

## **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. The presentation of impacts and mitigation is organized as follows:

- CAM004 sewer separation (upstream)
- CAM004/CambridgePark Drive area drainage, including the new CAM004 outfall and detention basin
- CAM400 sewer separation
- CAM002, CAM401B and SOM01A dry weather flow connection relief
- Rindge Avenue siphon relief
- MWR003 hydraulic relief gate and floatables control
- Floatables control for other Cambridge outfalls

A table summarizing impacts and mitigation for each of these components is provided at the end of this chapter.

#### **CAM 004 SEPARATION (UPSTREAM)**

##### **Description of Work**

The CAM 004 tributary area (approximately 245 acres) extends along Fresh Pond Parkway from Huron Avenue to the Alewife Brook Parkway including all side streets east of Fresh Pond Parkway (Figure 8-1). A portion of this area is very flat and prone to significant flooding and



combined sewer system overflows during storm events with a return interval frequency of approximately two years. Combined sewer overflows contribute to water quality degradation in Alewife Brook and could potentially affect the City's potable water supply at Fresh Pond.

The proposed project remains similar to the original CAM 004 scope of work detailed in the February 12, 1998 Interim Preliminary Design Report as Contract No. 8 and Contract No. 9. The project consists of a sewer separation program based on the following approach:

- Utilize combined sewers as sanitary or storm drains. Replace inadequately sized pipe with new storm drain pipe to accommodate the 10 year storm design flows and new sanitary pipe to convey estimated peak sanitary flows.
- Eliminate common manholes.
- Utilize existing pipe to the extent possible. Rehabilitate pipe where needed.
- Identify and remove illicit connections to storm drains and remove stormwater connections from sanitary sewers.

The proposed construction schedule for the sewer separation work is shown on Figure 8-2. Contract No. 9, which covers the low-lying areas, will be constructed first, with a scheduled start date of January 2005 and a completion date of June 2006. Contract No. 8 will begin construction in June 2007 and be completed in September 2008. The construction sequencing requires that Fresh Pond Parkway, Contract 2B and CambridgePark Drive Area Drainage construction be completed before the start of CAM 004 sewer separation work. Contract No. 1 (Fresh Pond Parkway/Wheeler Street storm drain cleaning and internal inspection) and Contract 2A (Fresh Pond Phase I Sewer Separation) are completed.

### **Short and Long-Term Impacts and Mitigation Measures**

**Short-Term Impacts and Mitigation Measures.** Short term impacts from construction related activities will be mostly traffic related given that most construction is within City streets. Vehicular traffic will be properly routed in accordance with requirements of the Cambridge Police, Cambridge Traffic and Parking, and in conformance with the Manual on Uniform Traffic

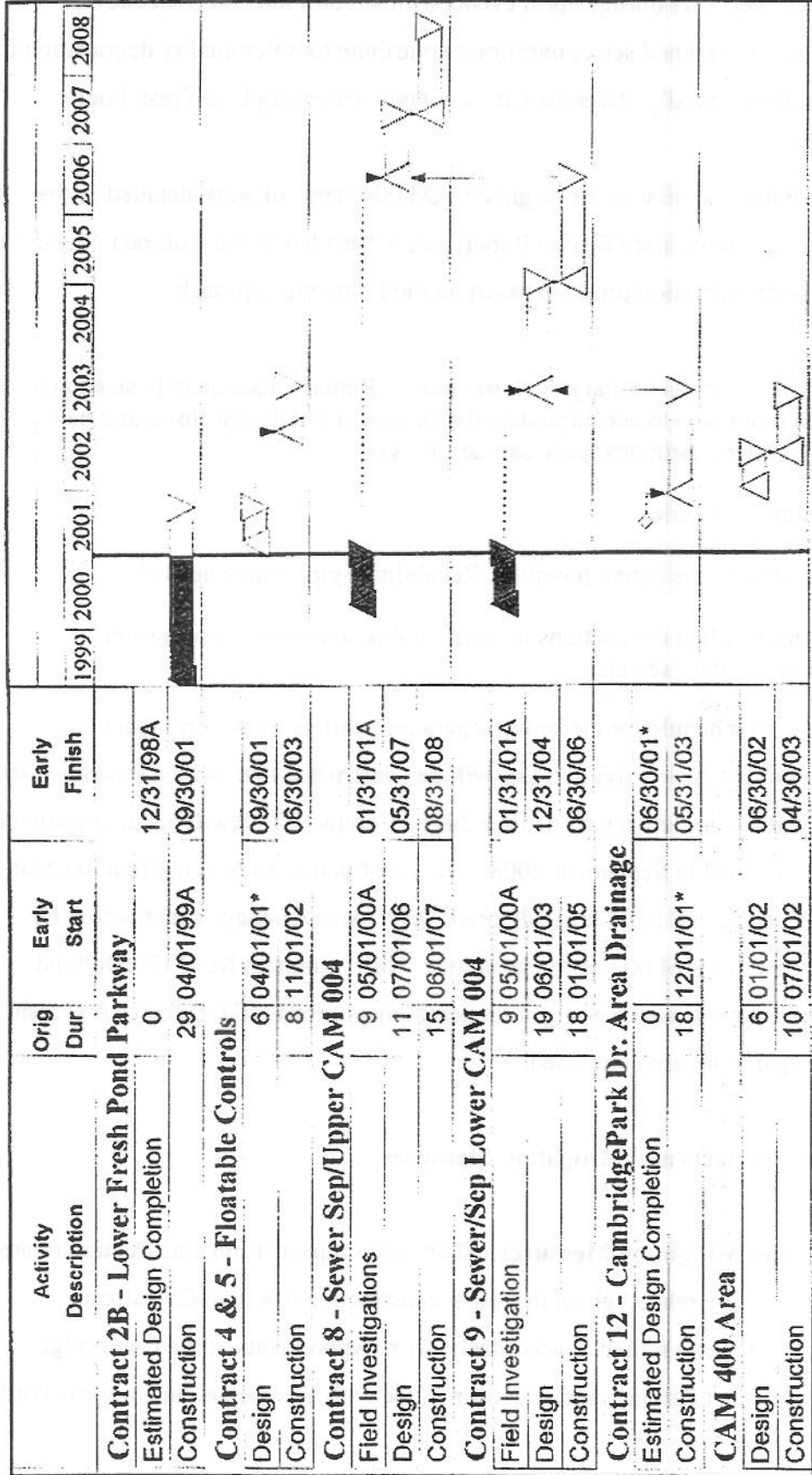


Figure 8-2  
CAM 004/400 Drainage Area  
Sewer Separation Schedule

Control Devices. Construction hours will be specified in accordance with the City of Cambridge regulations to minimize the duration of traffic impacts along project alignments.

Additional proposed mitigation measures to minimize short-term impacts associated with this project are detailed in Appendix A, and in Table 3 from the report entitled Draft Construction Impact Mitigation Guidelines for Phase I Waiver Combined Sewer Overflow Projects submitted to the MEPA Unit by the MWRA dated January, 1998 (Appendix D).

**Long-Term Impacts and Mitigation Measures.** Long-term impacts are limited to very minor and short duration disruptions in streets during future routine maintenance activities such as internal inspections and pipe cleaning.

### **Permit Needs**

State permits required for construction of this project include: a DEP Sewer Extension permit; and a NPDES Discharge Permit. Local permits include a City of Cambridge street opening permit.

### **Easements/Land Acquisition**

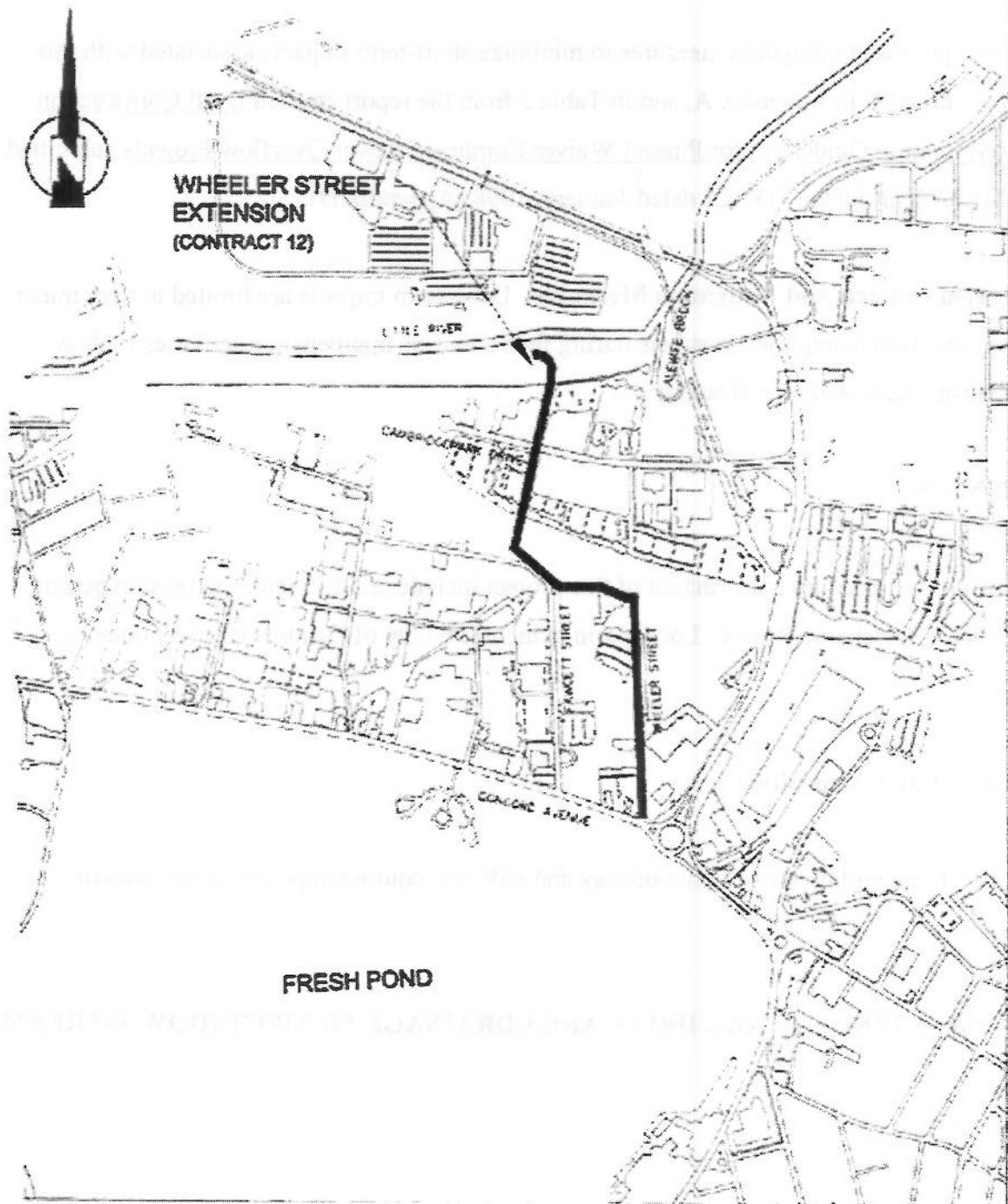
All work will be within public rights-of-way and will not require temporary or permanent easements.

