

**Municipality/Organization:** City of Malden  
**EPA NPDES Permit Number:** MA041046  
**MADEP Transmittal Number:** 041088  
**Annual Report Number  
& Reporting Period:** No. 1: April 1, 2010-March 31, 2011

## NPDES PII Small MS4 General Permit Annual Report

### Part I. General Information

**Contact Person:** John J. Russell, P.E. **Title:** City Engineer  
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#### Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Signature:** 

**Printed Name:** John J. Russell

**Title:** City Engineer

**Date:** May 2, 2011

## **Part II. Self-Assessment**

During the 2010-2011 permit year the City of Malden continued the implementation of its formal Stormwater Management Program. Through the use of dedicated staff and contracted outside services, primary elements of this effort included an ongoing IDDE Program, inspection and mapping of the municipal drainage infrastructure, outfall sampling, targeted dry weather inspections, and targeted repairs of infrastructure components. Stormwater Ordinances for the regulation and enforcement of stormwater management practices were adopted in April 2009 and enforcement actions during this reporting period have been undertaken pursuant to this regulatory mechanism. The City of Malden, has invested significant time and capital funding to develop a Stormwater Compliance Team compiled of members of the Department of Public Works, Engineering and outside technical support. Through continued implementation of the Stormwater Compliance Team's (SCT) Rapid Assessment Program, the City of Malden has identified and removed two (2) illicit discharges and identified major potable water line breaks that were addressed during this reporting period.

The City, through its commitment to the MS4 Program has greatly advanced the efficiency of its catch basin (CB) inspection, maintenance and inventory program, resulting in the cleaning of approximately 1,113 catch basins structures and the rodding over 3,500 feet of laterals during the 2010 – 2011 permit year. This effort has also included extensive repairs to CB's and laterals (BMP 5-6), reducing the potential for sediment entrainment and improving the functionality of these primary BMPs and a significant reduction of flooding issues. The City has inspected and/or mapped a majority municipal drainage network and GIS mapping has become a valuable tool in prioritizing repairs and maintenance.

A summary of the key program tasks implemented and/or advanced during Phase 2 of the MS4 program may be referenced as Attachment 1, and as evidenced from a review of this and prior year submissions, the City has met a majority of the proposed provisions of the 2010 North Coastal Municipal Separate Sewer Stormwater (MS4) permit. This has included the removal of illicit discharges, public education and outreach, ordinance implementation, CB inspection/cleanout and maintenance, mapping, outfall monitoring, electronic file management, and capital planning.

During this reporting period the City has demonstrated its capability to continue the implementation of a successful IDDE Plan. A summary of the results of this program may be referenced within Part III, Section 3 of this document.

## Part III. Summary of Best Management Practices (BMPs) and Compliance Team Goals

### 1. Public Education, Outreach and Community Involvement

<b>BMP 1-1</b>	<b>Place Educational Information on City's Web Site and Malden Access Television (MATV)</b>
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**Responsible Department/Person:**  
Engineering Dept, Mayor's Office & MATV

**Measurable Goal(s):**  
Continued maintenance of the City informational web site and participation with MATV.

**Progress on Goals- Year 8:**  
The City continues to maintain an informational website and work with representatives of MATV to update the community on stormwater management issues. During this past year, two (2) informational programs were developed by representatives of Tri Cap and provided to the residents of Malden.

**Goal Status:**  
Ongoing

<b>BMP 1-2</b>	<b>Conduct Recycling Opportunities &amp; Paint Waste Collection Days</b>
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**Responsible Department/Person:**  
DPW & Mayor's Office

**Measurable Goal(s):**  
Continuation and possible expansion of recycling collection days, distribution of related educational information.

**Progress on Goals- Year 8**  
MDPW sponsors four (4) paint waste collection and recycling days annually

**Goal Status:**  
Annual Program - Activity Ongoing

**BMP 1-3 Enforce Pet Waste Management Programs**

**Responsible Department/Person:**

Animal Control Dept & City Clerk

**Measurable Goal(s):**

Posting of signage, installation of waste collection containers, park maintenance, ordinance enforcement, Community involvement.

**Progress on Goals- Year 8:**

During this permit year a dedicated pet park was created within the City to promote improved pet waste control.

**Goal Status:**

Activity Ongoing

**BMP 1-4 Establish a partnership with local schools to educate Malden's students about stormwater**

**Responsible Department/Person:**

Stormwater Compliance Team

**Measurable Goal(s):**

Workshops, demonstration projects, student involvement

**Progress on Goals- Year 8:**

The Beebe School continues to work with the City of Malden to promote awareness of stormwater quality issues. Demonstration projects pertaining to the cleaning of catch basins and the efforts that may be undertaken by students to improve stormwater quality discharges (i.e. litter/debris removal) have been performed by representatives of the Stormwater Compliance Team.

**Goal Status:**

Through the use of website posting and reconnection to the class room, the City hopes to substantially advance the involvement of its students in meeting the goal. Further, the City wishes to expose students to potential career opportunities that exist in the field of Environmental Science.

**BMP 1-5 Hold formal school classroom programs supported by the Compliance Team**

**Responsible Department/Person:**

Stormwater Compliance Team

**Measurable Goal(s):**

Classroom involvement

**Progress on Goals- Year 8:**

See BMP 1-4. The City, through its stormwater compliance team is developing curriculum/information for posting on its website. No classroom presentations were held this year.

**Goal Status:**

Emphasis to be placed upon greater community interaction during Year 8. BMP 1-4 and 1-5 to be combined for this coordinated effort.

**BMP 1-6 Development of student involvement/internship for High School Seniors**

**Responsible Department/Person:**

Engineering Dept & MDPW

**Measurable Goal(s):**

Number of participants

**Progress on Goals- Year 8:**

One (1) high school student worked for the MDPW & Engineering Dept during the 2010 summer break.

**Goal Status:**

Activity Ongoing

**BMP 1-7 Expand Cooperative Education programs for college level interns**

**Responsible Department/Person:**

Engineering Dept

**Measurable Goal(s):**

Number of participants

**Progress on Goals- Year 8:**

One (1) summer college intern was retained by the Engineering Department.

**Goal Status:**

The City is currently exploring ways to partner high school and college interns in areas of public outreach and curriculum development. BMPs 1-6 and 1-7 will be coordinated to meet this goal.

<b>BMP 1-8</b>	<b>Host or participate in Stormwater Management brainstorming sessions with citizen advisory groups and Mystic River Watershed representatives (MyRA)</b>
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**Responsible Department/Person:**

Eng. Dept. & Mayor's Office

**Measurable Goal(s):**

Annual Participation. Dissemination of information to the general public

**Progress on Goals- Year 8:**

Stormwater quality data collected by the City has been shared with MyRA. On May 15, 2010, a "Walk Malden" community event was held which involved a walking tour of the Malden River. During this tour, educational outreach was provided to community residents by representatives of the SCT, the Malden School Committee and elected officials.

**Goal Status:**

River walks and workshops with community members are proposed. Greater participation in regional planning and professional trade organizations is also a priority for SCT members.

## 2. Local Planning Processes and Community Involvement

<b>BMP 2-1</b>	<b>Development of incentives for redevelopment initiatives that address existing stormwater management concerns</b>
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**Responsible Department/Person:**

Local Planning Agencies and Compliance Team

**Measurable Goal(s):**

Mitigation of existing stormwater concerns.

**Progress on Goals- Year 8:**

Through GIS mapping and inspection, the SCT continues to identify areas where infrastructure improvements can be made during redevelopment activities to improve flow conveyance and stormwater quality. This information is reviewed and prioritized during Department Head meetings to ensure their inclusion in the review of redevelopment activities. One major project has involved the removal of 108 sump pumps from the municipal sewer system and the adoption of a policy for its implementation and inventory of these discharges to the drainage system. In addition, the review process for drainage requirements associated with redevelopment projects now includes a focus upon quality of discharge to the municipal system.

**Goal Status:**

Output from the ongoing infrastructure mapping/CB inspection program together with CIP Planning is being evaluated to prioritize infrastructure needs that will be intergraded into redevelopment design and review processes.

<b>BMP 2-2</b>	<b>Development of a “Clean Malden” Program</b>
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**Responsible Department/Person:**

Stormwater Compliance Team

**Measurable Goal(s):**

Promote neighborhood stewardship programs designed to remove trash from sensitive watershed areas, catch basin inlets and report conditions of concern.

**Progress on Goals- Year 8:**

During this permit year, community members and in particular Tri Cap conducted several events to promote community awareness and involvement. This effort was also supported by representatives of MDPW, which included the training of students on a stormwater enhancement project.

**Goal Status:**

During the next permit year, the SCT will continue to promote neighborhood stewardship and communication efforts.

<b>BMP 2-3</b>	<b>Inter-departmental review and communication to address stormwater quality concerns</b>
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**Responsible Department/Person:**

Local Planning and Inspectional Agencies

**Measurable Goal(s):**

Coordination of Planning and Inspectional services to further identify and address stormwater management issues.

**Progress on Goals- Year 8:**

During this reporting period and through the adoption of a City ordinance pertaining to the stormwater management requirements, the objectives of this BMP have been integrated into the formal Department Head meeting agenda. Representatives of Board of Health (BOH) continue to be instrumental in successful enforcement actions when necessary.

**Goal Status:**

Achived and Ongoing

<b>BMP 2-4</b>	<b>Development of an electronic database file management system</b>
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Compilation of all stormwater infrastructure information, integration of all ongoing inspection, inventory and repair activities.

**Progress on Goals- Year 8:**

Expanding upon the planning and management capabilities realized from initial GIS mapping efforts, the City completed an interdepartmental evaluation of needs during FY2010. Through the assistance of Camp Dresser and McKee (CDM), the City is nearing completion of converting and updating its current mapping system to GIS/electronic format using field GPS receivers. Drainage infrastructure has been updated and inventoried as a part of daily work practices by MDPW personnel, with targeted mapping and inspection also performed by outside contractors. An overview of this inspection program is provided on Figure 1, contained within Attachment 2.

The City hired a full time GIS manager during FY2010 to work with CDM on program implementation. Detailed base maps have been developed through the completion of an aerial flight that was performed in the spring of 2010. CDM is also preparing data layers for additional plans and documentation that will be used by City Engineering and MDPW staff.

**Goal Status:**

Activity Ongoing

<b>BMP 2-5      Development and implementation of local ordinances</b>
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**Responsible Department/Person:**

Local Planning Agencies and Compliance Team

**Measurable Goal(s):**

Adopt and enforce state and federal regulatory guidance. Perform community infrastructure needs analysis and conveyance of information to local permitting processes. Assign BMP guidance and requirements to private land use activities that are connected to the urban stormwater network.

**Progress on Goals- Year 8:**

The City continues to enforce the stormwater ordinances adopted in 2009.

**Goal Status:**

Achieved

<b>BMP 2-6      Completion of an infrastructure needs analysis</b>
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**Responsible Department/Person:**

Eng. Dept, DPW, Compliance Team

**Measurable Goal(s):**

Development of a long term plan for infrastructure upgrade

**Progress on Goals- Year 8:**

During this permit year, (BMPs 2-3 and 2-4) extensive repairs to the City's drainage system were made based upon the input from the ongoing CB inspection and inventory program. This program, which is now a daily work practice, will continue to assist in the implementation of timely infrastructure repairs.

**Goal Status:**

Annual Ongoing Activity

<b>BMP 2-7</b>	<b>Identification of capital improvement projects necessary to improve stormwater quality</b>
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Conveyance of CIP requirements to Planning Board and local permitting processes.

**Progress on Goals- Year 8:**

See BMP 2-6. Based upon potential stormwater quality improvement benefits and functional needs, recommendations are provided for and included in the annual CIP.

**Goal Status:**

Annual Ongoing Activity

### 3. Stormwater Monitoring and Inspection Program

**BMP 3-1      Conduct a minimum of one annual inspection of all known outfalls during dry weather sampling events.**

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Documentation of inspection results.

**Progress on Goals- Year 8:**

The annual inspection of all known outfalls has been performed and the installation of signage identifying the appropriate sampling and contact information is ongoing. In addition, interior discharge locations to major flow systems have been inspected as a part of the City's dry and wet weather monitoring program. A copy of the language developed for signage may be referenced as Attachment 3- Supporting Documentation for BMP 3-1.

**Goal Status:**

Achieved and Ongoing Activity

**BMP 3-2      Perform targeted sampling and analyses during dry weather and wet weather sampling events to document seasonal and annual trends.**

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Collection of water quality data

**Progress on Goals- Year 8:**

A summary of the results obtained from dry weather sampling may be referenced from Attachment 4 - Supporting Documentation for BMP 3-2.

**Goal Status:**

Achieved and Ongoing Activity

**BMP 3-3 Perform mass balance modeling within primary watersheds to isolate sub basin bacteria loading sources.**

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Identification of source area contributions

**Progress on Goals- Year 8:**

During this reporting period, dry weather inspection of the infrastructure contributing to stormwater discharges to Linden Brook and Town Line Brook within easterly portions of the City has been completed. This effort has resulted in the isolation of discharges containing bacterial loading and potable water from water line breaks.

During each site inspection base flow was present within the culvert. Five locations along the length of the culvert were sampled and higher levels of E. Coli were detected within interior areas (Dodge and Mingo Streets), in contrast to the low levels detected within the culvert upstream and downstream of these locations. It was proposed to sample six (6) locations within the culvert; however no openings in the culvert could be located at the time of sampling just prior to the Malden/Revere City line. An inspection of tributary drainage lines in the area of Dodge and Mingo at the time of sampling did not reveal any dry weather flows discharging to the culvert. Reference may be made to the City's IDDE Program Status Reports that were filed within the last permit year. (Attachment 5).

**Goal Status:**

Initial city wide objectives have been met, IDDE program implementation ongoing.

**BMP 3-4 Target the evaluation of stormwater discharges from "green space" parklands, cemeteries and open space to assist in the segregation of human, animal and waterfowl bacteria contributions.**

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Separation of non-human bacterial loading and implementation of mitigation measures.

**Progress on Goals- Year 8:**

The City has implemented several measures to reduce discharge of non-human bacterial loading at park lands, cemeteries and open space. These include control measures for the geese population, such as egg collection/treatment, the use of dogs and postings to prevent the feeding of waterfowl. The City has completed and is continuing with the replacement of grass playing fields with synthetic surfaces, which has a direct impact upon geese waste contributions and overall runoff quality.

**Goal Status:**

Ongoing Activity

<b>BMP 3-5</b>	<b>Development of mitigation strategy based upon sampling and inspection progress for consideration in annual capital planning.</b>
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Preparation of annual report.

**Progress on Goals- Year 8:**

As outlined under BMP 3-3, targeted sampling has focused upon Linden and Town Line Brook watersheds during this permit year. The results obtained from this sampling program, together with the development of an electronic file management system continue to assist in the prioritization of infrastructure needs which are reflected in CIP recommendations for the 2011-2012 fiscal year.

**Goal Status:**

Both in-house and contracted services are in place to oversee mitigation maintenance and planning efforts.

<b>BMP 3-6</b>	<b>Development and Implementation of an Illicit Discharge Detection and Elimination (IDDE) Plan</b>
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**Responsible Department/Person:**

Eng Dept & Compliance Team

**Measurable Goal(s):**

Development and implementation of an IDDE Plan.

**Progress on Goals- Year 8:**

The City continues to implement its approved IDDE program through its daily CB inspection and maintenance program through the use of a dedicated MDPW Stormwater Team and outside services. Excerpts of the IDDE Plan pertaining to this effort, which has been filed with USEPA maybe referenced as Attachment 6.

**Goal Status:**

Achieved

#### 4. Pre- and Post-Construction Stormwater Runoff Control Measures

<b>BMP 4-1</b>	<b>Development of inspection protocol/checklist local permitting agencies to monitor ongoing construction activities</b>
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Development of checklist

**Progress on Goals- Year 8:**

The City's permitting process now incorporates the guidance criteria contained within adopted stormwater ordinances to guide its review process (Attachment 7). Further work is ongoing to integrate the results from daily inspection and monitoring into these processes.

**Goal Status:**

Achieved and Ongoing

<b>BMP 4-2</b>	<b>Integration of Applicant Certification requirement for the monitoring and inspection of development activities into local planning processes.</b>
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Applicant Certification and submission of inspection and monitoring reports (See BMP 4-1).

**Progress on Goals- Year 8:**

This goal is advanced through conceptual design stage for implementation.

**Goal Status:**

Ongoing

<b>BMP 4-3</b>	<b>Promote the use of new and innovative products/designs in new development initiatives. Condition of approval, monitoring</b>
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**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Conditions of Approval, monitoring of construction activities.

**Progress on Goals- Year 8:**

Two (2) municipal projects (Pine Banks Park and South Broadway Park) continue to evaluate the use of low impact development design measures and enhanced stormwater quality improvements, such as bioswales and synthetic playing field surfaces. Compliance team members and municipal employees have attended workshops pertaining to LIDD practices.

**Goal Status:**

During the 2010-2011 permit year there were two (2) private redevelopment projects where design measures promulgated under the MDEP Stormwater program and identified through technology updates were provided to local permitting personnel.

<b>BMP 4-4</b>	<b>Enforcement of existing state and federal guidance.</b>
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**Responsible Department/Person:**

Planning Board and Inspectional Services, Eng. Dept.

**Measurable Goal(s):**

Documentation of violations, implementation of corrective actions.

**Progress on Goals- Year 8:**

See BMP 3-6 and 5-8. Following the adoption of local control measures in April 2009, the City has enforced the removal illicit discharges and required that investigations be undertaken to support the removal of improper stormwater discharges.

**Goal Status:**

Ongoing

**BMP 4-5      Develop partnerships in planning with local Conservation Commission**

**Responsible Department/Person:**

Planning Board and Inspectional Services, Eng. Dept.

**Measurable Goal(s):**

Stormwater quality management practices as conditions of approval.

**Progress on Goals- Year 8:**

The activities of the Compliance Team are directly communicated to the local Conservation Commission by a participating member. Similarly, updates to stormwater quality management practices and enforcement activities/requirements are addressed.

**Goal Status:**

Achieved and ongoing

**BMP 4-6      Site design measures to improve stormwater quality**

**Responsible Department/Person:**

Planning Board

**Measurable Goal(s):**

Improved design features for new development.

**Progress on Goals- Year 8:**

The adoption of local ordinances (See BMP 4-3) have provided planning review processes with guidance for appropriate design practices.

**Goal Status:**

Ongoing

## 5.0 Pollution Prevention and Stormwater Management Strategies.

<b>BMP 5-1      Develop a Formal Training Program for DPW Staff</b>
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**Responsible Department/Person:**

DPW, Human Resources Dept.

**Measurable Goal(s):**

Staff Training

**Progress on Goals- Year 8:**

The City has hired additional staff for the public works department and a dedicated vehicle is equipped with the necessary items for IDDE Plan implementation and overall program needs. A trained crew has also been established to aggressively maintain the catch basin cleaning, inspection and data collection program. This crew has been assigned to work with NCA and the Malden Engineering Department in meeting the objectives of the IDDE plan implementation and has been responsible for the identification of numerous water main leaks, resolution of illicit connections and repair of infrastructure components, all of which is directed towards the improvement in the quality of the City's stormwater discharges. Three (3) MDPW staff have been trained in the use of GIS mapping equipment.

**Goal Status:**

Achieved and ongoing

<b>BMP 5-2      Maintain Lawn Care Policy</b>
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**Responsible Department/Person:**

DPW, School Dept., Cemetery Dept

**Measurable Goal(s):**

Proper utilization of pesticides, herbicides, fertilizers and appropriate disposal of lawn trimmings, yard waste

**Progress on Goals- Year 8:**

The City currently has no license for the application of pesticides. Lawn care for recreational areas maintained by the MDPW.

**Goal Status:**

Ongoing activity

<b>BMP 5-3</b>	<b>Development of a maintenance and monitoring plan for open channel component of Town Line Brook</b>
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**Responsible Department/Person:**

Eng. Dept., DCR & Compliance Team

**Measurable Goal(s):**

Removal of excess sediment deposits, restoration of flow capacity, structural repair.

**Progress on Goals- Year 8:**

To date, no response or maintenance activities by DCR have been noted. The extent of damage to the concrete wall of this trapezoidal channel remains a significant concern, in that further delays are likely to result in costly damages that could be avoided through proper attention.

**Goal Status:**

No Action

<b>BMP 5-4</b>	<b>Implementation of recommended maintenance and monitoring plan developed for Spot Pond Brook at Oak Grove.</b>
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**Responsible Department/Person:**

Eng. Dept., DPW & DCR

**Measurable Goal(s):**

Implementation of those recommendations contained within engineering study completed by Meridian Associates, Inc.

