Nassau County
Stormwater Management Program

CEDAR SWAMP CREEK subwatershed Stormwater Runoff Impact Analysis AND CANDIDATE SITE ASSESSMENT REPORT

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Nassau County
Stormwater Management Program

Cedar Swamp Creek Subwatershed
Stormwater Runoff Impact Analysis

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1. INTRODUCTION

The Cedar Swamp Creek Stormwater Runoff Impact Analysis (Analysis Report) has been prepared in accordance with the Nassau County Stormwater Management Program *Stormwater Runoff Impact Analysis Procedures Manual* (Procedure Manual). The Procedure Manual provides a methodology to assess and score all of the subwatersheds in the County in accordance with a standardized procedure. The Analysis Report contains a summary of all of the assessment data collected and developed regarding the subwatershed condition and also identifies potential water quality improvements.

The goals and objectives of the Stormwater Runoff Impact Analysis are to:

- Assess the condition of the existing subwatershed;
- Map the drainage infrastructure;
- Identify pollutants of concern; and
- Develop candidate projects and sites for mitigation of pollutant loading and improvement of water quality within the stream to the greatest extent possible.

The Analysis Report is organized into two main sections as follows:

- Subwatershed assessment; and
- Stormwater management practice (SMP) candidate site assessment and recommendations.

The subwatershed assessment section describes the drainage infrastructure mapping, vulnerability analysis and stream assessment which were conducted in accordance with the methodology outlined in the Procedures Manual. The SMP candidate site assessment and recommendations section analyzes the collected data and identifies potential locations to site SMP's and also provides an analysis of potential pollutant load reduction and water quality improvement.

The data developed in this report can be entered into a comparative analysis sheet that will allow the County to track existing conditions and anticipated improvements for each subwatershed in the County.

2. SUBWATERSHED ASSESSMENT

The Center for Watershed Protection (CWP) classifies watersheds into five watershed management units. These include catchment area, subwatershed, watershed, subbasin, and basin. According to the CWP, the subwatershed-scale is preferred for assessment studies and is therefore the scale is used for this analysis. The drainage basins for water in Nassau County are the South Shore Estuary on the south shore and the Long Island Sound on the north shore. Nassau County has defined the watersheds based on the bay or inlet to which tributaries drain. The East Bay watershed is located between the Meadowbrook Parkway and the Wantagh Parkway on the south shore. Subwatersheds are the tributaries that drain to the watersheds. For East Bay, the tributaries include East Meadow Brook, Simmond Creek, Cedar Swamp Creek, Newbridge Creek, and Bellmore Creek.

The subwatershed assessment included review of available subwatershed data including Nassau County Geographic Information System (NCGIS) mapping, Town of Hempstead (TOH) draft GIS mapping, Nassau County record documents and other available municipal record documents. After available records were reviewed, the land use data was utilized to estimate existing impervious cover, water quality storm volumes and pollutant loads. The stream assessment was conducted to verify mapping, assess field conditions and examine drainage infrastructure systems. The compiled information was analyzed to identify locations where stormwater runoff is impacting the stream either via inputs (i.e., outfalls, illicit discharges or lack of buffers) or through effects on the stream corridor (erosion, channelization or stream crossings). This data was used to identify potential candidate site locations for recommended stormwater management practices.

2.1. DRAINAGE INFRASTRUCTURE MAPPING

All sources of potentially available drainage data were reviewed and the information collected on a new layer in the GIS system. Prior to completing the stream assessment, areas where drainage infrastructure appeared to be lacking were noted and highlighted for

review in the field. Drainage infrastructure data collected during the stream assessment was added to the drainage infrastructure maps.

2.1.1. MAP DEVELOPMENT

The Nassau County Geographic Information System (NCGIS) files for the subwatershed were requested and received from the Nassau County Department of Information Technology. The NCGIS data served as the base map on which newly identified information could be added. The TOH GIS data was added to the NC GIS data.

At the offices of the NCDPW Engineering Department, a list of drainage maps for road projects and subdivision developments within the subject subwatershed was compiled from the County drainage books (a series of three sets of documents). A Freedom of Information Law (FOIL) request including the list of drainage maps necessary for the subject infrastructure review was prepared. Table 2-1 shows the list of documents requested via the FOIL. Review of the Nassau County as-built records identified 90 documents that pertained to work conducted in the Cedar Swamp Creek subwatershed. The maps were provided to a printing sub-consultant for scanning into Tagged Image Files (TIFF) formatted documents. The documents were returned to the NCDPW Engineering Department along with a CD copy of the scanned documents. The drainage information from the scanned documents was transferred to a new GIS layer in accordance with Nassau County mapping protocols.

A FOIL request for available record documents for road projects within the subwatershed was made to New York State Department of Transportation. Paper copies of record documents were received. The drainage information that pertained to the subwatershed was mapped in AutoCAD and transferred to GIS format on the same layer as the scanned data from Nassau County record documents.

The final layer combining the data from all sources is titled "Final GIS Layers" and includes identification of the source of the data in the "Origin" database column. The data identified in the field using GPS is included on the "Final GIS Layers" and is identified as "Cashin Associates GPS".

2.1.2. FIELD DATA COLLECTION

Using the mapping developed in Section 2.1.1, areas with incomplete drainage mapping were identified. A field survey of the drainage infrastructure in those locations was conducted. This task was performed in conjunction with the Stream Assessment described in Section 2.3. During the assessment, the stream corridor was walked to verify the mapped outfalls and to identify other locations where storm runoff appeared to be directly entering the stream. The drainage infrastructure upstream of each outfall was then field verified to identify the extent of the drainage infrastructure contributing to each outfall. The drainage infrastructure of the Cedar Swamp Creek subwatershed is shown on Map 2-1.

2.2. SUBWATERSHED VULNERABILITY ANALYSIS

The Subwatershed Vulnerability Analysis consists of three components as follows:

- subwatershed characterization;
- impervious cover assessment; and
- pollutant load analysis.

The subwatershed characterization includes a description of the subwatershed's size, land uses, boundary, and length of waterbody. The impervious cover assessment calculates the amount of impervious area in the subwatershed based on: 1) NCGIS data for parking lots, roads, building footprints; and 2) area calculations for sidewalks and driveways. The pollutant load calculation uses NCGIS data for land use in conjunction with standard coefficients for runoff pollutant levels, resulting in an estimate of pollutant loads for the subwatershed.

2.2.1. SUBWATERSHED CHARACTERIZATION

The Cedar Swamp Creek subwatershed is located within the Town of Hempstead in the southern portion of Nassau County. For this report the subwatershed is defines as extending north from Merrick Road, limiting analysis to the freshwater segment of the creek. Cedar Swamp Creek is comprised of three main branches that have been assigned separate titles in NCGIS. Cedar Swamp Creek is comprised of the West Branch subwatershed, the East Branch subwatershed, and the Newbridge subwatershed area. All of the branches receive runoff from extensive drainage infrastructure systems. Cedar Swamp Creek flows south into East Bay.

The geographic limits of the Cedar Swamp Creek subwatershed were defined through review of the NC and TOH GIS data, topographic maps, plans of existing municipal drainage infrastructure, and field assessment. Map 2-2 shows subwatershed topography along with existing drainage infrastructure. The subwatershed boundary was reviewed as part of this study and was found to be consistent with the previously defined subwatershed limits. For this report the preserved area located between Merrick Road and Sunrise Highway and known as Cedar Swamp was included in the site assessment.

The current Cedar Swamp Creek subwatershed encompasses approximately 1,751 acres that contribute runoff that eventually enters Cedar Swamp Creek. The Cedar Swamp Creek subwatershed has been mapped to exclude most areas that can be defined as self-contained. When an area contains storm runoff in on-site drainage infrastructure, that area is described as self-contained. The original watershed has been reduced in size by the construction of these self-contained areas. Self-contained areas generally have recharge basins and/or drainage infrastructure that contain storm runoff volumes from roads, subdivision developments, and commercial and industrial site and allow the collected runoff to infiltrate to groundwater.

Cedar Swamp Creek subwatershed extends from Merrick Road north to North Jerusalem Avenue. Land use within the subwatershed is 56% residential. Of the 6269 residences in the subwatershed, 5,824 or 93% are smaller than one-quarter acre in size. Roads account for 15% of the subwatershed. Two major New York State roadways, the Southern State Parkway and Sunrise Highway extend through the subwatershed. Suburban commercial development accounts for 5% of the subwatershed and is located along the main roads, including Merrick Avenue, Cedar Swamp Avenue, Newbridge Road., Sunrise Highway, and Merrick Road. 0.5% of the subwatershed falls into the industrial category and 24% falls into the "other" category. The predominant land uses in the "other" category appear to be parklands and schools. The parklands include active recreational facilities and the natural areas surrounding the creek segments and ponds. The schools include buildings, parking lots and athletic fields.

2.2.2. IMPERVIOUS COVER ASSESSMENT

Percentage of impervious cover has been determined to be an indicator of subwatershed health. Lower percentages of impervious cover in a subwatershed generally indicate that water quality is less impacted by pollutants than in subwatersheds with higher impervious cover percentages. The Center for Watershed Protection (CWP) has established subwatershed classification based on percentage of impervious cover ranging from sensitive streams (0-10% impervious) to urban drainage stream (>60% impervious). The impervious cover assessment uses methodology included in the NC Procedures Manual. The methodology is based on CWP procedures that use GIS data to estimate impervious cover. The impervious cover within the subwatershed was calculated from the NCGIS data and standardized tables developed by the CWP. The NCGIS data necessary to calculate impervious cover is presented in Table 2-2 GIS Data Chart.