## **CAM004/CAMBRIDGEPARK DRIVE AREA DRAINAGE PROJECT (DOWNSTREAM)**

### **Introduction**

The CambridgePark Drive Area Drainage project consists of the construction of a new storm drain pipe from the end of the Fresh Pond Parkway which will discharge into a new detention basin located in the Alewife Reservation adjacent to the Little River (Figure 8-3). The existing storm drain system in Wheeler Street has limited flow capacity (one to two year storm event) and

**CAMBRIDGE PARK DRIVE AREA DRAINAGE  
CONTRACT 12 LOCUS MAP**



**FIGURE 8-3. LOCUS MAP**

the area currently experiences flooding events because of the limited pipe capacity. A new storm drain pipe is needed to both convey the increase in stormwater flows and to reduce current flooding events resulting from the CSO sewer separation program in the Fresh Pond area.

Presently, combined sewage and stormwater are discharged to the Little River via the 66-inch Wheeler Street Drain. This drain has an outlet located just south of the Alewife MBTA station rotary garage. The drain discharges to the shallow Alewife Brook channel which is connected to the Little River just upstream of the Route 2 bridge. This conduit conveys wet weather flows from three tributary areas. These areas include the following:

- **CAM 004 Area** which is presently a mix of major stormwater flows and combined sewage flows from Concord Avenue and Fresh Pond Parkway. Sewer separation of this area is underway and is scheduled to be completed by 2008.
- **CAM 401A Area** which is presently a mix of combined sewer flows with some segments of separate stormwater flows from Sherman Street. These flows discharge to the Wheeler Street Drain from Sherman Street via the 72-inch Sherman Street Drain located parallel to the B & M Railroad tracks. Long term sewer separation of this area including stormwater management is in the conceptual facilities planning phase.
- **Fawcett Street Area** which is mostly a separated sewer area intermixed with some storm over sanitary manholes that are being eliminated as part of the City's Common Manhole Rehabilitation Program. This area includes stormwater flows from the Fresh Pond Mall, Terminal Road and CambridgePark Drive.

The 4-foot by 12-foot box culvert proposed in this project is designed to augment the conveyance capacity of the Wheeler Street Drain to provide 10-year 24-hour design storm service to the CAM 004 area only. The present design storm service of the CAM 401A area and Fawcett Street area are not being upgraded beyond current levels (approximately 2-year storm service) as part of this project.

The purpose of this project is to convey the excess stormwater flows (stormwater that now enters the sanitary sewer system or floods the streets and surrounding properties) to a detention basin adjacent to the Little River. The detention basin will be constructed at the CambridgePark Drive storm drain discharge point to mitigate the increased stormwater flows prior to discharge to the

Little River. Project need, description, alternatives analysis, impacts and benefits (both CSO and non-CSO benefits) are described below.

### **Project Need**

Severe and frequent combined sewer surcharging and flooding in the primarily residential Fresh Pond Parkway area pose a threat to public health. Surface flooding in the parkway threatens the adjacent City of Cambridge water supply reservoir, Fresh Pond, a Class A surface water resource. Flooding also presents a public health threat to pedestrians and the large number of people that use the Fresh Pond Reservation on a daily basis for recreational purposes. Combined sewer surcharging causes basement and surface flooding in and adjacent to residences and businesses, resulting in economic loss and adverse impacts to public health. Surface flooding routinely occurs in higher magnitude storm events (greater than two year).

The existing Wheeler Street Drain from the Fresh Pond Parkway presently conveys only the one to two year storm event to Alewife Brook. Because sewer separation will increase the volume of stormwater flow to this drain system, additional pipe capacity is needed to convey stormwater to Alewife Brook/Little River and control Fresh Pond area flooding. A detention basin, proposed to be located in the Metropolitan District Commission's (MDC) Alewife Reservation, is designed to control the rate of stormwater discharge to the Little River/Alewife Brook from the new CambridgePark Drive area storm drain pipe. The detention basin will mitigate potential downstream flooding impacts resulting from the increase in stormwater discharge to Little River. In addition to controlling potential downstream flooding impacts, the stormwater detention basin offers water quality benefits as well, including bacteria, solids and BOD reduction. Best management practices will be implemented to address floatables and sediments. The lack of floatable and grit control measures in stormwater conveyed from the Fresh Pond and Sherman Street areas have severely degraded the Alewife Brook and Little River (Figures 8-4, 8-5, 8-6).



## Alternatives Analysis

Several citywide stormwater retention, detention and discharge locations and alignment alternatives were evaluated for the new CambridgePark Drive area drain. Potential stormwater discharge locations identified included Fresh Pond, Jerry's Pond, the Charles River, Alewife Brook and Little River. Potential stormwater retention and detention options include locations within the CAM 004 area such as the Tobin School field, the National Guard Armory Parking Lot, areas within the Fresh Pond Reservation, the Fresh Pond Mall parking lot, the CambridgePark Drive area parking lots and the MDC parkland.

Additional subalternative analyses were also completed to evaluate various combinations of limited watershed detention and retention concepts including a larger detention basin in the Alewife Reservation. The principal goals of the alternatives analysis were to determine if environmentally and economically feasible alternatives could be identified that would eliminate the need for the detention basin within the Alewife Reservation; and to identify alternatives that would mitigate to the fullest extent practicable downstream flooding impacts on the Alewife Brook and Little River resulting from the separated stormwater system in the CAM 004 area.

**Stormwater Retention and Detention Alternatives.** In response to issues and concerns raised at several public meetings conducted in November and December 2000, a more detailed analysis of stormwater retention tanks and detention basins in the upper reaches of the CAM 004 area was completed. The goals of the analyses were to determine, if feasible, alternative locations to the detention basin in the Alewife Reservation existed. Any alternative location must retain or detain stormwater to an extent that would mitigate potential downstream flooding impacts on the Alewife Brook and the Little River and nearby flood prone properties. In particular, the section of Arlington in proximity to the Alewife Brook between the Route 2 Bridge and the Massachusetts Avenue Bridge was determined to be most at risk for downstream flooding potential.

Appendix A and Attachment F to this document provide complete documentation of the alternatives analyses described above. A brief summary of the results is provided below. A total

of nine alternatives (and sub-options) were developed as part of this detailed analysis. The alternatives include:

- pumping stormwater flows to a 57 acre-foot surface storage facility on MDC parkland;
- construction of an equivalent amount of subsurface retention storage by utilizing all of the relatively flat streets and areas in the lower CAM 004 watershed area;
- relocation of the proposed stormwater detention basin from the Alewife Reservation to existing parking areas in the CambridgePark Drive commercial area;
- pumping stormwater flows to Jerry's Pond with post storm pumping to the Little River; and
- various combinations of alternatives that combined a larger stormwater detention basin in the Alewife Reservation with lesser amounts of upstream detention and/or retention storage.

This survey of alternatives has estimated a capital cost range of \$13,000,000 to \$122,000,000 (Table 8-1). Certain of the alternatives have serious limitations ranging from extensive traffic and environmental impacts, extremely difficult and extended construction periods, hydraulic limitations, high O&M costs associated with pumping and order of magnitude increases in capital cost.

The analysis concludes that the recommended alternative (Alternative 6A) at a cost of \$17,500,000, is the most cost effective option. The other alternatives would cost 4 to 7 times as much while not yielding justifiable advantages. Construction of an approximate 8.8 acre-foot stormwater detention basin, encompassing an area of approximately 3.5 acres in the Alewife Reservation, coupled with limited upstream surface storage and retention storage and implementation of Best Management Practice technologies throughout the CAM 004 area will provide 10-year storm protection to the CAM 004 area and will significantly enhance the water quality of the Little River and Alewife Brook receiving water. The existing and marginally increased 10-year water surface elevation in the Alewife Brook in Arlington will be

**TABLE 8-1. ALTERNATIVES CAPITAL COST SUMMARY**

Alternative	Description	Estimated Capital Cost
1	Pump stormwater flows from the CAM 004 area to the Charles River	\$81,500,000(a)
2	Pump storm flows from the CAM 004 area to 57 acre-foot surface storage facility with pump discharge to Little River	\$96,000,000(a)
3	Provision of 57 acre-feet of underground retention storage within the CAM 004 area	\$122,000,000(a)
4	Relocation of the stormwater management detention basin outside of the Alewife Reservation parkland	\$59,500,000(a)
5	Discharge storm flows from the CAM 004 area to Jerry's Pond with pump discharge to Little River	\$77,500,000(a)
6	Construction of 4-foot by 12-foot box culvert and stormwater management detention basin in the Alewife Reservation	\$15,000,000(b)
6A	Alternative 6 with the addition of 3.0 acre-feet of existing upstream surface storage (New Street Program and BB&N)	\$17,500,000(b)
6B	Alternative 6A with the Detention Basin expanded to 12.0 acre-feet	\$17,650,000(b)
6C	Alternative 6B with 2.0 acre-feet of upstream surface storage at Tobin School and Armory	\$18,400,000(b)
6D	Alternative 6C with subsurface storage at the Tobin School and CambridgePark Drive	\$37,150,000(a)
7	Armor stone channel(s) through Alewife Reservation with discharge from the 4-foot by 12-foot box culvert directly to the Little River (does not provide flow attenuation)	\$13,000,000 (c)

Notes:

- (a) No increase in post project flows.
- (b) Slight increase in post project flows.
- (c) Significant increase in post project flows.

mitigated by the proposed construction of a earthen berm essentially paralleling the MWRA sewer easement between the Massachusetts Avenue and Route 2 bridges. This mitigation measure will be completed at a cost of approximately \$300,000.

