Municipality/Organization:	City of Malden
EPA NPDES Permit Number:	MA041046
MADEP Transmittal Number:	**041088**
Annual Report Number & Reporting Period:	**No. 11: April 1, 2013-March 31, 2014**

NPDES PII Small MS4 General Permit Annual Report

Part I. General Information

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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: ~John J Russell

Printed Name: John J. Russell

Title: City Engineer

Date: 04-29-2014

Part II. Self-Assessment

The City of Malden currently maintains a dedicated team of in-house staff and supporting technical services to meet the challenges of stormwater management within a highly urbanized study area, which includes "flow through" discharges from neighboring communities. In support of this compliance program, the City has invested significant resources and funding to support the objectives of the Stormwater Compliance Team (SCT). The systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, and removal of illicit discharges serves to demonstrate the effectiveness of the City's stormwater management program. Of particular note is that through the efforts of City personnel and outside technical support, GIS layers for its drainage and sewerage infrastructure have been developed. The improved understanding of the complex issues associated with over a century old infrastructure provided by this tool, is a major benefit that has been realized. To support the removal of illicit discharges the City has undertaken flow capacity analyses, GIS mapping of infrastructure components, completion of dry and wet weather sampling, Illicit Discharge Detection and Elimination (IDDE) Plan implementation and flow isolation studies. Building upon the results of dry weather mass balance / flow isolation studies, the City maintains a very aggressive IDDE program that has resulted in readily apparent improvement in the quality of stormwater discharges.

City representatives have been meeting with stewardship organizations such as the Mystic River Watershed Association (MyRWA) and the Friends of the Malden River throughout the last year to develop partnerships and transfer of information. Similarly, during this reporting period, the City has been able to meet with Department of Conversation and Recreations (DCR) in an attempt to address long needed repairs to major flow conveyance channels at the along Town Line Brook and at Oak Grove. The City has developed and is implementing a comprehensive surface water quality improvement program at Fellsmere Pond. This scope of work serves as a model for the City's commitment to improved surface water quality through the mitigation of stormwater related issues. The City is also continuing to work with and support the U.S. Amy Corps of Engineers (ACOE) National Ecosystem Restoration (NER) Plan that will enhance both habitat and surface water quality along the banks of the Malden River.

During the last reporting period the City has continued its comprehensive recreational improvements program within the areas tributary to outfalls that discharge to nearby surface waters. Further as an example of the City's commitment to the MS4 Stormwater program, staffing support for Malden Department of Public Works (MDPW) personnel, who represent the major component of the Compliance Team has been increased. The City has made significant progress towards meeting the requirements of proposed revisions to the MS4 General Permit, as they pertain to North Coastal Communities. In addition to water quality goals, a notable reduction in local flooding has been achieved through improvements to the drainage system, a once neglected infrastructure. Equally important, is the continued involvement of both private and public parties in the areas of education, watershed cleanup activities, and targeted/innovative BMP implementation.

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

1. Public Education, Outreach and Community Involvement

BMP 1-1 Place Educational Information on City's Web Site and Malden Access Television (MATV)

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 11:
The City has and continues to expand on community outreach through maintenance of an informational website and work with representatives of MATV to update the community on current stormwater management issues. The City has made a clear commitment, through its Mayor and related support staff to promote community awareness and involvement.

Goal Status:
Achieved original goals. Community outreach is an integral part of the City's efforts to mitigate stormwater quality concern.

BMP 1-2 Conduct Recycling Opportunities & Paint Waste Collection Days

Responsible Department/Person:
DPW & Mayor's Office

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

Progress on Goals- Year 11
MDPW sponsors two (2) paint waste collection and recycling days annually. As summarized in Part V, Section 2.5, these two (2) collection days resulted in the accumulation of a volume that incurred disposal costs of approximately $8,000. The City also continues to maintain its recycling programs at the MDPW yard.

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 11:
The Board of Health (BOH) actively monitors public recreation areas to discourage the feeding of waterfowl populations that contribute to the degradation of surface water quality. In addition, pet waste, education and control programs (stations) are in-place. The continued replacement of earthen/grassy playing field surfaces with synthetic cover is also a key factor in the reduction of animal waste contributions to stormwater runoff. Fellsmere Pond is a key surface water body that is monitored by City personnel. In addition, pet waste management is strictly enforced at public open spaces and recreational areas.

Goal Status:
Achieved

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 11:
The Stormwater Compliance Team spoke to Malden 4th and 5th grade students regarding the City drainage system. Stormwater management goals and ongoing practices are educational tools that are included in community outreach efforts. During this reporting year, the Friends of Malden River community involvement group was established. This stewardship organization is very involved in promoting community awareness and opportunities associated with this resource area.

Goal Status:
Through the use of website postings and connection to the classroom, the City hopes to continue the advancement of student involvement in meeting this goal.

BMP 1-5 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 11:
See BMP 1-4

Goal Status:
Activity Ongoing

BMP 1-6 Expand Cooperative Education programs for college level interns

Responsible Department/Person:
Engineering Dept

Measurable Goal(s):
Number of participants

Progress on Goals- Year 11:
During this reporting period the City Engineering Department employed an intern.

Goal Status:
The City is currently exploring ways to partner high school and college interns in areas of public outreach and curriculum development. BMPs 1-5 and 1-6 will be coordinated to meet this goal.

BMP 1-7	Host or participate in Stormwater Management brainstorming sessions with citizen advisory groups and Mystic River Watershed representatives (MyRWA)

Responsible Department/Person:
Eng. Dept. & Mayor's Office

Measurable Goal(s):
Annual Participation. Dissemination of information to the general public

Progress on Goals- Year 11:
Advocacy forums and meetings between the City (MRA), Tri-CAP and MyRWA have been held concerning stormwater, green infrastructure opportunities and restoration efforts for the Malden River. In March of 2014 MyRWA hosted a panel presentation regarding innovative ways to address stormwater runoff in Massachusetts. Additionally, Friends of the Malden River, which is a group of residents from local towns, have held community meetings with MyRWA to expand upon their effectiveness in understanding issues and community activities such as cleanups of the Malden & Mystic Rivers. Grant opportunities have also been investigated for projects such as the rehabilitation at Pleasant Street. The City continues to actively work with interested stakeholders to advance the water quality goals of its stormwater compliance program.

Goal Status:
Ongoing community activity

2. Local Planning Processes and Community Involvement

BMP 2-1	Development of incentives for redevelopment initiatives that address existing stormwater management concerns

Responsible Department/Person:
Local Planning Agencies and Compliance Team

Measurable Goal(s):
Mitigation of existing stormwater concerns.

Progress on Goals- Year 11:
Recently completed and proposed municipal restoration projects for recreational areas have integrated stormwater quality enhancement measures into the design process. The most opportunities for the advancement of this goal continues to come from the identified infrastructure and watershed needs that are identified through the ongoing CB inventory, mapping inventory program. Through the integration of the stormwater management program into daily work practices by the Malden DPW, infrastructure deficiencies are more quickly identified and placed into the local permitting process.

Goal Status:
Through the changes in staffing and engineering support, increased planning and incentives to promote improved stormwater management practices will be a priority during the next permit year.

BMP 2-2 Development of a "Clean Malden" Program

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 11:
See BMPs 1-4 thru 1-7

MDPW staff maintains two (2) trash booms across the Malden River to retain the significant amount of trash and debris that is generated during the urban system primarily during rainfall events. Prior to this, extensive trash/debris depositions occurred along the banks of the Malden, and in particular within the vicinity of the Tuft Boathouse and Phase I of the River's Edge project, as depicted within the following photographs shown below. The maintenance of these trash booms have resulted in a significant improvement in surface water conditions for both passive and recreational activities associated with the River. The development of the Friends of the Malden citizens group is expected to further advance this goal.

Goal Status:
Achieved and ongoing

BMP 2-3 Inter-departmental review and communication to address stormwater quality concerns

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 11:
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 the BOH continue to be instrumental in successful enforcement actions when necessary. This program has led to the isolation and mitigation of illicit flow contributions as well as infrastructure deficiencies to be corrected.

Goal Status:
Ongoing

BMP 2-4 Development of an electronic database file management system

Responsible Department/Person:
Engineering Department and Compliance Team

Measurable Goal(s):
Compilation of all stormwater infrastructure information, integration of all ongoing inspection, inventory and repair activities.

Progress on Goals- Year 11:
Through the assistance of CDM-Smith, the City has completed the conversion of its current mapping system to GIS/electronic format using field GPS receivers. Future goals to advance the operational integration of the electronic file and data management program currently utilized by the City include the use of "tablets" in the field to more readily access information and update existing files. Changes in staffing and more direct daily involvement by engineering personnel will further advance this goal.

Goal Status:
Activity Ongoing

BMP 2-5 Development and implementation of local ordinances

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 11:
The City continues to enforce existing stormwater ordinances and is reviewing Green Infrastructure and LID guidance and proposed Permit revisions to provide further enforcement guidance.

Goal Status:
Achieved

BMP 2-6 Completion of an infrastructure needs analysis

Responsible Department/Person:
Eng. Dept, DPW, Compliance Team

Measurable Goal(s):
Development of a long term plan for infrastructure upgrade

Progress on Goals- Year 11:
The reorganization of Engineering and MDPW support staff advanced the understanding and prioritization of infrastructure needs, as well as more direct daily involvement by City staff.

Goal Status:
Annual Ongoing Activity

BMP 2-7 Identification of capital improvement projects necessary to improve stormwater quality

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Conveyance of CIP requirements to Planning Board and local permitting processes. Number of improvement projects completed.

Progress on Goals- Year 11:
See BMP 2-6. This BMP is to be combined with the preceding, ongoing activities.

Goal Status:
See above.

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. Identification of issues of concern and corresponding confirmation resolution/ implementation of mitigation measures.

Progress on Goals- Year 11:
During this permit year, one (1) possible illicit connection and one (1) illicit discharge were identified. The possible illicit connection was identified by the stormwater compliance team in a drainage manhole on Sharon Street during a dry weather inspection of the area. A dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc) was identified. The subsequent monitoring of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute. This discharge slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department contacted the owners of the Viking Seafoods property to further investigate this condition. Representatives of Viking Seafoods informed the City that this was process water from a cooling tower. To confirm, the Stormwater Compliance Team will conduct a dry weather sampling event in the spring.

In addition to the above, the owner of the property on South Washington Street where a possible illicit connection was initially identified in 2012 was contacted by the City of Malden Engineering Office and he advised the City that this was a roof drain connection. In response to this, the Engineering Office is currently attempting to schedule an onsite meeting with the property owner to further evaluate the connection.

The illicit discharge referenced above, which was identified during this reporting period, was also encountered during a dry weather inspection. Representatives of the Stormwater Compliance Team observed the dumping of grey water into a storm drain catch basin located at the Forestdale Elementary School on Sylvan Street. The City Engineering Department has notified the school that dumping of grey water into the drainage system is an illicit activity and must be stopped.

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 11:
A summary table with historic dry weather sampling results together with figures depicting approximate sample locations may be referenced as Attachment A. Following seasonal changes, a dry weather sampling will continue during the next permit year and a wet weather sampling event is proposed to be performed during the next qualifying rainfall event.

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 11:

Representatives of NCA and MDPW personnel continue to conduct dry weather inspections of the City's infrastructure. During this permit year the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook respectively, as well as the north central portion of Malden, which discharges to Lower Spot Pond Brook, and then Malden River have been iteratively inspected and monitored. Overall, it is estimated that approximately 42,000 linear feet of roadway has been evaluated for dry weather flows and drainage infrastructure over this permit year. However, it is to be noted that due to seasonal changes a majority of this work was performed prior to the middle of November 2013. This is an interactive and systematic program that has resulted in the identification and correction of infrastructure deficiencies, with the repair of flow conveyance networks and removal of illicit discharges leading to improvements in the quality of stormwater discharges. Historically, areas selected for inspection were 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. As this program has continued a more uniformed and systematic inspection program has been developed.

Within the Malden River watershed, periodic dry weather sampling during this permit year was conducted by NCA and the regional watershed group, Mystic River Watershed Association (MyRWA). A dry weather sampling event was conducted by MyRWA on 25 June 2013, which targeted outfalls to the Malden River identified as flowing at that time. According to information provided by MyRWA, several of the outfall discharges sampled contained elevated E. coli levels.

To further investigate the elevated bacteria loadings identified on 25 June 2013, NCA reviewed the MyRWA outfall monitoring data, as well as online U. S. Geologic Survey (USGS) precipitation data and noted that an antecedent rainfall event approximating the recommended precipitation limit had occurred in the area on 24 June 2013.

Upon receipt of the MyRWA sampling results and the nature of anticipated rainfall conditions for the month of June and the inconsistencies between the June MyRWA data and historic sampling profiles, NCA conducted a dry weather sampling event at several key outfalls that discharge to the Malden River on 12 September 2013.

This included the sampling of baseline water flow from the Malden River headwall (MR-0), as well as MR-2, which receives flows from the Saugus Branch. E. coli levels of 980 MPN/100 ml (MR-0) and 550 MPN/100 ml (MR-2) were identified respectively. Although each of these levels exceed the applicable standard, the bacteria concentrations were lower than those encountered during prior sampling events. Outfall MR-8, which is located below the Medford Street Bridge, was also sampled, as it was identified as flowing during dry weather conditions. A bacteria level of 292 MPN/100 ml was detected during NCA's September 2013 sampling event. Over the past several years of the stormwater compliance program, and of a likely consequence from ongoing eco-restoration efforts, a significant increase in waterfowl populations including swans, geese and ducks has been observed. The stagnant nature of surface water flows within the Malden River, together with this increase in waste loadings from waterfowl is currently under review to isolate human versus waterfowl bacteria contributions. This scope of work includes the use of multiple lines of evidence testing of outfall discharges to the River.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive. Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two (2) apartment buildings. Following dye testing by the Compliance Team, camera surveys performed by representatives of the property owner confirmed that compromises to the laterals servicing two (2) residential building had occurred. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4. Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Building 1054 and 1056 were completed by the property owner in March 2012. Since that time, several attempts have been made to collect a dry weather flow sample from LSP-4; however, due to base flow within the Lower Spot Pond Brook this sample location has been inaccessible. A sample from LSP-4 as well as upstream manhole E13-MH4 were collected during this permit year and E. coli levels of 2,000 MPN/100 ml were detected at each location. Although still elevated, the levels detected have decreased significantly relative to concentrations detected in 2012. The City Engineering Department is in the process of contacting the property owner to discuss the most recent sampling results.

Flow isolation studies performed to date within Linden Brook Culvert had not revealed any specific source conditions for the results of prior sampling. During this reporting period, multiple dry weather inspections of the Linden Brook Culvert Watershed were performed. As a part of these inspections, dry weather flow samples were collected revealing that the E. coli levels

encountered within the Linden Brook Culvert and contributing drainage system during the September 2013 sampling event were considerably lower than the results obtained during prior sampling events, with no exceedences of the applicable standard at four (4) of the five (5) locations sampled (Attachment A). The one exception was a dry weather flow within a drainage manhole (C18-MH5) located on Cherry Street, which contained an E. coli level of 23,000 MPN/100 ml. Flow within this manhole originates in the northern portion of Malden, along Sylvan Street, proximate to the Forestdale School and ultimately discharges into the Linden Brook Culvert. This flow will continue to be monitored next permit year. It is to be noted that a higher frequency monitoring program has been implemented in the area of the sewer siphon that exists near the outfall for the Linden Brook Culvert has been implemented to address possible blockages that occur over time.