The following sources or methods were used to calculate the impervious cover in the Cedar Swamp Creek subwatershed:

- NCGIS data allowed the actual footprint of all building areas and parking lot areas within each land use to be calculated.
- Area of roads was calculated from the NCGIS data.
- Total average driveway area was estimated by tallying the number of residences in each of five size categories, ranging from less than 1/8 acre to greater than one acre and applying impervious driveway factors from CWP as developed by Cappiella and Brown , 2001.
- Sidewalks were estimated by viewing aerial photography of the site and estimating the percentage of the subwatershed roads with sidewalks. In the case of Cedar Swamp Creek, 95% of the streets are estimated to have 4' wide sidewalks on both sides.

The impervious cover data was entered into the standard table from the Procedures Manual. The data table and results of calculations are shown on Table 2-3. The impervious area of the Cedar Swamp Creek subwatershed is 714 acres of the 1,751 total subwatershed acres. This represents 41% of the subwatershed. Based on the 41% impervious figure, Cedar Swamp Creek receives a subwatershed classification of non-supporting stream.

Non-supporting streams are dominated by urban stormwater runoff and increased flooding. The streams are generally channels for the conveyance of stormwater runoff and can no longer support the biological community. The stream channel becomes highly unstable, and many stream reaches experience severe widening, down cutting, and streambank erosion. Pool and riffle structure needed to sustain fish is diminished or eliminated and the substrate can no longer provide habitat for aquatic insects or spawning areas for fish. Water quality is consistently rated as fair to poor, and water

recreation is no longer possible due to the presence of high bacterial levels. Streams generally display increases in nutrient loads to downstream receiving waters, even if effective urban BMPs are installed and maintained. The biological quality of non-supporting streams is generally considered poor, and is dominated by pollution-tolerant insects and fish. Although these streams may have potential for partial repair, pre-development biological conditions cannot be achieved. These streams should be managed to prevent bank erosion, improve the stream corridor and improve water quality. The non-supporting subwatershed management goals are to minimize the downstream pollutant levels, alleviate flooding conditions, and improve the aesthetics of the corridor. All of these goals pertain to Cedar Swamp Creek.

2.2.3. STORM POLLUTANT LOAD CALCULATION

Nassau County has identified a number of pollutants associated with stormwater runoff to be of concern for the County's subwatersheds. Impervious surfaces act as a "trap and conveyance" mechanism for the pollutants, ultimately resulting in deposition of the pollutants into nearby waterbodies. These pollutants negatively affect the surface water quality. The pollutants identified by the County are carried in large quantities in storm runoff from roads and paved surfaces.

Total Suspended Solids – Total Suspended Solids (TSS), which includes silts and sediments, constitute the largest mass of pollutant loadings to surface waters. This pollutant is exported in greatest quantities from construction sites. In addition, TSS is generated from lands with insufficient vegetative cover, stream channel erosion, street sanding operations, and vehicle tires. NYSDEC has identified TSS as a pollutant of concern for New York State waters and requires that 80% of TSS be removed from runoff from new construction. The subwatershed's extensive road system, parking lots, and compacted soils on small, older lots contribute to TSS in Cedar Swamp Creek.

Phosphorus and Nitrogen – Total Phosphorus (TP) and Total Nitrogen (TN) are two nutrients necessary for plant growth. Nonpoint sources of TP and TN are recognized causes of water quality degradation in many water bodies. These nutrients, washed into waterbodies via stormwater runoff, typically originate in lawn fertilizers and animal wastes from pets, waterfowl, small mammals and livestock. NYSDEC has identified TP as a pollutant of concern for New York State waters and requires that 40% of TP be removed from runoff from new construction. Small older lots with yards that drain to the street and directly to the creek and pet wastes contribute TP and TN in Cedar Swamp Creek.

Fecal Coliform and Other Pathogens – Pathogens include bacteria, viruses and other microorganisms that can cause human illnesses such as hepatitis A. The suspected causes of this impairment originate in the feces of pets, livestock and waterfowl that are carried into waterbodies by stormwater runoff. Pet wastes and waterfowl contribute to high fecal coliform levels in Cedar Swamp Creek.

Hydrocarbons (Oils and Grease, Petroleum Compounds) – Oils and grease contain an array of hydrocarbon compounds, some of which can be toxic to aquatic life even at low concentrations. The major source of hydrocarbons in urban runoff is through the leakage of crankcase oil and other lubricating agents from motor vehicles and from facilities that service motor vehicles (e.g., repair shops and gasoline stations). Hydrocarbon concentrations are typically highest in runoff from parking lots, roadways, and service stations, areas which are significantly represented within the Cedar Swamp Creek subwatershed. Illegal disposal of waste oil onto streets and into storm sewers can also contribute to this problem.

Floatable Debris – Besides the obvious negative aesthetic effects, trash can impact aquatic life through either ingestion or entanglement. Roads through commercial areas within the Cedar Swamp Creek subwatershed contribute to the floatable debris load. In addition, dumping of large debris was observed in the Cedar Swamp Creek corridor.

The pollutant loads were calculated in accordance with the Nassau County Procedures Manual using the "Simple Method" for all pollutants with the exception of Floatable Debris. The Simple Method uses the land uses and CWP pollutant coefficients to calculate the pollutant loads. Land use was separated into the five categories of residential, commercial, industrial, roads and other. Pollutant load coefficients were assigned based on the land use. The "other" category includes parks, municipal properties and any other uses not included in the categories mentioned. Existing land uses within the subwatershed are presented on Map 2-4. The NCGIS land use data necessary to calculate pollutant loads is presented in Table 2-2 GIS Data Chart. Nassau County development criteria have long mandated that commercial and industrial properties contain their storm runoff on site. Those land uses can be excluded from the calculation if the field assessment confirms that these land uses are self-contained and do not contribute runoff to the waterbodies. For floatable debris, coefficients based on land use were developed for the categories of residential, commercial, industrial, roads and other. The coefficients are applied to each land use area to estimate floatable debris generation with the subwatershed.

The data was entered into the Water Quality Volume and Pollutant Load Calculation Table provided in the Procedures Manual. The resulting pollutant loads are shown on Table 2-4. The pollutant loads for each pollutant were assigned severity points based on the least, 1 point, to the most, 6 points, severe pollutant threat in the watershed. The pollutant loads are multiplied by the assigned severity points and the total is divided by 100 and entered into the pollutant severity score row on the Comparative Analysis Table. The pollutant loads are also used to assess potential SMP improvements to each individual subwatershed.

2.3. STREAM ASSESSMENT

The stream assessment was conducted in accordance with the NC Procedures Manual. In addition, the CWP *Unified Stream Assessment: A User's Manual* was reviewed prior to the field effort. The assessment was conducted during the winter months when the lack of vegetation improved access to and provided visibility of the outfalls and stream corridor condition. Cedar Swamp Creek was assessed by traveling upstream from the mouth of the river at East Bay. On the data sheets, the banks are described as left (west) and right (east) looking downstream.

The stream assessment for Cedar Swamp Creek was conducted from January 11, 2007 to January 22, 2007. The equipment used by survey personnel to conduct the assessment included data assessment sheets, GPS unit, dry erase board and markers, digital camera, clipboard, tape measure and waders. For this subwatershed, aerial photos and property line maps were used to record field data. In the event that property owners had concerns regarding the work, the survey team carried a contact list of the governing authority to provide to the residents. Each stream assessed was assigned an identification number starting with 100. Cedar Swamp Creek was the seventh stream assessed by this methodology and was assigned identification number 106.

During the stream assessment, the stream corridor was photographed at regular intervals and at specific locations. The interval photographs record the stream surroundings and any immediately identified points of interest. When a data assessment sheet was completed, a photograph of the specific location was taken. For each Outfall (OT) sheet, photographs were taken from three different directions. When the location to be photographed was accessible, a dry erase board was labeled with the RCH and OT #'s and sited to appear within the photograph. All photographs were immediately logged on the Photo Log sheet. The photographic log and photographs are included in Appendix B.

The data sheets were completed in either the field at each location or, when field conditions did not allow the immediate completion, immediately after returning from the field. Data Sheets are included in Appendix A. The data sheets are organized by reach in number order. In each reach section, the reach data sheets (RCH) are first followed by the outfall data sheets (OT), then the other data sheets.

When it was necessary to cross private property to reach the stream corridor, the assessment team would explain the purpose of the assessment and ask the property owner for permission to cross the property.

The creeks reach boundaries were determined during the field assessment. The reach limits are selected based on one or more of the following criteria: change in surrounding land use; change in stream conditions; or a dividing characteristic such as a stream crossing or long culvert. Cedar Swamp Creek was assigned three reaches based on changes in stream condition and branches. The reaches were assigned identification numbers starting with 106-1 at the subwatersheds downstream end. The branches were assigned reach numbers from downstream to upstream and from west to east. Reach 106-1 extends from Merrick Road north to Smith Street and includes Merokee Preserve (also known as Cedar Swamp) and Merokee Pond (also known as Newbridge Pond). Reach 106-2 is the western creek branch that extends from Merokee Pond north to the Southern State Parkway. The West Branch is predominantly in Reach 106-2. Reach 106-3 is the east branch that extends north from Merokee Pond to North Jerusalem Avenue. The East Branch is predominantly in Reach 106-3. The Newbridge subwatershed consists of a subsurface drainage infrastructure system the outfalls into Merokee Preserve in Reach 106-1. As there is no open water in the Newbridge Creek subwatershed it is not assigned a Reach identification number.