**Storm Drain Alignment Alternatives.** Three alignment alternatives for discharge to the Alewife Brook/Little River area (Figure 8-7) were evaluated. The three alternative alignments variations were evaluated for potential short and long term environmental, construction, operations and financial impacts.

Alternative A envisioned routing storm flows along Concord Avenue and Fawcett Street, across CambridgePark Drive, and discharging to wetlands adjacent to the Little River. This alternative was not selected due to the significant disruption it would cause on Concord Avenue and Fawcett Street; the higher probability of encountering soil and groundwater contamination; the extent of



changes to existing utility infrastructure that would be required; and the length of the route and its resulting diminished conveyance capacity.

The Alternative B alignment parallels the route of the existing Wheeler Street drain pipe. It would extend along Wheeler Street to CambridgePark Drive, discharging to Alewife Brook. This alternative would have stormwater flows from both the existing Wheeler Street and Sherman Street drains and the new storm drain pipe discharging at the same point to the Alewife Brook. This alternative would have resulted in significant erosion impacts to Alewife Brook and was not considered further.

Alternative C provides a separate discharge location from the existing Sherman Street and Wheeler Street discharges. Under Alternative C, the Fresh Pond storm drain will extend along Wheeler Street to the railroad, then parallel to the railroad to Fawcett Street, then across CambridgePark Drive to the MDC's Alewife Reservation. Stormwater flows will be discharged to a proposed detention basin in the Reservation adjacent to the Little River. The final route alignment was contingent upon being a sufficient distance west of Alewife Brook to allow the 4-foot by 12-foot box culvert to pass over the existing MWRA interceptor from Belmont. This alternative was selected because it provides the best hydraulic conditions and minimizes environmental impacts.

Alternative C, as first conceived, also included construction of a separate drain pipe to convey Sherman Street flows to a new outfall on the Alewife Brook. Based upon the results of the hydraulic analysis completed as part of this investigation and presented in subsequent sections of this document, a separate Sherman Street drain pipe will not be constructed as part of the proposed project. Providing a separate outlet for the Sherman Street flows resulted in unacceptable increases in downstream flooding levels while only providing a two year storm conveyance capacity for the Sherman Street area.

The storm drain pipe alignment (Alternative C) and the use and location of a proposed detention basin located in the Alewife Reservation for stormwater discharge control (Alternative 6A) were selected based on the above detailed alternatives analysis.

## **Project Description**

The CambridgePark Area Drain construction activities include construction of a proposed storm drain pipe, incorporating best management practices, and a stormwater detention basin in the Alewife Reservation to attenuate stormwater flows prior to discharge to the Little River. Portions of the Little River and Alewife Brook are located in the Metropolitan District Commission's Alewife Reservation. The "headwater" of the Alewife Brook is the 66 inch outlet from the CAM 004 CSO area (Wheeler Street Drain), the CAM 401A CSO area (Sherman Street Drain) and the Fawcett Street separated sewer system area. Discharge flows to Alewife Brook are generated only during storm events. For that reason, the Alewife Brook upstream of its confluence with the Little River, is often dry during the summer and fall. In this reach, Alewife Brook is an unlined channel that varies in width from approximately 8 to 12 feet.

**Proposed Storm Drain Pipe.** The CambridgePark Drive Area Drain (also referred to as Contract 12), as shown on Figure 8-3, is proposed to begin at the end of the existing Fresh Pond Parkway sewer separation construction project (Contract 2B), located at the intersection of Concord Avenue and Wheeler Street. Contract 2B will be completed by the summer of 2001. A 4 foot by 12 foot reinforced concrete box culvert will extend approximately 900 feet north along Wheeler Street and will continue across property owned by ABT Associates, Inc. a distance of approximately 600 feet to the railroad property. At the railroad tracks, the box culvert will travel west a distance of approximately 600 feet. The box culvert will continue west along Fawcett Street for a distance of approximately 200 feet, then north to the railroad tracks. The existing Fawcett Street drain pipe, which currently flows into the Wheeler Street Drain, will be disconnected from the Wheeler Street Drain and connected into the new 4-foot by 12-foot box culvert.

The normal range of the Little River water elevation requires the installation of the 4-foot by 12-foot box culvert to be at shallow depths (five to six feet) in order to discharge by gravity flow. Due to the shallow depth, the proposed 4-foot by 12-foot box culvert cannot be installed under the existing railroad tracks at the minimum depth required by the railroad. Instead, manifold type structures will be built on both sides of the railroad tracks to transition the flows from the

box culvert to four 48-inch diameter pipes which will be jacked approximately 100 feet under the commuter rails with a steel casing sleeve to the downstream manifold structure and then back into the box culvert. Crossing of the secondary spur tracks will utilize open cut construction techniques. The total length of open cut and jacking across railroad property is approximately 200 feet.

The 4-foot by 12-foot box culvert will continue north across the commercial area parking lots to CambridgePark Drive, a distance of approximately 500 feet. The box culvert will continue approximately 300 feet northerly from CambridgePark Drive to the Alewife Reservation adjacent to the Little River.

**Proposed Stormwater Detention Basin.** A detention basin is required at the proposed stormwater outfall in order to attenuate discharge impacts in the Little River for flows up to the 10-year, 24-hour storm event. Use of a detention basin with wetland vegetation for storm water attenuation and treatment is recognized as an environmentally appropriate measure. The design will be coordinated with the MDC and interested parties and be in accordance with EPA guidelines. Upland and wetland resource areas will be modified to construct the drainpipe outlet, stormwater detention basin and basin outlets. Three outlets will be provided from the detention basin and will include a low flow drain to the Little River; and two overflow weirs, one each on the eastern and western banks of the proposed basin. Flow from the weirs will spill and flow overland to the Little River. The basin will have an irregular configuration and varying depths to create wildlife habitat in the altered resource areas. A limited number of pathways will be constructed to maintain continuity of the existing trail system, as further described in the Landscaping Concepts section of this document. It is estimated that approximately 12,160 square feet of wetlands will be altered during construction. However, the creation of the detention basin will result in an increase of 62,555 square feet of wetlands.

**Long Term Project Benefits.** Benefits of the project include:

- significant reduction in CSO volume and pollutant loads to Little River/Alewife Brook;
- reduction in flooding and combined sewer surcharging in the CAM 004 catchment area;

- protection from existing and future downstream flooding along the Alewife Brook (between Route 2 and Massachusetts Avenue) resulting from the proposed earthen berm;
- protection from CSO surcharges to Fresh Pond; and
- enhanced wildlife habitat and improved public access to parkland and river front in the Alewife Reservation.

The frequent, severe flooding of streets and basements in the lower CAM 004 area, the imminent threat to the drinking water supply (Fresh Pond) and the threat to human health will be minimized. By removing stormflows from MWRA combined sewers, greater capacity for upstream sanitary flows from Belmont and downstream sanitary flows from Somerville will be available, thereby potentially reducing the volume and frequency of downstream CSO discharges. The MWRA system hydraulic grade line will be lowered, which will potentially reduce backups, surface overflows and surcharging in the community systems. The significant improvement in water quality in Alewife Brook will benefit Arlington and Somerville as well as Cambridge.

The construction of the proposed detention basin will enhance various types of wildlife habitats in the Alewife Reservation. The wetland area will be significantly enlarged, attracting a variety of wildlife to the area. Biodiversity will be supported through removal of invasive species from certain areas of the site followed by appropriate naturalized landscaping. The project will protect wildlife and maintain the Reservation's primitive character while enhancing the passive recreational value of the area.

Construction of the proposed flood control earthen berm along the Alewife Brook between the Route 2 rotary and the Massachusetts Avenue Bridge will reduce existing flooding occurrences along Alewife Brook in East Arlington, as well as mitigate the marginal increase in flood profile elevations resulting from this project.



## Short and Long Term Impacts and Mitigation Measures

Potential short and long-term impacts associated with the CambridgePark Drive area drainage project have been evaluated. Potential impacts analyzed include changes in water quality and hydraulic/flooding potential on the Alewife Brook and Little River; and alteration of wildlife habitat including wetland resource areas in the Alewife Reservation. Associated mitigation measures were evaluated and selected for incorporation into the final design. The potential impacts, both during and after construction, and proposed mitigation measures are described below.

Water quality, hydraulic impacts to the Alewife Brook and Little River and impacts to the Alewife Reservation have been primary considerations in the development of the CambridgePark Area Drainage Design program. Water quality and hydraulic impacts are summarized below and full evaluations are presented in the following attachments to Appendix A:

- Attachment A: Summary of Water Quality Impacts to the Little River
- Attachment B: Analysis of Pre and Post Project Peak Flow Discharges to the Little River
- Attachment C: Analysis of Stormwater Management Attenuation of Peak Flows to the Little River
- Attachment D: Analysis of Little River and Alewife Brook Hydraulic Profiles for Pre and Post Project Design Conditions
- Attachment E: Description and Operation of Proposed Stormwater Management Detention Basin
- Attachment F: Post project analysis and subsequent project modifications

Several important concerns were raised in three public meetings conducted in November and December, 2000. Attachment F presents extensive additional analyses performed in response to these concerns. They included a more detailed evaluation of alternatives to siting the proposed stormwater detention basin in the Alewife Reservation; the potential for exacerbating downstream flooding along the Alewife Brook particularly in low lying areas of Arlington

between the Route 2 rotary and Massachusetts Avenue Bridge; and water quality impacts to the Alewife Brook / Little River system associated with stormwater pollutants including floatables, oil/grease and other illicit discharges of chemicals to area storm drains.

The results of these evaluations are reflected in the project elements and mitigation measures described below.

