CHAPTER ONE
INTRODUCTION

OVERVIEW

In accordance with federal and state CSO policies, in 1997 the Massachusetts Water Resources Authority ("MWRA") recommended a long-term plan to bring combined sewer overflows ("CSOs") in the metropolitan Boston area into compliance with the Clean Water Act. The plan included 25 projects intended to eliminate or minimize CSO impacts in all Boston area receiving waters affected by CSO discharges, including Alewife Brook. One of the Alewife Brook projects called for the separation of combined stormwater and sanitary sewer systems in two large areas of Cambridge, to remove stormwater flows from the overburdened sewer system. The primary intent of the project was to reduce surcharging and combined sewer overflows in the local Cambridge systems and in the MWRA interceptor system which runs along Alewife Brook. A key element of the separation projects was that, to the extent feasible, the existing combined sewers would be converted to separate storm drains, by removing sanitary connections. The Massachusetts Environmental Policy Act (MEPA) Unit granted this project a Phase I Waiver from further environmental review in 1995, based on their determination that

> "...much of the work for sewer separation will take place under streets, [and] it will have little, if any, potential to cause significant short term (construction) or long term impacts on the environment. In addition, more immediate water quality benefits will be realized through early implementation of selected projects." (MEPA Final Record of Decision, July 14, 1995)

The City of Cambridge agreed to design and construct the sewer separation project, known as "CAM002-004 Sewer Separation," and MWRA agreed to fund the project cost.

In 1997-1999, during extensive field investigations to support design of the project, the City of Cambridge collected new information about the configuration and condition of its stormwater and sanitary systems. The new information indicated that in certain locations the combined sewer systems in Cambridge were very different from record plans that had been used to develop the CSO plan. It also became clear that the existing combined sewers had insufficient hydraulic

capacity to provide an appropriate level of storm drainage service. Thus, instead of converting existing combined sewers to storm drains, a significant degree of new, larger-capacity storm drainage piping was required. From this new information, Cambridge determined that the scope and cost of the work to separate sewers and achieve the established CSO control goals would be much greater than originally assumed. Cambridge estimated that the cost of the project could be as much as $75 million, compared to the original (1997) estimate of $12.1 million.

Based on this new information, it was no longer certain that the project represented the most cost-effective level of CSO control for Alewife Brook. The B_{cso} standard requires that "the highest level of control must always be achieved for each case as determined in the facilities plan through a cost/benefit analysis" (Massachusetts Department of Environmental Protection (DEP) Policy for Abatement of Pollution from Combined Sewer Overflow). Therefore, it became necessary for MWRA to reevaluate the long-term CSO control plan for Alewife Brook. With the new system information, as well as updated wet weather flow data collected in 1999, MWRA developed new estimates of existing CSO discharge frequency and volume. The estimate of existing annual CSO volume from all outfalls along Alewife Brook increased from 18 million gallons assumed in the 1997 plan to 50 million gallons, and the estimate of overflow activation frequency increased from 16 to 63 times per year. The reevaluation of CSO control alternatives, which was performed in accordance with federal and state CSO policies using the same technology-based and water quality-based planning approaches used to develop the 1997 CSO Plan, is presented in Chapter Five.

The purpose of the reevaluation was to compare a range of CSO control technologies and determine an appropriate, cost-effective level of control. The reevaluation confirms the original conclusion that sewer separation is the most cost-effective means to control CSO discharges to Alewife Brook, but the scope of the recommended sewer separation has been revised. Elements of the original 1997 recommended plan are compared with the revised recommended plan in Table 1-1. Figure 1-1 presents the original 1997 recommended plan, and Figure 1-2 presents the revised recommended plan.