**Progress on Goals- Year 8:**

No planned maintenance activities occurred during this reporting period.

**Goal Status:**

Funding for necessary improvements and attention by DCR will be requested.

**BMP 5-5 Expansion of programs such as the Fellsmere Pond restoration initiative**

**Responsible Department/Person:**

Mayor's Office, Compliance Team DPW

**Measurable Goal(s):**

Water quality improvement

**Progress on Goals- Year 8:**

The restoration of bordering walkways and trimming of vegetation to reduce stormwater loading has been completed. Pet stations have also been added. The focus of current municipal projects is directed towards BMP repair i.e. CB inspection inventory program and the replacement of grass playing field surfaces, control of geese population and cemetery improvements.

**Goal Status:**

The Fellsmere project has been completed and two recreational projects involving significant improvements to the City's drainage system and existing playing field surfaces are ongoing.

**BMP 5-6 Comprehensive catch basin inspection, inventory, maintenance program**

**Responsible Department/Person:**

Eng. Dept., DPW & Compliance Team

**Measurable Goal(s):**

Electronic logging of CB locations, documentation of CB construction and functional characteristics, recommendations for improved performance standard compliance at individual locations or tributary segments of the drainage system.

**Progress on Goals- Year 8:**

During 2010 the City has recently hired additional staff for the Public Works Department to advance the objectives of the Stormwater Compliance Team. In addition, a vehicle was retrofitted and is equipped with the necessary items to support IDDE implementation. A trained crew has also been established to aggressively maintain the catch basin cleaning, inspection and data collection program. This crew has been assigned to work with NCA and the Malden Engineering Department in meeting the objectives of the IDDE plan implementation and has been responsible for the identification of numerous water main leaks, resolution of illicit connections and repair of infrastructure components, all of which is directed towards the improvement in the quality of the City's stormwater discharges. Through the use of dedicated staffing to meet this goal, catch basin cleaning and repairs are now being performed as a daily work activity.

**Goal Status:**

Achieved and Ongoing

<b>BMP 5-7      Continue sewer re-lining and connection upgrade program</b>
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**Responsible Department/Person:**

Eng. Dept. & DPW

**Measurable Goal(s):**

Reduction in I/I, identification of potential illicit connections, assist in infrastructure needs analysis

**Progress on Goals- Year 8:**

The City of Malden is also currently implementing a strategic GIS Implementation Plan with the assistance of CDM. Malden has been in the process of a comprehensive I&I study for its municipal sewer system, which is nearing completion. As stated below, Phase 3 of this SSES program has included the following specific tasks, as outlined within a memorandum to the City prepared by CDM.

Phase 3 SSES

In the spring of 2010, a flow isolation program was conducted in what has been identified as the "Phase 3 Area" within the City. The Phase 3 Area represents the final of a 3 phase SSES program that intends to identify and mitigate infiltration and inflow (I/I) in the City. Approximately 246,000 linear feet of sewer was flow isolated that resulted in the identification 1,446,562 GPD of infiltration. The flow isolation data was also evaluated to determine the limits of follow up close circuit television inspection (CCTV). As a result, approximately 28,754 linear feet of sewer was CCTV inspected in the summer and fall of 2010. Currently, COM on behalf of the City is preparing a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. The report is expected to be finalized in early 2011. It is also anticipated that the City will implement design and construction recommendations in 2011/2012.

The SSES program is being funded primarily through the MWRA Infiltration and Inflow Local Financial Assistance Program. According to the MWRA III Local Financial Assistance Program funding summary as of May 2010, the City has a balance of \$2,132,000 available. Further, according to a letter dated December 9, 2009 from the MWRA to the City of Malden, the City maintains a balance of interests totaling \$898,300.04 therefore the total funding available to the City through the MWRA III Local Financial Assistance Program is \$3,030,300.04.

In conjunction with the completion of a photometric survey CDM initiated a comprehensive flow measurement study for the municipal sewer system for use in the completion of the capacity assessment that will identify system deficiencies, with the overall goal of reducing the potential of SSOs within the City. An overview of this program, as prepared by CDM is outlined below.

Wastewater Collection System Capacity Assessment

In response to the ACO, the City is performing a capacity assessment of its wastewater collection system. This involves development of a dynamic hydraulic model of the City's wastewater collection system to evaluate the interceptor sewers and to support the capacity assessment. The model will be integrated into the GIS system to allow it to be viewed in conjunction with other geographic data and facilitate electronic data collection and analysis now and in the future. Development of the hydraulic model includes two primary activities that include data collection and model development and calibration. The data collection effort includes obtaining physical system data, reports, and electronic flow metering records to support model development. The model development and calibration effort will help prepare a dynamic computer model of the wastewater collection system and calibrate the model using existing measured flow data. The City's flow metering program and meter data obtained from the MWRA will be used to calibrate the proposed hydraulic models to develop accurate baseline conditions. further, the City is updating wastewater collection system mapping that accurately represents pipe connectivity, pipe sizes, pipe invert elevations, and pipe materials for all pipes 10-inches in diameter and greater.

**Goal Status:**

Ongoing activity

<b>BMP 5-8      Development and implementation of communication/notification plan for SSOs</b>
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**Responsible Department/Person:**

Eng. Dept. & DPW

**Measurable Goal(s):**

Notification of U.S. EPA and MDEP within 24 hours of event occurrence

**Progress on Goals- Year 8:**

No SSOs were identified during Year 8.

**Goal Status:**

Achieved and Ongoing

## 6. Pollution Prevention and Good Housekeeping in Municipal Operations

### **BMP 6-1 Regular meetings of Compliance Team to review plan implementation results**

**Responsible Department/Person:**

Compliance Team

**Measurable Goal(s):**

Data evaluation and review, implementation of corrective actions, and prioritization of mitigation measures.

**Progress on Goals- Year 8:**

Stormwater management requirements, compliance enforcement and ongoing working practices are now a regular agenda item at Department Head meetings. There is daily interaction with key members of the Compliance Team.

**Goal Status:**

Achieved and Ongoing

### **BMP 6-2 Annual Compliance review**

**Responsible Department/Person:**

Compliance Team & Mayor's Office

**Measurable Goal(s):**

Identification of capital plan improvements, modification of plan and objectives, documentation of plan activity for Annual Report.

**Progress on Goals- Year 8:**

This document together with the development of a working GIS system represents major milestones that serve to demonstrate the extent of efforts that have been undertaken by the City of Malden to achieve the goals and objectives of the MS4 program. In that recent focus upon stormwater quality in addition to quantity has become a focal point of daily work practices. This is evidenced by both the timing and extent of infrastructure repairs that have been completed and the significant advancement of municipal needs that has been achieved.

**Goal Status:**

Ongoing

## **Part IV. Summary of Information Collected and Analyzed**

See Attachment 1

## Part V. Program Outputs & Accomplishments (Optional)

### 5.1 Programmatic (See BMPs 1-4 and 5-1)

5.1.1	Stormwater management position created/staffed	Compliance Team Established
5.1.2	Annual program budget/expenditures	\$ 475,000

### 5.2 Education, Involvement, and Training (See BMPs 1-1, 1.2, 1-4, and 1-5)

5.2.1	Estimated number of residents reached by education program(s)	75%
5.2.2	Stormwater management committee established	Yes
5.2.3	Stream teams established or supported	Yes
5.2.4	Shoreline clean-up participation or quantity of shoreline miles cleaned	2 Miles
5.2.5	Household Paint Waste Collection Days	
	Days sponsored	4 Days
	Community participation	45%
	Material collected	\$16,250
5.2.6	School curricula implemented	Yes

### 5.3 Legal/Regulatory (See BMPs 2-5 and 3-6)

5.3.1	Regulatory Mechanism Status	
	Illicit Discharge Detection & Elimination	Adopted
	Erosion & Sediment Control	Adopted
	Post-Development Stormwater Management	Adopted

### 5.4 Mapping and Illicit Discharges (See BMPs 2-4)

5.4.1	Outfall mapping complete	All Known-100%
5.4.2	Estimated or actual number of outfalls	51
5.4.3	System-Wide mapping complete	
	Sewer-Paper/Mylar	100%
	Sewer-GIS	100%
	Drain-Paper/Mylar	100%
	Drain-GIS	
5.4.4	Outfalls inspected/screened	100%
5.4.5	Illicit discharges identified	9
5.4.6	Illicit connections removed	60 GPD (est.)
5.4.7	% of population on sewer	99.6%
5.4.8	% of population on septic systems	0.4%

## 5.5 Construction

5.5.1	Number of construction starts (>1-acre)	2
5.5.2	Estimated percentage of construction starts adequately regulated for erosion and sediment control	2
5.5.3	Site inspections completed	4
5.5.4	Tickets/Stop work orders issued	None
5.5.5	Fines collected	None
5.5.6	Complaints/concerns received from public	None

## 5.6 Post-Development Stormwater Management

5.6.1	Estimated percentage of development/redevelopment projects adequately regulated for post-construction stormwater control	
5.6.2	Site inspections completed	
5.6.3	Estimated volume of stormwater recharged	

## 5.7 Operations and Maintenance (See BMPs 5-1)

5.7.1	Average frequency of catch basin cleaning (seasonal) (non-commercial/non-arterial streets)	5 days a week
5.7.2	Average frequency of catch basin cleaning (commercial/arterial or other critical streets)	5 days a week
5.7.3	Total number of structures cleaned	1100
5.7.4	Storm drain cleaned	1,000 LF
5.7.5	Qty. of screening/debris removed from storm sewer infrastructure	1050 tons
5.7.6	Disposal or use of debris (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Stoughton LF
5.7.7	Cost of screening disposal	NA
5.7.8	Average frequency of street sweeping (non-commercial/non-arterial streets)	6 days a week
5.7.9	Average frequency of street sweeping (commercial/arterial or other critical streets)	6 days a week
5.7.10	Qty. of sand/debris collected by sweeping	2025 tons
5.7.11	Disposal or use of sweepings (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Stoughton LF
5.7.12	Cost of sweeping disposal	NA
5.7.13	Street sweepers purchased/leased	1
5.7.14	Street sweepers specified in contracts	0
5.7.15	Reduction in application on public land of: ("N/A" = never used; "100%" = elimination) Fertilizers (State regulations require applicators (license which City does not currently have)	100%
	Herbicides	None
	Pesticides	None

5.7.16 Anti/De-Icing precuts and rations

5000 gallon tank

5.7.17 Pre-wetting techniques utilized

5.7.18 Manual control spreaders used

5.7.19 Automatic or Zero-velocity spreaders used

5.7.20 Estimated net reduction in typical year salt application

5.7.21 Salt pile covered

Salt 98%

Sand 2%

CaCl<sub>2</sub> 100 gals/30 tons

CaCl<sub>2</sub>-100%

Yes

No

Yes

15%

Yes

## ATTACHMENT 1

### Summary of Key Project Activities Phase 2: MS4 Stormwater Program City of Malden

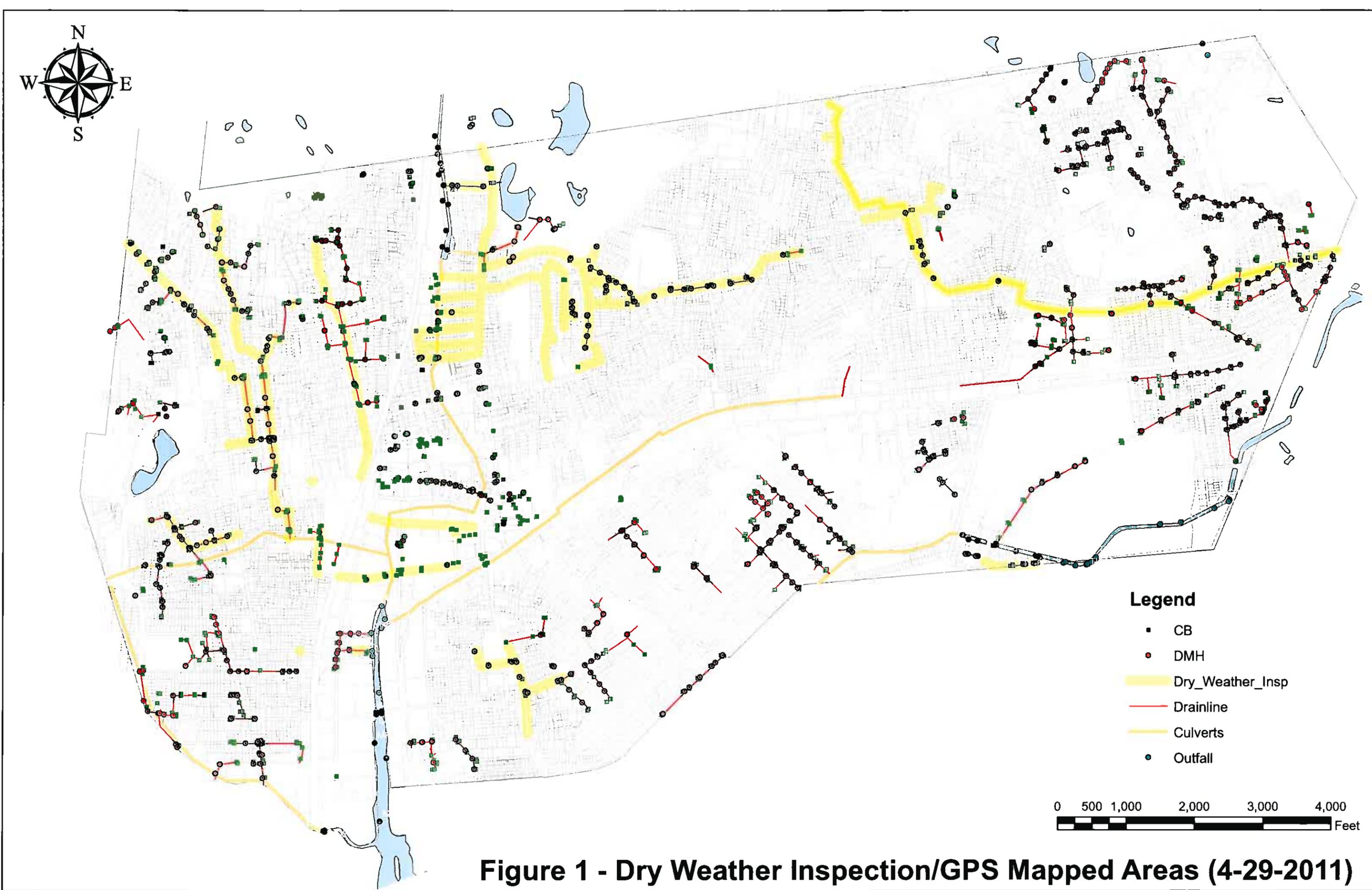
1. Development of a formal Compliance team structure and assignment of responsibilities.
2. Regularly scheduled meetings with Compliance team members and municipal departments.
3. Review of Federal, State, and local guidance pertaining to the development of stormwater management ordinances. Submission of recommended documentation to the City Council which became effective April 2009.
4. Evaluation for NPDES Phase II program objectives and preparation of annual MS4 General Permit Report.
5. Acquisition of necessary software and field equipment to support ongoing GIS mapping and electronic file management program.
6. Development of GIS mapping for infrastructure, resources, topography, maintenance/repair activities, and illicit discharges.
7. Integration of comprehensive catch basin (CB) inspection, inventory, and mapping system into the City catch basin cleaning program
8. 2,313 catch basins & manhole structures were cleaned, inspected and inventoried
9. Representatives MDPW had participated in the cleanup of Town Line Brook with local Watershed Association.
10. Implemented a targeted dry weather manhole inspection program.
11. Performed dry weather sampling to isolate culverted surface waters and potential illicit discharges.
12. Conducted Public Education and Outreach in the areas of SSOs and illicit discharges.
13. Reviewed in-house engineering plans for potential SSOs and sewer underdrains
14. Performed site inspections to investigate documented former SSO connections and underdrains.
15. Investigated and resolved data gaps pertaining to the mapping, conveyance capacity and functionality of drainage system components
16. IDDE Plan development and Implementation
17. Conducted an assessment of the Capacity, Management, Operation, and Maintenance (CMOM) issues for the municipal sanitary sewer infrastructure.
18. Purchase and maintenance of a Trash Boom for the headwaters of the Malden River at Charles Street.
19. Installation of a second Trash collection boom-within the Malden River, downstream of the initial boom

## ATTACHMENT 1 (continued)

20. A Draft City of Malden Sewer System Capacity, Management, Operation and Maintenance (CMOM) Corrective Action Plan was submitted on October 29, 2009 for USEPAs review and approval. This Corrective Action Plan was developed through numerous meetings with City Engineering staff, NCA and discussions with the City's principal engineering consultant for the sewer system, Fay, Spofford and Thorndike, Inc. (FST).
21. In accordance with the provisions of the AO, a compilation of the information pertaining to the operation and maintenance of its municipal sewer system has been placed on file with the City of Malden Engineering Department. A Capacity, Management, Operation and Maintenance (CMOM) Program document was prepared through the collaborative efforts of the Engineering Department, NCA and FST, and was submitted to US EPA on 30 November 2009.
22. Acquisition of a municipal street sweeper
23. A Jet truck was purchased by the City, which will be used to reduce blockages, cleaning of lines and assist in system evaluation.
24. To provide additional capacity to the existing sewer system and to address the concurrent goals of the City's IDDE Plan, a total of 108 sump pumps, which formerly discharged to the municipal system have been removed.
25. The City is performing a capacity assessment of its wastewater collection system. This involves development of a dynamic hydraulic model of the City's wastewater collection system to evaluate the interceptor sewers and to support the capacity assessment. In the spring of 2010, 20 flow meters were installed at key locations within Malden's sewer system further the City has coordinated with the MWRA and obtained integral flow meter data, collected from 2005 through 2010, for the 8 MWRA meters in the City. The City's flow metering program and meter data obtained from the MWRA will be used to calibrate the proposed hydraulic models to develop accurate baseline conditions.
26. Completion of the final phase of the SSES citywide flow isolation program. The results obtained from Phase 3 of this SSES program which are being used to develop contracts for the next phase of the I&I removal program, which are expected to be executed in the summer of 2011.
27. As a part of Phase 3 SSES activities, approximately 37,000 linear feet of sewer lines were cleaned utilizing a jet truck
28. During the completion of work during Phase 3 of the SSES program, a section of eight (8) inch vitrified clay (VC) sewer main was found to have collapsed in Huntley Street. To mitigate this condition, 28 feet of sewer main was replaced.
29. Purchased Emergency spill kits for all storm water crew vehicles and supervisor vehicles.
30. Worked with FEMA to itemize and formulize a reimbursement procedure and protocol during state of emergency storm events.
31. Attended Municipality Steering Committee meetings involving Mystic River Water Shed Association.

**ATTACHMENT 2**

**BMP 2-4: Supporting Documentation**



**Figure 1 - Dry Weather Inspection/GPS Mapped Areas (4-29-2011)**

**ATTACHMENT 3**

**BMP 3-1: Supporting Documentation**

**CITY OF MALDEN  
STORM WATER PROGRAM**

**OUTFALL TL-0**

**MALDEN ENGINEERING & WATERWORKS**

**CONTACT:**

**781-397-7040 Weekday Business Hours**

**781-397-7160 Evenings, Weekends, Holidays**

10" wide x 8" high x .063 thick Aluminum sign

Graphics shown will change in the red area as per customer provided text.