Of further note, within the Linden Brook Watershed is the continued reduction in bacteria levels detected during the September 2013 sampling event at H43-MH1 where a level of 12 MPN/100 ml was detected during the most recent sampling event. This is in marked contrast to the concentrations encountered at this location in January 2012 (28,000 MPN/100 ml). Additional details pertaining to dry weather inspections may be referenced from the Illicit Discharge Detection and Elimination Program (IDDE) Semi-Annual Status Reports, which have been filed with USEPA and may be referenced as Attachment B.

Goal Status:
Initial city wide objectives for this goal have been met. IDDE program and dry weather flow isolation studies are 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 11:
The City has implemented several measures to reduce discharge of non-human bacterial loading at park lands, cemeteries and open space. These have included the use of dogs, postings to prevent the feeding of waterfowl, pet waste stations and enforcement of posted signage. During this permit year the City was awarded a contract for the conversion from grass playing fields to synthetic surfaces, at South Broadway Park. These improvements are located within the Town Line Brook watershed and will have a direct impact upon waterfowl waste contributions, as well as overall runoff quality.

Goal Status:
Ongoing Activity

BMP 3-5	Development of mitigation strategy based upon sampling and inspection progress for consideration in annual capital planning.

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Preparation of annual report.

Progress on Goals- Year 11:
Dry weather sampling continues to focus upon primary surface water bodies that received base-flow as surface water as well as "flow through" bacterial loading from adjacent communities. The surface water bodies principally include the Malden River, Lower Spot Pond Brook, West End (Edgeworth Brook) Culvert, Little Creek, Linden Brook and the Town Line Brook. Beyond the removal of illicit discharges, flow conveyance capacity requirements and necessary infrastructure repairs have been identified. Included amongst long term planning efforts is Phase 3 of a comprehensive Infiltration and In-flow (I&I) study for the municipal sewer system that was performed by CDM Smith, on behalf of the City. This report includes a summary of findings and proposed recommendations to mitigate infiltration and inflow into the City's sewer system and was presented for approval to Massachusetts Water Resources Authority (MWRA) during this permit year. Approval has been received, together with necessary funding.

The City has converted and updated a majority of its current storm drain system mapping to GIS format using field GPS receivers. This includes the scanning of existing record plans as well as the conversion of field data, specifically drainage infrastructure components are located and inventoried as a part of ongoing system wide maintenance, service and inspection program being implemented by the MDPW. 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 and outside technical staff to further investigate. The results obtained from the outfall sampling program, together with the development of an electronic file management system, continue to assist in the prioritization of infrastructure needs.

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

BMP 3-6	Development and Implementation of an Illicit Discharge Detection and Elimination (IDDE) Plan

Responsible Department/Person:
Eng Dept & Compliance Team

Measurable Goal(s):
Development and implementation of an IDDE Plan.

Progress on Goals- Year 11:
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. The Semi-Annual Status Reports pertaining to this effort, which have been filed with USEPA, may be referenced as Attachment B.

Goal Status:
Achieved

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

BMP 4-1	Development of inspection protocol/checklist local permitting agencies to monitor ongoing construction activities

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Development of checklist

Progress on Goals- Year 11:
The City's permitting process now incorporates the criteria contained within adopted stormwater ordinances to guide its review process. These ordinances provided the mechanism for enforcement and work is ongoing to integrate the results from daily inspection and monitoring into these processes.

Goal Status:
Achieved and Ongoing

BMP 4-2	Integration of Applicant Certification requirement for the monitoring and inspection of development activities into local planning processes.

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 11:
No progress has been made to these certification requirements, beyond conditions of approval and City oversight.

Goal Status:
Ongoing

BMP 4-3 Promote the use of new and innovative products/designs in new development initiatives. Condition of approval, monitoring

Responsible Department/Person:
Compliance Team

Measurable Goal(s):
Conditions of Approval, monitoring of construction activities.

Progress on Goals- Year 11:
Municipal projects within the City have primarily involved the conversion of urban fill areas into capped recreational improvements and the planned conversion of South Broadway Park to synthetic playing field surfaces. During the next reporting period, surface cover and drainage improvements are proposed for completion at Callahan Park. Responses to a Request for Proposal (RFP) were recently received and the contract is awaiting approval. Additional improvements performed during this permit year have included the placement of synthetic playing surfaces at MacDonald Stadium, located in the downtown area. Stormwater runoff from prior grass and earthen surfaces at MacDonald Stadium flow into West End Brook, which discharges to the Malden River.

Goal Status:
Ongoing

BMP 4-4 Enforcement of existing state and federal guidance.

Responsible Department/Person:
Planning Board and Inspectional Services, Eng. Dept.

Measurable Goal(s):
Documentation of violations, implementation of corrective actions.

Progress on Goals- Year 11:
See BMP 3-6 and 5-8. Following the adoption of local control measures in April 2009, the City has enforced the removal of illicit discharges and required that investigations be undertaken to mitigate improper stormwater discharges. This has involved the upgrade of private sewer connections to the municipal system, removal of illicit discharge connections and the cleanup/maintenance of private properties exhibiting the potential to adversely contribute to wet weather runoff.

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 11:
The goals of this general permit and the corresponding IDDE program are directly communicated to the local Conservation Commission. In addition, infrastructure needs and deficiencies are communicated to the Commission for review and consideration during the local permitting process.

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 11:
The adoption of local ordinances (See BMP 4-3) have provided planning review processes with guidance for appropriate design practices, in addition to BMP 2-5. Further, compliance with stormwater guidance for new development (310 CMR 10.00) is maintained.

Goal Status:
Ongoing

5.0 Pollution Prevention and Stormwater Management Strategies.

BMP 5-1 Develop a Formal Training Program for DPW Staff

Responsible Department/Person:
DPW, Human Resources Dept.

Measurable Goal(s):
Staff Training

Progress on Goals- Year 11:
In addition to increased engineering involvement in daily work practices, the City has increased its DPW staff, and during the previous permit year a dedicated vehicle was equipped with the necessary items for IDDE Plan implementation and overall program needs. A trained crew has been assigned to work with NCA and the Malden Engineering Department in meeting the objectives of the IDDE Plan and General Permit Program compliance. This team 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. Beyond the identification of illicit discharges, the committed focus upon surface water quality and the contributing drainage infrastructure has led to more timely repairs and improved system maintenance.

Goal Status:
Achieved and ongoing

BMP 5-2 Maintain Lawn Care Policy

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 11:
The application of pesticides, herbicides and fertilizers is provided by a licensed outside contractor, supervised by the MDPW. All other lawn care for recreational areas is maintained by the MDPW.

Goal Status:
Ongoing activity

BMP 5-3	Development of a maintenance and monitoring plan for open channel component of Town Line Brook

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 11:
Two (2) meetings were held with DCR this reporting period concerning Town Line Brook. DCR committed to cleaning the channel; however no work has been completed to date. The extent of damage to the concrete wall of this trapezoidal channel remains a significant concern, and has been reviewed with representatives of USEPA. The extent of sediment deposition with the channel, together with compromises in its structural integrity represents long term and ongoing sources for degradation of surface water quality.

Goal Status:
Ongoing

BMP 5-4	Implementation of recommended maintenance and monitoring plan developed for Spot Pond Brook at Oak Grove.

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 11:
Two (2) meeting were held with DCR this reporting period concerning Spot Pond Brook. DCR committed to cleaning the channel; however work has been completed to date. No planned maintenance activities occurred during this reporting period.

Goal Status:
Funding for necessary improvements and attention by DCR remains the goal of this BMP.

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 11:
The current Administration has made significant commitment to public outreach and community involvement. At the core of this effort is education and input from concerned residents, as well as the business community. With the development of the Friends of the Malden River Organization, a focus of community involvement includes bank clean up, potential public opportunities and enhancement alternatives for the Malden River Corridor. During this reporting period, a comprehensive mitigation program for Fellsmere Pond was developed and has been initiated. This scope of work includes bank stabilization measures, a sediment vathymetric survey, control of invasive species, and enforcement of control to restrict/reduce public feeding of waterfowl population. During the design phase of this program compromises to the drainage infrastructure contributing to Fellsmere Pond were identified and are now being addressed to improve the quality of discharges.

Goal Status:
Achieved and 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 11:
During the 2013-2014 permit year, the Engineering Department and the MDPW continued to document catch basin locations and functional characteristics in conjunction with catch basin cleanings. The information obtained from the CB inventory and clean program is integral to the isolation of illicit flows, implementation of timely repairs and continued development of the GIS drainage layer. Specifically, an ongoing maintenance program also includes repairs to catch basins and laterals, which reduces the potential for sediment entrainment and reduces flooding issues.

Goal Status:
Achieved and Ongoing

BMP 5-7 Continue sewer re-lining and connection upgrade program

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 11:

BMP 3-5 a capacity assessment has been completed by CDM Smith for the Malden sanitary sewer system. This assessment included the monitoring of flows and depths at key locations throughout the system. A hydraulic model has also been constructed of the main sewers in the City including those owned by MWRA. The model has been calibrated to measured flows and is being used to project the response of Infiltration and inflow (I/I) to assess potential capacity deficiencies. As stated in the prior year submittal preliminary results indicate that some portions of the City's system do have excessive I/I when a 1 year design storm is applied (as per MADEP protocol). However, the hydraulic capacity of the pipes can convey these flows downstream without showing signs of overflows.

During this reporting period, a $3 million dollar contract (2014 S-1) was signed by the City for extensive sewer relining services. It is anticipated that work will be initiated in the spring-summer of 2014.

Goal Status:
Ongoing activity

BMP 5-8 Development and implementation of communication/notification plan for SSOs

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 11:
No SSOs were identified during Year 11.

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 11:
Stormwater management requirements, compliance enforcement and ongoing work practices have been integrated into daily work procedures, with an emphasis placed upon improved communication.

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 11:
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. This is evidenced by both the timing and extent of infrastructure repairs and the overall improved understanding of the municipal drainage and sewer systems.

Goal Status:
Ongoing

Part IV. Summary of Information Collected and Analyzed

See Attachment B

Part V. Program Outputs & Accomplishments (Optional)

1. Programmatic (See BMPs 1-4 and 5-1)

1.1	Stormwater management position created/staffed	Compliance Team Established
1.2	Annual program budget/expenditures	$ 700,000 – 850,000

2. Education Community Involvement and Training (See BMPs 1-1, 1.2, 1-4, and 1-5)

2.1	Estimated number of residents reached by education program(s)	55%
2.2	Stormwater management committee established	Yes
2.3	Stream teams established or supported	Yes
2.4	Shoreline clean-up participation or quantity of shoreline miles cleaned	None
2.5	Household Paint Waste Collection Days	
	Days sponsored	2 Days
	Community participation	20%
	Material collected	$8,000
2.6	School curricula implemented	Yes

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

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

4. Mapping and Illicit Discharges (See BMPs 2-4)

4.1	Outfall mapping complete	All Known-100%
4.2	Estimated or actual number of outfalls	65
4.3	System-Wide mapping complete	
	Sewer-Paper/Mylar	100%
	Sewer-GIS	100%
	Drain-Paper/Mylar	100%
	Drain-GIS	90%
4.4	Outfalls inspected/screened	100%
4.5	Illicit discharges identified	8
4.6	Illicit connections removed	260 GPD (est.)
4.7	% of population on sewer	99.6%
4.8	% of population on septic systems	0.4%

5. Construction

5.1	Number of construction starts (>1-acre)	1
5.2	Estimated percentage of construction starts adequately regulated for erosion and sediment control	1
5.3	Site inspections completed	2
5.4	Tickets/Stop work orders issued	None
5.5	Fines collected	None
5.6	Complaints/concerns received from public	None

6. Post-Development Stormwater Management

6.1	Estimated percentage of development/redevelopment projects adequately regulated for post-construction stormwater control	100%
6.2	Site inspections completed	4
6.3	Estimated volume of stormwater recharged	None

7. Operations and Maintenance (See BMPs 5-1)

7.1	Average frequency of catch basin cleaning (seasonal) (non-commercial/non-arterial streets)	5 days a week
7.2	Average frequency of catch basin cleaning (commercial/arterial or other critical streets)	5 days a week
7.3	Total number of structures cleaned	350
7.4	Storm drain cleaned	850 LF
7.5	Qty. of screening/debris removed from storm sewer infrastructure	300 tons
7.6	Disposal or use of debris (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Haverhill LF
7.7	Cost of screening disposal	NA
7.8	Average frequency of street sweeping (non-commercial/non-arterial streets)	6 days a week
7.9	Average frequency of street sweeping (commercial/arterial or other critical streets)	6 days a week
7.10	Qty. of sand/debris collected by sweeping	840 tons
7.11	Disposal or use of sweepings (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Haverhill LF
7.12	Cost of sweeping disposal	NA
7.13	Street sweepers purchased/leased	1
7.14	Street sweepers specified in contracts	0
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

7.16	Anti/De-Icing precuts and rations	Salt 100% CaCl2 100 gals/30 tons
	5000 gallon tank	CaCl2-100%
7.17	Pre-wetting techniques utilized	Yes
7.18	Manual control spreaders used	No
7.19	Automatic or Zero-velocity spreaders used	Yes
7.20	Estimated net reduction in typical year salt application	15%
7.21	Salt pile covered	Yes

