DRAFT

Local Flood Protection Project

Aberjona River

Winchester, Massachusetts

ENVIRONMENTAL ASSESSMENT

FINDING OF NO SIGNIFICANT IMPACT

&

CLEAN WATER ACT SECTION 404(B)(1) EVALUATION

October 2007

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS
01742-2751

TABLE OF CONTENTS

Section **Page**

Attachments

Tables, Figures, and Photographs

+

ACRONYMNS AND ABBREVIATIONS

ACOE	Army Corps of Engineers
AWQC	Ambient water quality criteria
BMPs	Best Management Practices
Cfs	Cubic feet per second
Cy	Cubic yard
DBH	Diameter at breast height
DD	Decision Document
DEP	Department of Environmental Protection (Massachusetts)
DO	Dissolved oxygen
EA	Environmental Assessment
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
Ft.	Feet
Lf.	Linear feet
MADEP	Massachusetts Department of Environmental Protection
MADWP	Massachusetts Division of Watershed Protection
MBTA	Massachusetts Bay Transportation Authority
MEPA	Massachusetts Environmental Policy Act
mg/kg	Milligram/kilogram (= ppm)
mg/l	Milligram/liter (= ppm)
MWRA	Massachusetts Water Resources Authority
NAAQS	National Ambient Air Quality Standard
NED	National Economic Development Plan or New England District
NEPA	National Environmental Policy Act
NGVD	National Geodedic Vertical Datum
NOx	Nitrous oxides
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls

PEC	Probable Effects Concentration
Ppb	Parts per billion
Ppm	Parts per million
RONA	Record of Non-applicability
RM	River mile
SIP	State Implementation Plan
TCLP	Toxic Characteristics Leaching Procedure
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
*u*g/l	Microgram per liter (= ppb)
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile organic compounds
VPH	Volatile petroleum hydrocarbons

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1.0 Introduction

1.1 Study Purpose and Need

The Aberjona River flows through the densely-developed town center of Winchester, Massachusetts. Over the past decade Winchester has experienced four floods (October 1996, June 1998, March 2001, and March 2004) which disrupted the community and led to significant economic losses. The frequency of the flooding along the Aberjona has prompted the Town of Winchester to ask the U.S. Army Corps of Engineers (ACOE) to investigate the causes of, and possible solutions to, the problem.

1.2 Project Authority

This report was prepared under the authority contained in Section 205 of the 1948 Flood Control Act (Public law 80-858), as amended. Section 205 is part of the ACOE Continuing Authorities Program. The program provides the authority to evaluate and correct flooding problems that are economically justified and within the Federal interest.

1.3 Purpose of the Environmental Assessment

This draft Environmental Assessment (EA) was prepared to comply with Council of Environmental Quality and Corps of Engineers regulations for implementing the National Environmental Policy Act of 1969 (NEPA). NEPA requires Federal agencies to consider the environmental effects of a proposed action and solicit comments during the planning process from government agencies and the interested public

The EA serves as a disclosure document that describes the proposed action and alternatives, environmental resources in the affected area, and the environmental effects of the proposed action. The EA also provides decision makers with sufficient information to determine whether a Finding of No Significant Impact (FONSI) or a more elaborate review, culminating in preparation of an Environmental Impact Statement (EIS), is appropriate.

The EA describes the alternatives considered (Section 2.0), the recommended plan (Section 3.0), the affected environment (Section 4.0), the environmental effects of the recommended plan and alternative plans (Section 5.0), measures to minimize adverse environmental effects (Section 6.0), and coordination with agencies and the interested public (Section 7.0).

Additional information about the study area and the proposed project is presented in the Detailed Project Report (DPR) that accompanies this EA.

The draft EA is made available for public review. The Corps will carefully consider all comments received during the public review period, and modify the draft EA as appropriate. Based on the level of anticipated environmental impacts, the Corps expects to issue a FONSI upon completion of the EA.

2.0 Project Description

This section describes the alternatives developed to meet the objective of flood damage reduction and the recommended plan. More information about the planning process is provided in the DPR.

2.1 Flood Control Measures

Measures typically considered to control and/or modify flooding include both structural and non-structural features. Structural measures applicable to the study area are those that would reduce over-bank flooding. Nonstructural measures reduce, or mitigate the damages caused by flooding. All measures were considered in relationship to the study's concerns and constraints as well as the site problems, needs and opportunities.

Non-Structural Measures

Relocation: Relocation involves moving structures out of flood prone areas to reduce risk of flooding and flood damages. Relocation was found not to warrant further consideration since this alternative would not meet with local approval. Also, Winchester is largely built-out and suitable land open to relocate flood prone structures is not available.

Flood Insurance: The town of Winchester is currently participating in the National Flood Insurance Program, making all property owners eligible for coverage. The risk zones in which the properties are located determines the rate for this coverage. Because of the relatively high risk in downtown Winchester, flood insurance premiums are expensive.

Structural Measures

Upstream Retention of Floodwater: The possibility of using small reservoirs located in the upper Aberjona River watershed to reduce flood flow was investigated. This study investigated potential sites which were defined as being undeveloped parcels greater than 2-acres that are not in the 100-year flood plain. All parcels of land with the Massachusetts GIS classifications of "Forested", "Open Land", and "Urban Open" that were adjacent to the 100-year flood plain were analyzed. The majority of potential upstream storage areas are in the city of Woburn, with smaller areas located in Winchester and Stoneham. The analyses showed about 7.32 million cubic feet (cf) of flood storage was available, only about 1/3 of the amount necessary to alleviate the flood damages in downtown Winchester. Because the real-estate acquisition and construction costs to acquire the flood storage would be very high and far exceed any accrued flood reduction benefits; this alternative was eliminated from further detailed analysis.

Flood Flow Bypass (Conduit): This measure would divert floodwaters from flood prone areas to prevent over bank flooding through a 4-foot diameter subsurface conduit.

The bypass could begin at the Center Falls Dam crossing beneath Main Street and traveling generally along the Mystic Valley Parkway whereby flood flows would be directed back into the Aberjona River downstream of the Bacon Street Bridge. The annualized construction costs of such a plan were determined to be three times greater than the potential flood reduction damages prevented. Due to these costs as compared to less costly flood reduction plans this alternative was eliminated.

Flood Flow Bypass (Open Channel): This measure would divert flood flows over the right bank of the river immediately downstream from the Waterfield Bridge. The open-channel would allow flows to be conveyed over the MWRA sewer easements and onto the town's commuter parking lot area. Trench excavation would then proceed in a southerly direction adjacent to both the river to the east and the commuter rail line to the west. The trench would convey flood flows back into river in the vicinity of Ginn Field. Based on existing topographic survey information this alternative appeared to be impractical and was eliminated from further consideration.

Channel Modifications: Several alternatives which would widen the channel from 20 to 32 and 39 ft were considered. Due to Massachusetts Water Resources Authority (MWRA) sewer lines along the right (west) bank, any channel widening must occur along the left (east) bank. The channel modification would begin at the Waterfield Road Bridge and extend downstream to the USGS gauging station, about 1,200 linear feet (lf). All channel widening alternatives would also include removal of a concrete weir at the USGS gauging station and a repositioning of the granite block revetment along the left bank of the river. These alternatives were cost effective and acceptable to local sponsor and were retained for further consideration. They are discussed in more detail in Section 2.2.

Land Treatment: Preserving or enhancing vegetative cover to encourage water infiltration reduces surface runoff. The effect on flood discharges varies with individual watersheds, the characteristics of flood producing storms, and antecedent surface conditions. In general, land treatment has a greater effect on preventing flood conditions from worsening as development occurs than on reducing existing flood stages. Inasmuch as land treatment would have a limited effect on reducing existing flood stages in downtown Winchester, this alternative was eliminated from further consideration. The Corps recommends continued consideration of this measure by other public and private interests to improve and protect remaining open space in the Aberjona watershed.

Levees and Floodwalls: Construction of levees or floodwalls in the vicinity of downtown Winchester was not acceptable to local citizens. Because of the lack of local support and more costly than other structural measures, these measures were eliminated from further investigation.

Preflood Emergency Flood Fighting: When a flood event is imminent, the construction of temporary sandbag levees can help a community survive a flood. In the case of Winchester Center, both private and public interests have successfully placed sandbags around building foundations to prevent significant flood damages. In

downtown Winchester, the majority of flood damages associated from recent events indicate that retail closures, school closures and detours are the primary losses the community suffers at this time. Because preflood flood fighting would have a limited effect on reducing existing flood stage disruptions in downtown Winchester, this alternative was eliminated from further consideration.

2.2 Flood Control Alternatives

Four structural flood control measures were evaluated (see attached DPR for plans):

Option 1: Full channel widening (39 foot), with concrete retaining wall

This channel widening option entails the excavation of approximately 26,700 CY of riverbank material (primarily clean sand, gravel, and rocks). The upstream limit of the project is at the Waterfield Road Bridge. The project extends about 1,200 lf downstream and would terminate downstream of the existing USGS gage. The river channel bottom would be widened to about 39 feet. The existing granite block retaining wall along the east bank would be repaired and a reinforced concrete wall constructed along the widened left bank. The granite block revetment along the left bank would be repaired and left in place. Trees growing along the west bank would be largely left in place. The bituminous asphalt side walk would be relocated away from the widened river and be placed along the parkway. The channel's existing low flow depth would be maintained by a 20 foot wide low flow channel which would step up 2 feet into the widened channel. The total construction cost for this option was estimated at $1,460,000. The plan has an annual cost of $81,600, annual benefits of $68,000, and a benefit to cost ratio of 0.80.

Option 2: Full channel widening (39 foot), with bioengineered slope stabilization

This option would achieve similar flood reduction benefits as Option 1. Most of the project features in the first option are the same. In lieu of the concrete wall the bioengineered stabilization would be fully constructed along the left bank and extend from the toe to the top of the slope. To achieve the necessary channel conveyance area, 850 lf of the parkway's sidewalk would need to be removed and crosswalks would be required to cross the parkway to accommodate pedestrian traffic.

