City of Boston
Town of Brookline

Muddy River Flood Control, Water Quality and Habitat Enhancement, and Historic Preservation Project

April 2008

Prepared by: CDM

MEPA
Annual Update

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Secretary Ian A. Bowles
Attn: MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Subject: EOEA No.11865
Annual Update for the Muddy River Flood Control, Water Quality and Habitat Enhancement, and Historic Preservation Project

Dear Secretary Bowles:

The enclosed 2007 Annual Update is provided for review pursuant to the Special Provisions provided by MEPA in the final Certificate issued for this project (EOEA No. 11865). The Muddy River Flood Control, Water Quality and Habitat Enhancement, and Historic Preservation Project (Muddy River Restoration Project) is currently in the design phase by the US Army Corps of Engineers, the lead design agency. Project implementation activities in the past year included a design evaluation of the use of bridge-culverts instead of buried box culverts and completion of all field survey work. Design work on Phase I was underway with a 50% design package submitted in April.

This year's Annual Update is the third update and as such, builds upon the structure of the previous years' reports. The Annual Update incorporates suggestions made by the Maintenance and Management Oversight Committee (MMOC) given on the 2006 report as well as during the preparation of this year's report. As the project moves forward and construction, permitting, and monitoring components are initiated, the proponents expect that MEPA, agency staff, and the Citizens Advisory Committee (CAC) will have suggestions for additions or structure. The proponents and MMOC will work together in the coming year to further refine the structure of the Annual Update to ensure that it continues to be a useful and comprehensive reporting system for the duration of the Muddy River Restoration Project.

CDM

This Annual Update document in its entirety was submitted to MEPA, members of the CAC and the MMOC. Copies of the full report can be obtained upon request from Mr. Robert Kachinsky or Ms. Margaret Dyson with the Boston Parks and Recreation Department by calling (617) 635-4505.

Very truly yours,

Bruce R. Conklin

Bruce R. Conklin, P.E.
Vice President
Camp Dresser & McKee Inc.

cc: MMOC
CAC
M. Dyson, BPRD
R. Kachinski, BPRD
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Section 1
General

1.1 Project Description and Introduction

The Muddy River Flood Control, Water Quality and Habitat Enhancement, and Historic Preservation Project include the following activities:

- Sediment removal (i.e. dredging) and infrastructure improvements to improve/restore the flood carrying capacity of the Muddy River as well as Leverett, Willow and Ward's Ponds.
- Wetlands restoration/bank stabilization along the river via bank re-grading, removal of existing vegetation that is inconsistent with the Olmsted plan and reestablishing of a more diverse plant community along the banks of the river and ponds. This will improve habitat capacity compared to existing conditions and serve to stabilize banks.
- Historic landscape improvements to rehabilitate Olmsted's historic park system will include: removal of invasive vegetation; protection of historic resources during construction; preservation of the historic riverbank configuration; and planting native vegetation in keeping with the historic landscape design.
- Institution of best management practices (BMPs) throughout the watershed with the goal of reducing sediment loading to the river by 30 percent.

This annual report presents project activities accomplished between January and December 2007 as well as anticipated project activities in 2008. No construction activities occurred during this timeframe. Other project activities focused on design activities for the daylighting portion of the project by the U.S. Army Corps of Engineers, survey work, continued work on agreements between project participants (e.g. MOU, design agreement and project cooperation agreement), and coordination with other public entities such as the Boston Water and Sewer Commission (BWSC), the Massachusetts Historical Commission, and the Massachusetts Highway Department (MHD).

The following text lists the project objectives of the Muddy River Restoration Project and where the objectives are addressed within this Annual Update.

Project Objective	*Report Section where Addressed*
Flood Control	Section 2
Improve Water Quality	Sections 2, 4.5
Enhance Riparian and Aquatic Habitat	Sections 1.3, 2, 3.4
Rehabilitate Landscape and Historic Resources	Sections 1.3, 2
Institute BMPs	Sections 4.1 – 4.4

1.2 Completed Project Work

Several tasks were fully completed in 2007, and several tasks were underway in 2007 that will be completed in 2008.

Design Evaluations

A design evaluation of the use of bridge-culverts instead of buried box culverts was concluded; the bridge-culvert was adopted. An in depth evaluation of the elimination of one of the bridge culverts by eliminating the 'jug handle' was undertaken. This involved extensive discussions with all concerned entities. It was agreed that the elimination of the 'jug handle' along with modification of the area roadways was an improvement as well as a cost savings option.