**Little River/Alewife Brook Water Quality Impacts – Stormwater.** When all sewer separation work in the CAM 004 area is completed in 2008, water quality impacts, relative to 1997 pre-project conditions, are anticipated to be altered as follows. The total wet weather stormwater discharge to the Little River will increase by 65.7 million gallons per year; total wet weather Organic Carbon (BOD5) discharge to the Little River will decrease by 34.5%, or 5.30 tons per year; and total wet weather Fecal Coliform (colonies/100 milliliters) discharge to the Little River will decrease by 90%. Upon completion of all proposed stormwater best management practices in the CAM 004 area, TSS removal of all input loadings to the stormwater system is estimated to be 78.7 tons/year which is a decrease of 84.1%. Of this total, 53 tons/year is associated with BMP enhancements including doubling the number of catch basins, construction of in-line sediment controls and construction of the proposed stormwater detention basin. In summary, despite an increase in separate stormwater volume, the pollutant loading will decrease. Details are presented in Appendix A, Attachment A.

**Hydraulic Impacts/Potential Flooding Along Alewife Brook and Little River.** The following paragraphs summarize the analysis of hydraulic impacts of the project to Alewife Brook and Little River. The conclusion of the hydraulic evaluations is that the increased stormwater discharges may result in marginal increases in Little River/Alewife Brook water elevations of between 1 to 2 inches from Route 2 to Massachusetts Avenue. This conclusion assumes a worst case scenario that the peak stormwater flows from upstream tributary areas, the detention basin discharge, and the Wheeler Street drain discharge occur at the same time. The detention basin provides a key means to attenuate the peak flows and limit the downstream hydraulic impacts. Further, a low earthen berm is proposed along a portion of the Alewife Brook to mitigate existing and potential marginal water elevation increases resulting from the project.

**Analysis of Pre- and Post-Project Peak Flow Discharges to the Little River.** A summary of the analysis of the pre- and post-project peak flow discharges to the Little River resulting from the proposed CambridgePark Drive Area Drainage construction is presented below. Details of the analysis are presented in Appendix A, Attachments B and F.

#### **10 Year, 24 Hour Storm**

The 10-year 24-hour pre-project wet weather discharge to the Little River from the CAM 004, CAM 401A and Fawcett Street areas are estimated to be 150 cubic feet per second (cfs) using the SWMM EXTRAN model. This peak discharge is the sum of 140 cfs from the Wheeler Street Drain (surcharge conditions) and 10 cfs of surface runoff from the lower Fawcett Street building and parking areas.

The hydraulic modeling results for the 10-year 24-hour pre project conditions indicated severe surface flooding in the CAM 401 area, and considerable surface flooding throughout the CAM 004 area, particularly in the vicinity of Vassal Lane and Lakeview Avenue near the Fresh Pond Parkway and along CambridgePark Drive.

The 10-year, 24-hour post project wet weather discharge to the Little River from the CAM 004, CAM 401A and Fawcett Street areas are estimated to be approximately 182 cfs using the SWMM EXTRAN model. This peak discharge is the sum of 132 cfs from the Wheeler Street Drain (minus the Fawcett Street contribution) and 50 cfs discharged from the proposed stormwater detention basin in the Alewife Reservation.

For the 10-year, 24-hour post-project condition, the system operates with surcharge levels within 0.5-feet to 2-feet to the ground surface throughout most of the CAM 004 area proposed stormwater collection system.

#### **25 Year, 24 Hour Storm**

The 25-year, 24-hour, post project wet weather discharge to the Little River from the CAM 004, CAM 401A and Fawcett Street areas are estimated to be approximately 113 cfs using the SWMM EXTRAN model. This peak discharge is the sum of 63 cfs from the Wheeler Street Drain and 50 cfs discharged from the proposed 4-foot by 12-foot box culvert to the Alewife Reservation. The peak flow is less than the 10-year, 24-hour storm because of backwater from the higher flood level of the Little River/Alewife Brook. The detention basin would be flooded during this condition (a 25-year, 24-hour storm event with a Little River elevation of 6.4 feet National Geodetic Vertical Datum (NGVD)). Extensive

surface flooding occurs in the CAM 401 area and throughout the CAM 004 watershed, principally at Fawcett Street and along Fresh Pond Parkway.

### **100 Year, 24 Hour Storm**

Due to the high flood level of the Little River/Alewife Brook, the 100-year, 24-hour post project wet weather discharge to the Little River from the CAM 004, CAM 401A and Fawcett Street areas are estimated to be approximately 95 cfs using the SWMM EXTRAN model. This peak discharge is the sum of 30 cfs from the Wheeler Street Drain and 65 cfs from the proposed 4-foot by 12-foot box culvert to the Alewife Reservation. Severe surface flooding occurs in the CAM 401A area and throughout the CAM 004 area and Fawcett Street area. The assumed Little River elevation of 8.3 feet NGVD, coincides with the ground surface elevation in the Concord Avenue Rotary area.

**Analysis of Stormwater Attenuation of Peak Flows to Little River.** Flow from the proposed stormwater detention basin in the Alewife Reservation will be discharged into the Little River from three separate locations: a low flow drain outlet, and separate weirs discharging to an eastern overland flow route and a western overland flow route. The modeling results, described in Attachments C and F to Appendix A, show the effectiveness of the proposed detention basin in attenuating (reducing) peak flow rates to the Little River.

The peak 10-year 24-hour storm flow rate is decreased from 189 cfs to 50 cfs by the detention basin storage and controlled overland surface routing of flows. The peak flow through the detention basin is also delayed by two hours. This delay ensures that the peak flows from the detention basin do not occur at the same time as the peak flow from the existing Wheeler Street Drain.

Overall, the total peak flow rate for the 10-year 24-hour storm from both the Wheeler Street Drain/Sherman Street Drain and the detention basin into Little River/Alewife Brook, is attenuated from 320 cfs to 182 cfs and delayed by approximately two hours. This combination of reduced and delayed peak flows mitigates the impacts of the increased flow (32 cfs) on the hydraulic profile of the Little River and Alewife Brook during the 10-year 24-hour storm event.

**Analysis of Little River and Alewife Brook Water Elevations for Pre and Post Project Conditions.** The purpose of the HEC-RAS river modeling was to perform a hydraulic analysis of the Little River/Alewife Brook channel to estimate the changes in water surface elevations as a result of the sewer separation and drainage improvements in the CAM004 catchment areas of the City of Cambridge. Design peak flows for the 10-year 24-hour storm from the stormwater detention basin and the Wheeler Street Drain used in the HEC-RAS river model are as follows: a) detention basin= 50 cfs, b) Wheeler Street/Sherman Street drain = 132 cfs.

As described in further detail in Attachments D and F to Appendix A, the portion of Little River/Alewife Brook analyzed begins at Perch Pond on the upstream end at the confluence with Wellington Brook and extends to just beyond the bridge at Woodstock Avenue. The River and Brook are bordered along this reach by Arlington to the north, Cambridge to the south and Somerville to the east. The selected study area corresponds closely with the 1982 Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for the City of Cambridge.

Flow data was originally input into the model based upon previously computed hydrologic conditions from the FIS and topographic data of the abutting properties derived from aerial surveys with 2-foot contour intervals. Discharge points were correlated with a model cross-section and peak flow data was input into the model at these sections. For the Little River analysis, the 10-year 24-hour storm was evaluated to show the downstream impacts resulting from the proposed CambridgePark Drive area drainage improvements.

The initial modeling results indicated that the increased 10-year 24-hour flows from the CambridgePark Drive area drain improvements alone (without the detention basin) resulted in a water surface profile increase of as much as 0.85 feet at the upstream end of the modeled area when compared to the existing conditions. However, when the proposed stormwater detention basin was added to the model, the water surface profile showed only a slight increase, ranging from 0.0 to 0.14 feet (less than 2 inches) greater

than the existing (year 2000) conditions. It is important to note that this marginal increase in flood profile was generated by the model using extremely conservative modeling assumptions including coincident peak discharges from the Upper Alewife Watershed, and the Wheeler Street drain and the detention basin.

Beyond the 10-year, 24-hour design storm, the Little River flood stage will overtop the proposed stormwater detention basin, and the City of Cambridge storm drainage system will be hydraulically limited due to the high river elevation (hydraulic grade line will be at the ground surface) in the lower CAM 004 area.

The 25-year, 24 hour flows from the Cambridge drainage improvements resulted in a small water surface profile increase of 0.12 feet (less than 1.5 inches) at the upstream end of the analysis area when compared to existing (year 2000) conditions. The addition of the proposed stormwater detention basin has relatively little impact on the water surface elevations (because it is flooded by the Little River), and contributes a minimal amount of storage to the system.

The 100-year 24-hour storm was not simulated in the HEC-RAS river model. Estimating the impacts of flows from the 4-foot by 12-foot box culvert on the Little River/Alewife Brook for the 100-year storm is problematic due to the extreme adverse backwater effect from the Mystic River. During the 100-year storm, surface flooding encompasses the detention basin as well as large portions of the Fawcett Street area and the CAM004 area (up to the Concord Avenue rotary).

The results of these initial hydraulic modeling simulations were presented at public meetings in Cambridge and Arlington in November and December, 2000. Concerns were raised regarding historical and chronic flooding of low lying areas of Arlington adjacent to the Alewife Brook between the Route 2 bridge and the Massachusetts Avenue bridge.

As a result of these concerns, the project proponents conducted a more detailed investigation between late December 2000 and late February 2001. Specifically, detailed

instrument surveys were completed in East Arlington to more accurately define the topography of the flood prone areas described above. Additionally, the project staff investigated the Town of Arlington's storm drainage system in this area to better understand its influence on localized flooding during major storm events. Finally, the project proponents investigated the concept of constructing a low profile earth berm in the flood prone areas of East Arlington to contain significant flood events up to the 25-year, 24-hour storm to within the MDC's Alewife Reservation corridor.

#### **Flood Control Berm between the Route 2 Bridge and Massachusetts Avenue Bridge.**

Construction of a flood control berm is proposed just south of Lafayette Street/Boulevard Road at an elevation high enough to contain the water in the Alewife Brook channel to eliminate over bank flooding during a 10-year, 24-hour storm. The proposed berm would need to be constructed at an elevation of at least 6.0 feet (NGVD) to provide adequate protection for the 10-year, 24-hour storm and 6.5 feet (NGVD) for 25-year, 24-hour storm flood protection (Refer to Figure ES-3 in Appendix A). This proposed berm would potentially extend from Route 2 to the Massachusetts Avenue Bridge. The height of the berm would typically be 2 to 3 feet above existing ground level at most locations for 900 feet between the Route 2 culvert outlet and Herbert Street, and then spot filled 6-inches to 1 foot above existing ground surface for an additional 1000 feet from Herbert Street extending east toward the Massachusetts Avenue bridge. This geometry would provide protection up to a 25-year, 24-hour storm event (if constructed to elevation 6.5 NGVD). A suitable location would be the cross country route along the MWRA easement of the Alewife Brook conduit. Some of the existing manhole rims along the Alewife Brook conduit are raised above ground surface to the 100 year flood elevation. The berm could be offset from the exact interceptor sewer alignment if construction or design logistics were problematic. The earthen berm would be loamed and seeded for sedimentation and erosion control while minimizing long-term maintenance to grass mowing which is currently the maintenance practice for this location.

