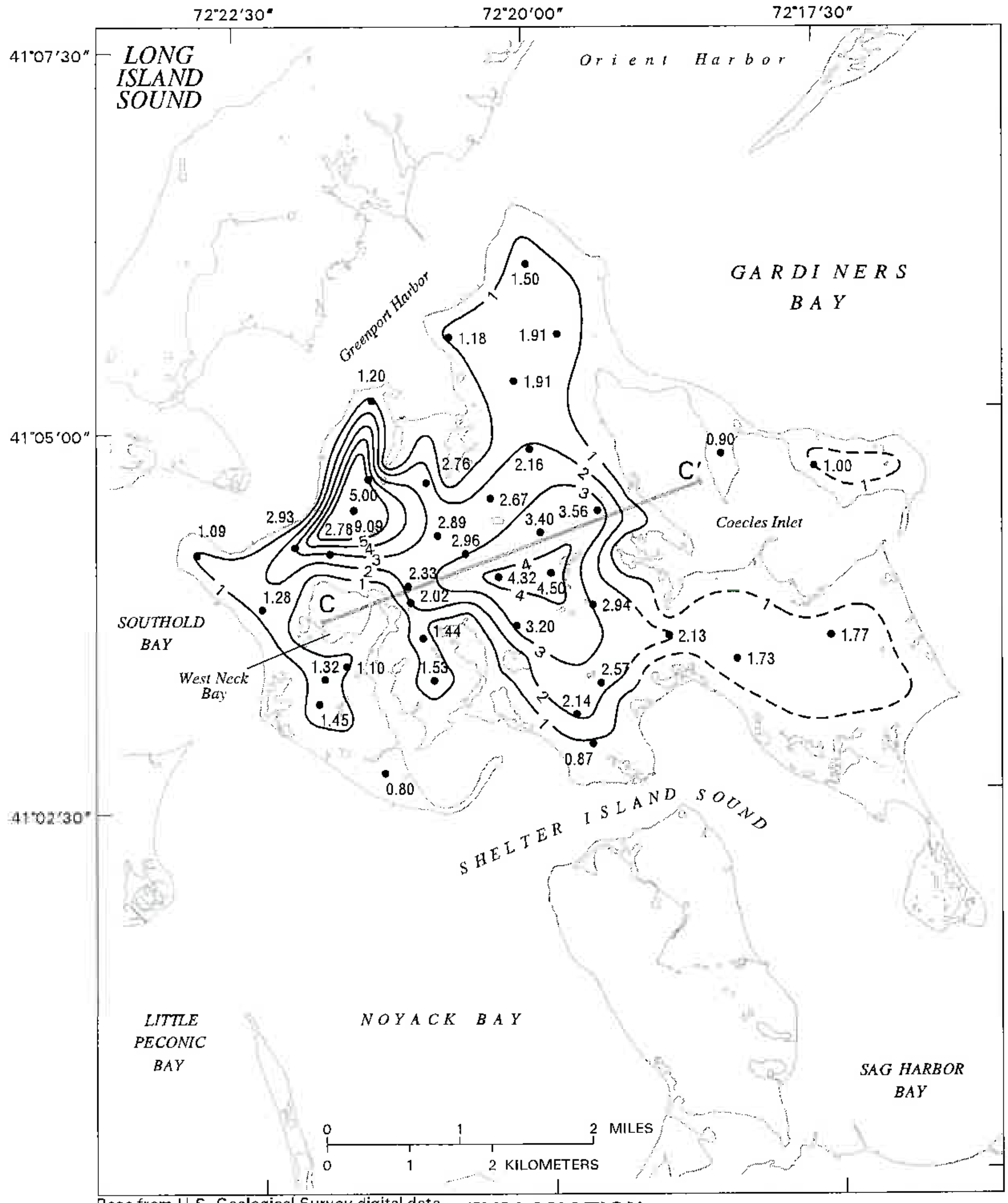


Figure 7.--Water-table altitude on Shelter Island in December 1983.



Base from U.S. Geological Survey digital data

EXPLANATION

C — C' LINE OF SECTION — Shows trace of vertical section shown in figure 4C.

— 1 — — WATER-TABLE CONTOUR — Shows altitude of water table on March 17–20, 1995. Dashed where approximately located. Contour interval 1 foot. Datum is sea level.

• 1.77 OBSERVATION WELL — Number indicates altitude of water, in feet above sea level.

Figure 5C. Water-table altitude in March 1995, water levels in observation wells, and location of vertical section C-C′ in the West Neck Bay study area, eastern Suffolk County, N.Y. (Location of study area is shown in fig. 2.)

