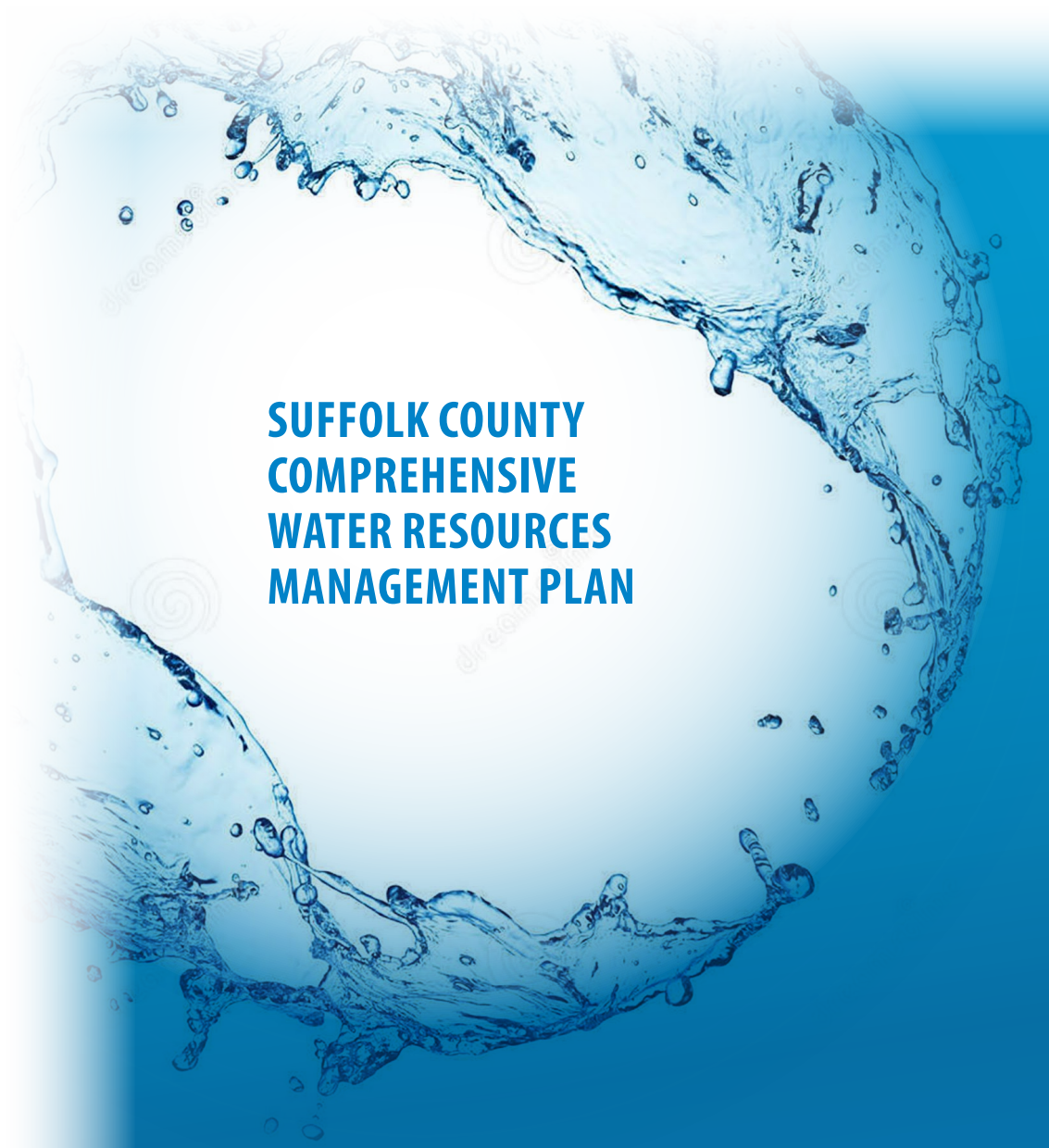
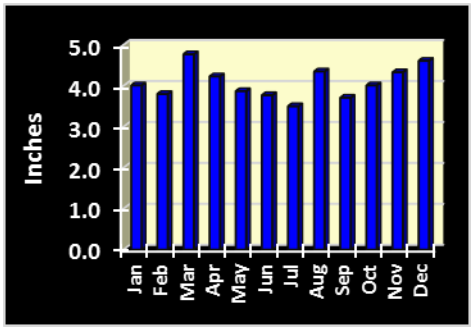


SUFFOLK COUNTY
COMPREHENSIVE
WATER RESOURCES
MANAGEMENT PLAN

Section 4
DRINKING WATER SUPPLY

Section 4
Drinking Water Supply

The fact that Suffolk County's extensive and productive aquifer system provides the sole source of potable water supply for the County's 1.5 million residents[31] has been documented for decades. All of the County's groundwater originates as precipitation that recharges the island - the County is fortunate to receive an annual average of almost 49 inches of precipitation[32], relatively evenly distributed throughout the year. While the amount of precipitation that recharges the aquifer varies by season and location throughout the County, on average, it is estimated to provide approximately 1,367 million gallons of recharge each day to the aquifer system County-wide.



Average Monthly Precipitation: 1949-2014 (from Brookhaven National Laboratory)

Natural groundwater throughout most of the County is of very high quality. In fact, the **1987 Comp Plan** identified only four inorganic constituents – chlorides, sulfate, iron and manganese – that exceed drinking water standards in native groundwater in some parts of the aquifer system. Over the years, groundwater quality has, however, been impacted by materials used, stored or disposed of at the ground surface that may be carried by recharging precipitation down to contaminate the aquifer system. The sands, silts, gravels and clays that make up the unsaturated zone and the aquifer system function as a large sand filter that has helped to protect the resource from many of these contaminants.

The combined efforts of programs at the Federal, State, County and Town levels to protect the aquifer system have been reasonably successful in controlling the impacts of development on groundwater - although groundwater quality data indicate that additional efforts are required. Consequently, compared to many sources of supply throughout the country, Suffolk County's groundwater supply remains for the most part, a high quality source of potable water, despite the impacts of the 1.5 million people who live in the watershed.

4.1 Problem Identification

Several potential issues of concern that affect residents' access to a reliable and safe supply of water have been identified. Drinking water supply issues have been identified and described in more detail in the Task 4 and Task 7

[31] With the exception of the approximately 2500 residents of Fishers Island who utilize a combination of wells and surface water.

[32] Based on precipitation data collected at Brookhaven National Laboratory since 1949.

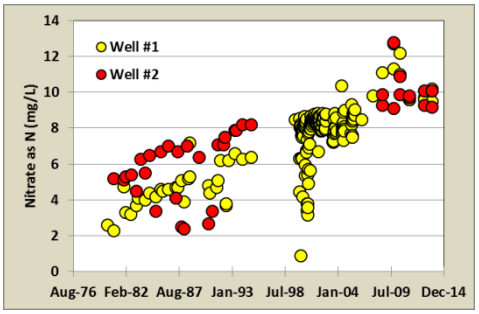
memoranda. Both environmental and infrastructure constraints impact access to a reliable potable supply in some areas of the County; both types of potential constraints are briefly summarized below.

Water supply issues relating to the aquifer's ability to yield sufficient potable supply include:

- Water quality – contamination from anthropogenic (e.g., nitrate and pesticides) and natural (e.g., iron, manganese, chlorides) sources;
- Localized impacts of water supply pumping on surface water features, such as streams, ponds and wetland areas;
- Localized impacts of water supply pumping on saltwater interfaces.

Water supply issues resulting from infrastructure limitations include:

- Potential reliability and water quality concerns associated with non-community and private supplies; and
- The impacts of increasing peak demands on existing water supply infrastructure.



Nitrate as nitrogen concentrations from Church Street – Northport Wellfield (SCWA)

4.1.1 Resource Limitations

4.1.1.1 Groundwater Quality Limitations

Most untreated groundwater in Suffolk County complies with existing drinking water Maximum Contaminant Levels (MCLs) and community supplies are treated to remove the low levels of volatile organic compounds (VOCs) or other contamination that may be detected. The presence of high levels of nitrate or chlorides, and any detections of pesticides are, however, more problematic to address from a potable water supply perspective, due to the complexity and cost associated with treatment.

South Spur Drive – Ion exchange process removes nitrate (SCWA)

Two areas of the County where existing groundwater quality has affected the ability to utilize the existing groundwater supply have been identified during this study:

- Northport and East Northport, where nitrate levels measured in untreated water from existing Suffolk County Water Authority (SCWA) Magothy wells have ranged from 8 mg/L to 12 mg/L, and
- Southold, where the extent of the shallow aquifer is limited by underlying and surrounding saltwater, and where agricultural contaminants such as nitrates and pesticides have caused widespread groundwater contamination.

4.1.1.2 Groundwater Quantity Limitations

From a County-wide water quantity perspective, Suffolk County's aquifers can readily provide the 314.5 million gallons per day (mgd) required to satisfy the projected future demand for water supply in 2030. Based upon conceptual water balances prepared for the Main Body of the island, the North and South Forks and Shelter Island, County-wide recharge amounts to an average of approximately 1,367 mgd (**Task 4.3 - Hydrology,** CDM, 2006). However, in localized coastal areas, projected water supply demands do exceed the capacity of the limited shallow fresh water aquifer present. In addition, the effects of water supply pumping on groundwater-fed streams, ponds and wetlands areas must also be considered.

Projected community water supply demands in the year 2030 summarized on **Table 4-1** were developed in 2010 based on population projections provided by the Suffolk County Department of Economic Development and Planning (at the time, Suffolk County Planning Department, **Task 3 – Land Available for Development and Population Analysis Western Suffolk County**, 2009, and **1999 Existing Land Use Inventory – Eastern Suffolk County**), and the assumption that community supply will be provided to all residents currently obtaining supply from private wells. Incorporating peak water supply pumping demands that are based on currently observed peak demand factors, the 2030 projections indicate that additional wells will be required in Brookhaven, East Hampton, Huntington, Smithtown and Southold. In fact, over one hundred new supply wells would be required in the County based upon projection of peak water demand patterns and typical well capacities.

As the need for additional wells is identified and new wells are sited, the potential impacts of water supply pumping on surface water features such as ponds, streams and wetland areas must be considered on a site-specific basis. In general, wells screened within the Magothy aquifer are not anticipated to cause significant impacts to surface water features, although impacts are possible on a localized basis. The potential for water supply pumping to affect surface waters and wetland features is one factor affecting the well permitting process. If new supply wells are required in areas where freshwater is unavailable in the Magothy aquifer (e.g., on the North Fork), potential impacts on groundwater baseflow to streams and surface water features will need to be considered on a site-specific basis.

The USEPA Lists Six Basic Steps for Private Well Owners

(from USEPA, 2002):

- Identify potential problem sources.
- Talk with "local experts" (Health Department).
- Have your water tested periodically - annually for total coliform, nitrate, TDS, pH and any other suspected contaminants
- Have the test results interpreted and explained clearly.
- Set a regular maintenance schedule for your well, do the scheduled maintenance, keep accurate and up-to-date records.
- Remedy any problems.

Table 4-1 Projected Average 2030 Water Community Water Supply Pumpage

Town	2013 Pumpage (mgd)[1]	Projected (2030[2]) Pumpage (mgd)
Babylon	27.6	29.1
Brookhaven	65.7	81.9
East Hampton	6.4	11.5
Huntington	38.8	41.4
Islip	41.6	43.8
Riverhead	7.6	12.7
Shelter Island	0.1	1.8
Smithtown	22.7	24.9
Southampton	15	17.2
Southold	2.8	4.6
Total	228.3	268.8

1. Source of community supply pumpage data: major water purveyors (SCWA, South Huntington, Dix Hills, Greenlawn, Riverhead, Hampton Bays, Northport VA Hospital, Shelter Island Heights, West Neck Water Supply, Dering Harbor); NYSDEC (Saltaire, West Gilgo Beach)
2. Assumes all private wells on community supply by 2030.

Similarly, the potential for water supply pumping on the forks, Shelter Island and in coastal areas to cause saltwater intrusion or upconing must be carefully evaluated considering well locations, depths and pumping rates.

4.1.2 Infrastructure Limitations

Community supplies currently provide potable water to more than 87 percent of Suffolk County residents; approximately 80 percent of the population is served by the Suffolk County Water Authority (SCWA). Community supplies (identified in Appendix H) are generally acknowledged to be the most reliable means of providing a dependable, safe supply of potable water that complies with all applicable drinking water criteria or MCLs.

The Suffolk County Department of Health Services (SCDHS) has summarized the established benefits of community supplies as follows:

- Community supplies must meet rigorous federal and state quality standards and are routinely tested for purity, whereas non-community wells are tested for fewer parameters at reduced frequencies, and private wells are only required to be tested once - for approval of new construction. Due to the existence of treatment and disinfection systems, professional operations, and the routine

maintenance performed on community systems, compliance with MCLs is more reliable.

- Community supply wells are generally deeper and less prone to contamination than private wells and non-community wells.
- During power outages, public water continues to be available, whereas private well owners are left without water for drinking and sanitary purposes.
- Public water hydrants protect life and property by providing greater fire protection as a continuing available water source for firefighting activities, and often reduce fire insurance costs for homeowners.

Nevertheless, for a variety of reasons, in many parts of the County, non-community systems and private wells continue to provide potable supplies.

4.1.2.1 Non-Community Supply Limitations

The number of non-community systems has declined in recent decades, from 725 in 1984 as documented in the ***1987 Comp Plan***, down to 273 in 2008 (**Task 7.4 – Non Community Supplies**; CDM, 2008) to 192 in 2014 (personal communication, SCDHS). Most remaining non-community systems are transient systems, such as parks, convenience stores and restaurants. Non-transient non-community water systems include schools, large businesses and government run facilities with over 25 employees. Approximately 75 percent of non-community systems are supplied by a single well, and the majority of the non-community systems do not provide any treatment.

New York State Department of Health (NYSDOH) requires that non-community systems be monitored for microbials quarterly (monthly if the system has a disinfection waiver) and for nitrates annually (quarterly if nitrates exceed 5 mg/L), while VOCs and pesticides are monitored at state discretion. SCDHS inspects all non-community systems on an annual basis. Since 2003, the SCDHS has tested non-community wells for VOCs and pesticides annually. Monitoring of community supplies occurs more frequently, providing a greater level of safety.

4.1.2.2 Private Well Limitations

A Geographic Information Systems (GIS) analysis of Suffolk County Department of Economic Development and Planning (SCDEDP, formerly Suffolk County Planning Department), SCWA and other water supplier data that was completed as part of this study concluded that approximately 47,000 private wells continued to provide potable supply to Suffolk County residents (**Task 7.5 – Private Water Supply Wells**, CDM, 2009); the SCDHS estimates

that this number has declined to approximately 45,000 as of 2015. Private wells are very susceptible to contamination from near-surface activities and from sources such as on-site wastewater disposal systems, spills, fertilizers and pesticides, because they are generally screened at very shallow depths, typically 40 feet into the water table. While the majority of the private wells are located in the towns of Brookhaven, East Hampton, Shelter Island, Southampton and Southold, thousands are also used in the western towns. Nitrate exceeded the drinking water standard of 10 mg/L in approximately seven percent of the private wells sampled by SCDHS between 2007 and 2013. VOCs exceeded the 5 µg/L threshold in 19 percent of the private wells sampled by SCDHS between 1997 and 2013.

NYSDOH recommends annual testing of private wells for total coliform. USEPA and the National Groundwater Association (NGWA) also recommend annual testing of private wells for, at a minimum, total coliform, nitrate, total dissolved solids and pH. SCDHS provides a private well water quality testing program that analyzes for a much wider range of potential contaminants, including semi-volatile chemicals, pharmaceuticals, and pesticide compounds and their breakdown products, for a sampling fee of $100, which is much lower than the cost of analyses performed by commercial laboratory testing. In 2012 and 2013, fewer than 600 private well owners requested water quality testing under SCDHS's private well water quality testing program; this is less than 1 percent of the private wells existing in the County. Suffolk County resolutions 245-2000 and 1009-2000 require that when a home with a private well is purchased, the well must be tested prior to closing on the home purchase.