Other Tasks

In addition to the design evaluations, the following work was conducted:

1. A 50 percent design submission based upon the original layout (i.e., including the 'jug handle') was presented for review in April. Reviews were completed over the next month.

2. Agreement with the Boston Water and Sewer Commission was reached at a conceptual level regarding relocation of existing water, sewer, and drainage pipes affected by the project.

3. Dialogue with the Boston Landmarks Commission and the Massachusetts Historical Commission continued, leading to anticipated final submission for permits in 2008. A draft Memorandum of Understanding was prepared and submitted for review.

4. Landscaping design was advanced to the 60 percent level.

5. Water quality baseline data acquisition and analysis continued.

6. Hydraulic modeling, leading to the establishment of a hydraulic profile and channel cross sections was completed.

7. All field survey work, including checking, was completed.

8. Discussions regarding real estate issues were started with the U.S. Army Corps of Engineers (Corps).

9. A final decision was reached regarding surface treatment of the exposed wall surfaces of the new work.

Notice of Project Change – Boston Parks and Recreation Department (BPRD)

In February 2008, the BPRD submitted a Notice of Project Change (NPC) for the modification on the type of flow conveyance structures, the size of the structures, the footprint to be occupied by the structures, and elimination of a surface roadway.

Material changes to the project as previously reviewed include: 1.) changes from culverts to bridges under the Riverway and upstream of Brookline Avenue to downstream of the Jug Handle Road; 2.) elimination of the twin culverts under the Riverway; 3.) shortening the culvert that was upstream of Brookline Avenue to continue to downstream of the Jug Handle Road to convey the flow only under Brookline Avenue; and 4.) elimination of the Jug Handle Road. Appendix A contains a copy of the NPC.

1.3 Status of Applicable Reports and Plans

The following text describes the status of the reports and plans submitted in 2007. After BPRD completed the Charlesgate dredging and restoration pursuant to the Phase I Draft (April 16, 2002) and Final Record of Decision (July 29, 2002) and expiration of the one year contractual maintenance period, BPRD returned control of the Charlesgate area to its owner, DCR. DCR is now responsible for maintenance of that area. Appendix B contains a copy of the maintenance form created with the assistance of the MMOC.

Maintenance Operation Plans

In 2007, DCR carried out its maintenance at Charlesgate through a combination of its Urban Parks Charles District labor force, seasonal horticultural staff and contracted services.

A part-time seasonal horticulturalist was hired in June and provided regular maintenance through October. Maintenance logs indicate that 480 work hours were provided by the seasonal horticulturalist. Maintenance activities included daily trash pick-up, trimming and pruning of plant material and leaf raking, weeding and mulching of planting beds, invasive removal (hand pulling) and maintenance of rip rap. Grass mowing, graffiti removal and cleaning of the water sheet and tree pruning were outsourced. DCR Charles District field staff provided as-needed maintenance starting in October and will continue to do so until a seasonal hire is in place in spring 2008.

In conjunction with the 2007 Park Serve, a successful volunteer clean-up was organized by the MMOC and the Friends of Charlesgate. Over 30 volunteers were on hand to help with raking, trash pick-up and removal of vegetation from rip-rap. A similar clean-up is being planned for Park Serve 2008.

Charlesgate was monitored regularly by operations staff for the establishment of homeless encampments.

Maintenance Logs

Charlesgate maintenance logs are on file at the Charles District office.

BMP Monitoring and Maintenance Logs

The design work during 2007 did not include constructing or establishing BMPs within the area. Therefore, no BMP monitoring or maintenance logs are required.

Pest Control Programs

None were necessary.

Water Quality Monitoring Program

With no construction on the project along the Muddy River in 2007 there was no additional water quality monitoring in 2007 beyond he baseline water quality monitoring program which is described in Section 4.5.

Plantings

There were no new plantings in 2007.

Aquatic and Wildlife Distribution

The aquatic and wildlife habitat in the Charlesgate portion of the Muddy River is limited due to the hardscape along the river, existing overpasses and the adjacent land uses. These conditions limit the wildlife habitat potential in the Charlesgate portion by separating it from portions of the Muddy River upstream and the Charles River downstream. However, the area was planted with plant materials consistent with the Olmsted landscape design palette to the extent practicable as proposed in the EIR, and the revegetated conditions improve habitat compared to pre-construction conditions. Removal of contaminated sediment from the channel improves conditions for benthic organisms and increased depth of water improves habitat conditions for pelagic species including fish.

As construction begins in additional areas over the next few years (see schedule in Section 6), the aquatic and wildlife distribution in those areas will be described in the corresponding Annual Update.