APPENDIX VI

Data From Simmons, 1986

GEOHYDROLOGY AND GROUND-WATER QUALITY ON SHELTER ISLAND,

SUFFOLK COUNTY, NEW YORK, 1983-84

by Dale L. Simmons

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 85-4165

Prepared in cooperation with

TOWN OF SHELTER ISLAND

Syosset, New York

1986

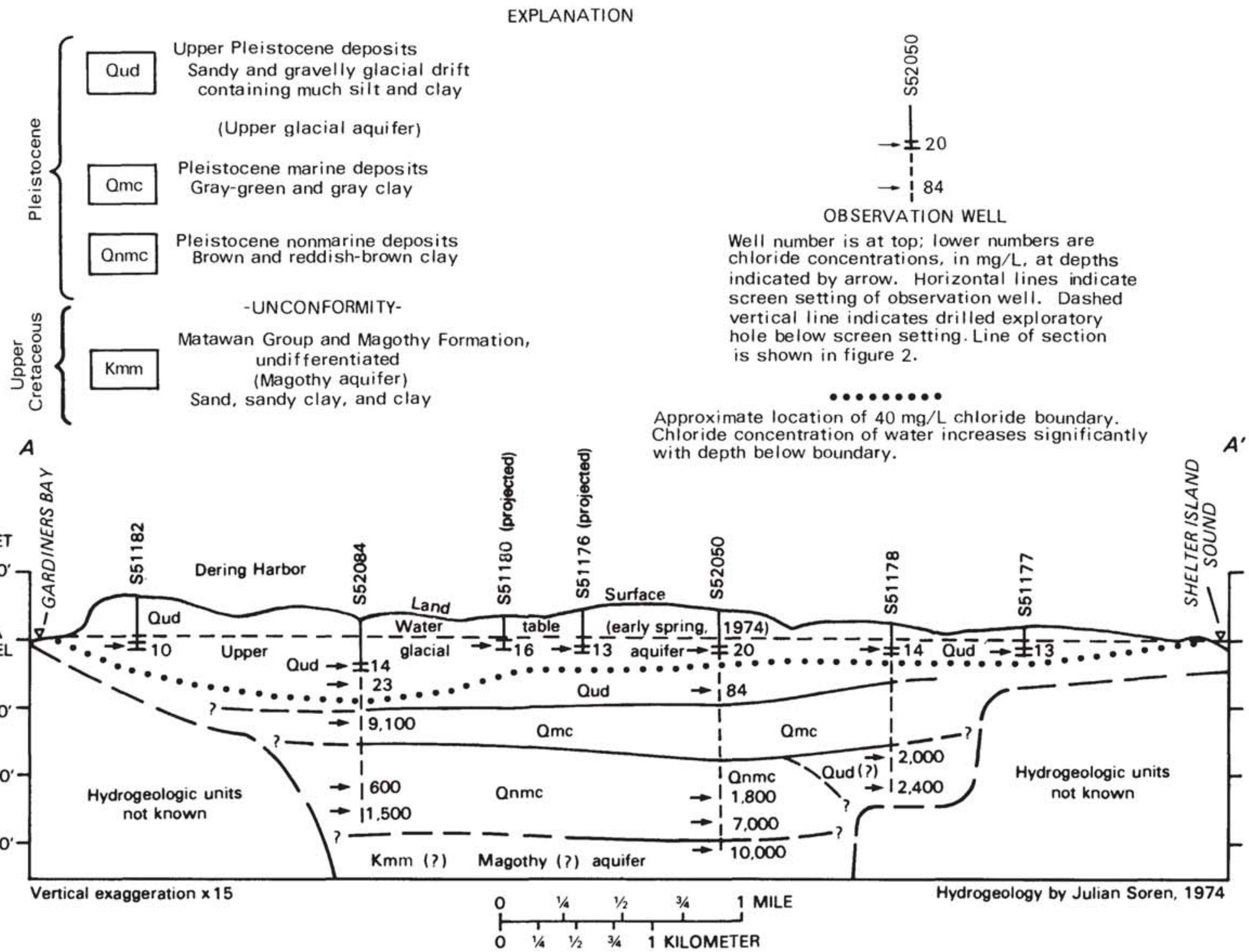


Figure 3.--Hydrogeologic section through Shelter Island. (Location of section is shown in fig. 2. Modified from Soren, 1978.)

The position of the freshwater/saltwater interface is not fixed; rather, it continuously shifts in response to fluctuations in recharge and ground-water withdrawal. It moves seaward with increased recharge and landward with increased withdrawal. Any attempt to define its location is therefore valid only within a relatively short time span.

Chloride concentrations in shallow ground water in the 10 new observation wells were measured during well installation and twice subsequently. The concentrations, shown in table 3, illustrate the extreme variability of chloride in water in or near the zone of diffusion and reflect its changing position with time. At nine wells, the chloride concentration was highest during September-October, immediately after the summer period of little recharge and high ground-water use. At seven wells, the chloride concentration was lowest in early spring, a period of high recharge and relatively low ground-water use.

Table 3.--Chloride concentrations in shallow ground water on Shelter Island, 1983-84.

[Well locations are shown in fig. 2; values are in mg/L; a dash indicates no sample was collected]

Well number	September - October 1983	December 1983	March - April 1984
S75432	150	25	22
S75433	220	23	110
S75434	36	21	19
S75435	125	64	14
S75436	38	28	--
S75437	2,400	310	18
S75438	152	180	20
S75439	27	20	20
S75440	15	7.8	11
S75441	20	18	11

During the installation of the 10 new wells, additional ground-water samples were collected from various depths below the water table and analyzed for both specific conductance and chloride concentration. Results, shown in table 4, indicate that the chloride concentration above the interface generally remains relatively constant or increases only slightly with depth. Below the beginning of the zone of diffusion (40 mg/L), however, the chloride concentration increases rapidly--as much as an order of magnitude within 10 ft--until it approaches or exceeds 19,000 mg/L, the chloride concentration of sea water.

The chloride concentrations in table 4 were used to estimate the altitude of the interface at each well. These values are included in table 4 for comparison with those predicted by the Ghyben-Herzberg (1:40) relationship. At each well, the probable depth of the interface based on chloride data is

Table 4.--Chloride concentration and specific conductance of ground water at various depths and approximate altitude of freshwater/saltwater interface in 10 observation wells on Shelter Island, September through October 1983.

[Well locations are shown in fig. 2]

Well number	Sampling altitude[1] (ft below sea level)	Chloride concentration (mg/L)	Specific conductance (μS/cm)	Approximate altitude of interface[2] (ft below sea level)
S75432	8	150	316	<8
	22	325	729	(65)
	33	2,750	6,638	
	42	22,000	39,780	
	54	22,000	42,020	
	64	22,100	37,718	
S75433	14	220	475	<14
	23	1,430	3,588	(71)
	33	21,300	39,000	
	44	20,000	40,625	
	54	21,400	39,618	
S75434	8	36	168	≥8
				(82)
S75435	16	125	345	<16
	22	94	271	(77)
	33	280	557	
	54	18,200	35,113	
	64	23,600	44,918	
S75436	5	38	234	≥33
	33	38	238	(510)
S75437	13	2,400	6,311	<13
	21	415	839	(56)
	31	20,600	35,569	
	42	22,500	43,350	
	52	22,500	40,230	
	73	23,400	41,210	
S75438	12	152	423	<12
	17	63	223	(83)
	22	66	300	
	32	570	1,454	
	53	17,800	34,840	
	74	20,000	37,868	
S75439	15	27	153	>70
	19	22	144	(130)
	30	14	97	
	50	15	70	
	61	25	111	
	70	24	116	
S75440	8	15	93	>39
	18	15	91	(130)
	39	20	111	
S75441	44	20	178	>54
	54	18	103	(100)

1 Rounded to nearest foot.
2 Upper number represents estimate based on chloride data; lower number (in parentheses) represents prediction from Ghyben-Herzberg relationship (1:40).