The total economic cost for Option 2 is $772,000. Although this option would achieve a significant amount of flood damage reduction to the community, as the study unfolded it became clear that the loss of the sidewalk did not meet the project constraint of maintaining the Mystic Valley parkway. Therefore, this option was found to be not implementable and was dropped from further consideration.

Option 3: Partial Channel widening (32 foot), with sidewalk

In an effort to maintain the parkway's western sidewalk the study examined only allowing for a partial channel widening of 32 feet. The scope of construction is similar to that of Option 2 but 850 lf of sidewalk would be relocated to the edge of the parkway.

The total construction cost for this option was estimated at $787,000. The plan has an annual cost of $41,800, annual benefits of $37,800, and a benefit to cost ratio of 0.9.

Option 4: Partial Channel widening (39 foot), with lowered riverbank sidewalk

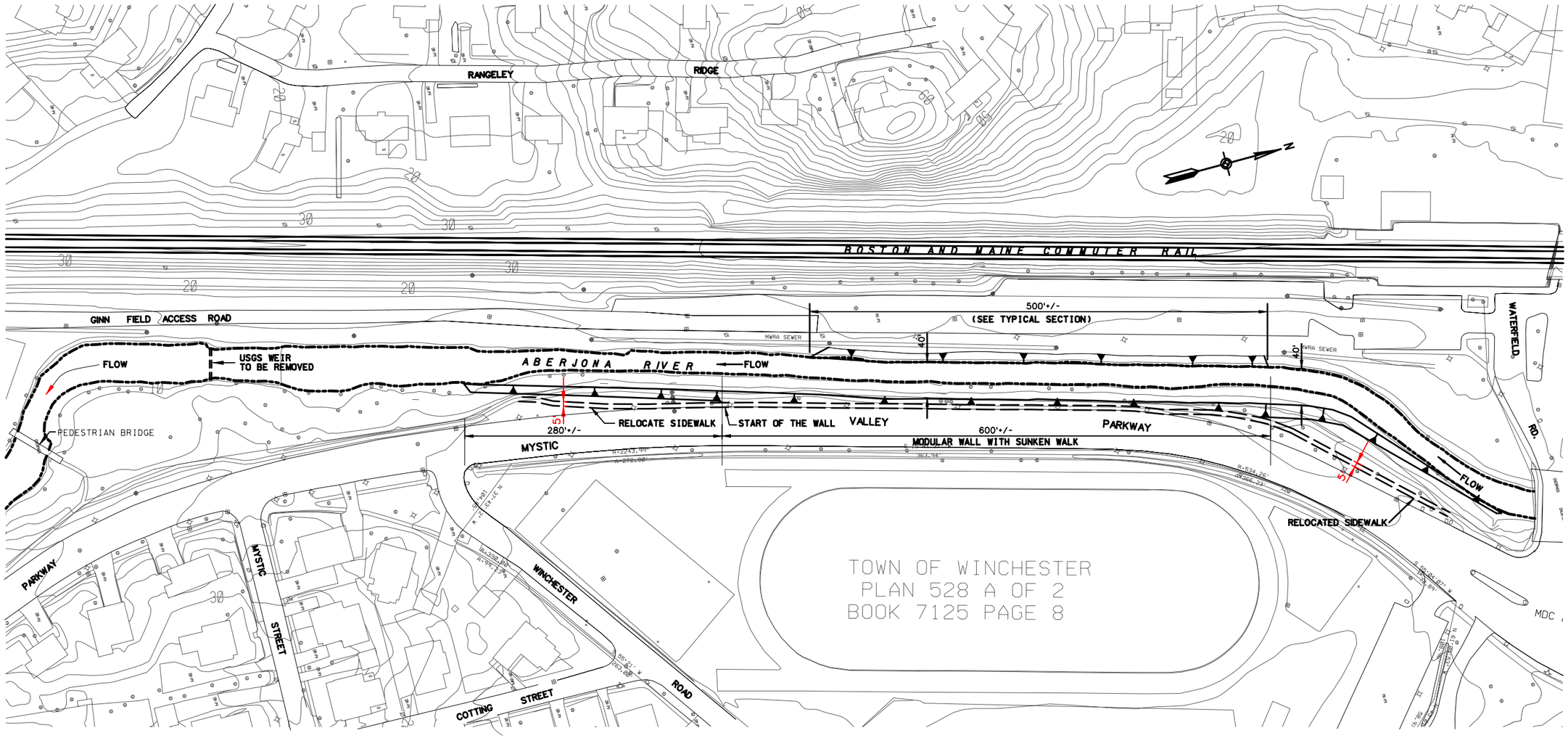
The final option examined the potential of widening the project to the maximum extent possible while allowing for a lowered "below street grade" sidewalk. The sidewalk would be placed about 1/3 way down the bioengineered slope. The maximum channel width would be about 39 feet. Approximately 9,100 CY of material would be excavated. The total construction cost for this option was estimated at $1,257,000. The plan has an annual cost of $63,100, annual benefits of $68,000, and a benefit to cost ratio of 1.1.

2.3 **Recommended Plan**

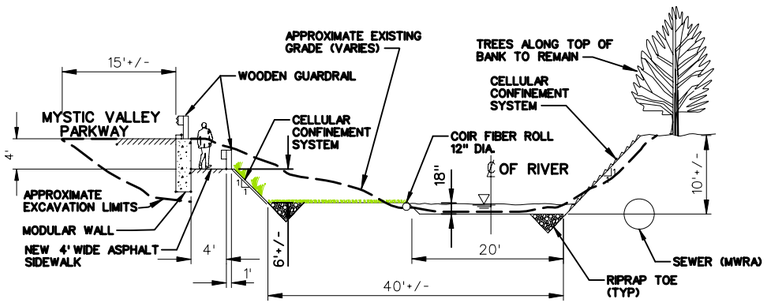
Option 4 was selected as the recommended plan (Figure 1). The plan will widen the river's channel to a maximum width of 39 ft for 1,200 lf downstream from the Waterfield Road Bridge. The project includes the relocation of the Mystic Valley Parkway's drainage outfalls and the removal of the USGS concrete weir. The USGS will replace the weir with an electrical sensing probe. Existing granite revetment along the east side of the river will be removed and replaced with an engineered slope using a cellular confinement system (geocell). The toe of the geocell will be covered with riprap to resist scouring. Geocells will be vegetated with shrubs. The bottom of the channel will consist of an 20 ft wide vegetated shelf and a 2 foot deep 20 ft. wide low flow channel. To provide sufficient flowage capacity, a 400 ft section of the embankment along the west sided of the river may also need to be cleared and stabilized with a geocell system. The extent of clearing required within this section will be determined during design. The design, however, will avoid clearing trees on the upper slopes of the west bank to the greatest practical extent. Along the remainder of the west bank, all trees growing below or within the granite block protection will be cleared. Trees in good health growing above the granite block protection will remain. Most construction will occur in the dry, within a series of temporary cells constructed using a portable coffer dam system. Construction will occur from upstream to downstream and would take about three to four months to complete. All work will occur from the east bank, minimizing risk to the MWRA sever line, impacts to vegetation on the west side of the river, and the Town of Winchester permit parking lot. Test results (see Section 3.7.2) indicate excavated material (9,100 CY) will be mostly clean sand with some gravel and rock. It will be transported offsite for reuse or disposal at a landfill.

Relationship of Recommended Plan to the ENSR Study

In an effort to assess wide-spread flooding issues the Winchester Selectmen commissioned a town-wide Aberjona River Flood Study. This study was initiated in response to major flooding that occurred throughout the town of Winchester during the storms of Oct. 1996 and June 1998. The study recommended various river conveyance improvements to reduce flooding and its associated damages to property. Subsequent to this study the town's consultant (ENSR) also completed a draft Environmental Impact



PLAN – CHANNEL WIDENING – OPTION 4
SCALE: 1"=60'-0"



TYPICAL CUT SECTION
MODULAR WALL WITH SUNKEN SIDEWALK
SCALE: 1"=10'-0"

Figure 1 – Recommended Plan

GRAPHIC SCALES:
1" - 10' (10 0 10 20)
1" - 60' (60 0 30 120)

US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT

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MARK	DESCRIPTION	DATE	APPR

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SIZE: ANSI D | PLOT SCALE: | PLOT DATE:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

WATER RESOURCES DEVELOPMENT PROJECT
LOCAL PROTECTION PROJECT
ABERJONA RIVER
WINCHESTER, MASSACHUSETTS

PLAN AND SECTION

SHEET IDENTIFICATION NUMBER
C-101
SHEET 1 OF 2

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Report (EIR) and a Supplemetnal Draft EIR to incorporate the most advantageous flood reduction improvements. Most of theses improvements were related to the enlargement of culvert and bridge openings throughout town. A description and location of these improvements are as follows:

Project #	Location Description	Modification Description
1	Wedgemere B&M Railroad Sta.	Relocate Siphon.
2	*Waterfield Rd. to Bacon St.*	*Currently being investigated by the USACE*
3	Center Falls Dam	Replace 30-in. sluice gates ***(completed)***
4	Mt. Vernon St.	Add box culvert.
5	Shore Rd.	Additional box culvert ***(completed)***
6	High School Playing Fields	Add box culvert.
8	B&M Railroad Bridge	Reconstruct bridge.
10	Muraco School RR Bridge	Enlarge Bridge opening
12	Dam adjacent to the Muraco School	Remove Dam ***(completed)***
Mitigation	Scalley Dam, Woburn	New Control Structure
	Mid Lakes Dam	Improvements to Dam
	Craddock Locks, Medford	Improvements to Locks

All of the proposed numbered projects are within Winchester's corporate limits. The primary purpose of these improvements will be to convey flood waters through upstream damage zones by addressing hydraulic restrictions. All of the above projects are currently undergoing different phases of State and Federal permit reviews.