Historic and Character Defining Features

There were no construction activities or plantings in 2007. However, future work will be installed in accordance with the approved plans to restore the naturalistic planting scheme consistent with Olmsted's treatment in other parts of the river.

1.4 Project Work for Upcoming Year

The project work for 2008 includes completion of design (ready for bidding) of all work in the area to be daylighted between the Riverway and Avenue Louis Pasteur. In addition, design work will start on the Phase 2 upstream and downstream dredging work.

1. A comprehensive review package (Plans, Outline Specifications, and Cost Estimate) will be submitted in June for review and comments by the Sponsors. This will reflect 90 percent completion.

2. All permitting activities will be commenced in spring 2008 and are expected to be concluded in the summer.

3. The complete construction bid package for Phase 1 will be ready for bid in late summer/early fall.

4. All necessary discussions required as a part of the Section 106 process under the National Historic Preservation Act with the Boston Conservation Commission, the Landmarks Commission, the Massachusetts Historical Commission and all other interested entities will be concluded in the summer.

5. The traffic management plan, stormwater management plan, emergency response plan for storm events, and construction sequencing plan will be included in the construction documents.

6. A work plan will be prepared and implemented to cover the design activities relating to the Phase 2.

7. The Town of Brookline will do repair work on the Willow Pond culvert; however they are waiting for funding.

8. BPRD is working with a landscaper to mend damage caused by the MBTA to a berm in the Back Bay Yard area. The area will be modified to create a pathway.

Section 2
Environmental Mitigation

Existing conditions of the Muddy River had deteriorated over the past several decades and required actions to restore the river and adjacent parklands and mitigate the degraded conditions as described below:

- Flooding had worsened overtime because: 1) there is little natural storage left in the developed watershed thus increasing rates and volumes of runoff directed to the river, 2) sediment and debris were deposited in the river reducing flood-carrying capacity of the river, and 3) encroachment of invasive *phragmites* (a wetland indicator plant present in wetland areas regulated pursuant to the Massachusetts Wetlands Protection Act) has narrowed the channel and reduces capacity;
- Water quality had deteriorated over time as an array of natural and man-made compounds were discharged to the river in runoff and accumulated in the sediment; and
- Non-native invasive plant species such as *Phragmites*, knotweed, and buckthorn have overtaken portions of the river and its bank, pushing out native species, creating safety hazards, eliminating natural habitats, greatly limiting the diversity of wildlife habitat and altering the Olmsted landscape along the Muddy River.

Necessary improvements cannot be realized without both the structural improvements, as well as the dredging and bank stabilization. The purpose of these efforts as part of the Muddy River improvement project is to institute a comprehensive restoration of the river for the first time in a century.

2.1 Environmental Impacts and Mitigation for Upcoming Year

The Muddy River Project is in the planning and design stage. Boston and Brookline are responsible for planning and have contracted with the Army Corps of Engineers for the design work. It is not anticipated that any construction work will take place within the next year; construction for the daylighting portion is anticipated to begin February 2009. Therefore, no construction related environmental impacts will occur within the next year.

2.2 Environmental Mitigation Success

Mitigation within the project area (as described in the project objectives) will serve to improve flood control, improve water quality, enhance aquatic and riparian habitat, and restore landscape and historic resources. As described in Section 3.4, the *Phragmites* Control Demonstration Study has resulted in a decrease of approximately 90 percent of *Phragmites* biomass from 2006 to 2007. Construction of the daylighting and dredging portions of the Muddy River Project is necessary to provide the full extent of mitigation benefits anticipated for this project.

2.3 Environmental Mitigation Modifications

No modifications have been proposed to date.

Section 3
Management and Maintenance Plan

3.1 Management Structure Changes

A Memorandum of Agreement (MOA) by and among the Executive Office of Energy and Environmental Affairs, DCR, the City of Boston, the Town of Brookline, the Emerald Necklace Conservancy, and the Muddy River Restoration Project Maintenance and Management Oversight Committee (MMOC) concerning roles and responsibilities for maintenance and management for the Muddy River Restoration Project was signed and effective on June 7, 2007. Appendix C contains a copy of the MOA.

3.2 Effectiveness and Success of New Plantings

The new plantings at Charlesgate were reviewed in early fall 2005 by the Boston Parks Department, the DCR, and Pressley Associates. The plantings were found to be healthy and growing at that time. Any plantings that were not thriving were replaced and the property was accepted by the DCR. The plantings are providing bank stabilization and erosion control.