Appendix B.--Analyses of selected chemical constituents of water from observation wells, 1983-84, and physical characteristics of wells

[Well locations are shown in fig. 2; concentrations in milligrams per liter; dashes indicate analysis not performed]

Well number	Casing material	Depth of screen below land surface (ft)	Date sampled	Constituent or characteristic: Specific conductance (µS/cm at 25°C)	pH (standard units)	Temperature (°C)	Chloride (Cl)	Dissolved solids	Nitrate (NO_3, as N)	Iron, total (Fe)	Iron, dissolved (Fe)	Manganese, total (Mn)	Manganese, dissolved (Mn)
S51169	steel	44-54	9-28-83	131	5.9	14.0	13	97	0.86	2.0	---	0.03	---
			11-29-83	127	5.9	11.5	12	93	.90	.43	.14	.02	.02
			4- 2-84	125	5.6	11.5	14	88	1.1	.62	.13	.02	.01
S51170	steel	21-31	9-28-83	129	5.8	14.0	28	99	.40	.11	---	.02	---
			11-29-83	140	5.8	14.0	28	99	.10	1.9	1.4	.10	.09
			4- 2-84	122	5.7	12.0	27	86	<.10	1.2	.22	.04	.04
S51171	steel	43-53	9-28-83	208	5.8	12.0	19	143	4.9	.50	---	.03	---
			12- 1-83	216	5.7	11.0	19	138	4.4	.34	.22	.04	.02
			4- 2-84	122	5.6	12.0	17	79	4.6	1.0	.20	.02	.01
S51172	steel	25-35	9-27-83	326	5.7	12.0	40	205	5.5	1.2	---	.01	---
			12- 1-83	194	5.4	12.0	37	216	5.6	.56	.22	.01	.01
			4- 2-84	305	5.5	11.8	46	195	4.3	5.5	.29	.02	.02
S51173	steel	39-49	9-27-83	137	6.0	14.5	16	98	1.1	.80	---	.02	---
			12- 5-83	122	6.0	13.0	15	83	1.0	.95	.14	.01	.01
			4- 4-84	116	5.5	13.4	14	81	1.0	12.0	.18	.03	.01
S51174	steel	51-61	9-27-83	168	5.7	13.0	18	115	2.2	.48	---	.03	---
			12- 7-83	161	6.0	12.0	19	106	2.2	.25	.10	.02	.02
			4- 2-84	174	5.7	13.0	21	120	2.8	.52	.17	.02	.02
S51175	steel	48-58	9-27-83	161	5.9	13.0	17	119	1.5	---	---	---	---
			12- 5-83	160	6.0	11.0	16	108	1.4	.30	.25	[a].06	.07
			4- 2-84	164	5.7	11.5	18	108	1.8	1.0	.28	.04	.04
S51176	steel	47-57	9-27-83	156	5.7	13.0	18	102	1.2	6.7	---	.04	---
			12- 7-83	134	5.8	10.0	15	89	1.1	21.0	1.1	.04	.04
			4- 4-84	135	5.4	11.9	17	90	1.5	10.0	.58	.04	.04
S51177	steel	27-37	9-29-83	108	5.4	11.5	15	70	<.10	.51	---	<.01	---
			12-14-83	126	5.5	12.0	23	71	.90	1.3	.81	.03	.03
			4- 3-84	109	5.3	12.3	17	80	<.10	[a]4.8	5.0	.05	.05

(continued)

Appendix B.--Analyses of selected chemical constituents of water from observation wells, 1983-84, and physical characteristics of wells (Continued)

[Well locations are shown in fig. 2; concentrations in milligrams per liter; dashes indicate analysis not performed]

				Constituent or characteristic									
Well number	Casing material	Depth of screen below land surface (ft)	Date sampled	Specific conductance (μS/cm at 25°C)	pH (standard units)	Temperature (°C)	Chloride (Cl)	Dissolved solids	Nitrate (NO_3, as N)	Iron, total (Fe)	Iron, dissolved (Fe)	Manganese, total (Mn)	Manganese, dissolved (Mn)
S51178	steel	25-35	9-29-83	139	6.1	12.5	11	111	0.58	2.3	--	0.03	--
			12-16-83	142	6.0	12.0	11	92	.70	.25	.17	[a].01	.02
			4- 3-84	146	5.9	11.8	13	111	.80	.40	.14	.01	.01
S51179	steel	55-65	9-29-83	145	6.3	14.5	11	104	.20	1.1	--	.02	--
			12-14-83	132	6.3	12.5	11	88	.20	.46	.20	.01	.01
			4- 3-84	125	6.2	13.2	10	94	.20	4.1	.18	.03	.01
S51180	steel	39-49	9-29-83	153	5.9	12.5	21	114	.98	1.5	--	.13	--
			12- 7-83	57	5.9	11.0	8.5	40	<.10	1.7	.93	.07	.07
			4- 4-84	145	5.5	--	23	97	1.8	6.5	4.9	.20	.20
S51181	steel	62-72	9-28-83	211	6.1	14.0	17	138	4.0	.21	--	<.01	--
			12-16-83	203	5.9	13.0	16	118	4.0	.16	.03	.01	.01
			4- 4-84	191	5.8	9.8	16	120	4.5	1.1	.03	.01	.01
S51182	steel	64-74	9-28-83	72	5.9	14.5	9.1	53	<.10	11.0	--	.06	--
			12- 8-83	59	5.8	11.0	7.8	42	5.9	1.7	.15	[a].01	.02
			4- 4-84	58	5.6	11.4	8.2	49	<.10	4.6	.11	.02	.01
S51183	steel	39-49	9-29-83	108	5.9	12.0	12	74	.10	--	--	--	--
			12- 8-83	105	6.1	10.0	12	72	.09	.46	.20	.01	.01
			4- 3-84	92	5.9	11.2	14	69	.10	.30	.20	.01	.01
S52050	steel	52-62	9-27-83	229	5.9	14.5	15	164	8.7	12.0	--	.08	--
			12- 7-83	208	5.8	13.0	13	155	9.1	.36	.10	.02	.02
			4- 3-84	187	5.4	13.2	13	118	4.7	.56	.33	.03	.03
S52084	steel	62-72	9-28-83	133	7.2	13.5	15	102	1.2	.77	--	.02	--
			12- 8-83	121	6.1	12.0	13	88	1.4	.32	.04	.01	<.01
			4- 3-84	123	6.0	12.3	14	94	1.5	.19	.03	<.01	<.01

(continued)

Appendix B.--Analyses of selected chemical constituents of water from observation wells, 1983-84, and physical characteristics of wells (Continued)

[Well locations are shown in fig. 2; concentrations in milligrams per liter; dashes indicate analysis not performed]