NANGLE CONSULTING ASSOCIATES, INC

ATTACHMENT A

Environmental Engineering and Land Use Planning

960 Turnpike Street, Canton, MA 02021 Telephone (781) 821-0521 email: nangle@ncaenv.com Facsimile (781) 821-4182

Table 1.0 Dry Weather Conditions - E. Coli Concentrations

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	E. Coli (MF) (MPN/100ml) 9213D ACTION LEVEL- 235 col/100ml																					
	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	8/4/2011	11/8/2011	12/13/2011	1/11/2012	4/13/2012	6/15/2012	9/11/2012[5]	9/27/2012	2/22/2013	4/5/2013	9/12/2013	9/24/2013
Malden River																						
MR-0	150	1,100	-	68	-	-	110	-	-	-	-	-	9,200	-	-	-	3,090	-	-	490	980	-
MR-1	-	160	-	-	-	-	130	-	-	-	-	-	390	-	-	-	-	-	-	-	-	-
MR-4	-	-	-	-	-	-	-	-	-	-	-	-	220	-	-	-	-	-	-	-	-	-
MR-5	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-	-
MR-6	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-	-	-	-	-
MR-8																					292	-
MR-11	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-	-	-
MR-12	-	-	-	-	-	-	-	-	-	-	-	-	59	-	-	-	-	-	-	-	-	-
Saint Mary St.[1]	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-0-Channel[2]	-	460	-	-	-	-	-	10,000	-	2,000	-	-	-	1,700	-	-	-	-	-	-	-	-
LSP-3	-	-	-	-	-	-	-	-	-	-	-	-	-	1,600	-	-	-	-	-	-	-	-
LSP-4	-	-	-	-	-	-	-	14,000	-	2,000	17,000	-	-	>242,000	-	100,000	-	-	-	-	-	2,000
LSP-5.1-Channel[2]	-	630	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-9	-	-	-	-	-	-	-	-	-	-	-	34	-	84	-	-	-	-	-	-	-	-
LSP-10-Channel[2]	-	350	-	-	-	-	-	4,900	-	-	-	-	-	10,000	-	-	-	-	-	-	-	-
C39-MH0.1	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C46-MH19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	-	-	-	-	-
E2-MH2	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E2-MH1	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E13-MH2 (Elrich)	-	-	-	-	-	-	-	-	-	98	-	-	-	-	-	-	-	-	-	-	-	-
E13-MH4 (Elrich)	-	-	-	-	-	-	-	-	-	2,400	-	-	-	-	-	-	-	-	-	-	-	2,000
E28-MH8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-
E28-SP1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,100	-	740	-	-	-	-	-
E28-SP2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,200	-	310	-	-	-	-	-
E28-MH4A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-
H16-MH13	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H16-MH17	-	-	-	-	ND (2.0)	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H25-MH2	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M8-MH3	-	-	-	5,100	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M26-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NG-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P36-MH5	-	-	3,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R18-MH1	-	-	-	-	-	290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S29-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160	-	-
S29-MH3	-	-	96	-	-	-	-	-	-	-	-	-	-	-	-	-	13,330	-	-	190	-	-
W25-MH1	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Little Creek																						
LC-0	7	140	-	ND (2.0)	-	-	190	-	-	-	2,400	-	65	-	-	-	-	-	-	-	-	-
Town Line Brook																						
TL-0[3]	1,500	280	-	62	-	-	730	-	-	-	-	96	-	-	-	-	-	-	-	-	-	-
TL-1	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-3	-	-	-	-	-	-	-	-	-	-	-	8.5	-	-	-	-	-	-	-	-	-	-
TL-5	-	-	-	-	-	-	-	2,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-9	640	-	-	-	-	-	-	8,200	-	-	-	130	-	-	-	-	410	-	-	-	-	-
TL-13	30	70	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-	-	-	-
TL-24	520	1,500	-	-	-	-	-	24,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-BL-EV	440	740	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B53-MH7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	-	-	-	-	-
BP-MH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-
S3-MH12[3]	-	2,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,880	-	-	-	-	-
L23-MH1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saugus Branch																						
MR-2	-	ND (2.0)	-	-	-	-	220	-	-	1,100	-	-	1,200	-	-	-	-	-	-	-	550	-
Broadway/Eastern[4]	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Linden Brook																						
B46-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1
C18-MH5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23,000
C36-MH1	-	-	-	-	-	-	160	-	-	-	-	-	-	6.3	-	-	-	-	-	-	-	-
D17-MH1	-	-	-	-	-	-	1,200	-	360	-	-	-	-	460	-	-	-	-	-	-	-	-
F1-MH4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310	-	-	12	-	-
F23-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
H43-MH1	-	-	-	-	-	-	1,600	-	2,400	-	-	-	-	28,000	-	-	5,470	-	-	580	-	12
K6-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	-	-	-	-
L5-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	580	-	-
LBR-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>241,920	-	<10	1	-	-
M31-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
O10-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,300	-	650	-	-
P24-MH1	-	-	-	-	-	-	96	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-
V1-MH1	-	-	-	-	-	-	-	-	15	-	-	-	-	5.2	-	-	-	-	-	-	-	-
W26-MH1	-	-	-	-	-	-	180	-	-	-	-	-	-	390	-	-	-	-	-	320	-	-

File No. 465.09

[1]2007 samples collected 9/25/07

[2]2007 samples collected on 6/21/07

[3]2007 samples collected 7/12/07

[4]2007 samples collected 9/12/07

[5]Samples collected by USEPA

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Environmental Engineering and Land Use Planning
989 Turnpike Street, Canton, Massachusetts 02021

Figure - Malden River Outfalls

0 50100 200 300 400
Feet

Figure - Lower Spot Pond Brook Outfalls

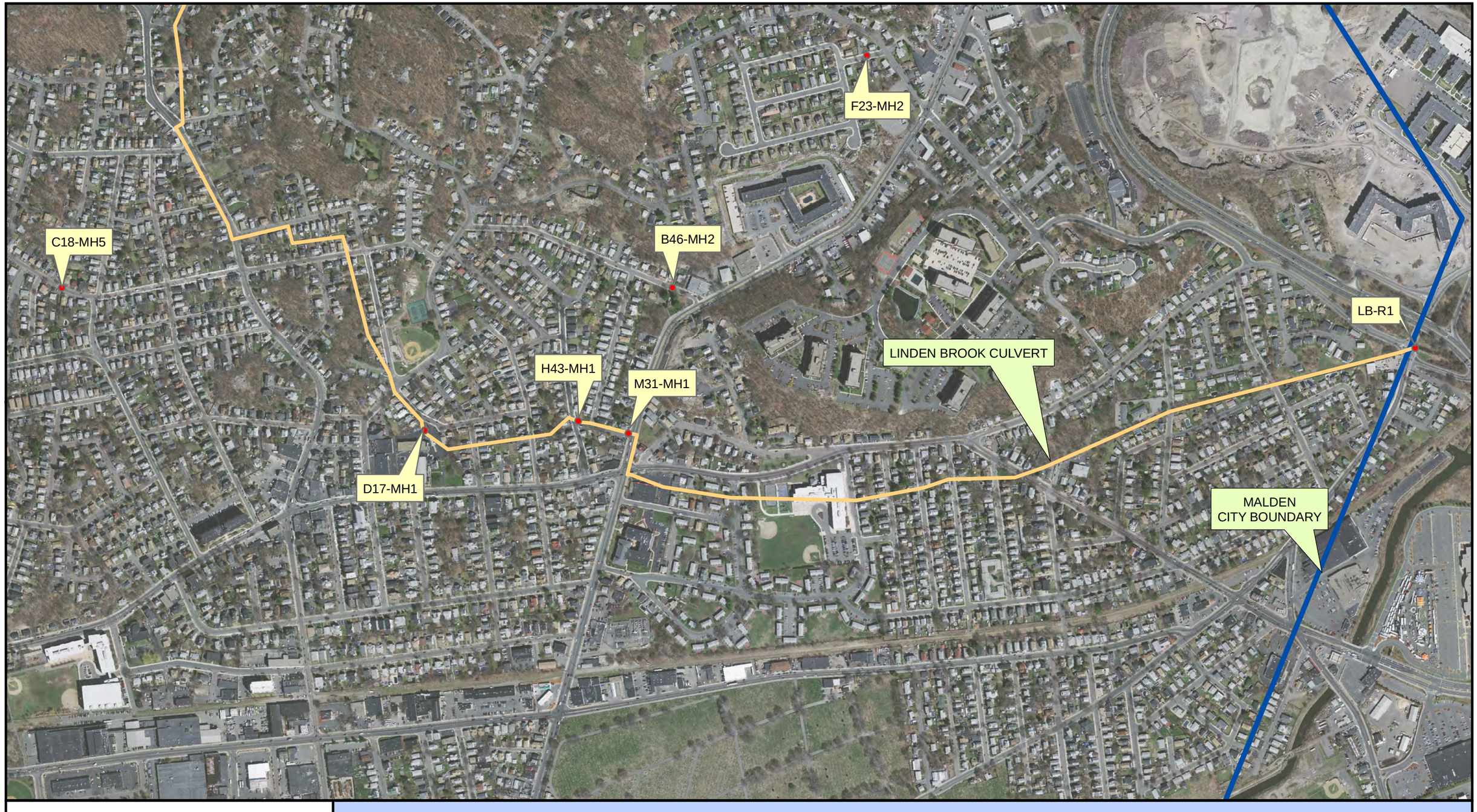

Figure 3 - Dry Weather Sampling Program

MALDEN, MASSACHUSETTS

0 830 1,660 2,490 3,320 Feet

NANGLE CONSULTING ASSOCIATES, INC

ATTACHMENT B

Environmental Engineering and Land Use Planning

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CITY OF MALDEN

Illicit Discharge Detection and Elimination Program
Semi-Annual Status Report

July 1, 2013 – December 31, 2013

Prepared by:

Nangle Consulting Associates, Inc.
960 Turnpike St
Canton, MA 02021

and

City of Malden Engineering Department
200 Pleasant Street
Malden, Massachusetts

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TABLES

FIGURES

1.0 INTRODUCTION

This status report pertains to the period of 1 July through 31 December 2013 for the City of Malden's Illicit Discharge Detection and Elimination (IDDE) Program. The City of Malden's IDDE plan was developed to facilitate the implementation of a systematic and iterative procedure for the evaluation of dry weather flows, identification of potential illicit discharges and timely repairs to the storm drainage infrastructure, with the overall goal of improving surface water quality discharge within the City of Malden. This semi-annual status report 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) to document key program tasks completed during this reporting period.

Since its inception, the City's IDDE program has identified and removed several illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages, enforced Best Management Practices (BMPs)/stormwater ordinances and completed repairs to components of the drainage infrastructure. A key component of this effort has been the development and implementation of a comprehensive GIS mapping and catch basin cleaning/repair program, which is maintained by the MDPW and Engineering Department. The goals and objectives of this IDDE plan are directed towards the reduction in the historic bacteria levels that have been detected at selected outfalls within the City. In addition, as a "flow though" community, bacteria loadings entering into the City of Malden's infrastructure from upstream neighboring communities have also been quantified. As noted in prior submittals, the results of dry weather inspections, together with both dry and wet weather sampling, support the opinion 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 City Engineering and Public Works Departments have coordinated their efforts and together with outside technical assistance, have developed a program that integrates the implementation of the IDDE Plan into the routine daily work practices. This integration of program goals by City personnel has led to the identification of infrastructure deficiencies and enabled the timely repair of potential flow and water quality concerns. These 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 restructuring of the stormwater compliance team to include more direct oversight by engineering personnel continues to enhance the understanding of infrastructure needs.

This report has been prepared to document and summarize IDDE activities that have been undertaken by the City during the July 2013 through December 2013 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. During this reporting period, the comprehensive GIS mapping program initially developed by NCA has continued to be expanded for use by municipal departments under the direction of CDM Smith. Utilizing the data and information obtained during this reporting period, 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, one (1) possible illicit connection and one (1) illicit discharge were identified. To assist in the review of the information contained within this report, a summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0. The possible illicit connection was identified by the stormwater compliance team in a drainage manhole on Sharon Street during a dry weather inspection of the area. Inspection of the manhole revealed a dry weather flow discharging from a pipe which appeared to be emanating from the rear of the building located at 50 Crystal Street (Viking Seafoods Inc). A subsequent evaluation of the drainage manhole revealed that the discharge appears to be intermittent, with flows observed to be approximately 10 – 12 gallons per minute. This discharge slowed to a trickle over an approximate 10 minute timeframe. The City Engineering Department is in the process of working with the owners of the Viking Seafoods property to further investigate this condition.

The illicit discharge identified this reporting period was also encountered during a dry weather inspection. Representatives of the stormwater compliance team observed the dumping of grey water into a storm drain catch basin located at the Forestdale Elementary School on Sylvan Street. The City Engineering Department has notified the school that dumping of grey water into the drainage system is an illicit activity and must be stopped.

In addition to the above, the owner of the property on South Washington Street where a possible illicit connection was initially identified in 2012 was contacted by the City of Malden Engineering Office and he advised the City that this was a roof drain connection. In response to this, the Engineering Office is currently attempting to schedule an onsite meeting with the property owner to further evaluate the connection. The continued assessment of a possible grease blockage within a sewer siphon located at the intersection of Salem and Lynn Streets that passes beneath Linden Brook was also conducted this reporting period. This structure is located at the City line between Malden and Revere and additional details pertaining to the ongoing investigation and inspection program may be referenced from Section 3.1.3.

3.0 OVERVIEW OF IDDE ACTIVITIES (JULY 2013 – DECEMBER 2013)

In addition to outfall sampling, 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 and sampling 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.

As described in prior status reports, a comprehensive dry weather sampling effort using multiple lines of evidence testing was performed by representatives of USEPA and NCA in the fall of 2012. The focus of this extensive USEPA analytical program was directed towards the isolation of potential human based contributions to dry weather flows, using an approach that greatly exceeds the limitations of simple bacteria sampling. Specifically, this approach was intended to resolve traditional limitations involving reliance upon bacteria analysis associated with animal waste contributions.

During this reporting period, several targeted sampling events were also completed to address and build upon the results obtained from the September 2012 sampling program. A primary focus of the current dry weather inspection program continues to be directed towards the Linden Brook watershed and areas where persistent dry weather flows have been identified. A summary of the results obtained from these sampling efforts are described in the following section of this report.

By design, observations recorded during the dry weather inspections, together with the results of infrastructure sampling, serve as the basis for future work plan tasks and modifications to the original IDDE plan. Accordingly, the IDDE program maintained by the City is regarded as an ongoing and iterative effort that has successfully demonstrated the capability to quickly respond to water quality issues as needs and concerns are identified. The City of Malden has invested significant time and capital funding to develop a Stormwater Compliance Team (SCT) comprised of members of the Department of Public Works, Engineering and outside technical support. Key tasks performed by this group include the performance of dry weather inspections targeted sampling efforts together with the systematic cleaning of catch basins, and related infrastructure components. In addition, their efforts have led to the identification of infrastructure needs, rapid 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. Increased involvement by engineering technical staff in the daily work practices of MDPW stormwater personnel is also intended to further this goal. 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. The current municipal leadership has made a

significant effort to increase public awareness and participation through increased integration of digital and electronic media into daily practices. 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 continue to conduct dry weather inspections of the City's infrastructure and during this reporting period the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook, respectively and the north central portion of Malden, which discharges to Lower Spot Pond Brook, and ultimately the Malden River have been iteratively inspected and monitored. Overall, it is estimated that approximately 42,000 linear feet of roadway has been evaluated for dry weather flows and drainage infrastructure over the last six (6) month period. However, it is to be noted that due to seasonal changes, a majority of this work was performed prior to the middle of November 2013. This is an interactive and systematic program that has resulted in the identification and correction of infrastructure deficiencies, with the repair of flow conveyance networks and removal of illicit discharges leading to improvements in the quality of stormwater discharges. Historically, areas selected for inspection were 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. As this program has continued a more uniformed and systematic inspection program has been developed.

A map depicting the approximate locations where targeted dry weather inspections have been conducted by NCA to date is presented as Figure 2. In addition, the drainage infrastructure is also inspected by DPW during the catch basin cleaning program. Upon the identification of previously unknown dry weather flows, the Engineering Department and NCA are immediately notified by MDPW personnel and targeted mass balance sampling efforts are performed. During dry weather inspections completed under the IDDE program, various dry weather flows have been identified. A summary of these flows within the municipal system that have been identified to date are shown on Table 2.0 and Figure 3. As stated above, during this reporting period, multiple dry weather investigations were performed within three (3) key areas that warranted further flow isolation efforts based upon prior dry weather sampling data. These areas include the northeast and southeast sections of Malden, which contribute flows to Linden Brook and Town Line Brook, respectively. In addition, the north central portion of Malden was also targeted, which discharges to Lower Spot Pond Brook, and ultimately the Malden River.