For new construction on individual parcels, the SCDHS requires whole house (point of entry or POE) treatment systems for removal of iron, manganese, chloride, VOCs, and aldicarb residues where well water quality is unsatisfactory and public water is not available. However there are thousands of older residences relying on private wells that have not been tested.

4.1.2.3 Peak Water Supply Demands

Over the past 20 years, the increase in the use of automated irrigation systems has caused a large increase in per capita water usage during summer months, as shown on **Figure 4-1**. Peak pumping occurs during the early morning hours when automated sprinkling systems typically operate, as shown by **Figure 4-2**. During 2008, the peak day for water demand in the County required that SCWA pump very close to capacity while utilizing water in storage**.** Peak water demands that approach the capacity of the existing infrastructure have also been reported by other water suppliers such as the Riverhead Water District. If the trend of increasing summer irrigation continues, stress on the existing infrastructure will also increase.

Figure 4-1 – Summer water supply pumping associated with increased outdoor water use and automated irrigation systems has significantly increased in recent years

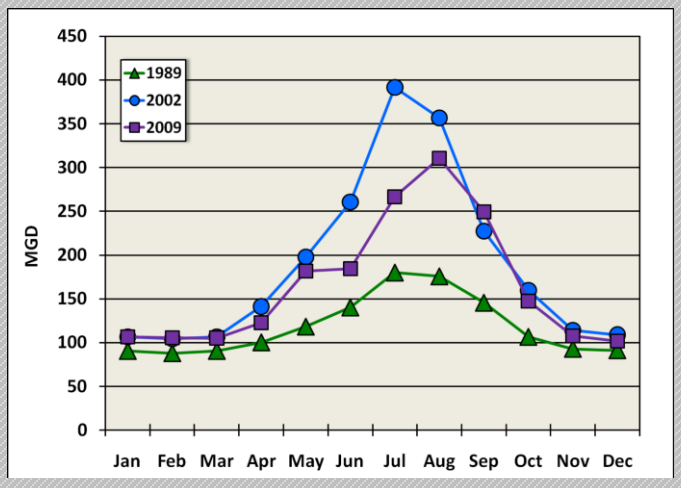
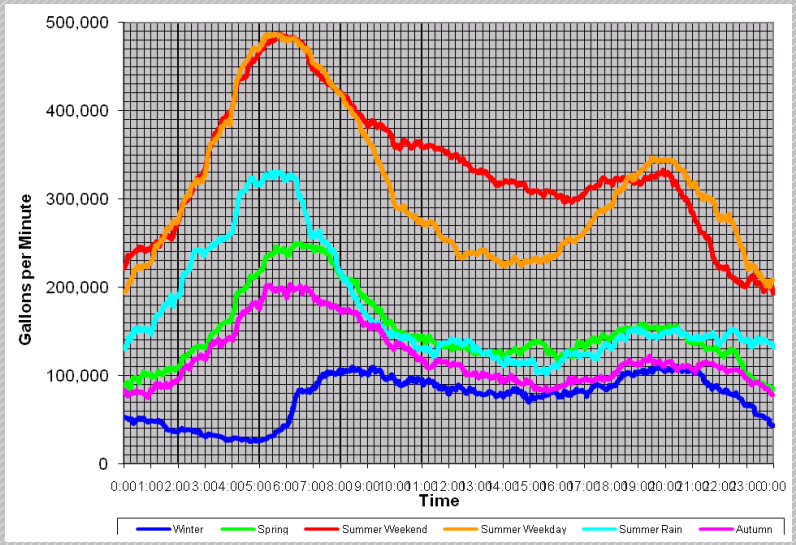


Figure 4-2- Peak SCWA Demand in 2008

Summer pumping rates, shown by the red and orange lines, are significantly greater than winter pumping rates, shown in blue. The early-morning peak demand results from automated irrigation systems.



4.2 Drinking Water Supply Goals and Objectives

Working together with the SCDHS, SCWA, and the Suffolk County Comprehensive Water Resources Management Plan Steering Committee, three drinking water supply management goals were identified, along with more detailed and measurable objectives. These goals and objectives are targeted to provide a healthy and safe supply of potable water to County residents through 2030. Although it is acknowledged that full achievement of these goals within the next fifteen years may not be realized, the recommendations presented in this document provide the framework for provision of a reliable, high quality potable supply for future generations.

The goals and objectives are consistent with County policy declarations that are articulated in Article 4 of the Suffolk County Sanitary Code:

760-401: " … the policy of the County of Suffolk is to protect the groundwater to insure the availability of an adequate and safe source of water supply for generations to come by: enforcing the local, state and federal laws regulating water supply; promoting the extension of public water supply to all areas of the County; maintaining a process of groundwater planning; carrying out research and development in the field of alternatives to community water supply; and by promoting education and acceptance of the importance of groundwater management and protection."

The goals reflect SCDHS philosophy that all Suffolk County residents are entitled to safe potable water, and that the availability of a community water supply is the most reliable way to assure the population of a reliable supply of high quality potable water. They also recognize that an increasing portion of the groundwater that is pumped from the aquifer system is used for landscape irrigation. This increased discretionary use of the resource has stressed the capacity of existing water supply infrastructure in some areas. If landscape irrigation trends continue through the planning period, they will continue to stress the aquifer system in coastal areas such as the North Fork and will require significant investment in additional infrastructure.

Drinking water supply goals, and the supporting objectives, are summarized in **Table 4-2**. The first management goal and supporting objectives are consistent with the Groundwater Resource Management goals and objectives described in Section 3. Hence, implementation of the Groundwater Resource Management recommendations will also result in progress in achieving the first drinking water supply goal; those recommendations are not repeated here.

Table 4-2 Drinking Water Supply Goals and Objectives

Drinking Water Supply Goals and Objectives

GOAL 1: All County residents should have access to safe potable water that is in compliance with drinking water MCLs, USEPA health advisories and New York State guidance levels.

OBJECTIVES:

1. All drinking water should comply with MCLs and USEPA and New York State health advisories.
2. All areas within 50-year capture zones to community supply wells should be subject to the most stringent practicable pollution control measures.
3. Source water protection (e.g., pollution prevention) is preferred to wellhead treatment.
4. The Pine Barrens Core Preservation Area should continue to be preserved for future water supply.

GOAL 2: A community public water supply should be available to all Suffolk County residents.

OBJECTIVES:

1. The infrastructure necessary to supply and convey potable water to all Suffolk County residents should be identified.
2. The infrastructure necessary to supply and convey potable water to all Suffolk County residents should be constructed.

GOAL 3: Residential and commercial irrigation should be managed to reduce peak demands on water supply infrastructure.

OBJECTIVE:

1. Within three years, Suffolk County should adopt regulations to manage residential and commercial irrigation.

4.3 Recommendations to Address Drinking Water Supply

4.3.1 Introduction

Working together with project stakeholders, a variety of recommendations have been identified to guide drinking water supply management through the planning period, in accordance with the drinking water supply goals and objectives. Additional recommendations that address the first goal ***(All County residents should have access to safe potable water that is in compliance with drinking water MCLs, USEPA health advisories and New York State guidance levels)*** by protecting the groundwater resource itself via land use and/or management controls, source water protection or wastewater management are described in Section 3 and Section 8 of this Plan. The recommendations presented in this section of the Plan focus upon the new infrastructure and institutional alternatives associated with responding to goals number two ***(A community public water supply should be available to all Suffolk County residents)*** and number three ***(Residential and commercial irrigation should be managed to reduce peak demands)***.

4.3.2 Extension of Community Supplies

Provision of a community water supply has been identified as the recommended approach to provide a reliable, safe supply of potable water that complies with all applicable drinking water criteria or MCLs. SCDHS Office of Drinking Water has identified several existing community supplies that should be incorporated into a SCWA service area or other effectively managed municipal water district, based upon aging infrastructure and/or the small population serviced. These community water suppliers are listed on **Table 4-3**.

Distribution systems serving developments such as condominiums, apartments, townhomes or home owner associations should also be owned and maintained by the community water supplier, to assure that the system is operated and maintained, and that adequate pressure is maintained for fire protection.

Residents using private wells should be encouraged to connect to public (community supply) wherever it is possible. In general, although water mains exist throughout most of the western towns (Huntington, Babylon, Smithtown, Islip and Brookhaven), some residents continue to utilize private wells for potable supply. Because the private wells are more susceptible to contamination than public supplies and there are no continuing monitoring requirements, connection to the community supply is recommended whenever available.

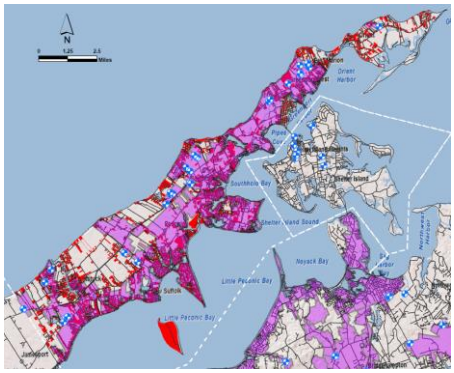
Table 4-3 Community Water Supplies That Could be Improved by SCWA Takeover

Water System Name	Population Served (2008)	Number of Wells
Bridgeford Colony	16	1
Dougherty Water Company	34	1
Kings Cabins [(1)]	7	1
Maidstone Park Cottages	20	1
McCarren Water Supply	30	1
McCrodden Water Company	33	1
Shelter Island Chalets [(1)]	15	1
Wolfies Tavern	10	1

(1) SCWA does not currently provide water on Shelter Island; if, in the future, SCWA does have a presence on the island, the service areas of these supplies should be incorporated.

SCDHS private well standards should be amended to require new single family residences to connect to a public water supply if one is available within 500 feet of the parcel being developed. Public water should be available to vacant or developed properties that can potentially be subdivided into lots with areas less than 40,000 square feet in compliance with the density requirements of Article 6 of the Suffolk County Sanitary Code and in accordance with town zoning. Previously subdivided, undeveloped parcels with densities equivalent to or less than one dwelling unit per acre should be designated to be served with a public water supply system.

Additional area-specific recommendations are summarized in the following sections.



Residential land use in Southold (red) and SCWA distribution zones (purple)

4.3.2.1 North Fork

Background

Currently, SCWA, non-community suppliers and private wells all provide water to different parts of the Town of Southold. Because the quality of the shallow aquifer has been compromised by widespread contamination from agricultural contaminants such as nitrates and pesticides, provision of a community supply for all residents is recommended. Several alternatives have been considered to supply Southold residents with a water supply that complies with drinking water criteria.

The ***1987 Comp Plan*** recommended establishment of water quality districts for some areas of the North Fork. The experience gained from the SCWA satellite system at Browns Hills Association in Orient has shown that a

treatment district can be problematic, even for a small scale district with a centralized water supply. In Browns Hills, where the nitrate concentration of water from the two public supply wells operated by the SCWA exceeds the 10 mg/L MCL, individual under-sink treatment units were installed to provide potable water at acceptable nitrate concentrations to a single tap in each home (Point of Use or POU system). SCWA personnel access to these units for monitoring and filter maintenance has been problematic and the staffing costs have been significant. SCWA proposed to supply the homes at Browns Hills by extending a water main from its distribution system in East Marion to eliminate the need for the POU systems. This would provide water that complies with the nitrate MCL at all taps for every service connection. In addition to protection of Browns Hills residents, this approach would make potable water available to residents with contaminated private wells in Orient and provide for increased fire protection. To date, no water main extension has been installed.

SCDHS and SCWA viewed the Browns Hills POU experience as a "best-case" pilot project with the advantages of an experienced water supplier, a small community (25 homes) contained within a limited area, and identical treatment systems for nitrate reduction at single household taps. The establishment of a treatment district over a broader area to address the varied water quality problems identified in North Fork wells (e.g. nitrate, VOCs, iron, pesticides, MTBE), requiring different types and sizes of treatment technologies and varied monitoring requirements for each parameter, would provide more challenges to effective operations.

Therefore, extension of SCWA service to all Southold Town residents, and to non-community systems with documented contamination (e.g., SCDHS sampling of the non-community water supply system serving the ***Cross Sound Ferry*** has consistently revealed a variety of compounds, including Atrazine degradates, Simazine, DEET and Tebuthiuron), is recommended to protect public health.

SCDHS Recommendations

Historical SCDHS water quality data obtained from sampling private water supply wells was used to identify priority areas for water main extensions to areas impacted by contaminants, such as nitrates exceeding 6 mg/L, and pesticide and VOC contamination. For Southold Township, the SCDHS has made recommendations to the Town and SCWA that public water be extended to specific areas in Laurel, Mattituck, Cutchogue, Southold, East Marion and Orient, based upon contamination of existing private wells as summarized below.

Laurel - Aldrich Lane extending south from Sound Avenue to interconnect with the Main Road water main, due to high levels of nitrate and detections of parent pesticides or metabolites/degradates of Aldicarb, Alachlor, Metolachlor, and perchlorate.

Mattituck - Wickham Avenue, and Mill Lane, due to high levels of nitrate and detections of Aldicarb degradates, Metolachlor, and perchlorate, and Soundview Avenue, where elevated concentrations of nitrates, Aldicarb degradates, VOCs and perchlorate were observed.

Cutchogue - Duck Pond Roads, Vista Place, and portions of Depot Lane, Oregon Road, between Mill Lane and Depot Road, and Digman's Road, Route 48, between Alvah's Lane and Horseshoe Drive, and along the southern portion of Alvah's Lane, tapped from Route 25 and Bridge Lane, due to elevated nitrates, parent pesticides or metabolites/degradates of Aldicarb, Metolachlor, Metalaxyl, Dinoseb, Dacthal metabolites, and Imidacloprid.

GAC System for VOC Removal (SCWA)

Southold - Ruch Lane, Bayview Avenue and Colony Road, due to detections of MTBE.

East Marion - Stars and Rocky Point Roads, Aquaview Drive and Southern Boulevard between Cedar Drive and Rocky Point Road due to detections of parent pesticides or metabolites/degradates of Aldicarb, Dacthal and elevated nitrates.

Orient - Kings Street, Village Lane, Orchard Street, Oyster Pond Lane, Navy Street, Old Farm and Douglas Harbor Roads, Willow-Terrace Lane, Major Pond Road, and Narrow River Road due to significant detections of numerous contaminants, including Alachlor, parent pesticides or metabolites/degradates of Aldicarb, Dacthal metabolites, nitrates, and MTBE. Also, existing properties north of Main Road, between Ryder Farm Lane, Park View Lane and Three Waters Lane, due to detections of Alachlor and Metolachlor, and properties located between Greenway Drive West and Greenway Drive East, as they do not meet the density requirements of Article 6.

Evaluation of Alternative Approaches to Provide Community Supply

At the time of the draft 2010 Comp Plan, SCWA had an installed capacity of approximately 10,000 gallons per minute (gpm) in Southold, which included potential capacity from the storage tank at Moore's Lane. As older wells have been replaced with lower capacity wells in recognition of site-specific aquifer characteristics, this installed capacity has since been reduced. Based on current water demand rates and SCDEDP population projections, and assuming that all residents choose to connect to an available public supply, by 2030, a total of 14,526 gpm will be required to satisfy the peak water supply

pumping rate. Therefore, approximately 6,100 gpm of additional capacity is projected to be required (excluding the storage tank at Moore's Lane). Using the average 164 gpm capacity of existing wells in Southold, 38 new wells would be required to meet the projected 2030 demands, if no conservation measures targeting outdoor water use are implemented.

If a conservation program is successful in reducing peak outdoor use during the summer months, it is recommended that an additional 3 wells be added so that an adequate supply remains if the largest wellfield in eastern Southold is removed from service for any reason.

Several alternative approaches to provide this projected water supply demands were evaluated (**Task 8.3 Water Transmission Costs,** SCWA 2010 and **Task 9.1/9.2 Water Supply Recommendations**, CDM, 2010), including:

- Development of new wells in Southold;
- Development of new wells in Riverhead and transmission of the water eastward to Southold; and
- Development of new wells in the Pine Barrens, and transmission of the water eastward to Southold.