				Constituent or characteristic									
Well number	Casing material	Depth of screen below land surface (ft)	Date sampled	Specific conductance (µS/cm at 25°C)	pH (standard units)	Temperature (°C)	Chloride (Cl)	Dissolved solids	Nitrate (NO_3, as N)	Iron, total (Fe)	Iron, dissolved (Fe)	Manganese, total (Mn)	Manganese, dissolved (Mn)
S75432	PVC[b]	24-29	12-15-83	131	5.5	13.0	25	75	<0.10	0.33	<0.01	0.14	<0.01
			3-26-84	128	5.7	11.5	22	77	< .10	.61	< .01	.04	.02
S75433	PVC	30-35	12-15-83	132	5.6	12.0	23	71	< .10	3.3	.14	.23	.19
			3-26-84	420	5.4	10.5	110	229	< .10	.21	< .10	.19	.19
S75434	steel	60-62	12-15-83	175	5.8	11.5	21	96	4.8	13.0	.48	.28	.19
			3-26-84	156	5.8	11.0	19	93	2.8	2.6	.12	.03	.03
S75435	PVC	32-37	12-14-83	347	6.0	12.0	64	177	1.4	.66	< .01	.15	.11
			4- 5-84	161	6.0	11.9	14	93	1.5	.39	.03	.04	.03
S75436	steel	60-62	[c]1- 4-84	318	6.6	11.0	28	186	14.0	15.0	.08	.34	.18
S75437	PVC	20-25	12-15-83	1,410	6.7	13.0	310	585	.38	2.5	< .01	.36	.30
			4- 6-84	104	5.8	12.2	18	57	< .10	.39	.01	.11	.11
S75438	PVC	18-23	12-19-83	694	5.5	13.0	180	372	.40	.10	.01	1.7	1.5
			4- 6-84	148	5.3	11.5	20	87	.20	.18	---	.35	---
S75439	PVC	24-29	12-16-83	174	5.5	12.0	20	104	2.0	.63	.01	3.1	2.9
			4- 6-84	155	5.1	12.3	20	99	3.6	.21	.01	[a]2.8	3.0
S75440	PVC	51-53	12-19-83	83	5.3	10.0	7.8	52	< .10	9.5	.27	.64	.22
			4- 5-84	80	5.4	11.2	11	53	< .10	1.6	.39	[a].08	.10
S75441	PVC	31-33	12-19-83	106	5.9	12.0	18	64	< .10	.69	.39	.15	.15
			4- 5-84	79	5.7	10.9	11	54	< .10	.56	.21	.05	.05

[a] value for total constituent reported by lab is less than that for dissolved constituent.
[b] polyvinyl chloride
[c] well tampered with; sample contaminated.

APPENDIX VII

Laboratory Reports for January and June 2014

Technical Report

prepared for:

Leggette Brashears & Graham White Plains Office
4 Westchester Park Drive, Suite 175
White Plains NY, 10604
Attention: John Benvegna

Report Date: 01/10/2014
Client Project ID: Shelter Island
York Project (SDG) No.: 14A0179

CT Cert. No. PH-0723 | New Jersey Cert. No. CT-005 | New York Cert. No. 10854 | PA Cert. No. 68-04440

120 RESEARCH DRIVE | STRATFORD, CT 06615 | (203) 325-1371 | FAX (203) 357-0166

Report Date: 01/10/2014
Client Project ID: Shelter Island
York Project (SDG) No.: 14A0179

Leggette Brashears & Graham White Plains Office
4 Westchester Park Drive, Suite 175
White Plains NY, 10604
Attention: John Benvegna

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on January 09, 2014 and listed below. The project was identified as your project: **Shelter Island**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Notes section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the attachment to this report, and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
14A0179-01	75437.1	Water	01/08/2014	01/09/2014
14A0179-02	75438	Water	01/08/2014	01/09/2014
14A0179-03	90279	Water	01/08/2014	01/09/2014
14A0179-04	51170	Water	01/08/2014	01/09/2014
14A0179-05	51178	Water	01/08/2014	01/09/2014
14A0179-06	51177	Water	01/08/2014	01/09/2014
14A0179-07	51176	Water	01/08/2014	01/09/2014

General Notes for York Project (SDG) No.: 14A0179

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All samples were received in proper condition for analysis with proper documentation, unless otherwise noted.
6. All analyses conducted met method or Laboratory SOP requirements. See the Qualifiers and/or Narrative sections for further information.
7. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
8. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.

Approved By: **Date:** 01/10/2014

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: **75437.1** | **York Sample ID:** **14A0179-01**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 9:25 am	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**7.11**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 17:02	01/09/2014 17:02	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.576**		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 17:02	01/09/2014 17:02	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 17:02	01/09/2014 17:02	KK

Sample Information

Client Sample ID: **75438** | **York Sample ID:** **14A0179-02**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 10:40 am	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**39.9**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 17:21	01/09/2014 17:21	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**1.11**		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 17:21	01/09/2014 17:21	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	**1.19**		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 17:21	01/09/2014 17:21	KK

Sample Information

Client Sample ID: **90279** | **York Sample ID:** **14A0179-03**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 12:00 pm	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**20.4**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 18:18	01/09/2014 18:18	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**5.39**		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 18:18	01/09/2014 18:18	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 18:18	01/09/2014 18:18	KK

Sample Information

Client Sample ID: **51170** | **York Sample ID:** **14A0179-04**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 1:10 pm	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**29.4**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 18:37	01/09/2014 18:37	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	ND		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 18:37	01/09/2014 18:37	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 18:37	01/09/2014 18:37	KK

Sample Information

Client Sample ID: 51178 | **York Sample ID:** 14A0179-05

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 2:22 pm	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**20.1**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 18:55	01/09/2014 18:55	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	ND		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 18:55	01/09/2014 18:55	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 18:55	01/09/2014 18:55	KK

Sample Information

Client Sample ID: 51177 | **York Sample ID:** 14A0179-06

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 2:52 pm	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**2.17**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 19:14	01/09/2014 19:14	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	ND		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 19:14	01/09/2014 19:14	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 19:14	01/09/2014 19:14	KK

Sample Information

Client Sample ID: **51176** | **York Sample ID:** **14A0179-07**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0179	Shelter Island	Water	January 8, 2014 3:56 pm	01/09/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**9.45**		mg/L	0.0690	0.500	1	EPA 300.0	01/09/2014 19:33	01/09/2014 19:33	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.205**		mg/L	0.0120	0.0500	1	EPA 300.0	01/09/2014 19:33	01/09/2014 19:33	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/09/2014 19:33	01/09/2014 19:33	KK

Notes and Definitions

ND	Analyte NOT DETECTED at the stated Reporting Limit (RL) or above.
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
MDL	METHOD DETECTION LIMIT - the minimum concentration that can be measured and reported with a 99% confidence that the concentration is greater than zero. If requested or required, a value reported below the RL and above the MDL is considered estimated and is noted with a "J" flag.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two.
For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the MDL, with values between the MDL and the RL being "J" flagged as estimated results.