3. Affected Environment

3.1 General Setting

The Aberjona River is a tributary of the Mystic River, a coastal river in Massachusetts which flows into Boston Harbor. The Mystic River watershed encompasses an area of approximately 76 square miles north of Boston (Figure 1). Although the river was once tidal all the way up to the Lower Mystic Lake, the Amelia Earhart Dam now restricts saltwater to below the confluence of the Malden and Mystic Rivers.

The Aberjona is the largest sub-basin in the Mystic watershed, comprising ~25% of the total watershed area (MRWA, 2006). The nine-mile-long Aberjona River originates in Reading and flows south through Woburn and Winchester before discharging into the upper fore bay of the Upper Mystic Lakes.

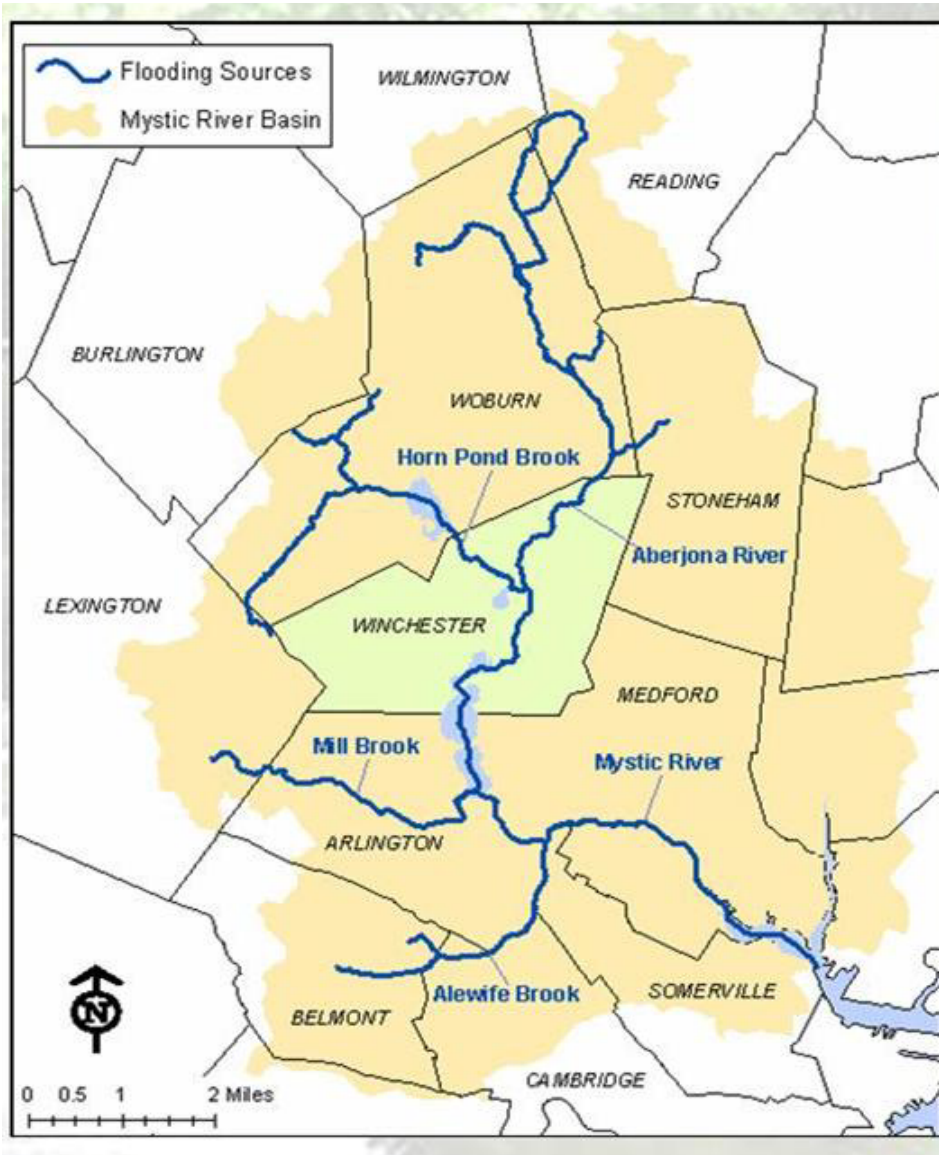


Figure 2: Mystic River Watershed

3.2 Study Area

The DPR study area is located in both the geographical and retail center of Winchester (Figure 2). The upstream limits of the study are defined as the confluence of the Horn

Pond Brook with the Aberjona River. At this juncture the river's conveyance meets and exceeds requirements for the USACE project participation. Proceeding downstream (south) from this point is the Winchester High School, town administration offices, and the town's business and retail district known as downtown Winchester. The downstream study limits were defined as the point where any flood protection project effects were found to have no increases to the estimated 100-year event flood stage on the Mystic Lakes.

Beginning at the town's upstream corporate limits the Aberjona River flood plain is generally broad and flat up to the Swanton Street Bridge. At this point the flows are directed through three 6-foot diameter underground culverts. These culverts convey the river to just upstream of the Horn Pond Brook confluence. The river then empties into Skillings Pond then flows through the Mt. Vernon Street box culverts and into the Town Hall Duck Pond. The pond's level is controlled by the Main Street Center Falls Dam. The river then flows under the Main Street and Waterfield Road bridge openings. For the next ¼ mile the river flows along the Mystic Valley Parkway through a narrow man-made open channel lined with granite block (Photograph 1). Massachusetts water resources Authority (MWRA) sewer lines run along the left bank of the river through this reach. Also on the left side of the river is an MBTA parking area and an elevated rail line. The river then flows over the USGS gauging station weir, under a footbridge, and through the Ginn Field recreation area. It continues on under the Bacon Street and Boston and Main Rail Road bridges and finally discharges into the Upper Mystic Lakes. Photograph 2 shows an aerial view of the study area between the Waterfield Road Bridge and Bacon St Bridge. Downtown Winchester is to the right and the Upper Mystic Lake to the upper left.

Photograph 1: Channelized reach of the Aberjona River downstream of Waterfield Road.

The Aberjona River has been impounded, widened, straightened, constricted by culverts, and filled in many locations over a period of 3 centuries. Floodplains and floodplain wetlands have been filled. Runoff has increased as forests were replaced with roads, parking lots and other impervious surfaces. Major alterations in the vicinity of downtown Winchester include:

- Impounding of the river by the Center Falls Dam.
- Filling a river channel and floodplains in what is now the Manchester Field area in the 1890's early 1900's (see Figure 3)
- Filing of wetlands and floodplains and culverting of the river upstream of downtown Winchester in the 1930's. This area is now occupied by playing fields and the Winchester High School.
- Straightening and channelizing the river downstream of Waterfield Road in the early 1950's (Photographs 3 and 4).

All of these actions contribute to current flooding problems in downtown Winchester. The course of present day Aberjona (see Photograph 4) bears little resemblance to its configuration in 1889.

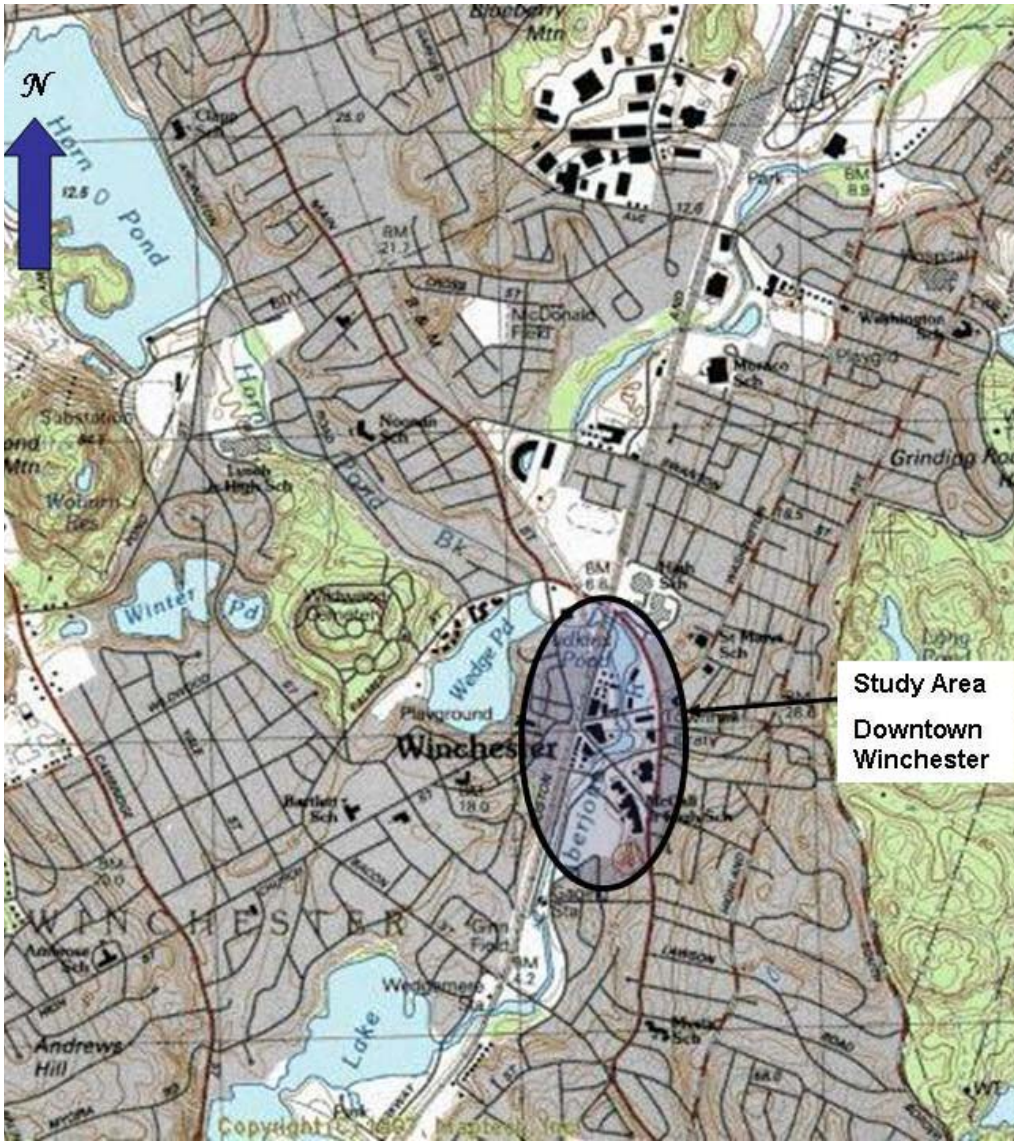


Figure 3: Study Area.