Three primary concerns with developing the additional capacity from wells sited within Southold were identified:

- The ability of the shallow aquifer to sustain the additional capacity without salt-water upconing/intrusion or without causing a water table decline that could impact wetlands and surface water bodies;
- Identification and acquisition of available land for well sites and potential treatment facilities; and
- The cost associated with construction of the additional wells, transmission mains and treatment facilities.

In order to evaluate the capability of the shallow aquifer to sustain the additional projected water supply demands, a transient groundwater model simulation was developed using the dual-density North Fork Model (CDM, 2003). Because the additional required infrastructure is driven by peak demand, a 20-year transient model simulation was developed based on SCWA 2008 pumping rates, including peak pumping rates experienced during the summer months. Several of the options that were simulated are presented here:

Option #1: Provision of future projected needs from new wells in Riverhead and Southold (higher capacity wells in Riverhead),

Option #2: Provision of future projected needs from new wells in Southold, and

Option #3: Use of existing and new wells in Southold to provide reduced future water supply needs based on implementation of a successful conservation program.

The transient model simulations incorporated average 2008 water supply pumping rates for the non-growing season (September-May). During the growing season, the model simulations used average 2008 water supply pumping rates for the 18 hour period from 10 AM to 4 AM and a peak pumping rate (approximately 4.53 times the average pumping rate) for the four hour period from 4 AM to 10 AM, mimicking peak water demand patterns identified by SCWA (please see **Figure 4-2**).

The first sets of model evaluations simulated projected water supply pumping based on current peak water demand rates that did not include conservation. Option 1 would supply all projected future needs by the addition of nine new wells, five of which were assumed to be located in Southold and pumping at the current average capacity of the existing wells (200 gpm), and four of which were assumed to be located in Riverhead, where higher capacity wells of up to 1,000 gpm can typically be sited (SCWA, personal communication). As shown on **Figure 4-3**, the five new Southold wells were assumed to be located within the 5 foot water table contour (referenced to mean sea level) in the Cutchogue area and in western Southold/eastern Riverhead near Laurel and Jamesport; two new 1000 gpm wells were simulated between Church Lane and Northville Turnpike in Riverhead, and two new 500 gpm capacity wells were simulated in eastern Riverhead, within the 8-foot water table contour. The simulated new well locations are hypothetical, and were identified based solely on the current water table elevation and well screen intervals that are consistent with those of other area supply wells. In addition to the nine new wells, Sound Avenue wells 1A and 1B, Evergreen Drive #2, and North Road (Greenport #2), all of which were installed but were not yet operational in 2008, were also included in the simulation.

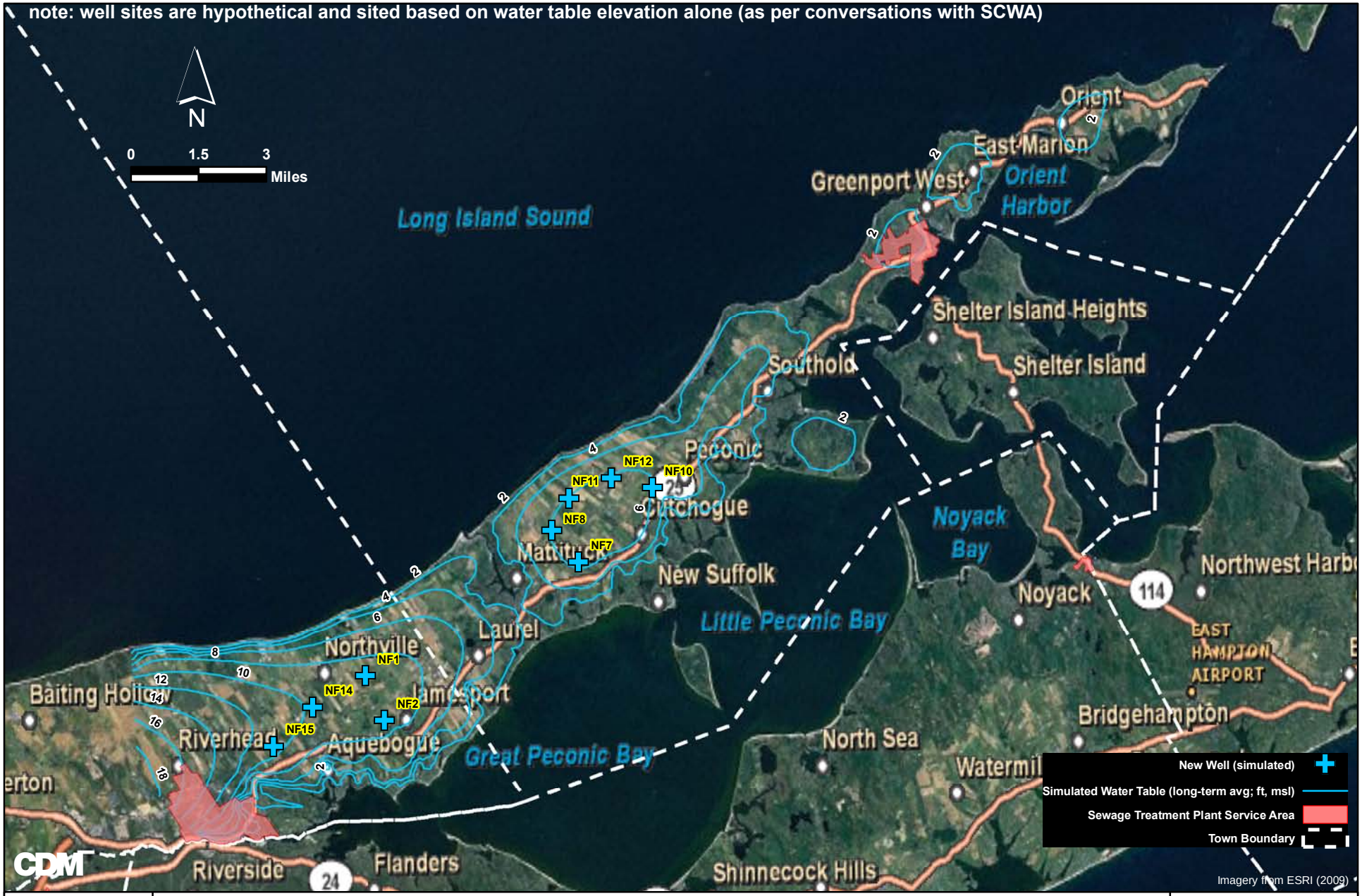
Differences in the position of the saltwater/fresh water interface from baseline conditions after 20 years are shown on **Figure 4-4.** The position of the saltwater interface is simulated to rise by between 15 and 50 feet in the area of interest and reach a new steady-state position within 20 years. Although the elevation of the interface is predicted to rise, the simulated position of the interface is projected to remain well below the elevation of any of the well

screens, so that the quality of the water would not be impacted by saltwater. Only minor changes in the interface elevation are observed in Southold (approximately 15 feet). Impacts to the position of the saltwater interface are more apparent in Riverhead, where the elevation of the interface is simulated to rise by approximately 50 feet (see **Figure 4-4**). Please note that these changes to the saltwater interface location are based on the increased water supply pumping alone, and do not consider the impacts of projected sea level rise further in the future.

Although the 2030 pumping projections are not simulated to cause either saltwater intrusion or upconing affecting the supply wells, it is anticipated that all wells would require treatment for nitrate removal, and potentially for iron/manganese, VOC and/or pesticide removal. In addition, permitting the new wells may be problematic as simulated water table declines from existing conditions may potentially impact freshwater wetlands. As shown on **Figure 4-5**, the simulated decline in the water table from a base of existing conditions approaches 0.5 feet in some wetlands in Riverhead. A greater change in head is observed in Riverhead than in Southold as a result of greater pumping, and because the area is being served by a sanitary sewer system that discharges treated effluent to surface water.

The second option assessed the potential to site all new supply wells within the Town of Southold. Due to the limited freshwater thickness on the North Fork, it is assumed that the new wells could only be located within the 5 foot water table contour, (located generally in the Cutchogue area and just east of the Riverhead/Southold town boundary) and that the capacity of the wells would be limited to 200 gpm. The simulated "new" wells are shown on **Figure 4-6** (locations are represented as wellfields in which more than one well is installed at a given site). As shown on **Figure 4-7**, the elevation of the saltwater interface is simulated to increase in Southold by approximately 40 feet. Although the interface does not intersect the screens of any wells, the water table decline intersects freshwater wetlands (**Figure 4-8**) which may affect the potential to permit new wells in this area.

Finally, an additional simulation assuming successful implementation of a conservation program targeting peak outdoor water use was also performed. Under this scenario, Option 3, three additional wells would be recommended. Should conservation measures be put in place to reduce the peaking factor from the existing 4.5 down to 3.0, the peak demand for Southold would be reduced to 9,642 gpm. Preliminary model simulations indicated that while the 2008 network of supply wells pumping at or near capacity would be sufficient to meet demands, installing three or four new wells to replace wells located closer to the coastline may be more sustainable.



Potential New Supply Wells in Southold for 2030 Water Demand with No Conservation

Suffolk County Comprehensive Water Resources Management Plan

Figure 4-3

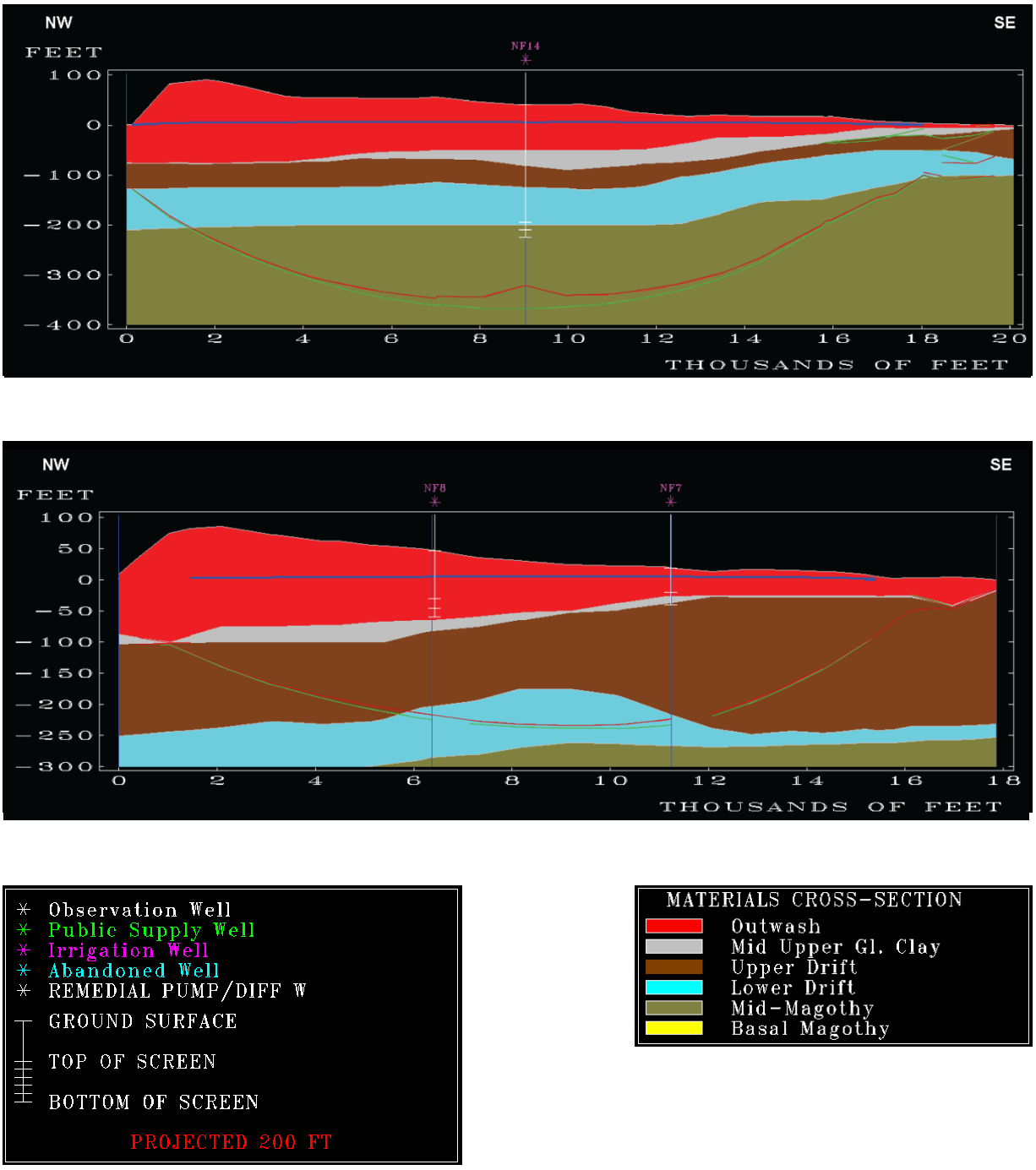
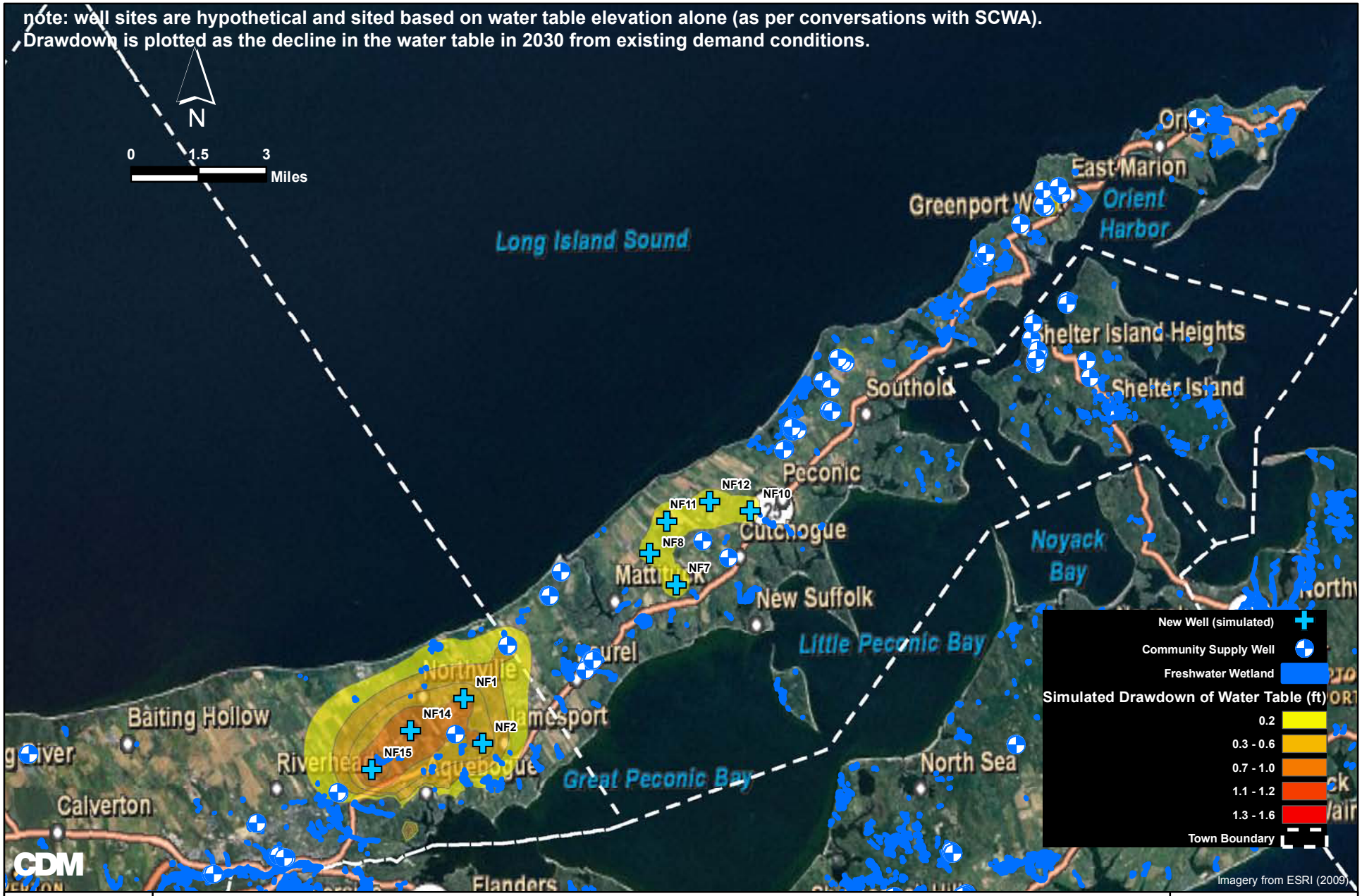