54 Total---\$ 945.00 installed by customer

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60 SHARON ST. ▲ MALDEN, MA 02148 ▲ 781-322-3785

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SALESMAN  
**Paul D**

DRAWN BY  
**EWS 09/11/09**

CUSTOMER  
**Malden DPW**

SCALE  
**AS SHOWN**

APPROVED BY

**ATTACHMENT 4**

**BMP 3-2: Supporting Documentation**

**Table 1.0 Dry Weather Conditions - Miscellaneous Laboratory Testing**

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	Nitrogen, Ammonia (mg/L)							Surfactants, MBAS (mg/L)							E. Coli (MF) (col/100ml)											
	350.1							425.1							9213D											
	ACTION LEVEL-0.5 mg/L							ACTION LEVEL-0.1 mg/L							ACTION LEVEL- 235 col/100ml											
	09/12/06	09/11/07	06/25/09	8/6/2009	7/29/2010	8/4/2010	8/31/2010	09/12/06	09/11/07	06/25/09	8/6/2009	9/21/2009	7/29/2010	8/4/2010	8/31/2010	09/12/06	09/11/07	9/24/2008	4/17/2009	6/25/2009	8/6/2009	7/29/2010	8/4/2010	8/10/2010	8/31/2010	
<b>Malden River</b>																										
MR-0	0.176	ND (0.40)	-	-	ND (0.075)	-	-	ND (0.05)	0.05	-	-	-	0.07	-	-	150	1100	-	68	-	-	110	-	-	-	-
MR-1	-	2.96	-	-	ND (0.075)	-	-	-	ND (0.05)	-	-	-	0.06	-	-	-	160	-	-	-	-	130	-	-	-	
Saint Mary St. <sup>1</sup>	-	ND (0.40)	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	-	
LSP-0-Channel <sup>2</sup>	-	ND (0.40)	-	-	-	ND (0.075)	-	-	ND (0.05)	-	-	-	-	ND (0.05)	-	-	460	-	-	-	-	10,000	-	2,000	-	
LSP-4	-	-	-	-	-	ND (0.075)	-	-	-	-	-	-	0.45	-	-	-	-	-	-	-	-	14,000	-	2,000	-	
LSP-5.1-Channel <sup>2</sup>	-	ND (0.40)	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	630	-	-	-	-	-	-	-	-	
LSP-10-Channel <sup>2</sup>	-	ND (0.40)	-	-	-	ND (0.075)	-	-	ND (0.05)	-	-	-	-	ND (0.05)	-	-	350	-	-	-	-	4900	-	-	-	
C39-MH0.1	-	-	-	0.416	-	-	-	-	-	-	0.41	-	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	
E2-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	
E2-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	
H16-MH13	-	-	-	-	ND (0.075)	-	-	-	-	-	0.93	-	-	-	-	-	-	-	-	-	25	-	-	-	-	
H16-MH17	-	-	0.432	0.495	-	-	-	-	-	0.06	0.44	-	-	-	-	-	-	-	ND (2.0)	ND (2.0)	-	-	-	-	-	
H25-MH2	-	-	0.556	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	
M3-CB30	-	-	-	-	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	
M3-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	-	
M3-MH4	-	-	-	-	-	-	7.52	-	-	-	-	-	-	ND (0.25)	-	-	-	-	-	-	-	-	-	2,400	-	
M8-MH3	-	-	-	0.424	-	-	-	-	-	-	0.27	-	-	-	-	-	-	-	5100	ND (2.0)	-	-	-	-	-	
M26-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
P36-MH5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3500	-	-	-	-	-	-	-	-	
R18-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	290	-	-	-	-	-	
S29-MH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96	-	-	-	-	-	-	-	-	
W25-MH1	-	-	-	0.264	-	-	-	-	-	-	0.08	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	
<b>Little Creek</b>																										
LC-0	0.687	ND (0.40)	-	-	0.518	-	-	ND (0.05)	ND (0.05)	-	-	-	0.06	-	-	7	140	-	ND (2.0)	-	-	190	-	-	-	-
<b>Town Line Brook</b>																										
TL-0 <sup>3</sup>	0.561	ND (0.40)	-	-	0.253	-	-	ND (0.05)	ND (0.05)	-	-	-	ND (0.05)	-	-	1500	280	-	62	-	-	730	-	-	-	-
TL-1	0.085	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	
TL-5	-	-	-	-	-	0.769	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	2400	-	-	-	
TL-9	3.49	-	-	-	-	1.16	-	ND (0.05)	-	-	-	-	-	ND (0.05)	-	640	-	-	-	-	-	8200	-	-	-	
TL-13	0.16	ND (0.40)	-	-	-	-	-	ND (0.05)	ND (0.05)	-	-	-	-	-	-	30	70	-	-	-	-	-	-	-	-	
TL-24	0.172	4.72	-	-	-	0.256	-	ND (0.05)	0.92	-	-	-	-	0.05	-	520	1500	-	-	-	-	24,000	-	-	-	
TL-BL-EV	0.121	0.654	-	-	-	-	-	ND (0.05)	0.11	-	-	-	-	-	-	440	740	-	-	-	-	-	-	-	-	
S3-MH12 <sup>3</sup>	-	0.774	-	-	-	-	-	-	0.09	-	-	-	-	-	-	-	2200	-	-	-	-	-	-	-	-	
L23-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	
<b>Saugus Branch</b>																										
MR-2	-	ND (0.40)	-	-	ND (0.075)	-	-	-	ND (0.05)	-	-	-	0.05	-	-	-	ND (2.0)	-	-	-	-	220	-	-	1,100	
Broadway/Eastern <sup>4</sup>	-	ND (0.40)	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	140	-	-	-	-	-	-	-	-	
<b>Linden Brook</b>																										
C36-MH1	-	-	-	-	0.195	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	160	-	-	-	
D17-MH1	-	-	-	-	0.077	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	1200	-	360	-	
H43-MH1	-	-	-	-	0.122	-	-	-	-	-	-	-	0.07	-	-	-	-	-	-	-	-	1600	-	2400	-	
P24-MH1	-	-	-	-	0.097	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	96	-	-	-	
V1-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	
W26-MH1	-	-	-	-	0.119	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	180	-	-	-	

File No. 465.08

<sup>1</sup>2007 samples collected 9/25/07

<sup>2</sup>2007 samples collected on 6/21/07

<sup>3</sup>2007 samples collected 7/12/07

<sup>4</sup>2007 samples collected 9/12/07

**ATTACHMENT 5**

**BMP 3-3: Supporting Documentation**

# **CITY OF MALDEN**

## **Illicit Discharge Detection and Elimination Program Semi-Annual Status Report**

February 2010 - July 2010

Prepared by:

**Nangle Consulting Associates, Inc.**

960 Turnpike St  
Canton, MA 02021

and

**City of Malden Engineering Department**

200 Pleasant Street  
Malden, Massachusetts

File No. 465.09

## **TABLE OF CONTENTS**

1.0	Introduction	1
2.0	Documented Illicit Discharges and Connections	1
3.0	IDDE Activities February – July 2010	2
3.1	Targeted Dry Weather Inspection / Sampling Program (NCA)	3
3.2	Drainage System Mapping-IDDE Inspection Program (MDPW)	6
3.3	Drainage System Maintenance/Repair (MDPW)	7
4.0	Sanitary Sewer Overflows (SSO's)	7
5.0	Evaluation of IDDE Program Goals and Objectives	8

## **APPENDICES**

Appendix A	MS4 Annual Status Report
Appendix B	SSO Reports
Appendix C	MyRWA March 2010 Dry Weather Sampling Report

## **1.0 INTRODUCTION**

In accordance with the provisions of the City of Malden Illicit Discharge Detection and Elimination (IDDE) Program, this semi-annual status report has been prepared through cooperative efforts by the City of Malden Engineering Department, the City of Malden Department of Public Works (MDPW) and the firm of Nangle Consulting Associates, Inc. (NCA). Past sampling of storm drain outfalls in various portions of the City have revealed that levels of bacteria, indicative of potential sewage discharge are present at several locations, particularly during wet weather conditions. The source of these elevated levels is believed to be primarily due to aged infrastructure, however the potential for illicit discharges to the City's storm drain system must be acknowledged. Accordingly, an IDDE plan was prepared to enable the implementation of a systematic program to assess the storm drainage infrastructure for the presence of illicit discharges.

Working in concert with the City Engineering and Public Works Departments, an IDDE program has been developed that integrates a number of the necessary tasks into the routine storm drain system maintenance and service program being conducted by the Public Works Department. This report has been prepared to document and summarize the IDDE activities that have been undertaken by the City during the February 2010 through July 2010 reporting period. Utilizing the data and information obtained, an updated work plan of prioritized tasks for the next 6 month period has also been prepared and is included within Section 5.0 of this report.

## **2.0 DOCUMENTED ILLICIT DISCHARGES AND CONNECTIONS**

During this reporting period, two (2) illicit discharges were identified. A summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0. On 29 April 2010, the MDPW was notified of an accident at 496 Broadway that involved a release of an unknown amount of hydraulic fluid from an overturned forklift into a drainage system catch basin. At the time of arrival, MDPW personnel could not gain access to the impacted catch basin and as such inspected downstream drainage structures that had revealed flowing stormwater and petroleum odors, however no sheen or floating petroleum product was observed.

Once the accident debris was cleared, the impacted catch basin was accessed and found to contain only sediments with no outlet flow. This basin is located within the Linden Brook watershed. MDPW plugged the basin outlet and installed a temporary berm around the structure to prevent any stormwater intrusion. The responsible party was instructed to engage an environmental clean-up contractor and to provide documentation regarding the clean up to the City. No release condition was reported to the MDEP by the responsible party, which would indicate that the volume of petroleum released was less than the reportable quantity of 10 gallons. According to information provided by the MDPW, the catch basin was cleaned and the plug removed by an environmental cleanup contractor on behalf of the responsible party for the release.

A second illicit discharge was discovered by the Malden Board of Health on 18 May 2010. Sewage was reportedly observed flowing from a pipe emanating from the property at 36 Charles Street that was discharging into the City's storm drain system. An investigation by the MDPW revealed that a temporary pump and piping system had been installed during the March 2010 storm events described in Section 4.0 when a basement sanitary sewer overflow (SSO) had occurred at this location. The temporary piping was disconnected and the discharge was removed on 19 May 2010.

As noted in prior status reports, indications of petroleum sheen had been observed within a manhole located near the property identified as 1081 Fellsway where a historic release of petroleum had been identified and documented within the files maintained by the Massachusetts Department of Environmental Protection (MDEP). During this reporting period a notice was sent the property owner by the City of Malden Engineering Department. An inspection of monitoring wells existing upon the 1081 Fellsway property between the historic release area and the manhole where the sheen had been identified was conducted by a representative of the property owner who has indicated to the City that there were no indications of petroleum observed. The City will continue to monitor and investigate this issue during the next 6 month period.

### **3.0 IDDE ACTIVITIES FEBRUARY 2010 – JULY 2010**

The City of Malden's IDDE program incorporates the use of three (3) primary measures to identify and mitigate illicit discharges to its municipal drainage system which may be described as follows:

- (1) Targeted dry weather inspections by representatives of the Stormwater Compliance Team
- (2) Detailed inspection of the municipal infrastructure during the daily implementation of the catch basin clean-out and drainage system mapping program.
- (3) Response to public, private or governmental agencies reports of possible sudden and/or identified discharge to the municipal storm system.

As described in the City's 2009 IDDE work plan, targeted dry weather inspections are driven in large part by the results of dry and wet weather sampling at outfalls which discharge to surface water conveyances, principally the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. To provide a basis for the iterative dry weather inspection program and the observations recorded during this reporting period, the following excerpts from the City's IDDE work plan describes the methods and prioritization procedure maintained for this ongoing mitigation measure;

- Based upon the initial outfall monitoring data obtained, the City is currently implementing a Rapid-Assessment Prioritization approach through the targeted assessment of dry-weather flows in several areas within the City. Specifically the major tributaries to the most significant volume dry weather discharges to the Town Line Brook and the Malden River have been identified and sampled at key junction locations to initially determine the dry weather contributions from adjacent communities through major flood control infrastructure that is routed through the City of Malden.

By design, the observations recorded during each regulatory period and corresponding recommended work plan tasks serve to update or modify the original IDDE work plan to meet its overall goals. More specifically, the IDDE program maintained by the City is an iterative and evolving effort that contains the capability and flexibility to implement water quality enhancement measures as needs are identified.

As described in further detail within Section 3.2 of this status report, the City of Malden, has invested significant time and capital funding to develop a Stormwater Compliance Team compiled of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group includes the systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, identification and response to illicit discharges, posting of outfall signage and general system maintenance. An overview of this program, which has been developed by the City to meet the objectives of the Stormwater Compliance Team, is provided in the following excerpt from the City's Annual NPDES Stormwater Discharge Permit (MS4) Report, a copy of which is included as Appendix A.

The City has recently hired additional staff for the Public Works Department to advance the objectives of the Stormwater Compliance Team. In addition, a vehicle has been retrofitted and is equipped with the necessary items to support IDDE implementation. A trained crew has also been established to aggressively maintain the catch basin cleaning, inspection and data collection program. This crew has been assigned to work with NCA and the Malden Engineering Department in meeting the objectives of the IDDE plan implementation and has been responsible for the identification of numerous water main leaks, resolution of illicit connections and repair of infrastructure components, all of which is directed towards the improvement in the quality of the City's stormwater discharges.

Through communication during regular department head meetings, public outreach, postings of signage and daily practices, a general awareness of the need for response to illicit discharges has been developed as the third component of the City's IDDE program. Contact information is readily available through a variety of media to ensure implementation of appropriate response measures by members of the Stormwater Compliance Team.

### **3.1 Targeted Dry Weather Inspection/Sampling Program (NCA)**

Representatives of NCA and MDPW personnel conducted regularly scheduled targeted inspections of the City's infrastructure. Areas selected for inspection are based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. Dry weather inspections conducted during this reporting period have not revealed any illicit discharges or connections. A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. It should be noted that areas inspected by DPW staff for illicit connections/discharges include all those areas where infrastructure has been located and that the targeted areas depicted on Figure 2 represent a subset of the total area that has been inspected to date. During the course of the dry weather inspections, a number of dry

weather flows, consisting primarily of waterline leaks and culverted surface waters have been identified. A summary of these dry weather flows within the municipal system that have been identified to date is provided on Figure 3, and are described as follows.

- Flow 1 – City of Medford water line leak (removed).
- Flow 2 – Groundwater breakout near St. Mary’s Street
- Flow 3 – Fellsmere Reservation base flow
- Flow 4 – Malden River surcharge (submerged invert)
- Flow 5 – DCR Spot Pond Brook base flow
- Flow 6 – Base flow, Forestdale-Pine Banks Park
- Flow 7 – Groundwater breakout, illicit discharge (removed 8/09), Flow 8
- Flow 8 – Waterline Leak (under investigation)
- Flow 9 – Groundwater breakout
- Flow 10 – Linden Brook base flow

As shown, with the exception of water line leaks (Flow 1, Flow 8) and the illicit discharge that contributed to Flow 7, the remaining dry weather flows have been determined to be either base flow from culverted surface waters, or groundwater breakout from higher elevations. No illicit discharges were identified within this portion study area during this reporting period during either the targeted or routine (Section 3.2) inspection program.

Consistent with the original objectives of the IDDE program, the initial focus of this effort was directed towards those portions of the infrastructure that discharge to the Malden River. Monitoring has also been performed within Town Line Brook and more recently the City has begun to expand the dry weather inspections and evaluation to Linden Brook. Key observations and/or conditions that have been identified and are further supported by the tasks completed during this reporting period are summarized below.

**Malden River**

- There is significant base flow during dry weather thorough culverted channels/brooks located in northwestern portions of the City.
- No significant contribution from tributary drainage areas within northwestern portions of the City to the culverted surface water flows have been identified to date other than waterline leaks.
- Dry weather monitoring has revealed elevated bacteria levels in surface waters upstream of the City of Malden within the Spot Pond Brook Channel at Oak Grove.
- Recent dry weather sampling at the upstream headwall of the Malden River and the Little Creek headwall at Rivers Edge Drive have revealed low levels of

bacteria, below the 235 col/100 ml action level. This data is generally consistent with historic dry weather data at these sampling locations.

- Historic monitoring of the Saugus Branch Brook outfall to the Malden River has not revealed any significant indications of bacteria contributions.

Based upon the data and information obtained to date, it appears that there are limited dry weather bacterial contributions to the Malden River from northwestern portions of the City and in areas in Malden to the west of the Malden River within the Little Creek/West End Culvert watershed.

### **Town Line Brook**

- Base flow conditions exist within Town Line, which emanate from culverted flows that originate in the Town of Everett and as discussed further below, are tidally influenced.
- During this reporting period significant tidal influences in the form of an approximate an 2-3 foot change in surface water elevation were observed from Broadway and over the remaining length of the culvert to the Revere City line. Typically, these flows have been controlled by tidal gates and the further evaluation of this condition with representatives of the City of Revere will be performed if necessary.
- While the historic monitoring has revealed relatively uniform E. Coli levels during dry and wet weather sampling events, minor exceedances (600 – 700 col/100 ml) of the threshold criteria have been consistently detected at the Town Line Brook Culvert at Broadway.
- Samples collected from within the culvert at the Malden/Everett City line indicate much higher concentrations of E. Coli bacteria than those observed at the Broadway end of the culvert suggesting bacterial source contributions from Everett.
- Consistent indications of dry weather bacteria contributions from at outfall TL-9, which serves the lower portion of Hadley Street and the City of Everett, have been observed.
- Consistent indications of elevated dry weather bacteria levels at TL-24 at the Trifone Brook discharge to Town Line Brook have been observed.

Based upon the data obtained to date, three major sources of dry weather bacteria loading to the open channel portion of Town Line Brook have been identified including culverted base flows from the City of Everett, discharges from storm

drainage within lower Hadley Street (TL-9), and from Trifone Brook (TL-24). During prior reporting periods a targeted mass balance sampling of dry weather flows in Hadley Street was performed which revealed that this contribution (TPL9) was originating in the City of Everett.

### **Linden Brook Culvert**

As described previously, the initial focus of IDDE efforts was directed towards the Malden River and Town Line Brook, and during this reporting period the evaluation of dry weather conditions have progressed in an easterly direction including the Linden Brook Culvert, which is the major stormwater conveyance structure in northeastern portions of the City. A dry weather inspection was recently completed and base flow was observed throughout the culvert at that time. Five locations along the length of the culvert were sampled and higher levels of E. Coli were detected within interior areas (Dodge and Mingo Streets), in contrast to the low levels detected within the culvert upstream and downstream of these locations. It was proposed to sample six (6) locations within the culvert; however no openings in the culvert could be located at the time of sampling just prior to the Malden/Revere City line. An inspection of tributary drainage lines in the area of Dodge and Mingo at the time of sampling did not reveal any dry weather flows discharging to the culvert. During the next reporting period it is proposed to target this area for further evaluation.

## **3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)**

The City is currently in the process of converting and updating its current storm drain system mapping to GIS format using field GPS receivers. Drainage infrastructure is located and inventoried as a part of ongoing system wide maintenance, service and inspection program being implemented by the MDPW. A map of the infrastructure located to date is presented as Figure 4. During routine maintenance activities, structures are located and key attributes of the systems features are recorded. Information pertaining to the structure type, condition, inlet/outlet size(s) and type(s) and workability are recorded.

The information collected by MDPW is continually compiled in a GIS stormwater drainage system database. Further, information collected during this process can also be utilized by MDPW to prioritize repairs and assist in Capital Improvement Planning. Consistent with the goals of IDDE plan implementation a majority of key drainage tributaries in west Malden that discharge to the Malden River, have been mapped and inventoried. As indicated in prior IDDE documentation, the City of Malden is also currently implementing a strategic GIS Implementation plan with the assistance of the firm of Camp, Dresser and McKee, Inc.

During this data collection process, MDPW personnel are also inspecting drainage system components for indications of dry weather flow as well as illicit discharges or connections. Upon encountering any indications of the potential for illicit

discharges to the storm drain system, the MDPW personnel notify engineering personnel to investigate. As described in Section 2.0, only two (2) illicit discharges has been identified during this reporting period.

### **3.3 Drainage System Maintenance/Repair (MDPW)**

In addition to the inspection and mapping program, during this reporting period MDPW personnel performed the following drainage system maintenance/repair activities.

- Cleaned 350 catch basins
- Cleaned 200 drain manholes
- Rodded 1,300 feet of laterals
- Repaired 17 catch basins
- Repaired a collapsed set of laterals proximate to 80 Lyme Street

In addition to work completed by MDPW, repairs were also made at the following locations by Charles Contracting Inc. during this reporting period:

- Broadway @ Salem Street
- Forest @ Sylvan
- Linwood Street
- Eastern Ave
- Charles @ Pearl
- Crystal Street
- Pleasant Street @ Beebe school

Outfall signage has been installed in accessible areas by the MDPW and the majority of outfall locations have been temporarily marked in the field to facilitate outfall sampling. Permanent signage in remaining areas is currently being installed by MDPW personnel.

## **4.0 SANITARY SEWER OVERFLOWS (SSO'S)**

The City of Malden, like numerous other communities served by the Massachusetts Water Resource Authority (MWRA) sewer system, experienced a failure of the regional sewage conveyance network in response to extensive rainfall events in March of 2010. The intensity of these rains and capacity limitations of the MWRA system resulted in sewer manhole surcharges and basement back-ups within the City and eventually led the MWRA to directly discharge untreated wastewater to receiving waters throughout the system including the Malden River.