Photograph 2: Aberjona River study area from the Waterfield Road Bridge (right) to the Bacon Street Bridge. Google Earth.

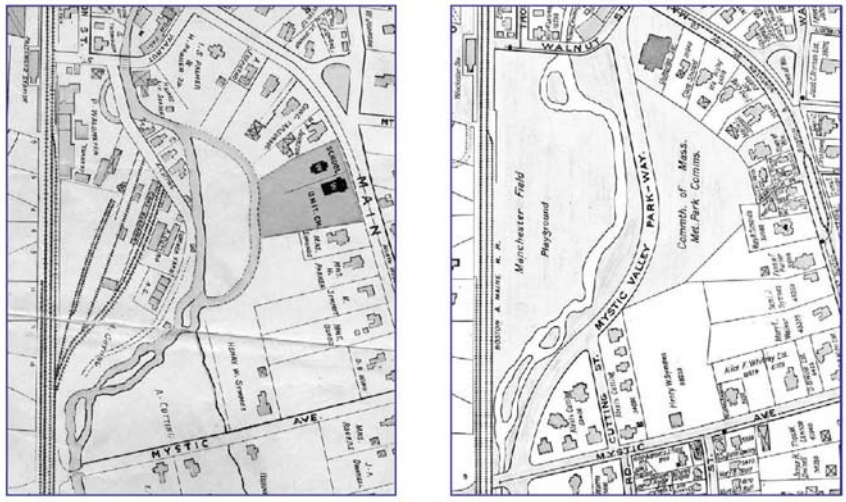


Figure 3: Reconfiguration of the Aberjona River in the 1890's

Photograph 3: Aberjona River Downstream of Waterfield Bridge following channelization.

Photograph 4: Aberjona River in 1965 after completion of channelization project. →

3.3 Land Use

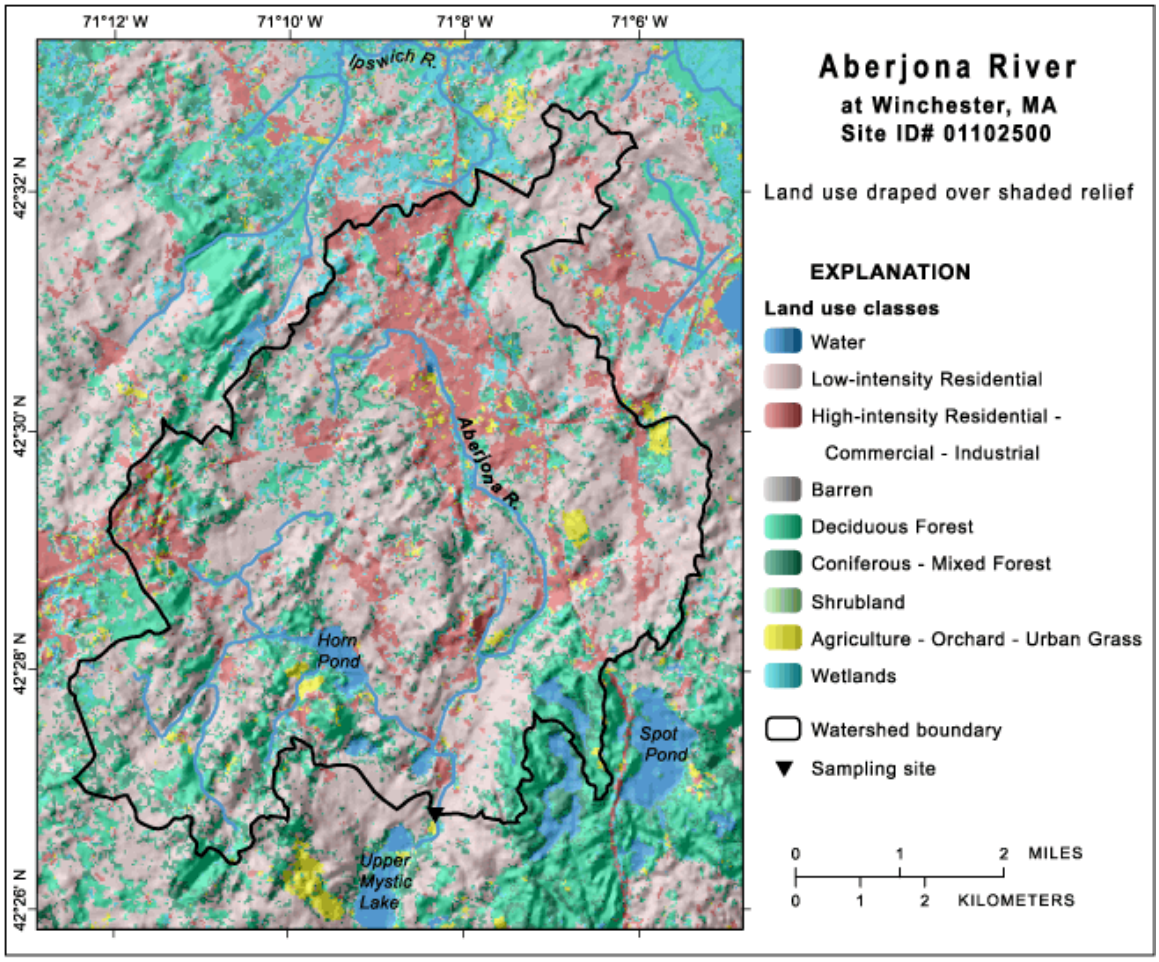
Land use in the Aberjona's watershed upstream of the USGS gauging station (Figure 5) is primarily urban (residential/commercial). The USGS classifies the basin upstream of the gauge as 67.3% urban, 23.8% forested, and 4.3% wetland (USGS, 2006). Land use in Winchester is shown in Figure 6 and Table 1. Nearly 80 percent of the town is developed.

3.4 Topography, Soils, Geology, and Climate

Winchester is located within the seaboard lowlands section of the New England Physiographic Province. This section roughly coincides with the area inundated by the ocean and areas of large glacial lakes formed during the last glacial retreat. Within the study area, The land surface rises from an elevation of 5 ft at the entrance to the Mystic Lakes to about 26 ft. at the Winchester/Woburn town line (northwest of downtown

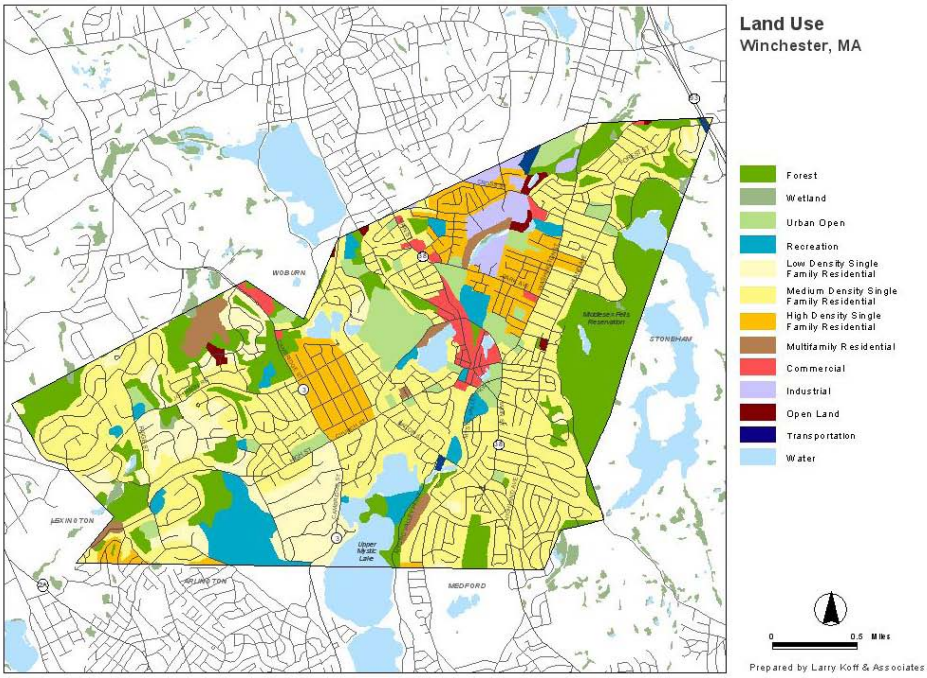
Winchester). The predominate bedrock lithology underlying the town of Winchester and the Aberjona River are Mafic Rocks and Avalon Granite, with a small area of Pelitic Metamorphic Rocks in the southeastern corner of the town (Mass GIS Data layers, January 2004). Bedrock in low lying areas associated with Aberjona River, Horn Pond Brook, Horn Pond, Winter Pond, Wedge Pond and Upper Mystic Lake is overlain by glacial sand and gravel deposits ranging from 0-200 feet thick. In addition, areas of post-glacial Floodplain Alluvial Soils are evident in low areas directly adjacent to the Aberjona River and Horn Pond Brook. Higher elevation areas associated with Andrews Hill, Mount Pisgah, and Wildwood Cemetery in the eastern and central portions of the town and the Winchester Highlands along the eastern portion of the town are dominated by basal till with areas of exposed bedrock (Mass GIS Data layers, October 1999).

The climate of Winchester is typical of New England areas, with warm summers and cold winters. Average temperatures range from 70^{o} Fahrenheit (F) in July to 17^{o}F in January. The average annual precipitation is 42 inches



Land use data from USGS National Land Cover Dataset (NLCD), 1992; see http://landcover.usgs.gov/natllandcover.html
Shaded relief data from USGS National Elevation Dataset (NED), 1999; see http://edcnts12.cr.usgs.gov/ned/About.htm

Figure 5: Aberjona River Watershed.