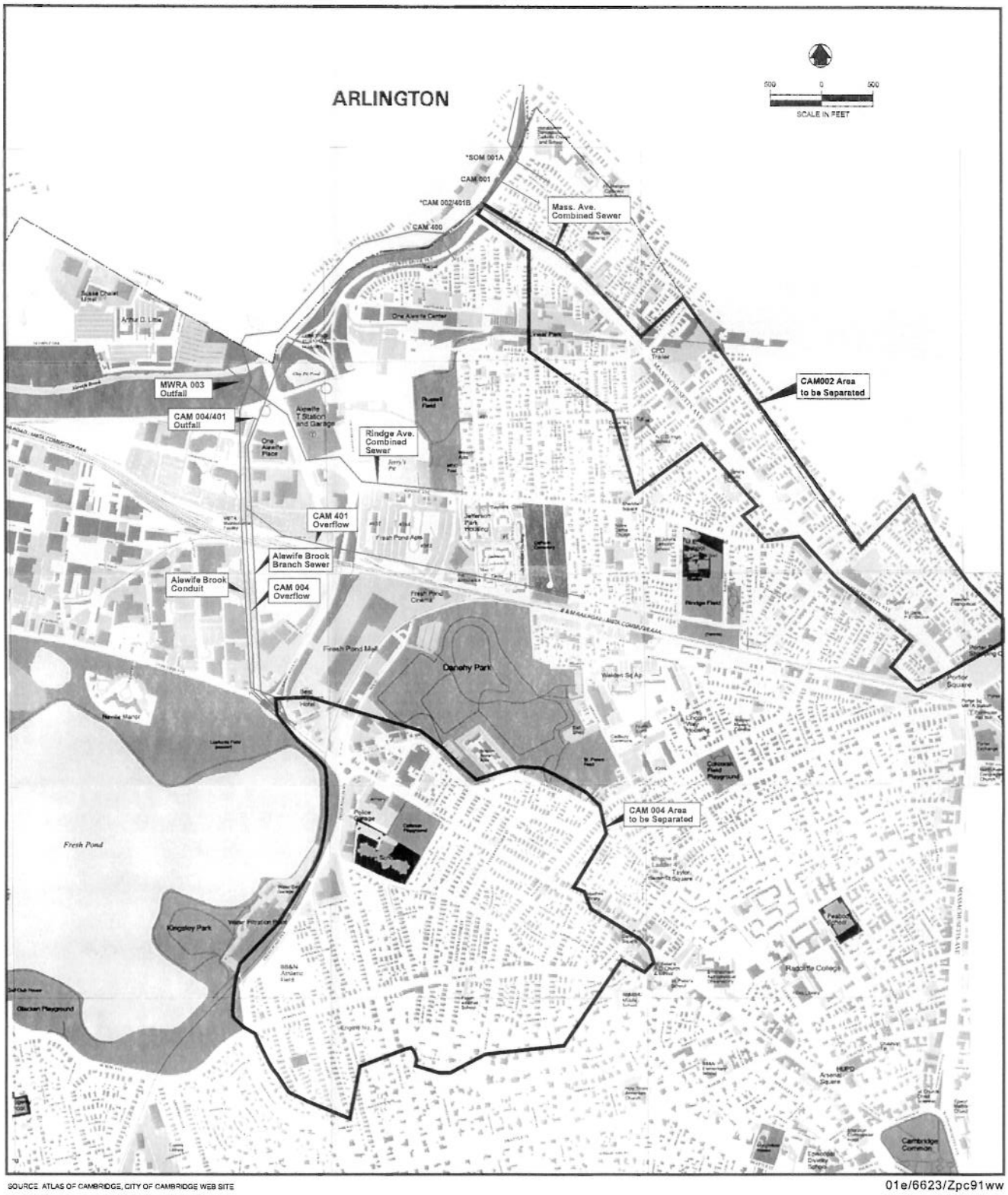
TABLE 1-1. COMPARISON OF 1997 RECOMMENDED PLAN AND THE REVISED RECOMMENDED PLAN FOR ALEWIFE BROOK CSO CONTROL

1997 Recommended Plan[1]	Revised Recommended Plan[1]
• Separate sewers in the CAM004 tributary area to reduce CSO discharges • Separate sewers in the CAM002 tributary area to eliminate CSO discharges	• Separate sewers in the CAM004 tributary area to eliminate CSO discharges (includes construction of a new stormwater outfall and wetland detention basin • Increase size of local sewer connection at CAM002, CAM401B and SOM01A, to reduce CSO discharges at these locations • Increase size and capacity of Rindge Avenue siphon to reduce CSO discharges at MWR003; add hydraulic relief gate • Separate sewers in the CAM400 tributary area
Floatables control at remaining CSO outfalls (SOM01A, CAM001, CAM004, CAM400, CAM401)	• Floatables Control at remaining CSO outfalls (SOMA001A, CAM001, CAM002, CAM004[2], CAM400, CAM401A, CAM401B and MWR003)
Estimated Total Cost: $12.1 M	Estimated Total Cost: $74.0 M

(1) Both the 1997 plan and the new plan include separation of "baffle" manholes in Somerville, to eliminate CSO discharges at outfalls SOM001 and SOM002. In addition, with funding from the MWRA SOP program, SOM002A, SOM003 and SOM004 were closed. The City of Somerville completed this work between 1994 and 1996.