3.1.1 Malden River Watershed

The City of Malden's stormwater compliance team initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during dry weather sampling events, the City has identified significant base flow as surface waters, to the Malden River. Consistent with the original design of the MDC/DCR conveyance network; this occurs primarily thorough culverted channels/brooks located in northwestern portions of the City. This flow includes contributions that originate from the Fells Reservation and Lower Spot Pond Brook. As shown on Figure 4, a total of 23 outfalls to the Malden River have been identified, nine (9) of which have been identified as flowing

during dry weather conditions. Periodic dry weather sampling has been performed by NCA, the regional watershed group, Mystic River Watershed Association (MyRWA) and the USEPA.

A dry weather sampling event was conducted by MyRWA on 25 June 2013, which targeted outfalls to the Malden River identified as flowing at that time. According to information provided by MyRWA, several of the outfall discharges sampled contained elevated E. coli levels. To further investigate the elevated bacteria loadings identified on 25 June, NCA reviewed the MyRWA outfall monitoring data, as well as online U. S. Geologic Survey (USGS) precipitation data and noted that an antecedent rainfall event approximating the recommended precipitation limit had occurred in the area on 24 June 2013. Based upon the precipitation information and the apparent inconsistencies between the 25 June MyRWA data and historic sampling profiles, NCA conducted a dry weather sampling event at several key outfalls that discharge to the Malden River on 12 September 2013.

This included the sampling of baseline water flow from the Malden River headwall (MR-0), as well as MR-2, which receives flows from the Saugus Branch. As shown on Table 3.0, E. coli levels of 980 MPN/100 ml (MR-0) and 550 MPN/100 ml (MR-2) were identified, respectively. Although each of the levels is in exceedance of the applicable standard, concentrations are lower than those encountered during prior assessment activities. MR-8, located below the Medford Street Bridge was also sampled this reporting period, as it was identified as flowing during dry weather conditions. Reference to Table 3.0 reveals that only slightly elevated levels of bacteria (292 MPN/100 ml) were detected during the September 12, 2013 sampling event at this location.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive (Figure 5). Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two apartment buildings. Following dye testing by the Compliance Team, camera surveys performed by representatives of the property owner confirmed that compromises to the laterals servicing two (2) residential building had occurred. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4. Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Building 1054 and 1056 were completed by the property owner in March 2012. Since that time, several attempts have been made to collect a dry weather flow sample from LSP-4, however due to base flow within the Lower Spot Pond Brook; this sample location has been inaccessible. A sample from LSP-4, as well as upstream manhole E13-MH4 were collected during this reported period and as shown on Table 3.0, an E. coli level of 2,000 MPN/100 ml was detected at each location. Although still elevated, the levels detected have decreased significantly relative to concentrations detected in 2012. The City Engineering Department is in the process of contacting the property owner to discuss the most recent sampling results.

3.1.2 Town Line Brook Watershed

Town Line Brook in Malden begins at the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Significant tidal influences exist in the form of an approximate 2-3 foot change in surface water elevation between Broadway and the remaining length of the culvert to the Revere City line. As shown on Figure 6, a total of 29 outfalls to Town Line Brook in Malden have been identified. The historic monitoring data of Town Line Brook has revealed relatively uniform bacteria levels during dry weather sampling events. Several outfall locations have consistently exhibited bacteria loadings during dry weather sampling events, including S3-MH12, TL-0, TL-9 and Trifone Brook (TL-24). Manhole sample point S3-MH12 is the upstream sampling point for this section of the Brook as it enters the Malden system from Everett, while TL-0 is located at Broadway, where Town Line Brook daylights. TL-9 is located proximate to the terminus of Hadley Street in Malden and receives dry weather flows from the City of Everett, with Trifone Brook (TL-24), also flowing from Everett prior to discharging into Town Line Brook. No dry weather flows from the Town Line Brook watershed were sampled during this reporting period, however, dry weather inspections of the watershed area revealed one (1) dry weather flow located on Sharon Street. As discussed in Section 2.0, this flow discharges from a possible illicit connection and will be evaluated during the next reporting period.

3.1.3 Linden Brook Watershed

Linden Brook Culvert is the major stormwater conveyance network located in northeasterly portions of the City. Dry weather inspections have revealed base flow throughout the culvert at all times, with E. coli levels detected historically within the mid-portion of the culvert, at manholes D17-MH1 and H43-MH1 (Figure 7). Flow isolation studies performed to date within this portion of the City had not revealed any specific source conditions for the results of prior sampling. During this reporting period, multiple dry weather inspections of the Linden Brook Culvert Watershed were performed. As a part of these inspections, several dry weather flow samples were collected from the approximate manhole locations shown on Figure 7. Reference to Table 3.0, indicates that the E. coli levels encountered within the Linden Brook Culvert and contributing drainage system during the September 2013 sampling event were considerably lower than the results obtained during prior sampling events, with no exceedences of the applicable standard at four (4) of the five (5) locations sampled. The one exception was a dry weather flow within a drainage manhole (C18-MH5) located on Cherry Street which contained an E. coli level of 23,000 MPN/100 ml. Flow within this manhole originates in the northern portion of Malden, along Sylvan Street, proximate to the Forestdale School and ultimately discharges into the Linden Brook Culvert. This flow will continue to be monitored next reporting period.

Of particular note within the Linden Brook Watershed is the continued reduction in bacteria levels detected during the September 2013 sampling event at H43-MH1 where a level of 12 MPN/100 ml was detected during the most recent sampling event. This is in marked contrast to the concentrations encountered at this location in January 2012 (28,000 MPN/100 ml). The Linden Brook Culvert will continue to be monitored during the next reporting period, with specific emphasis on westerly contributing flows from Cherry Street, at manhole C18-MH5.

During the September 2012 sampling event, representatives of the USEPA collected a water sample from outfall LBR-1 (Figure 7), located in Revere, where distinct indications of sewage odors were noted. Consistent with identification of strong sewage odors and immediately apparent from a review of Table 3.0 is the significantly elevated level of E. coli (>241,920 MPN/100 ml) detected in sample LBR-1. To assess this condition and as described in prior status reports, the City of Malden contracted with National Water Main Cleaning Company, under the supervision of CDM Smith. As summarized in the following excerpt from an email to the City of Malden from CDM Smith, it is believed that line blockage due to grease build up may have been a crucial factor for the conditions identified at LBR-1, in addition to a "minor" defect in the form of a leaky joint. Although maintenance was routinely performed on this siphon, the extent of grease build up indicates that a higher frequency of cleaning and maintaining is necessary to further understand the condition.

> As you know, National Water Main Cleaning Company along with CDM Smith staff were out on site on Tuesday November 6, 2012 to investigate the potential illicit connection into the Linden Brook Culvert at Salem Street near the Route 1 underpass. The following in a summary of the day's events. The following figure graphically represents the results of the work.
>
> National Water Main was onsite to clean and CCTV the siphon under the Old Linden Brook culvert. Upon arrival the condition of the sewers had not changed from the previous visit held 2 weeks prior: The downstream manhole (MH 3 in the attached figure) and a manhole upstream of the siphon (MH 1 in the figure) were completely plugged with heavy grease. A limited amount of liquid was passing through MH 3. Heavy cleaning of MH 3 and the sewer under the culvert took longer than expected. From MH 3 upstream to MH 1 an enormous amount of grease and sediment was removed. The pipe was 100% clogged with slugs of grease in several spots.
>
> The sewer between MH 1 and MH 2 was successfully CCTV'd with the aid of the jetter (upstream of the siphon). This pipe was found to be in good condition. The most notable defect was a leaking joint (runner) at 9pm 54-ft from MH 1 (while traveling downstream). This was a rather minor defect. Active I/I was observed, however, it is possible that when the siphon builds some head, a small amount of sewage could exfiltrate from this same joint.
>
> We discovered what appears to be an external drop connection just downstream of MH 2. This prevented us from CCTV'ing any further as the camera could not pass the vertical 90 degree bend. CCTV from the upstream direction would require two jetters or bypass pumping, (one to keep MH 3 drained and one to intercept flow from upstream in MH 2). This vertical drop was heavily blocked with grease. Approximately 80% of the grease in this pipe was removed with a root cutter and the pipe is in much better condition.
>
> Last we lowered the camera into the 12-in connection to the culvert that once housed a gate valve (in MH 3). It no longer houses any gate, instead there is a masonry plug that seems to be in good condition. As the intent of finding the definitive source of sewage into the culvert was inconclusive, we recommend that we resample the outfall and test for parameters consistent with sewage. If the results are consistent with the previous results we should develop a new approach to finding the source.

Based upon the "inconclusive finding" cited by CDM Smith, future higher frequency inspections of the siphon and related service connections have been performed. In addition to the higher frequency inspections, two (2) sampling events were performed at LBR-1 during this reporting period. As shown on Table 3.0, dry weather samples collected at LBR-1 on 22 February and 4 April 2013 indicated concentrations of <10 MPN/100ml and 1 MPN/100ml, respectively. The higher frequency inspections, as well as dry weather sampling of LBR-1 will be continued during the next reporting period.

3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)

The City is continuing to convert its paper storm drain system mapping to GIS format through the compilation of digitized plans, field GPS data collection and planimetric mapping information obtained from recent aerials. In addition, drainage infrastructure information including components pipe sizes, type, connections and flow parameters are also inventoried as a part of the ongoing system wide maintenance, service and inspection program. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering and outside technical staff to further investigate.

3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis

The City of Malden now maintains a strategic GIS Implementation plan that was developed with the assistance of CDM Smith. The City of Malden has also completed a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. CDM Smith, on behalf of the City, has prepared 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. This report was presented for approval to MWRA during this permit year. Approval was received together with necessary funding. Currently, contract drawings and specifications are being prepared to address the recommendations of the Phase III Study.

4.0 SANITARY SEWER OVERFLOWS (SSO'S)

No SSOs were identified during this reporting period.

5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES

As described in the previous sections of this submittal, the City of Malden has implemented a comprehensive illicit discharge elimination program that has resulted in the isolation and mitigation of numerous improper discharges/connections and reduced significant potable water losses due to the detection of leakages. In addition to this, the dry weather sampling program has identified several target areas of intermittent bacteria loadings. These target areas will remain as a primary focus of activities to be performed during this biannual reporting period. The delineation of discrete drainage watersheds and continued implementation of the catch basin cleaning, inspection and inventory program remains a priority of work practices that are being performed by the SCT.

In addition to the above, the GIS drainage map is nearing completion and a large percentage of historic information has been linked to the network, thus enabling improved understanding of the overall municipal system and corresponding program capabilities. During the development of the GIS drainage map, the manual recording of system components, such as pipe diameter, dry weather flow characteristics, and structural conditions has been performed and is being entered into the digital database. This represents a key program goal for the next reporting period, as the conversion to a fully digital data entry process continues.

Table 1.0 Summary of Illicit Connections/Discharges identifed as of 12/31/2013

Illicit Connections

Illicit Connection Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-1	1/15/2009	Sewage	40 gpd	2/16/2009	33 Lodgen Ct., Unit 1F
ID-2	1/15/2009	Grey Water	100 gpd	3/2/2009	34 Hanover Street
ID-4	8/28/2009	Sewage	60 gpd	9/4/2009	2-4 Hancock Street
ID-9	5/18/2010	Sewage	60 gpd	5/19/2010	36 Charles Street
ID-12	Apr-12	No Flow	NA	Pending	100-110 Pleasant Street
ID-13	Sep-12	Sewage	Unknown	January-13	Exchange Street
ID-15	Oct-13	Dry Weather Flow	Unknown	Pending	Sharon Street

Total Illicit Flow Removed to Date: ***260 gpd*** ***(94,900 gal/yr)***

Illicit Discharges

Illicit Discharge Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-3	8/11/2009	Oil Sheen	Unknown	n/a	Near 1081 Fellsway
ID-5	9/10/2009	#2 oil spill	<5 gallons	9/10/2009	269 Pearl Street
ID-6	9/21/2009	Poss. Washwater	Unknown	9/21/2009	120 Main Street
ID-7	12/9/2009	Trans. Dielectric fluid	<27 Gallons	12/10/2009	Near 6 Grove Street
ID-8	4/29/2010	Hydraulic Fluid	<10 Gallons	4/29/2010	496 Main Street
ID-10	2/10/2012	Sewage	Note 1	Pending	1056 Erlich Drive
ID-11*	9/11/2012	Sewage	Unknown	11/6/2012	Linden Brook @ Lynn St.
ID-14	8/15/2013	Grey Water	Unknown	13-Dec	Forestdale School

1 - approximately 1 gallon per minute observed discharging at LSP-4 during dry weather

* Possible discharge due to grease blockage-Syphon still under investigation

Table 2.0 Summary of Dry Weather Flows Identifed as of 12/31/2013

Flow Identification	Location	Flow Type	Status
Flow 1	Medford City Line	Water Line Leak	Removed
Flow 2	Saint Mary's Street	Groundwater	No Further Action
Flow 3	Fellsmere Reservation	Groundwater	No Further Action
Flow 4	Malden River	Surcharge-Submerged Invert	Evaluation Ongoing
Flow 5	DCR Spot Pond Brook	Base Flow	Evaluation Ongoing
Flow 6	Forestdale-Pine Banks Park	Base Flow	No Further Action
Flow 7	Wigglesworth Street	Groundwater-Illicit Discharge	Removed
Flow 8	Main Street	Water Line Leak	Removed
Flow 9	Pierce Street	Groundwater Breakout	No Further Action
Flow 10	Linden Brook	Base Flow	Evaluation Ongoing
Flow 11	LSP-4	Dry Weather Flow	Evaluation Ongoing
Flow 12	Kennedy Dr-Granada Highlands Apts.	Base Flow	No Further Action
Flow 13	Orchard Street	Dry Weather Flow	Evaluation Ongoing
Flow 14	Exchange Street	Intermittent Dry Weather Flow	Evaluation Ongoing
Flow 15	Lower Commercial Street	Dry Weather Flow	Evaluation Ongoing
Flow 16	Huntley Street	Dry Weather Flow	No Further Action
Flow 17	Goldcliff Road	Dry Weather Flow	Evaluation Ongoing
Flow 18	Cherry & Gilbert Streets	Dry Weather Flow	Evaluation Ongoing
Flow 19	Sylvan Street	Dry Weather Flow	Evaluation Ongoing
Flow 20	First Street & Elwell Ave	Base Flow	No Further Action
Flow 21	Bowman Street	Base Flow	No Further Action
Flow 22	Springdale Street	Dry Weather Flow	Evaluation Ongoing
Flow 23	Grant Street	Dry Weather Flow	Evaluation Ongoing
Flow 24	Wheeler Street	Dry Weather Flow	Evaluation Ongoing
Flow 25	Revere Street	Dry Weather Flow	Evaluation Ongoing
Flow 26	Kennedy Dr & Fairfield Avenue	Base Flow	No Further Action
Flow 27	Sharon Street	Dry Weather Flow-illicit connection	Evaluation Ongoing