The creek reaches range in length from approximately 2 miles long (Reach 106-2) to approximately 2.5 miles long (Reach 106-3). A significant portion of the stream corridor

is surrounded by high-density residential properties. In these areas, the stream and its buffers are narrow and severely impacted by the adjacent land uses. The creek is dominated by stormwater runoff from extensive upgradient drainage infrastructure. There is limited open space available with the subwatersheds. Merokee Preserve is the only location with the creek corridor that is surrounded by a preserved land which provides a vegetated buffer and shade for the stream in that segment.

Field conditions were recorded on aerial photography. The locations for which data sheets were completed are noted on the aerial photography which are include in Appendix A. Due to the large scale of the subwatershed, the aerial photography was used in lieu of the limited space allotted for this task on the Reach Level Assessment sheets. The photographs are included in Appendix A which is a separately bound document. The following paragraphs are a summary of the data collected on the assessment sheets.

REACH 106-1

In Reach 106-1, the stream is wide and briefly divided into two segments, an eastern and western segment. Both segments are surrounded by forested area (Merokee Preserve). The western segment receives its flow from the upstream portion of the creek via two culverts at Merokee Pond. The eastern segment appears to receive flow from stormwater drainage system from Sunrise Highway via an outfall located at the northeast corner of the preserve. The remainder of the reach encompasses Merokee Pond, which is located on the north side of Sunrise Highway and the Long Island Rail Road. It is connected to the southern end of the creek by a long concrete culvert that runs underneath Sunrise Highway and the Long Island Rail Road. Merokee Pond is predominantly surrounded by residential properties. The following information regarding the condition of the stream in Reach 106-1 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;

- ≥ 50% stream shading;
- channel dynamics mostly natural with some channelization with gabion cages, concrete, and various other methods;
- reach accessibility for the most part was difficult due to private property, sensitive areas, and man-made structures; and
- some vegetation disruption.

Eighteen outfalls were identified. The outfalls ranged in size from several small 4" to 8" diameter pipes from residential properties to a 48" diameter pipe from underground drainage infrastructure located in the Smith Street area. Of the 18 outfalls, 2 (OT-7A and OT-14) were located on Sunrise Highway, a New York State road. The following is a summary of the condition of identified outfalls. Outfalls identified as having dry weather flow may be potential illicit discharges and should be further investigated.

- OT-5 is located north of Merrick Road on the left bank of the stream. This outfall appears to be connected to an adjacent auto body shop. It is identified as a corroded 4" metal pipe with no dry weather flow visible. See photographs 6and 7 in Appendix A.
- Dry weather discharges were observed at OT-4, OT-11, and OT-12. OT-4 is a 24" concrete pipe located in the road culvert under Merrick Road with moderate flow. OT-11 is a 12" concrete pipe with a trickle flow. OT-12 is identified as one 12" and one 24" concrete pipe. However, only the 24" pipe has a trickle flow. See photographs 39-47 in Appendix A.
- OT-11, OT-12, and OT-13 are all located at the northeast corner of Merokee Preserve just south of Sunrise Highway. They appear to be discharging directly into the stream from surface inlets in the nearby Keyspan yard. Stockpiles of sand/salt, plastic pipes and utility equipment are located near these surface inlets. The condition of the stream in this area is identified as having yellowish to

brownish stained water with significant sedimentation (possibly a cementicious material) and small oil sheen. See photographs 39-46 in Appendix A

- An excessive amount of orange staining, algae growth, and floatable debris was observed at OT-14 located at the northeast corner of Merokee Preserve just south of Sunrise Highway. This location includes a 42" circular concrete pipe and a 30" square pipe which appear to discharge stormwater runoff from Sunrise Highway. See photographs 53-57 in Appendix A.

A summary of the results of the remainder of the data sheets are as follows:

- Four stream crossings occurred in Reach 106-1. The southernmost stream crossing extends under Merrick Road, creating a possible fish barrier to the tidal segment of the creek extending beyond the subwatershed boundary. See photographs 1 and 8. The two middle stream crossings under Sunrise Highway, which are approximately 300' long culverts, also create a fish passage barrier. See photographs 59-63. The fourth and northernmost stream crossing is a culvert located under Smith Street and is located at the northwest end of Merokee Pond. This culvert is approximately 40' long and appears to be used as a grade control device, possibly also creating a fish barrier. See photographs 23-25 in Appendix A.
- IB-1 shows a severely impacted buffer zone due to man-made structures. Both of the stream's banks have been replaced with a wooden retaining wall (approximately 12 feet high) encroaching on the creek buffer and removing vegetation. See photographs 22-25 in Appendix A.
- UT-1 identifies an apparent abandoned metal pipe system, possibly water pipes connected to an abandoned building located at the northeast corner of Merokee Pond south of Sunrise Highway. The pipes range in size from approximately 4" to 20" and appear to be in poor condition. The pipes are oriented in an east/west direction and cross over the stream at various locations. The stream has an orange stain and excessive algae growth in the areas where the pipes cross over, possibly due to leakage and corrosion associated with the pipes.

- The overall trash levels in this reach ranged from poor to marginal condition. The overall reach showed high levels of trash such as bottles, cans, Styrofoam, metals, glass and lighters, etc in isolated areas. Floatable debris appears to accumulate in specific areas by being transported downstream until trapped at these locations or by accumulating from illegal dumping. According to nearby residents, TR-1, located along the south and west bank of Merokee Pond near OT-7 and the southern culverts, is a floatable debris trash accumulation area. There was little sign of trash accumulation at the time of this analysis because, according to the residents, the area was recently cleaned. See photographs 27, 65, and 66. TR-2 identifies an excessive trash accumulation at the northeast corner of Merokee Preserve near the Keyspan yard on Sunrise Highway. At this site, it appears that trash consisting of tires, construction debris, paper, shopping carts, metals, and plastics was dumped illegally.

The overall Reach 106-1 stream condition was assessed to be in the suboptimal range due to isolated areas of moderate stream bank vegetation cover and suboptimal in-stream habitat. The overall buffer and floodplain condition was assessed to be in the suboptimal range due to isolated floodplain encroachment areas.

REACH 106-2

In reach 106-2, the stream is narrow and predominantly channelized by various methods such as stone, wood, and earthen structures. The stream is predominantly surrounded by residential properties. There are seven stream crossings, all of which are residential roads. The following information regarding the condition of the stream in Reach 106-2 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;

- ≥ 25% stream shading;
- channel dynamics mostly channelized with concrete, stone, and various other methods;
- reach accessibility for the most part was difficult due to private property, sensitive areas, and man-made structures; and
- excessive vegetation disruption.

Thirty one outfalls were identified. The outfalls ranged in size from a ¾" garden hose (OT-1) to a 36"x24" elliptical pipe (OT-30). Most of the outfalls in this reach are 3" or 4" diameter pipes from residential properties. Of the 29 remaining outfalls identified, 4 were drainage grates directly above the culverts (OT-4, OT-5, OT-28 and OT-29), 23 were 3-4" house connections (OT-2, OT-3, OT-6 through OT-25, and OT-27), and 2 were 15" concrete pipes (OT-26 and OT-31). The following is a summary of the condition of identified outfalls.

- OT-11 is located between Marion Avenue and Margaret Boulevard in a wooden retaining wall. It was identified as a possible illicit discharge due to the excessive white staining (possible detergents and or soaps). See photographs 103 and 108.
- OT-26 and OT-31 were both identified as partially buried 15" concrete pipes with very little flow capacity. OT-26 is located at the south end of the Alice Avenue culvert on the east side. OT-31 is located on the northwest corner of Camp and Lake Avenues. See photographs 141-142 and 155-158. Photograph 127 shows a small section of possible buried pipe in the stream bank located at the northwest corner of the Nancy Boulevard culvert. Further investigation is necessary at this site.

A summary of the results of the remainder of the data sheets and other miscellaneous observations are as follows:

- Seven stream crossings occurred in Reach 106-2, all of which are culverts under residential roads. The culvert located between Helene Avenue and Woodbine Avenue is approximately 600 feet long and is under a residential development. The north end

of this culvert has a metal grate covering its opening, possibly for child protection or a trash guard. An excessive amount of accumulated or illegally dumped trash was noted at this site. The trash consisted of yard waste and 6 or 7 filled black trash bags. See photographs 87-95. The north end of the Camp Avenue culvert also has a metal grate covering its opening, again possibly for child protection or as a trash guard. However, only a minor amount of accumulated trash, mostly floatable and paper debris, was evident at this location. See photographs 154 and 155.