(2) Temporary floatables control will be provided at Drain Vault No. 5 (CAM004) until the regulator is closed following completion of upstream sewer separation.

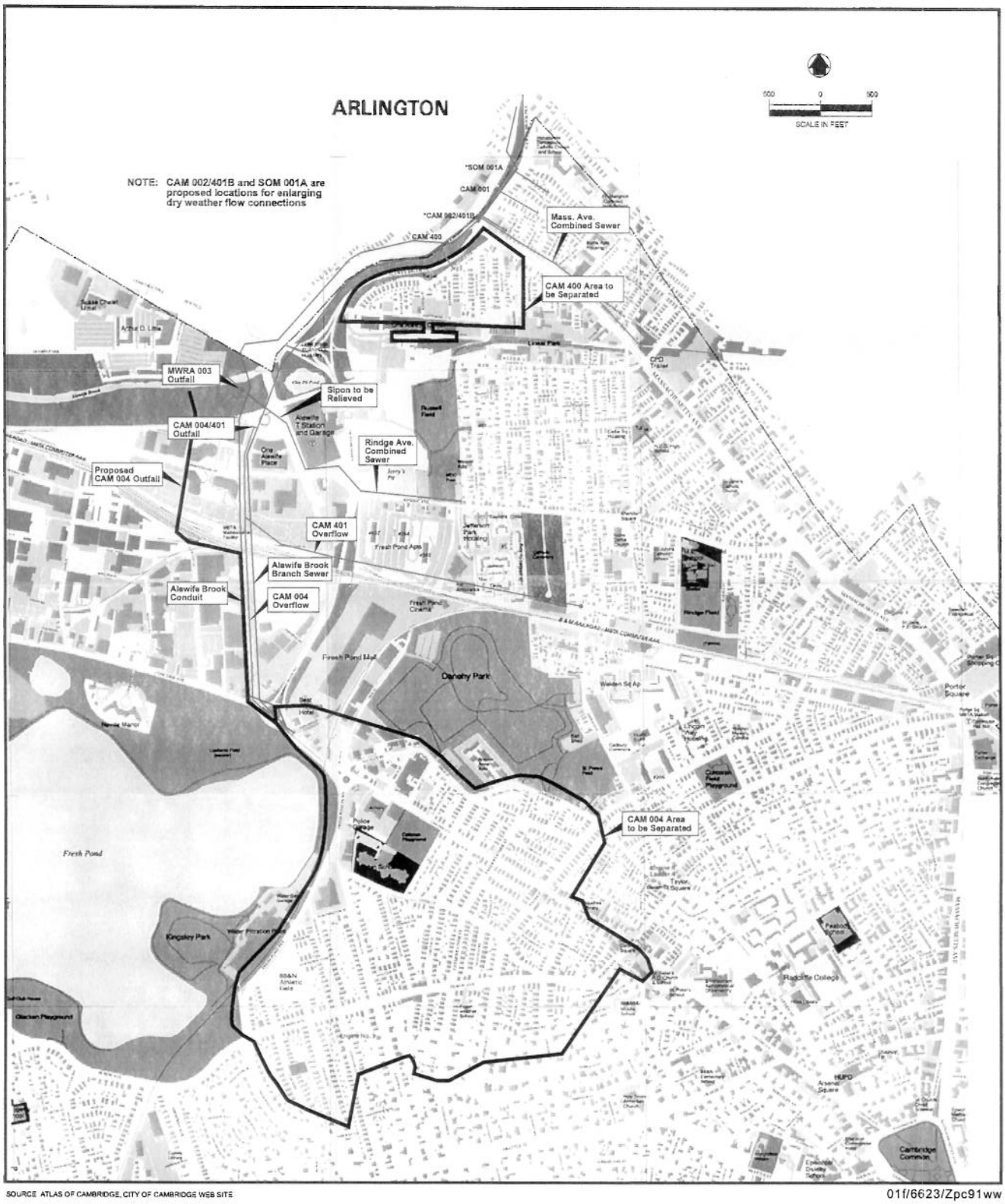
As indicated in Table 1-1, sewer separation in the CAM004 area is still recommended, however it will require the construction of a new stormwater outfall to the Little River. A vegetated wetland detention basin is proposed to be constructed in the Metropolitan District Commission (MDC) Alewife Brook Reservation, adjacent to the Little River, to detain and attenuate the additional stormwater flows and mitigate impacts on flood elevations. While Cambridge has already constructed a small portion of the sewer separation work originally recommended in the CAM002 area, the revised plan no longer