Table 3.0 Dry Weather Conditions - E. Coli Concentrations
Site Location, Outfalls/Manholes Malden, MA
Sample Description: Water

Sample Designation	E. Coli (MF) (MPN/100ml) 9213D ACTION LEVEL- 235 col/100ml																					
	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	8/4/2011	11/8/2011	12/13/2011	1/11/2012	4/13/2012	6/15/2012	9/11/2012[5]	9/27/2012	2/22/2013	4/5/2013	9/12/2013	9/24/2013
Malden River																						
MR-0	150	1,100	-	68	-	-	110	-	-	-	-	-	9,200	-	-	-	3,090	-	-	490	980	-
MR-1	-	160	-	-	-	-	130	-	-	-	-	-	390	-	-	-	-	-	-	-	-	-
MR-4	-	-	-	-	-	-	-	-	-	-	-	-	220	-	-	-	-	-	-	-	-	-
MR-5	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-	-
MR-6	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-	-	-	-	-
MR-8																					292	-
MR-11	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-	-	-
MR-12	-	-	-	-	-	-	-	-	-	-	-	-	59	-	-	-	-	-	-	-	-	-
Saint Mary St.[1]	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-0-Channel[2]	-	460	-	-	-	-	-	10,000	-	2,000	-	-	-	1,700	-	-	-	-	-	-	-	-
LSP-3	-	-	-	-	-	-	-	-	-	-	-	-	-	1,600	-	-	-	-	-	-	-	-
LSP-4	-	-	-	-	-	-	-	14,000	-	2,000	17,000	-	-	>242,000	-	100,000	-	-	-	-	-	2,000
LSP-5.1-Channel[2]	-	630	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-9	-	-	-	-	-	-	-	-	-	-	-	34	-	84	-	-	-	-	-	-	-	-
LSP-10-Channel[2]	-	350	-	-	-	-	-	4,900	-	-	-	-	-	10,000	-	-	-	-	-	-	-	-
C39-MH0.1	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C46-MH19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	-	-	-	-	-
E2-MH2	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E2-MH1	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E13-MH2 (Elrich)	-	-	-	-	-	-	-	-	-	98	-	-	-	-	-	-	-	-	-	-	-	-
E13-MH4 (Elrich)	-	-	-	-	-	-	-	-	-	2,400	-	-	-	-	-	-	-	-	-	-	-	2,000
E28-MH8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-
E28-SP1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,100	-	740	-	-	-	-	-
E28-SP2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,200	-	310	-	-	-	-	-
E28-MH4A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-
H16-MH13	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H16-MH17	-	-	-	-	ND (2.0)	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H25-MH2	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M8-MH3	-	-	-	5,100	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M26-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NG-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P36-MH5	-	-	3,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R18-MH1	-	-	-	-	-	290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S29-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160	-	-
S29-MH3	-	-	96	-	-	-	-	-	-	-	-	-	-	-	-	-	13,330	-	-	190	-	-
W25-MH1	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Little Creek																						
LC-0	7	140	-	ND (2.0)	-	-	190	-	-	-	2,400	-	65	-	-	-	-	-	-	-	-	-
Town Line Brook																						
TL-0[3]	1,500	280	-	62	-	-	730	-	-	-	-	96	-	-	-	-	-	-	-	-	-	-
TL-1	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-3	-	-	-	-	-	-	-	-	-	-	-	8.5	-	-	-	-	-	-	-	-	-	-
TL-5	-	-	-	-	-	-	-	2,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-9	640	-	-	-	-	-	-	8,200	-	-	-	130	-	-	-	-	410	-	-	-	-	-
TL-13	30	70	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-	-	-	-
TL-24	520	1,500	-	-	-	-	-	24,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-BL-EV	440	740	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B53-MH7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	-	-	-	-	-
BP-MH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-	-	-
S3-MH12[3]	-	2,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,880	-	-	-	-	-
L23-MH1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saugus Branch																						
MR-2	-	ND (2.0)	-	-	-	-	220	-	-	1,100	-	-	1,200	-	-	-	-	-	-	-	550	-
Broadway/Eastern[4]	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Linden Brook																						
B46-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1
C18-MH5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23,000
C36-MH1	-	-	-	-	-	-	160	-	-	-	-	-	-	6.3	-	-	-	-	-	-	-	-
D17-MH1	-	-	-	-	-	-	1,200	-	360	-	-	-	-	460	-	-	-	-	-	-	-	-
F1-MH4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310	-	-	12	-	-
F23-MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
H43-MH1	-	-	-	-	-	-	1,600	-	2,400	-	-	-	-	28,000	-	-	5,470	-	-	580	-	12
K6-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	-	-	-	-
L5-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	580	-	-
LBR-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>241,920	-	<10	1	-	-
M31-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
O10-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,300	-	650	-	-
P24-MH1	-	-	-	-	-	-	96	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-
V1-MH1	-	-	-	-	-	-	-	-	15	-	-	-	-	5.2	-	-	-	-	-	-	-	-
W26-MH1	-	-	-	-	-	-	180	-	-	-	-	-	-	390	-	-	-	-	-	320	-	-

File No. 465.09
[1]2007 samples collected 9/25/07
[2]2007 samples collected on 6/21/07
[3]2007 samples collected 7/12/07
[4]2007 samples collected 9/12/07
[5]Samples collected by USEPA

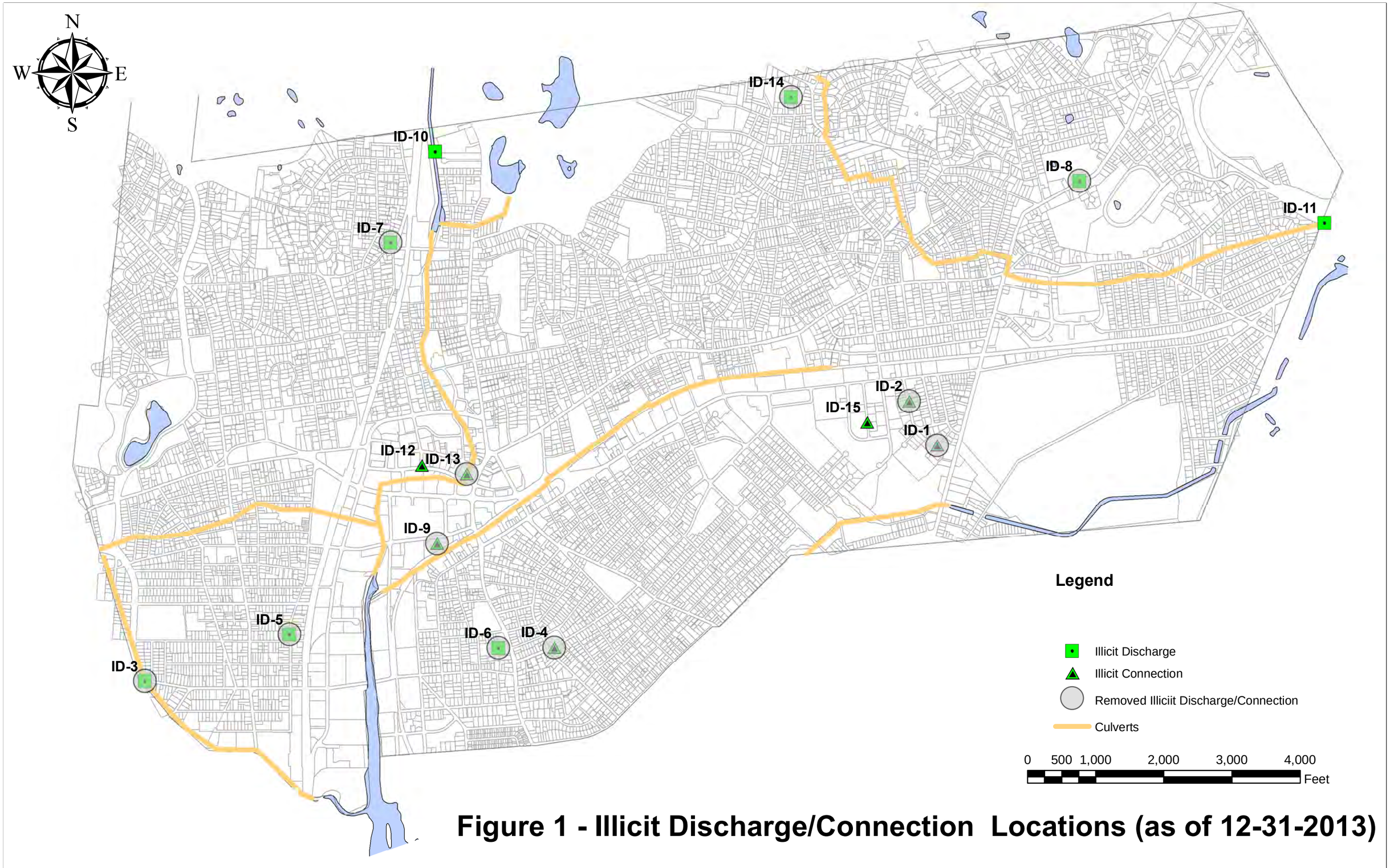

Figure 1 - Illicit Discharge/Connection Locations (as of 12-31-2013)

N
W E
S

Legend

Culverts

Dry_Weather_Insp

0 500 1,000 2,000 3,000 4,000

Feet

Figure 2 - Dry Weather Inspection Areas (as of 12-31-13)

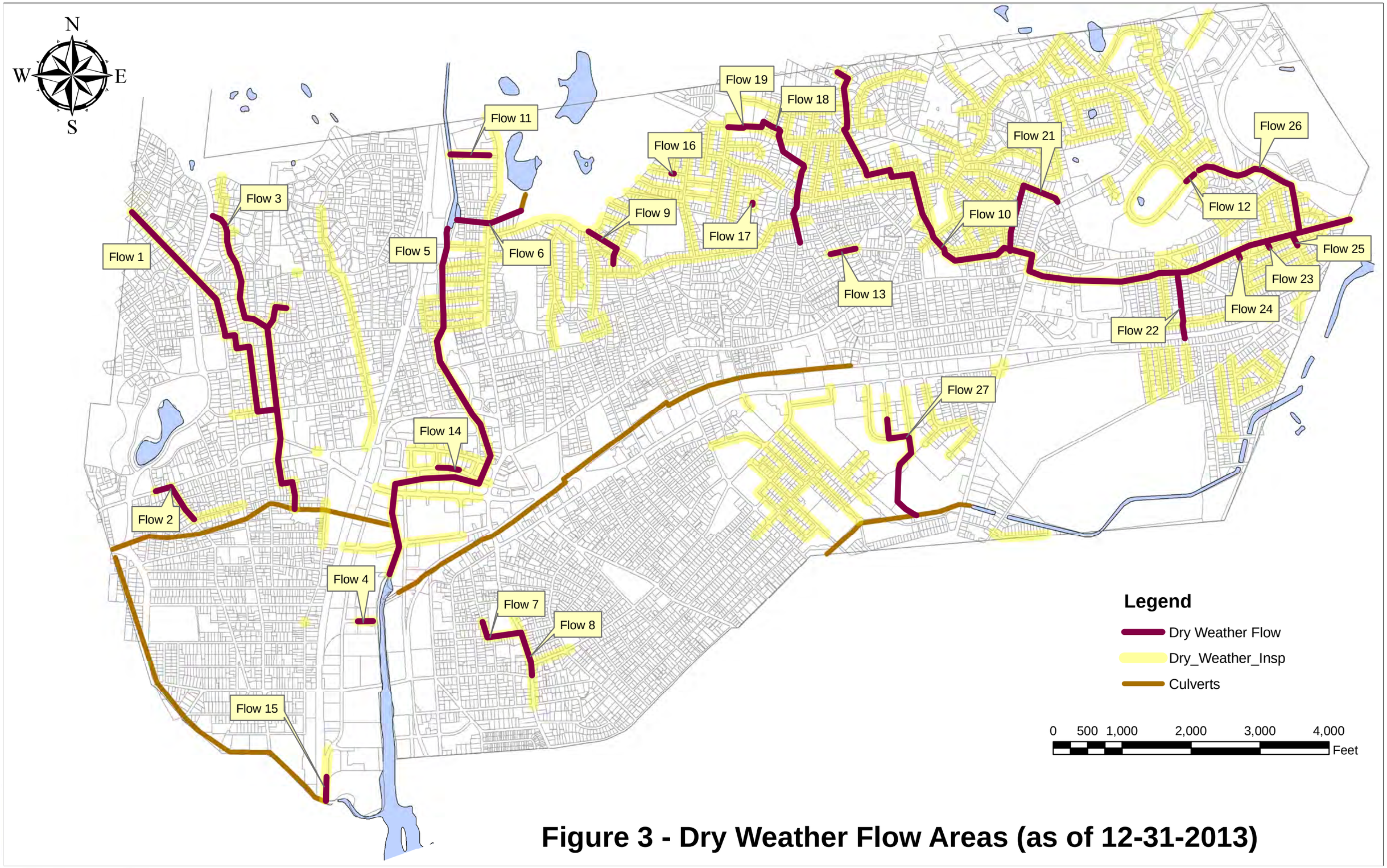

Figure 3 - Dry Weather Flow Areas (as of 12-31-2013)