The construction of the berm from the end of the Herbert Road intersection with Lafayette Street and along the private road (parallel to Fairmont Street) reduces flood

storage volume by 3.8 acre-feet (between elevation 3.6 and 6.5 NGVD). This volume is compensated for at the detention basin where there is 3.87 acre-feet of new flood storage being created between elevation 3.75 and 6.5 (NGVD) and another 1.18 acre-feet between elevation 6.5 and 8.0 (NGVD). The detention basin is located approximately 1000 feet upstream along the Alewife Brook/Little River from the beginning of the berm in Arlington. Because the topography is essentially flat from the detention basin area to the Arlington berm area, the compensatory volume provided by the detention basin has an unrestricted hydraulic connection to the Alewife Brook water surface elevation in the Arlington berm area and is within the same reach of the Little River/Alewife Brook.

The proposed berm will decrease the floodplain upstream cross sectional area which could potentially increase the water surface flood elevations. However, the modeling simulations of the decreased floodplain cross sectional area indicated the water flow velocities increased slightly which offset a water elevation rise. Therefore, constructing the berm along the floodplain does not increase the upstream maximum water surface elevation during flood events. It is noted that modeling simulations above the 25-year, 24-hour storm event with or without the berm in place are subject to significant limitations due to the relatively flat topography of the area and the availability of topographic mapping at 2-foot contour intervals outside of the detailed survey areas.

Representatives of the MWRA and the City of Cambridge met with Department of Environmental Management (DEM) officials responsible for local administration of the Federal Emergency Management Agency's National Flood Insurance Program on March 27, 2001, to discuss the concept of the flood control berm described above. During these consultations, DEM officials clearly indicated a preference for "non-structural" solutions to mitigate flooding impacts such as retrofitting or acquisition of existing properties in flood prone areas including those identified along Fairmont Street.

Representatives of the MWRA and the City of Cambridge further explained that during significant flooding events, when the berm will contain flood waters, there was a very high probability that the flood waters would be contaminated by combined sewer



discharges to the Little River/Alewife Brook system. Therefore, the flood control berm, which is considered to be a “structural solution” by DEM officials, will have a critically important dual benefit of preventing not only nuisance flooding of the impacted properties but will significantly mitigate the public health risk associated with human contact with flood waters containing CSO during these events. DEM officials indicated during these consultations that this public health benefit will be given strong consideration during the review of the flood control berm concept.

**Post-Construction Stormwater Management.** Based upon the hydrologic and hydraulic analyses described above, mitigation measures to attenuate flow and velocity of peak discharges to the Little River and Alewife Brook will be incorporated into the final design documents. Stormwater discharges to the Little River/Alewife Brook will increase as a result of this project. The impacts on peak flow and water surface elevations will be mitigated by the proposed stormwater detention basin. Other attenuation features of the detention basin include the eastern and western overflow weirs (spillways) which will be designed into the detention basin earth berms. During high intensity storms, when the detention basin nears full capacity, flows will spill over the two weirs and travel overland parallel to the river through densely vegetated areas which will further reduce peak flow rates, rather than being discharged directly to the Little River. This resulting flow attenuation reduces the impacts of the increased stormwater flow and results in a water surface profile in the Little River and Alewife Brook ranging from 0.0 to 0.14 feet (1.7 inches) greater than existing conditions. The maximum potential increase in flood elevation of 0.14 feet will be mitigated by the proposed earthen berm constructed along Alewife Brook Conduit easement.

Best Management Practices (BMPs) incorporated into the project design will provide additional protection to the MDC Reservation, Alewife Brook and Little River. BMPs include aggressive street sweeping, deep catch basin sumps and hoods, grit pits and a sediment forebay in the detention basin. The BMPs, in conjunction with an intensive maintenance program to be conducted by the City of Cambridge Department of Public Works, will significantly improve the physical, chemical and biological quality of the collected stormwater. The first flush low intensity stormwater flows will continue to be directed to the existing Wheeler Street storm drain

pipe discharging to Alewife Brook. However, the quality of the flows will be improved. Flows from the existing drainpipe will enter a proposed grit chamber to be located at the end of Wheeler Street.

Fawcett Street drainage will be connected to the 4-foot by 12-foot culvert. Stormwater from this system will provide base flows to the proposed detention basin during low intensity storm events to ensure the basin area is frequently “wetted” with stormwater to maintain wetland vegetation. The Fawcett Street stormwater discharge will be directed through manhole grit pits to ensure stormwater of good quality is conveyed to the detention basin.

A floatables control chamber will be constructed just prior to the entrance of the 4-foot by 12-foot box culvert to the Alewife Reservation area. A coarse bar rack screen will be installed within a chamber with access hatches to readily inspect and maintain the facility. The chamber will also be outfitted with a bottom acting slide gate to enable rapid isolation of the box culvert from the stormwater facility in the event of an upstream spill of contaminants such as fuel oil. A separate bar rack will be installed on the 4-foot by 12-foot box culvert outlet at the entrance to the detention basin to prevent human and animal access.

**Proposed Stormwater Drain Pipe Construction.** Short term impacts from construction related activities associated with the stormwater drain pipe will include traffic management both within city streets (Wheeler Street, Fawcett Street, CambridgePark Drive) and the industrial area parking lots. Vehicular traffic will be properly routed in accordance with requirements of the Cambridge Police, Cambridge Traffic and Parking Department, and in conformance with the Manual on Uniform Traffic Control Devices. Construction hours will be specified in accordance with City of Cambridge regulations to minimize the duration of traffic impacts along project alignments. Construction within industrial parking areas will be coordinated with the impacted businesses to minimize disruption and manage business access. Storage of construction equipment and materials will be confined to designated staging areas. As part of its Community Relations program, the City of Cambridge has met individually with impacted businesses and property owners to begin the construction planning process.

Additional proposed mitigation for short term impacts to be implemented for this project are detailed in Table 3 from the report entitled Draft Construction Impact Mitigation Guidelines for Phase I Waiver Combined Sewer Overflow Projects submitted to the MEPA Unit by the MWRA dated January, 1998 (Appendix D.)

**Proposed Stormwater Detention Basin Construction.** Short-term impacts from construction of the detention basin include the potential for erosion and sedimentation. Straw bales and silt fence will be placed to define the limits of disturbance, and to minimize exposure of surrounding areas to sedimentation from the proposed activities. Additional sedimentation control measures are described below.

A silt curtain will be installed along Little River at the detention basin outlet to minimize sedimentation of the waterway during construction. A sandbag dike will be constructed adjacent and parallel to the southern bank of the Little River at the location of the proposed outlet.

Supplementary dewatering systems will be set up within the work area as needed to maintain relatively dry conditions. All water collected from the dewatering operations will be treated in a temporary sedimentation basin prior to discharge to the Little River. Straw bale check dams will be installed as needed along the length of the detention basin at maximum 100-foot intervals to minimize erosion within the work area during construction.

Any contaminated soils encountered will be handled and disposed of in accordance with Massachusetts Contingency Plan requirements (310 CMR 40.0000).

The Alewife Brook downstream of the confluence with the Little River and the upper reaches of the Little River are part of an important anadromous fish passage that leads to the spawning grounds in Little Pond. Mitigation consists of scheduling in-water and silt-producing activities described above to avoid the April 15 to May 31 fish spawning period. No changes to water levels or obstructions to flow in the Little River are proposed or required.

It is estimated that the duration of the stormwater detention basin construction will be four to six months. Complete re-vegetation of the stormwater detention basin area may extend over two growing seasons. Prior to start of construction, sedimentation and erosion controls (i.e. straw bales and siltation fabric) will be installed to delineate the limits of work zone and the edge of wetland area. Soil stockpile areas will be designated within the work zones and construction vehicle access and egress to the work zones will be restricted. The Alewife Brook Parkway staging area which is accessed off of CambridgePark Drive will also be used for material and equipment storage. Approximately 30,000 cubic yards of excess material will be generated from the detention basin construction. It is estimated that there will be a maximum of 25 truck trips per 8 hour day, 5 days per work week, over a four month period resulting from the removal of excess material off site. The assumed truck route will be from CambridgePark Drive to Alewife Brook Parkway to Route 2.

The soils in the stormwater detention basin have been pre-characterized to determine chemical concentrations which may impact handling and disposal. Eight test pits and two soil borings were conducted and soil samples collected and analyzed from each test pit and soil boring location. With the exception of one soil sample with an elevated concentration of the pesticide DDT, the results of the soil sampling did not detect contaminated parameters exceeding MCP reportable concentrations. Based on available test data, excess soils will not require special handling or disposal. All excess soil will be either reused on site, reused by the Contractor off site or properly disposed at a landfill facility.

The majority of the earth work associated with the construction of the proposed detention basin will be undertaken during fall and winter months. As such, project activities will take place during a period of minimal biological and wildlife activities, and impacts to the surrounding wetlands will be minimized. Dewatering requirements will be minimized due to seasonal low groundwater conditions. A groundwater monitoring plan will be developed prior to the start of construction to assist with the monitoring of dewatering activities and attendant impacts on adjacent wetlands. Street sweeping and truck wheel washing will be instituted to control off site impacts. Water spray will be used for dust control during soil handling operations.

The existing trails will be closed to the public during construction of the detention basin in Alewife Reservation. New trails will be constructed to replace the existing trails disturbed during construction of the detention basin. The new trails will have a smooth walking surface and will provide an improved and easier accessed trail system for public use.

Long term impacts of the detention basin construction are described in the water quality, hydraulic modeling, and landscaping sections of this document.