3.3 Fish and Wildlife Usage

Studies to determine changes to fish and wildlife usage within the project area will occur once a larger portion of the project is completed.

3.4 Management and Maintenance Plan Success

The BPRD submitted a *Phragmites australis* Control Demonstration Study to the Boston Conservation Commission (DEP File No. 006-1090, Order of Conditions issued September 12, 2006) for a 1,990 square foot treatment area in the Back Bay Fens. The study is designed to evaluate the effectiveness of an alternative to spray application of herbicide to control *Phragmites* growing along the Muddy River.

The location of treatment is within the project area. It is located in the Back Bay Fens near the intersection of Fenway and Boylston Streets. The approximate dimension of this area is 60 ft long and 20 ft wide; an area of 1,200 sq ft. The *Phragmites* stand is located on a gently sloped bank above the normal water surface elevation. The treatment area is part of an extensive *Phragmites* stand that borders much of the Muddy River in the Back Bay Fens between Agassiz Road and Boylston Street. The lower limit of the treatment area is bordered by *Phragmites* that will not be treated and is located close to open water. The upper limit is bordered by turf and a pathway. *Phragmites* in the area is approximately 10-15 ft tall with a density of 20 shoots per square meter. The area has not recently been disturbed by mowing or fire. Most of the proposed treatment area is Bordering Vegetated Wetland.

1. **Initial Treatment**

Date

September 21, 2006

Shoots Treated (cut stump)

1,818

Average Height of Treated Shoots

>4 m

Rodeo Used

4 liter 25% RODEO/water mixture

Permanent Monitoring Plots (3 1X2m plots)

The plots contained 60 shoots (average density – 10.0 shoots/square meter)

2. **Follow-up Monitoring and Treatment**

Date

September 21, 2007

New Shoots Treated (cut stump)

279 (originating from 38 distinct shoot bases)

Maximum Height of Treated Shoots

3 m (ca. 80% below 150 cm)

Rodeo Used

0.5 liter 25% RODEO/water mixture

Permanent Monitoring Plots (3 1X2m plots)

The 3 plots contained 24 shoots originating from 2 surviving 2006 plants (2006 shoot base). The average height of these shoots was 133 cm (max height 240 cm).

Phragmites biomass was not measured, but there was an estimated >90% reduction from 2006 to 2007.

A report will be submitted to the Conservation Commission by December 31, 2008 including the following information: each occurrence of application of herbicide, conditions necessitating follow-up application, amount of herbicides and adjuvants applied, and any adverse impacts upon non-target vegetation and wildlife. A draft interim report was submitted in April 2008.

No activities were conducted in 2007 regarding Japanese knotweed due to premature mowing by BPRD. Injections will be applied in 2008.

Section 4
Best Management Practices Plan

4.1 Completed BMPs

The following sub-sections describe the BMP activities identified in the EIR that have been implemented in the watershed during the previous year within the Town of Brookline and City of Boston.

Brookline

BMPs include source control, structural improvements and policy/regulatory controls.

Source Control and Structural Improvements

1. The Town of Brookline identified and removed 6 illicit connections to the municipal drainage system in 2007. A total of 4 out of the 6 illicit connections removed from the municipal storm drain system were tributary to the Muddy River. This removes illicit sanitary discharges to the Muddy River, which decreases bacteria and nutrients conveyed to the river. Within the Town of Brookline, a total of 1,050 GPD of sewage was removed from the drainage system in 2007; 690 GPD of sewage was removed from the Muddy River watershed.

2. The Town of Brookline continued year round street sweeping where every street was swept once per week (weather permitting in winter months), and every night in commercial areas.

3. There are approximately 1,550 CBs in the Town of Brookline. In 2007, the Town cleaned out 1,015 CBs at least once during the past year to maintain optimum sediment removal capacity of the CBs to limit the sediment load conveyed to the river. (See Section 4.3 for removal quantities.)

4. The Town of Brookline completed a total of 6 sets of inspections of the outfalls to the Muddy River during dry and wet weather events.

5. The Town of Brookline found five nests for Canadian geese and addled 14 eggs.

Policy/Regulatory BMPs

6. The Town of Brookline passed a wetlands protection bylaw in 2007; four permits, all related to the Muddy River project area, were issued under the new bylaw during 2007.

7. A program is in effect that requires developments to infiltrate runoff to the maximum extent practicable. The program requires an infiltration system with the provision for an overflow to the drainage system should storm events exceed infiltration capacity to prevent flooding. In 2007, DPW reviewed a total of 32 site

plans for compliance with this policy. None of these site plans were within the Muddy River project area.