Two significant rain fall events occurred in March of 2010 that resulted in surcharges within the MWRA regional sanitary sewer system, which in turn resulted in numerous sewage backups within the City. In accordance with the Administrative Consent Order, the USEPA was notified of the SSO's that occurred during each of these storm events. A GIS map depicting the

approximate location of basement and sewer manholes where SSO's occurred during the initial storm event that began in mid-March is presented as Figure 5. As shown, numerous SSO's occurred throughout the City, with the highest density of SSO's occurring in central western portions of the City proximate to the West End/Edgeworth Culvert. Previous inspections in this area have revealed that portions of this culvert have exposed earthen walls and pervious wooden bottoms. Accordingly, it is expected that significant exfiltration of culverted flows contributed to the basement flooding/SSO condition. Conversely, the infiltration of bacteria laden groundwater was likely discharged to the Malden during wet weather conditions. Easterly portions of the culvert have been replaced and the results of the inspection program serve to support CIP recommendations to be considered during the next fiscal planning process.

A second storm event began on 29 March 2010 and the City was notified by the MWRA that previously sealed bypass structures to the Malden River would be opened to mitigate the potential for surcharging within the City. Significant volumes (5-10 million gallons) of waste water were also discharged by the MWRA during this storm event within downstream portions of the system to prevent treatment system damage and mitigate up stream SSO's. As evidence from a review of Figure 6 as compared to Figure 5, a significantly less number of occurrences were reported following the second storm event, which may be due in part to the relief in downstream flow due to emergency measures taken by the MWRA. A listing of all of the SSO locations that was included within the City's notification to USEPA is included within Appendix B of this report. Other than the two storm events described above, no additional SSO's have been identified during this reporting period. A map depicting the location of all prior SSO's that have been identified to date is presented as Figure 7.

## **5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES**

To date, the results of the IDDE program continue to support the opinion that wet weather contributions, or infiltration/exfiltration during high rainfall events, represent the majority of bacterial loading detected at outfalls to surface waters within the City. As described in prior reports, the foundation for this condition was set once open channel surface waters were culverted by the Department of Conservation and Recreation (DCR) (formerly the Metropolitan District Commission). This flood control/early development program began during the late 1800's and led to the culverting of Spot Pond Brook, West End (Edgeworth) Brook, Linden Brook, and Town Line Brook and Little Creek.

As outlined in the original IDDE work plan, the initial focus of this program was directed towards portions of the City that are tributary to the Malden River, based upon the results of surface water sampling and corresponding ecosystem value. No significant dry weather discharges, other than waterline leaks, have been identified during the inspection of this portion of the City and the results of dry weather sampling obtained to date support these observations. It is also to be noted that representatives of (Mystic River Watershed Association) MyRWA reported similar indications of low bacteria levels at Malden River sampling locations, as described in Appendix C. Indications of significant increases in E. Coli levels during wet weather events have been quantified at Little Creek, (8700 vs. 190 col/100 ml) and at the outlet for the Saugus Branch Brook DCR drainage channel (9200 vs. 220 col/100 ml). Conversely, relative uniform levels have been observed for Town Line Brook at Broadway (610 – 730

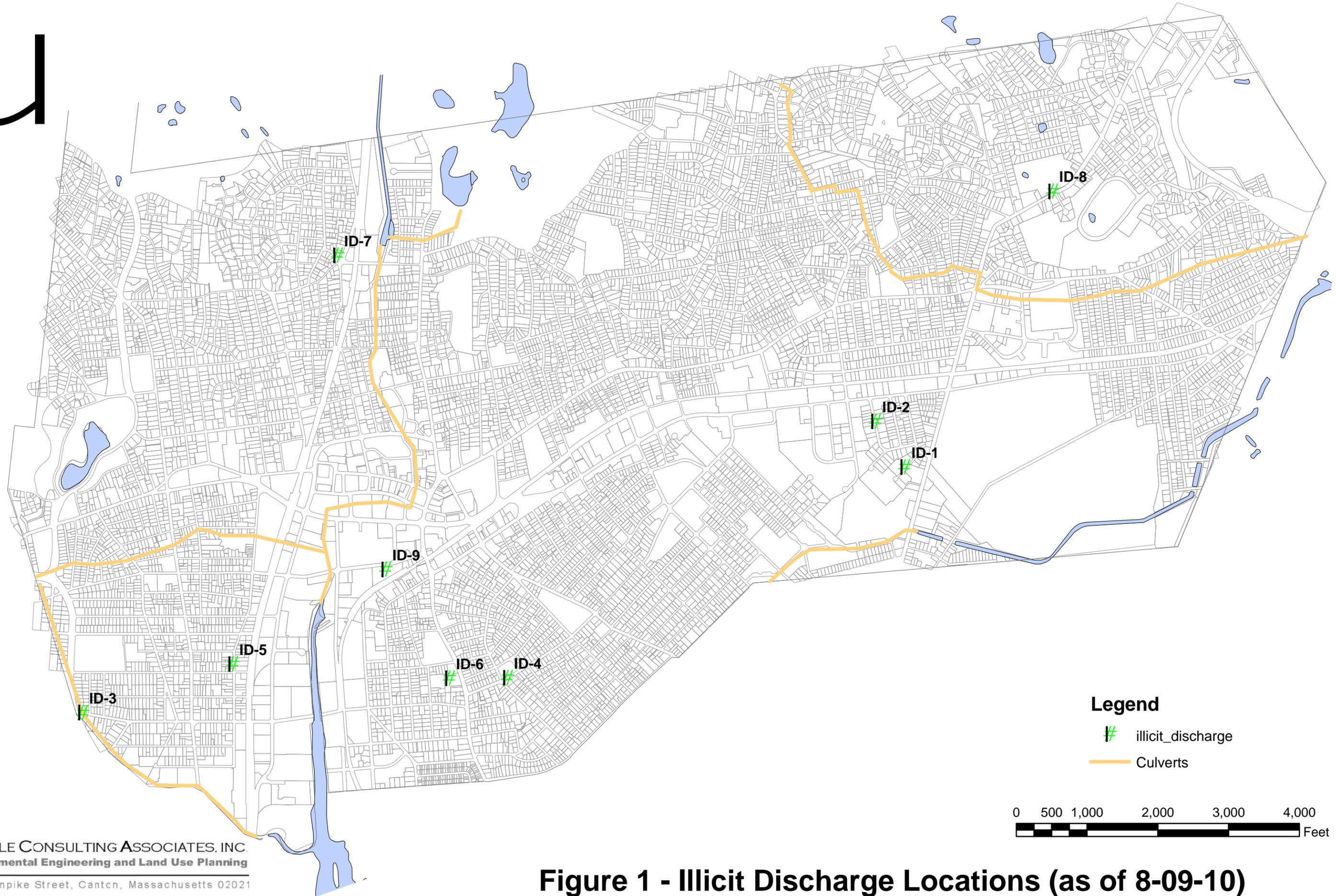
col/100ml) during both wet and dry weather sampling events. Relatively uniform trends between dry and wet weather sampling events have also been observed at Oak Grove.

Further insight to the causal factors contributing to the wet weather trends observed has been provided by the failure of the regional sewage network during this reporting period, particularly within the Edgeworth section of Malden. The proximity of SSO's within Central Malden to regional connections is also of note, and during the next reporting period targeted dry weather inspections and mass balance sampling during wet weather conditions will be undertaken to investigate these conditions in further detail. It is proposed to continue dry weather sampling at LSP10 and MR-0 to confirm lack of significant dry weather contributions from the City of Malden to the Malden River via the Lower Spot Pond Brook Culvert. In accordance with the overall goals and objectives of the IDDE program, targeted dry weather inspections will also be performed in north central portions of the City and in the area of Linden Brook to continue the upstream – downstream procedure for flow isolation.

During the reporting period the City has greatly advanced its capacity to meet the goals of the IDDE program through the development of a dedicated stormwater team. As described in further detail within Appendix A, each member of the Compliance Team has been trained in the use of field mapping equipment and the guidance provided in the IDDE work plan. Building upon the foundation established during previous reporting periods and ongoing implementation of the City wide GIS system, IDDE plan implementation is now an integral component of daily activities.

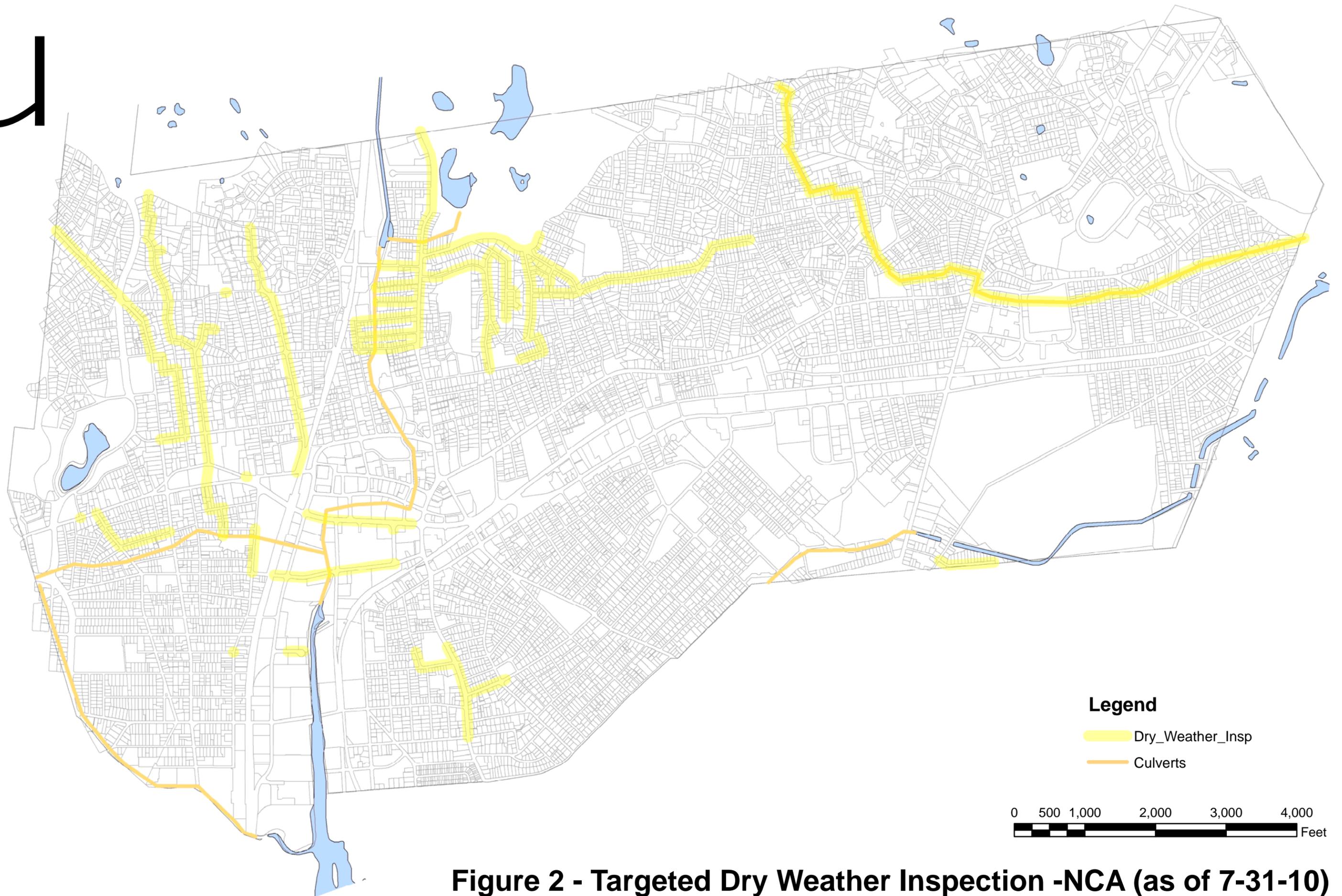


N



**Figure 1 - Illicit Discharge Locations (as of 8-09-10)**

N



**Figure 2 - Targeted Dry Weather Inspection -NCA (as of 7-31-10)**

N

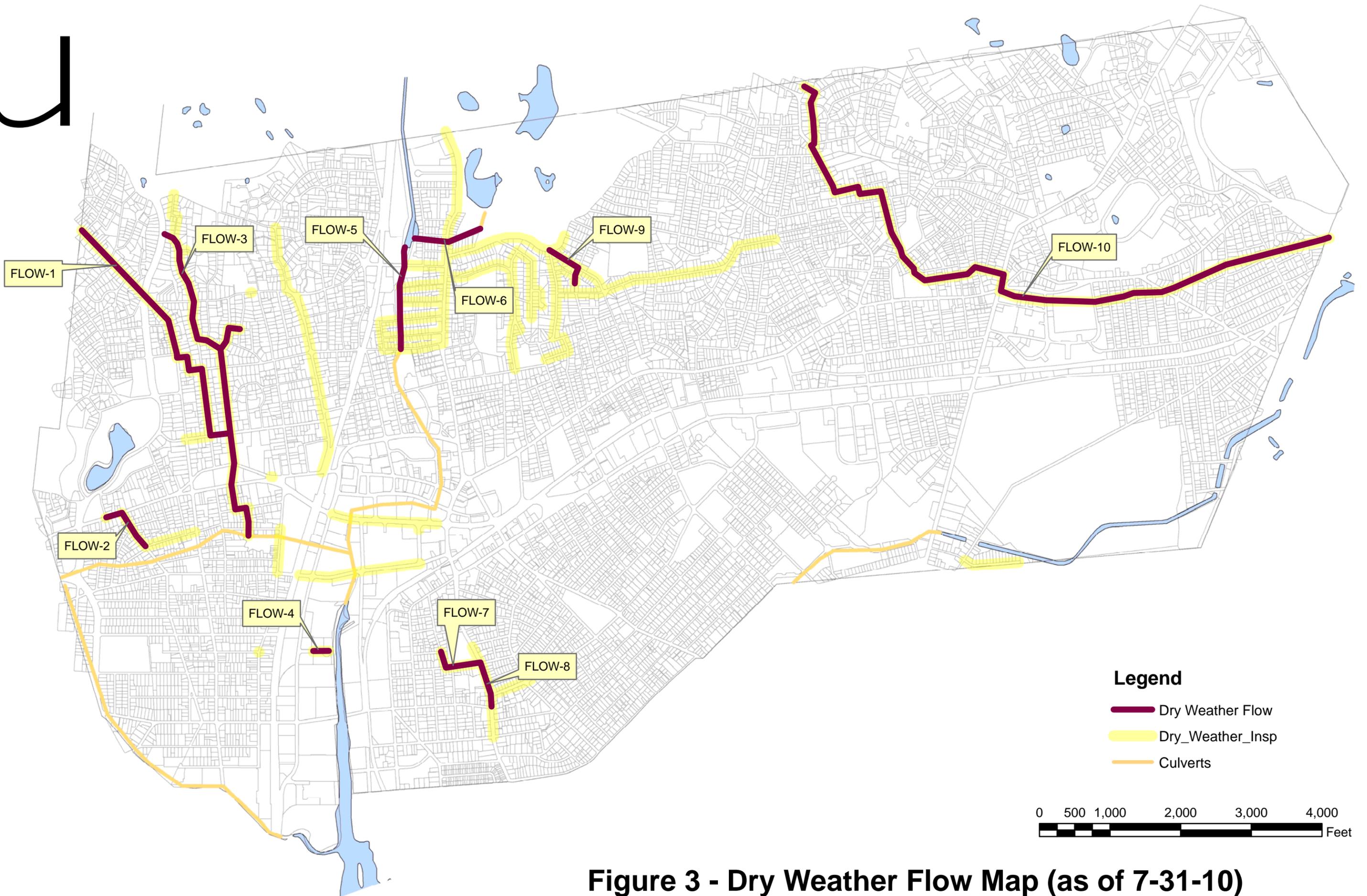
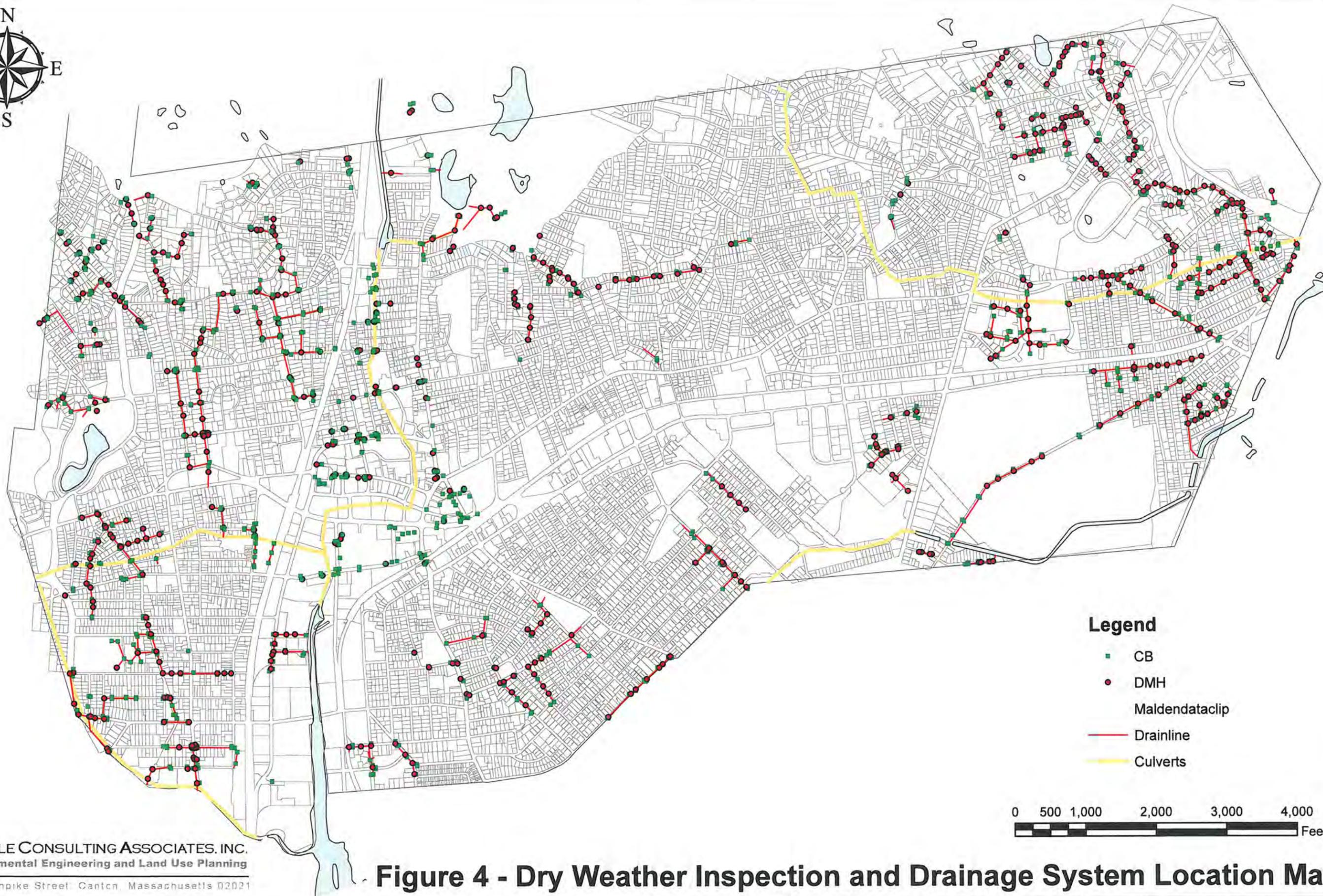