Corrective Action: Client submitted sample not on C-o-C - 1/9/13

Technical Report

prepared for:

Leggette Brashears & Graham White Plains Office
4 Westchester Park Drive, Suite 175
White Plains NY, 10604
Attention: John Benvegna

Report Date: 01/13/2014
Client Project ID: Shelter Island
York Project (SDG) No.: 14A0214

Report Date: 01/13/2014
Client Project ID: Shelter Island
York Project (SDG) No.: 14A0214

Leggette Brashears & Graham White Plains Office
4 Westchester Park Drive, Suite 175
White Plains NY, 10604
Attention: John Benvegna

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on January 10, 2014 and listed below. The project was identified as your project: **Shelter Island**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Notes section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the attachment to this report, and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
14A0214-01	**52084**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-02	**51182**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-03	**75435**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-04	**75432**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-05	**75433**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-06	**51183**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-07	**73974**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-08	**51169**	**Water**	**01/09/2014**	**01/10/2014**
14A0214-09	**38461**	**Water**	**01/09/2014**	**01/10/2014**

General Notes for York Project (SDG) No.: 14A0214

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All samples were received in proper condition for analysis with proper documentation, unless otherwise noted.
6. All analyses conducted met method or Laboratory SOP requirements. See the Qualifiers and/or Narrative sections for further information.
7. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
8. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.

Approved By: **Date:** 01/13/2014

Benjamin Gulizia
Laboratory Director

YORK
ANALYTICAL LABORATORIES INC

Sample Information

Client Sample ID: **52084** | **York Sample ID:** **14A0214-01**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 8:10 am	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**8.96**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 21:04	01/10/2014 21:04	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	ND		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 21:04	01/10/2014 21:04	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	**0.178**		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 21:04	01/10/2014 21:04	KK

Sample Information

Client Sample ID: **51182** | **York Sample ID:** **14A0214-02**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 9:00 am	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**5.06**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 21:22	01/10/2014 21:22	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.140**		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 21:22	01/10/2014 21:22	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 21:22	01/10/2014 21:22	KK

Sample Information

Client Sample ID: **75435** **York Sample ID:** **14A0214-03**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 11:05 am	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**17.7**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 21:41	01/10/2014 21:41	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**2.84**		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 21:41	01/10/2014 21:41	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 21:41	01/10/2014 21:41	KK

Sample Information

Client Sample ID: **75432** **York Sample ID:** **14A0214-04**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 11:50 am	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**22.1**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 22:00	01/10/2014 22:00	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.134**		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 22:00	01/10/2014 22:00	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 22:00	01/10/2014 22:00	KK

Sample Information

Client Sample ID: 75433 **York Sample ID:** 14A0214-05

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 12:20 pm	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**37.7**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 22:18	01/10/2014 22:18	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.183**		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 22:18	01/10/2014 22:18	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 22:18	01/10/2014 22:18	KK

Sample Information

Client Sample ID: 51183 **York Sample ID:** 14A0214-06

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 1:50 pm	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**11.6**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 22:37	01/10/2014 22:37	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	ND		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 22:37	01/10/2014 22:37	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 22:37	01/10/2014 22:37	KK

Sample Information

Client Sample ID: 73974 | **York Sample ID:** 14A0214-07

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 2:45 pm	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**3.27**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 23:34	01/10/2014 23:34	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.154**		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 23:34	01/10/2014 23:34	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 23:34	01/10/2014 23:34	KK

Sample Information

Client Sample ID: 51169 | **York Sample ID:** 14A0214-08

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 3:20 pm	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**10.0**		mg/L	0.0690	0.500	1	EPA 300.0	01/10/2014 23:53	01/10/2014 23:53	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	ND		mg/L	0.0120	0.0500	1	EPA 300.0	01/10/2014 23:53	01/10/2014 23:53	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/10/2014 23:53	01/10/2014 23:53	KK

Sample Information

Client Sample ID: **38461** | **York Sample ID:** **14A0214-09**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14A0214	Shelter Island	Water	January 9, 2014 4:40 pm	01/10/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	**15.2**		mg/L	0.0690	0.500	1	EPA 300.0	01/11/2014 00:12	01/11/2014 00:12	KK

Nitrate as N

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
14797-55-8	Nitrate as N	**0.264**		mg/L	0.0120	0.0500	1	EPA 300.0	01/11/2014 00:12	01/11/2014 00:12	KK

ortho-Phosphate as P

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	MDL	RL	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
	Ortho-Phosphate as P	ND		mg/L	0.0630	0.100	1	EPA 300.0	01/11/2014 00:12	01/11/2014 00:12	KK

Notes and Definitions

ND	Analyte NOT DETECTED at the stated Reporting Limit (RL) or above.
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
MDL	METHOD DETECTION LIMIT - the minimum concentration that can be measured and reported with a 99% confidence that the concentration is greater than zero. If requested or required, a value reported below the RL and above the MDL is considered estimated and is noted with a "J" flag.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two.
For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the MDL, with values between the MDL and the RL being "J" flagged as estimated results.

YORK ANALYTICAL LABORATORIES
120 RESEARCH DR.
STRATFORD, CT 06615
(203) 325-1371
FAX (203) 357-0166

Field Chain-of-Custody Record

NOTE: York's Std. Terms & Conditions are listed on the back side of this document. This document serves as your written authorization to York to proceed with the analyses requested and your signature binds you to York's Std. Terms & Conditions.

York Project No. 14A0214

YOUR Information	Report To:	Invoice To:	YOUR Project ID	Turn-Around Time	Report Type
Company: LBG, INC	Company:	Company:	Shelter Island	RUSH - Same Day ☐	Summary Report
Address: 4 westchester park Dr Whiteplains, NY	Address: S	Address: S		RUSH - Next Day ☐	Summary w/ QA Summary
Phone No. 914 694 5711	Phone No. A	Phone No. A	Purchase Order No.	RUSH - Two Day ☐	CT RCP Package
Contact Person: John Benvengnc	Attention: M	Attention: M		RUSH - Three Day ☐	CTRCP DQA/DUE Pkg
E-Mail Address: Benvengnc@LBGNY.com	E-Mail Address: E	E-Mail Address: E	Samples from: CT__ NY__ NJ__	RUSH - Four Day ☐	NY ASP A Package
				Standard(5-7 Days) ☒	NY ASP B Package
					NJDEP Red. Deliv.

