

MS4 Survey of the Croton-Kensico
Watershed
Westchester County, New York

Final Report

July 2011

Prepared by the Interstate Environmental Commission
For the New York State Department of Environmental Conservation

American Recovery and Reinvestment Act (ARRA) Clean Water Act Section 604(b)



Final Report

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Project/Organization Information

Project Information

Project Name	MS4 Survey of the Croton-Kensico Watershed, Westchester County, New York		
Primary Project Type	Phase II Stormwater for Municipal Separate Storm Sewer Systems (MS4s) and Construction Planning		
State Contract Number	C304268		
Project Start Date	Dec 1, 2009	Project End Date	Jul 31, 2011
ARRA Award Amount	\$28,500.00	Total Project Cost	\$37,819.00

Organization Information

Name	Interstate Environmental Commission		
Address 1	311 W. 43rd St.		
Address 2	Suite 201		
City	New York	State	New York
Zip Code + 4	10036-6034		
Telephone	212-582-0380	Fax	212-581-5719
E-mail	Contact Us Form via website	Website	http://www.iec-nynjct.org

Report Preparer

Name	Caitlyn Nichols		
Job Title	Sr. Environmental Specialist		
Telephone	212-582-0380	E-mail	cnichols@iec-nynjct.org

Introduction

Project Introduction & Description

The primary purpose of the project should be described, along with a general overview of major project goals and outcomes. Affected bodies of water and project locations should also be noted.

Abstract

This project developed a GIS-based stormwater system map, which inventories and illustrates the location of MS4 components within the Croton River North Basins subwatershed. Project deliverables provide up-to-date information and future management capabilities for the Town of Somers' stormwater asset data. Mapping of the conveyance system, specifically within the Purdy Lake community, will be used to implement the municipality's illicit discharge, detection, and elimination program as well as to assist with the routine maintenance of the Town's stormwater drainage system and intermunicipal MS4 connections. This project serves as a practicable model for CKWIC MS4s to consider in implementation of IDDE field mapping and inspections.

Project Goals and Objectives

The work of MS4 component identification and mapping and creation of a subwatershed map are part of MS4 General Permit compliance (section IX.A.3) for a complete IDDE program. This work will enable source trackdown of any suspected illicit discharges identified either at outfalls or within stream systems, and is necessary for the detection and elimination of illicit connections within the MS4 system, which will ultimately ameliorate the environmental quality of receiving waterways.

The regional map is intended to assist with maintenance of each MS4s stormwater conveyance system and assist with the identification of projects related to the CKWIC's retrofit program. Maintenance of the conveyance system and implementation of retrofit projects will assist with reducing the water quality impacts of sediment, phosphorus and other pollutants that tend to collect within the conveyance system components.

The CKWIC watersheds drain into reservoirs that comprise part of the New York City water supply system. This system supplies drinking water to over nine million people. While the New York City's Catskill-Delaware System supplies most of the City's drinking water needs, the Croton System is used to augment the supply, especially in times of drought and/or increased demand and can supply on average 10% of the City's drinking water demand. All MS4s within the NYC East of Hudson Watershed (Croton and Kensico in Westchester County) were designated to obtain coverage under the NYS DEC General Stormwater Permit GP-0-08-002, through special or enhanced conditions, and were charged with reducing phosphorus, as the pollutant of concern, in order to meet the allotted waste load allocations of the TMDL. A phosphorus TMDL has been developed for the Croton Watershed, which contains several waterbodies that have been listed on the NYS 2008 Section 303(d) list [H-31-P44 New Croton Reservoir, H-31-P44 Upper New Croton/Muscoot Reservoir, H-31-P44-14-P50 Amawalk Reservoir, H-31-P44-14-1, Titicus Reservoir, H-31-P44-35-P109, and Cross River Reservoir were each listed for phosphorus pollution resulting from urban runoff. Hallocks Mill Brook, Lower, H-31-P44-26/P103 was listed for ammonia pollution from municipal sources. The entire East of Hudson watershed was identified as an area in need of phosphorus reductions through the Phosphorus TMDL issued by the NYS DEC.

The central focus of this project was Purdy Lake, an older residential community situated in the Town of Somers. The study area is within the Croton River North Basins subwatershed, which is part of the Muscoot Watershed Basin, and is currently under a phosphorus restriction. Subwatersheds with high phosphorus levels may be indicative of illicit activities. For example, a proximal commercial office complex has been identified as a potential source of

stormwater pollutants. It is noteworthy, that areas with older developments may be more likely to have illicit discharges because unlike current/recent development projects, project review considerations were not applicable to permitting processes for older development projects. Along with the primary objective, which was to gather and update MS4 stormwater component information to create a GIS storm sewer map, underlying goals also achieved included outfall reconnaissance field inspections to identify the condition of structural MS4 components and assistance with the identification of potential illicit discharges.