Source: MassGIS

Land Use Summary (MassGIS Land Use Coverage, 1999)			
Category	**Acres**	**% Developed**	**% Total**
Residential	2,557	81.4	62.8
Multifamily	72	2.3	1.8
High density (<0.25 acre lots)	329	10.5	8.1
Moderate density (0.25 – 0.5 acre lots)	1,757	55.9	43.1
Low density (>0.5 acre lots)	399	12.7	9.8
Commercial	87	2.8	2.1
Industrial	75	2.4	1.8
Transportation	10	0.3	0.2
Recreation	191	6.1	4.7
Public/Institutional	224	7.1	5.5
Total Developed	**3,144**		**77.1**
Agriculture	17		0.4
Forest/Wetland	717		17.6
Other Open Land	20		0.5
Total Open Space	**754**		**18.5**
Water	175		4.3
Total Town Area	**4,073**		

Figure 6 and Table 1: Land use in Winchester (Town of Winchester, 2005).

According to the Middlesex County Massachusetts Interim Soil Survey Report (NRCS, 1995), the primary soil types in Winchester are the following:

Soil Type	Description
Udorthents, loamy	This soil type consists of areas from which soil has been excavated and/or deposited due to construction operations. They occur in uplands, glacial outwash, glacial lake and coastal plains, and Urban Land. These areas have been disturbed to the extent that the natural layers of soil are no longer recognizable and are no longer a major feature in determining limitations or capability of the land.
Udorthents-Urban land Complex, 0-25 % slopes, & Urban land	Urban soils consists of areas where the soil has been altered or obscured by buildings, industrial areas, paved parking lots, sidewalks, roads, and other development. See above for description of Udorthents.
Merrimac-Urban land Complex	The Merrimac series consists of very deep, somewhat excessively drained soils formed in glacial outwash. They are nearly level to very steep soils on outwash terraces and plains and other glaciofluvial landforms.
Canton-Charlton-Urban land Complex	The Canton series consists of very deep, well drained soils formed in a loamy mantle underlain by sandy till. See above for description of Charlton series.
Charlton-Hollis-Urban land Complex, rocky, 3-15 % slopes, and	The Hollis series consists of shallow, well drained and somewhat excessively drained soils formed in a thin mantle of till derived mainly from gneiss, schist, and granite. They are nearly level to very steep upland soils on bedrock-controlled hills and ridges. See above for description of Charlton and Urban soils.
Udorthents, wet substratum.	This soil type consists of gently sloping areas that were previously tidal marsh, floodplains, bays, harbors, and swamps that have been filled. Fill consists of various types of soil material, rubbish and refuse. Depths of fill range from 2 feet to 20 feet or more. According to the 1995 Interim Soil Survey Report, a majority of land in the project area adjacent to the Aberjona River is mapped as this soil type. For instance, this soil type is mapped for the maintained lawn areas of Davidson Park and the high school playing fields.

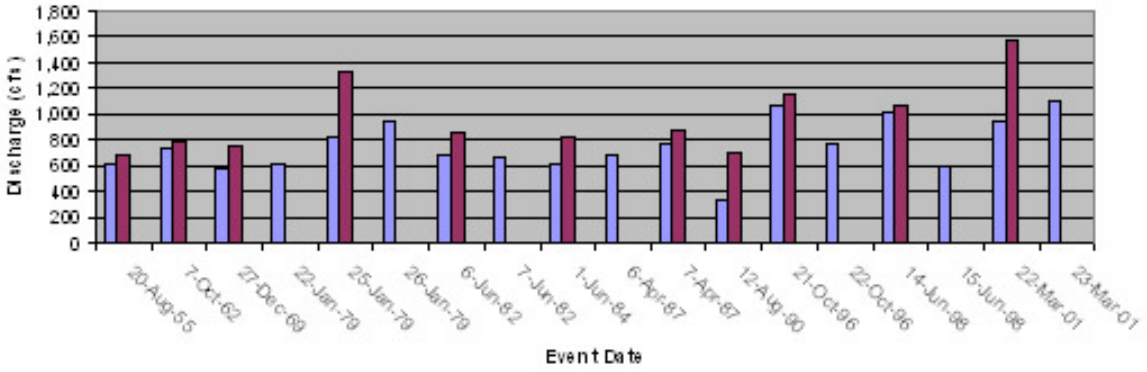
3.5 Hydrology

The Mystic River Basin covers 63 square miles in Boston's northern suburbs, extending from Reading Center to the Amelia Earhart Dam in inner Boston Harbor. The basin can be divided into three sub-basins: The Aberjona River and the Upper Mystic Lake (Upper Mystic Basin) in the north, the Lower Mystic Lake and River in the south, and the Malden River in the east. The Aberjona River segment of the basin as shown in Figure 4 is the focus of this study. The Aberjona River drains 26 square miles, primarily in the city of Woburn and the town of Winchester. The Aberjona's largest tributaries are Hall's, Sweetwater and Horn Pond Brooks. Its largest impoundment is Horn Pond covering 120 acres. The river is dammed at two locations in Winchester.

The Upper Mystic Lake covers 165 acres, with a maximum depth of 80 feet. It receives most of its flow from the Aberjona River. The lake was created by a dam which was built in 1864. The dam is located about 2 ¼ miles downstream from Winchester Center. Prior to the dam's construction, the Upper and Lower Lakes had the same water surfaces. At present, the spillway of the dam generally maintains the level of the Upper Mystic Lake at elevation 114 feet (National Geodetic Vertical Datum (NGVD) 1929.

The USGS Aberjona River gage has provided a continuous record of flow for the river since 1939. Its mean annual discharge is 30 cubic feet per second (cfs), with mean daily discharge ranging from 5 cfs in September to 79 cfs in March. In recent years peak recorded flows at the gage have exceeded 1,100 cfs on several occasions. The maximum recorded discharge was 1,580 cfs in 2001.

Figure 7 (below) shows the largest daily mean and peak flows recorded at the Aberjona River gage from its installation in 1939 through 2001.



It is notable that three of the four largest flow events recorded at the USGS Aberjona River gage, were within a 5-year period from October 1996 through March 2001. The remaining largest event occurred in January 1979. This phenomenon can be partially explained that in 1996 and 1998 flood events were the two largest rainstorms ever recorded for the Boston area. The 1996 flood was the result of one of the largest storms on record for all of New England. The flood flows from the 2001 event were due to the combination of a moderately large rainstorm with nearly complete melting of a significant snow pack in the northern portion of the watershed. The 2001 event is similar in this regard to the 1979 event, which also occurred when there was a significant snow pack. Even with these factors considered, it appears likely that runoff events in the Aberjona watershed are becoming more severe. Urbanization of the upper watershed continues to remove pervious areas, thus increasing direct runoff (reducing absorption back into the soil and groundwater) to the river from rainfall.

A recent study by ENSR for FEMA is updating the 100 year flood plain. Preliminary results for downtown Winchester are shown in Figure 7. Areas in dark blue are within

the current 100 year FEMA floodplain. The ENSR analysis indicates that areas in light blue are also within the 100 year FEMA flood plain.

Despite the apparent record of increased flooding, normal flow in the Aberjona River is reduced by ground-water withdrawals along the river and subsequent diversion out of the basin by way of the MWRA sewer system. This reduction is most noticeable during low-flow periods. For example, compared to nearby river basins such as the Assabet, Charles, and Shawsheen, the annual 7-day, 10-year low flows in the Aberjona River at Winchester are about one-half to one-third of their expected value (USGS, 2006).

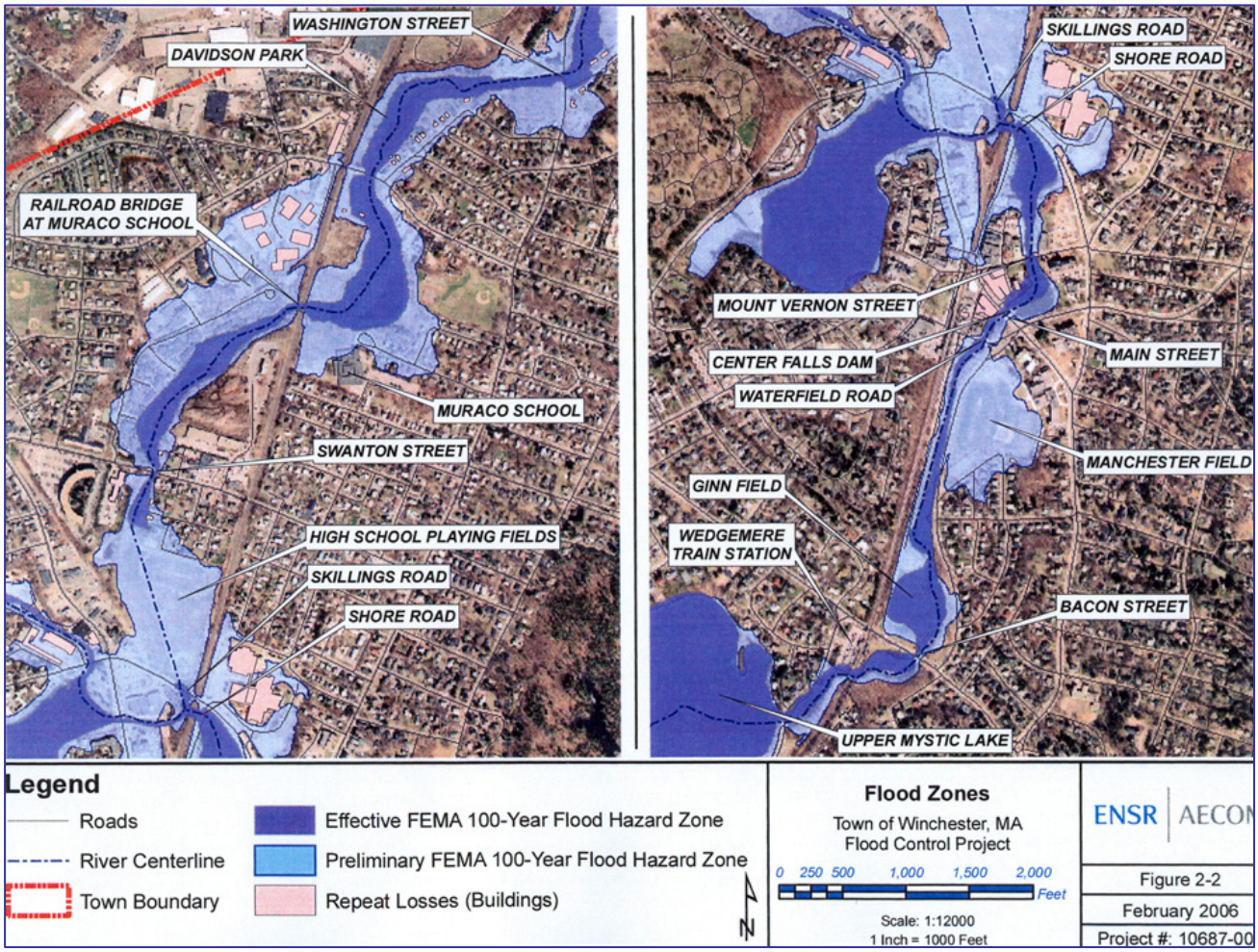


Figure 8: Preliminary 100 year FEMA floodplain.