8. The Town of Brookline conducted public education programs as outlined in the NPDES permit:

   - Informational brochures and posters were hung at schools, town hall, and the library.
   - Stormwater website was maintained, including a dedicated email.
   - Informational and enforcement "hotline" was implemented to manage residents' concerns regarding stormwater.
   - Storm drain stenciling occurred as a component of the Town of Brookline's environmental education programming.

Boston

The following BMPs include source control structural improvements:

1. Boston Water and Sewer Commission (BWSC) cleans CBs in accordance with the following policy: CBs are scheduled for cleaning at 30 month intervals. Shallow basins and basins in flood prone or environmentally sensitive neighborhoods are scheduled for cleaning at 15 month intervals. Shallow basins are identified from the Commission's GIS Oracle data base.

   It is estimated that 717 CBs in the Muddy River tributary area are owned by the BWSC. This is an increase of 11 catch basins over the 2006 count. The increase is due to the identification of an additional 11 catch basins as being owned by BWSC, as opposed to other parties.

   BWSC cleaned 218 individual CBs in 2007 (about 30 percent of the total), in the Muddy River tributary area.

2. The Commission hosts CB stenciling events upon request. There were no CB stenciling events held in the Muddy River drainage area in 2007.

3. BWSC did not install any new particle separators in areas tributary to the Muddy River in 2007. There are two BWSC particle separators within the watershed. Each was cleaned in 2007 as follows:

   - Fenwood Road (off Brookline Ave) was cleaned October 6, 2007. Approximately one-half (0.5) of a cubic yard of material was removed.
   - Perkins Street (Jamaica Pond) was cleaned August 16, 2007. Approximately 1.5 cubic yards of material was removed.

4. BWSC is performing illegal connection investigations in drainage areas in Boston that are tributary to the Muddy River. Investigations in the Village Brook and Tannery Brook drainage areas are 95% complete, in the Daisy Field drainage area tributary to Leverett Pond (18G233) the investigation is 82% complete, and in three drainage areas tributary to the Riverway (19G194, 19G043 and 20G161) investigations are 21%, 42% and 92% complete respectively).

   BWSC identified one (1) illegal connection in the drainage areas tributary to the Muddy River in 2007. The illegal connection was located in the Daisy Field drainage area. The illegal connection was corrected in 2007, removing an estimated 243 gallons of sewage per day from the Muddy River. One illegal connection in the Muddy River tributary area was identified in 2006 and corrected in 2007, removing an estimated 5,454 gallons of sewage per day from the Muddy River. The illegal connection was located in drainage area 20G161, which discharges to the Riverway.

   Since 1986, the Commission has identified and corrected 38 illegal connections to storm drains in Boston that discharge to the Muddy River. An estimated 87,480 gallons of sewage per day has been removed from the river as a result.

5. Through site plan review in 2007, the Commission approved the installation of two (2) infiltration devices (dry wells) and one (1) grit chamber proposed by private developers of projects in the watershed.

DCR

DCR is implementing both structural and non-structural best management practices to reduce pollution to receiving surface waters, including:

1. DCR is implementing a storm water management plan that involves public outreach and education, illicit discharge detection and elimination, construction and post construction storm water controls and municipal housekeeping. This year, DCR initiated monthly street sweeping of the Muddy River Parkways, including assistance from State Police to tow illegally parked vehicles to allow DCR to clean the streets from curb to curb.

2. DCR mapped with GPS and cleaned a total of 246 catch basins and drainage manholes owned by DCR along the Muddy River Parkways. Out of this total, DCR cleaned and water jetted 148 catch basins and drains throughout the Fenway and Riverway areas. Several areas have been identified for repair in coordination with Boston Parks Department and Army Corps of Engineers. Some of these areas will likely have to wait until Phase I Muddy River Project is completed to avoid short-term repairs that will be ineffective once river dredging or bank work is completed.

3. DCR coordinated with the Museum of Fine Arts (MFA) to replace an undersized drainage pipe and install a sediment control device to address storm water flows

from MFA that ultimately flow through DCR drainage structures to the Muddy River. MFA completed its repair and replacement of the parkway drainage pipe and installed a particle separator device in July 2007. MFA submitted an as-built drawing of the work on August 21, 2007. This work will improve drainage from the Fenway and accommodate additional drainage from MFA property. DCR will clean this sediment control device at least annually.