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

Figure 4 - Malden River Outfalls

0 50100 200 300 400
Feet

Figure 5 - Lower Spot Pond Brook Outfalls

Figure 6 - Town Line Brook Outfalls

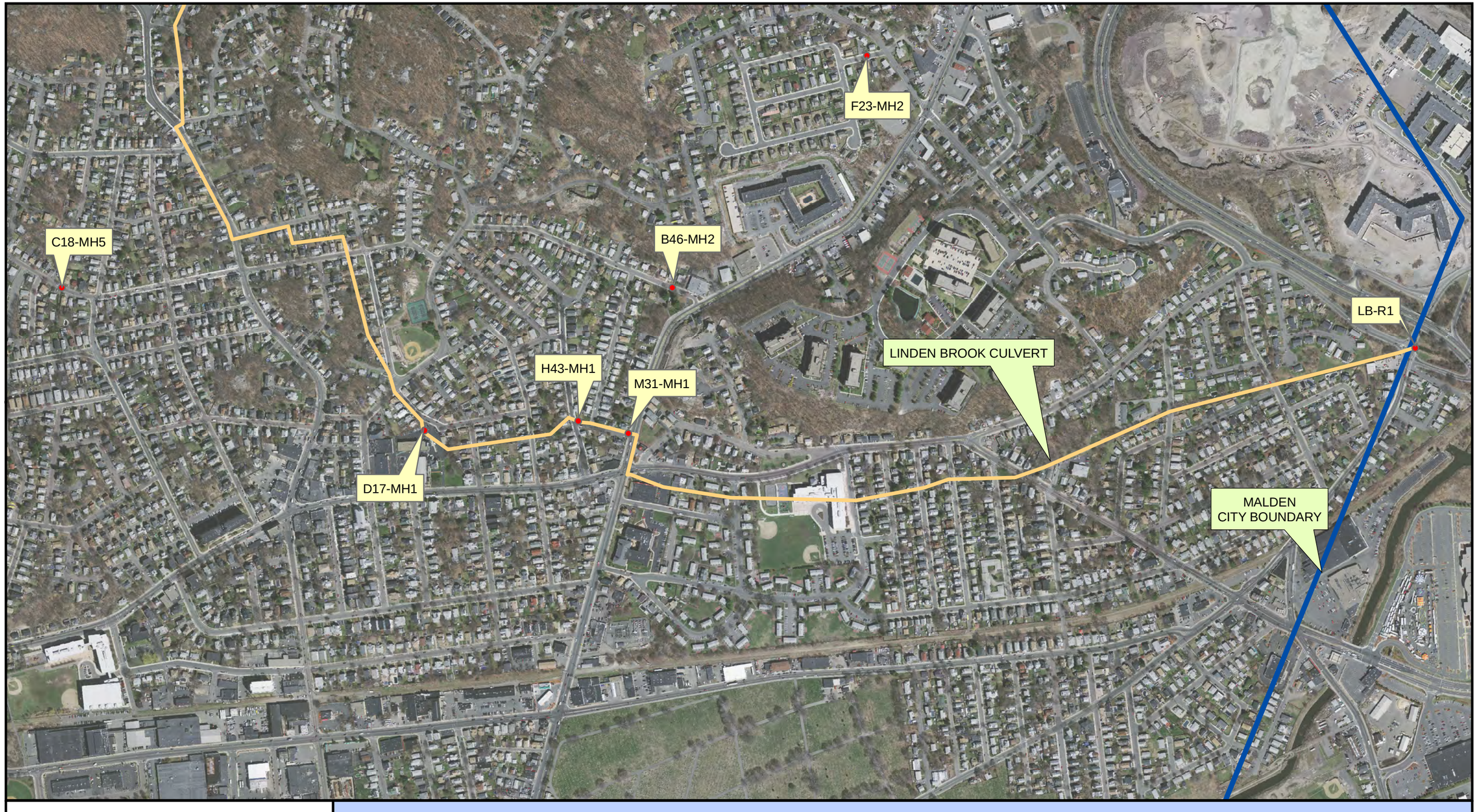

Figure 7 - Dry Weather Sampling Program

MALDEN, MASSACHUSETTS

0 830 1,660 2,490 3,320

Feet

CITY OF MALDEN

Illicit Discharge Detection and Elimination Program
Semi-Annual Status Report

January 1, 2013 – June 30, 2013

Prepared by:

Nangle Consulting Associates, Inc.
960 Turnpike St
Canton, MA 02021

and

City of Malden Engineering Department
200 Pleasant Street
Malden, Massachusetts

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1.0 INTRODUCTION

The City of Malden has developed and continues to maintain an Illicit Discharge Detection and Elimination (IDDE) Program that is directed towards the improvement of surface water quality through the mitigation of illegal and unsuitable discharges through its municipal stormwater conveyance network. This semi-annual status report for the period of 1 January through 30 June 2013 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) to document key program tasks completed during this reporting period. The City of Malden's IDDE plan was developed to facilitate the implementation of a systematic and iterative procedure for the evaluation of dry weather flows, identification of potential illicit discharge and timely repairs to the storm drainage infrastructure.

Since its inception, the City's IDDE program has identified several illicit discharges/connections to the municipal drainage system, reduced significant potable water losses due to the detection of leakages, enforced Best Management Practices (BMPs)/stormwater ordinances and completed repairs to components of the drainage infrastructure. A key component of this effort is the City of Malden's GIS mapping and catch basin cleaning/repair program, which is maintained by the MDPW. The goals and objectives of this IDDE plan are directed towards the reduction in the historic bacteria levels that have been detected at selected outfalls within the City. In addition, as a "flow though" community, bacteria loadings entering into the City of Malden's infrastructure at upstream connections have also been quantified. The results of dry weather inspections, together with both dry and wet weather sampling, support the opinion 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 City Engineering and Public Works Departments have coordinated their efforts and together with outside technical assistance, have developed a program that integrates the implementation of the IDDE Plan into the routine daily work practices. The integration of the goals of this IDDE Plan into daily work practices by City personnel has identified and enables the timely repair of infrastructure deficiencies. Their 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. This has included a restructuring of responsibilities and staffing to provide a greater involvement by engineering technical staff to assist the MDPW stormwater compliance crew. The restructuring of the stormwater compliance team to include more direct oversight by engineering personnel, which was performed during the last reporting period, continues to enhance the understanding of infrastructure needs.

This report has been prepared to document and summarize IDDE activities that have been undertaken by the City during the January 2013 through June 2013 reporting period and identify key goals and objectives to be considered during future phases of plan implementation. During this reporting period, the comprehensive GIS mapping program initially developed by NCA has continued to be expanded for use by municipal departments under the direction of CDM Smith. Utilizing the data and information obtained during this reporting period, 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. However, last reporting period; one (1) potential illicit discharge was identified, in the form of a possible grease blockage within a sewer siphon located at the intersection of Salem and Lynn Streets that passes beneath Linden Brook. This structure is located at the City line between Malden and Revere. Additional details pertaining to the ongoing investigation and inspection program may be referenced from Section 3.1.3. To assist in the review of the information contained within this report, a summary of the illicit discharges/connections identified to date is presented on Figure 1 and Table 1.0.

3.0 OVERVIEW OF IDDE ACTIVITIES (JANUARY 2013 – JUNE 2013)

In addition to outfall sampling, 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 and sampling 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.

As described in the last status report, a comprehensive dry weather sampling effort using multiple lines of evidence testing was performed by representatives of USEPA and NCA in the fall of 2012. During this reporting period, several targeted sampling events have been undertaken to address and build upon the results obtained from the September sampling program. A primary focus of the dry weather inspection program continues to be directed towards the Linden Brook watershed and areas of dry weather flows that have been identified. A summary of the results obtained from these sampling efforts are described in the following section of this report.

By design, observations recorded during the dry weather inspections, together with the results of infrastructure sampling, serve as the basis for future work plan tasks and modifications to the original IDDE plan. Accordingly, the IDDE program maintained by the City is regarded as an ongoing and iterative effort that has successfully demonstrated the capability to quickly respond to water quality issues as needs and concerns are identified. The City of Malden has invested significant time and capital funding to develop a Stormwater Compliance Team (SCT) comprised 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. Increased involvement by engineering technical staff in the daily work practices of MDPW stormwater personnel is also intended to further this goal. 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. The current municipal leadership has made a significant effort to increase public awareness and participation through increased integration of digital and electronic media into daily practices. 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 continue to conduct targeted dry weather inspections of the City's infrastructure. This is an interactive and systematic program extending across the entire City that has resulted in the identification and correction of infrastructure deficiencies. Overall, the repair of flow conveyance networks and removal of illicit discharges has led to improvements in the quality of stormwater discharges. 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.

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 that are addressed during the catch basin cleaning program. During this effort, infrastructure components are mapped and the corresponding attributes are located. Upon the identification of previously unknown dry weather flows, the Engineering Department and NCA are immediately notified by MDPW personnel and targeted mass balance sampling efforts are performed. Portions of the municipal infrastructure that have been addressed by the compliance team including these targeted subset areas are summarized on Figure 3.

During dry weather inspections completed under the IDDE program, several 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)**
Flow 8 – Waterline Leak **(removed)**
Flow 9 – Groundwater breakout
Flow 10 – Linden Brook base flow
Flow 11 – LSP-4 dry weather flow
Flow 12 – Kennedy Drive, proximate to Granada Highlands Apartments
Flow 13 – Orchard Street
Flow 14 – Exchange Street – Intermittent flows
Flow 15 – Lower Commercial Street

During this reporting period, several dry weather investigations were performed within two (2) key areas that warranted further flow isolation efforts based upon prior dry weather sampling data. These areas include West End Brook, proximate to Stadium Street (S29-MH3) and contributions to Linden Brook at sampling location H43-MH1, which is located at the intersection of Home and Mingo Streets. Dry weather flow contributions have also been documented upstream of sample location H43-MH1 from Orchard Street (O10-MH1). Further details pertaining to the dry weather sampling efforts at West End Brook may be referenced from Section 3.1.1, while details pertaining to Linden Brook may be referenced from Section 3.1.3. In addition to the above, dry weather investigations were performed within the northern portion of Malden, adjacent to the Forestdale Cemetery. These investigations revealed no dry weather flows.

As described previously, the USEPA, in collaboration with members of the Stormwater Compliance Team and representatives of NCA performed a dry weather sampling event on 11 September 2012. This sampling effort was offered to the City to help identify the infiltration and/or discharge of illicit sewage/human waste stream loadings to the municipal drainage system using a multiple lines of evidence testing approach. This included the evaluation of a comprehensive suite of parameters, including the following:

1. E. coli
2. Enterocossus
3. Atenolol
4. Acetaminophen
5. Cotinine
6. 1,7-Dimethylxanthine
7. Caffeine
8. Metoprolol
9. Carbamazepine
10. Surfactants
11. Chlorine
12. NH3
13. Salinity
14. Temperature
15. Conductivity

As stated above, the focus of this extensive USEPA analytical program was directed towards the isolation of representative human based contributions to dry weather flows, using an approach that greatly exceeds the limitations of simple bacteria sampling. Specifically, this approach was intended to resolve traditional limitations involving reliance upon bacteria analysis associated with animal waste contributions.

3.1.1 Malden River Watershed

The City of Malden's stormwater compliance team initially targeted potential illicit discharges to the Malden River as its highest priority. Utilizing the outfall monitoring data and information obtained during dry weather sampling events, the City has identified significant base flow as surface waters, to the Malden River. Consistent with the original design of the MDC/DCR conveyance network; this occurs primarily thorough culverted channels/brooks located in northwestern portions of the City. This flow includes contributions that originate from the Fells Reservation and Lower Spot Pond Brook. As shown on Figure 5, a total of 23 outfalls to the Malden River have been identified, nine (9) of which have been identified as flowing during dry weather conditions. Periodic dry weather sampling has been performed by NCA, the regional watershed group, Mystic River Watershed Association (MyRWA) and more recently, the USEPA.

As indicated previously, prior dry weather inspections have identified dry weather flows within the West End Brook Culvert at the manhole identified as S29-MH3 (Figure 6). Reference to Table 2.0 reveals that elevated levels of bacteria (13,330 MPN/100 ml) were detected during the September 11, 2012 sampling event at this location, which was in marked contrast to those obtained during prior sampling events. To further assess this area of the drainage system, another dry weather sample was collected on 5 April 2013. In addition, manhole S29-MH1 (Figure 6), which is located upstream of S29-MH3 was also sampled at that time. Consistent with prior results, the sampling of West End Brook Culvert during this reporting period revealed bacteria levels of 160 MPN/100ml at S29-MH1 and 190 MPN/100ml at S29-MH3, as summarized on Table 2.0.

The Stormwater Compliance Team has conducted numerous dry weather sampling events to investigate the elevated E. coli levels encountered previously at LSP-4, an outfall for the drainage system located within Eldrich Drive (Figure 7). Base flow, as groundwater, is consistently observed within this drainage network and to isolate potential sewage contributions to this base flow, a comprehensive evaluation of the flow conveyance network associated with LSP-4 was completed in February 2012. Given the proximity of the sewer and drain lines to LSP-4, as well as the settlement of the drain line in the area of Buildings 1054 and 1056 Elrich Drive, the focus of assessment activities was directed towards the sewer laterals and nearby drainage line servicing the two apartment buildings. Following dye testing by the Compliance Team, camera surveys performed by representatives of the property owner confirmed that compromises to the laterals servicing two (2) residential building had occurred. Recommendations made by the SCT involved restoring the integrity of the main drainage line to stop the discharges that have been documented at LSP-4. Working with representatives of the Malden Engineering Department, repairs to the sewer laterals in the area of Building 1054 and 1056 were completed by the property owner in March 2012. Several attempts have been made to collect a dry weather flow sample from LSP-4, however due to base flow within the Oak Grove

Channel; this sample location has been inaccessible. It is anticipated that during the next reporting period, a dry weather sample will be collected from LSP -4 to evaluate the effect of the sewer lateral repair.

3.1.2 Town Line Brook Watershed

Town Line Brook in Malden begins at the Malden and Everett city boundary and is culverted until it daylights into an open concrete lined trapezoidal channel at Broadway. Significant tidal influences exist in the form of an approximate 2-3 foot change in surface water elevation between Broadway and the remaining length of the culvert to the Revere City line. As shown on Figure 8, a total of 29 outfalls to Town Line Brook in Malden have been identified. The historic monitoring data of Town Line Brook has revealed relatively uniform bacteria levels during dry weather sampling events. Several outfall locations have consistently exhibited bacteria loadings during dry weather sampling events, including S3-MH12, TL-0, TL-9 and Trifone Brook (TL-24). Manhole sample point S3-MH12 is the upstream sampling point for this section of the Brook as it enters the Malden system from Everett, while TL-0 is located at Broadway, where Town Line Brook daylights. TL-9 is located proximate to the terminus of Hadley Street in Malden and receives dry weather flows from the City of Everett, with Trifone Brook (TL-24), also flowing from Everett prior to discharging into Town Line Brook.

3.1.3 Linden Brook Watershed

Linden Brook Culvert is the major stormwater conveyance network located in northeasterly portions of the City. Dry weather inspections have revealed base flow throughout the culvert at all times, with E. coli levels detected historically within the mid-portion of the culvert, at manholes D17-MH1 and H43-MH1 (Figure 9). Flow isolation studies performed to date within this portion of the City had not revealed any specific source conditions for the results of prior sampling. During this reporting period, an inspection of the Linden Brook Culvert was performed, including the area upstream of the Home Street sampling location. As a part of this inspection, several dry weather flow samples were collected from the approximate manhole locations shown on Figure 9. Reference to Table 2.0, indicates that the E. coli levels encountered within the Linden Brook Culvert during the April 2013 sampling event were considerably lower than the results obtained during the September 2012 sampling events. Of particular note is the reduction in bacteria levels detected during the April 2013 sampling event at H43-MH1 and the upstream manhole O10-MH1. The Linden Brook Culvert will continue to be monitored during the next reporting period, with specific emphasis on the mid-portion of the culvert, at manholes D17-MH1 and H43-MH1.

During the September 2012 sampling event, representatives of the USEPA collected a water sample from outfall LBR-1, located in Revere, where distinct indications of sewage odors were noted. Three (3) additional samples were also collected by the USEPA in Revere from the open channel flow of Town Line Brook, the results of which are summarized on Table 3.0. Consistent with identification of strong sewage odors and immediately apparent from a review of Table 3.0 are the significant elevated levels of all sampling parameters, with the exception of Carbomazepine in sample LBR-1. It is important to note that the more uncommon drugs such as this tended to exhibit more variation within the overall sampling program in comparison to the more common constituents, caffeine and acetaminophen.