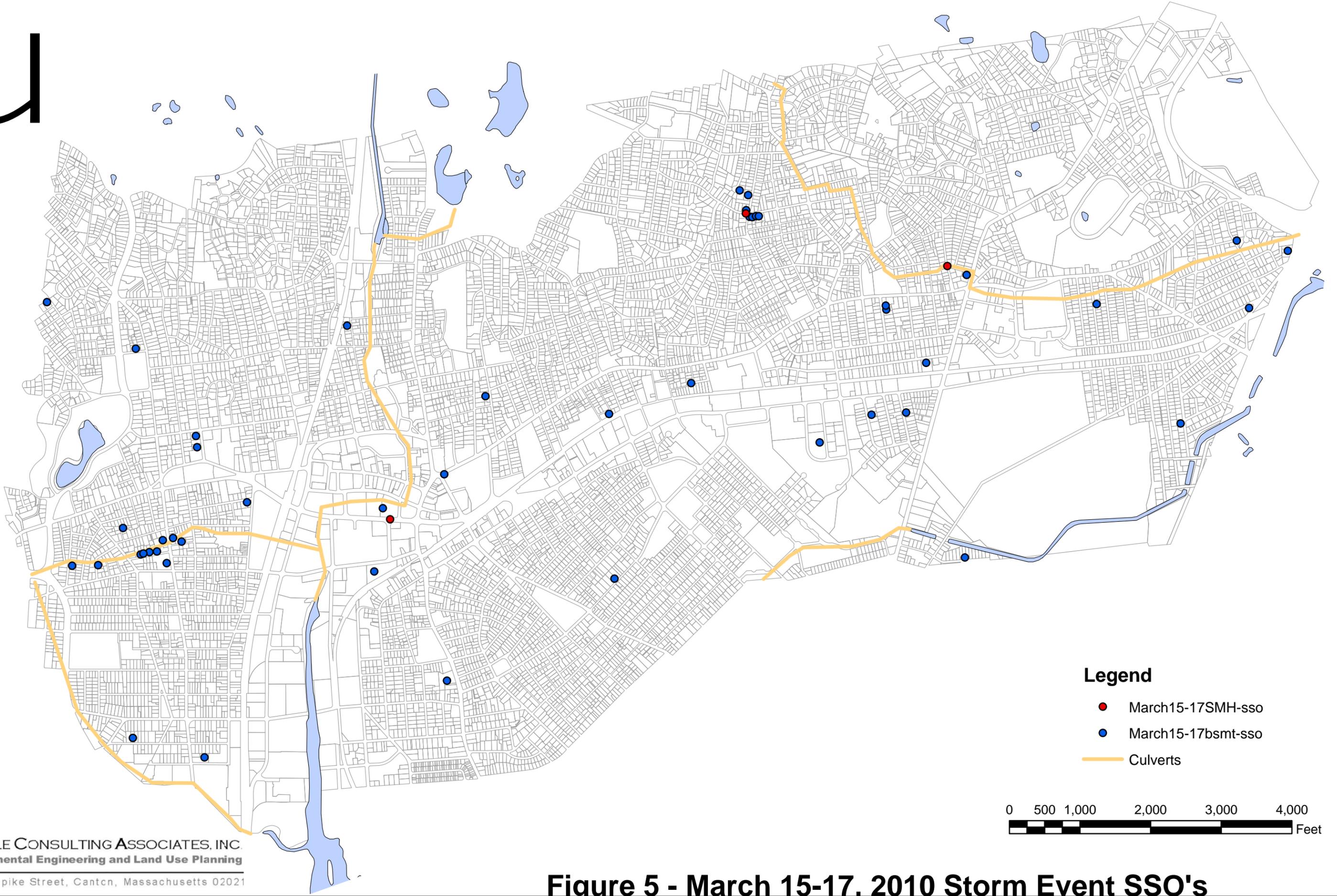
Figure 3 - Dry Weather Flow Map (as of 7-31-10)



**NANGLE CONSULTING ASSOCIATES, INC.**  
Environmental Engineering and Land Use Planning  
960 Turnpike Street, Canton, Massachusetts 02021

**Figure 4 - Dry Weather Inspection and Drainage System Location Map**

N



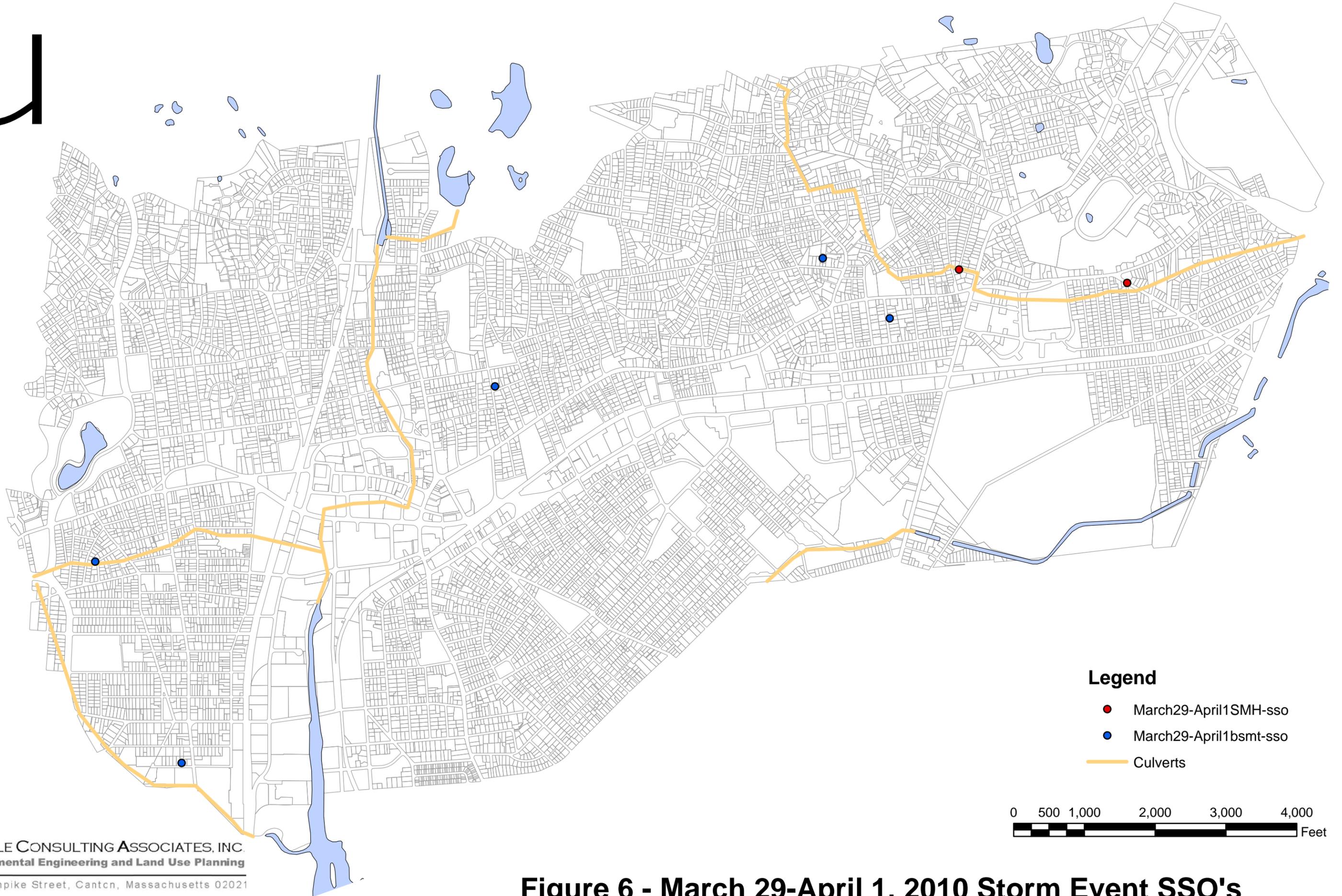
**Legend**

- March15-17SMH-ss0
- March15-17bsmt-ss0
- Culverts



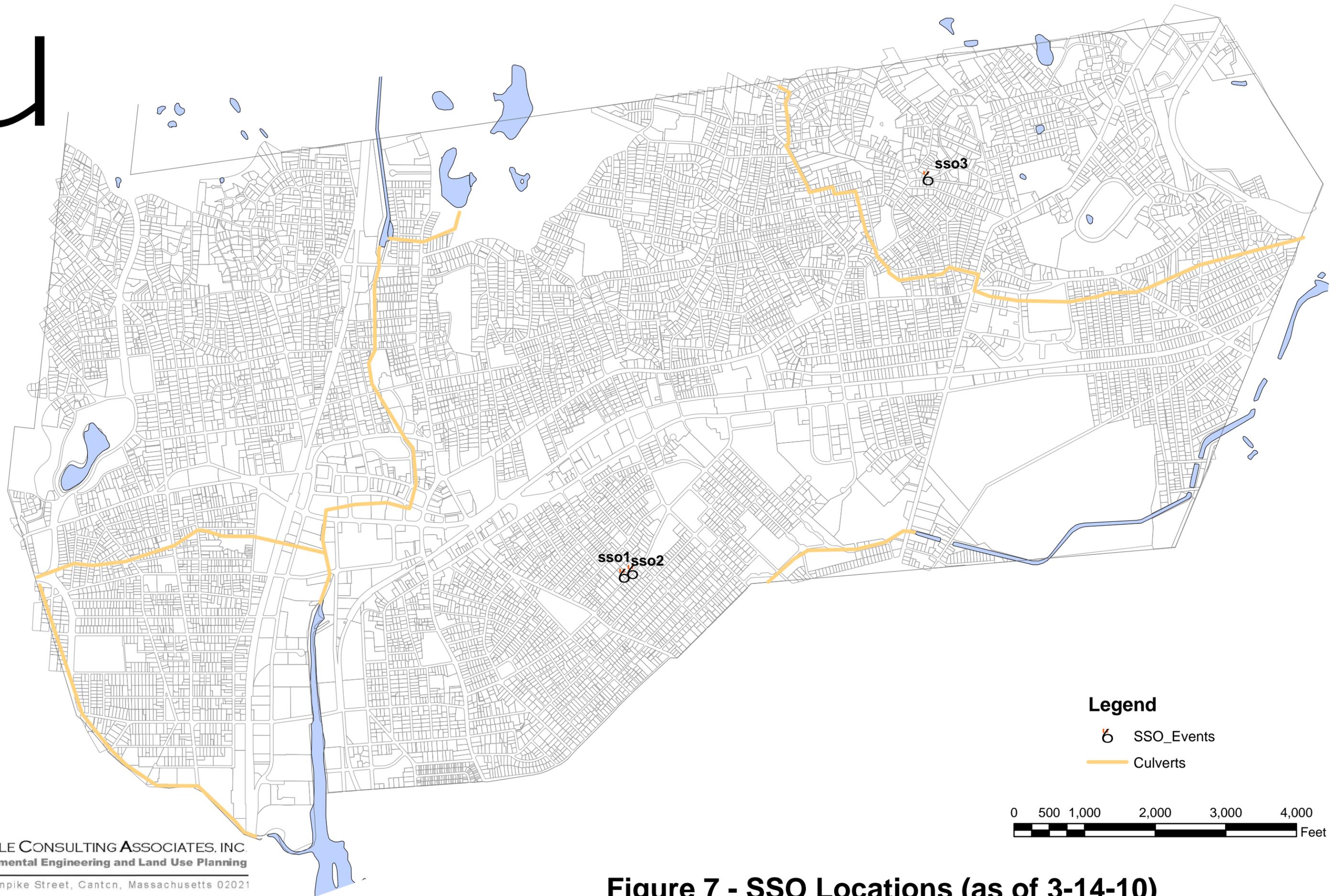
**Figure 5 - March 15-17, 2010 Storm Event SSO's**

H



**Figure 6 - March 29-April 1, 2010 Storm Event SSO's**

N



**Figure 7 - SSO Locations (as of 3-14-10)**

# **CITY OF MALDEN**

## **Illicit Discharge Detection and Elimination Program Semi-Annual Status Report**

July 1, 2010 – December 31, 2010

Prepared by:

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Canton, MA 02021

and

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## **TABLE OF CONTENTS**

1.0	Introduction	1
2.0	Documented Illicit Discharges and Connections	2
3.0	Overview of IDDE Activities: July – December 2010	2
3.1	Targeted Dry Weather Inspection / Sampling Program (NCA)	3
3.1.1	Malden River Watershed	4
3.1.2	Town Line Brook Watershed	5
3.1.3	Linden Brook Watershed	6
3.1.4	Saugus Branch Watershed	6
3.2	Drainage System Mapping-IDDE Inspection Program (MDPW)	7
3.3	Inflow Infiltration Sewer System Evaluation & Capacity Analysis	7
3.4	Drainage System Maintenance/Repair (MDPW)	9
4.0	Sanitary Sewer Overflows (SSO's)	10
5.0	Evaluation of IDDE Program Goals and Objectives	11

## **TABLES**

Table 1.0	Summary of Illicit Connections/Discharges Identified as of 12/31/2010
Table 2.0	Dry Weather Conditions – Miscellaneous Laboratory Testing
Table 3.0	Wet Weather Conditions – Miscellaneous Laboratory Testing

## **FIGURES**

Figure 1	Illicit Discharge Locations
Figure 2	Dry Weather Inspection Areas - NCA
Figure 3	Dry Weather Inspection Areas - NCA/MDPW
Figure 4	Dry Weather Flow Map
Figure 5	Lower Spot Pond Brook Outfalls
Figure 6	Malden River Outfalls
Figure 7	Town Line Brook Outfalls
Figure 8	Linden Brook Culvert
Figure 9	Drainage System Mapping
Figure 10	Sewer Survey Plan

## **APPENDICES**

Appendix A	Laboratory Certificates
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## 1.0 INTRODUCTION

In accordance with the provisions of the City of Malden Illicit Discharge Detection and Elimination (IDDE) Program, this semi-annual status report for the period of 1 July through 31 December 2010 has been prepared through the cooperative efforts of the City of Malden Engineering Department, the City of Malden Department of Public Works (MDPW) and Nangle Consulting Associates, Inc. (NCA). This IDDE plan was prepared to enable the implementation of a systematic program to assess the storm drainage infrastructure for the presence of illicit discharges. Since its inception, the City's IDDE program has identified illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages and aided in both the identification of and completion of extensive repairs to the drainage infrastructure. This effort has also supported the City of Malden's GIS mapping and catch basin cleaning/repair program through the integration of dry weather inspections and outfall sampling.

The goals and objectives of this IDDE plan are tied to the historic identification of bacteria levels encountered during the sampling of selected outfalls within the City, particularly during wet weather conditions. The results of dry weather inspections, together with both dry and wet weather sampling have supported the belief that wet weather loadings are tied to the age and condition of the municipal infrastructure, major portions of which were installed during the late 1800's and early 1900's. The integration of the goals of this IDDE Plan into daily work practices by City personnel has enabled the identification of infrastructure deficiencies and direct response mitigation/repair measures have led not only to the removal of illicit connections/discharges but improved flow conveyance to eliminate historic flooding concerns.

The City Engineering and Public Works Departments have coordinated their efforts and together with outside technical assistance, have developed a program that integrates necessary tasks into the routine daily work procedures and general storm drain system maintenance. In addition to the mitigation measures identified above, the results of the IDDE program have advanced the efficiency of capital planning and infrastructure upgrades. This report has been prepared to document and summarize the IDDE activities that have been undertaken by the City during the July 2010 through December 2010 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. Consistent with this, utilizing the data and information obtained, an updated work plan of prioritized tasks for the next 6 month period has also been prepared and is included within Section 5.0 of this report.

## **2.0 DOCUMENTED ILLICIT DISCHARGES AND CONNECTIONS**

During this reporting period, no illicit discharges were identified. A summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0. In addition, target areas for dry weather inspections completed during this reporting period are described in Section 3.2.

## **3.0 OVERVIEW OF IDDE ACTIVITIES (JULY 2010 – DECEMBER 2010)**

The City of Malden's IDDE program incorporates the use of three (3) primary measures to identify and mitigate illicit discharges to its municipal drainage system which may be described as follows:

- (1) Targeted dry weather inspections by representatives of the Stormwater Compliance Team
- (2) Detailed inspection of the municipal infrastructure during the daily implementation of the catch basin clean-out and drainage system mapping program.
- (3) Response to public, private or governmental agencies reports of possible sudden and/or identified discharge to the municipal storm system.

As described in the City's 2009 IDDE work plan, targeted dry weather inspections are driven in large part by the results of dry and wet weather sampling at outfalls which discharge to surface water conveyances, principally the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. To provide a basis for the iterative dry weather inspection program and the observations recorded during this reporting period, the following excerpt from the City's IDDE work plan describes the methods and prioritization procedure maintained for this ongoing mitigation measure;

- Based upon the initial outfall monitoring data obtained, the City is currently implementing a Rapid-Assessment Prioritization approach through the targeted assessment of dry-weather flows in several areas within the City. Specifically the major tributaries to the most significant volume dry weather discharges to the Town Line Brook and the Malden River have been identified and sampled at key junction locations to initially determine the dry weather contributions from adjacent communities through major flood control infrastructure that is routed through the City of Malden.

By design, the observations recorded during each regulatory period and corresponding recommended work plan tasks serve to update or modify the original IDDE work plan to meet its overall goals. The IDDE program maintained by the City is an iterative effort that has displayed the capability to directly implement water quality enhancement measures as needs and concerns are identified.

As described in further detail within Section 3.2 of this status report, the City of Malden, has invested significant time and capital funding to develop a Stormwater Compliance Team compiled of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group includes the systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, identification and response to illicit discharges, posting of outfall signage, general system maintenance and mitigation of environmental conditions of concern as they are being identified.

Through department head meetings, public outreach, postings of signage and daily work practices, a general awareness of the need for response to illicit discharges has been developed as the third component of the City's IDDE program. Contact information is readily available through a variety of media, including mailings and web site postings to ensure implementation of appropriate response measures by members of the Stormwater Compliance Team. Public outreach has also included active participation by the Compliance Team through community workshops, educational presentations and regional watershed meetings.

### 3.1 Targeted Dry Weather Inspection/Sampling Program (NCA)

Representatives of NCA and MDPW personnel conduct regularly scheduled targeted dry weather inspections of the City's infrastructure. Areas selected for inspection are generally based upon the results of the outfall sampling program and/or the identification of dry weather flows by MDPW staff during their routine maintenance and infrastructure locating program. Dry weather inspections conducted during this reporting period have not revealed any illicit discharges, or connections. A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. Areas inspected by DPW staff for illicit connections/discharges consist of portions of the infrastructure addressed by catch basin cleaning program. During this effort, infrastructure components are mapped and the corresponding attributes are located. Overall portions of the municipal infrastructure that have been addressed by the compliance team including the targeted subset areas are summarized on Figure 3.

During the course of the dry weather inspections, a number of dry weather flows, consisting primarily of waterline leaks and culverted surface waters have been identified. A summary of these flows within the municipal system that have been identified to date are shown on Figure 4, and are described as follows.

- Flow 1 – City of Medford water line leak (**removed**)
- Flow 2 – Groundwater breakout near St. Mary's Street
- Flow 3 – Fellsmere Reservation base flow
- Flow 4 – Malden River surcharge (submerged invert)
- Flow 5 – DCR Spot Pond Brook base flow
- Flow 6 – Base flow, Forestdale-Pine Banks Park
- Flow 7 – Groundwater breakout, illicit discharge (**removed 8/09**)
- Flow 8 – Waterline Leak (under investigation)
- Flow 9 – Groundwater breakout
- Flow 10 – Linden Brook base flow
- Flow 11 – LSP-4 dry weather flow

Dry weather flow (Flow 11) was identified during this reporting period. As shown on Figure 4, this flow was identified at an outfall that discharges to the Lower Spot Pond Brook Culvert (LSP-4). It was determined that a portion of this flow was originating from a drainage system located within a housing complex on Elrich Drive. Comprehensive efforts to identify the source of this dry weather flow were performed, however none was identified to date, as site work was constrained by winter weather and this program will continue during the next reporting period. As stated previously, no illicit discharges were identified during this reporting period during either the targeted or MDPW daily inspection program (Section 3.2).

Consistent with the original objectives of the IDDE program, the focus of the dry weather sampling effort was initially directed towards those portions of the infrastructure that discharge to the Malden River. Since that time, the IDDE Program has been expanding to include the Town Line Brook, Linden Brook and the Saugus Branch systems. Key observations and/or conditions that have been identified are summarized below;

### *3.1.1 Malden River Watershed*

As stated, the City initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during sampling events, the City has identified significant base flow to the Malden River during dry weather through culverted channels/brooks located in northwestern portions of the City. This flow includes contributions from the Fells Reservation and Lower Spot Pond Brook Culvert. As shown on Figures 5 and 6, a total of 17 outfalls to the Malden River have been identified to date, three (3) of which have been identified as flowing during dry weather conditions.

During this reporting period, the Stormwater Compliance Team conducted several dry weather sampling events within the Lower Spot Pond Brook Culvert. As shown on Table 2.0 and Figure 5, an elevated E. coli level of 10,000 col/100ml was detected within open channel flow for Spot Pond Brook at the Malden/Melrose line on 8/14/2010. Consistent with this, dry weather monitoring data collected by the Mystic River Watershed Association (MyRWA) in March of 2010 from Ell Pond which is located upstream of this open channel sample location, also revealed elevated E. coli levels (5,654 col/100ml). Historically, E. coli levels as high as 16,640 col/100ml have been reported by MyRWA from their sampling efforts at Ell Pond.