4. DCR and its contractors have been working with Boston Parks Department to address flooding problems and slow drainage in those areas where DCR shares a common property boundary along the Riverway and Jamaicaway and sections of Jamaica Pond and Leverett Pond. DCR cleaned and water jetted these common areas to improve street drainage from the parkways and identified other areas where additional outfall repairs in wetland resource areas will require permits from Boston Conservation Commission. Areas include drainage at the northern terminus of the Huntington Overpass near the outfall to Leverett Pond and catch basins near 300 Fenway. Outside wetland resource areas, DCR will replace broken curbing and eroded roadside slopes along the Riverway and Jamaicaway and repair broken catch basins and drainage piping in Brookline Avenue at Landmark Square.

4.2 BMPs Planned for Upcoming Year

The following sub-sections describe the BMP activities that are planned for upcoming year within the Town of Brookline and City of Boston.

Brookline

The Town of Brookline plans to implement or continue the following BMPs to reduce the sediment and other stormwater contaminants from being conveyed to the Muddy River:

- Continue illicit storm drain connection detection and removal program.
- Continue weekly street sweeping program.
- Continue the annual CB clean out program.
- Replace old CBs without deep sumps with new CBs with deep sumps as the DPW conducts street and drainage system repairs. The total number of CBs to be replaced is unknown as this work is ongoing.
- Route 9 resurfacing project – The Brookline Conservation Commission will work with the Massachusetts Highway Department (MHD) to ensure the water quality improvements agreed to by MHD are implemented, such as: 1) include a drainage swale in the project to improve stormwater discharge quality in one location; and 2) replace any old CB with a new deep sump CB based on results of the structural inspection.

- Continue public education programs.
- Continue waterfowl control measures.

Boston

New Programs:

- In 2008, BWSC will begin an investigation to identify illegal connections to storm drains in the Longwood Medical Area.

Ongoing Programs:

BWSC plans to continue implementing the following BMPs within the Muddy River watershed:

- Continue cleaning BWSC CBs in the watershed in accordance with the BWSC's policy.
- Clean the two particle separators in the drainage area in 2008.
- Consider installing new particle separators when preparing capital improvement plans for the area.
- Require installation of particle separators for new parking lots and new and re-development as appropriate. A BWSC Standard Type 5 catch basin is required as opposed to a particle separator when the total area to be drained in 7,500 square feet or less. A particle separator is required when the total area to be drained is greater than 7,500 square feet. The requirements for particle separators are included in the Commission's site plan requirements which are posted on the Commission's website.
- Require on-site retention of stormwater to the extent possible for new and re-developments.
- Continue supporting DEPs and MWRA's policy which requires proponents proposing to add significant new wastewater flow to reduce infiltration and inflow at a 4:1 ratio (4 parts of I/I removed for every 1 part of new wastewater flow added).
- Continue requiring dye testing of new sewer connections to ensure they are properly connected to the sewer system.
- Clean and maintain sewers and drains as needed.
- Host CB stenciling events upon request.

- Continue investigating illegal connections in the drainage areas tributary to the Muddy River.

DCR

DCR will continue to implement its storm water management plan setting out weekly, monthly, and annual activities according to the compliance schedule deemed acceptable by the Environmental Protection Agency and the Massachusetts Department of Environmental Protection. No new structural BMPs are planned.

4.3 Sand/Sediment Removal

Brookline

Approximately 70 percent of the Town of Brookline is within the Muddy River watershed. It is assumed that 70 percent of the total amount of sand and sediment removed from Brookline CB cleaning and street sweeping programs was within the watershed. Table 4-1 below presents the weight of sediment that was removed from each of the maintenance programs in the watershed.

Table 4-1
Sand/Sediment Removal within Brookline

BMPs	*Total Removed within the Town of Brookline (tons)*	*Total Removed within portion of the Town of Brookline that falls within the Watershed (tons)*
Catch basin cleaning	1,414	990
Street sweeping	1,218	853
Total	2,788	1,952

Boston

BWSC prevented sand and sediment from entering the Muddy River by removing debris from its CBs and particle separators.

- BWSC cleaned 218 CBs in 2007 in the Muddy River tributary area. Approximately 301 cubic yards of material was removed from the CBs.

- BWSC cleaned two particle separators located within the Muddy River tributary area in 2007.. A total of 2 cubic yards of material was removed. Table 4-2 lists the location of the particle separators and the amount of material removed in 2006 and 2007.

  The amount of material removed from particle separators can vary greatly from year to year. The amount of material capture in a particle separator is dependent on many factors, such as frequency and intensity of rain and snow storms, land use, topography and size of the area tributary to the particle separator, season

during which the separator was cleaned, activity in the tributary area in the period prior to cleaning, and various design factors. A vactor truck with a vacuum hose is typically used to clean particle separators. This equipment is not conducive to accurate quantification of material removed. Therefore, the amount of material removed is estimated by the operator and not measured. Each operator estimates the amount of material removed as best they can.