SOURCE: ATLAS OF CAMBRIDGE, CITY OF CAMBRIDGE WEB SITE

01e/6623/Zpc91ww

FIGURE 1-1.
ORIGINAL MWRA 1997 RECOMMENDED PLAN FOR ALEWIFE BROOK CSO CONTROL



SOURCE ATLAS OF CAMBRIDGE, CITY OF CAMBRIDGE WEB SITE

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FIGURE 1-2.
PROPOSED REVISED RECOMMENDED PLAN FOR ALEWIFE BROOK CSO CONTROL

includes CAM002 sewer separation. Rather, it proposes sewer separation in the CAM400 area instead. The revised plan also recommends a set of localized hydraulic improvements, including in the CAM002 area, that reduce overflows at other CSO outfall locations in Cambridge and Somerville.

Table 1-2 presents the predicted reduction in annual CSO frequency and volume to Alewife Brook for the original 1997 plan and the revised recommended plan. A cost/benefit comparison of the reevaluated alternatives is presented in Chapter Six. As indicated in Table 1-2, the revised recommended plan is predicted to attain the same annual percent reduction in CSO volume as the original plan. It should be noted that the MWRA and City of Cambridge have already moved forward on the construction of the downstream portion of the CAM004 sewer separation project, based on the judgement that this work would be a common element of any long-term plan for Alewife Brook. As a result of this construction, significant reductions in the activation frequency and volume of CSO to Alewife Brook have already been achieved. The annual average CSO activation frequency has been reduced from 63 to 25, and the total annual volume has been reduced from 50 to 33 million gallons.

MWRA believes that this revised plan is the most cost-effective long-term plan for CSO control for Alewife Brook, that is, providing higher levels of control would not yield significant water quality benefits despite significantly higher costs. MWRA is now recommending this plan to meet existing regulatory and federal court obligations. At the same time, MWRA understands that final regulatory decisions regarding the water quality designation can and will be made only in the framework established by the Alewife Brook/Upper Mystic River Variance issued by DEP. The Variance stipulates that DEP will determine the appropriate level of CSO control and the water quality standard for Alewife Brook at the conclusion of the Variance period in March 2002 (further details on the Variance are presented in Chapter Two).

In addition to addressing water quality in Alewife Brook, the revised recommended plan responds to the serious needs to improve infrastructure, alleviate flooding of Cambridge residential neighborhoods by sewage-contaminated water, and protect the public drinking water supply at Fresh Pond Reservoir.

TABLE 1-2. COMPARISON OF PREDICTED CSO REDUCTION FOR THE 1997 RECOMMENDED PLAN AND THE REVISED RECOMMENDED PLAN

1997 Recommended Plan

	Activation Frequency*	Annual CSO Volume (mg)*	% Volume Reduction
Assumed Existing Conditions	16	18.3	-
Recommended Plan	4	2.9	84%

Revised Recommended Plan

	Activation Frequency*	Annual CSO Volume*	% Volume Reduction
Updated Existing Conditions	63	49.7	-
Recommended Plan	7	7.4	84%

* in a Typical Rainfall Year

Consideration has been given to the appropriateness and cost-effectiveness of the revised plan under a range of possible future planning decisions and changed environmental conditions, such as the potential for a significant reduction in pollutant concentrations in existing separate stormwater flows. Based on recent sensitivity analyses, which considered possible changes in environmental conditions, MWRA is confident that the current plan will not be invalidated, in whole or in part, by any future CSO or stormwater evaluations or regulatory decisions. However, future regulatory findings may determine that additional CSO control, over and above the revised plan MWRA now recommends, is warranted and will thus require MWRA and the City of Cambridge to consider additional control measures.

PROJECT RE-EVALUATION

As mentioned above, during the course of preliminary design for sewer separation in the areas upstream of outfalls CAM002 and CAM004, issues were identified that contributed to significantly increased estimates of the capital cost of doing the separation work:

- On many streets, the actual system configuration was different from what had been indicated on the City of Cambridge sewer maps. In particular, pipes that were indicated to be separate storm drains were, in fact, combined sewers, and a number of cross connections existed among the sanitary, storm drain and combined sewer systems.

- The City of Cambridge identified that the existing combined system did not have sufficient hydraulic capacity to provide what it considered to be an appropriate level of storm drainage service and flood control. Since the original concept for separation in the CAM002 and CAM004 areas was based on converting the existing combined sewers to storm drains, significant investment in new storm drain piping would be required to meet the necessary level of drainage service.