- IB-1 identifies the entire reach as having moderate to major impacted buffers at various locations due to man-made structures. The major impacted areas include a section between Woodbine Avenue and Marion Avenue. This site is identified as a completely concrete section of stream bed with no vegetative buffer. It is severely eroded at the southern end, near the Woodbine Avenue culvert, with part of an adjacent property's concrete structure overhanging the stream. See photographs 86-95. From Marion Avenue to Nancy Boulevard, the right bank of the stream consists of various retaining walls consisting of wood and concrete blocks. This site has little or no buffer. See photographs 101-126. The other impacted site, located between Nancy Boulevard and Alice Avenue, consists of a residential property's concrete structure/wall as the stream's left bank, with no buffer zone. See photographs 128-137. A dirty diaper was also identified in the stream, possibly from illegal dumping and may potentially be a health issue. See Photograph 135.
- The overall trash levels in this reach ranged from marginal to suboptimal condition. The overall reach showed minor to moderate levels of trash such as yard waste, paper, plastics, and other floatable debris in isolated areas. Floatable debris appeared to accumulate in specific areas by being transported downstream until trapped at these locations or by accumulating from illegal dumping.
- Two construction sites were identified near the stream with little or no sediment protection. One appears to be an extension to an existing house and is located on the right bank of the stream. See Photographs 128 and 137. The other is located at the northernmost end of the reach and appears to be a new home construction site. See

Photograph 160. Both sites have little or no sediment and erosion protection for the stream.

The overall Reach 106-2 stream condition was assessed to be in the poor to marginal range due to poor in-stream habitat and little or no vegetative protection. The overall buffer and floodplain condition was assessed to be in the poor to marginal range due to numerous floodplain encroachment areas and little or no buffer zones.

REACH 106-3

Reach 106-3 extends from the northeast end of Merokee Pond up to Redmond Road. The immediate creek corridor is wide and channelized by earthen material. The Grand Avenue Middle School is located to the east and Bellewood Drive is located to the west. In this reach, the creek's width varies due to various channelization methods. Several schools are located within close proximity to the creek, but the majority of the surrounding land use is residential land. The following information regarding the condition of the waterbody in Reach 106-3 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;
- $\leq$ 25% stream shading;
- channel dynamics mostly channelized;
- reach accessibility is somewhat easy due to large publicly owned areas along stream and various stream crossings; and
- buffer and floodplain moderately to severely disrupted from human activities.

Forty-two outfalls were identified. The outfalls ranged in size from a ¾" garden hose (OT-36) to a 36" concrete pipe (OT-22). Of the 42 identified outfalls, 5 were drainage grates directly above various culverts (OT-1, OT-2, OT-3, OT-19 and OT-20), 7 were 3-

4" house connections (OT-11, OT-17, OT-35 through OT-37, OT-41 and OT-42), and 2 were pipes from an unknown source (OT-26 and OT-29). The remaining 28 outfalls were either concrete pipes or open channel sluices, or a combination thereof. The following is a summary of the condition of identified outfalls.

The following outfalls have damage ranging from minor to major, dry weather discharge, or a combination thereof:

- OT-4 shows moderate erosion under the headwall and appears to have shifted. There also appears to be a trickle flow dry weather discharge. See photos 169-170.
- OT-5 shows major erosion and undermining under the headwall. There also appears to be a trickle flow dry weather discharge. See photos 171-172.
- OT-6 shows a headwall broken into two pieces around the pipe and also appears to be collapsing into the stream. See photos 174-175.
- OT-7 shows severe damage. The end section and headwall are completely separated from the pipe run and have fallen into the stream and this site also shows signs of excessive orange staining coming from a trickle flow dry weather discharge. See photos 176-178.
- OT-8 shows moderate cracks and erosion issues under the headwall. See photos 179-180.
- OT-27 shows a headwall broken into two pieces and separating from the pipe. See photos 236-237.
- OT-30 shows the outfall as a concrete pipe and sluice combination with major cracks and erosion issues. See photos 245-247.
- OT-33 shows the concrete apron under the headwall as being severely eroded and broken into several pieces. There is also spray paint graffiti on the headwall. See photographs 252 and 254.
- OT-34 shows moderate erosion under headwall and collapsing brick work. See photographs 255-257.

- Several outfalls appear to be discharging from various school athletic fields and parking lots. These areas also appear to have high waterfowl populations which contribute to the stream's fecal coliform pollutant load. OT-5, OT-6, OT-8, OT-9 and OT-10 appear to be discharging from the Grand Avenue Middle School, while OT-24, OT-27 and OT-32 appear to be discharging from Mephan High School. OT-27 is located near the school's sand/salt and soil storage areas. The runoff from these areas may enter the stream during heavy rainfall and contribute to pollutant loads.
- Two outfalls, OT-12 and OT-15, have a metal grate covering the pipe opening, possibly as a trash or child barrier. OT-12 is a 15" concrete pipe located at the east end of Loines Avenue and OT-15 is a 12" concrete pipe located at the east end of Marion Avenue. OT-12 appears to be clogged with floatable debris. See photographs 194-196 and 205-206.

A summary of other areas of concern are as follows:

- Four stream crossings occurred in Reach 106-3, most of which are culverts under residential roads. The culvert located under Grand Avenue connects Reach 106-3 to Reach 106-1 (Merokee Pond), is approximately 100 feet long, and is under residential properties located on the south side of Grand Avenue. UT-1 identifies the culvert under Camp Avenue as having multiple utility pipe crossings. Some of these pipes are corroded and appear to be staining the stream. See photographs 220 and 225.
- IB-1 identifies the entire reach as having moderate to major impacted buffers at various locations due to man-made structures. The major impacted areas include a section between OT-34 and OT-41, an area that has various wooden, stone, and gabion cage retaining wall structures behind multiple residences. These retaining walls vary in height from 2 feet to 7 feet and are along the stream's left and right banks, allowing for major floodplain encroachment and little or no vegetative buffer. See photographs 257-282. There is also a section of stream located approximately 500 feet upstream from this site all the way to Redmond Road. This area is severely disrupted by various

retaining walls made of materials such as gabion cages, blue plastic barrels, tires, vinyl siding, sheet metal, wood, stone and concrete. A majority of the retaining walls appear to be in unstable condition and may possibly collapse in the future. Improved channel stabilization appears to be necessary at this location. The buffer zones and floodplains are severely impacted by these structures. See Photograph 257-282.

- ER-1 is located on the right stream bank toward the north end of Bellewood Drive. The stream bank is of earthen material and appears to have partially collapsed, possibly due to the meander in the stream or the bank's steep slope. See Photograph 246-247.
- The overall trash level in this reach was in the marginal range. The majority of the reach showed minor to moderate levels of trash such as yard waste, paper, plastics, and other floatable debris with the exception of some isolated areas. Trash appeared to accumulate in these specific areas by being transported downstream until trapped at these locations or by accumulating from illegal dumping. Photographs 167 and 168 show an area located just north of Grand Avenue with 2 floating debris barriers. These barriers consist of orange floatation devices that remain on top of the stream and capture most of the floatable debris transported from upstream. North of this area, near OT-9, fallen tree branches have collected some of the floatable debris from upstream. See photographs 183 and 185. Another area were trash appears to be collecting is located north of the Camp Avenue culvert and consists of various floatable debris, golf clubs, bicycles and a construction barrel. See photograph 332 and 243. Areas where illegal dumping appears to be problematic are located toward the northern end of the reach, behind various residential properties. These areas exhibited construction debris and yard waste, apparently dumped over an adjacent fence. See photographs 272-273, 289 and 298-299.

The Reach 106-3 overall stream condition was assessed to be in the marginal range due to inadequate vegetative protection and floodplain connection. The overall buffer and

floodplain condition was assessed to be in the poor to marginal range due to numerous floodplain encroachment areas and little or no buffer zones.

Table 2-5 Subwatershed Comparative Analysis tabulates the information collected during the field assessment, along with the impervious cover results and pollutant severity score to produce a subwatershed total score. While the subwatershed total score can be subjective due to the many additional factors involved in assessing the subwatershed condition and the feasibility of SMP's, the general subwatershed score categories are as follows:

- 0-15 Optimal/Sensitive
- 16-30 Suboptimal/Impacted
- 31-45 Marginal/Non-supporting
- 46+ Poor/Urban

Cedar Swamp Creek was scored a 39, placing this creek in Marginal/Non-supporting category. Marginal/non-supporting creeks are estimated to have been extensively impacted by high levels of impervious cover and significant pollutant loads. The subwatershed score can also be used to assess the conditions of a specific subwatershed in relation to other subwatersheds in the County or other jurisdiction. For example a watershed with a score of 48 would be identified as poor/urban and would face greater impacts that a watershed with a score of 11. However, even watersheds with low score may have segments that can be improved by specific stormwater management practices.

The Marginal/non-supporting category appears to match the existing conditions of some segments of the creek; however many locations appear to be much lower when considered separately. The only location with adequately vegetated buffers and preserved lands is Merokee Preserve but an entire drainage infrastructure system (Newbridge Subwatershed) discharges into the western corner of the Preserve. The remainder of the waterbody has

minimal buffers, little open land and in many locations the creek has been severely channelized. These segments have been extensively impacted by the surrounding land use and stormwater drainage systems and appear to offer little opportunity for traditional SMP practices.

3. SMP CANDIDATE SITE ASSESSMENT AND RECOMMENDATIONS

3.1. WATER QUALITY CLASSIFICATIONS/DESIGNATED USES

Table 3.1 summarizes the NYSDEC general water quality classifications in terms of their best usage. The watersheds that were analyzed for this report include the freshwater sections of the river and creek tributaries which fall within the Class 'C" waters.