Figure 4- 4 Change in Saltwater Interface Elevation in 2030 with No Conservation

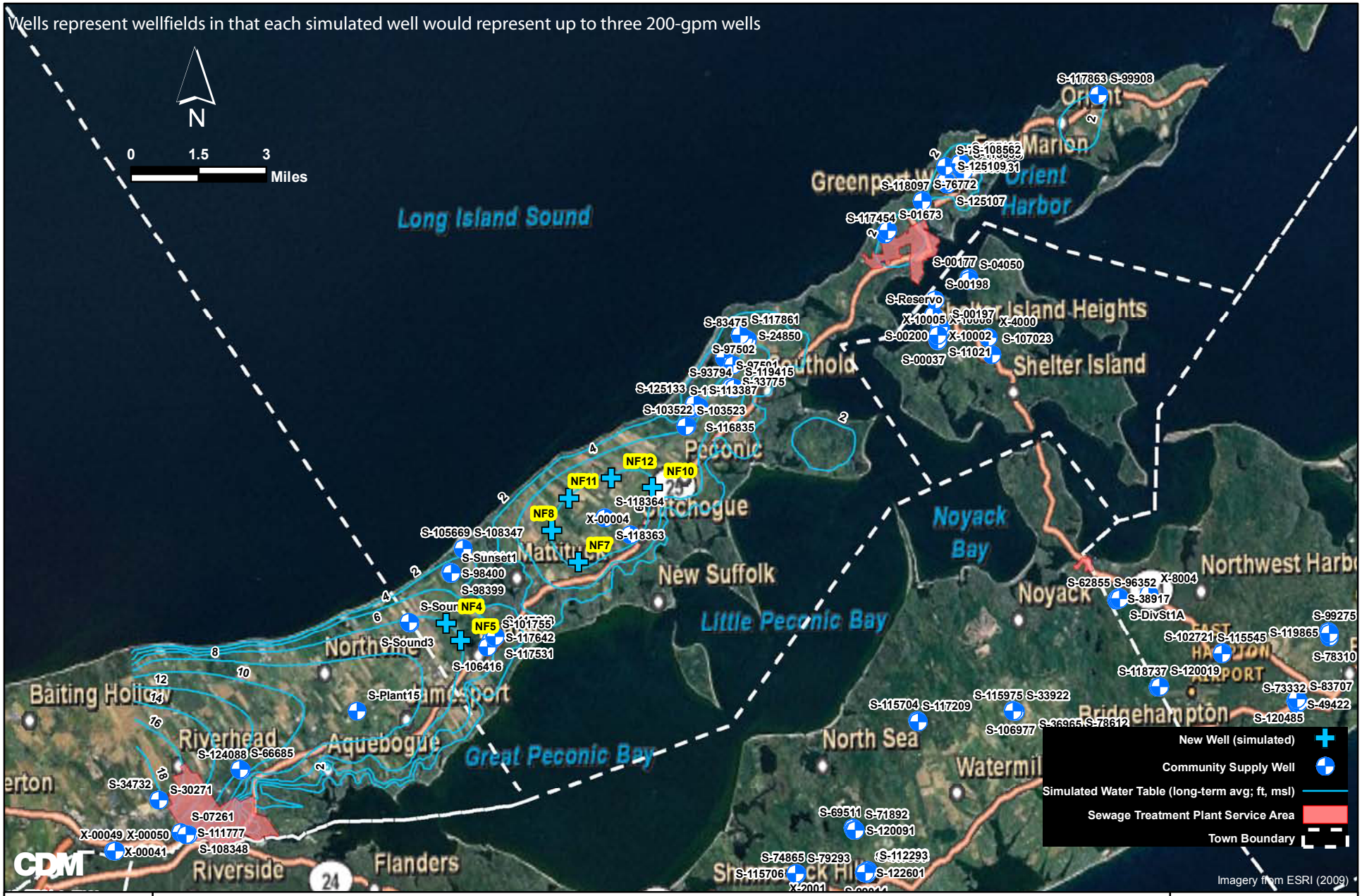
(Existing Conditions (green) and Projected Southold Water Demand Conditions (red). Northwest-Southeast Cross-section in Riverhead Shown on (a) and Southold on (b))



Simulated Water Table Drawdown in Southold and Riverhead in 2030, with No Conservation.

Suffolk County Comprehensive Water Resources Management Plan

Figure 4-5



Potential New Supply Wells in Southold in 2030, with No Conservation

Suffolk County Comprehensive Water Resources Management Plan

Figure 4-6

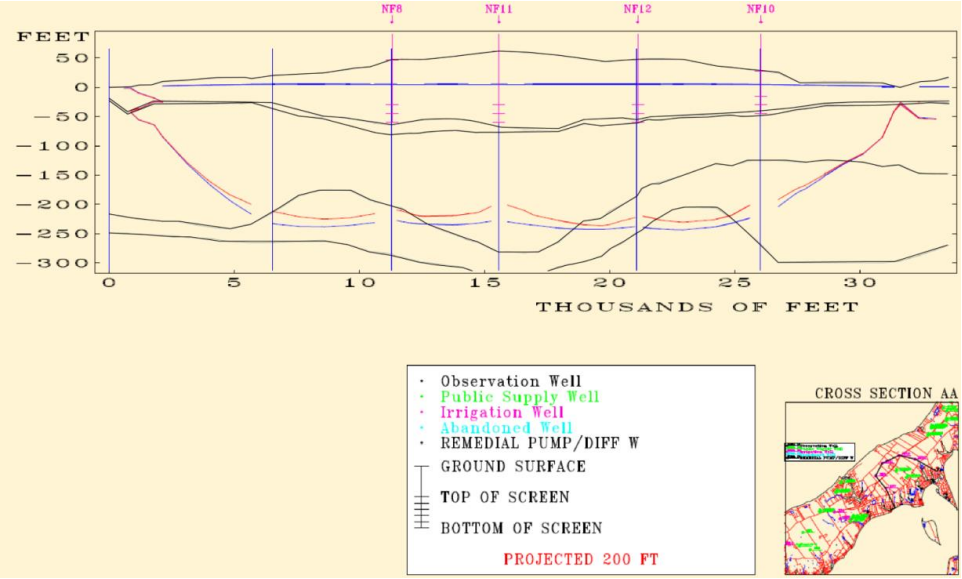
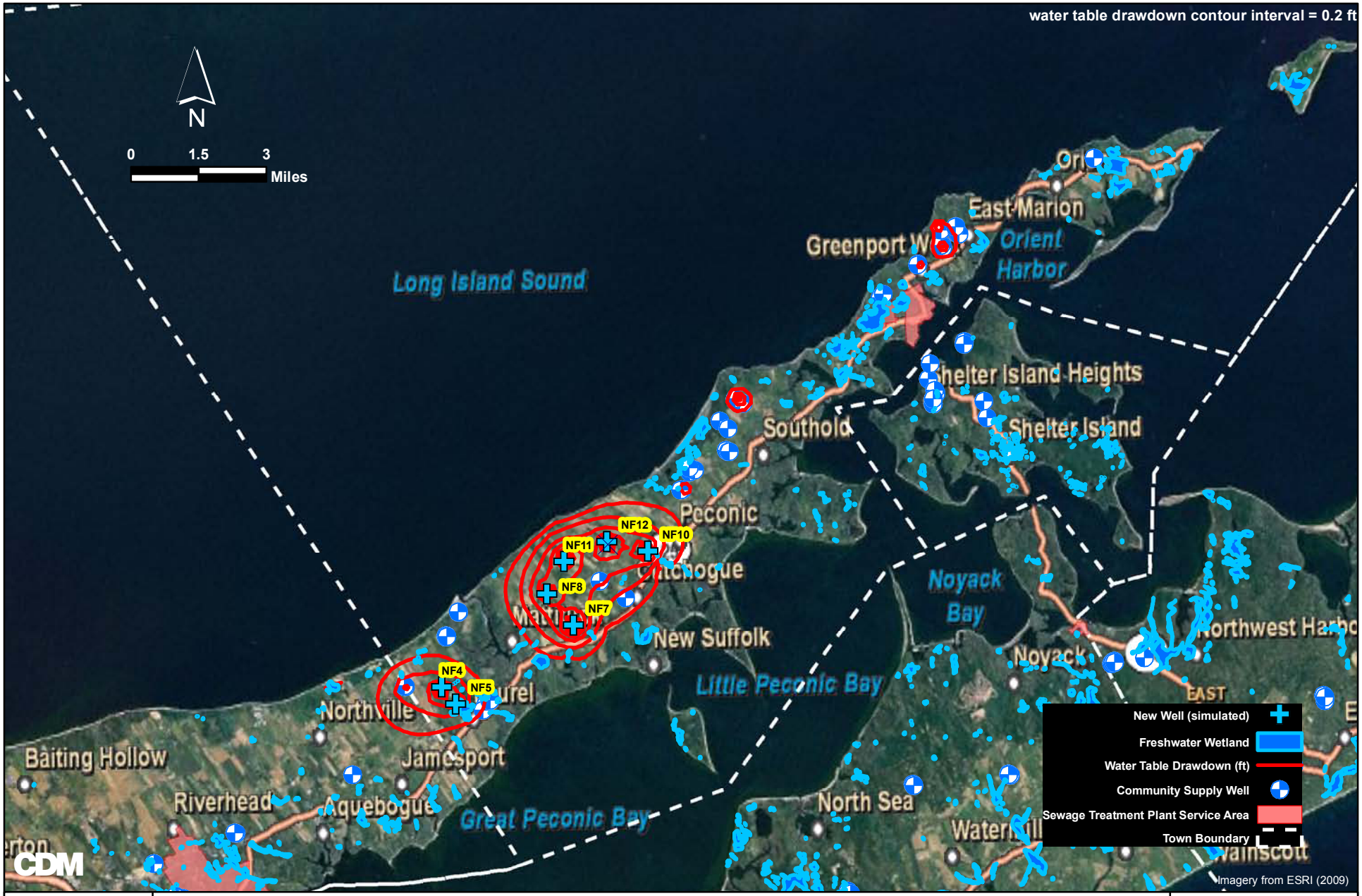


Figure 4-7 Simulated Position of the Saltwater Interface in Southold at 2030 under Existing Pumping Conditions (blue) and 2030 Pumping Conditions (red).

In this simulation, 980 gpm of peak pumping was moved from existing wells S-105669, S-108347, S-101755, S-127039, S-127226, and S-126076 to four hypothetical new wells (two new wells in Southold and two new wells in Riverhead). An additional 600 gpm was simulated to be pumped from three new wells located in Southold during peak summer periods. Use of all of these wells during periods of peak demand results in a peaking factor of 3.2. This configuration would give the SCWA more operating flexibility, should the conservation measures fall short of their target (a summer peaking factor of 3.0). Results are shown on **Figure 4-9.**

Simulation results show limited drawdown relative to existing peak conditions; a number of combinations of new wells and pumping rates (assuming the same total peak rate) would have yielded similar results; that is, only a slight decline in the water table elevation from existing conditions is predicted to result from water supply pumping.

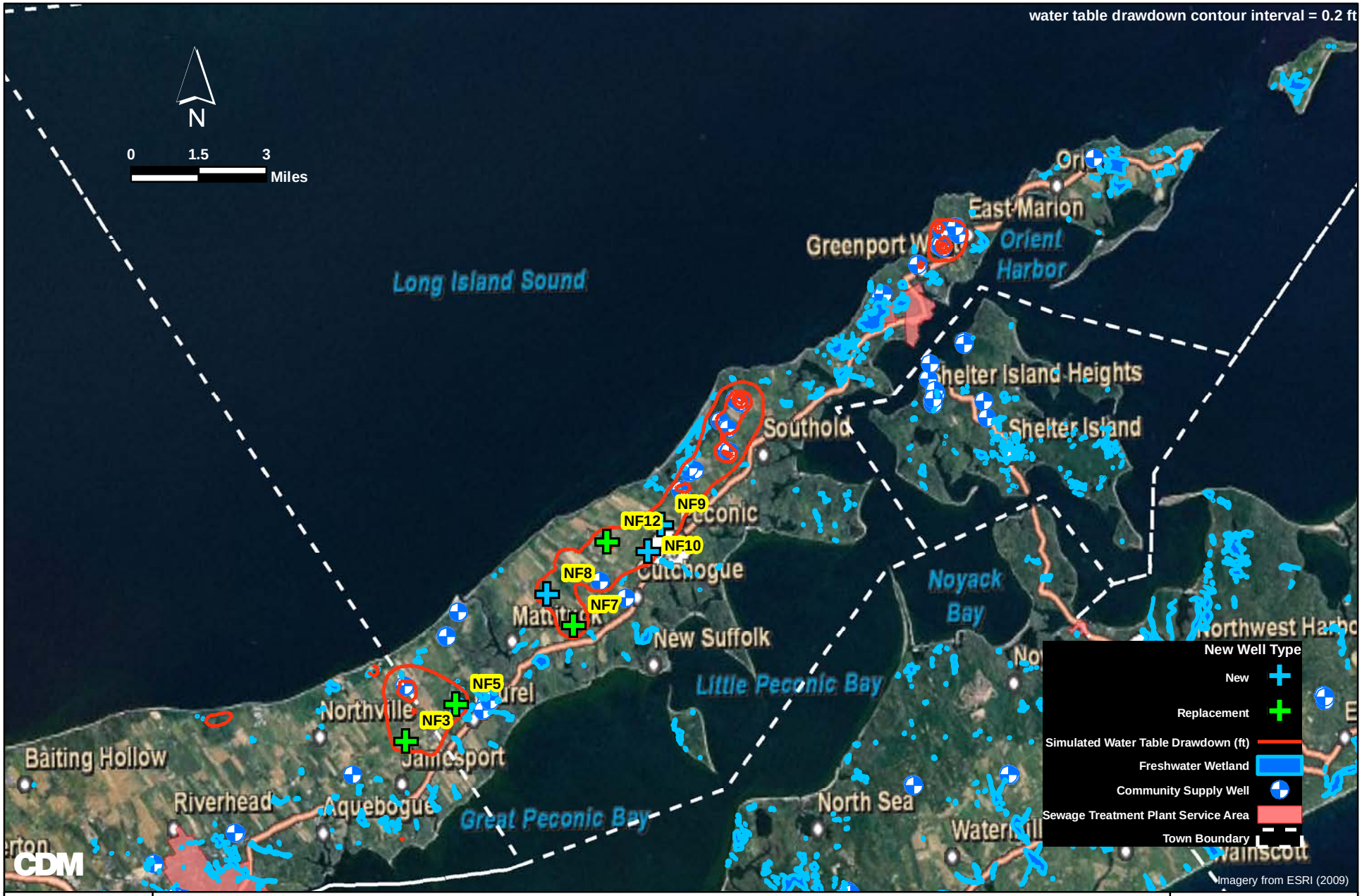
Well-specific treatment requirements for contaminants such as nitrate or pesticides that are found in North Fork groundwater have not been defined for these wells, however, the reduced number of additional wells required as a result of conservation makes Option 3 a more implementable approach. The replacement wells may also not be required should the coastal wells remain in



Simulated Water Table Drawdown (from existing pumping conditions) in Southold in 2030 with No Conservation

Suffolk County Comprehensive Water Resources Management Plan

Figure 4-8



Simulated Drawdown from Southold Water Demand
From Baseline (existing) with Conservation
Suffolk County Comprehensive Water Resources Management Plan

Figure 4-9

Due to the difficulty in siting high capacity wells on the North Fork, and the poor water quality that has resulted in many areas from historical agricultural practices, SCWA has also considered the possibility of installing several new wells in the Pine Barrens, and transmitting the water approximately 32 miles to Southold.