- The City of Cambridge found that the separation work may need to be extended outside of the previously-identified areas to meet CSO control goals. Additional study is planned to determine the extent of work necessary. Preliminary indications are that the construction cost for sewer separation in this extended area would be in the order of an additional $15 to $20 million.

The City of Cambridge conducted additional field investigations in order to detail the current existing sewer system configuration. The field inspection program consisted of six tasks: mapping, catch basin and manhole inspections, smoke testing, building inspections, dye flooding and TV inspection of the sewer pipes. The purpose of the field investigations was to identify interconnections among existing storm drain, combined, and sanitary sewer systems. These interconnections must be eliminated to achieve effective sewer system separation. The sanitary sewers proposed to remain in service were internally inspected to verify the condition and adequacy of the pipe.

In addition, Cambridge performed hydraulic modeling of the sewer system to reevaluate the available flow capacity in the existing sewer system. Hydraulic models of both the storm drainage and combined sewer systems in CAM002 and CAM004 were developed to evaluate the capacity of each existing system for selected design year storms. Hydraulic calculations were

performed on the sanitary sewer pipes to determine flow capacity and to compare to estimated peak sanitary wastewater flows.

Cambridge prepared a recommendation of sewer improvements and system modifications, on a street by street basis. Construction cost estimates were also prepared as part of the recommendation.

Cambridge completed a Supplemental Preliminary Design Report (PDR) which estimated that the cost to complete the intended sewer separation work and attain the recommended level of CSO control would greatly increase, from about $12 million estimated in the 1997 Final CSO Plan to about $75 million. Based on these findings, questions were raised as to whether sewer separation was still the appropriate recommendation for CSO control for Alewife Brook, and if so, whether the scope of work could be revised to cost-effectively maximize the benefit to the receiving water.

PURPOSE OF THE NOTICE OF PROJECT CHANGE

This NPC is intended to comply with the requirements of the MEPA regulations of the Executive Office of Environmental Affairs and to comply with DEP facilities planning requirements in accordance with state and federal CSO policies. This report supplements MWRA's *Final CSO Facilities Plan and Environmental Impact Report – EOEA# 10335* (FEIR) filed with the MEPA Unit in August 1997. A description of previous regulatory reviews and the regulatory framework of the CSO Plan is presented in Chapter Two.

MWRA and the City of Cambridge have jointly prepared and issued this NPC to conduct a public review process and to obtain MEPA approval on the revised recommended plan for Alewife Brook CSO control. MEPA approval is necessary to allow already-begun CSO project design and construction to continue. While the DEP-issued Variance for CSO discharges to Alewife Brook establishes a regulatory framework and timeframe for making final decisions on CSO control and water quality standards, that same Variance requires MWRA to implement the 1997 plan. Furthermore, a federal court order in the Boston Harbor Case also requires MWRA to implement the 1997 plan on an aggressive, defined schedule (the federal court order is

discussed in Chapter Two). This NPC is one necessary step in a process to obtain state and federal approvals, including approval of revisions to the federal court schedule, to substitute this revised plan for the 1997 plan in those regulatory and legal requirements.

MWRA and the City of Cambridge have held several public meetings in advance of completing this NPC, and much of the information in this report is in response to questions and concerns raised at the meetings (see Chapter Two for a description of the public participation process). An additional public hearing or workshop will be held during the MEPA public comment period.

The NPC attempts to fully describe the regulatory and legal framework for implementing CSO control in Alewife Brook. It provides a detailed review of the current design and construction status of the original recommended plan, describes the reasons for reevaluating the plan, and presents updated estimates of CSO discharges and impacts. The document presents the reevaluation of CSO control alternatives and the reasons for selecting the revised sewer separation plan. The document also presents the construction requirements, environmental and community impacts, impact mitigation measures and cost estimates. The NPC also describes the significant benefits associated with the project, summarized below:

- 84 percent reduction in annual CSO volume discharged in a typical year;
- improved stormwater quality resulting in a reduction in stormwater pollutant loads despite increased quantity of flows;
- protection of a public drinking water supply from potential CSO contamination;
- increased level of flood protection for Cambridge residential neighborhoods in the CAM004 tributary area;
- protection from *existing* "downstream" flooding by waters containing CSO along the Alewife Brook in Arlington as well as mitigation for a marginal increase in river elevations due to the project, and
- creation of additional wetlands and enhancement of walking trails in the Alewife Reservation.