Print Clearly and Legibly. All Information must be complete. Samples will NOT be logged in and the turn-around time clock will not begin until any questions by York are resolved.

Samples Collected/Authorized By (Signature)

Mike Reiff
Name (printed)

Matrix Codes
S - soil
Other - specify(oil, etc.)
WW - wastewater
GW - groundwater
DW - drinking water
Air-A - ambient air
Air-SV - soil vapor

Volatiles		Semi-Vols.	Pest/PCB/Herb	Metals	Misc. Org.	Full Lists	Misc.
8260 full	TICs	8270 or 625	8082PCB	RCRA8	TPH GRO	Pri.Poll.	Corrosivity
624	Site Spec.	STARS list	8081Pest	PP13 list	TPH DRO	TCL Organics	Reactivity
STARS list	Nassau Co.	BN Only	8151Herb	TAL	CT ETPH	TAL Met/CN	Ignitability
BTEX	Suffolk Co.	Acids Only	CT RCP	CT15 list	NY 310-13	Full TCLP	Flash Point
MTBE	Ketones	PAH list	App. IX	TAGM list	TPH 1664	Full App. IX	Sieve Anal.
TCL list	Oxygenates	TAGM list	Site Spec.	NJDEP list	Air TO14A	Part360-Routine	Heterotrophs
TAGM list	TCLP list	CT RCP list	SPLP or TCLP	Total	Air TO15	Part360-Baseline	TOX
CT RCP list	524.2	TCL list	TCLP Pest	Dissolved	Air STARS	Part360-Expanded No Dioxins/Furans	BTU/lb.
Arom. only	502.2	NJDEP list	TCLP Herb	SPLP or TCLP	Air VPH	Part360-Expanded Full List	Aquatic Tox.
Halog.only	NJDEP list	App. IX	Chlordane	Indiv. Metals	Air TICs	NYCDEP Sewer	TOC
App.IX list	SPLP or TCLP	TCLP BNA	608 Pest	LIST Below	Methane	NYSDEC Sewer	Asbestos
8021B list		SPLP or TCLP	608 PCB		Helium	TAGM	Silica

Electronic Data Deliverables (EDD)
Simple Excel
NYSDEC EQuIS
EQuIS (std)
EZ-EDD (EQuIS)
NJDEP SRP HazSite EDD
GIS/KEY (std)
Other
York Regulatory Comparison Excel Spreadsheet
Compare to the following Regs. (please fill in):

Sample Identification	Date/Time Sampled		Sample Matrix	Choose Analyses Needed from the Menu Above and Enter Below	Container Description(s)
52084	1/9/14	0810	GW	Chloride, Nitrates, Phosphorus	1 - Plastic
51182	↓	0900	↓	↓	↓
75435	↓	1105	↓	↓	↓
75432	↓	1150	↓	↓	↓
75433	↓	1220	↓	↓	↓
51183	↓	1350	↓	↓	↓
73974	↓	1445	↓	↓	↓
51169	↓	1520	↓	↓	↓
38461	↓	1640	↓	↓	↓

Comments

Preservation Check those Applicable: 4°C___ Frozen___ HCl___ MeOH___ HNO_3___ H_2SO_4___ NaOH___ ZnAc___ Ascorbic Acid___ Other___

Special Instructions
Field Filtered ☐
Lab to Filter ☐

Samples Relinquished By	Date/Time	Samples Received By	Date/Time
[signature]	1/10/14 0800	TC [signature]	1/10/14 11:25
Samples Relinquished By	Date/Time	Samples Received in LAB by: PGrace	1-10-14 1845

Temperature on Receipt 3.8 °C

Technical Report

prepared for:

Leggette Brashears & Graham White Plains Office
4 Westchester Park Drive, Suite 175
White Plains NY, 10604
Attention: John Benvegna

Report Date: 06/11/2014
Client Project ID: Shelter Island
York Project (SDG) No.: 14F0295

CT Cert. No. PH-0723 New Jersey Cert. No. CT-005 New York Cert. No. 10854 PA Cert. No. 68-04440

Report Date: 06/11/2014
Client Project ID: Shelter Island
York Project (SDG) No.: 14F0295

Leggette Brashears & Graham White Plains Office
4 Westchester Park Drive, Suite 175
White Plains NY, 10604
Attention: John Benvegna

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on June 06, 2014 and listed below. The project was identified as your project: **Shelter Island**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Notes section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the attachment to this report, and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
14F0295-01	75437.2	Water	06/04/2014	06/06/2014
14F0295-02	51170	Water	06/04/2014	06/06/2014
14F0295-03	51169	Water	06/04/2014	06/06/2014
14F0295-04	75438	Water	06/04/2014	06/06/2014
14F0295-05	38461	Water	06/04/2014	06/06/2014
14F0295-06	90279	Water	06/04/2014	06/06/2014
14F0295-07	51177	Water	06/04/2014	06/06/2014
14F0295-08	51178	Water	06/04/2014	06/06/2014
14F0295-09	75433	Water	06/04/2014	06/06/2014
14F0295-10	75432.2	Water	06/04/2014	06/06/2014
14F0295-11	52084	Water	06/04/2014	06/06/2014
14F0295-12	51182	Water	06/05/2014	06/06/2014
14F0295-13	75435	Water	06/05/2014	06/06/2014
14F0295-14	51176	Water	06/05/2014	06/06/2014
14F0295-15	73974	Water	06/05/2014	06/06/2014
14F0295-16	51183	Water	06/05/2014	06/06/2014

General Notes for York Project (SDG) No.: 14F0295

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All samples were received in proper condition for analysis with proper documentation, unless otherwise noted.
6. All analyses conducted met method or Laboratory SOP requirements. See the Qualifiers and/or Narrative sections for further information.
7. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
8. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.