The potential to site new high capacity wells in Riverhead and transmit the potable water to Southold was also evaluated on a preliminary basis.

Conceptual cost estimates for these options were documented in the Task 8.3 Memorandum prepared by SCWA (2010), and are also summarized on Table 4-4.

Should any of these alternatives be identified for implementation, costs in 2010 dollars would be escalated to the mid-point of construction. Estimates of the relative ranking of alternative costs remain applicable regardless of the year of construction.

service. In addition, the much smaller predicted decline in the water table should be more favorable from a permitting standpoint.

Conceptual Capital Cost

Based on cost information provided by SCWA, preliminary conceptual capital cost estimates were developed in 2010 dollars for each of the options considered. More detailed costs, based upon the site-specific locations, capacities and treatment requirements associated with each new well would be required as the alternatives are further developed. Land acquisition costs have not been included, due to the site-specific nature of the investment. The cost estimates shown do not include escalation, as the schedule of construction has not been defined.

Table 4-4 summarizes the preliminary conceptual capital costs of each scenario, including the expansion of the distribution system to all residential properties in areas that are currently outside of the SCWA pressure zones 30 and 35. These costs are preliminary conceptual estimates because wells have not been sited, and well-specific treatment needs based on site-specific water quality data have not been defined.

Table 4-4 Conceptual Capital Cost Estimates for Southold Water Demand Alternatives

Option	Name	Conceptual Capital Cost ($ millions, 2010 dollars)				
		Wells	Transmission Main	Treatment	Expansion of Distribution System	Total
1	Riverhead Transmission Main with Supplemental Southold Wells	$ 12.32	$ 7.50	$ 4.97	$ 96.00	**$ 120.79**
2	Expand Existing System in Southold	$ 12.72	$ -	$ 15.93	$ 96.00	**$ 124.65**
3	Existing System with Conservation	$ 5.91	$ -	$ 3.38	$ 96.00	**$ 105.29**
4	Wells in Pine Barrens, run transmission main from Pine Barrens to Southold	$ 4.84	$ 48.00	$ -	$ 96.00	**$ 148.84**
5	Riverhead Transmission Main	$ 6.05	$ 7.50	$ -	$ 96.00	**$ 109.55**

Note: Costs in 2010 $ would be escalated to the mid-point of construction; information on the relative ranking of costs remains applicable regardless of the year of construction.

For these estimates, treatment costs have been presumed as described below:

- Option 1: Assumes that a centralized nitrate removal plant is required for new wells in Southold only. Cost assumes a 1,000 gpm plant, treating 600 gpm at a capital construction cost of $2,000,000. In addition, the cost includes a Granular Activated Carbon (GAC) facility at $500,000. A 24,700 foot raw water transmission main to the centralized facility is estimated at $100 per linear foot.

- Option 2: Assumes nitrate removal for a total flow of 3,000 gpm from the Southold wells, GAC treatment for all wells (centralized

plant in Southold) and 63,400 feet of raw water transmission main to centralized plants.

- Option 3: Assumes centralized nitrate and VOC removal plant for 1,000 gpm and 15,000 feet of raw water transmission main.

The cost of the distribution system extension was calculated using GIS, assuming that distribution pipelines would follow the existing road network in Southold. The length of all roads in Southold outside of SCWA Zones 30 and 35 was estimated to be approximately 960,000 linear feet. Using a distribution system construction cost of $100 per linear foot (SCWA, 2010), the total cost of the distribution system extensions was approximated at $96M. This should be considered a very preliminary cost estimate, because the actual length of distribution mains will vary based on factors such as final alignment, topography, sensitive environmental features, and because the unit cost of $100 per linear foot will vary depending on factors such as pipe size, market price of material, the ability to utilize public right-of-ways or the need to repave, etc. In addition, depending on development patterns in 2030, additional roadways are likely to be constructed which would increase project costs.

These costs were described in more detail in the Task 9 memorandum (**Drinking Water Supply Recommendations**, CDM, 2010) and are based on costs documented by SCWA in the Task 8 memoranda (**Water Production Costs, Water Treatment Costs** and **Water Transmission Costs** (SCWA, 2009 and 2010). The cost estimates assume that groundwater pumped from Riverhead only requires routine disinfection and corrosion control; any additional treatment required (iron removal, GAC, nitrate removal, etc.), would further increase the costs shown. Estimated treatment costs for nitrate removal at a centralized treatment facility for water withdrawn from the new wells in Southold are included, based on water quality data. Finally, SCWA has not historically provided centralized treatment facilities; the cost of pumping water from the wellhead to the treatment facility, and then to distribution would be an additional consideration.

The Engineering News Record (ENR) Construction Cost Index (CCI), which is based on a twenty city average of costs for common labor, steel, concrete and labor, is widely used to estimate the impacts of escalation. As of December 2014, the ENR CCI was 2.7%. Each of the conceptual capital cost estimates presented in this document could be escalated to the projected mid-point of construction using this escalation rate to provide a more up-to-date assessment of actual anticipated implementation costs. As the objective of this example is to compare the estimated capital cost associated with each alternative, the relative differences between alternative costs would remain the

same. For these estimates, treatment costs have been assumed as described below.

All of the potential alternatives identified to provide a safe and adequate supply of potable water to Southold are significant construction projects that are only described conceptually here. Assuming that the peak pumping rate can be reduced through a successful conservation program targeting outdoor water use, installation of three additional wells in Southold would be the most cost effective approach to provide a safe and reliable supply to North Fork residents, assuming that limited treatment will be required. Siting new wells in Riverhead, and transmitting the water east to Southold appears to be the most cost effective approach to satisfy the 2030 water demand on the North Fork if a conservation program is not implemented. This option requires the fewest new wells and, based on available water quality data, potentially the least required treatment of the North Fork alternatives. However, after potentially suitable well sites are selected, additional analyses will be required to evaluate treatment requirements, the potential site-specific water table drawdown, and any potential impacts to freshwater wetlands.

Although considerably more costly at an estimated $148M (2010 dollars), the Pine Barrens alternative may prove to be the most feasible from a water resources perspective depending upon the projected water table drawdown in area wetlands resulting from siting new wells in Riverhead. These potential impacts will need to be assessed based on the locations selected for the new wells. Similarly, the impacts of potential new wells located within the Pine Barrens upon local wetlands would also require evaluation. Finally, if additional new wells required to respond to the projected increased demand in the Riverhead Water District are sited in the eastern part of the town, the ability to withdraw additional water in Riverhead for transmission to Southold would be reduced.

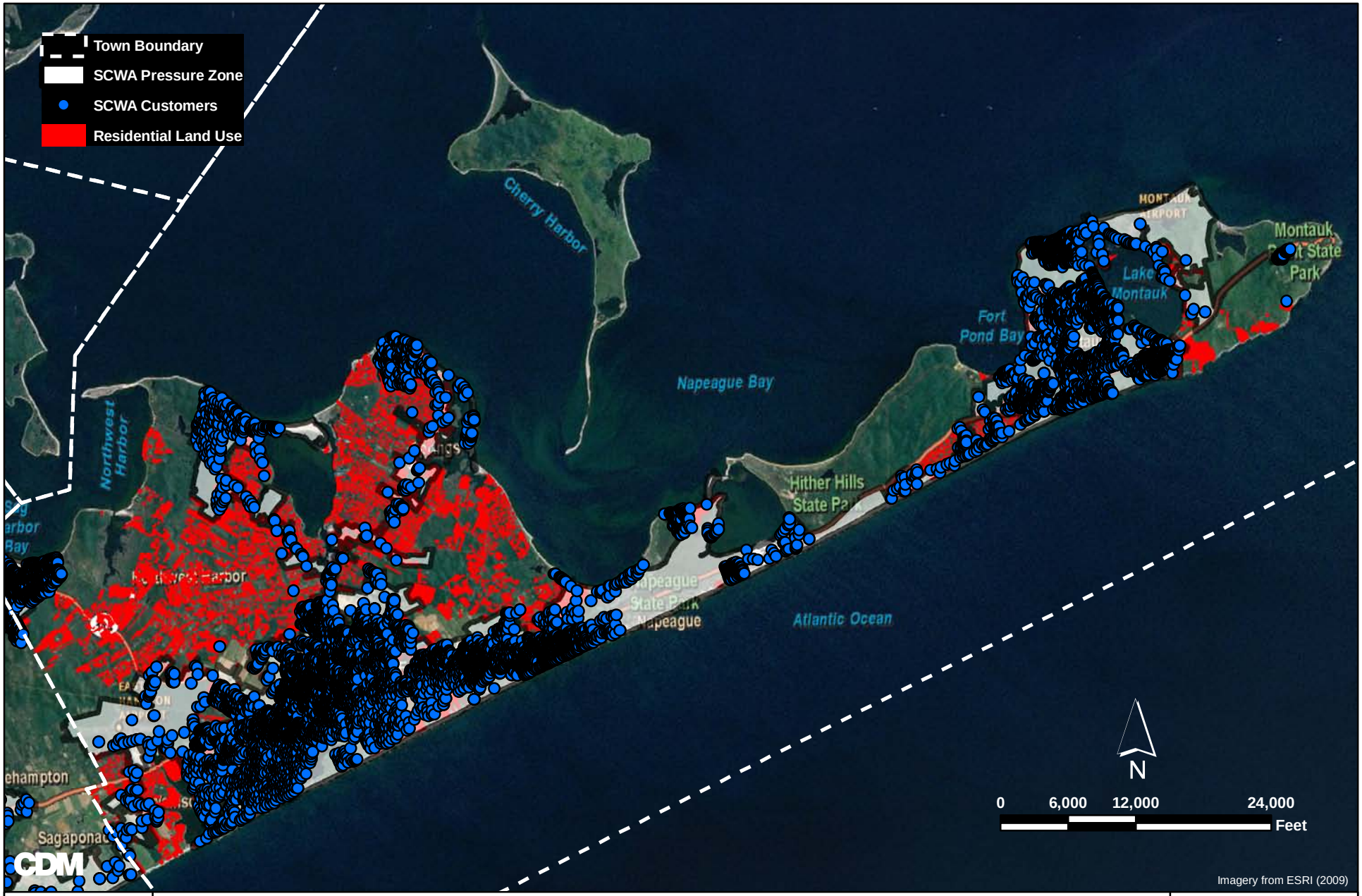
4.3.2.2 South Fork

There are also a number of areas on the South Fork where access to community supply is not yet available, including two large regions within East Hampton that currently do not have public water; the northwestern region of the town between Southampton and just west of Three Mile Harbor, and the eastern region of the town east of Three Mile Harbor and within the vicinity of Dennistown Bell Park, as shown on **Figures 4-10** and **4-11**. Although SCWA and Hampton Bays Water District have significantly expanded service areas in Southampton since the ***1987 Comp Plan*** was published, some areas continue to remain on private wells as shown on **Figure 4-11**. Expansion of the SCWA should continue in Southampton, particularly in southern regions with upgradient agricultural land uses and existing elevated nitrate levels, such as in Sagaponack and Watermill.

Existing SCWA distribution areas should be extended throughout Southampton and East Hampton. While the evaluation of future water supply needs based upon historical water use did not identify the need for additional wells to meet projected 2030 demands in Southampton (the need for additional booster pumps/stations was identified and the need for additional wells was identified in East Hampton, which shares distribution zone 23 with Southampton), SCWA has identified the need for additional capacity, based upon summer 2010 pumping demands. In an effort to resolve the low distribution pressure problems that were common in the Westhampton, Southampton, and East Hampton areas during the summer of 2010, the SCWA has applied to the NYSDEC for permits to increase its overall withdrawal capacity. The SCWA is mindful of the fact that in this portion of eastern Suffolk County, increases in capacity have the potential to induce contaminants and/or saltwater into a given well. For this reason, SCWA has developed a regional planning approach to address this problem.

The majority of the overall increase in supply for this area will come from small, incremental increases in the permitted capacities of existing wells in the area and addition of higher capacity pumps and associated infrastructure. Part of the overall increase in withdrawal is to come from new wells constructed in areas where water quality is known to be excellent, and where computer modeling has identified minimal negative impacts from increased pumping. New wells are planned for existing wellfields in Bridgehampton and Westhampton. A new well that will be screened in a productive area of the Magothy aquifer will be accompanied by a deeper monitoring well to provide early warning of saltwater upconing. In addition, new wells are being planned to replace existing wells that are prone to high iron and manganese, and contamination from documented releases. Finally, a new wellfield would be added in Bridgehampton. The SCWA's regional planning approach, balancing environmental and economic impacts, will result in a total planned increased capacity of 4,300 gpm.

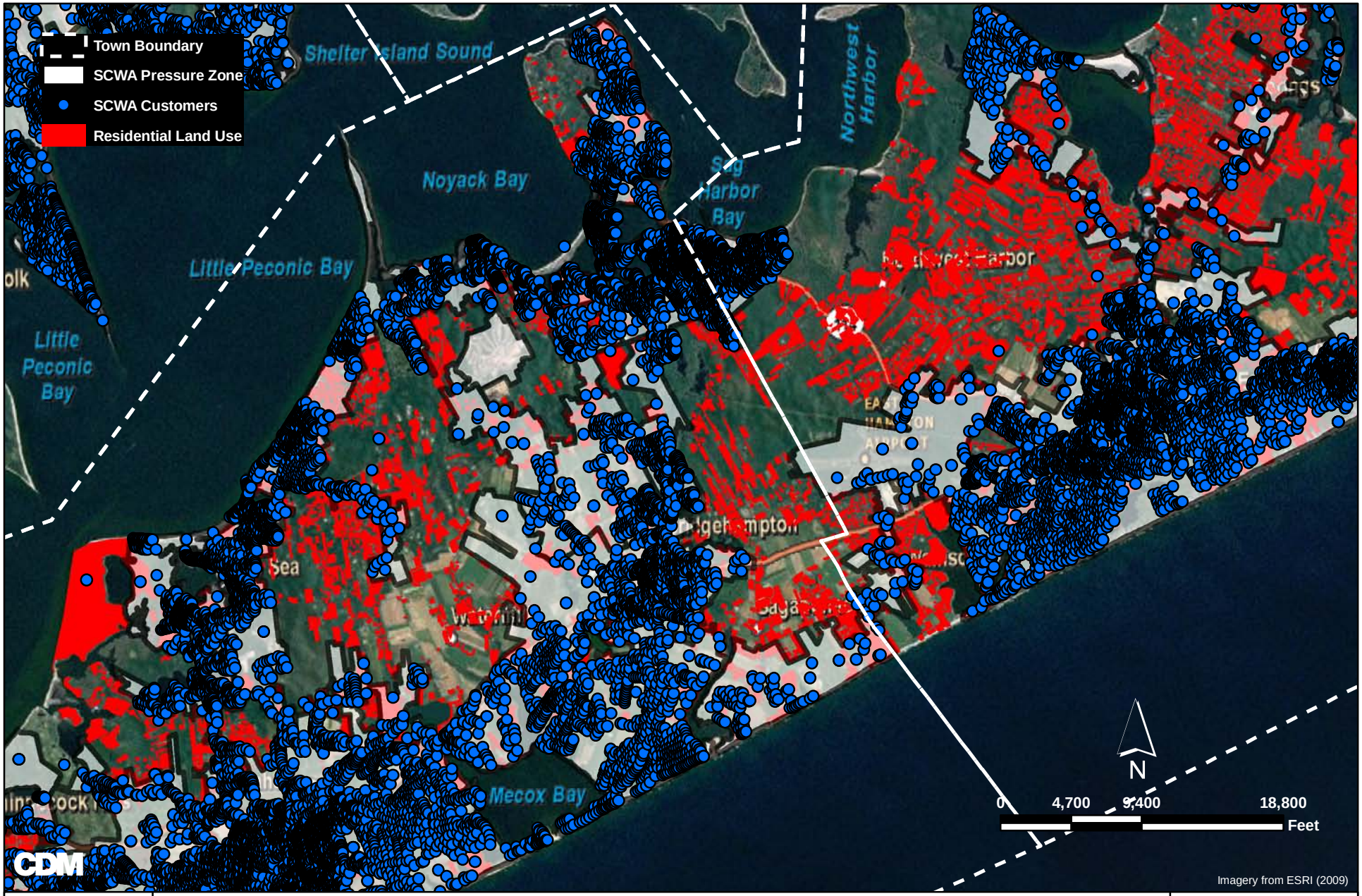
Additional supply needs, including up to 29 new wells, are projected for East Hampton to provide community supply to all residents on private wells and to meet projected new demands in 2030, unless conservation is successfully implemented to reduce outdoor use during the period of peak demand. SCWA has recently been granted easements on a number of properties that Suffolk County has acquired under the County's Drinking Water Protection Program, including properties in East Hampton as shown on **Figure 4-12**. These, and existing SCWA properties should be used for the new wellfields, depending upon the location(s) of additional demand.