During the 14 August dry weather sample event, an elevated E. coli level (14,000 col/100ml) was also identified at outfall LSP-4, which is located approximately 462 feet downstream of the Malden/Melrose sample location (Figure 5). A targeted investigation of this condition was performed by NCA/DPW personnel, which revealed that a portion of this flow appeared to be emanating from a housing complex located on Elrich Drive. An inspection of the drainage system within the housing complex revealed dry weather flow and water quality samples collected from upgradient drain manholes M3-MH2 and M3-MH4 revealed E. coli levels of 98 and 2,400 col/100ml, respectively. It is to be noted that M3-MH4 is the closest to LSP-4 and based upon field observations, M3-MH2 is the upstream most manhole of the housing complex drainage network. Based upon the volumes of flow at outfall LSP-4 and the upstream sample location (M3-MH2) within the Elrich Drive complex, it appeared that additional contributions were occurring between these two sampling points, however, a detailed assessment of the drainage system by NCA/DPW did not identify any additional dry weather flows. However, during the assessment of this condition, several drain manholes and catch basins were discovered within the housing complex in close proximity to sewer lines. Further investigations will be performed in the spring of 2011 in an attempt to isolate potential dry weather flows. As indicated on Table 2.0, a subsequent sampling of LSP-4 on 31 August revealed a significant decrease in E. coli levels (2,000 col/100ml)

The characterization of wet weather discharges to the Malden River was also conducted by NCA during this reporting period through the collection of wet weather samples on 16 August 2010 from outfalls MR-4, MR-6, LSP-4 and LSP-9. The approximate locations of these sampling points are identified on Figures 5 & 6 and reference to Table 3.0 reveals E. coli levels in the range of 580 - >24,000 col/100ml were detected at outfalls MR-4, LSP-4 and LSP-9.

### *3.1.2 Town Line Brook Watershed*

Town Line Brook begins as surface runoff west of Broadway near the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Base flow conditions exist within Town Line, which emanate from culverted flows that originate in the Town of Everett. Significant tidal influences in the form of an approximate a 2-3 foot change in surface water elevation was observed from Broadway and over the remaining length of the culvert to the Revere City line. As shown on Figure 7, a total of 29 outfalls to Town Line Brook have been identified to date, five (5) of which have been observed as flowing during dry weather conditions.

The historic monitoring data of Town Line Brook at Broadway has revealed relatively uniform bacteria levels during dry weather sampling events. However, downstream outfalls at two (2) specific locations have consistently contained bacteria loadings during dry weather sampling events. As shown on Table 2.0 and consistent with historic data, the highest concentrations (24,000 col/100ml) were detected at Trifone Brook (TL-24), which discharges into Town Line from Everett. In addition, indications of dry weather bacteria contributions (8,200 col/100ml) were again identified at outfall TL-9, which serves the lower portion of Hadley Street and the City of Everett. As described in the July 2009 status report, a comprehensive investigation of dry weather flows within the Hadley street area was performed in July 2009. The results of this effort revealed the following.

A review of the sewer engineering plans for Hadley Street revealed a reference to a SSO connection at the manhole designated H1-MH2. In addition, as outlined in prior submittals, the results of the rapid assessment outfall sampling program revealed an elevated level of fecal coliform during one (1) sampling event at outfall location TL-9, which is located downstream of H1-MH2. To investigate this condition and the possibility of a SSO connection on Hadley Street a manhole inspection was performed in July of 2009. A Sketch Plan of Site depicting the configuration of the drainage network, located within Hadley Street and its intersection with Miller Street may be referenced as Figure 9.

The inspection of this manhole indicated that this connection had been sealed with concrete. However, dry weather flow was observed. Upstream manholes revealed that this dry weather flow was emanating from a drainage line connected to H1-MH1 at the intersection of Miller and Hadley Streets. As elevated fecal coliform had been detected previously at outfall sample location TL-9, this indicator parameter was utilized during the July 2009 sampling event. With reference to Figure 9, fecal coliform levels of 68, 260 and 220 col/100ml were detected at H1-MH1, H1-MH2 and TL-9, respectively. As noted previously, E. Coli will be utilized as the parameter for illicit discharge/connections, if identified, with the fecal coliform parameter used solely as a screening tool.

During this reporting period E coli levels (2,400 col/100ml) were also detected within dry weather open channel flow within Town Line Brook immediately adjacent to Lynn Street. The levels encountered at Lynn Street may be attributable to flushing as a result of the significant tidal changes noted. Based upon the data obtained to date, three major sources of dry weather bacteria loading to the open channel portion of Town Line Brook have been identified including culverted base flows from the City of Everett, discharges from storm drainage within lower Hadley Street (TL-9), and from Trifone Brook (TL-24). As described above, mass balance sampling has been performed at Hadley Street to the Everett city line and contributions from both Trifone Brook and the upper most sampling location for Town Line Brook suggest that these contributions are emanating from areas outside the City of Malden.

### *3.1.3 Linden Brook Watershed*

Linden Brook Culvert is the major stormwater conveyance structure in northeastern portions of the City. Dry weather inspections were completed during this reporting period and base flow was observed throughout the culvert at all times. To supplement the water quality database for Linden Brook, three (3) manhole locations (D17-MH1, H43-MH1 and V1-MH1) along the length of the culvert were sampled. With reference to Table 2.0 and Figure 8, it is seen that levels of E. coli in the range of 1,600 – 2,400 col/100ml were detected within the middle portions of the culvert. An inspection of tributary drainage lines in the area at the time of sampling did not reveal any dry weather flows discharging to the culvert. During the next reporting period it is proposed to target this area for further evaluation.

### *3.1.4 Saugus Branch Watershed*

The Saugus Branch watershed services central and adjacent portions of Malden and this drainage system begins proximate to Broadway and flows westerly to its outfall at the Malden River. Historic sampling of surface water quality at this discharge location has revealed low to moderate bacteria levels. During this reporting period higher E. coli levels were observed during dry and wet weather events and it is possible that these results reflect contributions from the significant surcharge of the MWRA sewer system during the heavy rainfall events in the spring of 2010. This consideration will be further evaluated during the next reporting period.

### **3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)**

The City is currently in the process of converting and updating its current storm drain system mapping to GIS format using field GPS receivers. Drainage infrastructure is located and inventoried as a part of ongoing system wide maintenance, service and inspection program being implemented by the MDPW. During routine maintenance activities, structures are located and key attributes of the systems features are recorded. Information pertaining to the structure type, condition, inlet/outlet size(s) and type(s) and workability are recorded. As shown on Figure 9, during this reporting period the MDPW mapped a majority of the Linden Brook drainage area. In addition to this data collection process, MDPW personnel are also inspecting drainage system components for indications of dry weather flow as well as illicit discharges or connections. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering personnel to investigate.

The information collected by MDPW is continually compiled in a GIS stormwater drainage system database. Further, information collected during this process can also be utilized by MDPW to prioritize repairs and assist in Capital Improvement Planning. Consistent with the goals of IDDE plan implementation a majority of key drainage tributaries in west Malden that discharge to the Malden River, have been mapped and inventoried. During the implementation of this program numerous structural deficiencies and line blockages have been identified by the Compliance team. A substantial benefit that has been achieved is the direct response mitigation of these conditions, which have been reflected in the significant reduction of flooding concerns within the City.

### **3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis**

The City of Malden is also currently implementing a strategic GIS Implementation plan with the assistance of the firm of Camp, Dresser and Mckee, Inc (CDM). The City of Malden has been in the process of a comprehensive I&I study for its municipal sewer system, which is nearing completion. A City of Malden sewer survey plan depicting the Phase 3 study area, together with previously completed areas of study, is presented as Figure 10. As stated below, Phase 3 of this SSES program has included the following specific tasks, as outlined within a memorandum to the City prepared by CDM.

#### Phase 3 SSES

In the spring of 2010, a flow isolation program was conducted in what has been identified as the "Phase 3 Area" within the City. The Phase 3 Area represents the final of a 3 phase SSES program that intends to identify and mitigate infiltration and inflow (I/I) in the City. The attached figure depicts the Phase 3 Area. Approximately 246,000 linear feet of sewer was flow isolated that resulted in the identification 1,446,562 GPD of infiltration. The flow isolation data was also evaluated to determine the limits of follow up close circuit television inspection (CCTV). As a result, approximately 28,754 linear feet of sewer was CCTV inspected in the summer and fall of 2010. Currently, COM on behalf of the City is preparing a Phase 3 SSES report that includes a summary of findings and proposed recommendations to mitigate excessive infiltration and inflow into the City's sewer system. The report is expected to be finalized in early 2011. It is also anticipated that the City will implement design and construction recommendations in 2011/2012.

The SSES program is being funded primarily through the MWRA Infiltration and Inflow Local Financial Assistance Program. According to the MWRA III Local Financial Assistance Program funding summary as of May 2010, the City has a balance of \$2,132,000 available. Further, according to a letter dated December 9, 2009 from the MWRA to the City of Malden, the City maintains a balance of interests totaling \$898,300.04 therefore the total funding available to the City through the MWRA III Local Financial Assistance Program is \$3,030,300.04.

In conjunction with the completion of a photometric survey CDM initiated a comprehensive flow measurement study for the municipal sewer system for use in the completion of the capacity assessment that will identify system deficiencies, with the overall goal of reducing the potential of SSOs within the City. An overview of this program, as prepared by CDM is outlined below.

#### Wastewater Collection System Capacity Assessment

In response to the ACO, the City is performing a capacity assessment of its wastewater collection system. This involves development of a dynamic hydraulic model of the City's wastewater collection system to evaluate the interceptor sewers and to support the capacity assessment. The model will be integrated into the GIS system to allow it to be viewed in conjunction with other geographic data and facilitate electronic data collection and analysis now and in the future. Development of the hydraulic model includes two primary activities that include data collection and model development and calibration. The data collection effort includes obtaining physical system data, reports, and electronic flow metering records to support model development. The model development and calibration effort will help prepare a dynamic computer model of the wastewater collection system and calibrate the model using existing measured flow data. To date, an extensive flow metering effort has been completed. In the spring of 2010, 20 flow meters were installed at key locations within Malden's sewer system further the City has coordinated with the MWRA and obtained integral flow meter data, collected from 2005 through 2010, for the 8 MWRA meters in the City. The City's flow metering program and meter data obtained from the MWRA will be used to calibrate the proposed hydraulic models to develop accurate baseline conditions. further, the City is updating wastewater collection system mapping that accurately represents pipe connectivity, pipe sizes, pipe invert elevations, and pipe materials for all pipes 10-inches in diameter and greater. This map will be the basis for the hydraulic model. The sewer system developed for the hydraulic model is expected to be completed in 2011.

During this reporting period, the following specific tasks have also been completed to further the goals of the IDDE program.

- A Jet truck was purchased by the City, which will be used to reduce blockages, cleaning of lines and assist in system evaluation.
- The results obtained from Phase 3 of the SSES program are being used to develop contracts for the next phase of the I&I removal program, which is expected to be executed in the summer of 2011.
- To provide additional capacity to the existing sewer system and to address the concurrent goals of the IDDE Plan, a total of 108 sump pumps, which formerly discharged to the municipal system were removed during this reporting period. During this effort, the City also implemented a sump pump removal program and reconnection policy for those to be connected to the municipal drainage system.
- As a part of Phase 3 SSES activities, approximately 37,000 linear feet of sewer lines were cleaned
- During the completion of work during Phase 3 of the SSES program, a section of eight (8) inch vitrified clay (VC) sewer main was found to have collapsed in Huntley Street. To mitigate this condition, 28 feet of sewer main was replaced.

### 3.4 Drainage System Maintenance/Repair (MDPW)

In addition to the inspection and mapping program, during this reporting period MDPW personnel performed the following drainage system maintenance/repair activities.

- Cleaned 248 catch basins
- Removed of approximately 300 cubic yards of catch basin material
- Cleaned 178 drain manholes
- Rodded 1,200 feet of laterals
- Repaired 11 catch basins
- Repaired 60 feet of collapsed laterals

During this reporting period, repairs were also made through contractual services between the City of Malden and Charles Contracting Inc for the repair of catch basins/manholes at the following locations:

Franklin @ Almont St  
Sylvan St @ Willard St  
18 Freemont St  
Medford St @Sheridan St  
21 Hancock St  
Tremont St @ Spring St  
Sterling St @ Stadium Rd  
168 Bowdoin St  
364 Washington St  
132 Daniels St  
Roberts St @ Salem St  
Lynde St @ Pierce St  
West St @ Estey St  
Charles St @ Russell St  
Bellrock St @ Converse Ave

Pleasant St @ Beebe School  
Thatcher St @ Highland Ave  
Emerald St @ Highland Ave  
Broadway @ Eastern Ave  
9 Converse Ave  
26 Converse Ave  
Medford St:  
between Pearl St & Highland Ave.  
Eastern Ave @ Andrew St  
616 Broadway  
630 Broadway  
196 Adams St  
Eastern Ave @ Warren Ave

In addition to the above, all supervisors' trucks were supplied with "Strom Water Response Kits" and the MDPW has retrofitted a vehicle with a submergible pumping system in order to respond to low lying flooding calls during storm events. Outfall signage has been installed in accessible areas by the MDPW and the majority of outfall locations have been temporarily marked in the field to facilitate outfall sampling. Permanent signage in remaining areas is currently being installed by MDPW personnel.

#### **4.0 SANITARY SEWER OVERFLOWS (SSO'S)**

As referenced within the last IDDE Status Report, The City of Malden, like numerous other communities served by the Massachusetts Water Resource Authority (MWRA) sewer system, experienced a failure of the regional sewage conveyance network in response to extensive rainfall events in March of 2010. The intensity of these rains and capacity limitations of the MWRA system resulted in sewer manhole surcharges and basement back-ups within the City and eventually led the MWRA to directly discharge untreated wastewater to receiving waters throughout the system including the Malden River. No SSOs were identified during this reporting period.

## 5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES

To date, the results of the IDDE program continue to support the opinion that wet weather contributions, or infiltration/exfiltration during high rainfall events, represent the majority of bacterial loading detected at outfalls to surface waters within the City. As described in prior reports, the foundation for this condition was set once open channel surface waters were culverted by the Department of Conservation and Recreation (DCR) (formerly the Metropolitan District Commission). This flood control/early development program began during the late 1800's and led to the culverting of Spot Pond Brook, West End (Edgeworth) Brook, Linden Brook, and Town Line Brook and Little Creek.

As outlined in the original IDDE work plan, the initial focus of this program was directed towards portions of the City that are tributary to the Malden River, based upon the results of surface water sampling and corresponding ecosystem value. No significant dry weather discharges, other than waterline leaks, have been identified during the inspection of this portion of the City and the results of dry weather sampling obtained to date support these observations. It is also to be noted that representatives of MyRWA reported similar indications of low bacteria levels during dry weather conditions at Malden River sampling locations.

As discussed in Section 3.1.1, elevated E. coli levels were detected within open channel flow at Spot Pond Brook at the Malden/Melrose line during this reporting period. Dry weather monitoring data collected by MyRWA also revealed elevated E. coli levels in areas upstream of the Malden/Melrose line. In addition, an elevated E. coli level was also identified at outfall LSP-4, which is located downstream of the Malden/Melrose sample location. A targeted investigation of this condition was performed by NCA/DPW personal, which revealed that flow appeared to be emanating from a housing complex located on Elrich Drive. Based upon the volumes of flow at outfall LSP-4 and the upstream sample location within the Elrich Drive complex, it appeared that additional contributions were occurring between these two sampling points, however, a detailed assessment of the drainage system performed by NCA/DPW, did not identify additional dry weather flows. Supplemental investigations will be performed in the spring of 2011, in an attempt to isolate potential dry weather flows from LSP-4 and further characterize open channel flow along the Malden/Melrose line.

The proximity of the SSO's which occurred during the last reporting period within Central Malden to regional connections is also of note. Targeted dry weather inspections and mass balance sampling during wet weather conditions will be continued to investigate these conditions. The ongoing sewer flow capacity analysis being performed by CDM will also be integrated into this evaluation. In accordance with the overall goals and objectives of the IDDE program, targeted dry weather inspections will continue in north and central portions of the City and in the area of the central Linden Brook sample location.

During the reporting period the City has greatly advanced its capacity to meet the goals of the IDDE program through the development of a dedicated stormwater team. Each member of the Compliance Team has been trained in the use of field mapping equipment and the guidance provided in the IDDE work plan. Building upon the foundation established during previous reporting periods and ongoing implementation of the City wide GIS system, IDDE plan implementation is now an integral component of daily activities.



**Table 2.0 Dry Weather Conditions - Miscellaneous Laboratory Testing**

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	Nitrogen, Ammonia (mg/L)							Surfactants, MBAS (mg/L)							E. Coli (MF) (col/100ml)											
	350.1							425.1							9213D											
	ACTION LEVEL-0.5 mg/L							ACTION LEVEL-0.1 mg/L							ACTION LEVEL- 235 col/100ml											
	09/12/06	09/11/07	06/25/09	8/6/2009	7/29/2010	8/4/2010	8/31/2010	09/12/06	09/11/07	06/25/09	8/6/2009	9/21/2009	7/29/2010	8/4/2010	8/31/2010	09/12/06	09/11/07	9/24/2008	4/17/2009	6/25/2009	8/6/2009	7/29/2010	8/4/2010	8/10/2010	8/31/2010	
<b>Malden River</b>																										
MR-0	0.176	ND (0.40)	-	-	ND (0.075)	-	-	ND (0.05)	0.05	-	-	-	0.07	-	-	150	1100	-	68	-	-	110	-	-	-	-
MR-1	-	2.96	-	-	ND (0.075)	-	-	-	ND (0.05)	-	-	-	0.06	-	-	-	160	-	-	-	-	130	-	-	-	
Saint Mary St. <sup>1</sup>	-	ND (0.40)	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	-	
LSP-0-Channel <sup>2</sup>	-	ND (0.40)	-	-	-	ND (0.075)	-	-	ND (0.05)	-	-	-	-	ND (0.05)	-	-	460	-	-	-	-	10,000	-	2,000	-	
LSP-4	-	-	-	-	-	ND (0.075)	-	-	-	-	-	-	0.45	-	-	-	-	-	-	-	-	14,000	-	2,000	-	
LSP-5.1-Channel <sup>2</sup>	-	ND (0.40)	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	630	-	-	-	-	-	-	-	-	
LSP-10-Channel <sup>2</sup>	-	ND (0.40)	-	-	-	ND (0.075)	-	-	ND (0.05)	-	-	-	-	ND (0.05)	-	-	350	-	-	-	-	4900	-	-	-	
C39-MH0.1	-	-	-	0.416	-	-	-	-	-	-	0.41	-	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	
E2-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	
E2-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	
H16-MH13	-	-	-	-	ND (0.075)	-	-	-	-	-	0.93	-	-	-	-	-	-	-	-	-	25	-	-	-	-	
H16-MH17	-	-	0.432	0.495	-	-	-	-	-	0.06	0.44	-	-	-	-	-	-	-	ND (2.0)	ND (2.0)	-	-	-	-	-	
H25-MH2	-	-	0.556	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	
M3-CB30	-	-	-	-	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	-	-	-	-	-	
M3-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98	-	
M3-MH4	-	-	-	-	-	-	7.52	-	-	-	-	-	-	ND (0.25)	-	-	-	-	-	-	-	-	-	2,400	-	
M8-MH3	-	-	-	0.424	-	-	-	-	-	-	0.27	-	-	-	-	-	-	-	5100	ND (2.0)	-	-	-	-	-	
M26-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
P36-MH5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3500	-	-	-	-	-	-	-	-	
R18-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	290	-	-	-	-	-	
S29-MH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96	-	-	-	-	-	-	-	-	
W25-MH1	-	-	-	0.264	-	-	-	-	-	-	0.08	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	
<b>Little Creek</b>																										
LC-0	0.687	ND (0.40)	-	-	0.518	-	-	ND (0.05)	ND (0.05)	-	-	-	0.06	-	-	7	140	-	ND (2.0)	-	-	190	-	-	-	-
<b>Town Line Brook</b>																										
TL-0 <sup>3</sup>	0.561	ND (0.40)	-	-	0.253	-	-	ND (0.05)	ND (0.05)	-	-	-	ND (0.05)	-	-	1500	280	-	62	-	-	730	-	-	-	-
TL-1	0.085	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	
TL-5	-	-	-	-	-	0.769	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	2400	-	-	-	
TL-9	3.49	-	-	-	-	1.16	-	ND (0.05)	-	-	-	-	-	ND (0.05)	-	640	-	-	-	-	-	8200	-	-	-	
TL-13	0.16	ND (0.40)	-	-	-	-	-	ND (0.05)	ND (0.05)	-	-	-	-	-	-	30	70	-	-	-	-	-	-	-	-	
TL-24	0.172	4.72	-	-	-	0.256	-	ND (0.05)	0.92	-	-	-	-	0.05	-	520	1500	-	-	-	-	24,000	-	-	-	
TL-BL-EV	0.121	0.654	-	-	-	-	-	ND (0.05)	0.11	-	-	-	-	-	-	440	740	-	-	-	-	-	-	-	-	
S3-MH12 <sup>3</sup>	-	0.774	-	-	-	-	-	-	0.09	-	-	-	-	-	-	-	2200	-	-	-	-	-	-	-	-	
L23-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	
<b>Saugus Branch</b>																										
MR-2	-	ND (0.40)	-	-	ND (0.075)	-	-	-	ND (0.05)	-	-	-	0.05	-	-	-	ND (2.0)	-	-	-	-	220	-	-	1,100	
Broadway/Eastern <sup>4</sup>	-	ND (0.40)	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	140	-	-	-	-	-	-	-	-	
<b>Linden Brook</b>																										
C36-MH1	-	-	-	-	0.195	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	160	-	-	-	
D17-MH1	-	-	-	-	0.077	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	1200	-	360	-	
H43-MH1	-	-	-	-	0.122	-	-	-	-	-	-	-	0.07	-	-	-	-	-	-	-	-	1600	-	2400	-	
P24-MH1	-	-	-	-	0.097	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	96	-	-	-	
V1-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	
W26-MH1	-	-	-	-	0.119	-	-	-	-	-	-	-	ND (0.05)	-	-	-	-	-	-	-	-	180	-	-	-	