**Resource Area Impacts in the Alewife Reservation.** Based upon preliminary calculations, approximately 12,160 square feet of Bordering Vegetated Wetland (BVW) will be disturbed to construct the proposed detention basin. Work in this area will be under the jurisdiction of the Cambridge Conservation Commission under the Massachusetts Wetlands Protection Act. The basin is designed to retain sufficient moisture to support the wetlands vegetation that will be planted in the hydric soils used in the basin. The net increase in BVW area will be approximately 62,555 square feet. The net increase in floodplain storage from elevation 1.0 to 5.0 feet NGVD will be approximately 8.8 acre feet upon completion of the detention basin. The additional flood storage created up to the 10-year storm event (approximately 8.8 acre-feet) will be available to the City of Cambridge. At greater storm events, the additional flood storage from elevation 5 feet to elevation 8 feet (approximately 3 acre-feet) will benefit downstream communities since the Cambridge storm system's conveyance capacity will be at its limit.

Construction of the detention basin outlet channel will impact approximately 70 linear feet of Bank, and 1,000 square feet of Land Under Water.

Approximately 22,500 square feet of riverfront area within 25 feet of the Alewife Brook and the Little River will be impacted.

**Wildlife Habitat at the Alewife Reservation: Existing and Post Construction.** The area of the Alewife Reservation on the south side of the Little River and west of the

Alewife MBTA station contains a variety of wildlife habitat cover types, including deciduous forest, shrub land of various canopy cover amounts and heights, and open meadows, both wet and upland (Figure 8-8). The location of wetlands with respect to open areas provides an opportunity to preserve many of the wildlife values of this area, and to enhance the diversity of the area while constructing a detention basin. Since wetland will be avoided as much as possible during construction, and most of the forested areas are in wetland, very little wooded area will have to be disturbed for this project. Most of the forested land is dominated by quaking aspen, a tree more often found in upland areas, but here growing in low-lying land with wetland soils and hydrology.

The area proposed for the detention basin is composed mainly of upland dominated by staghorn sumac, with an area of blackberries and goldenrods, a small section of young aspen forest, and a herbaceous area dominated by Phragmites and Japanese knotweed. The majority of the detention basin site is dominated by sumac or blackberries, and while these have wildlife value, they are also found in large areas elsewhere on the site. The detention basin provides an opportunity to design a wildlife area which can increase the diversity of habitat present and provide more of some needed habitat, such as additional wetlands.

The goal of the detention basin design with regard to wildlife will be to provide a complex habitat structure, with a maximum of niches for wildlife. This is best achieved by an irregular shoreline and a variety of depths throughout the basin, preservation and enhancement of adjacent and surrounding vegetation, and planting of a variety of native wetlands plants throughout the basin.

An irregular shoreline will create more potential breeding area for birds, as more breeding birds will utilize a wetland if they are visually isolated from other breeding birds. An irregular shoreline is also longer, and will, therefore, create more habitat for species utilizing the basin's wetted edge. The range of basin depths, in addition to providing diverse habitat for wildlife, will help prevent monocultures of cattails or Phragmites, with relatively low wildlife value, from

becoming established. Planting the wetland with a variety of native wetland plants within one season after construction will also help prevent dominance of cattail or Phragmites, as these species tend to invade uncolonized, disturbed areas.

Trees and shrubs adjacent to the basin will be preserved as much as possible during construction. Where this cannot be practically done, native trees and shrubs will be planted adjacent to and on the slopes of the basin, as they can provide critical perching, nesting, and cover requirements for many bird species, as well as a food supply. Some species recommended for their food value to wildlife include spicebush, buttonbush, elderberry, silky dogwood, and red maple. Some evergreen shrubs will be planted as well, as these will improve winter habitat and cover, which is now sparse in the area.

An increase in safe nesting areas for birds can also be incorporated into the stormwater basin final design. Nesting areas can be provided with the addition of islands (for ground-nesters), nest boxes (for cavity-nesters) and preservation and enhancement of the surrounding trees and shrubs (for foliage-nesters).

In summary, a detention basin designed with wildlife habitat needs in mind can lead to an overall enhancement of wildlife numbers and diversity as a result of this project. While the existing sumac and blackberries in the proposed basin area have value for wildlife food and cover, they are also abundant elsewhere in the Reservation, and their loss can be more than made up for by the increased diversity of habitat and the addition of wetland habitat afforded by the detention basin.

The wetlands to be impacted by the project are in the proposed areas of the inlet channel and sediment forebay and are dominated by Phragmites. Their loss will be much more than compensated for by the larger and more diverse wetlands to be constructed in the detention basin.

**Landscaping Concepts - Public Access and Enjoyment.** The Landscape Site Restoration Plan (Figure 8-9) for the area of the proposed stormwater detention basin





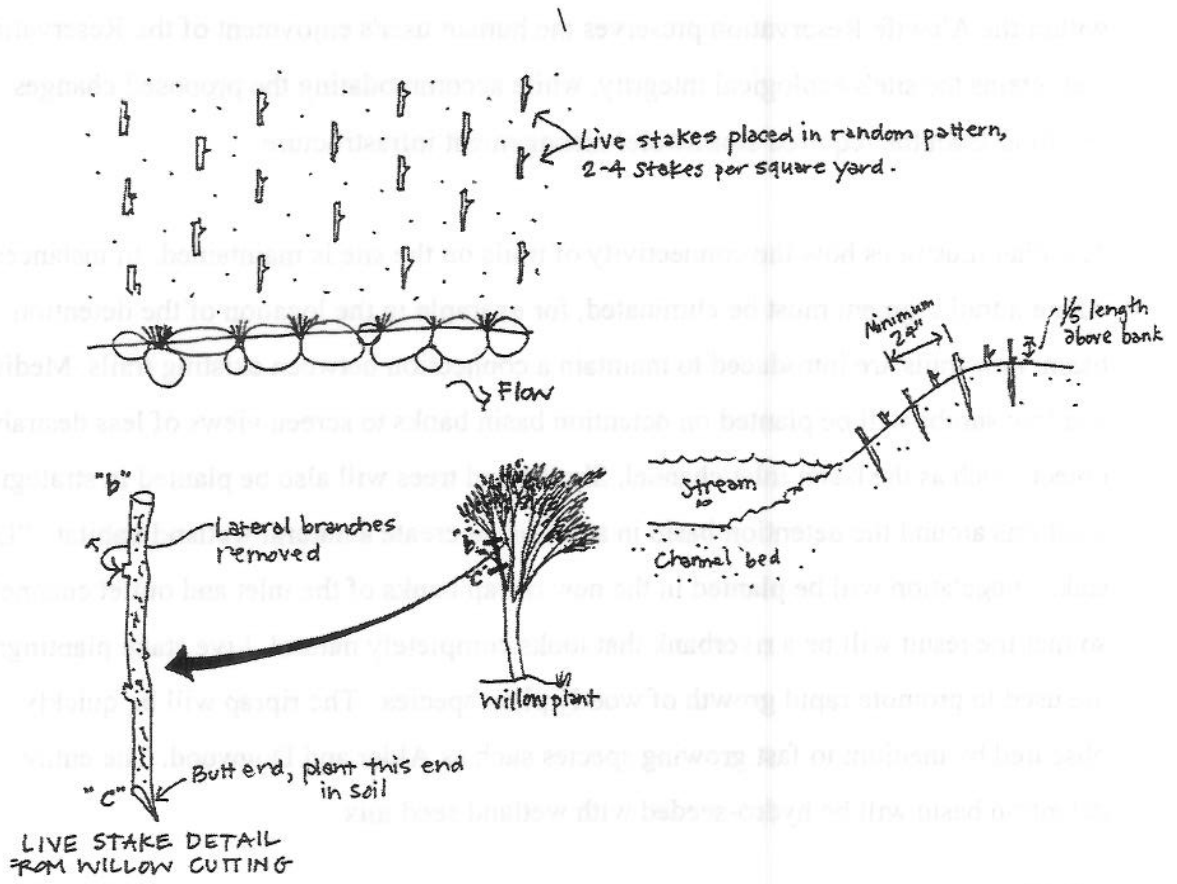
within the Alewife Reservation preserves the human user's enjoyment of the Reservation and retains the site's ecological integrity, while accommodating the proposed changes resulting from the required stormwater management infrastructure.

The Plan illustrates how the connectivity of trails on the site is maintained. In instances where a trail segment must be eliminated, for example in the location of the detention basin, new trails are introduced to maintain a connection between existing trails. Medium and low shrubs will be planted on detention basin banks to screen views of less desirable objects such as the basin inlet channel. Shrubs and trees will also be planted in strategic locations around the detention basin in an effort to create a natural wetland habitat. "Live stake" vegetation will be planted in the new riprap banks of the inlet and outlet channels so that the result will be a riverbank that looks completely natural. Live stake plantings are used to promote rapid growth of woody plant species. The riprap will be quickly obscured by medium to fast growing species such as Alder and Dogwood. The entire detention basin will be hydro-seeded with wetland seed mix.

The sketch of live stake installation (Figure 8-10) illustrates how live stakes are installed and the two stream bank photographs (Figures 8-11 and 8-12) illustrate before and after images of a stream where a live stake planting was done.

There are two section lines drawn on the Plan, A-A' and B-B' (Figures 8-13 and 8-14). These sections show the relationship between the detention basin/inlet channel and adjacent banks and trails.

The photographs of in-situ soil paths or trails (Figures 8-15 and 8-16) are images that show the visual effect of a trail or road that is made with the organic soil binder "soil stabilizer." This organic material admixture allows the trail surface to be more durable while still maintaining a natural looking and pervious travel way.