Western Residential Areas in East Hampton Not Served by Public Supply

Suffolk County Comprehensive Water Resources Management Plan

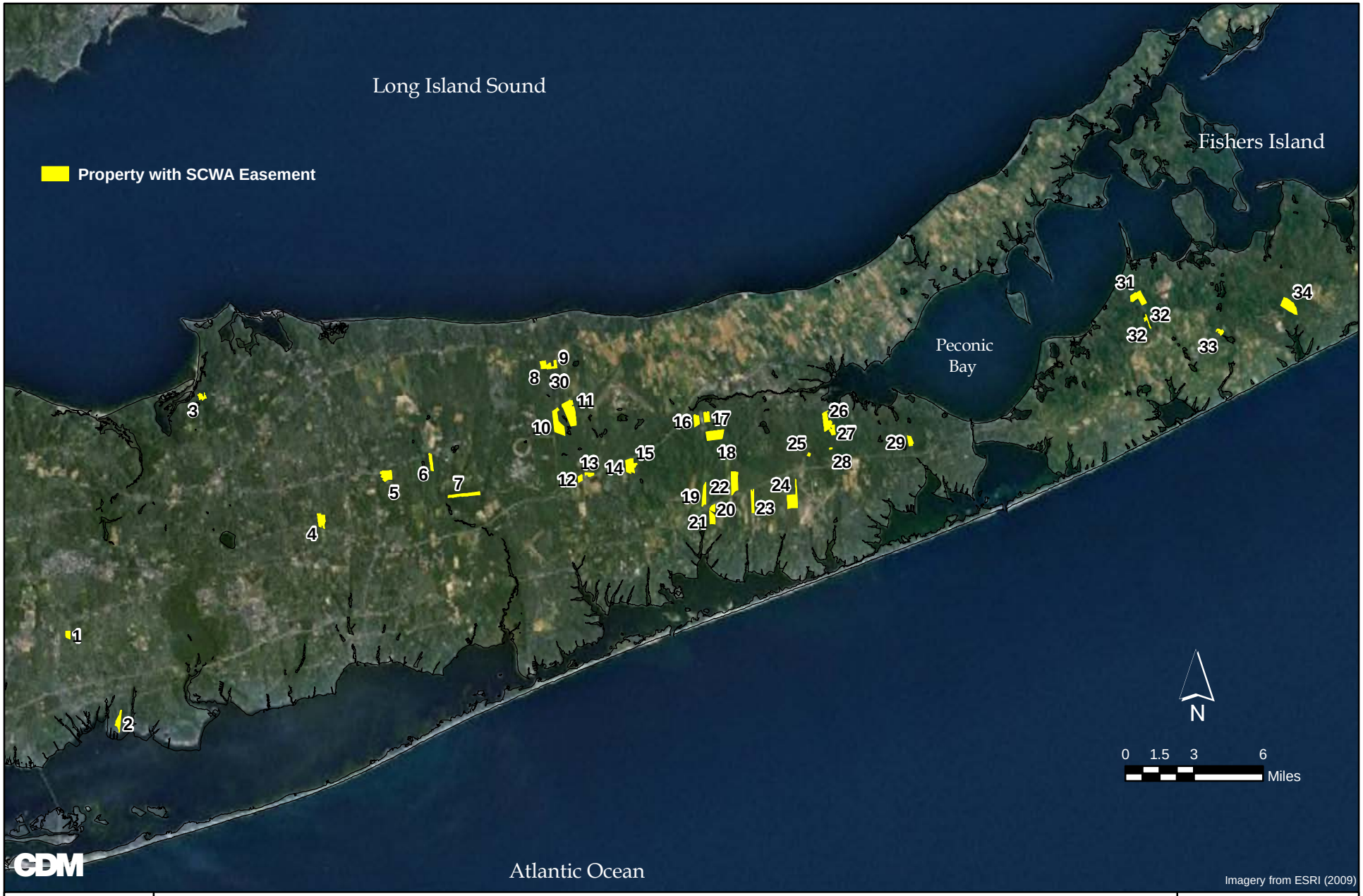
Figure 4-10



Eastern Areas in Southampton Not Served by Public Supply

Suffolk County Comprehensive Water Resources Management Plan

Figure 4-11



Suffolk County Comprehensive Water Resources Management Plan
Properties with Suffolk County Water Authority Easements
(from, SCWA, 2010)

Figure 4-12

4.3.2.3 Eastern Brookhaven

Based on population projections and current peak water supply pumping rates, an additional ten to eleven new wells will also be required in the Town of Brookhaven:

- Zone 18: Two wells at 1,200 gpm each;
- Zone 20: Seven wells at 900 gpm each;
- Outside of the existing SCWA distribution area, depending on the distribution system configuration, one additional well may be needed at 900 gpm, and
- Depending upon the areas of additional demand, and the sites selected for new wells, additional booster pumps/stations may also be required.

SCWA has a number of properties in the town of Brookhaven, including the easements recently granted from properties acquired under the County's Drinking Water Protection Program (**Figure 4-12**). These properties could be used for the new wellfields, depending upon the location(s) of additional demand and raw water quality.

4.3.2.4 Northport

SCWA has evaluated the potential to replace nitrate-impacted wells in the Northport area with water obtained from new wells to be located in the Pine Barrens (**Task 8.3 Water Transmission Costs**, SCWA 2010). A water supply project of this scope would include the following components:

- Nine new wells in the Pine Barrens, providing 12,000 gpm;
- Two to three new pump stations, and;
- A 28 mile transmission main running along the Long Island Expressway west from Exit 70 to Exit 52, where it would join the proposed Northport transmission main.

SCWA has developed a total preliminary cost estimate of over $51M for this option and has noted that additional costs are likely to be associated with booster pumps along the route of the new main.

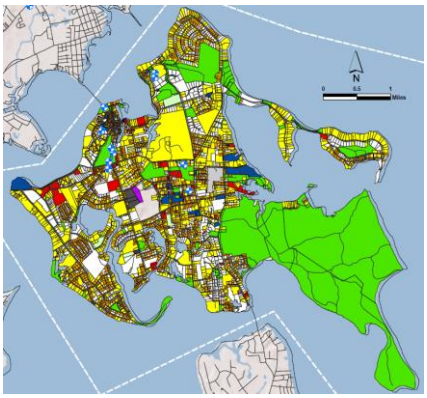
SCWA continues to explore other alternatives. Consideration is being given to siting a new wellfield at several potential alternative locations in southeastern Huntington/southwestern Smithtown where water quality data appears to indicate that lower levels of nitrogen are present, such as West Hills County

Park in Huntington. This would reduce transmission costs from the Pine Barrens alternative considerably. Site-specific costs, including well station, treatment, transmission, and any additional pump stations will be dependent upon the location selected.

SCWA had also explored the possibility of utilizing a new Lloyd well for blending. A Lloyd well would be sited within the area of northern Huntington where the USGS hydrologic framework indicates that the Magothy formation is not present. The 1986 amendment to New York State's Environmental Conservation Law established a moratorium on new Lloyd wells in areas that are not coastal communities. Coastal communities were defined as areas where the Magothy aquifer is either not present, or is contaminated with chlorides. If this option were to be approved, improved water quality could be provided by blending water from newly constructed Lloyd wells with water from the existing Magothy wells, thereby eliminating the need for costly nitrate treatment or long distance transmission. Additional detailed evaluation of the impacts of using Lloyd water is warranted.

4.3.2.5 Shelter Island

Community, non-community and private supply wells currently provide potable supply to Shelter Island residents. Because there is no industry and very little commercial and agricultural land use on Shelter Island, the potential to introduce contaminants such as VOCs and pesticides to the aquifer is lower than elsewhere in the County, and the shallow private wells are therefore not as susceptible to contamination. Nevertheless, SCDHS has documented the presence of contaminants such as nitrate and ibuprofen in the groundwater, which are most likely introduced by on-site wastewater disposal systems, along with MTBE, presumably from stormwater runoff and previous spills/discharges of gasoline containing MTBE.



Land Use on Shelter Island (Suffolk County Department of Economic Development and Planning)

Provision of a community supply to all of Shelter Island requires additional detailed study, due to the hydrogeologic characteristics of the local aquifer system. Siting of up to seven supply wells that would be required to meet projected 2030 demands could be challenging, given the limited extent of the freshwater system, and the low productivity of much of the formation. In the past, the SCWA has considered development of a transmission main from North Haven (SR 114) to provide water from the South Fork to Shelter Island residents. SCWA has developed a preliminary estimate of $2.3M for directional drilling of 2,500 feet of 24-inch high density polyethylene (HDPE) pipe from North Haven to Shelter Island. A total project cost to provide public supply would also include the cost for new wells, and distribution lines throughout the Town.

In the meantime, it is recommended that private wells undergo a comprehensive water quality analysis every three years to confirm that the potable supplies remain in compliance with MCLs (EPA recommendations of annual sampling for total coliform, nitrate, pH and other suspected contaminants should also be implemented).

4.3.3 Additional Recommendations Pertaining to Private Wells

In general, safe potable water that is in compliance with drinking water MCLs, USEPA health advisories and New York State guidance levels can most reliably be provided by a community water supply. It is recognized however that extension of public supplies to areas currently served by private wells will not occur overnight; the considerable planning, siting, permitting, design and construction required to extend a community supply, particularly on the East End, will take years. The following recommendations have been identified to provide additional protections for residents that continue to utilize private wells in the interim, in accordance with Suffolk County's philosophy that access to a safe potable supply in compliance with applicable drinking water criteria should be available to all.

- SCDHS Division of Environmental Quality (DEQ) Office of Water Resources (OWR) should develop a private well database including well location, date of installation, sampling dates, treatment units installed and any water quality problems. Wells that have not been sampled within the last 10 years should be targeted for sampling and analysis. SCWA has developed a GIS database of their customer base, which was utilized during the private well analysis (Task 7.5 Private Wells, CDM, 2009). Continued updates from water purveyor databases should be utilized (particularly the larger suppliers such as SCWA, South Huntington, Dix Hills, Greenlawn, Riverhead and Hampton Bays) to build the private well database.

- SCDHS OWR should consider requiring all private wells to undergo a comprehensive water quality analysis, including testing for bacteria and nitrate, every three years, to confirm that the water supplied complies with MCLs.

- Suffolk County should consider additional outreach about the water quality testing program for private wells to inform residents that the program exists, and the benefits and safeguards provided by proper testing. Outreach can be in the form of a mailer targeted to parcels that are not already served by public supply and/or highlighted on the County's website. Additional staffing (samplers and laboratory

technicians) will be required to collect and analyze additional samples, should the program be more highly utilized.

- The existing SCDHS fee for private well sampling and analysis is $100, but an exemption can be filed for households that have a cumulative family income of less than $25,000. However, based on a New York State minimum wage of $8.75 per hour (2015), a three person household of minimum wage earners would have an annual household income of $54,600. The exemption should be updated to more contemporary minimum wage assessments; SCDHS DEQ should consider increasing the cumulative family income for the water quality exemption to $55,000.

- Option B of Section 406.4-12(b) of the SCDHS well standards should be revised to include additional specifications for double casing of the test well through an aquiclude or confining layer to prevent poorer quality water from the shallow aquifer from migrating to deeper portions of the aquifer that may be locally hydraulically separated by the aquiclude/clay layer.

- Suffolk County should require a variance for private well installation in areas where the saltwater interface is <40 feet below the water table, so that they have the opportunity to review all pertinent information including the saltwater interface location (induction log) and proposed well screen depth.

- SCDHS OWR should revise the Suffolk County Private Water System Standards to be consistent with the more stringent New York State Standards requiring a minimum distance of 200 feet between a private well to a cesspool (or leaching pool), where property sizes allow.

4.3.4 County-wide Peak Pumping Demands

Conservation is described in depth in the **1987 Comp Plan**. At that time, total community supply pumpage in the County was estimated at 146 mgd, and it was assumed that a 5 percent reduction in pumpage could be achieved by implementation of a conservation program. In fact, while the Suffolk County population has increased by approximately 14 percent, from 1,284,231 in 1980 to 1,499,738 in 2013 (http://quickfacts.census.gov), average daily community water supply pumping during that same time increased by 56 percent, from 146 mgd to 228 mgd. Approximately 80 percent of groundwater withdrawn in Suffolk County for all purposes is pumped by community water suppliers. Community supply pumping during the winter months has only increased by approximately 15 mgd since 1987/1988, while pumping during the summer has

increased by 100 mgd or more. Much of this increase is attributed to the installation and use of automatic irrigation systems.

Per capita water use varies significantly by town, as summarized on **Table 4-5.** Some of this apparent variation is due to the fact that more commercial and industrial water users exist in Babylon, for example, as compared to Shelter Island. In addition, landscape irrigation practices and seasonal population increases on the East End have a significant impact.

Review of average monthly pumping from the Greenlawn Water District, Riverhead Water District, SCWA, and the South Huntington Water District reveals that the demand on community supply systems increases significantly during the summer months. **Figure 4-13**, average monthly pumping in SCWA Distribution Zone 1, illustrates the pattern observed in many areas of the County. In fact, approximately 42 percent of the total average annual withdrawal from SCWA between 2006 and 2009 exceeded the baseline water supply pumpage and is presumed to supply outdoor water uses, including irrigation.

Table 4-5 Per Capita Water Usage by Town

Town	Gallons per Capita per Day (2008)
Shelter Island	92
Islip	116
Southampton	117
Southold	118
Brookhaven	141
Huntington	166
Smithtown	198
Babylon	199
East Hampton	230
Riverhead	253

Review of current (2013) pumpage by Town indicated similar patterns for most west end towns. Recent changes to per capita water use in the east end towns

were not readily discernible, due to the impacts of seasonal population changes.

Average Monthly Pumping from SCWA Distribution Area 1

Average monthly pumping from the Greenlawn, Riverhead and South Huntington Water Districts shows similar patterns, in that approximately 40 percent of total average annual water supply pumping appears to be utilized for outdoor water use during the growing season.

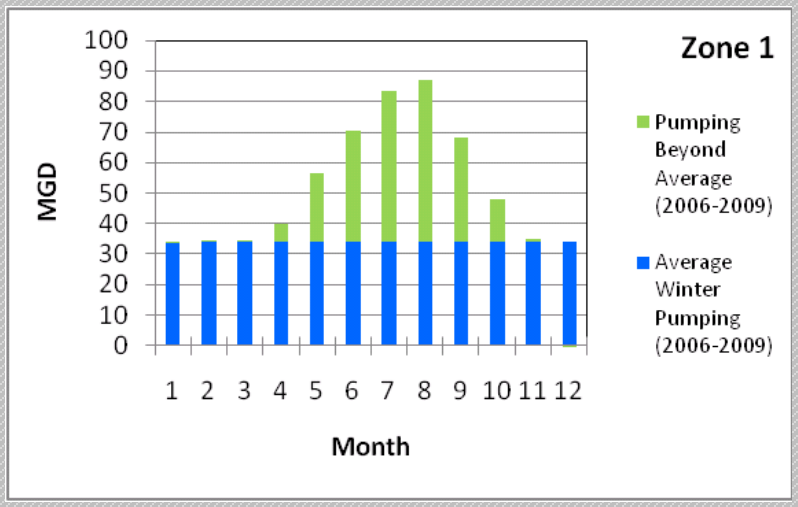


Figure 4-13 Average Monthly Pumping from SCWA Distribution Area 1

Previous estimates have concluded that approximately 30 percent of SCWA pumpage is utilized exclusively for lawn irrigation (Munster, 2004). Almost 60 percent of the total annual pumpage in Riverhead has recently been estimated to be attributed to outdoor use.