Table 4-2
Sand/Sediment Removal within Boston

Location	2006-Amount of Material Removed (cubic yards)	2007-Amount of Material Removed (cubic yards)
Fenwood Road	4.00	0.50
Perkins Street	0.25	1.50

Street sweeping in the Muddy River area has taken place on the scheduled Boston DPW program. However, the volume of sweepings can not be determined from the information available. The area draining directly to the Muddy River in Boston is a small portion of the overall DPW area and can not be estimated with any reasonable accuracy from the overall volume of sweepings removed.

DCR

The amount of street sweepers was increased in 2007. However, street sweeping and CB cleaning sand/sediment removal quantities are not available because the method employed for street sweeping is not amenable to quantifying removal amounts.

4.4 BMP Implementation

The entities responsible for implementing BMPs within the Muddy River watershed (BWSC, Boston DPW, Brookline DPW, and the DCR) have ongoing BMP programs as reported in Sections 4.1 and 4.2 in compliance with the EIR.

4.5 Water Quality Monitoring Program

The FEIR and SFEIR required that a program of quarterly water quality monitoring be established. Northeastern University has been engaged to perform all sampling and analytical work with overview by the city and town.

Historical and relevant data regarding previous sampling and testing has been collected, reviewed, and compiled. This will be used as a baseline to compare data collected under this program. A draft of the report was submitted in January 2007 and the report was finalized in March 2007.

A Sampling and Analysis Plan was prepared to document the procedures and protocols for the Water Quality Monitoring Program. This plan was submitted as a draft in January 2007 and the plan was finalized in April 2007.

A program has been developed that started with a round of sampling and testing between July and September, 2006. Others will follow at three month intervals. Until the completion of all construction, this same schedule will be followed each year through final commissioning of the works unless otherwise agreed to by all involved parties. After that, the management plan will provide for such monitoring.

Results of sampling rounds for October – December 2006, January – March 2007 and April – June 2007 were all submitted in 2007. Sampling for July – September 2007 and October – January 2007 have been completed and reports on the results are pending. Data obtained in the sampling rounds subsequent to the July – September 2006 round has corrected the collection and testing issues that arose in the first round. The data collected looks to be consistent and complete with minor exceptions where sampling or testing problems have occurred. These problems include situations like frozen sampling locations, accidents with the samples or laboratory equipment testing problems. Issues arising in the program are properly documented in the reports and corrective actions taken to prevent future occurrences.

Table 4-3 includes average values for the parameters measured in the year 2007. The only data included in the summary is data from the first three quarters (through September) of 2007 since the fourth quarter data has not been received to date. Average values represent averages of all 14 sampling locations for each quarter that were averaged for the year. A more detailed data report will be prepared summarizing data at each location with maximum and minimum values. Some of the averages were not included for several reasons. In 2007, much of the metals data has been retained for later analysis due to some problems with the testing equipment. In some cases the data included notations such as "Trace" and "Not Detected" that could not be averaged. In a more rigorous data evaluation some probability can be assigned to less than detectable limits or trace to arrive at a mean for the data. The data included in this table is to give a general sense of the information collected, not to provide a rigorous evaluation.

A review and comparison of the data is anticipated to be conducted in 2008.

When dredging work starts, a separate additional sampling and testing program (sampling to be completed by the construction contractor) will be implemented as part of the construction work. That program's primary purpose will be to monitor changes in the river water during dredging, especially turbidity and TSS.

Table 4-3
Summary of Water Quality Sampling Data for the Muddy River in 2007

Description	Units	Average for 2007 Data
Physical Parameters		
Temperature	dC	15
Specific Conductance	uS/cm	802
Dissolved Oxygen	mg/L	8.6
DO Saturation	%	82
pH	su	6.72
Analysis		
Chloride	mg/L	285
Alkalinity	mg/L	56
Acidity	mg/L	8.9
Biological Oxygen Demand	mg/L	4
Chemical Oxygen Demand	mg/L	15.3
Total Organic Carbon	mg/L	4.5
Total Suspended Solids	mg/L	11.7
Total Dissolved Solids	mg/L	461
Fecal Coliform	CFU/100mL	No Data Available
E. Coliform		No Data Available
Enterococcus		No Data Available
Oil & Grease	mg/L	0
Total Petroleum Hydrocarbon	mg/L	0
Total Nitrogen	mg/L	4.12
NH4	mg/L	0.9
NO2	mg/L	0.14
NO3	mg/L	2.12
Total Phosphorus	mg/L	0.12
PO4	mg/L	No Data Available
Color	APCU	91.5
Turbidity	NTU	6.9
Metals		
Zinc	ug/L	14
Chromium	ug/L	35
Lead	ug/L	No Data Available
Copper	ug/L	No Data Available
Cadmium	ug/L	No Data Available
Arsenic	ug/L	34
Sb	ug/L	No Data Available
Berilium	ug/L	No Data Available
Selenium	ug/L	No Data Available
Ag	ug/L	No Data Available
Ti	ug/L	No Data Available
Nickel	ug/L	No Data Available
Mercury	ug/L	No Data Available