File No. 465.08

<sup>1</sup>2007 samples collected 9/25/07

<sup>2</sup>2007 samples collected on 6/21/07

<sup>3</sup>2007 samples collected 7/12/07

<sup>4</sup>2007 samples collected 9/12/07

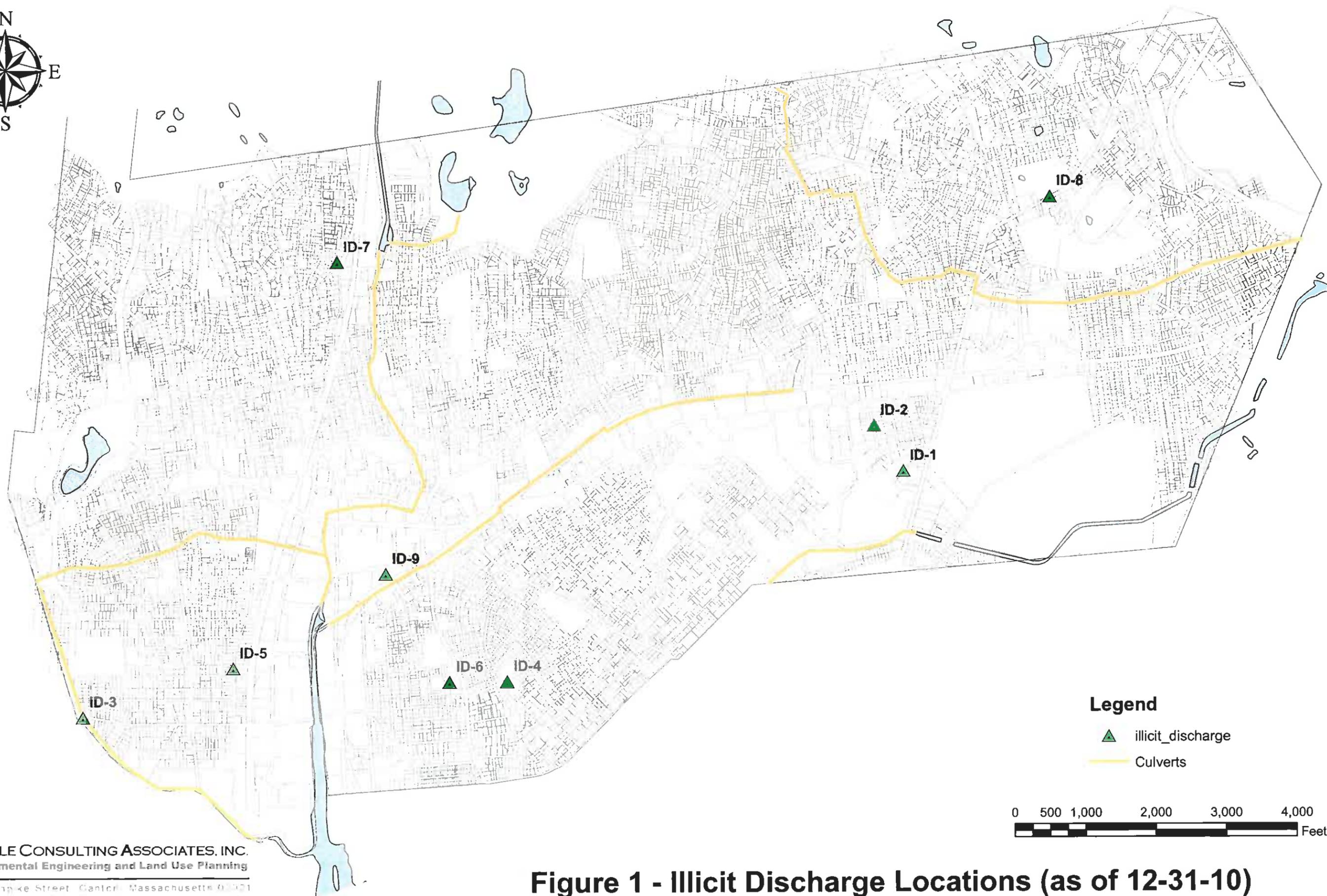
**Table 3.0 Wet Weather Conditions - Miscellaneous Laboratory Testing**

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

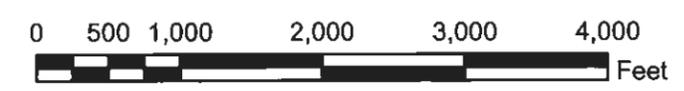
Sample Identification	Nitrogen, Ammonia (mg/L)				Surfactants, MBAS (mg/L)				E. Coli (MF) (col/100ml)			
	350.1				425.1				9213D			
	ACTION LEVEL-0.5 mg/L				ACTION LEVEL-0.1 mg/L				ACTION LEVEL- 235 col/100ml			
	9/20/06	9/28/07	3/17/10	8/16/10	9/20/06	9/28/07	3/17/10	8/16/10	9/20/06	9/28/07	3/17/10	8/16/10
<b>Malden River</b>												
MR-0	0.125	ND (0.4)	0.372	-	0.08	0.12	0.14	-	6700	2700	9400	-
MR-1	-	ND (0.4)	-	-	-	ND (0.05)	-	-	-	15	-	-
MR-4	-	-	-	1.34	-	-	-	0.23	-	-	-	580
MR-6	-	-	-	2.51	-	-	-	0.1	-	-	-	120
MR-9	-	0.877	-	-	-	0.35	-	-	-	540	-	-
MR-10	-	1.41	-	-	-	0.09	-	-	-	310	-	-
Saint Mary St.	-	ND (0.4)	-	-	-	ND (0.05)	-	-	-	31	-	-
Fellsmere Pond	-	-	-	-	-	-	-	-	-	27	-	-
LSP-4	-	-	-	23.4	-	-	-	0.55	-	-	-	>24,000 <sup>1</sup>
LSP-5.1-Channel	-	ND (0.4)	-	-	-	0.09	-	-	-	1100	-	-
LSP-9	-	-	-	ND (0.075)	-	-	-	0.24	-	-	-	1700
LSP-10-Channel	-	ND (0.4)	-	-	-	0.09	-	-	-	740	-	-
<b>Little Creek</b>												
LC-0	0.173	ND (0.4)	0.419	-	0.08	0.27	0.15	-	6700	170	8700	-
LC-1	-	-	-	-	-	-	-	-	-	18	-	-
P12-MH10	-	-	-	-	-	-	-	-	-	140	-	-
<b>Town Line Brook</b>												
TL-0	0.354	ND (0.4)	0.204	0.195	ND (0.05)	0.27	0.11	0.27	600	>20,000 <sup>1</sup>	610	10,000
TL-9	1.21	-	-	-	0.06	-	-	-	500	-	-	-
TL-13	0.256	ND (0.4)	-	-	ND (0.05)	ND (0.05)	-	-	630	300	-	-
TL-16	ND (0.75)	-	-	-	ND (0.05)	-	-	-	ND (2)	-	-	-
TL-24	0.183	3.96	-	0.36	ND (0.05)	0.77	-	0.31	6200	5200	-	>24,000 <sup>1</sup>
TL-BL-EV	0.229	ND (0.4)	-	-	0.07	0.26	-	-	4200	27,000	-	-
S3-MH12	-	ND (0.4)	-	-	-	0.19	-	-	-	11,000	-	-
<b>Saugus Branch</b>												
MR-2	0.535	9.33	0.319	0.395	0.07	0.09	0.15	0.13	140	510	9200	>24,000 <sup>1</sup>
Broadway/Eastern	-	ND (0.4)	-	-	-	0.09	-	-	-	2100	-	-

<sup>1</sup> This result is an estimate, due to confluent colony growth on the dilution plate.



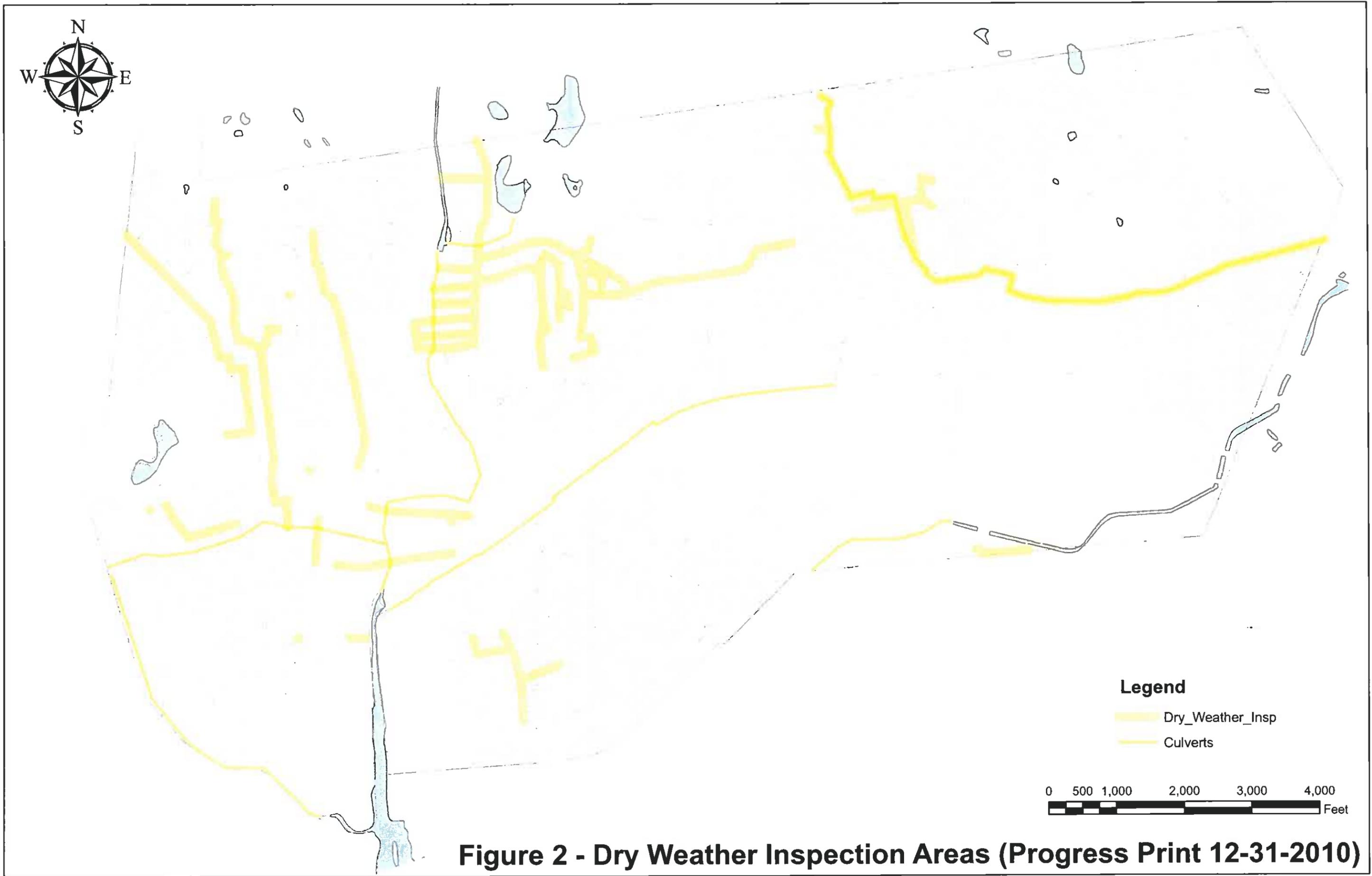
**Legend**

-  illicit\_discharge
-  Culverts

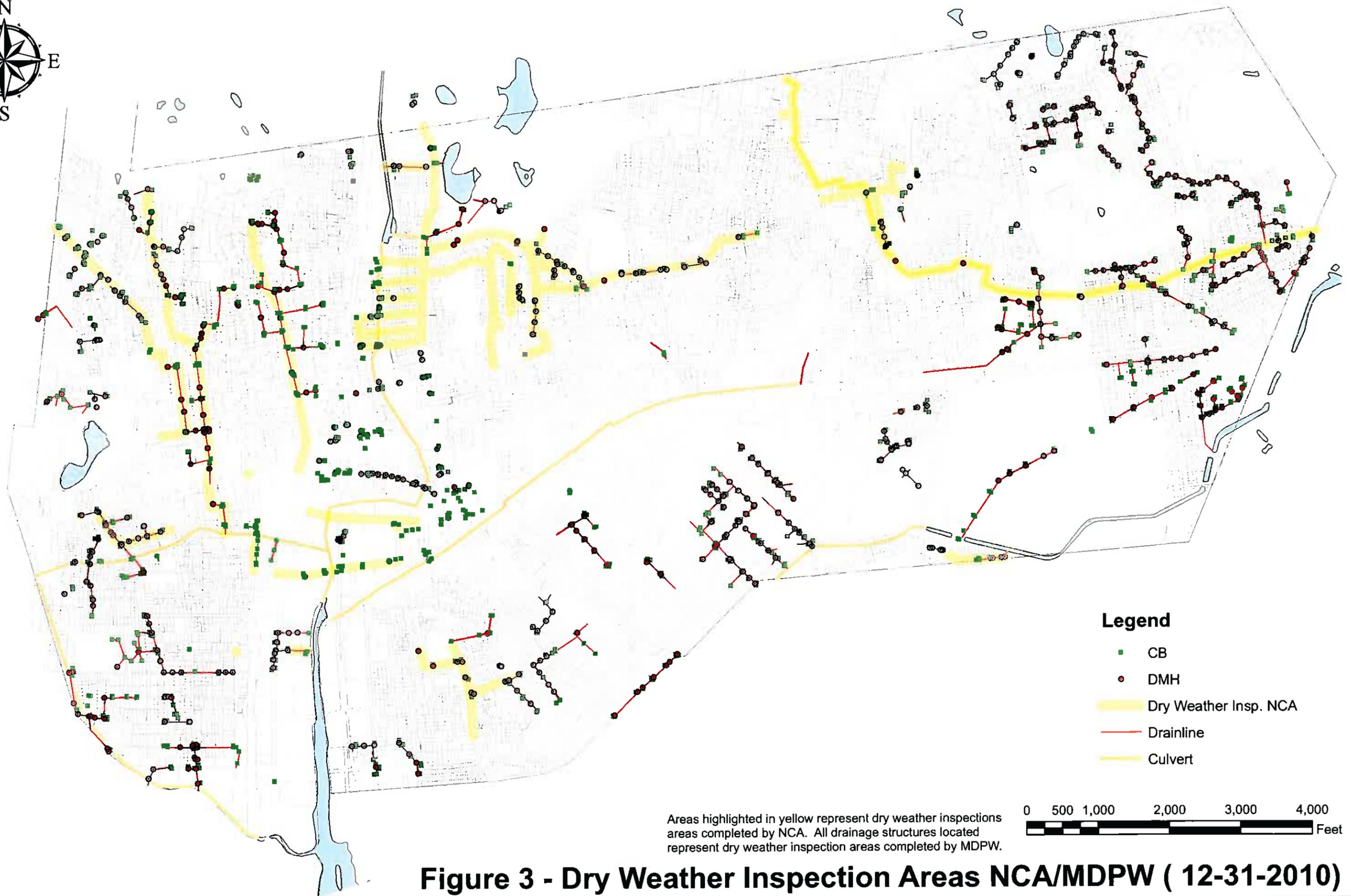


**NANGLE CONSULTING ASSOCIATES, INC.**  
Environmental Engineering and Land Use Planning  
480 Turnpike Street Canton, Massachusetts 01921

**Figure 1 - Illicit Discharge Locations (as of 12-31-10)**



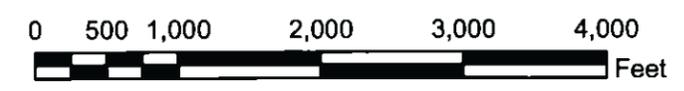
**Figure 2 - Dry Weather Inspection Areas (Progress Print 12-31-2010)**



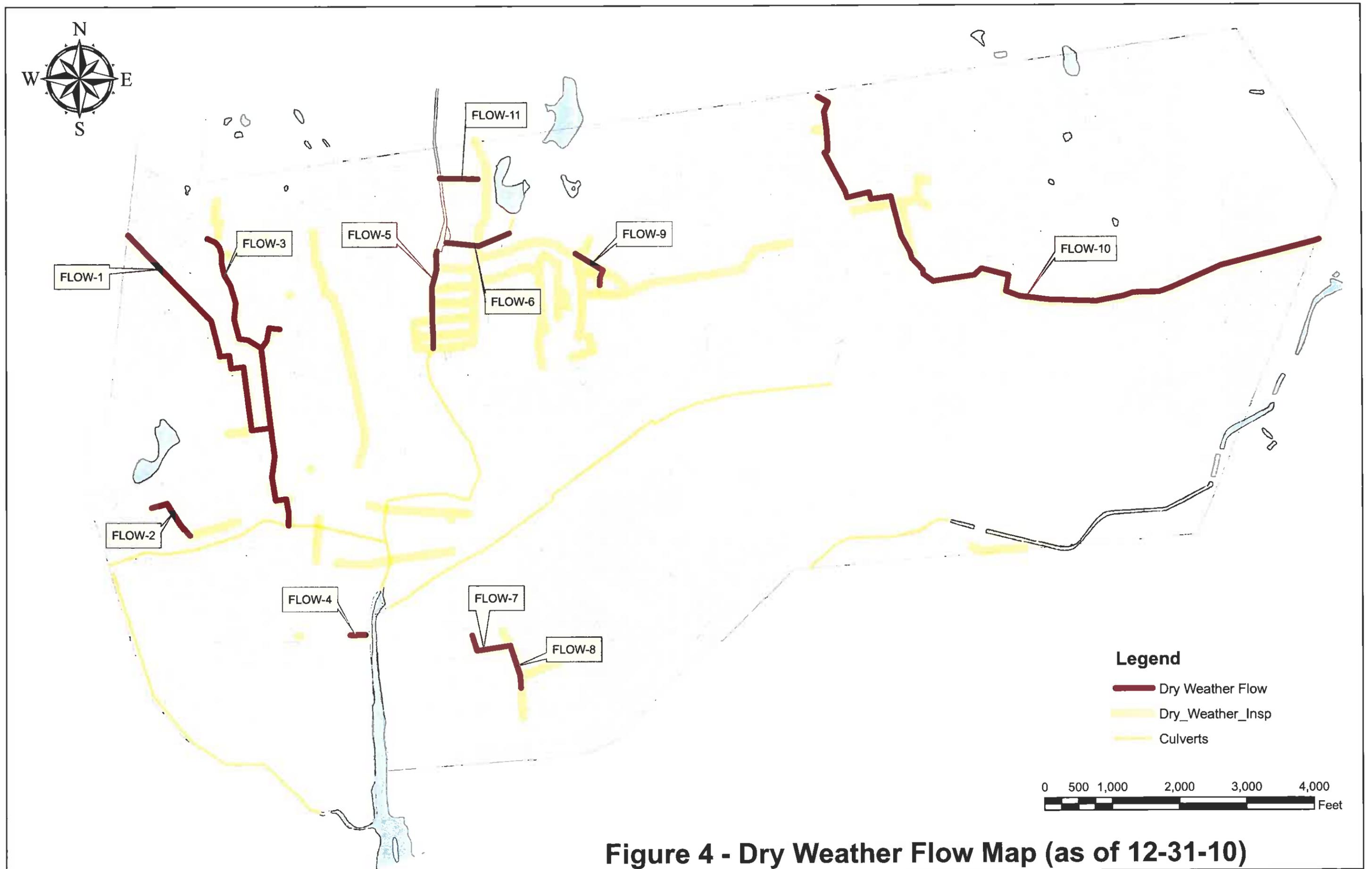
**Legend**

- CB
- DMH
- Dry Weather Insp. NCA
- Drainline
- Culvert

Areas highlighted in yellow represent dry weather inspections areas completed by NCA. All drainage structures located represent dry weather inspection areas completed by MDPW.