Riley/O'Connell

**FIGURE 8-10. INSTALLATION OF LIVE STAKES SHOWN WITH AN OPTIONAL ROCK TOE KEY**

FIGURE 8-13. LANDSCAPE SITE PLAN; CROSS SECTION A-A

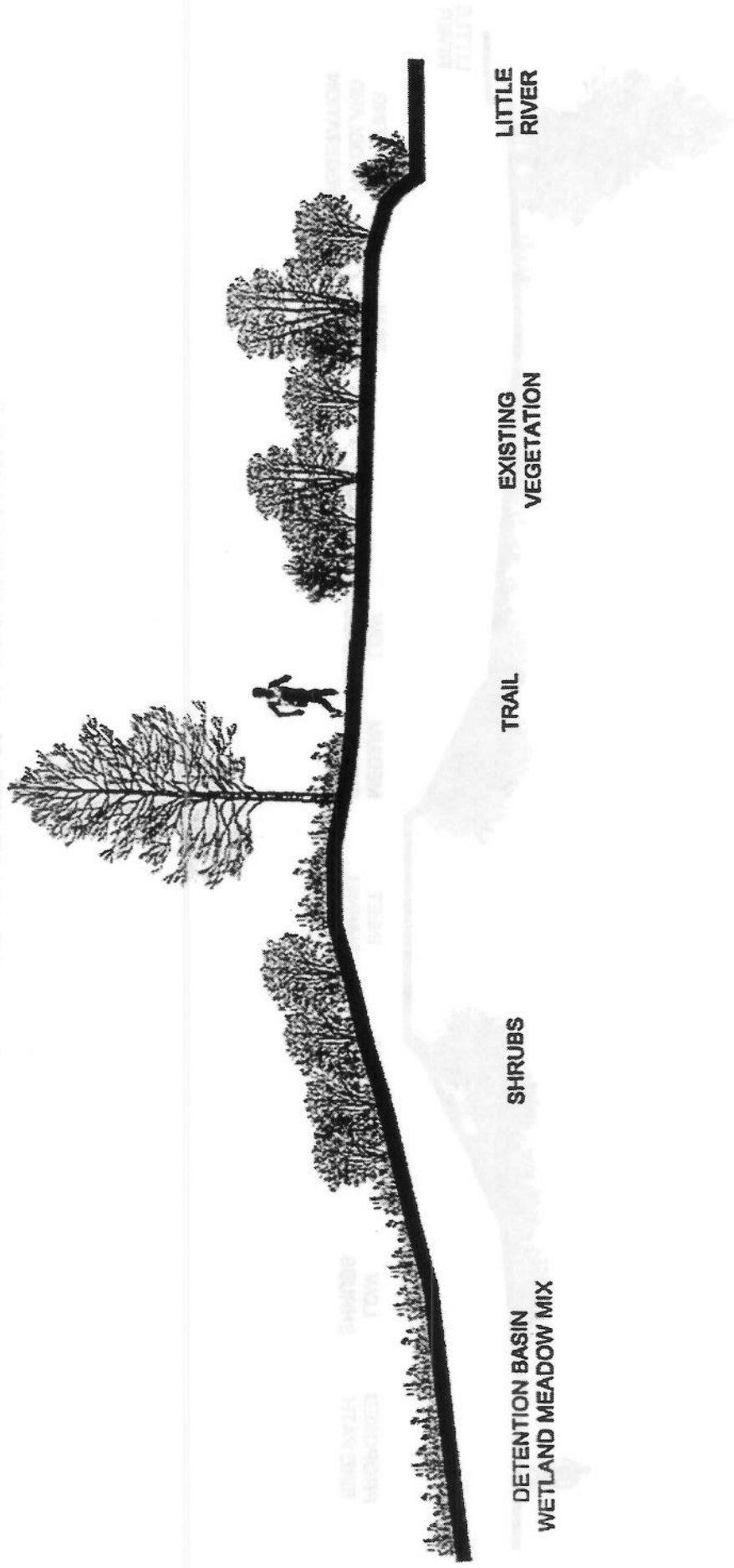


FIGURE 8-13. LANDSCAPE SITE PLAN; CROSS SECTION A-A

FIGURE 8-14 LANDSCAPE SITE PLAN; CROSS SECTION B-B

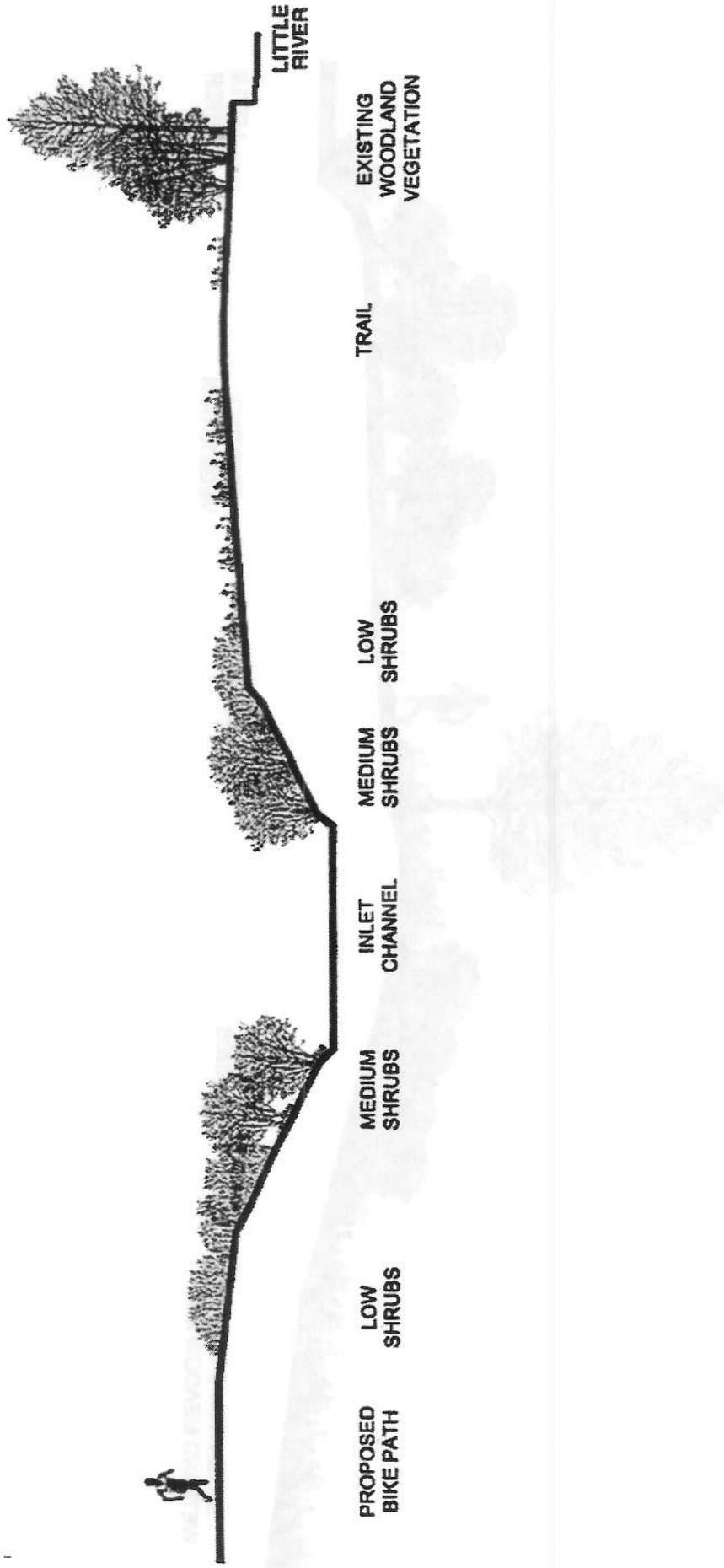


FIGURE 8-14. LANDSCAPE SITE PLAN; CROSS SECTION B-B

**Landscaping for Enhanced Wildlife Habitat.** The majority of the Alewife Reservation will be unaffected by the project. In these areas, snags (fallen or dead trees) will continue to be left untouched so that they can be utilized by the wildlife on the site.

Most of the proposed plants are either currently growing on the site or are native to similar habitats. Several of the proposed plant species have very high wildlife value. According to Gary Hightshoe's Native Trees, Shrubs, and Vines for Urban and Rural America, the criteria for very high wildlife value is if the plant has 50 or more wildlife users. The species proposed that are listed in this category include silky dogwood (*Cornus amomum*), redosier dogwood (*Cornus sericea*), spicebush (*Lindera benzoin*), fragrant sumac (*Rhus aromatica*), elderberry (*Sambucus canadensis*), and highbush blueberry (*Vaccinium corymbosum*). Plant species with 25-49 wildlife users are considered of high wildlife value and of the proposed plants for this plan, these include shadbush (*Amelanchier canadensis*), speckled alder (*Alnus rugosa*), bayberry (*Myrica pensylvanica*), staghorn sumac (*Rhus typhina*), pussy willow (*Salix discolor*), and arrowwood (*Viburnum dentatum*).

Aggressive species such as Phragmites and Japanese Knotweed are likely to eclipse native species if left unchecked. Therefore, the eradication of these species during construction from the area of the proposed inlet channel and sediment forebay of the proposed detention basin will be beneficial to the long-term ecological diversity of the site.

Long term Boston area rainfall analysis indicates that for an average of 80 days per year, there is a measurable rainfall of 0.1 inches to 1 inch. Data also indicates that the average time between storm events is 4.3 days, thus there are 285 days each year that do not have measurable precipitation. With regard to the proposed detention basin, this means that there will be 80 days per year with measurable flow to the detention basin. Based on this information, the basin will have saturated soil and/or a measurable amount of water 20% to 30% of the year and drying soil 80% of the year. For an average storm event of .5 inches in 24 hours the proposed detention basin will have between 0 and 24 inches of

ponded water for about 16 hours, and about 2 feet and 4 feet of depth for about 8 hours. For storms of greater or less than 24 hours, the basin depth will vary accordingly.

Based on a series of recent soil borings in the detention basin area, we know that the soil ranges from sand to clay. While clayey soils can be difficult to work, organic matter can be added to help improve the porosity of the soil to increase water infiltration and air movement, thus aiding good root growth. Wetland plant expert, Julie Marcus of New England Wetland Plants, confirms that the proposed plant list will do well with the soil types indicated by the tests.

The proposed plant species list for the detention basin is comprised of species that are tolerant of inundation and saturated soil as well as droughty conditions. It includes plants that have indicator status of either Obligate Wetlands or Facultative Wetlands.

Therefore, the proposed plant lists cover a wide range of hydrologic conditions, thus assuring successful establishment of a wetland. The species list is drawn from the publication that is currently considered the local authority on wetland plantings, *The Vascular Plant List of Massachusetts: A County Checklist, 1999*, (Somers and Storrie, MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program).

The plant lists are broken into three categories. The first list is a seed mix that will be planted throughout the entire detention basin area. The second list is recommended for the bottom of the basin only. The third plant list is a woody shrub list for the sides and tops of the banks of the detention basin.