3.6 Water Quality

The Massachusetts Surface Water Quality Standards designate the Aberjona River as Class B Waters. Class B Waters are defined in 314 CMR 4.05 as "waters designated as habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated, these waters shall be suitable as a source of public water supply with appropriate treatment. These waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process use. These waters shall have consistently good aesthetic value".

The Aberjona River in downtown Winchester is on the §303d list of impaired waterways (MADEP, 1999). The 303(d) list reports on all streams and lakes identified as impaired for one or more pollutants and which therefore do not meet one or more water quality standards. Impaired waters are identified through assessment and monitoring programs conducted by MADEP, other agencies, and volunteer networks. The Aberjona is listed as impaired for organic enrichment/low dissolved oxygen, pathogens, and unionized ammonia (NH_3).

Aberjona River water quality data collected by various agencies through 2002 is summarized in the "Mystic River Watershed Assessment and Action Plan (MRWA, 2005). Between 1998 and 2002 water quality at the USGS permanent gauging station frequently failed criteria for fecal coliform bacteria, enteroccal bacteria, total nitrogen, and total phosphorus.

Data collected by the USGS below the USGS gauging station monthly from October 1998 until September 2001 is summarized below:

Table 2: Water Quality at USGS Gauging Station.

Parameter	Criteria	Low	High	Median	% Fail Criteria
Dissolved Oxygen	> 5.0 mg/l	2.6	15.0	7.8	13
Dissolved Oxygen % Saturation	> 60 %	28	110	79	15
pH	6.5 – 8.3	6.4	7.7	7.2	1
Water temperature (^oC)	< 28.3	0.4	24.8	14.5	0
Specific Conductance	n.a.	342	2410	543	n.a.
Flow (cfs)	n.a.	2	1300	17	n.a.

Water quality criteria for dissolved oxygen, percent oxygen saturation, pH, and water temperature were usually met during the USGS study. Most of the very low DO levels occurred during the summer of 1999 and/or when flow was less than 6 cfs. DO concentration is expected to be lower upstream of the gauging station because water is aerated as it flows over the weir.

3.7 Sediment and Soil Quality

The Corps collected sediment and soil samples from the study area in 2003. Samples were collected between the Waterfield and Bacon St. Bridges (WHG, 2003). Surface grab samples were collected from the river. Soil samples were collected from the riverbank using a hand auger or Geoprobe. Selected samples were analyzed for metals, semivolatile organic compounds, PCBs, pesticides, total organic carbon (TOC), and grain size. Results are summarized in Tables 3 and 4. Data from a USGS sediment sample taken downstream of the weir in 1998 in also included in Table 3. Chemical test results were compared with criteria in the following documents to determine suitability of the material for reuse and/or disposal requirements: (1) the Massachusetts Contingency Plan Reportable Concentration for the Soil 1 Category (MCP RCS-1, the most strict category for upland soils); (2) Maximum Allowable Contaminant Levels (MACLs) (Table 1 in MA DEP Interim Policy #COMM-94-007, *Sampling, Analysis, Handling and Tracking requirements Dredged Sediment Reused or Disposed at Massachusetts Permitted Landfills*) used to identify whether sediments can be reused at lined landfills.

3.7.1 Sediments

Surface sediment between the Waterfield Bridge and USGS weir are primarily sands with gravel, with low (< 1%) organic content. Sample 1B collected from near the bridge was silty sand with leaf remains and 16.5 % organic carbon. Concentrations of metals and semivolatile organics were highest in sample 1B and the 1998 USGS sample. Sample 1B was collected 10-15 ft upstream of the Waterfield Bridge. The USGS sample was collected downstream of the footbridge. Levels of most metals and PAHs in these two samples exceeded probable effect concentrations (PECs) developed by McDonald et al. (2000). The PEC is the concentration of a chemical in sediment thought probable to pose a risk to aquatic life. Concentrations of metals and other chemicals were generally below PEC levels in the other samples. Except for sample 1B, contaminant levels in channel sediments were below the RCS-1 and MACL limits. Sediment sample 1B exceeds the RCS-1 limit for benzo(a)pyrene, cadmium, and chromium, and the RCS-1 and MACL limit for arsenic. This indicates that fine grained, organic rich sediment excavated from the project area may require special handling and disposal.

3.7.2 Soils

Test results indicate soil and subsoil material consists of sands, gravels, cobbles, and boulders. Contaminant levels in the samples were generally below the RCS-1 and MACL limits. Two samples (3P1 & SP2 composite samples) exceeded RCS-1 limits for chromium. These samples were collected near the USGS gauge. Sample 4R (0-22”), collected near Bacon Street, exceeded the RCS-1 limit for chromium and arsenic. Sample 1P (0-49”), collected near the Waterfield Road Bridge, exceeded the RCS-1 limit for biphenyl. The testing indicates some soil and subsoil from the project area may need to be directed towards a lined landfill.