Table 3.1 NYSDEC Water Quality Classifications (6 NYCRR Part 885 and Part 701)**.**

Waterbody	Water Classification	Best Usage
River /Creek - freshwater	C	The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
River/Creek - saline	SC	The best usage of Class SC waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
East Bay	SA	The best usages of Class SA waters are shell fishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

The NYSDEC has designated East Bay and its tributaries, including Cedar Swamp Creek, a priority waterbody with known aquatic life impairment. A priority waterbody is a waterbody determined by NYSDEC staff, with public input, having uses precluded, impaired, stressed or threatened and, in some cases, requiring establishment of a TMDL. The causes of the impairments have been identified as silt, sediments, phosphorus and pathogens from urban and storm runoff. East Bay and its tributaries are NYSDEC uncertified shellfishing areas. Uncertified shellfishing areas are lands where the NYSDEC

has prohibited shellfish harvesting for food uses in accordance with NYSDEC regulation 6 NYCRR Part 41.

Table 3.1 identifies "best usages". The actual usage of the waters is dependent upon the impairments to the quality of the waters. The numerous parameters that commonly characterize water quality include taste, color, suspended solids, oils, refuse, thermal discharges, phosphorus, nitrogen, pathogens and dissolved solids. A common example of this is Class "B" waters that have a best usage for primary recreational contact (swimming) but are closed due to impacts to the water quality as a result of high bacteria levels. Town and County beaches are often closed after a rainfall that causes high bacteria levels in those waters.

Two major water quality parameters for Class "C" waters are dissolved oxygen (DO) and coliform bacteria concentrations. Adequate DO is essential to the growth and reproduction of finfish and shellfish. DO is also important for the natural decomposition of organic wastes. Current public health standards call for low coliform bacteria concentrations as the presence of such bacteria is regarded to be an indication of potentially pathogenic contamination from human or animal wastes. The actual water quality may not be suitable for the best usage based on these water quality parameters.

3.2. SITE ASSESSMENT/SMP SELECTION

The Cedar Swamp Creek subwatershed is dominated by high density residential and commercial land use. The creek corridor is narrow and has limited, if any, buffer width. The impervious cover assessment determined that the subwatershed is 41% impervious and that Cedar Swamp Creek is a non-supporting creek with severe degradation from urbanization. There are limited buffer areas along the creek and numerous potential 'hot spots' or illicit discharges that may drain to the creek were identified. Hot spots are land uses that are known to have high levels of various materials including oil, grease, auto or marine parts, dumpsters, gas tanks or other hazardous materials. Illicit discharges are

locations where storm runoff or unpermitted discharges outfall directly into the brook corridor or into infrastructure that discharges into or will eventually reach the brook.

No self–contained areas, subdivisions or roads were identified in this subwatershed. Some commercial properties may be self-contained, in particular those that are more recently developed, but individual on-site drainage systems were not reviewed for this report. Outfalls from commercial properties were documented whenever located. As existing properties are redeveloped, the drainage infrastructure should be reviewed and modified to contain storm runoff on-site.

The subwatershed is connected to the Cedar Swamp Creek through drainage infrastructure. Locations that drain to recharge basins have been removed from the watershed in previous mapping work completed by Nassau County or Town of Hempstead. The drainage infrastructure and area topography are shown on Map 2-2.

SMP's that can treat pollutants found in runoff from roads and high-density residential areas include ponds, infiltration trenches, sand filters, and bioretention basins. Additionally, ultra-urban retrofits can be considered if suitable locations for other SMP's are not available or feasible. Due to the lack of buffer areas and available land, Cedar Swamp Creek provides limited opportunity to site SMP's such as ponds, wetlands or bioretention basins and may require extensive use of ultra-urban retrofits.

3.3. SMP IMPLEMENTATION CANDIDATE SITES

There are limited locations within the Cedar Swamp Creek subwatershed that offer opportunity to site SMP's. The limited flow of an individual outfall, when compared to the large size of the entire watershed, makes the identification of specific outfalls that will have a noticeable effect on the stream quality difficult to determine. In lieu of identifying specific individual candidate sites, the following is a discussion of potential structural and non-structural SMP's and general types of candidate sites. General locations for Candidate

Sites are shown on Map 3-1. These practices should be considered for possible future use in this subwatershed as deemed necessary.

As the subwatershed has road, commercial and residential land uses, pollutants of concern include sediments, trash, hydrocarbons (oil and grease), nitrogen, phosphorus and bacteria. SMP's should address each of these pollutants if possible.

Nassau County should discuss the development of SMP'S for the outfalls that carry state road runoff into Cedar Swamp Creek with New York State. The impacts from these outfalls represent a large portion of the pollutant loading to the creek.

Several schools are located along Cedar Swamp Creek as well as along other creeks on the south shore. Schools (which are NYSDEC non-regulated MS4's) should be encouraged to develop programs to enhance the vegetated buffers along the creek shoreline and to identify locations where runoff from school properties is discharging to the creek. School properties may have available land area to site infiltration or filtering practices. If not already in place, Nassau County should work with schools to develop Integrated Pest Management (IPM) programs to reduce fertilizer and pesticide use on school properties, particularly those locations where lawn areas drain to the creek.

The creek should be further investigated for illicit discharges and "hot spots". Locations of potential illicit discharges and hot spot concerns include locations along Merrick Avenue, Merrick Road, Sunrise Highway, Newbridge Road, Bellmore Avenue, Jerusalem Avenue, and North Jerusalem Road. Commercial uses along these roads include auto repair shops, service stations, gas stations, parking lots and car washes. Specific locations within the subwatershed that have the potential to be "hot spots" include a Keyspan facility, located on southwest corner of Sunrise Highway and Newbridge Road adjacent to the Merokee Preserve, and the Long Island Railroad facilities located north of Sunrise

Highway. The Keyspan facility was identified to include dumpsters, metal/plastic pipes, sand/salt/temporary asphalt storage, various heavy equipment and utility trucks.
An additional location of potential illicit discharges is in the northern segment of Merokee Preserve, adjacent to the Keyspan yard, where a system of multiple interconnected metal pipes of unknown source appear to be abandoned. The pipes extend over the creek and continue in various directions in the immediate vicinity of the creek. See photographs 47 to 52 in Appendix A.

Generally, most outfalls in the Cedar Swamp Creek subwatershed lack buffer areas and have limited open space remaining to site traditional SMP's. Feasible SMP's may be limited to ultra-urban retrofits in these locations. If available upgradient land areas can be identified, they may be used to site detention facilities that can reduce the intensity and volume of the larger storm events and also reduce some of the erosion evident through this subwatershed. Identification of such upgradient locations would require an assessment of the subwatershed that is beyond the scope of this report.

Non-structural SMP's that can aid in reducing the pollutants that enter Cedar Swamp Creek include:

- Increased street sweeping;
- Public education on fertilizer and chemical use and disposal;
- Public education on the importance of buffers between cultivated lawns and waterbodies;
- Public education on the importance of vegetative cover to prevent soil erosion;
- Public education on the proper storage and disposal of various materials for commercial property including the auto shops and gas stations discussed earlier; and
- Public education regarding the impacts of dumping and trash disposal on area roads and along the creek corridor.

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
NCDPW Engineering Department
Map File List of Requested Plans
Table 2-1

Cedar Swamp Creek (ID No. 106)					
COUNTY FILE # (BROWN / BLACK BOOK)		**OLD COUNTY FILE #** (BLUE BOOK)		**MUNICIPALITY FILE #** (RED BOOK)	
1326-3	548-4	339-4		1637-6	
2022-8	94-4	339-6		1085-6	
1285-1	527-7	2196-4		1021-3	
4135-6	336-5	1479-2		1085-2	
1214-4		1291-6		7285-2	
1381-2		1698-2		1754-3	
L2-31-2		1291-4		2120-6	
1669-5		1463-3		7227-1	
1655-3		1360-4		2008-2	
1103-1		1176-2		122-5	
1049-4		525-5		LOG# 2535	
312-8		1637-8		2508-1	
1308-3		656-12		7286-1	
715-2		2140-2		1310-1	
1039-1		1463-1		2168-5	
L1-25-4		1638-7		4386-3	
206-11		1368-5		7233-2	
411-4		1938-5		1031-4	
1979-1		1611-3		2506-1	
1669-6		53-1		7401-1	
545-6		1575-9		7266-1	
555-1		1636-2		7237-2	
1438-2		1335-5		2507-1	
1443-5		205-8		ENV.25-1043	
71-5		222-8		7244-1	
51-Y-2		1349-7			
1952-2		670-9			
L2-46-1		2192-1			
1609-6		1718-10			
2048-5					
1325-1					
1664-6					

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
GIS Data
Table 2-2

Name of Subwatershed: Cedar Swamp Creek (ID No. 106)

Tributary to:	**East Bay**
Adjacent Land Use:	**High Density Residential**

Impervious Information

	Area		Building Area		Parking Lot Area		Length of Roads		Number of Residences
Residential	972	Acres	224	Acres					6,269
Commercial	85	Acres	23	Acres	24	Acres			
Industrial	8	Acres	4	Acres	2	Acres			
Roadway (Pavement)	261	Acres							
Other (Parks, Municipal, (ROW-Pvmt), Etc.)	424	Acres	19	Acres	38	Acres			
Total Subwatershed	1,751	Acres	269	Acres	64	Acres	331,350	LF	