Approved By: **Date:** 06/11/2014

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: 75437.2 | **York Sample ID:** 14F0295-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 8:40 am	06/06/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**40.8**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 18:02	06/10/2014 18:02	KK

Sample Information

Client Sample ID: 51170 | **York Sample ID:** 14F0295-02

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 9:26 am	06/06/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**30.4**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 18:21	06/10/2014 18:21	KK

Sample Information

Client Sample ID: 51169 | **York Sample ID:** 14F0295-03

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 10:31 am	06/06/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**9.34**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 18:40	06/10/2014 18:40	KK

Sample Information

Client Sample ID: 75438 | **York Sample ID:** 14F0295-04

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 11:15 am	06/06/2014

Chloride

Log-in Notes: **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst

YORK ANALYTICAL LABORATORIES INC

Sample Information

Client Sample ID: **75438** — **York Sample ID:** **14F0295-04**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 11:15 am	06/06/2014

Chloride — **Log-in Notes:** — **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**44.2**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 18:59	06/10/2014 18:59	KK

Sample Information

Client Sample ID: **38461** — **York Sample ID:** **14F0295-05**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 11:46 am	06/06/2014

Chloride — **Log-in Notes:** — **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**10.8**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 19:17	06/10/2014 19:17	KK

Sample Information

Client Sample ID: **90279** — **York Sample ID:** **14F0295-06**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 12:26 pm	06/06/2014

Chloride — **Log-in Notes:** — **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**18.7**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 19:36	06/10/2014 19:36	KK

Sample Information

Client Sample ID: **51177** — **York Sample ID:** **14F0295-07**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 1:10 pm	06/06/2014

Chloride — **Log-in Notes:** — **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	Chloride	ND		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 19:55	06/10/2014 19:55	KK

Sample Information

Client Sample ID: 51178 **York Sample ID:** 14F0295-08

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 2:17 pm	06/06/2014

Chloride **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**20.6**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 20:13	06/10/2014 20:13	KK

Sample Information

Client Sample ID: 75433 **York Sample ID:** 14F0295-09

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 3:22 pm	06/06/2014

Chloride **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**38.5**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 20:32	06/10/2014 20:32	KK

Sample Information

Client Sample ID: 75432.2 **York Sample ID:** 14F0295-10

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 4:09 pm	06/06/2014

Chloride **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**37.7**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 21:29	06/10/2014 21:29	KK

Sample Information

Client Sample ID: 52084 **York Sample ID:** 14F0295-11

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 4, 2014 5:12 pm	06/06/2014

Chloride **Log-in Notes:** **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**8.00**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 21:48	06/10/2014 21:48	KK

Sample Information

Client Sample ID: 51182 | **York Sample ID:** 14F0295-12

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 5, 2014 8:15 am	06/06/2014

Chloride | **Log-in Notes:** | **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**8.58**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 22:07	06/10/2014 22:07	KK

Sample Information

Client Sample ID: 75435 | **York Sample ID:** 14F0295-13

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 5, 2014 9:05 am	06/06/2014

Chloride | **Log-in Notes:** | **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**18.2**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 22:25	06/10/2014 22:25	KK

Sample Information

Client Sample ID: 51176 | **York Sample ID:** 14F0295-14

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 5, 2014 10:16 am	06/06/2014

Chloride | **Log-in Notes:** | **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**19.8**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 22:44	06/10/2014 22:44	KK

Sample Information

Client Sample ID: 73974 | **York Sample ID:** 14F0295-15

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 5, 2014 10:50 am	06/06/2014

Chloride | **Log-in Notes:** | **Sample Notes:**

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**19.1**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 23:03	06/10/2014 23:03	KK

Sample Information

Client Sample ID: **51183** | **York Sample ID:** **14F0295-16**

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
14F0295	Shelter Island	Water	June 5, 2014 12:16 pm	06/06/2014

Chloride

Log-in Notes:

Sample Notes:

Sample Prepared by Method: EPA 300

CAS No.	Parameter	Result	Flag	Units	LOD/MDL	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
16887-00-6	**Chloride**	**13.2**		mg/L	0.690	5.00	10	EPA 300.0	06/10/2014 23:22	06/10/2014 23:22	KK

Notes and Definitions

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon NELAC 2009 Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two.
For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

YORK ANALYTICAL LABORATORIES INC
York Analytical Laboratories
120 Research Dr.
Stratford, CT 06615
(203) 325-1371
Fax (203) 357-0166

Field Chain-of-Custody Record

NOTE: York's Std. Terms & Conditions are listed on the back side of this document. This document serves as your written authorization to York to proceed with the analyses requested and your signature binds you to York's Std. Terms & Conditions.

York Project No. 14F0295

YOUR Information	Report To:	Invoice To:	YOUR Project ID	Turn-Around Time	Report Type
Company: LBG, Inc	Company:	Company:	Shelter Island	RUSH - Same Day ☐	Summary Report
Address: 4 Westchester Park Dr White Plains, NY	Address: SAME	Address: SAME		RUSH - Next Day ☐	Summary w/ QA Summary
Phone No. 914 6945711	Phone No.	Phone No.	Purchase Order No.	RUSH - Two Day ☐	CT RCP Package
Contact Person: John Benvegna	Attention:	Attention:		RUSH - Three Day ☐	CTRCP DQA/DUE Pkg
E-Mail Address: Benvegna@LBGNY.com	E-Mail Address:	E-Mail Address:		RUSH - Four Day ☐	NY ASP A Package
			Samples from: CT__ NY__ NJ__	Standard(5-7 Days) X	NY ASP B Package
					NJDEP Red. Deliv.

Print Clearly and Legibly. All Information must be complete. Samples will NOT be logged in and the turn-around time clock will not begin until any questions by York are resolved.

Samples Collected/Authorized By (Signature): [signature]

Name (printed): Mike Reiff

Matrix Codes
S - soil
Other - specify(oil, etc.)
WW - wastewater
GW - groundwater
DW - drinking water
Air-A - ambient air
Air-SV - soil vapor

Volatiles		Semi-Vols.	Pest/PCB/Herb	Metals	Misc. Org.	Full Lists	Misc.
8260 full	TICs	8270 or 625	8082PCB	RCRA8	TPH GRO	Pri.Poll.	Corrosivity
624	Site Spec.	STARS list	8081Pest	PP13 list	TPH DRO	TCL Organics	Reactivity
STARS list	Nassau Co.	BN Only	8151Herb	TAL	CT ETPH	TAL Met/CN	Ignitability
BTEX	Suffolk Co.	Acids Only	CT RCP	CT15 list	NY 310-13	Full TCLP	Flash Point
MTBE	Ketones	PAH list	App. IX	TAGM list	TPH 1664	Full App. IX	Sieve Anal.
TCL list	Oxygenates	TAGM list	Site Spec.	NJDEP list	Air TO14A	Part 360-Routine	Heterotrophs
TAGM list	TCLP list	CT RCP list	SPLP or TCLP	Total	Air TO15	Part 360-Baseline	TOX
CT RCP list	524.2	TCL list	TCLP Pest	Dissolved	Air STARS	Part 360-Expanded No Dioxins/Furans	BTU/lb.
Arom. only	502.2	NJDEP list	TCLP Herb	SPLP or TCLP	Air VPH	Part 360-Expanded Full List	Aquatic Tox.
Halog.only	NJDEP list	App. IX	Chlordane	Indiv. Metals	Air TICs	NYCDEP Sewer	TOC
App.IX list	SPLP or TCLP	TCLP BNA	608 Pest	LIST Below	Methane	NYSDEC Sewer	Asbestos
8021B list		SPLP or TCLP	608 PCB		Helium	TAGM	Silica