Table 3: Aberjona River Sediment Test Results

Chemical	Units (dry weight)	RCS-1 MADEP	MACL MADEP	PEC	Woods Hole (2003) STA 3R	STA 1B	STA 2B	STA 3B	STA 2W	STA 3W	STA 7W	STA 6W	USGS
Semi-Volatile Organics													
Naphthalene	ug/kg	4000	-	561	-	ND	ND	ND	ND	29	ND	ND	270
2-Methylnaphthalene	ug/kg	4000	-	-	-	ND	ND	ND	ND	ND	ND	ND	
1-Methylnaphthalene	ug/kg	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	-
Biphenyl	ug/kg	50	-	-	-	ND	ND	ND	ND	ND	ND	ND	-
2,6-Dimethylnaphthalene	ug/kg	-	-	-	-	180	ND	ND	ND	ND	ND	ND	260
Acenaphthylene	ug/kg	100000	-	640	-	210	30	28	ND	110	28	ND	820
Acenaphthene	ug/kg	20000	-	500	-	98	ND	ND	ND	ND	64	ND	280
Fluorene	ug/kg	400000	-	536	-	140	31	ND	ND	58	75	ND	-
Phenanthrene	ug/kg	100000	-	1170	-	2800	550	110	400	860	770	72	5400
Anthracene	ug/kg	1000000	-	845	-	390	95	ND	76	170	170	ND	1500
1-Methylphenanthrene	ug/kg	-	-	-	-	200	34	ND	43	62	41	ND	490
Fluoranthene	ug/kg	1000000	-	2230	-	7300	940	230	880	1300	1100	180	12000
Pyrene	ug/kg	1000000	-	1520	-	4800	780	180	640	960	850	150	10000
Benz(a)Anthracene	ug/kg	7000	-	1050	-	2300	340	100	340	480	400	67	-
Chrysene	ug/kg	7000	-	1290	-	3800	390	120	380	510	410	98	7100
Benzo(b)Fluoranthene	ug/kg	7000	-	1340	-	4600	410	100	330	460	390	100	9400
Benzo(k)Fluoranthene	ug/kg	70000	-	1340	-	3300	390	120	350	480	400	88	3100
Benzo(e)Pyrene	ug/kg	-	-	-	-	3000	250	85	250	340	260	87	-
Benzo(a)Pyrene	ug/kg	2000	-	1450	-	3100	370	120	340	530	400	93	5700
Perylene	ug/kg	-	-	-	-	640	88	32	89	130	96	30	-
Indeno(1,2,3-cd)Pyrene	ug/kg	7000	-	320	-	1500	140	86	220	290	180	52	4000
Dibenz(a,h)Anthracene	ug/kg	700	-	130	-	320	27	ND	48	53	37	ND	730
Benzo(g,h,i)Perylene	ug/kg	1000000	-	320	-	1100	84	60	150	180	120	38	4400
Total PAHs	ug/kg	-	100000	22800	-	39778	4949	1371	4536	7002	5791	1055	65450
Pesticides/PCBs													
PCB (BZ 49)	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	1.3	-
PCB (BZ 66)	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	7.9	-
PCB (BZ 87)	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	4.4	-
PCB (BZ 105)	ug/kg	-	-	-	ND	ND	0.68	ND	ND	ND	ND	0.57	-
PCB (BZ 118)	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	0.75	-
PCB (BZ 153)	ug/kg	-	-	-	4.2	8.9	1.2	1.2	ND	0.50	0.74	1.1	-
PCB (BZ 180)	ug/kg	-	-	-	11	ND	ND	ND	ND	ND	ND	ND	-
PCB (BZ 183)	ug/kg	-	-	-	ND	ND	ND	ND	ND	0.86	ND	ND	-
PCB	ug/kg	2000	<2000	676	-	-	-	-	-	-	-	-	830
4,4 DDD	ug/kg	4000	-	28	9.4	23	4.2	1.1	0.59	2.5	2.3	3.8	82
4,4 DDE	ug/kg	3000	-	31.3	29	21	1.4	0.66	0.61	1.4	3.4	6.6	110
4,4 DDT	ug/kg	3000	-	62.9	120	8.4	0.67	0.85	1.2	1.1	1.5	2.0	34.0
Total DDT	ug/kg	-	-	572	158.4	52.4	6.27	2.61	2.4	5	7.2	12.4	-
Aldrin	ug/kg	40	-	-	ND	ND	ND	ND	ND	ND	ND	ND	<2
a-BHC	ug/kg	50000	-	-	ND	ND	ND	ND	ND	ND	ND	ND	<2
alpha Chlordane	ug/kg	700	-	-	2	25	3.2	0.89	0.7	1.7	2	3.8	65
g-Chlordane	ug/kg	10000	-	-	2.5	32	9	1.5	0.72	ND	ND	ND	-
Technical Chlordane	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Total Chlordane	ug/kg	-	-	17.6	4.5	57	12.2	2.39	1.42	1.7	2	3.8	65
b-BHC	ug/kg	10000	-	-	ND	ND	ND	ND	ND	ND	ND	ND	<2
d-BHC	ug/kg	50	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Dieldrin	ug/kg	500	-	61.8	ND	ND	ND	ND	ND	ND	ND	ND	14
Endosulfan I	ug/kg	500	-	-	ND	ND	ND	ND	ND	ND	ND	ND	<2
Endosulfan II	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Endosulfan sulfate	ug/kg	800	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Endrin	ug/kg	800	-	207	ND	ND	ND	ND	ND	ND	ND	ND	<4
Endrin aldehyde	ug/kg	800	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Endrin ketone	ug/kg	0.003	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
g-BHC	ug/kg	700	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Heptachlor	ug/kg	200	-	-	ND	ND	ND	ND	ND	ND	ND	ND	<2
Heptachlor epoxide	ug/kg	90	-	16	ND	ND	ND	ND	ND	ND	ND	ND	7
Methoxychlor	ug/kg	200000	-	-	4.3	51	4.6	9.2	6	10	15	4	<10
Toxaphene	ug/kg	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	-
Metals													
Antinomy	mg/kg	20	-	-	-	1.6	ND	ND	ND	1.2	ND	ND	3.4
Arsenic	mg/kg	20	40	33	-	64	4	4.8	4.5	2.6	4.2	6.3	140
Barium	mg/kg	1000	-	-	-	100	14	17	23	12	13	26	450
Berylilium	mg/kg	0.7	-	-	-	0.49	0.21	0.19	0.24	0.11	0.16	0.25	3.2
Cadmium	mg/kg	2	80	4.98	-	6.1	0.18	0.17	0.16	0.08	0.13	0.61	7.3
Chromium	mg/kg	30	1000	111	-	150	18	14	11	7.4	12	16	440
Copper	mg/kg	1000	-	149	-	210	13	18	13	9.3	11	17	360
Lead	mg/kg	300	2000	128	-	230	27	28	21	25	23	32	580
Mercury	mg/kg	20	10	1.06	-	0.94	0.019	0.024	0.017	0.015	0.031	0.018	2.2
Nickel	mg/kg	20	-	48.6	-	19	16	9.5	8.8	5	9.2	12	46
Selenium	mg/kg	400	-	-	-	1.3	ND	ND	ND	ND	ND	0.16	1.6
Silver	mg/kg	100	-	-	-	0.52	0.058	0.079	0.042	0.048	0.048	0.048	1.3
Thalium	mg/kg	8	-	-	-	ND	ND	ND	ND	ND	ND	ND	2
Vanadium	mg/kg	600	-	-	-	31	15	14	16	7.6	12	18	100
Zinc	mg/kg	2500	-	459	-	1000	110	81	74	41	63	150	1500
Other Properties													
Gravel	Percent	-	-	-	-	23.0	28.0	0.4	28.4	20.1	15.3	63.1	-
Sand	Percent	-	-	-	-	62.8	71.7	99.1	70.6	79.3	84.1	36.2	-
Silt/Clay	Percent	-	-	-	-	14.2	0.3	0.5	0.8	0.6	0.6	0.7	-
Total Organic Carbon	Percent	-	-	-	-	16.5	0.24	0.19	0.55	0.15	0.24	0.43	-

Table 4: Soil and Subsoil Test Results

Chemical	Units (dry weight)	RCS-1 MADEP	MACL MADEP	STA 1P (0-49")	STA 1P (49-78")	STA 2P1&2P2 (composite)	STA 2P1&2P2 (composite)	STA 3P1 &3P2 (composite)	STA 3P1&3P2 (composite)	STA 4P (0-17")	STA 4P (17-59")	STA 4R (0-22")	STA 4R (22-55")	STA IR (0-12")	STA 2R (0-10")	STA 3R (0-10")
Semi-Volatile Organics																
Naphthalene	ug/kg	4000	-	500	ND	27	ND	ND	ND	ND	ND	97	ND	ND	ND	ND
2-Methylnaphthalene	ug/kg	4000	-	230	ND	ND	ND	ND	ND	ND	ND	36	ND	ND	ND	ND
1-Methylnaphthalene	ug/kg	-	-	180	ND	ND	ND	ND	ND	ND	ND	28	ND	ND	ND	ND
Biphenyl	ug/kg	50	-	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dimethylnaphthalene	ug/kg	-	-	86	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	ug/kg	100000	-	200	ND	62	ND	60	ND	ND	ND	220	ND	30	35	42
Acenaphthene	ug/kg	20000	-	410	ND	ND	ND	ND	ND	ND	ND	140	ND	56	ND	ND
Fluorene	ug/kg	400000	-	520	ND	ND	ND	ND	ND	ND	ND	160	ND	70	ND	ND
Phenanthrene	ug/kg	100000	-	5000	ND	250	30	210	ND	43	ND	2300	ND	690	160	200
Anthracene	ug/kg	1000000	-	880	ND	54	ND	45	ND	ND	ND	470	ND	180	31	41
1-Methylphenanthrene	ug/kg	-	-	220	ND	29	ND	ND	ND	ND	ND	110	ND	55	ND	28
Fluoranthene	ug/kg	1000000	-	4900	ND	460	55	430	ND	89	ND	4000	ND	1000	320	410
Pyrene	ug/kg	1000000	-	4000	ND	420	39	350	ND	78	ND	3400	ND	800	300	360
Benz(a)Anthracene	ug/kg	7000	-	1700	ND	230	28	180	ND	40	ND	1500	ND	430	150	200
Chrysene	ug/kg	7000	-	1900	ND	280	32	230	ND	59	ND	1700	ND	460	210	280
Benzo(b)Fluoranthene	ug/kg	7000	-	1700	ND	320	35	220	ND	57	ND	2200	ND	390	260	310
Benzo(k)Fluoranthene	ug/kg	70000	-	1600	ND	290	32	230	ND	52	ND	2000	ND	380	230	260
Benzo(e)Pyrene	ug/kg	-	-	1100	ND	2110	ND	160	ND	42	ND	1400	ND	270	140	230
Benzo(a)Pyrene	ug/kg	2000	-	1700	ND	270	26	210	ND	51	ND	1700	ND	400	170	340
Perylene	ug/kg	-	-	360	ND	61	ND	50	ND	ND	ND	390	ND	89	40	52
Indeno(1,2,3-cd)Pyrene	ug/kg	7000	-	530	ND	110	26	160	ND	52	ND	550	ND	200	70	110
Dibenz(a,h)Anthracene	ug/kg	700	-	120	ND	24	ND	36	ND	ND	ND	120	ND	44	ND	30
Benzo(g,h,i)Perylene	ug/kg	1000000	-	340	ND	72	26	110	ND	40	ND	340	ND	130	41	86
Total PAHs	ug/kg	-	100000	28228	ND	5069	329	2681		603		22861	ND	5674	2157	2979
Pesticides/PCBs																
PCB (BZ 28)	ug/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND
PCB (BZ 105)	ug/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND
PCB (BZ 153)	ug/kg	-	-	ND	ND	ND	ND	1.7	ND	ND	ND	2.3	ND	0.63	2.2	4.3
PCB (BZ 187)	ug/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PCB	ug/kg	2000	<2000	ND	ND	ND	ND	1.7	ND	ND	ND	2.3	ND	0.63	2.2	4.3
4,4 DDD	ug/kg	4000	-	1.2	ND	0.91	ND	2.9	ND	0.68	ND	6.1	ND	1.4	1.2	3.0
4,4 DDE	ug/kg	3000	-	5.8	ND	5.5	ND	11	ND	18	ND	14	ND	14	7.6	39
4,4 DDT	ug/kg	3000	-	7.6	ND	8.0	ND	15	ND	34	ND	14	ND	11	20	160
Total DDT	ug/kg	-	-	14.6	ND	14.4	ND	28.9	ND	52.7	ND	34.1	ND	26.4	28.8	202
Aldrin	ug/kg	40	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
a-BHC	ug/kg	50000	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha Chlordane	ug/kg	700	-	1.6	ND	0.96	ND	2.8	ND	0.54	ND	3.5	ND	ND	0.80	2.1
b-BHC	ug/kg	10000	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
d-BHC	ug/kg	10000	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	ug/kg	50	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	ug/kg	500	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	ug/kg	500	-	ND	ND	ND	ND	ND	1.2	ND	1.4	ND	1.2	ND	ND	ND
Endosulfan sulfate	ug/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	ug/kg	800	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	ug/kg	800	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	ug/kg	800	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
g-BHC	ug/kg	0.003	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
g-Chlordane	ug/kg	700	-	1.0	ND	1.0	ND	2.8	ND	ND	ND	4.1	ND	0.64	2.2	2.2
Heptachlor	ug/kg	200	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	ug/kg	90	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	ug/kg	200000	-	25	ND	16	ND	ND	ND	6.1	ND	19	ND	23	11	7.2
Technical Chlordane	ug/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	ug/kg	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals																
Antimony	mg/kg	20	-	0.24	ND	0.21	ND	0.19	ND	0.11	ND	0.18	ND	0.16	0.31	0.19
Arsenic	mg/kg	20	40	11	2.2	8.5	3.1	8.2	2.7	18	2	22	8.9	13	11	8.1
Barium	mg/kg	1000	-	68	39	32	16	32	39	31	45	26	44	24	35	24
Berylilium	mg/kg	0.7	-	0.5	0.22	0.43	0.24	0.43	0.41	0.55	0.42	0.44	0.4	0.36	0.43	0.30
Cadmium	mg/kg	2	80	1.1	0.055	0.22	0.0233	0.35	0.0081	0.12	0.06	0.97	0.095	0.33	0.33	0.18
Chromium	mg/kg	30	1000	25	12	21	9.0	32	32	24	14	54	18	17	18	19
Copper	mg/kg	1000	-	67	12	19	5.7	30	13	22	21	110	17	21	19	18
Lead	mg/kg	300	2000	88	3.9	110	3.5	74	6.4	63	7.2	140	3.7	74	120	150
Mercury	mg/kg	20	10	0.24	ND	0.23	0.0073	0.23	0.016	0.11	ND	0.37	0.0078	0.16	3.5	0.12
Nickel	mg/kg	20	-	12	9.6	10	6.4	13	20	17	11	8.9	11	9.7	12	11
Selenium	mg/kg	400	-	0.93		0.61		0.54	0.21	0.5	0.28	0.68	0.10	0.41	0.39	0.2
Silver	mg/kg	100	-	0.14	0.06	0.12	0.03	0.15	0.055	0.08	0.14	0.15	0.11	0.087	0.12	0.11
Thalium	mg/kg	8	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	mg/kg	600	-	20	18	24	10	26	40	27	24	21	21	21	28	26
Zinc	mg/kg	2500	-	260	31	76	15	81	59	48	62	210	34	72	78	60
Other Properties																
Gravel	Percent	-	-	3.5	41.6	9.1	0.9	6.3	24.1	30.1	48.5	6.0	29.3	16.2	17.7	12.5
Sand	Percent	-	-	86.8	55.6	78.7	80.4	82.1	68.4	59.8	48.8	78.5				
Silt/Clay	Percent	-	-	9.7	2.8	12.2	18.7	11.6	7.5	10.1	2.7	15.5	9.5	11.6	9.8	7.7
Total Organic Carbon	Percent	-	-	4.9	0.09	4.9	0.13	2.4	0.5	3.3	0.54	0.13	0.12	3.0	5.0	2.5