While there are adequate groundwater supplies to meet all potable needs within the County, existing infrastructure is not adequate to respond to the increased water supply demand during hot, dry summer periods, in particular the increased use of automatic irrigation systems during the early morning hours, as exemplified during the summer of 2010. For example, thirteen wells provided potable water supply for the Riverhead Water District in 2010. From November through March; operation of just four of those wells was usually sufficient to meet the water demands of Riverhead residents. However, during hot dry summer days, pumping of all thirteen wells was not enough to meet the increased demand. The Town estimates that during the summer months, eighty percent of the water pumped is used to water lawns, and that seventy percent of residents have irrigation systems. In fact, per capita water use in Riverhead was the highest of any town in the County. Since 2010, the Riverhead Water District has installed five new public water supply wells to address the increased demands.

Therefore, the Suffolk County water conservation program should focus upon outdoor water use. The increased demand resulting from the use of automatic sprinkling systems should be specifically addressed to reduce the summer time pumping peaks, and to reduce the amount of additional infrastructure required to extend community supply to areas of need, such as the North Fork, where fresh water supplies are more limited. In recognition of the more limited supply of fresh water available, Shelter Island has already addressed the need to reduce lawn irrigation; new underground sprinkler systems are prohibited, and existing underground irrigation systems must be removed by September 2013 under Shelter Island Town Code, section 82-5.

Outdoor conservation measures that have been implemented elsewhere are summarized on **Table 4-6**.

Table 4-6 Potential Outdoor Conservation Measures

Potential Outdoor Conservation Measures
Irrigation restrictions (e.g., odd/even)
Irrigation controller rebates
Rain sensor regulations
Landscape requirements
Turf removal programs
Landscape professional/contractor education programs
Xeriscape workshops/education
Landscape contractor certification program
Soil moisture sensor rebate
Gray water system education
Water waste prohibition
Rain barrel catchment
Swimming pool and spa covers
Irrigation audits of large turf areas
Reclaimed water for large turf areas
Conservation Rates
System Water Audits
Leak Detection
Distribution system pressure regulation
Irrigation controller rebates

Measures that have been effective at reducing outdoor water use and reducing peak pumping needs include:

- Developing customer education programs;

- Modifying rate structures;
- Implementation and enforcement of outdoor water use ordinances and
- Implementation of incentives or ordinances for low water demand landscapes.

It is recommended that a County-wide conservation program consisting of the following four components be developed to reduce peak summertime pumpage in Suffolk County:

1. A County law mandating rain sensors to shut sprinkler systems off when it is raining should be enacted.

- SCDHS should develop and implement a conservation program to address all suppliers in the County.
- Water suppliers in the County should consider implementing an increasing block rate structure for seasonal use.
- A County law mandating odd-even lawn watering days should be promulgated by the Suffolk County legislature.

Each of these recommendations is discussed in more detail below.

4.3.4.1 Rain Sensor Shut-off Devices

While the public has become increasingly aware that both water and money can be saved by turning off in-ground sprinkler systems during precipitation events, casual observation indicates that sprinkler systems on a number of properties continue to operate even during rain events.

A local law should be established to require that all new in-ground sprinkler systems incorporate a rain sensor that would turn the system off when a pre-specified amount of precipitation is detected. Although installation of rain sensors will not reduce the peak pumping rates that occur during hot, dry periods, they will reduce demand on the water supply system during the summer months, as well as reduce power consumption, potable supply treatment costs and run-off.

4.3.4.2 Conservation Program

Article 4 of the Suffolk County Sanitary Code addresses conservation as summarized on the following page:

760-433 Conservation

- Owners of public water supply systems shall be responsible to take water conservation measures to control the quantity of water being utilized.
- The Department may require the owner of a public water system to submit documentation that an adequate water conservation program is in place.

It is recommended that Suffolk County, in collaboration with the water suppliers, establish a County-wide conservation program to educate residents and commercial and industrial water users on the benefits and opportunities associated with water conservation, to track the success of the outdoor irrigation reduction recommendations and to enforce compliance with the requirements. Since the time that the ***1987 Comp Plan*** was prepared, an increasing number of utilities throughout the country have implemented very successful water conservation programs. Both United Water New York (UWNY) and the Massachusetts Water Resources Authority (MWRA) have implemented extensive and comprehensive water conservation programs – per capita use in both supplier service areas is less than 100 gallons per capita per day (gpcd). In Suffolk County, only Shelter Island has a per capita use rate of less than 100 gpcd.

In Suffolk County, basic conservation measures such as metering, publication of voluntary water conservation measures on supplier websites, billing inserts and the annual drinking water quality reports are already in place. However, participation in programs focused on reducing peak outdoor water demand is voluntary in most towns, with the exception of Shelter Island. Additional information about the SCWA (and other suppliers') customer bases is required in order to develop a comprehensive conservation program, as commercial and industrial customers have different demands and opportunities for conservation than residential customers. To date, this type of information has not been available.

SCDHS OWR should work with County water suppliers to support the development of a comprehensive conservation program. The basic steps and components of a potential program are outlined below:

- The water suppliers should compile data on water demand per sector (residential, commercial, industrial) by season, to assess impacts on peak demand and help to guide conservation efforts;
- Specific peak demand reductions should be targeted, perhaps by supplier or by Town;

- Water suppliers should provide data on daily and peak pumping rates to OWR to assess the effectiveness of proposed conservation measures in reducing peak demands, and to identify any potential need for increased conservation measures;

- If implementation of the recommended conservation measures (e.g., alternate day watering, automatic rain shut-off, conservation rates) does not reduce the peak demands as anticipated, customer surveys should be conducted to further understand sector water demands, compliance with conservation measures, and the effectiveness of proposed measures;

- SCDHS OWR should consider working with Cornell Cooperative Extension to monitor evapotranspiration rates, and to post evapotranspiration data on the County website to guide lawn watering decisions;

- SCDHS OWR should work together with Cornell Cooperative Extension and the water suppliers to advance xeriscaping principles throughout the County; and

- Conservation measures should be incorporated into the public education initiatives described in the Task 10 memoranda.

4.3.4.3 Seasonal Rate Structure

Empirical studies have shown that outdoor water use is more responsive to price than indoor use, especially during the summer months when outdoor use is greatest. Since outdoor use tends to be more discretionary than indoor water use, people are more willing to reduce outdoor water use as prices increase. Because outdoor water use occurs mainly in the peak summer months, the costs of providing outdoor peak demand can be increased; outdoor use should be priced at a higher rate during peak periods of the year, both to help to recover the incremental cost of providing water during peak periods and as an inducement to conserve water because of seasonally limited supplies. The American Water Works Association (AWWA) reports that "conservation rates have proven to be an effective tool for reducing peak season demand" (AWWA, 1997) and a recent Water Environment Federation (WEF, 2010) study reported that saving money was the most frequently identified factor motivating conservation. AWWA has documented that only 1 out of 3 water suppliers continue to use uniform rates.

Conservation-based rate structures have been used successfully to reduce water demands in arid regions (Albuquerque, NM and Phoenix, AZ), in rapidly developing areas (Cary, NC), and in nearby suburban areas with similar

household characteristics (Rockland County, NY, northern New Jersey). Conservation-based rate structures can include inclining rate blocks, seasonal rates, and excess use charges. Developing the appropriate rates and definition of 'excessive water use' is one challenge that water suppliers face when establishing rate structures to motivate conservation. Several Suffolk County water suppliers have already established increasing block rates.

Establishment of an increasing block structure, an excessive use rate structure, water budget based rate structure, or seasonal rates from April through September are all options to reduce peak summertime usage. The increasing block (also known as inclining block) rate structure increases the unit cost for water as water use increases; today this is the most common rate structure used by water utilities. Increasing block rate structures typically have two to three tiers, although some water suppliers have implemented rate structures with a greater number of tiers. The first tier establishes a reasonable minimal cost based on minimum water use for a typical household in the service area, and the next tier(s) are priced significantly (e.g., more than 50 percent) higher for additional water use. The Alliance for Water Efficiency (www.allianceforwaterefficiency.org, 2009) reports that the increasing block tier structure is considered to be the most effective rate structure to motivate conservation. Excessive use rates establish a significantly higher rate for "excess use"; this type structure requires definition of excess water, which is not always straightforward. Water budget- based rate structures are the most complex, data-intensive rate structures, although they are also very effective in prompting conservation, and are fair, as they are based on individual household needs. Based upon the number of people per household and the square footage of landscape, base water usage is established for each residence, and rates increase according to established tiers as the baseline water use is exceeded. This approach requires significant work to establish the baseline water use, as well as more complicated tracking and billing procedures. Finally, seasonal rates can be established during the peak summer use period. In some areas, this may be three months (from June through August), in others it is the six month period from May through October.

Because conservation in Suffolk County is targeted to reduce summer time peak water use, implementation of a seasonal rate structure may be the simplest and most effective rate structure to prompt reduced outdoor water use. SCWA has already implemented a monthly meter reading/billing program for large accounts. Monthly billing has been shown to be more effective than quarterly billing in providing timely feedback to water customers in terms of how much water they are using, and the associated costs. The feedback provided by quarterly billing is not as timely; hence residents cannot respond to increased charges resulting from increased water use as promptly.

4.3.4.4 Odd/Even Watering Restrictions

Cornell Cooperative Extension and others have determined that in general, landscaping requires one inch of water each week to thrive. In fact, long term average precipitation records show that Suffolk County receives approximately 4 inches of precipitation per month throughout an average year. During lower than average precipitation months during the growing season, or when precipitation is not distributed consistently throughout the month, supplemental water may be required. However, automatic irrigation systems that water lawns each day, including rainy days (see **Figure 4-13**), can often exceed the targeted one inch of precipitation per week. Although the amount of water delivered to a lawn by a sprinkler system varies depending upon the distribution system pressure, the sprinkler setting and the duration of sprinkling, it is estimated that about an inch of water is provided by an hour of sprinkling (United Water Suez).

Therefore, watering a lawn for just 15 minutes each day would provide almost twice as much water as the lawn requires, even if there were no precipitation events during that week. In fact, an assessment of precipitation at 15 Suffolk County precipitation gages during the 'growing season months' of April through September during the 1960s drought of record showed that the growing season irrigation need ranged from just 8.6 inches in 1963 to 10.3 inches in 1964.

Some Suffolk County suppliers (e.g., Dix Hills) already have established mandatory odd/even irrigation requirements with fines for non-compliance. SCWA, the largest water supplier in the County, does not have a formal conservation program in place. While information provided on the SCWA website identifies odd/even irrigation as a recommended conservation measure, they currently have no formal conservation enforcement program. Therefore, establishment of a local law restricting lawn watering to odd/even days based upon house number, should be established by Suffolk County to reduce unnecessary landscape irrigation throughout the County.

While additional information is required to more accurately estimate the reduction in peak pumping demand that would result from enactment of this legislation, on a preliminary basis it is assumed that the peak demand on the system could be expected to be reduced by twenty-five percent (reducing the peaking factor to about 3).

4.3.5 Supply and Pumpage Monitoring

The Suffolk County water supply is monitored by both the SCDHS and by water suppliers themselves to assess water quality. Public health is protected by existing monitoring programs that analyze for more parameters and at

greater frequencies than is required by federal and state regulations, in most cases. SCDHS continues to administer a multi-tiered monitoring program that includes the County's aquifer system (source water), community, non-community and private supply wells, and targeted groundwater investigations.

Additional water quantity and water quality monitoring is recommended, to protect public health, to provide the information necessary to better identify and respond to aquifer system stresses such as drought conditions, and to support management functions. Recommended quantity and quality monitoring of the County's aquifer is described in Section 3 of this document. Water supply monitoring recommendations are summarized below.

Water quantity monitoring recommendations include:

- All non-residential private wells (e.g., agricultural, commercial, industrial, non-community) should be metered. Well locations and depths should be reported to SCDHS OWR for incorporation into a new database. Pumpage for all non-residential wells should be reported on an annual basis to SCDHS OWR. A comprehensive database of all of the water supply withdrawals will help the SCDHS to better assess the demands on the aquifer system, in particular during times of drought, and the potential for saltwater intrusion. Perhaps even more significantly, knowledge of pumping centers and approximate rates will provide the SCDHS with the information necessary to assess the potential migration of any contaminants in the local aquifer system, and will also allow them to notify water users of any potential threats to the quality of their water supply. Finally, an assessment of private well pumpage will assist the SCWA in siting and managing supply wells, particularly on the North Fork where large capacity agricultural wells can have a significant impact on the water table.

- SCDHS OWR should maintain the database of well locations and pumpage, and incorporate this information into their facility review procedures and response procedures as appropriate.

Drinking water supply recommendations are summarized in **Table 4-7**.

Table 4-7 Drinking Water Supply Recommendations

Table 4-7
Drinking Water Supply Recommendations

Provision of Community Supply

Extension of community supply to all Suffolk County residents is recommended, in particular to areas of documented aquifer contamination in Southold Town and southern Southampton, as well as to areas served by non-community systems with documented contamination.

Residences using private wells should be encouraged to connect to public (community) supply wherever it is available.

Existing community supplies with aging infrastructure should be incorporated into the SCWA (or other municipal) service area. Water distribution systems serving developments such as condominiums, apartments, townhomes or home owners associations should be owned and maintained by the community supplier.

Conservation

It is recommended that a County-wide conservation program, including the following four components, be developed to reduce peak summertime pumpage in Suffolk County:

1. A County law mandating rain sensors to shut sprinkler systems off when it is raining should be enacted by the Suffolk County legislature.
2. SCDHS should develop and implement a conservation program to address all suppliers in the County.
3. Water suppliers in the County should consider implementing an increasing block rate structure for seasonal use.
4. A County law mandating odd-even lawn watering days should be enacted by the Suffolk County legislature.

Table 4-7 (continued)
Drinking Water Supply Recommendations

Private Wells

SCDHS DEQ OWR should develop a private well database including well location, date of installation, last sample date, treatment units installed and any water quality problems. Wells that have not been sampled within the last 10 years should be targeted for sampling for standard parameters.

SCDHS DEQ OWR should consider additional outreach about the water quality testing program for private wells to inform residents that the program exists, and the benefits and safeguards of proper testing.

SCDHS DEQ OWR should consider requiring all private wells to undergo a comprehensive water quality analysis, including testing for bacteria and nitrate, every three years, to determine compliance with MCLs.

SCDHS DEQ should consider increasing the cumulative family income for the private well testing fee exemption to $50,000.

Option B of Section 406.4-12(b) of the SCDHS well standards should be revised to include additional specifications for double casing of the test well through an aquiclude or confining layer so that poorer quality water from the shallow aquifer is not introduced to deeper portions of the aquifer that may be locally hydraulically separated by the aquiclude/clay layer.

SCDHS DEQ should require a variance for private well installation in areas where the saltwater interface is <40 feet below the water table, so that they have the opportunity to review all pertinent information including the saltwater interface location (induction log) and proposed well screen depth. New residences should be required to connect to public water if a main is located within 500 feet.

SCDHS DEQ should revise the Suffolk County Private Water System Standards to be consistent with the more stringent New York State Standards requiring a minimum distance of 200 feet between a private well and septic system leaching pool where property sizes allow.