As described in the previous status report, the City of Malden contracted with National Water Main Cleaning Company, under the supervision of CDM Smith. As summarized in the following excerpt from an email to the City of Malden from CDM Smith, it is believed that line blockage due to grease build up may have been a crucial factor for the conditions identified at LBR-1, in addition to a "minor" defect in the form of a leaky joint. Although maintenance is routinely performed on this siphon, the extent of grease build up indicates that a higher frequency of cleaning and maintaining is necessary to further understand the condition.

> As you know, National Water Main Cleaning Company along with CDM Smith staff were out on site on Tuesday November 6, 2012 to investigate the potential illicit connection into the Linden Brook Culvert at Salem Street near the Route 1 underpass. The following in a summary of the day's events. The following figure graphically represents the results of the work.
>
> National Water Main was onsite to clean and CCTV the siphon under the Old Linden Brook culvert. Upon arrival the condition of the sewers had not changed from the previous visit held 2 weeks prior: The downstream manhole (MH 3 in the attached figure) and a manhole upstream of the siphon (MH 1 in the figure) were completely plugged with heavy grease. A limited amount of liquid was passing through MH 3. Heavy cleaning of MH 3 and the sewer under the culvert took longer than expected. From MH 3 upstream to MH 1 an enormous amount of grease and sediment was removed. The pipe was 100% clogged with slugs of grease in several spots.
>
> The sewer between MH 1 and MH 2 was successfully CCTV'd with the aid of the jetter (upstream of the siphon). This pipe was found to be in good condition. The most notable defect was a leaking joint (runner) at 9pm 54-ft from MH 1 (while traveling downstream). This was a rather minor defect. Active I/I was observed, however, it is possible that when the siphon builds some head, a small amount of sewage could exfiltrate from this same joint.
>
> We discovered what appears to be an external drop connection just downstream of MH 2. This prevented us from CCTV'ing any further as the camera could not pass the vertical 90 degree bend. CCTV from the upstream direction would require two jetters or bypass pumping, (one to keep MH 3 drained and one to intercept flow from upstream in MH 2). This vertical drop was heavily blocked with grease. Approximately 80% of the grease in this pipe was removed with a root cutter and the pipe is in much better condition.
>
> Last we lowered the camera into the 12-in connection to the culvert that once housed a gate valve (in MH 3). It no longer houses any gate, instead there is a masonry plug that seems to be in good condition. As the intent of finding the definitive source of sewage into the culvert was inconclusive, we recommend that we resample the outfall and test for parameters consistent with sewage. If the results are consistent with the previous results we should develop a new approach to finding the source.

Based upon the "inconclusive finding" cited by CDM Smith, future higher frequency inspections of the siphon and related service connections was recommended to be performed. In response to this recommendation, weekly inspections of the infrastructure in the area of the siphon were performed. In addition to the higher frequency inspections, two (2) sampling events were performed at LBR-1 during this reporting period. As shown on Table 2.0, dry weather samples collected at LBR-1 on 22 February and 4 April 2013 indicated concentrations of <10 MPN/100ml and 1 MPN/100ml, respectively. The higher frequency inspections, as well as dry weather sampling of LBR-1 will be continued during the next reporting period.

3.2 Drainage System Mapping-IDDE Inspection Program (MDPW)

The City is in the process of converting its storm drain system mapping to GIS format through the compilation of digitized plans, field GPS data collection and planimetric mapping information obtained from recent aerials. In addition, drainage infrastructure information

including components pipe sizes, type, connections and flow parameters are also inventoried as a part of the ongoing system wide maintenance, service and inspection program being implemented by the MDPW. Upon encountering any indications of the potential for illicit discharges to the storm drain system, the MDPW personnel notify engineering and outside technical staff to further investigate.

3.3 Inflow Infiltration Sewer System Evaluation & Capacity Analysis

The City of Malden now maintains a strategic GIS Implementation plan that was developed with the assistance of CDM Smith. The City of Malden has also completed a comprehensive Infiltration and In-flow (I&I) study for its municipal sewer system. CDM Smith, on behalf of the City, has prepared 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. This report was presented for approval to MWRA during this permit year. Approval was received together with necessary funding. Currently, contract drawings and specifications are being prepared to address the recommendations of the Phase III Study.

4.0 SANITARY SEWER OVERFLOWS (SSO'S)

No SSOs were identified during this reporting period.

5.0 EVALUATION OF IDDE PROGRAM GOALS AND OBJECTIVES

As described in the previous sections of this submittal, the City of Malden has implemented a comprehensive illicit discharge elimination program that has resulted in the isolation and mitigation of numerous improper discharges/connections and reduced significant potable water losses due to the detection of leakages. In addition to this, the dry weather sampling program has identified several target areas of intermittent bacteria loadings. These target areas will remain as a primary focus of activities to be performed during this biannual reporting period. The delineation of discrete drainage watersheds and continued implementation of the catch basin cleaning, inspection and inventory program remains a priority of work practices that are being performed by the SCT.

In addition to the above, the GIS drainage map is nearing completion and a large percentage of historic information has been linked to the network, thus enabling improved understanding of the overall municipal system and corresponding program capabilities. During the development of the GIS drainage map, the manual recording of system components, such as pipe diameter, dry weather flow characteristics, and structural conditions has been performed. The daily field log information that has been recorded on the dry weather inspection reports (Attachment A) are now being entered into the digital database. This represents a key program goal for the next reporting period, as the conversion to a fully digital data entry process continues.

Table 1.0 Summary of Illicit Connections/Discharges identifed as of 6/30/2013

Illicit Connections

Illicit Connection Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-1	1/15/2009	Sewage	40 gpd	2/16/2009	33 Lodgen Ct., Unit 1F
ID-2	1/15/2009	Grey Water	100 gpd	3/2/2009	34 Hanover Street
ID-4	8/28/2009	Sewage	60 gpd	9/4/2009	2-4 Hancock Street
ID-9	5/18/2010	Sewage	60 gpd	5/19/2010	36 Charles Street
ID-12	Apr-12	No Flow	NA	Pending	100-110 Pleasant Street
ID-13	Sep-12	Sewage	Unknown	Jan-13	Exchange Street

Total Illicit Flow Removed to Date: ***260 gpd*** ***(94,900 gal/yr)***

Illicit Discharges

Illicit Discharge Identification	Date Identified	Discharge Type	Estimated Volume	Date Removed	Location
ID-3	8/11/2009	Oil Sheen	Unknown	n/a	Near 1081 Fellsway
ID-5	9/10/2009	#2 oil spill	<5 gallons	9/10/2009	269 Pearl Street
ID-6	9/21/2009	Poss. Washwater	Unknown	9/21/2009	120 Main Street
ID-7	12/9/2009	Trans. Dielectric fluid	<27 Gallons	12/10/2009	Near 6 Grove Street
ID-8	4/29/2010	Hydraulic Fluid	<10 Gallons	4/29/2010	496 Main Street
ID-10	2/10/2012	Sewage	Note 1	3/19/2012	1056 Erlich Drive
ID-11*	9/11/2012	Sewage	Unknown	11/6/2012	Linden Brook @ Lynn St.

1 - approximately 1 gallon per minute observed discharging at LSP-4 during dry weather

* Possible discharge due to grease blockage-Syphon still under investigation

Table 2.0 Dry Weather Conditions - E. Coli Concentrations

Site Location, Outfalls/Manholes Malden, MA

Sample Description: Water

Sample Designation	E. Coli (MF) (MPN/100ml) 9213D ACTION LEVEL- 235 col/100ml																			
	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	8/4/2011	11/8/2011	12/13/2011	1/11/2012	4/13/2012	6/15/2012	9/11/2012[5]	9/27/2012	2/22/2013	4/5/2013
Malden River																				
MR-0	150	1,100	-	68	-	-	110	-	-	-	-	-	9,200	-	-	-	3,090	-	-	490
MR-1	-	160	-	-	-	-	130	-	-	-	-	-	390	-	-	-	-	-	-	-
MR-4	-	-	-	-	-	-	-	-	-	-	-	-	220	-	-	-	-	-	-	-
MR-5	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-
MR-6	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-	-	-
MR-11	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-
MR-12	-	-	-	-	-	-	-	-	-	-	-	-	59	-	-	-	-	-	-	-
Saint Mary St.[1]	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-0-Channel[2]	-	460	-	-	-	-	-	10,000	-	2,000	-	-	-	1,700	-	-	-	-	-	-
LSP-3	-	-	-	-	-	-	-	-	-	-	-	-	-	1,600	-	-	-	-	-	-
LSP-4	-	-	-	-	-	-	-	14,000	-	2,000	17,000	-	-	>242,000	-	100,000	-	-	-	-
LSP-5.1-Channel[2]	-	630	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSP-9	-	-	-	-	-	-	-	-	-	-	-	34	-	84	-	-	-	-	-	-
LSP-10-Channel[2]	-	350	-	-	-	-	-	4,900	-	-	-	-	-	10,000	-	-	-	-	-	-
C39-MH0.1	-	-	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C46-MH19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	-	-	-
E28-MH8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-
E28-SP1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6,100	-	740	-	-	-
E28-SP2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,200	-	310	-	-	-
E28-MH4A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
E2-MH2	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E2-MH1	-	-	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H16-MH13	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H16-MH17	-	-	-	-	ND (2.0)	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H25-MH2	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M3-MH2	-	-	-	-	-	-	-	-	-	98	-	-	-	-	-	-	-	-	-	-
M3-MH4	-	-	-	-	-	-	-	-	-	2,400	-	-	-	-	-	-	-	-	-	-
M8-MH3	-	-	-	5,100	-	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M26-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NG-C1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P36-MH5	-	-	3,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R18-MH1	-	-	-	-	-	290	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S29-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160
S29-MH3	-	-	96	-	-	-	-	-	-	-	-	-	-	-	-	-	13,330	-	-	190
W25-MH1	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Little Creek																				
LC-0	7	140	-	ND (2.0)	-	-	190	-	-	-	2,400	-	65	-	-	-	-	-	-	-
Town Line Brook																				
TL-0[3]	1,500	280	-	62	-	-	730	-	-	-	-	96	-	-	-	-	-	-	-	-
TL-1	ND (2.0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TL-3	-	-	-	-	-	-	-	-	-	-	-	8.5	-	-	-	-	-	-	-	-
TL-5	-	-	-	-	-	-	-	2,400	-	-	-	-	-	-	-	-	-	-	-	-
TL-9	640	-	-	-	-	-	-	8,200	-	-	-	130	-	-	-	-	410	-	-	-
TL-13	30	70	-	-	-	-	-	-	-	-	-	ND (1.0)	-	-	-	-	-	-	-	-
TL-24	520	1,500	-	-	-	-	-	24,000	-	-	-	-	-	-	-	-	-	-	-	-
TL-BL-EV	440	740	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B53-MH7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410	-	-	-
BP-MH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200	-	-	-
S3-MH12[3]	-	2,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,880	-	-	-
L23-MH1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saugus Branch																				
MR-2	-	ND (2.0)	-	-	-	-	220	-	-	1,100	-	-	1,200	-	-	-	-	-	-	-
Broadway/Eastern[4]	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Linden Brook																				
C36-MH1	-	-	-	-	-	-	160	-	-	-	-	-	-	6.3	-	-	-	-	-	-
D17-MH1	-	-	-	-	-	-	1,200	-	360	-	-	-	-	460	-	-	-	-	-	-
F1-MH4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310	-	-	12
H43-MH1	-	-	-	-	-	-	1,600	-	2,400	-	-	-	-	28,000	-	-	5,470	-	-	580
K6-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	-	-
L5-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	580
LBR-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	>241,920	-	<10	1
O10-MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,300	-	650
P24-MH1	-	-	-	-	-	-	96	-	-	-	-	-	-	9.7	-	-	-	-	-	-
V1-MH1	-	-	-	-	-	-	-	-	15	-	-	-	-	5.2	-	-	-	-	-	-
W26-MH1	-	-	-	-	-	-	180	-	-	-	-	-	-	390	-	-	-	-	-	320

File No. 465.09

[1]2007 samples collected 9/25/07

[2]2007 samples collected on 6/21/07

[3]2007 samples collected 7/12/07

[4]2007 samples collected 9/12/07

[5]Samples collected by USEPA

Table 3.0 EPA New England Stormwater Outfall Inspection & Sampling Summary - Malden, MA 9/11/12[1]

Location				PPCP ng/L							Surfactants	Chlorine	NH3 (mg/l)	YSI Meter		
Site Name	Time	E.coli (MPN/100ml)	Entero (MPN/100ml)	Atenolol	Acetaminophen	Cotinine	1,7-Dimethylxanthine	Caffeine	Metoprolol	Carbamazepine			Test St.	Salinity ppt	Temp C	Conductivity uS
Malden River Watershed																
MR-0	815	3,090	ND	7.8	340	12	80	560	ND	6	NA	NA	NA	0.4	17.1	763
E28-SP2	835	310	ND	ND	1.5	1.5	2.3	21	ND	12	0.25	0	0	0.5	15.1	1061
E28-SP1	855	740	100	ND	2.6	1.3	2	27	ND	14	NA	NA	NA	0.5	14	1059
C46-MH19	915	850	310	49	3.3	27	ND	12	6.9	ND	1	0.02	>6	3.9	20.5	7.13 (mS)
S29-MH3	950	13,330	410	3.7	1,900	2	220	190	8.9	0.29	NA	NA	NA	0.3	17.8	693
NG-C1	1015	510	ND	ND	38	1.4	24	220	ND	ND	NA	NA	NA	0.4	18.1	717
Town Line Brook Watershed																
TL-9	1100	410	2,380	2.8	480	31	16	7,200	57	0.27	NA	NA	NA	0.4	21.3	770
B53-MH7	1120	410	100	ND	62	43	99	470	0.84	1.5	NA	NA	NA	0.2	20.6	334.9
BP-MH3	1135	200	ND	1.6	29	9.6	5.9	68	ND	0.31	NA	NA	NA	0.6	20.5	1205
S3-MH12	1155	2,880	2,160	ND	2,500	43	49	100	ND	ND	NA	NA	NA	0.2	21.2	479.3
S3-MS12D	1155	2,980	1,610	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Linden Brook Watershed																
LB-R1	1220	>241,920	26,130	790	35,000	570	4,900	15,000	320	ND	NA	NA	NA	1.7	19.3	3315
LB-01W	1235	200	200	2.6	30	7.7	9.8	66	3.6	1.4	NA	NA	NA	23.9	18.7	33.11(mS)
LB-02C	1237	740	520	1.3	13	6	4.2	37	2.2	0.94	NA	NA	NA	22.6	18.8	31.45(mS)
LB-03E	1239	100	100	0.97	5.9	6.7	4	190	1.3	1.1	NA	NA	NA	19.3	18.7	31.39(mS)
F1-MH4	1255	310	200	ND	1.9	1.7	44	13,000	1.6	0.86	NA	NA	0.06	0.1	17.5	238.6
H43-MH1	130	5,470	630	0.98	10	6.7	7.4	45	18	0.43	NA	NA	NA	0.2	20.9	489.2