Electronic Data Deliverables (EDD)
Simple Excel
NYSDEC EQuIS
EQuIS (std)
EZ-EDD (EQuIS)
NJDEP SRP HazSite EDD
GIS/KEY (std)
Other
York Regulatory Comparison Excel Spreadsheet
Compare to the following Regs. (please fill in):

Sample Identification	Date/Time Sampled		Sample Matrix	Choose Analyses Needed from the Menu Above and Enter Below	Container Description(s)
75437.2	6/4/14	0840	GW	Chloride	1-Plastic (250)
51170		0926			
51169		1031			
75438		1115			
38461		1146			
90279		1226			
51177		1310			
51178		1417			
75433		1522			
75432.2		1609			

Comments

Preservation Check those Applicable: 4°C____ Frozen____ HCl____ MeOH____ HNO$_3$____ H$_2$SO$_4$____ NaOH____ ZnAc Ascorbic Acid Other

Special Instructions
Field Filtered ☐
Lab to Filter ☐

Samples Relinquished By	Date/Time	Samples Received By	Date/Time
[signature]	6/6/14 0845	[signature]	6-6-14 8:45
Samples Relinquished By	Date/Time	Samples Received in LAB by	Date/Time
		[signature]	6/10/14 1540

Temperature on Receipt 4.1 °C

YORK ANALYTICAL LABORATORIES INC

YORK ANALYTICAL LABORATORIES
120 RESEARCH DR.
STRATFORD, CT 06615
(203) 325-1371
FAX (203) 357-0166

Field Chain-of-Custody Record

NOTE: York's Std. Terms & Conditions are listed on the back side of this document. This document serves as your written authorization to York to proceed with the analyses requested and your signature binds you to York's Std. Terms & Conditions.

York Project No. 14F0295

YOUR Information	Report To:	Invoice To:	YOUR Project ID	Turn-Around Time	Report Type
Company: LBG, Inc	Company:	Company:	Shelter Island	RUSH - Same Day ☐	Summary Report
Address: 4 Westchester Park Dr White Plains NY	Address:	Address:	Purchase Order No.	RUSH - Next Day ☐	Summary w/ QA Summary
Phone No. 9146945711	Phone No. Same	Phone No. SAME		RUSH - Two Day ☐	CT RCP Package
Contact Person: John Benvegna	Attention:	Attention:		RUSH - Three Day ☐	CTRCP DQA/DUE Pkg
E-Mail Address: Benvegna@LBGNY.com	E-Mail Address:	E-Mail Address:	Samples from: CT__ NY__ NJ__	RUSH - Four Day ☐	NY ASP A Package
				Standard(5-7 Days) ☒	NY ASP B Package
					NJDEP Red. Deliv.

Electronic Data Deliverables (EDD): Simple Excel; NYSDEC EQuIS; EQuIS (std); EZ-EDD (EQuIS); NJDEP SRP HazSite EDD; GIS/KEY (std); Other; York Regulatory Comparison; Excel Spreadsheet; Compare to the following Regs. (please fill in):

Print Clearly and Legibly. All Information must be complete. Samples will NOT be logged in and the turn-around time clock will not begin until any questions by York are resolved.

Samples Collected/Authorized By (Signature): [signature]

Name (printed): Mike Reiff

Matrix Codes: S - soil; Other - specify(oil, etc.); WW - wastewater; GW - groundwater; DW - drinking water; Air-A - ambient air; Air-SV - soil vapor

Volatiles		Semi-Vols.	Pest/PCB/Herb	Metals	Misc. Org.	Full Lists	Misc.
8260 full	TICs	8270 or 625	8082PCB	RCRA8	TPH GRO	Pri.Poll.	Corrosivity
624	Site Spec.	STARS list	8081Pest	PP13 list	TPH DRO	TCL Organics	Reactivity
STARS list	Nassau Co.	BN Only	8151Herb	TAL	CT ETPH	TAL Met/CN	Ignitability
BTEX	Suffolk Co.	Acids Only	CT RCP	CT15 list	NY 310-13	Full TCLP	Flash Point
MTBE	Ketones	PAH list	App. IX	TAGM list	TPH 1664	Full App. IX	Sieve Anal.
TCL list	Oxygenates	TAGM list	Site Spec.	NJDEP list	Air TO14A	Part 360-Routine	Heterotrophs
TAGM list	TCLP list	CT RCP list	SPLP or TCLP	Total	Air TO15	Part 360-Baseline	TOX
CT RCP list	524.2	TCL list	TCLP Pest	Dissolved	Air STARS	Part 360-Expanded No Dioxins/Furans	BTU/lb.
Arom. only	502.2	NJDEP list	TCLP Herb	SPLP or TCLP	Air VPH	Part 360-Expanded Full List	Aquatic Tox.
Halog.only	NJDEP list	App. IX	Chlordane	Indiv. Metals	Air TICs	NYCDEP Sewer	TOC
App.IX list	SPLP or TCLP	TCLP BNA	608 Pest	LIST Below	Methane	NYSDEC Sewer	Asbestos
8021B list		SPLP or TCLP	608 PCB		Helium	TAGM	Silica

Sample Identification	Date/Time Sampled		Sample Matrix	Choose Analyses Needed from the Menu Above and Enter Below	Container Description(s)
52084	6/4/14	1712	GW	Chloride	1- (250) Plastic
51182	6/5/14	0815	↓	↓	↓
75435	↓	0905	↓	↓	↓
51176	↓	1016	↓	↓	↓
73974	↓	1050	↓	↓	↓
51183	↓	1216	↓	↓	↓

Comments

Preservation Check those Applicable: 4°C____ Frozen____ HCl____ MeOH____ HNO_3____ H_2SO_4____ NaOH____ ZnAc Ascorbic Acid Other

Special Instructions

Field Filtered ☐
Lab to Filter ☐

Samples Relinquished By	Date/Time	Samples Received By	Date/Time
[signature]	6/6/14 0845	[signature]	6-6-14 8:45

Samples Relinquished By	Date/Time	Samples Received in LAB by	Date/Time
		[signature]	6/6/14 1540

Temperature on Receipt: 4.1 °C