Table 4-7 (continued)
Drinking Water Supply Recommendations

Monitoring

Additional monitoring and data management is recommended to protect public health, to better identify, understand and respond to aquifer system stresses and to support management functions.

All non-residential private wells (e.g., agricultural, industrial, commercial, non-community, geothermal) should be metered. Well locations and depths should be reported to SCDHS OWR for incorporation into a new database. Pumpage for all non-residential wells should be reported on an annual basis to SCDHS OWR. SCDHS DEQ should maintain the database of well locations and pumpage, and incorporate this information into their facility review procedures and response procedures as appropriate.

Existing analytical methods should be expanded to increase the number of PPCPs analyzed, including cotinine, diltiazem, hydrochlorothiazide, meprobamate, metropolol, naproxen, 4-nonylphenol, phenobarbital, sulfamethoxazole, tramadol, tributyl phosphate (TBP), Triphenyl phosphate (TPP), Tri (2-botoxy-ethyl) phosphate (TBEP), Tri (2-chloro-ethyl) phosphate (TCEP), Tri (2-dichlorisopropyl)phosphate and the Ames test.

Perchlorate should be added to the additional parameters note for Table 5 in Section 406.4-13. Nitrite, sodium, hardness, alkalinity and turbidity should be added to the parameter list (Table 5).

Outpost wells to monitor saltwater intrusion and upconing should be sited and constructed for all new wellfields located in coastal areas and the North and South Forks.

Assess potential impacts of water supply pumping on the Lloyd aquifer.

4.4 Implementation

4.4.1 Implementation Framework

A complete set of recommendations, including the framework for implementation of the drinking water supply recommendations is described in Section 9. Recommendations to improve groundwater quality and recommendations for data collection and management will also support the ability to provide a safe and reliable potable supply to Suffolk County residents. The implementation framework identifies the "owner", or entity responsible for implementation of each recommendation, other collaborators whose participation will be required and the time frame for implementation. Implementation of each recommendation is subject to funding availability, as well as other variables that will influence the timing of implementation, or even whether the recommendation can be fully implemented (e.g., community support). Most of the key activities associated with provision of extending community supply so that a safe and reliable potable source is available to all residents have already been initiated.

4.4.1.1 Extension of Community Water Supplies

The cost to extend community supply to County residents is significant; nevertheless, a conceptual cost benefit accounting analysis documented as part of Task 12.1 (CDM, 2010) which assessed the recommendation to extend public water supply to Southold on the North Fork concluded that based on the calculated benefit/cost ration, the public health and environmental benefits exceed the costs of the conceptual program. While a full cost benefit accounting of this recommendation would require more research to support the estimates of costs and benefits than can be accomplished as part of this project, it did provide a good example of the usefulness of this approach, and some guidance on the value of the recommendation.

4.4.1.2 Conservation

Groundwater pumpage projections based on 2008 peak demands concluded that over 100 additional wells and associated infrastructure would be required to meet 2030 water demands**.** Successful implementation of outdoor conservation measures to reduce the peak demand from approximately 4.25 down to 3.0 times the average demand would significantly reduce the number of additional wells needed during the planning period, as summarized on **Table 4-8** below. This is particularly important for East End areas such as the North Fork, where wells have a limited potential capacity due to the possibility of saltwater intrusion, and where the cost of treatment must also be considered given widespread nitrate and pesticide contamination.

Table 4-8 Projected New Supply Wells Required with and without Conservation

Town	Community Supply Pumping (MGD) (2013)	Peaking Factor	Projected Community Supply Pumping (MGD) (2030)	Number of Wells Needed (Existing Factor/Peak Reduced to 3.0)
Babylon	27.6	3.52	29.1	1/1
Brookhaven	65.7	4.14	81.9	11/4
East Hampton	6.4	4.29	11.5	29/6
Huntington	38.8	3.99	41.4	8/2
Islip	41.6	3.61	43.8	0/0
Riverhead	7.6	4.25	12.7	23/13
Shelter Island*	0.1	1.00	1.8	7/7
Smithtown	22.7	4.13	24.9	1/0
Southampton	15.	4.44	17.2	0/0
Southold	2.8	4.53	4.6	38/4

* Peaking factors not applied to Shelter Island. Peak is the increase in summer population.

Well needs are dependent on where actual development occurs

While the cost of developing and promulgating a new local law is not significant, it is assumed that one person with a vehicle will be needed to develop educational materials, monitor and enforce the local law, and, using data reported by the suppliers, monitor and document the effectiveness of the law in reducing the peak pumpage.

By contrast, if conservation is not implemented, as shown on **Table 4-4**, the incremental cost of new wells, transmission and treatment for Southold alone ranges from approximately $5M to $45M (in 2010 dollars), without including the cost for land for the new facilities. Annual pumping and treatment costs would also need to be considered on an area or site-specific basis, as described above for Southold. Implementation of conservation is clearly more cost-effective than construction of additional wells, and also provides additional environmental benefits.

It can be concluded that the cost of providing and operating additional infrastructure to satisfy lawn watering demands is significantly greater than the cost to establish new local laws mandating odd/even water restrictions and rain sensor shut-off devices. However, capital investment and annual operational costs must also be considered within the context of the anticipated revenue gained by the suppliers while meeting the peak demand. For example, again considering the Town of Southold, and assuming that the peak demand is sustained for five hours each day during 30 summer days, the SCWA would realize additional gross annual revenue of over $200,000 that year, based on

the higher peak pumpage rates and using the current $1.67/1000 gallon SCWA rate. At a rate of $200,000 year, it would take at least several decades to recoup the investment in additional infrastructure, based upon successful implementation of the least costly alternative considered.

4.4.1.3 Monitoring, Data Management, Evaluation and Coordination

As a minimum, all drinking water, ground water quality and quantity and surface water quality and quantity information should be entered into a new integrated database. Field data should be entered via portable hand held devices (e.g.; tablet such as an iPad or other mobile device) to reduce the time needed for transcription, data entry and data availability. Field and laboratory data should be regularly reviewed after routine uploading. SCDHS DEQ OWR should be responsible for maintaining this database. This database would comprise a portion of the proposed Capital Project 4081, the Environmental Health Information Management System (EHIMS) described by SCDHS that would encompass all of the Environmental Health programs. In addition to the groundwater, surface water and drinking water supply data, the database would incorporate data currently located within 30 different databases, including:

- Community, Non-Community and Bottled Water Supply Plant Inspections
- Private Well Inspection and Sampling
- Groundwater Pollution Investigations and Sampling
- Community Water Supply Plan Review
- Bathing Beaches
- Individual Water and Sewer Construction Plan Review
- Reality Subdivision Water and Sewer Plan Review
- State Pollutant Discharge Elimination System (SPDES)
- Sewage Treatment Plant Monitoring
- Petroleum Bulk Storage Tank Plan Review Inspection and Registration
- Enforcing Toxic and Hazardous Materials Storage regulations, which involve plan review, inspection and permitting of commercial and industrial facilities

- Sampling of Marine and Surface Waters for Chemical, Bacteriological and Algal Quality
- Environmental Remediation
- Public and Environmental Health Laboratory (PEHL) Laboratory Information Management System data integration with water quality databases
- State Environmental Quality Review (SEQR) Reviews

Integration of all of the existing databases addressing water quality and water quantity, as well as the factors affecting water quality and water quantity (e.g., facilities, spills, etc.) into a single database that could be viewed using a GIS interface would provide a number of benefits. For example, all of the datasets could be accessed by any user, instead of limiting access to an individual or group with access to and knowledge of a particular type of software; information currently residing within different databases could be mapped simultaneously to help assess water resource implications, and the data back-up would protect against the impacts of any hardware malfunctions (e.g., individual personal computer failure) or facility disaster (e.g., paper records).

Alternatively, it could be part of a larger, comprehensive Countywide database as recommended by IBM's Smarter Cities Challenge Report. The data would be readily available to all departments within the County to help to identify public health concerns and water resources issues, to identify appropriate management actions, to assess priorities and guide decision making. This data would be readily accessible so that queries relating to ground or surface water quality or data trends can be readily answered, issues can be rapidly and appropriately addressed, and the County can have the information to develop responses to long range concerns such as sea level rise. Finally, the data should be made available to other stakeholders outside the County such as SCWA, NYSDEC, the estuary programs, etc., so that timely decisions can be made based on the best available information.

It is recommended that SCDHS prepare a concise annual report summarizing the results of the countywide groundwater and surface water quality and quantity monitoring.

The report should contain, at a minimum, the following information:

- Background information on precipitation over the sampling period;
- Water supply pumping from each of the major water use categories, and monthly pumping from community supplies;

- Mapping of ground water levels, and figures depicting baseflow and stream flow; figures showing groundwater baseflow as a percentage of total stream flow;
- "Dot plot" type graphics depicting countywide water quality within each aquifer for each parameter of concern (e.g., nitrates, most often detected VOCs, pesticides, PPCPs);
- Statistics on water quality comparing annual water quality with baseline (1987, 2005 and 2013) years (baseline year dependent upon parameter of concern);
- Trend graphs of contaminants of concern for selected indicator wells, as well as trends in the minimum, mean, and maximum concentrations from all the wells;
- Water level graphs of selected indicator wells showing trends;
- Saltwater interface monitoring results depicting chloride concentrations with time;
- Results of nitrogen and pesticide analyses in monitoring wells characterizing agricultural areas;
- Identification of any newly observed contaminants of concern for future targeting;
- Tables summarizing surface water quality data identifying any contaminants of concern identified;
- Figures depicting trends in nitrate concentrations at sampling stations in the Long Island Sound, Peconic Estuary and South Shore Estuary; and
- Tables summarizing water quality data at the estuary program sampling locations and figures showing time histories of nitrogen and dissolved oxygen at key estuary program sampling locations.

In addition, each document should identify the apparent most significant issues affecting the resource and identify any additional priorities for monitoring and/or research.

Over the years, new monitoring tools and improved analytical capabilities have facilitated the identification of increasing numbers of contaminants in the environment, and the presence of these constituents can be detected at lower and lower concentrations. In addition, new tools and more powerful computer

capabilities have facilitated the synthesis of various types of data and information (e.g., GIS information, groundwater modeling output and groundwater quality data for example) and are conducive to presentation of data and results in comprehensive graphical representations, which are more robust and much faster to produce than in years past. The need to utilize and enhance the ability to use, analyze and share data within a GIS framework has previously been documented in the draft 2010 Comprehensive Water Resource Management Plan and supporting task memoranda going back as far as 2008.

As appropriate, the data should be used to update the groundwater models, and for model application to:

- Support site investigations;
- Evaluate impacts of changing conditions (e.g., simulation of the impacts of sea level rise on the water levels and the saltwater interface, simulation of the impact of drought on water levels, stream base flows and saltwater interfaces);
- Evaluate remedial alternatives;
- Delineate source water areas for new or proposed wells;
- Assess the impacts of proposed developments on downgradient water quality, in accordance with the procedure documented in the Task 5.2 memorandum (**Future Land Use Impacts**, CDM 2008).

It is presumed that the County would assign a groundwater model caretaker (SCDHS DEQ OWR) who would also review the modeling section of any reports (e.g., remedial investigations/feasibility studies, remedial design reports, etc.) submitted for County review. A single individual would fulfill both the model caretaker function and would support other on-going County programs. A brief summary of the model revisions and subsequent verification of the model calibration should be prepared for incorporation into the annual groundwater and surface water quality report. The monitoring report should be distributed to other County agencies, NYSDEC, SCWA and water suppliers to support their resource management efforts and should also be made available electronically via the Suffolk County website.

4.4.2 Implementation Responsibilities

Responsibilities for many of the drinking water supply activities identified in the Plan are currently shared by a number of agencies, on the federal, regional, state, county, town and local levels as previously documented in the Task 2.1, 2.2, 2.3 memorandum. Suffolk County has the authority to implement many of the drinking water supply recommendations identified in Section 9 and

most of the drinking water supply recommendations would be implemented by SCWA, SCDHS, and the other community suppliers operating within Suffolk County. Other collaborators who will support implementation efforts include USEPA, USGS, NYSDOH, NYSDEC, Towns, Estuary programs and Cornell Cooperative Extension of Suffolk County.

Defined roles and responsibilities will help to ensure that the work is completed as required to protect the County's drinking water supply. SCDHS has an established framework for groundwater monitoring and data collection, regulatory authority to monitor drinking water supplies and potential point sources of contamination, and the capability of using powerful tools such as computer models and GIS to evaluate most contemporary water resources issues.

Nearly all of the proposed drinking water supply management recommendations are targeted to begin implementation in the short term; e.g., within five years. In fact, SCDHS and SCWA have initiated key actions (e.g., prioritize areas where the availability of public supply should be provided) associated with high priority recommendations (e.g., to the extent that is practical, extend community supply to all residents). Full implementation of the recommendation to extend community supplies to all County residents is likely to take decades, and will also be contingent upon community support.

4.4.3 Assessment Monitoring

Implementation monitoring has two objectives:

- To monitor implementation of the plan recommendations, and
- To monitor the effectiveness of the plan recommendations in achieving the plan goals and objectives.

The effectiveness of these recommendations in achieving the drinking water supply goals and objectives will be assessed according to key performance indicators, summarized in **Appendix K**. The recommended approach for monitoring implementation progress has been developed specifically to minimize costs, by tracking implementation and progress using readily available information to the extent possible.

Much of the information needed to assess implementation of the Plan recommendations is already routinely collected and much of the information needed to assess the success of the Plan recommendations in achieving the stated goals and objectives will be collected, if the recommended data collection and database development programs are implemented. Monitoring should be conducted and documented annually.

Specific drinking water supply recommendations generally fall into one of several categories:

- Extension of Community Supplies to All Residents
- Conservation to Reduce Peak Summer Pumping
- Monitoring
- Private Wells

It is important to monitor the effectiveness of the Plan recommendations in achieving the stated goals and objectives, focusing on measures of progress that are quantifiable; the USEPA has reported that if indicators cannot be measured, then it is not possible to identify progress towards achieving goals.

Full implementation of some of these recommendations may take years, under the best of circumstances. For example, development of a comprehensive database will require planning, funding, database design and development, a process that is likely to take several years before the recommendation is fully implemented. Other recommendations, such as requiring that rain or moisture sensors be included with all new sprinkler system installations, could likely be implemented within a year. For all of the recommendations, it is important however that clear, consistent progress towards implementing the recommendations be observed. If the recommendations are not being implemented, this will be readily apparent so that corrective actions can be taken.

Achievement of the goals and objectives articulated in this Plan is likewise anticipated to take years, and likely decades, in some cases. For example, the planning, design, permitting and construction of extension of community water supply to all areas of the County may take decades. Achievement of other goals and objectives should be relatively straightforward (e.g., reduction of peak summertime irrigation pumping rates) and can be implemented within the shorter time frame that is targeted in the Plan Implementation Framework. Annual monitoring of Plan effectiveness and early assessments of Plan effectiveness will allow the County to modify the Plan and make improvements as necessary – ineffective components should be discarded and those recommendations that are most effective can be further enhanced.

The measures that are recommended to assess the effectiveness of the Plan in achieving the drinking water supply recommendations are primarily based upon data that is already routinely collected. The effectiveness of Plan recommendations in improving groundwater quality, for instance, can be readily assessed by compiling and reviewing the groundwater quality data that

is collected by SCWA and other suppliers, and by SCDHS. SCDHS already compiles much of the data that should be used to assess progress (e.g., number of private wells sampled, etc.); this data should also be noted on the spreadsheet. Assuming that a comprehensive database is established and populated as recommended, the assessment of Plan effectiveness will be straightforward, and readily accomplished within a couple of days. Data entered into a new user-friendly comprehensive database described in previous task memoranda can be readily accessed and evaluated; it will be very straightforward to assess trends and changes in water quality indicators such as nitrates, VOCs, pesticides and PPCPs.

Additional monitoring of the effectiveness of specific alternatives, for example, conservation, can also be conducted by the water suppliers themselves. Existing programs such as EPA's WaterSense program provide guidance and a framework for water supplier partners.

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