* sampling conducted in dry weather

[1] Data compiled by EPA

E. coli - color key: Red ≥ 10,000 col/100ml, Orange ≥ 1260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml
Entero - color key: Red ≥ 1000 col/100ml, Orange ≥ 350 Yellow ≥ 61 col/100ml, Black < 61 col/100ml
NH3 - color key: Red ≥ 6 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.0 mg/L
Surfactants - color key: Red ≥ 1.0 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L *** may give false positive at salinity greater than 1 ppt
PPCP color key: Pink = Concentrations greater than background
Cl2 - color key: Red ≥ 1.0 mg/L, Orange ≥ 0.3 mg/L, Yellow ≥ 0.02 mg/L, Black < 0.02 mg/L

REPORTING LIMITS
E. coli = 4 MPN/100mL
Enterococcus = 10 MPN/100mL
Surfactants Field = 0.1 mg/L
Ammonia Field = 0.1 mg/L

ND – not detected above the associated detection limit
NA – not applicable (analyte not tested for at that site at this time)
(~) – data reported as estimate

N

W E

S

ID-10

ID-8

ID-11

ID-7

ID-2

ID-1

ID-12

ID-13

ID-9

ID-5

ID-6

ID-4

ID-3

Legend

Illicit Discharge

Illicit Connection

Culverts

0 500 1,000 2,000 3,000 4,000

Feet

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

Figure 1 - Illicit Discharge/Connection Locations (as of 6-30-2013)

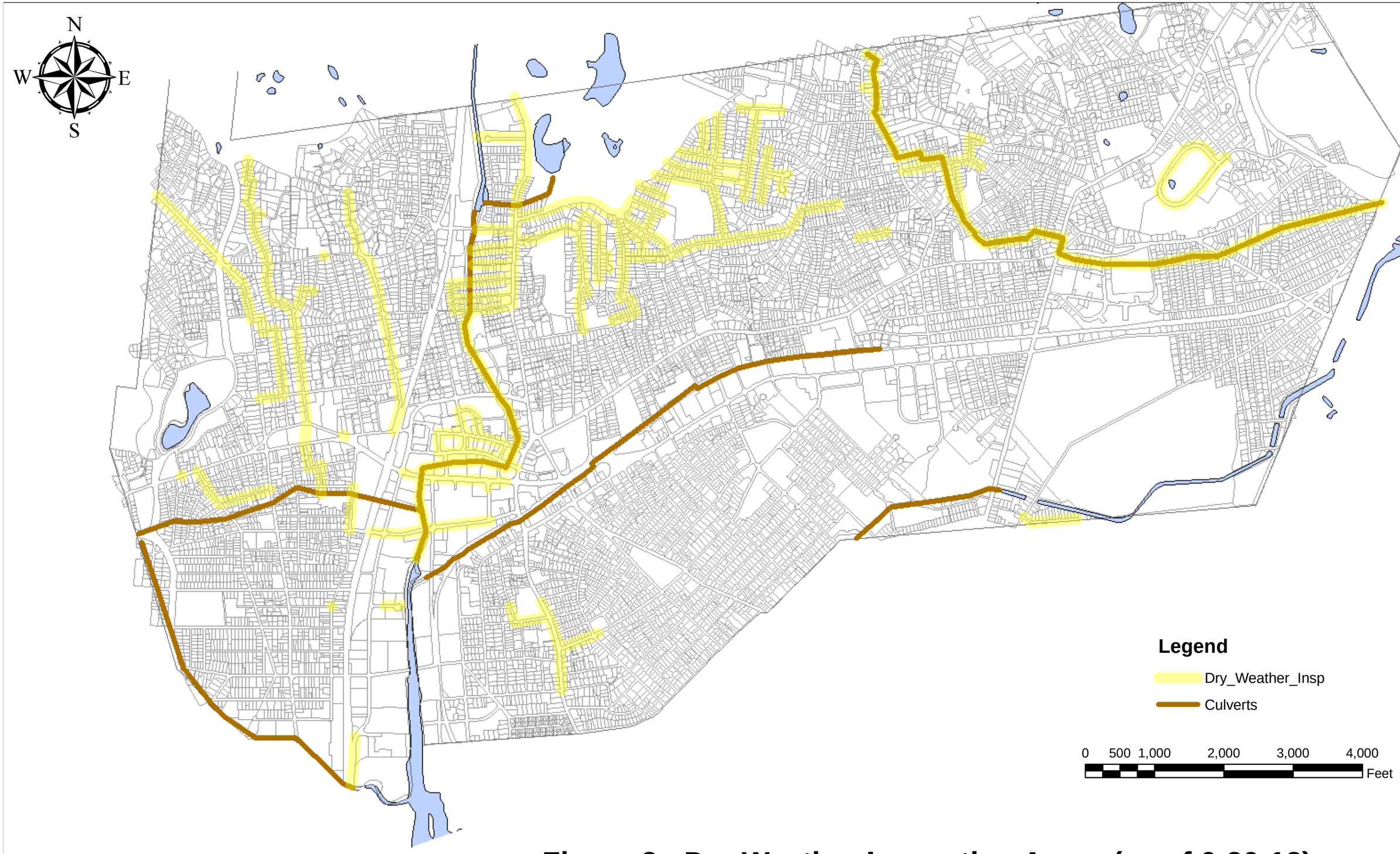

Figure 2 - Dry Weather Inspection Areas (as of 6-30-13)

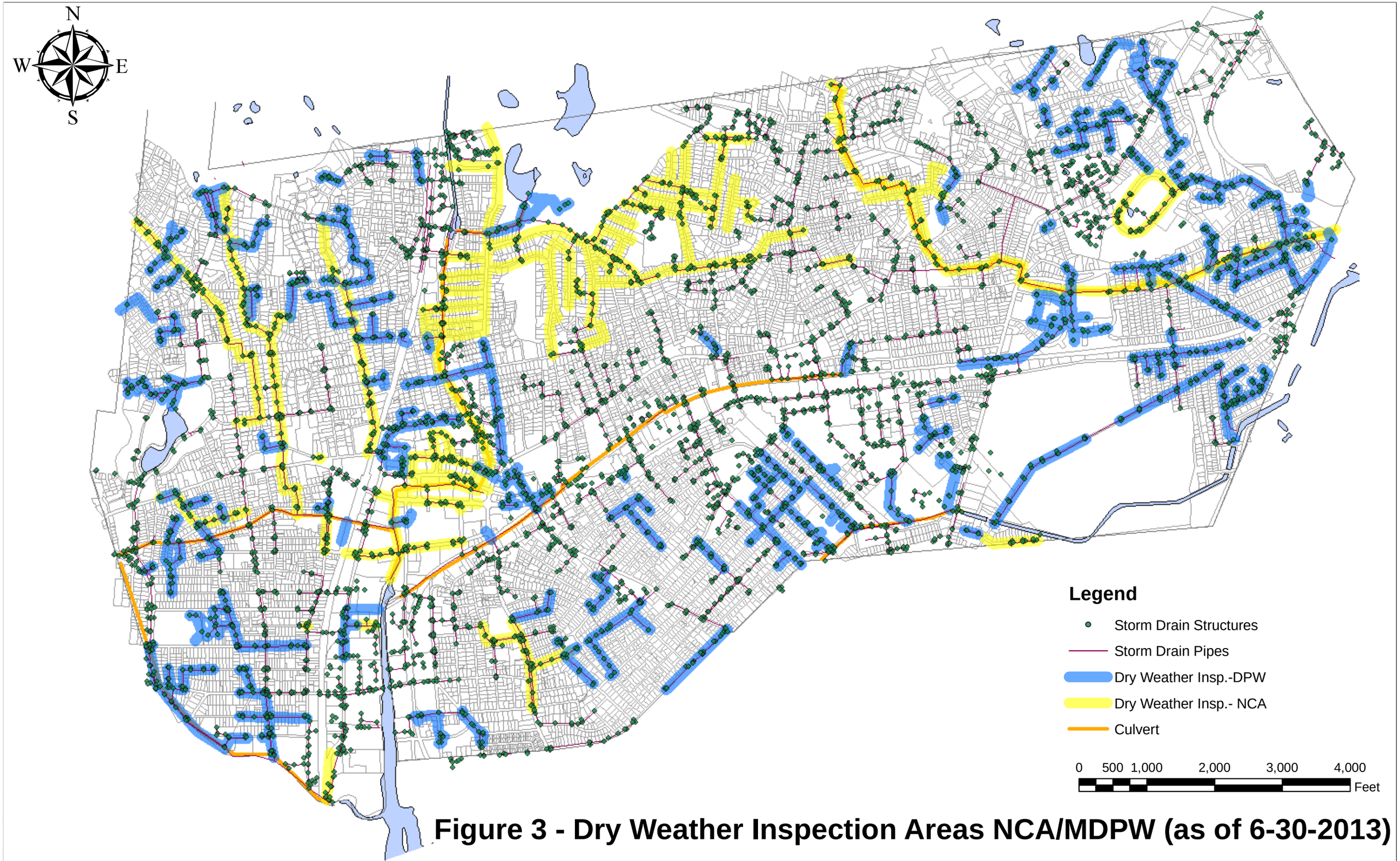

Figure 3 - Dry Weather Inspection Areas NCA/MDPW (as of 6-30-2013)

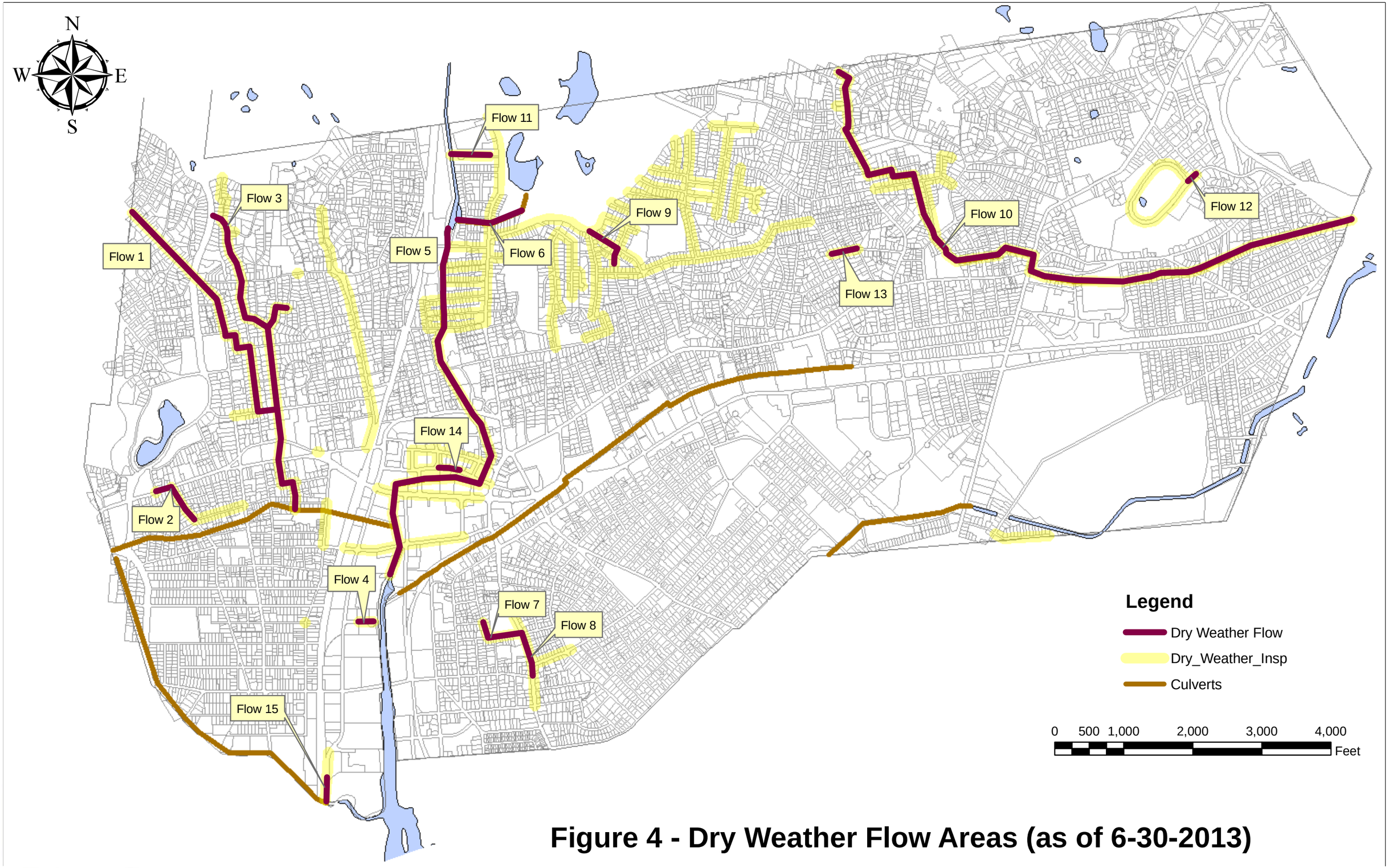

Figure 4 - Dry Weather Flow Areas (as of 6-30-2013)

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Environmental Engineering and Land Use Planning
989 Turnpike Street, Canton, Massachusetts 02021

Figure 5 - Malden River Outfalls

0 50100 200 300 400
Feet

Figure 6 - 6 April 2013 Dry Weather Sampling Program

WEST END/ SPOT POND BROOK CULVERTS - MALDEN, MA

Figure 7 - Lower Spot Pond Brook Outfalls

Figure 8 - Town Line Brook Outfalls

Figure 9 - Dry Weather Sampling Program

MALDEN, MASSACHUSETTS

0 750 1,500 2,250 3,000

Feet

NANGLE CONSULTING ASSOCIATES, INC

ATTACHMENT A

Environmental Engineering and Land Use Planning

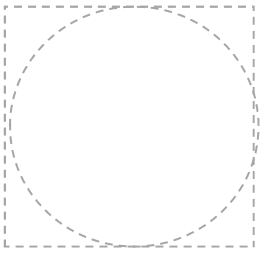
960 Turnpike Street, Canton, MA 02021 Telephone (781) 821-0521 email: nangle@ncaenv.com Facsimile (781) 821-4182

SITE REPORT - DRY WEATHER INSPECTION

Inspector:			
Date:			
Time:			
Precip. last 72 hrs:	yes/no, amount		
Structure Type:	DMH/ CB/ Outfall/ Other	**Maintenance needed:**	yes/no
Structure ID:		**Repairs needed:**	yes/no
Flow:	yes/no/standing water	**Re-Inspection needed:**	yes/no
Photograph:	yes/no	**Lat/Long:**	
Flow Rate:	estimate/measured		
Obvious signs of WW:	yes/no		
WW description:			
Ph:			
Conductivity:			
Temp:			
color:	none/red/orange/white/tan/other		
odor:	none/musty/sewage/sulfur/solvent/petroleum/chlorine/other		
Iron floc:	yes/no		
Surfacants:			
Ammonia:			
Fluoride:			
E. Coli:			
Enterocci;			
Other:			

NORTH

SKETCH/NOTES



1 Show all pipes
2 ID type (RCP/PVC/CMP/VC)
3 ID pipe diameter
4 ID flow direction (----->)
5 ID pipes with flow (**F**)
6 Number inv. from low to high
7 North is always 12:00