In the more urbanized village and hamlet areas in the Croton Watershed there are networks of pipes that serve as in-ground stormwater conveyance systems, whereas, in the less developed areas of the watershed, drainage channels and stormwater basins are prevalent. Within Somers, this varies; an in-ground conveyance system mainly handles residential drainage and street runoff in the Purdy Lake community. However, open system components, including engineered ditches and vegetated swales, together with, or natural drainage channels and stream corridors that characterize the area complement closed storm water inlet and outlet structures (i.e. catchbasins, storm sewer pipes and outfalls).

Summary of Activity

Objectives, Tasks, & Outcomes

Work plan objectives should be clearly linked to final project outcomes. For each objective listed on the work plan, a brief summary of the tasks and activities should demonstrate how project deliverables and outcomes have accomplished that objective.

Objective

Subwatershed selection-Prioritization of Study Area

Task Summary & Project Outcomes

CKWIC/Somers identified the need to initiate mapping in the Purdy Lake community within the Croton River North Basin. IEC was given an overview of area and conducted reconnaissance via site visits and meetings with CKWIC/Somers. After review of potential intermunicipal subwatershed areas via geographic and data capabilities, the project team decided to focus on this area, which is residential, but in close proximity to both commercial environmentally sensitive areas.

Objective

Obtain and review CKWIC consultant and Westchester County mapping practices and data models to establish and implement necessary mapping and field verifications standards

Task Summary & Project Outcomes

IEC initially consulted with Westchester County to obtain and review mapping standards, models and ORI practices used for County MS4 component mapping. IEC reviewed May 2010 MS4 regulations (GP-0-10-002) to ensure project will meet IDDE requirements. IEC completed review of national case-studies to identify acceptable data collection and mapping standards. For consistency, data models and mapping and field verifications standards practiced/set by Westchester Planning, align with guidance documents provided by County, Center for Watershed Protection, and NYS DEC. Although, no supplemental mapping standards were proposed by consultant or CKWIC/Somers, IEC submitted materials to Somers/CKWIC for any comments prior NYS DEC review.

Mapping standards and MS4 component identification/verification protocol and data sheets were established and implemented. IEC obtained and became familiarized with GPS equipment and software to program field equipment to align with hardcopy documentation field data sheets.

Objective

Identify MS4 components to be mapped in subwatershed

Task Summary & Project Outcomes

After review of case-studies, NYS DEC permit requirements, Town of Somers' Stormwater Management Plan goals, IEC finalized components to be mapped based on meeting and final input from the CKWIC/Town stormwater coordinator. It was determined that descriptive attribute information to be collected and/or verified for stormwater components include: location, street, open/closed system, structural characteristics (material, shape, dimensions, condition, flow direction (inflow/outflow) and flow observations. Features include: catchbasins, manholes, culverts, and outfalls.

Objective

Field verify and survey MS4 components to be mapped

Task
Summary
& Project
Outcomes

Both hardcopy and GPS technology was incorporation into field verification. Throughout the project there was an ongoing process of identifying and rectifying/creating necessary metadata, missing geo-spatial information and/or conflicts via on ground surveys and real-time GPS measurements.

Field collection involved updating and/or the collection of new features and attributes to align with scope of work, and resolve conflicting feature data, which resulted from incorporating data files from multiple sources. Progression of field surveys using list of known and suspected MS4 components to verify components, based on in-office data compilation and review, helped target gaps and rectify disparities. In addition to hardcopy, GPS technology, “eye-fi” GPS camera software incorporated for final site surveys. This provides back-up/QC via picture and GPS link during investigation for field verification purposes.

Objective

Field data review

Task
Summary
& Project
Outcomes

Authentication and verification of collected field data and in-office data spreadsheets were compiled into an Access database for quality assurance and comparison, which allows for additional review among hard-copy field sheets, and GPS and GIS data.

Digital field notes and photo files also served as additional means for review.

Objective

GIS development/Map features/ Create subwatershed MS4 map

Task
Summary
& Project
Outcomes

ArcGIS 9.3 was utilized to create the final GIS map, which includes baseline geographic data from a variety of sources (i.e. NYS DEC, Westchester Planning, NYS GIS data sharing cooperative). The GIS has the ability to reflect verified and previously suspected MS4 component data from (based on Westchester County, and Town of Somers information) and integrates physical and spatial attributes with respect to Croton River North Basin storm drain outfalls, inlets, catchbasins, manholes, culverts, stormwater pipes, engineered and natural open channels (i.e. ditches, vegetated swales, natural drainage).

Other relevant datasets that were incorporated include:

- Westchester municipal boundaries
- Westchester MS4 communities and CWIC municipalities
- Subwatersheds (includes East of Hudson River phosphorus-stressed subwatersheds)
- NHD waterbodies
- NHD flowlines shoreline (used to calculate stormwater contributing area)
- NHD Waterbodies
- Somers Roads
- Somers Tax Lots

The project team recognized that besides verification and inspection of Croton River North Basin outfalls,

additional data collection was critical to meet the “*minimum*” requirements set forth by *Mapping Element 1: Map of Outfalls*. Field procedures were adopted as outlined in the Town of Somers SWMP to identify the outfall location, which were originally established by a consultant, Azertia.