Residential Lots	Quantity in Subwatershed
43561 +	3
21781 - 43560 SF	18
10891 - 21780 SF	424
5446 - 10890 SF	5,056
0 - 5445 SF	768
Total Number	6,269

Assumed Percentage of Roadway With Sidewalks (%)	95
Sidewalk Width (FT)	4
Assumed Sides of Roadway With Sidewalk	2

*** Source NCGIS Database Dated July 24, 2006**

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Impervious Cover Calculations
Table 2-3

Impervious Driveway Factors		
Residential Lot Area (AC)	**Average Driveway Area (SF)**	**NC criteria**
2	3,212	1-2+ AC
1	2,073	1/2-1 AC
1/2	1,152	1/4-1/2 AC
1/4	652	1/8 - 1/4 AC
1/8	432	0-1/8 AC
Source : Cappiella and Brown, 2001		
WVA Table 4: Average Driveway Areas in the Chesapeake Bay Region		

Average Residential Driveway Area Calculation				
Subwatershed:	**Cedar Swamp Creek (ID No. 106)**			
Tributary to:	East Bay			
Residential > 1 acre - 3212 SF	Units	3	Acres	0.03
Residential > 1/2 acre to ≤ 1 acre - 2,073 SF	Units	18	Acres	0.2
Residential > 1/4 acre to ≤ 1/2 acre - 1,152 SF	Units	424	Acres	4
Residential > 1/8 acre to ≤ 1/4 acre - 652 SF	Units	5,056	Acres	50
Residential ≤ 1/8 acre - 432 SF	Units	768	Acres	8
Total Acres Driveways Impervious	Units	6,269	Acres	62

Sidewalk Area Calculation	
Subwatershed:	**Cedar Swamp Creek (ID No. 106)**
Tributary to:	East Bay
Linear feet of road	331,350
Assumed percentage with Sidewalks	95
Sidewalk Width	4
Sides Sidewalk	2
Total Acres Sidewalk	58
Calculation : LF of road x % with sidewalks x 4 ft w x 2 sides	

Impervious Area Calculation		
SubWatershed:	**Cedar Swamp Creek (ID No. 106)**	
Tributary to:	East Bay	
Adjacent Land Use:	High Density Residential	
Total Subwatershed Area	Acres	1,751
Impervious areas		
Buildings Area	Acres	269
Roads Area	Acres	261
Parking Lot Area	Acres	64
Sidewalks Area - See Table	Acres	58
Driveway Area Total - See Table	Acres	62
TOTAL IMPERVIOUS AREA	Acres	**714**
TOTAL % IMPERVIOUS	%	**41%**
Classification	**4**	

Impervious Area Notes
1. GIS Data Table is source for areas of buildings, roads and parking lots.
2. Sidewalk area calculations are based on percentage of sidewalk area estimated by preparer
3. Impervious Driveways Factors Table - Average Driveway Areas Souce: WVA Table 4, Cappiella and Brown

Initial Subwatershed Classification			
	8	Sensitive Stream	0-10% impervious
	6	Impacted Stream	>10%- to 25% impervious
	4	Non-Supporting Stream	> 25%- 60% impervious
	2	Urban Drainage Stream	> 60% impervious
Source: WVA Figure 4 and Table 2			

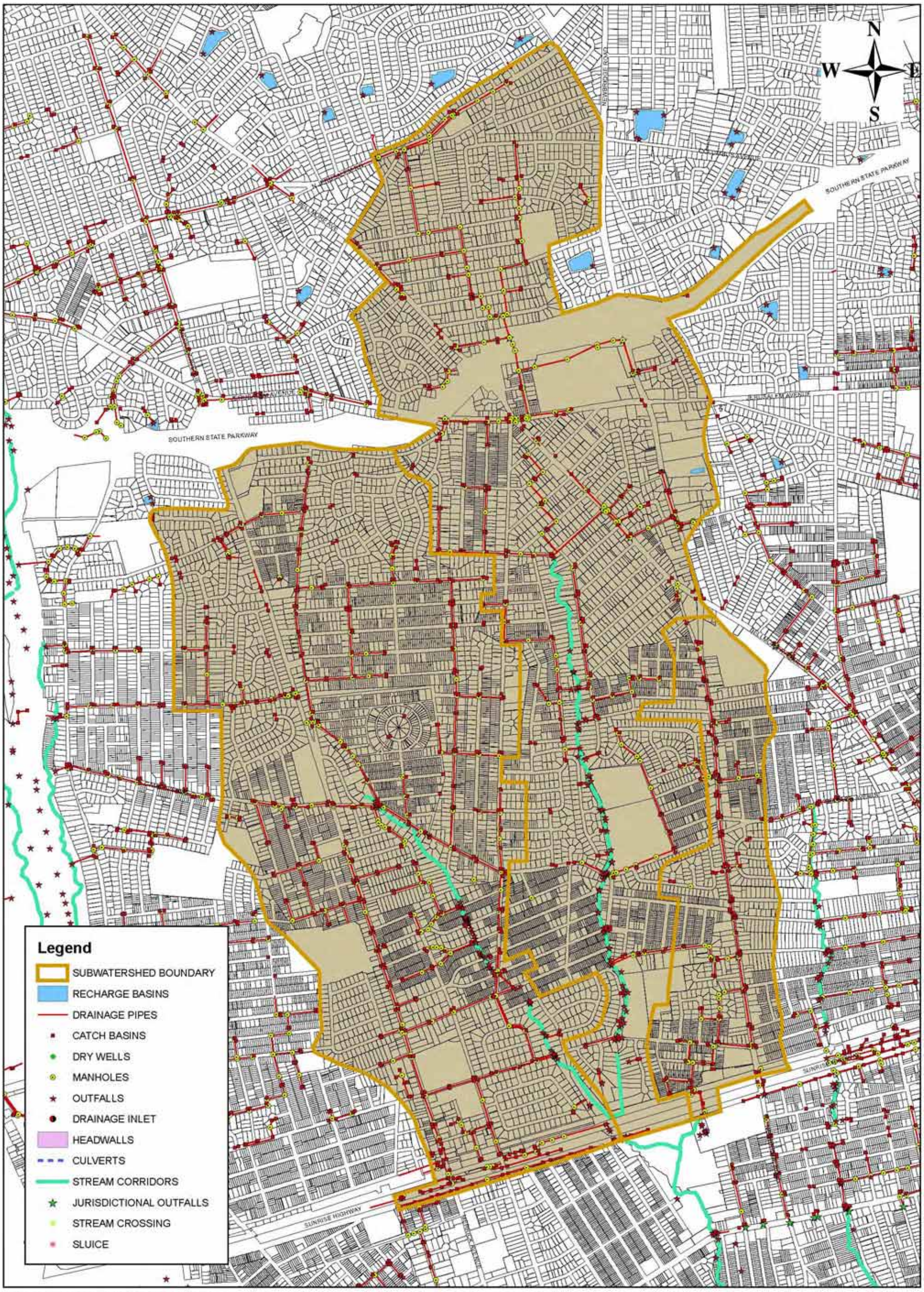
Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Water Quality Storm Event (WQSE) Volume and Pollutant Load Estimates
Table 2-4

Subwatershed		**Cedar Swamp Creek (ID No. 106)**							
Tributary To		East Bay							
Land Use		**Residential**	**Commercial**	**Industrial**	**Roadway**	**Other**	**TOTAL**		
Contributory Area	Acres	972.5	85.2	8.4	261.2	423.9	**1,751.1**		
Impervious Area	Acres	224.1	46.9	5.3	261.2	56.7	**594.2**		
Impervious Area	%	23.0	55.1	63.5	100.0	13.4	33.9		
Water Quality Storm Event Volume	WQv-acre-feet	25.0	4.6	0.5	24.8	7.2	62.2		
Water Quality Storm Event Volume	WQv-Cubic Feet	1,090,330.8	202,458.2	22,723.1	1,080,773.7	314,681.8	2,710,967.5		
Annual Rainfall	inches	42.0	42.0	42.0	42.0	42.0	42.0		
Annual Runoff	inches	9.7	20.6	23.5	35.9	6.4	13.4		
Total Nitrogen (TN)	coefficient mg/l	2.2	2.0	2.5	3.0	2.0		SEVERITY PTS.*	TOTALS
	lbs	4,704.3	794.1	111.4	6,358.7	1,234.3	**13,202.8**	3.0	39,608.3
Total Suspended Solids (TSS)	coefficient mg/l	100.0	75.0	150.0	120.0	54.5			
	lbs	213,831.0	29,778.9	6,684.5	254,348.0	33,634.2	**538,276.6**	4.0	2,153,106.5
Total Phosphorus (TP)	coefficient mg/l	0.4	0.2	0.4	0.5	0.3			
	lbs	855.3	79.4	17.8	1,059.8	160.5	**2,172.8**	2.0	4,345.6
Fecal Coliform (F Coli)	coefficient mpn/100 ml	7,750.0	3,000.0	2,400.0	1,700.0	5,000.0			
	billion colonies	7.6	0.5	0.0	1.6	1.4	**11.2**	6.0	67.2
Floatable Debris	coefficient CF/AC	5.0	8.0	5.0	8.0	5.0			
	CF	4,862.5	681.4	42.0	2,089.4	2,119.3	**9,794.5**	1.0	9,794.5
Oil and Grease	coefficient mg/l	3.3	5.0	4.0	8.0	3.0			
	lbs	7,056.4	1,985.3	178.3	16,956.5	1,851.4	**28,027.9**	5.0	140,139.5
							591,485.8		**2,347,061.5**
								SCORE	**1,340.3**