Because the project proposes work within the Metropolitan District Commission's Alewife Brook Reservation and related wetlands, Cambridge has provided a thorough review of alternatives that were considered in an attempt to avoid or minimize wetlands impacts.

DOCUMENT ORGANIZATION

This document is organized into the following Chapters.

Chapter One – Introduction. This chapter presents a brief overview of the project, followed by a discussion of the purpose of the NPC and a discussion of the events leading to the re-evaluation of the plan for Alewife Brook. This chapter concludes with an outline of the document organization.

Chapter Two – Planning and Regulatory Background. This chapter presents a summary of the regulatory process that has preceded development of this NPC, and the subsequent regulatory process that will ensue following submittal of the NPC. Background on the MWRA's long term CSO control planning process is then presented. The public participation process preceding and following submittal of the NPC is presented after the review of the planning process.

Chapter Three – Recommended Plan. This chapter summarizes the components of the revised recommended plan for CSO control for Alewife Brook, and provides a comparison to the original recommended plan as developed in the July 1997 FEIR. Following this summary, a discussion of the incremental benefits of phased implementation of the revised recommended plan is presented. This chapter concludes with a discussion of why elimination of CSOs to Alewife Brook through sewer separation is not recommended.

Chapter Four – Overview of Re-Evaluation. This chapter presents a summary of the scope of the re-evaluation of the CSO control plan for Alewife Brook, followed by a summary of the results of the re-evaluation.

Chapter Five – Development and Evaluation of CSO Control Alternatives. This chapter presents the methodology used in developing and evaluating CSO control alternatives for Alewife Brook; presents the baseline conditions from which the CSO control alternatives were developed; provides descriptions of the alternatives that were developed; and summarizes the performance of the range of alternatives.

Chapter Six – Comparison of CSO Control Alternatives. This chapter presents a comparison of the CSO control alternatives for Alewife Brook that were developed and described in Chapter Five. The alternatives are compared on the basis of cost per unit of pollutant load removed, cost/performance curves, and non-monetary factors.

Chapter Seven – Receiving Water Modeling. This chapter presents the results of preliminary modeling of the impacts of CSO, stormwater and upstream pollutant loads on the Alewife Brook/Upper Mystic River receiving water segment.

Chapter Eight – Revised Recommended Plan: Impacts and Mitigation. This chapter presents the anticipated short-term and long-term impacts and proposed mitigation for the various elements of the revised recommended plan. For certain elements, such as the new CAM004 outfall and detention basin, and MWR003 floatables control, additional details on alternatives evaluations are also presented.

It should be noted that the technical information presented in this NPC was developed in part by the MWRA and its consultant, Metcalf & Eddy, Inc., and in part by the City of Cambridge and its consultants, SEA Consultants, Inc. and Montgomery Watson, Inc. Table 1-3 summarizes the sources of the technical information presented herein.

TABLE 1-3. SOURCES OF TECHNICAL INFORMATION

Topic	NPC Chapter	Source
Re-evaluation of CSO Control Alternatives for Alewife Brook	Chapters 4, 5, 6,7, Appendix B, C	MWRA/Metcalf & Eddy, Inc.
CAM004 Separation Impacts and Mitigation	Chapter 8	City of Cambridge/SEA Consultants, Inc./ Montgomery Watson Inc.
Cambridgpark Drive Area Drainage Alternatives, Technical Analysis, Impacts and Mitigation	Chapter 8, Appendix A	City of Cambridge/SEA Consultants, Inc./ Montgomery Watson Inc.
CAM400 Separation Impacts and Mitigation	Chapter 8	City of Cambridge/SEA Consultants, Inc./ Montgomery Watson Inc.
Hydraulic Relief of Dry Weather Flow Connections at CAM002, CAM401B, and SOM01A Impacts and Mitigation	Chapter 8	MWRA/Metcalf & Eddy, Inc.
Rindge Avenue Siphon Relief Impacts and Mitigation	Chapter 8	City of Cambridge/SEA Consultants, Inc./ Montgomery Watson Inc.
Hydraulic Relief Gate and Floatables Control for MWR003 Alternatives Evaluation, Impacts and Mitigation	Chapter 8	MWRA/Metcalf & Eddy, Inc.
Floatables Control for Alewife Brook Outfalls Impacts and Mitigation	Chapter 8	City of Cambridge/SEA Consultants, Inc./ Montgomery Watson Inc.