## ALEWIFE DETENTION BASIN AREA PLANT LIST

### Herbaceous Emergent Vegetation for Entire Basin

Common Name	Scientific Name
Blue Vervain	Verbena hastata
Boneset	Eupatorium perfoliatum
Canada Goldenrod	Solidago canadensis
Canada Wild-rye	Elymus canadensis
Creeping Bentgrass	Agrostis stolonifera

**Common Name**

Creeping Red Fescue  
 Flat-top Aster  
 Fowl Bluegrass  
 Grass-leaved Goldenrod  
 Joe-Pye Weed  
 Nodding Bur-Marigold  
 Partridge Pea  
 Silky Wild Rye  
 Soft Rush  
 Switchgrass  
 Tioga Deertongue  
 Virginia Wild Rye

**Scientific Name**

*Festuca rubra*  
*Aster umbellatus*  
*Poa palustris*  
*Solidago graminifolia*  
*Eupatorium maculatum*  
*Bidens cernua*  
*Chamaecrista fasciculata*  
*Elymus villosus*  
*Juncus effusus*  
*Panicum virgatum*  
*Panicum clandestinum*  
*Elymus virginicus*

**Herbaceous Emergent Vegetation for Bottom Area of Basin****Common Name**

Bearded Sedge  
 Blue Vervain  
 Boneset  
 Chufa  
 Fowl Bluegrass  
 Fringed Sedge  
 Green Bulrush  
 Hop Sedge  
 Lurid Sedge  
 New York Aster  
 Soft Rush  
 Spotted Joe-Pye Weed  
 Swamp Aster  
 Water Plantain  
 Woolgrass

**Scientific Name**

*Carex comosa*  
*Verbena hastata*  
*Eupatorium perfoliatum*  
*Cyperus esculentus*  
*Poa palustris*  
*Carex crinita*  
*Scirpus atrovirens*  
*Carex lupulina*  
*Carex lurida*  
*Aster novi-belgii*  
*Juncus effusus*  
*Eupatorium maculatum*  
*Aster puniceus*  
*Alisma plantago-aquatica*  
*Scirpus cyperinus*

**Shrubs****Common Name**

Arrowwood  
 Bayberry  
 Buttonbush  
 Common Spicebush  
 Elderberry  
 Red Chokeberry  
 Redosier Dogwood  
 Silky Dogwood

**Scientific Name**

*Viburnum dentatum*  
*Myrica pensylvanica*  
*Cephalanthus occidentalis*  
*Lindera benzoin*  
*Sambucus canadensis*  
*Aronia arbutifolia*  
*Cornus serica*  
*Cornus amomum*

## **Regulatory Approval Requirements**

The status of regulatory approvals or agency reviews anticipated to be required is summarized below.

**DEP - Division of Wetlands and Waterways - Chapter 91.** A combined Waterways License Application has been filed with DEP/Division of Wetlands and Waterways (DWW) for a water dependent use. Signed and stamped drawings were submitted in compliance with DEP requirements for Chapter 91 filings. Future activities will include coordination with the DEP/DWW office, amending the application to reflect proposed changes developed as part of the NPC process, and attendance at one Chapter 91 Waterways hearing conducted by DEP. This hearing is not required due to water-dependent use, but may be held.

**DEP - Division of Water Pollution Control - 401 Water Quality Certification.** Applications for Water Quality Certifications for fill, excavation and dredging have been filed with DEP/Division of Water Pollution Control (DWPC) for this project as a result of the requirement for U.S. Department of the Army/Corps of Engineers Section 404 and Section 10 Permits. Appropriate applications, drawings, identification and description of turbidity controls, description of navigational impacts during construction, characterization and extent of fill, proposed mitigation for adverse impacts, etc., were submitted with the permit application. Similar to the Chapter 91 application, minor amendments will also be required to be made to this application.

**Cambridge Conservation Commission/Notice of Intent - Order of Conditions.** An Abbreviated Notice of Resource Area Delineation was filed with and approved by the Conservation Commission. A public hearing was held for the purpose of reaching consensus on the boundaries of BVW on the site as defined by the Wetlands Protection Act. A Notice of Intent to perform work for the CambridgePark Drive area drain within BVW and other resource areas as similarly defined will be filed as a limited project with the Commission for any proposed activity within 100 feet of such resource areas. The project is a limited project under the State Wetland Protection Act (M.G.L. c.131s.40) as defined at 310CMR10.53(3)(d). The project is



considered a limited project because it includes construction of public utilities that will disturb greater than 5,000 square feet of resource area. A Final Order of Conditions is required by DEP before it will issue a Chapter 91 License, if one is required.

**U.S. Department of the Army/Corps of Engineers - Section 404/Section 10 Permit.** An application for a Section 404/Section 10 permit was filed for this project. An application must be submitted where placement of fill within wetland areas and construction within a navigable waterway of the United States exceed Category I (non-reporting) thresholds. Likewise, minor amendments will need to be made to this permit application.

**Massachusetts Historical Commission.** The Massachusetts Historical Commission has determined that no significant historic or archaeological resources are present or will be adversely affected by the project.

**Natural Heritage and Endangered Species Program.** The project site is not within or adjacent to any certified vernal pools or estimated habitats of rare wetlands wildlife indicated on the Natural Heritage Atlas (2000-2001 edition). As such, NHESP has verbally indicated that it is unlikely that any species of animal or plant listed as threatened or endangered in the Commonwealth will be adversely affected by the project.

**National Pollutant Discharge Elimination System (NPDES).** NPDES Exclusion #01-012 was issued on October 20, 2000 by the Environmental Protection Agency for discharge of construction dewatering flows to Alewife Brook and the Little River following appropriate settling and treatment.

**Massachusetts Division of Fish and Wildlife and Environmental Law Enforcement (DFWELE).** Based on existing DFWELE files and a review of project information, the Division has indicated verbally that the project is unlikely to affect significant wildlife resources.

**Massachusetts Division of Marine Fisheries (DMF).** The Division of Marine Fisheries has recommended that appropriate measures be implemented to assure the passage of anadromous fish during periods of low flow in the Little River and Alewife Brook.

**National Marine Fisheries Services (NMFS).** The National Marine Fisheries Services (NMFS) has concurred with DMF's recommendation.

### **Easements/Land Acquisition**

**Easements.** To date, the City of Cambridge has met individually with all of the property owners to present the project construction activity, schedule, and discuss easement requirements. Approximately half of the alignment will be through existing easements and rights-of-way. New easements will be required from four private property owners. The City of Cambridge is also seeking approval from the MDC for work in the Alewife Reservation.

The complete list of easements is presented in Table 8-2.

**Land Acquisition - Article 97.** The stormwater detention basin and associated work is proposed to be constructed on land located in the Alewife Reservation which is subject to Article 97 of the Constitution of the Commonwealth of Massachusetts. The applicability of said Article was reviewed.

The project:

- Does not involve the transfer or conveyance of ownership or other interests,
- Does not constitute any change in physical or legal control, and,
- Does not result in any change in use, in and to Article 97 land or interests in Article 97 land owned or held by the Commonwealth or its political subdivisions.

The parcel currently serves an important stormwater management function. Three Combined Sewer Overflow (CSO) structures, CAM 004, CAM 401A, and MWR003 are located in the Reservation, and during high intensity storm events, much of the Reservation is flooded. The

**TABLE 8-2. LIST OF EASEMENTS REQUIRED**

Property Address	Property Owner	Contacted*Property Owner	New/ Existing Easement	Easement Length (ft)	Easement Area (sf)
115 Fawcett Street	Cooperative Reserve Supply Inc.	Tuesday Sept. 12, 2000	New	60	1,500
150 CambridgePark Drive	Genuity	Friday Sept. 15, 2000	New	365	9,125
55 Wheeler Street	ABT Associates Inc.	Monday Sept. 18, 2000	Existing New	690 690	6,900 3,450
125 CambridgePark Drive	Spaulding & Slye	Wednesday, Sept. 20, 2000	New	325	8,125

objective of the proposed project is to improve the efficiency of the stormwater management system.

In addition, the continued use of the parcel for stormwater management purposes does not destroy or threaten a unique or significant resource (e.g., significant habitat, rare or unusual terrain, or areas of significant public recreation), as determined by EOEA and its agencies.

On the contrary, the proposed project will protect the interests of Article 97. The project will result in improved water quality in the Alewife Brook, due to the reduction in the number of combined sewer discharges, and the reduction in the sediment load in stormwater flows originating near Fresh Pond that discharge to the Brook. Wetland creation and landscaping will enhance both wildlife and aquatic habitat. The project will also improve public access to and passive recreational use of the Reservation.

Therefore, the proposed project is not subject to Article 97 and will, therefore, not require any procedural disposition of land pursuant to Article 97.

## **CAM 400 SEPARATION**

### **Description of Work**

Field investigations of the CAM 400 tributary area were conducted in early 2000. The CAM 400 area investigated included Columbus Avenue, Seagrave Road, Whittemore Avenue, Kassul Park, Kimball Street, Harrison Avenue, Madison Avenue, Magoun Avenue and Massachusetts Avenue (Figure 8-17). Field investigation activities included surface manhole inspections and dye tracing. Based on the results of the field investigation, the following work is proposed:

### **Reduce Inflows into Sanitary Sewer**

- Identify catch basins with connections to sanitary sewers. Clean, dye trace and reconnect catch basin laterals to proper storm drain lines.
- Disconnect W. R. Grace building roof drains from sanitary sewer and reconnect the roof drains to appropriate storm drains.
- Convert the 18-inch diameter combined sewer in Kimball Street to a storm drain;
- Conduct building inspections on Whittemore Avenue and Kimball Street to identify and relocate sanitary services that are connected to the 18-inch diameter combined sewer on Kimball Street and the 20-inch diameter storm drain on Whittemore Avenue.

### **Eliminate Illicit Connections**

- Clean and televise the 18-inch diameter combined sewer on Kimball Street and 20-inch diameter storm drain on Whittemore Ave to determine the locations of any illicit connections.
- Conduct building inspections of the entire CAM 400 area. Approximately 110 buildings will be inspected.
- Correct sanitary service connections which are determined to be connected to the storm drain; locate illicit connections on Seagrave Road.
- Eliminate the overflow connection from manhole S75COM1425 to manhole S75CMH1655.
- Eliminate the overflow connection from manhole S71SMH2410 to manhole D40DMH4000.