SOURCE:
"C" Valve Source; See Table
Impervious Area is based on NCGIS Impervious Area Data from building areas, parking areas, and road areas
* The pollutant loads for each pollutant were assigned severity points based on the least, 1 point, to the most, 6 points, severe pollutant threat in the watershed. The pollutant loads are multiplied by the assigned severity points and the total is divided by 100

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Subwatershed Comparative Analysis
Table 2-5

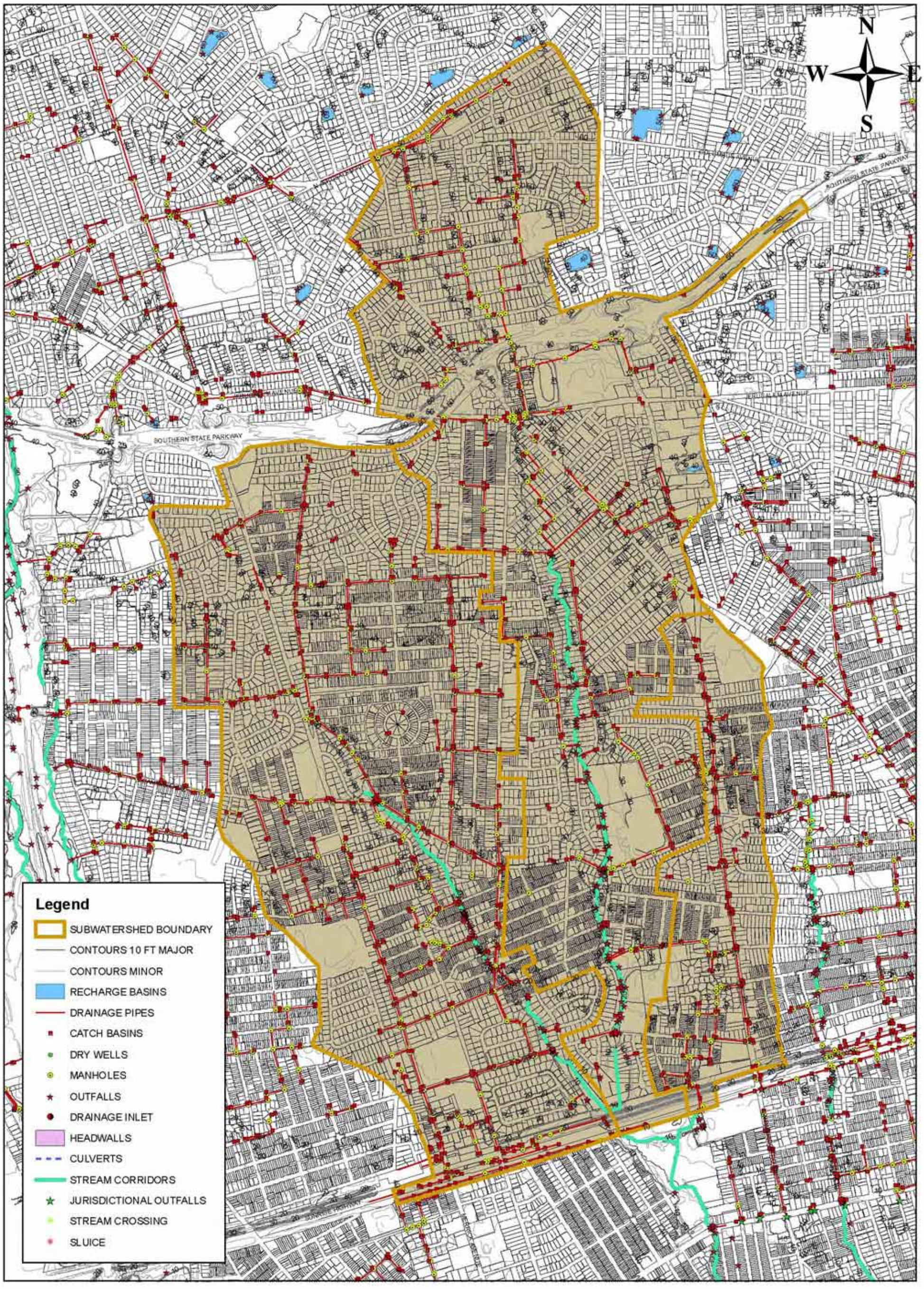
	Unit Criteria	Scoring Criteria	Cedar Swamp Creek (ID No. 106)					
			106-1		106-2		106-3	
Stream Assessment Quantification	**Unit**	**Points**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**
Outfall	per outfall	2	18	36	31	62	42	84
Suspected Illicit Discharge or Hot Spot Locations	per location	8	4	32	1	8	1	8
WQ Retrofit/Restoration Candidates	per location	1	5	5	1	1	3	3
Infrastructure Investigations Required	per location	1	1	1	1	1	0	0
Severe Bank Erosion	per location	1	0	0	1	1	3	3
Inadequate Buffers	per 5% of reach	5	2	10	18	90	12	60
Road Crossings	per location	1	3	3	4	4	5	5
Channelized Segments	per 5% of reach	1	1	1	19	19	18	18
Public Ownership of the Stream Corridor	per 10% of reach	1	8	8	0	0	3	3
Livestock Encroachment or High Waterfowl Populations	per location	5	1	5	0	0	2	10
Threatened Infrastructure	per location	3	0	0	3	9	9	27
Trash Accumulation In Stream	per location	5	2	10	1	5	5	25
Stream Condition Subtotal (RCH)	from RCH sheet.	80	64	-8	25	-3	42	-5
Buffer/Floodplain Condition Subtotal (RCH)	from RCH sheet.	80	51	-6	13	-2	21	-3
Reach Total	**No. of Reaches**	3	**97**		**195**		**238**	
Subwatershed Total			**530**					
Impervious Cover Classification	Sensitive, Impacted, Non supporting, Urban	8,6,4,2	**4**					
Pollutant Load			**13**					
Total Score			**48**					
RANK								



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

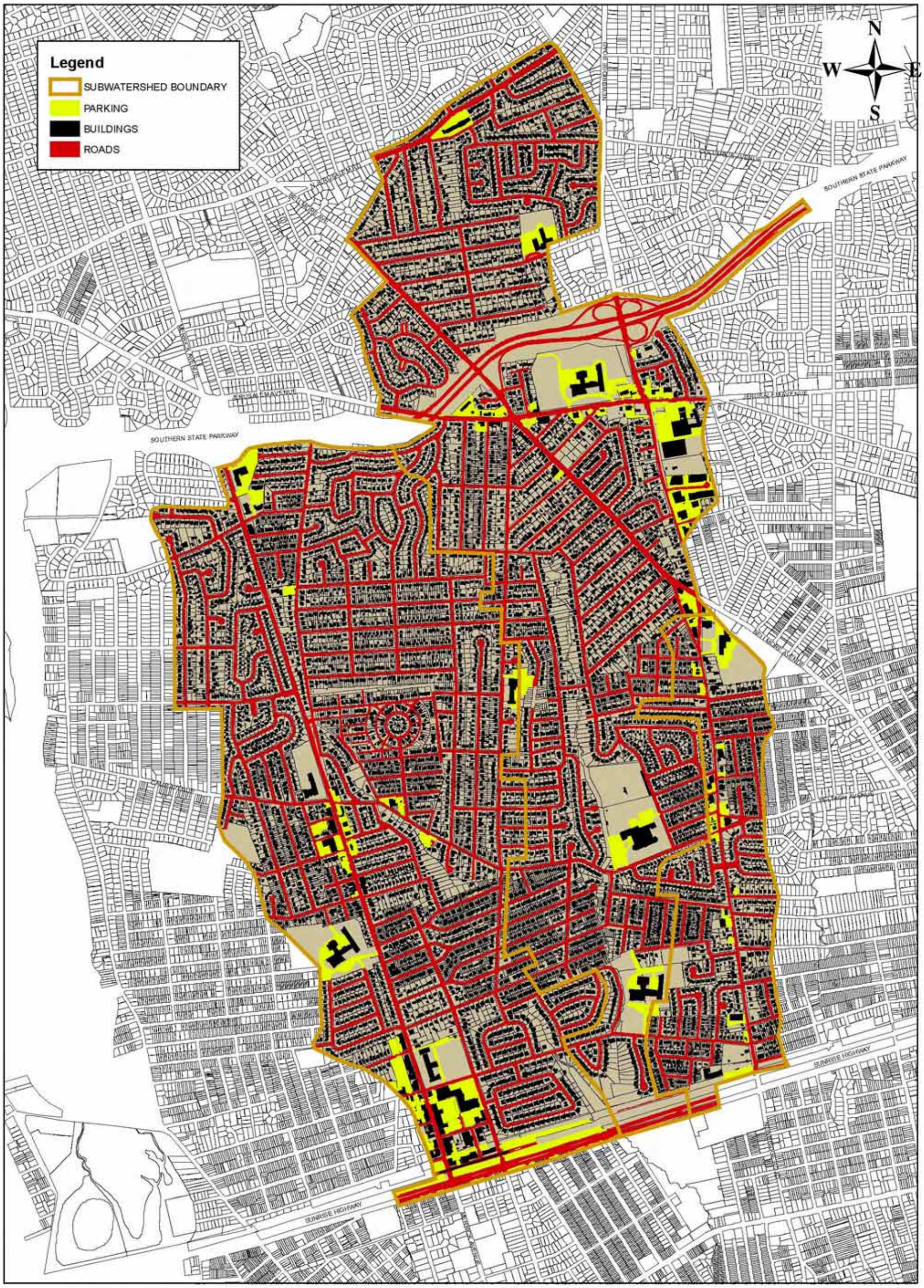
MAP 2-1
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
DRAINAGE INFRASTRUCTURE
CEDAR SWAMP SUBWATERSHED