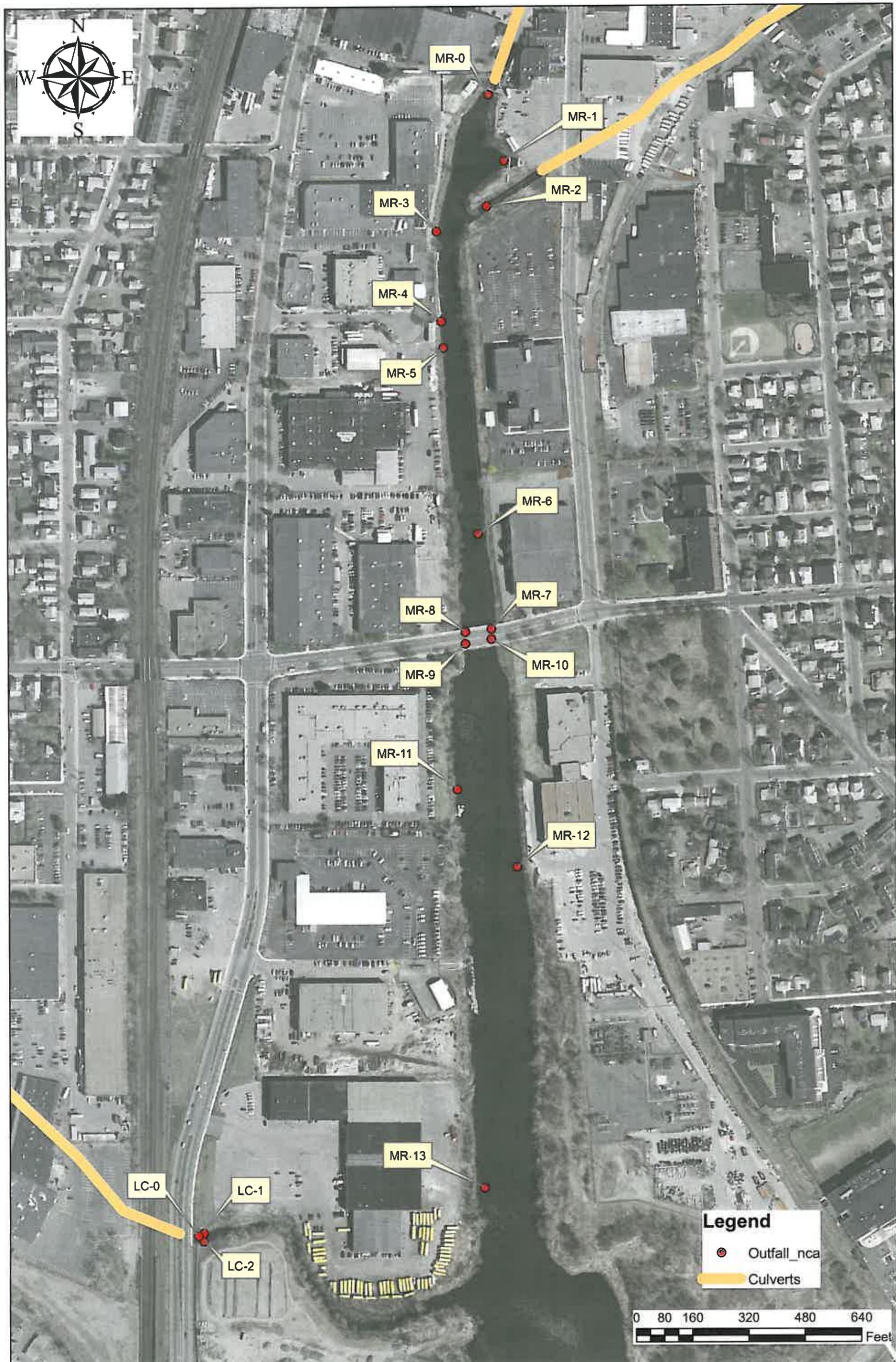
**Figure 3 - Dry Weather Inspection Areas NCA/MDPW ( 12-31-2010)**



**Figure 4 - Dry Weather Flow Map (as of 12-31-10)**



**Figure 5 - Lower Spot Pond Brook Outfalls**



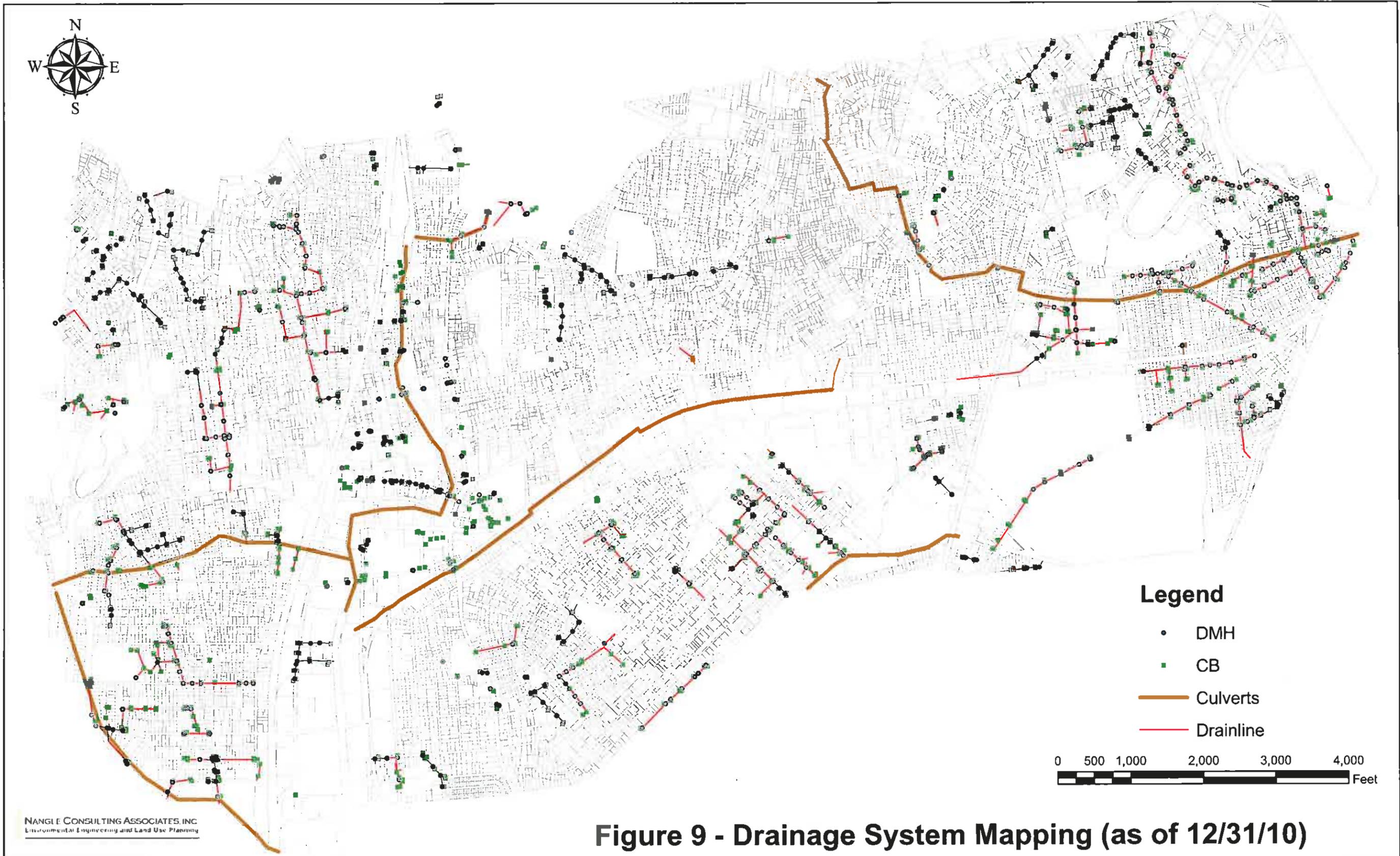
**Figure 6 - Malden River Outfalls**



**Figure 7 - Town Line Brook Outfalls**

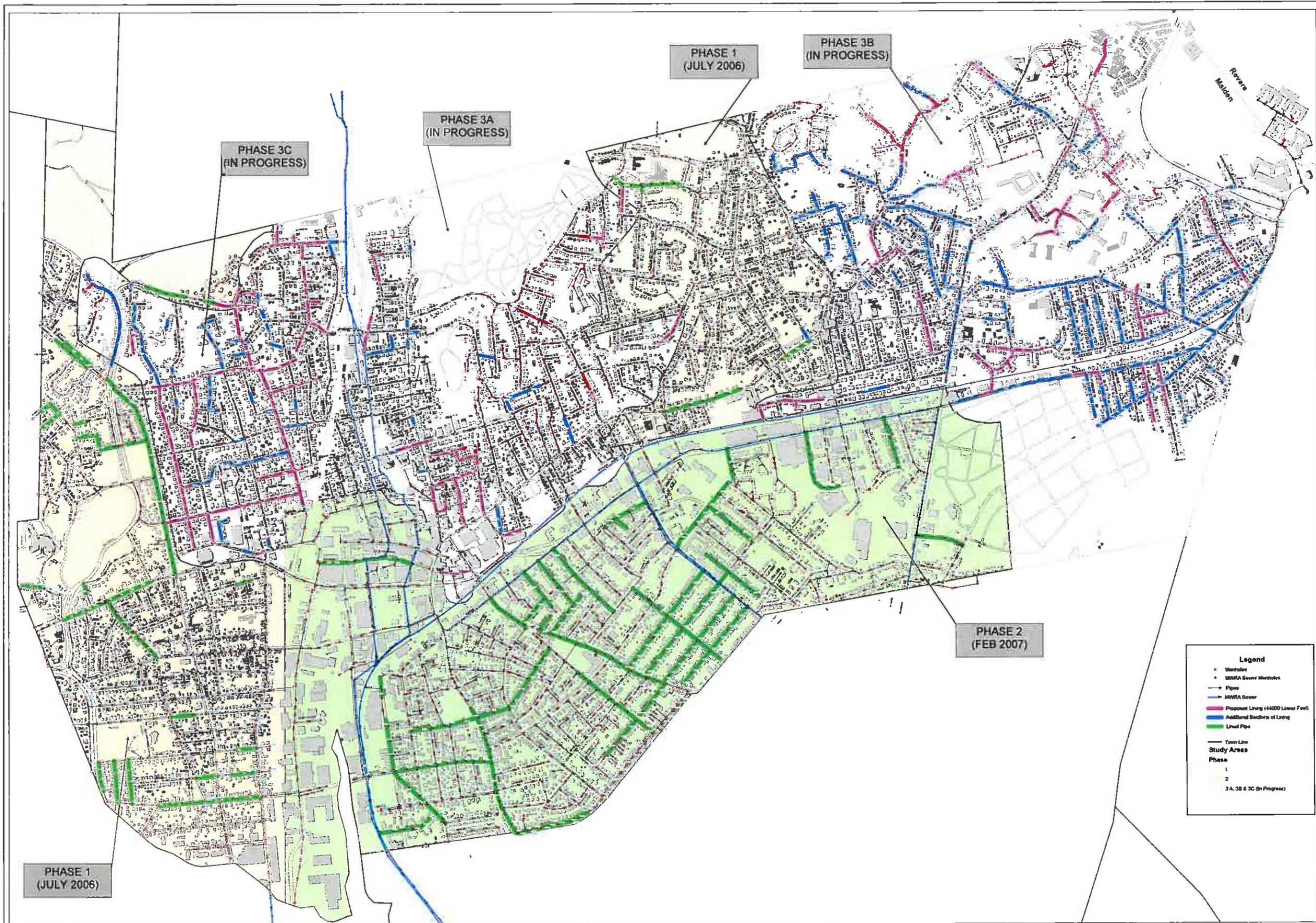


**Figure 8 - Linden Brook Culvert**



NANGLE CONSULTING ASSOCIATES, INC.  
Environmental Engineering and Land Use Planning

**Figure 9 - Drainage System Mapping (as of 12/31/10)**



PHASE 1  
(JULY 2006)

PHASE 1  
(JULY 2006)

PHASE 3B  
(IN PROGRESS)

PHASE 3A  
(IN PROGRESS)

PHASE 2  
(FEB 2007)

**Legend**

- Manhole
- MWRA Sewer Manhole
- Pipe
- MWRA Sewer
- Proposed Lining (44000 Linear Feet)
- Additional Sections of Lining
- Lined Pipe
- Town Line

**Study Areas**

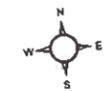
Phase

- 1
- 2
- 3A, 3B & 3C (In Progress)



Designed By: C. Spangher  
 Drawn By: D.M. & S.C. & L.J.  
 Reviewed By: S. Peters  
 Approved By: S. Burke  
 Date: January 2011

Malden Sewer Survey III  
 City of Malden, Massachusetts  
 January 2011



Mass State Plane Coordinate System  
 Datum: NAD83, UTM Zone  
 Information from PG&E 2008  
 Periodic and Utility Data derived from the GIS/PA

FIGURE 10

## ATTACHMENT 6

### BMP 3-6: Supporting Documentation

#### Excerpted from City of Malden Illicit Discharge Detection & Elimination Plan

Prepared by NCA April 29, 2009/ revised June 29, 2009

The City of Malden has prepared this Illicit Discharge Detection and Elimination (IDDE) Plan to support the continued removal of any illicit non-permitted discharges to the City's Storm Sewer system that are identified as resulting in the violation of the City's current National Pollution Discharge Elimination System (NPDES) permit issued by USEPA. In accordance with the provisions of the City's existing permit, an IDDE program has been implemented by the City and is currently ongoing. This plan has been prepared pursuant to the requirements established within an Administrative Order issued by the USEPA and corresponding guidance contained therein. Specifically, in accordance with the provisions of the AO, this plan has been prepared utilizing the format established in the EPA New England December 2008 IDDE Protocol. This plan has been prepared in cooperative effort by the City of Malden Engineering Department and the City of Malden Public Works Department with assistance from the firm of Nangle Consulting Associates, Inc. (NCA)

The City of Malden is bisected by two major drainage basins. Westerly portions of the City are located within the Mystic River watershed, which is a sub basin of the Boston Harbor basin. Stormwater and culverted surface waters in western portions of the City generally discharge to the Malden River, which flows to the Mystic River and ultimately to Boston inner harbor beyond the Amelia Earhart Dam. Surface and stormwater from the City of Melrose to the north and the City of Medford to the east are also conveyed through Malden to the Malden River, via flood control structures subject to the jurisdiction of the Massachusetts Department of Conservation and Recreation (DCR). Easterly portions of the City are located within the North Coastal drainage basin. Surface and stormwater within this portion of the City flows into the Linden Brook (culverted) and Town Line Brook (open channel). Each of these conveyance networks eventually discharge to the Rumney Marsh, which flows to Massachusetts Bay.

Sampling of storm drain outfalls in various portions of the city has been performed by the City of Malden, the USEPA and the Mystic River Watershed Association (MyRWA). In general, the results of these sampling efforts have revealed that elevated levels of bacteria, indicative of waste water contributions, are present at several discharge locations during both dry and wet weather events. The source of these elevated levels is believed to be attributable in part to illicit discharges to the City's storm drain system. Accordingly this plan has been prepared to document the procedures that have and will continue to be undertaken to identify and remove all illicit discharges. The City has undertaken a four step plan that generally involves the following:

1. Update/verification of the City's storm and sanitary sewer infrastructure mapping
2. Prioritization of drainage areas/outfalls for investigation
3. Investigation of targeted areas and implementation of corrective actions
4. Program evaluation

This plan has been prepared to outline the proposed approach the City will take to identify and remove illicit discharges to the storm drain system as well as provide a review of the City's efforts to date in support of currently proposed areas of investigation.

**ATTACHMENT 7**

**BMP 4-1: Supporting Documentation**

# City of Malden

## Stormwater Inspection Checklist

Inspection # \_\_\_\_\_ Final? – Yes / No  
Date: Time: \_\_\_\_\_ Weather: \_\_\_\_\_  
Construction inspector: \_\_\_\_\_  
Project Name/Address: \_\_\_\_\_

### Erosion and Sediment Control:

- |  |              |
|--|--------------|
| 1. Is there a good stand of grass on all areas disturbed by construction?                | Yes- No- N/A |
| 2. Is there a good stand of grass within all ditches and swales?                         | Yes- No- N/A |
| 3. Is there a good stand of grass within the detention basin?                            | Yes- No- N/A |
| 4. Are erosion and sediment control devices properly installed at the correct locations? | Yes- No- N/A |
| 5. Is there any evidence of erosion or sedimentation downstream from the project site?   | Yes- No- N/A |
| 6. Are all slopes less than 2:1?   | Yes- No- N/A |

### Storm Drainage Structures: (catch basins, inlets, manholes, junction boxes)

- |  |              |
|--|--------------|
| 1. Are all drainage structures installed at the proper location per approved plans?  | Yes- No- N/A |
| 2. Are all drainage structures installed at the proper grade and cross slope?        | Yes- No- N/A |
| 3. Are manhole lids installed correctly? Proper size?                                | Yes- No- N/A |
| 4. Are structure inverts shaped to prevent ponding water? Free from silt and debris? | Yes- No- N/A |
| 5. Are pipes properly grouted and fitted into each drainage structure?               | Yes- No- N/A |

### Storm Drainage Pipes:

- |  |              |
|--|--------------|
| 1. Has the proper aggregate backfill been used? Adequately compacted?  | Yes- No- N/A |
| 2. Does pipe size and pipe material agree with the approved plans?   | Yes- No- N/A |
| 3. Does the location and grade of storm drainage pipes agree with the approved plans?                                    | Yes- No- N/A |
| 4. Are pipe sections joined correctly (coupling bands for CMP, joints, gaskets, etc.)                                    | Yes- No- N/A |
| 5. Are pipes in good condition and undamaged?  | Yes- No- N/A |
| 6. Has proper outlet protection been installed? Headwalls, riprap with filter fabric, or other erosion control measures. | Yes- No- N/A |

### Ditches and Swales:

- |   |              |
|---|--------------|
| 1. Are the ditches and swales located per the approved plans?                       | Yes- No- N/A |
| 2. Does the constructed cross section (width, depth) agree with the approved plans? | Yes- No- N/A |
| 3. Are erosion control measures in place? Riprap with filter fabric.                | Yes- No- N/A |

**Stormwater Quality Structures:** (O/W separator, catch basin inserts, etc.)

- |   |              |
|---|--------------|
| 1. Is the correct brand, size, and model installed as per approved plans?   | Yes- No- N/A |
| 2. Is the structure installed at correct location, grade and elevation as per approved plans?   | Yes- No- N/A |
| 3. If the structure is located within a designated easement, is access easement free from obstructions and traversable?               | Yes- No- N/A |
| 4. Are lift holes plugged and all joints sealed to prevent leakage?   | Yes- No- N/A |
| 5. Has buffer zone been maintained throughout construction, or as required by approved plans and the Stormwater and Street Ordinance? | Yes- No- N/A |

**Stormwater Detention Basin:**

- |   |              |
|---|--------------|
| 1. Was Detention Basin installed as first item of construction, to prevent erosion/sediment?  | Yes- No- N/A |
| 2. Does the basin size and location agree with the approved plans & detention calculations?   | Yes- No- N/A |
| 3. Is the basin located within the detention basin easement, including fill and cut slopes?   | Yes- No- N/A |
| 4. Is the bottom of the detention basin graded to the outlet structure to prevent ponding?    | Yes- No- N/A |
| 5. Is there a good cover of vegetation on the slopes and bottom (to prevent erosion)?         | Yes- No- N/A |
| 6. Is the outlet structure constructed to agree with approved plans & detention calculations? | Yes- No- N/A |
| 7. Are the detention basin slopes at the approved grades (no steeper than 2:1 H:V)?           | Yes- No- N/A |
| 8. Is the detention basin berm graded at the proper elevation and width, all the way around?  | Yes- No- N/A |
| 9. Is the first flush volume adequate? With a controlled release over 24 hours?               | Yes- No- N/A |
| 10. Is there any evidence of utility lines or pipes within the detention basin easement?      | Yes- No- N/A |
| 11. Has the traversable access easement been constructed per approved plan?                   | Yes- No- N/A |