Additional attribute data regarding physical indicators of flow and structure, were collected to initiate IDDE efforts. This involved identification of the first (downstream) Water of the US to which the outfall discharges by means of a Water Index Number (WIN), where applicable. Thereby, outfall data now aligns and exceed “preferred” NYS DEC 2005 GP Requirements. for Mapping Element 1 where applicable (i.e. MS4 permit number; WIN Name; WIN number; HUC number, NHD Name; NHD number).

It was important to add additional data fields to include intermunicipal connections, so that future mapping in CKWIC subwatershed may identify the “type of outfall” and “mode of entry” (i.e. direct discharge to a Water of NY, direct via a ditch, indirect discharge to intermittent stream via overland flow, indirect discharge to a wetland (non-hydraulic or hydraulically connected), other non-regulated discharges, intermunicipal discharges, etc.). Another critical data field included was “confidence level” as per NYS DEC IDDE guidance.

In the creation of final geographic datasets interoperability/use was highly regarded and considered a priority. Metadata was added as per NYS DEC IDDE guidance. All geographic datasets now include metadata that are compliant with the Federal Geographic Data Committee (FGDC). All information will be maintained in digital format suitable for use in GIS software; and while prepared according to Town of Somers specifications, all datasets were specifically created and designed with consideration of the mapping elements and technical/spatial guidelines set forth by *NYS DEC IDDE Mapping Guidelines*, so that Somers can easily perform geographic transformations necessary for official reporting and transmission.

IEC has prepared all the information and documentation so that the Town of Somers may be fully capable to:

- take responsibility for implementing pollutant source tracking procedures;
- annually ensure that outfalls are being inspected and that inspections are documented;
- maintain inventory of any alterations to mapped structures (via mapping update forms and ORI investigations);
- GIS mapping is updated accordingly;
- share the resources and information gained with CKWIC, and interested regional stakeholders.

Problems Encountered/How Solved

A comprehensive summary of any problems encountered during the life of the project and how those problems were resolved should be listed. The list should include any information reported in the "Problems Encountered/How Solved" box on the Quarterly Report Cover Pages throughout the project.

Issue #1 Defining final study area

Final selection of the project area was initially delayed because CKWIC needed additional information and had difficulty identifying an appropriate subwatershed that includes two municipalities. Challenges included inconsistent municipal mapping capabilities, recordkeeping and availability of historical and current records. CKWIC proposed to IEC and DEC that the project area focus on a subwatershed that is primarily within 1 municipality to minimize problems accessing and comparing data across town-lines, which would maximize the amount of work that could be

accomplished, considering funding constraints. This plan was acceptable to DEC.

Issue #2 Identifying additional mapping standards.

Initial project tasks and deliverables held up by Consultant hired [prior to this grant] to assess CKWIC mapping activities and protocols. CKWIC did not receive any additional mapping standards as requested of private consultant previously contracted to assess the needs of CKWIC's region in terms of stormwater planning. CKWIC requested that their consultant supplement their final report with the additional information required/missing and this was delayed.

Issue #3 Data discrepancies and validity and availability of baseline information further constrained time and tight budget.

Prior Town outfall mapping initiatives did involve assignment of a unique identifier (such as a number and/or alpha numeric code) to identified stormwater features, which is documented in the Town's SWMP. Where feasible this was derived from sequential location of the outfall or drainage component on a map using street, intersection and distance along stream corridors. However, the major issue was that the established sequential procedure for assigning identification numbers to Somers' stormwater components (Asset ID) not leave adequate gaps for future and/or identification of components not accounted for. In the end, it was resolved by designing a comparative GIS, which integrates system components by a modification of the prior system. The Town and/or CWIC municipalities may consider and find it easier/more helpful if the identifier was assigned based on Lot and Block parcel identification information for the property that the stormwater feature is located on.

Field verification was difficult using prior GIS data, for reasons of incompleteness and uncertainty. This was further complicated by the actual translation/language of stormwater components (i.e. culvert; outfall, inlet) in former initiatives by the Town, which initially served as the primary background data. In order to rectify this issue, a hardcopy Highway Department outfall map was primarily used and additional data models were reviewed and more specialized case studies were collated to make up for lack of first hand/background knowledge gaps.

Changes to Project Work Plan

Any changes that were made to the project work plan during the life of the project should be noted, including a brief description of why the changes were necessary.

Instead of a subwatershed within two municipalities, CKWIC proposed to IEC and DEC that the project area focus on a subwatershed that is primarily within 1 municipality to minimize problems accessing and comparing data across town-lines, which would maximize the amount of work that could be accomplished, considering funding constraints. This plan was acceptable to DEC.