0 1,050 2,100 4,200 6,300 8,400 Feet



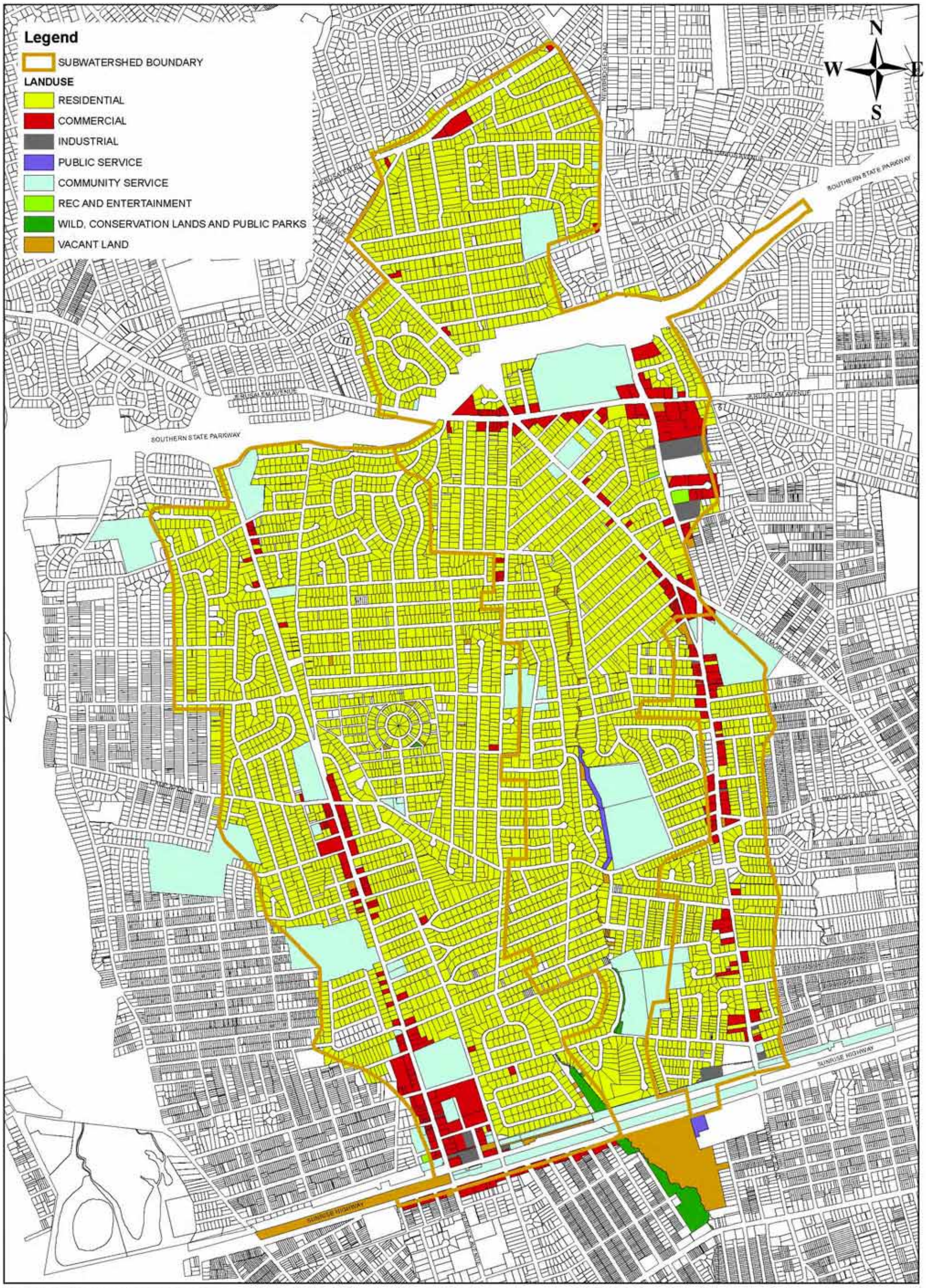
SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 2-2
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
CONTOURS
CEDAR SWAMP SUBWATERSHED



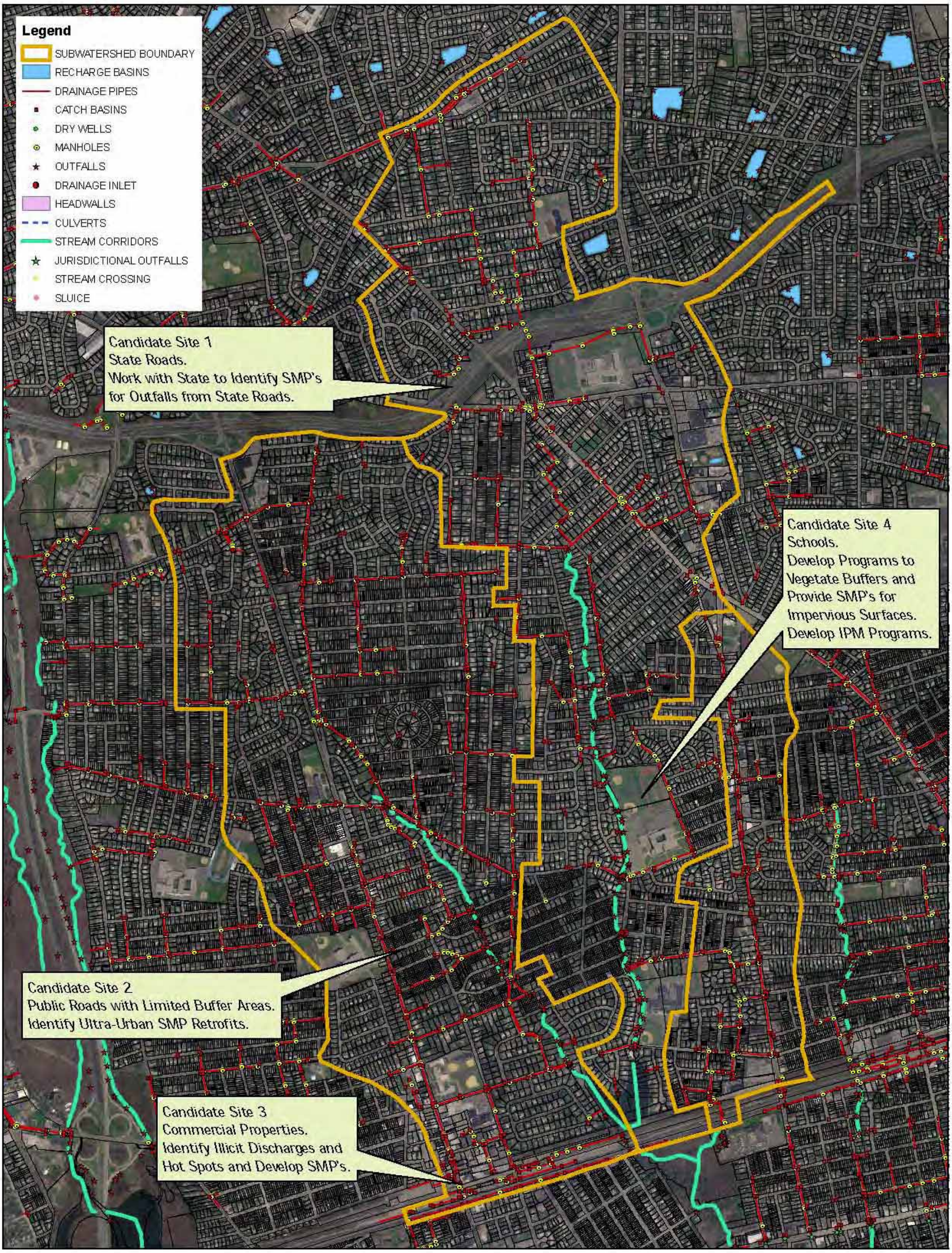
SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 2-3
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
IMPERVIOUS AREAS
CEDAR SWAMP SUBWATERSHED



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 2-4
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
LAND USE
CEDAR SWAMP SUBWATERSHED



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 3-1
NASSAU COUNTY STORMWATER MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
SMP CANDIDATE SITE MAP
CEDAR SWAMP SUBWATERSHED

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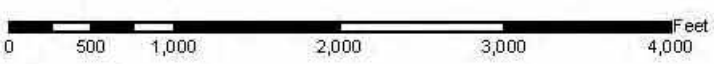

Nassau County
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CEDAR SWAMP CREEK SUBWATERSHED STORMWATER RUNOFF IMPACT ANALYSIS AND CANDIDATE SITE ASSESSMENT REPORT

APPENDIX A – FIELD DATA

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