Section 5
Environmental Permits and Approvals

5.1 Environmental Permits and Approvals for Upcoming Year

Assuming the Corps will meet its schedule and have Phase I (dredging) ready for bidding in the fall, with award following by late fall, it does not seem likely that construction will commence until the following spring (2009). However, all permits are being pursued contemporary with completion of Phase 1. Therefore, all required permits will be in hand at the time of award.

5.2 Permit Amendments or Additional Permits for Upcoming Year

Project work for the upcoming year will focus on completion and bidding for the daylighting portion. Start of design for the dredging portion will take place in 2008, including engineering evaluations and other project related investigations, preparing project designs and construction specifications, and developing cost estimates in preparation of bid documents.

5.3 Inspection Reports

No construction occurred in 2007; therefore, no inspection reports were required in 2007.

Section 6
Funding and Schedule

6.1 Funding Status and Implementation Schedule

Table 6-1 includes the anticipated engineering and construction schedules for the daylighting and dredging portions of the project. Appendix D provides a schedule for the engineering and construction activities as well as reporting requirements, permitting, and meetings.

Table 6-1
Scheduling Milestones for Daylighting and Dredging Portions

Milestone	*Dates*
Daylighting Portion - Engineering	11/05-9/08
Daylighting Portion - Construction	3/09-11/10
Dredging Portion - Engineering	8/08-9/09
Dredging Portion - Construction	2/10-5/11

The signed grant agreement, dated June 13, 2005, lists projected design costs to be $4.6 million, of which 25 percent is the non-Federal sponsor's contribution (the Corps' financial responsibility is 75 percent). Detailed construction costs will not be available until later in the design, but for planning purposes, the cost presented in Table 6-2 are consistent with the project costs reported in the SFEIR.

Table 6-2 summarizes the budget and finance status for the daylighting and dredging portions of the project and related construction. Note the $1,100,000 for the cost of the decision document (prepared by the Army Corps of Engineers pursuant to NEPA) increases the total design costs to $4,600,000. For construction costs, the U.S. Government share will be reduced by 10 percent and the sponsor share will be increased by 10 percent.

The Corps continues to provide quarterly budget status reports.

As a consequence of a one year schedule slippage in the design work, it is expected that cost escalation will cause an increase in the above construction budget. Furthermore, the added engineering effort which resulted in elimination of the bridge/culvert will result in an increase in the design budget. However, this increase should be offset by the elimination of the bridge/culvert. When design reaches the 90 percent level, it will be possible to quantify the above impacts.

Table 6-2
Summary Status of Budget and Finances for Daylighting and Dredging Portions

Daylighting Portion			
Design		Construction	
Entity	Budget	Entity	Budget
U.S. GOV	$1,575,000	U.S. GOV	$19,180,000
State	$262,500	State	$5,250,000
City	$225,750	City	$4,515,000
Town	$36750	Town	$735,000
DAYLIGHTING DESIGN TOTAL	**$2,100,000**	**DAYLIGHTING CONSTRUCTION TOTAL**	**$29,680,000**
Dredging Portion			
Design		Construction	
Entity	Budget	Entity	Budget
U.S. GOV	$1,050,000	U.S. GOV	$18,750,000
State	$175,000	State	$6,125,000
City	$150,000	City	$5,267,500
Town	$24,000	Town	$857,500
DREDGING DESIGN TOTAL	**$1,400,000**	**DREDGING CONSTRUCTION TOTAL**	**$31,000,000**

The total DCR design grant, including the design document, daylighting, and dredging portion, is $575,000.

Section 7
Response to Agency and Public Comments

The MMOC submitted written comments on the 2007 MEPA Annual Update; those comments have been incorporated into this year's report.

In addition, the MMOC provided comments on this year's Annual Update Report, the majority of which were responded to and included in this report.