3.8 Habitat

3.8.1 Aquatic Habitat and Wetlands

Photograph 5: Poor condition of existing granite block streambank protection.

The Aberjona River is channelized and straightened between Waterfield Road and the USGS gauging station (ca. 1200 linear feet). The river channel is about 20 – 25 feet wide at normal flows. The bank is steep (1:2 vertical:horizontal slope), with the lower bank lined with a granite block revetment. The granite block revetment is in poor repair with some blocks dislodged or missing and mature trees growing through the bank protection (Photographs 5 and 6). The upper bank is well vegetated with mature trees and shrubs. At normal flows the USGS weir creates a backwater throughout the reach upstream to the Center Falls Dam. At 15 cfs, the river is about 3 - 4 feet deep in the channelized reach. No riffle is present. The substrate is mostly sandy gravel with no shoal areas. Snags and dislodged granite blocks provide instream cover. None or only a very narrow fringe of wetland vegetation growing within or just above the granite block protection is present along the river throughout the reach.

Photograph 6: The Aberjona midway between Waterfield Road and the USGS weir.

Downstream of the USGS gauge to the Bacon Street Bridge the river widens and is less obviously channelized (Photograph 7). The reach is mostly run with areas of riffle immediately downstream of the USGS gauging station and upstream of the Bacon Street Bridge. Although the reach appears more "natural", old drawings and aerial photos show it was also altered during the 20th century (compare Figure 3 and Photograph 4). The substrate is generally sandy, with some mudflats located about 100 - 200 feet upstream of Bacon Street. Banks are well vegetated, with a very narrow fringe of wetland. Downstream of Bacon Street the river broadens and there are extensive riparian wetlands.

Photograph 7: Aberjona River and footbridge downstream of weir (USGS photo).

3.8.2 Terrestrial (Riparian) Habitat

Photograph 8: Ginn Field (the Aberjona River is to the right).

Upland habitat near the Aberjona River between the Waterfield Road Bridge and Bacon Street is bounded by an elevated railroad bed to the west and the Mystic Valley Parkway to the east. The area is mostly maintained as open space and includes a recreation area (Ginn Field), a public parking area, and wooded riparian habitat (Photograph 8). Wooded riparian habitat ranges in width from 10 ft. to 80 feet beyond the riverbank. The wooded riparian zone is narrowest for several hundred feet downstream of the Waterfield Road Bridge where the channel is constrained by a parking lot and to the west and by the Mystic Valley Parkway to the east.

The total area of vegetated riparian habitat within the reach is 4.5 acres. An additional 5 acres is turf. Upstream of the Waterfield Bridge the river passes through downtown Winchester and there is little viable riparian habitat. A well vegetated riparian corridor extends downstream of Bacon Street to the confluence of the Aberjona with the Upper Mystic Lake.

3.9 Biological Resources

3.9.1 Vegetation

Vegetation growing in the wooded riparian zone along the Aberjona River in the study area was inventoried during the summer of 2003. The inventory included plot sampling to quantify characteristics of the riparian community. A list of plant species found in the project area is provided in Table 5. Table 6 summarizes the plot data for the reach between Bacon Street and Waterfield Road.

The riparian zone along the river upstream of the weir is well wooded, with about 133 stems/10,000 sf. At this density, trees are spaced (on average) at about 9 ft. centers. The average width of wooded riparian zone along the reach (from top of granite block protection to turf) was 19 feet. Norway maple, red oak, and box elder were the dominant species in terms of density and basal area. Median DBH of trees in the reach was 5.4 inches. The largest trees in the sample plots were a 16 inch box elder and several multiple-stemmed Norway maple. Trees in the channelized reach are generally less than 8” in diameter. Those growing near the river are less than 70 years old because the riverbank was cleared in the late 1940’s during channelization of the river (see Photograph 3).

Dominant species in the sapling and shrub layer include: white ash, elm, tree of heaven, rugosa rose, box elder, European buckthorn, poison ivy, and Norway maple. Oriental

Table 5: Plants Species Occuring in the Study Area

Scientific Name	Common Name
Trees	
Acer negundo	Box elder
Acer platanoides	Norway maple
Acer rubrum	Red maple
Acer saccharinum	Silver maple
Acer saccharum	Sugar maple
Ailanthus altissima	Tree of heavan
Betula populifolia	Gray birch
Catalpa bignoniodes	Common catalpa
Fagus sylvatica	European beech
Fraxinus americana	White ash
Gleditsia triacanthos	Honey locust
Nyssa sylvatica	Blackgum
Populus tremuloides	Aspen
Prunus serotina	Black cherry
Pyrus malus	Apple
Quercus alba	White oak
Quercus rubra	Northern red oak
Quercus velutina	Black oak
Robinia pseudo-acacia	Black locust
Tilia americana	American basswood
Ulmus americana	American elm
Ulmus rubra	Slippery elm
Shrubs and Vines	
Alnus incana rugosa	Speckled alder
Amorpha fruticosa	False indigobush
Berberis thunbergii	Japanese barberry
Celastrus orbiculata	Asiatic bittersweet
Clethera alnifolia	Sweet pepperbush
Cornus ammonum	Silky dogwood
Cornus stolonifera	Red-osier dogwood
Euonymus	Burning bush
Parthenocissus quinquefolia	Virginia creeper

Table 5: Continued.

Scientific Name	Common Name
Shrubs and Vines	
Prunus sp.	Cherry
Rhamnus frangula	Glossy buckthorn
Rhus radicans	Poison ivy
Rosa multiflora	Multifloa rose
Rubus sp.	Bramble
Smilax rotundifolia	Common greenbriar
Solanum dulcamara	Bittersweet nightshade
Toxicodendron radicans	Poison ivy
Virburnum recognetum	Northern arrowwood
Vitis sp.	Grape
Grasses and Herbs	
Alliaria officinalis	Garlic mustard
Ambrosia artemisiifolia	Ragweed
Aster novae-angliae	New England Aster
Daucus carota	Wild carrot
Dichanthelium clandestinum	Deer tongue grass
Equisetum sp.	Horsetail
Erigeron annuus	Daisy fleebane
Graminae	Unidentifeid grasses
Hemerocallis fulva	Day-lily (escaped)
Impatiens pallida	Jewelweed
Lythrum salicaria	Purple loosestrife
Onoclea sensibilis	Sensitve fern
Osmunda cinnamomea	Cinnamon fern
Osmunda claytoniana	Interrupted fern
Polygonum cuspidatum	Oriental knotweed
Polygonum sp.	Smartweed
Pontederia cordata	Pickerelweed
Sagittaria sp.	Arrowhead
Taraxacum officinale	Common dandelion
Trifolium sp.	Clover

Table 6: Trees Occurring in Riparian Habitat along the Aberjona River.

Species	Upstream of Weir		Downstream of Weir	
	Density (No./10,000sf)	Basal Area (% of total)	Density (No./10,000sf)	Basal Area (% of total)
Norway Maple	52.0	33.7		
Red Oak	17.3	25.3	8.3	0.8
Red Maple	8.7	7.5	13.9	6.2
Box Elder	17.3	19.8		
White Ash	5.8	1.1	11.1	21.3
White Oak	8.7	1.7	16.7	55.0
Tree of Heaven	14.5	6.0		
Slippery Elm	2.9	1.4	13.9	6.7
Apple	2.9	2.7		
Common Catalpa	2.9	0.7		
Sugar maple			5.6	10.0
All Species	**133.0**		**69.5**	

Density of stems with a DBH greater than 3".
For trees with multiple stems, each stem is counted as an individual tree.
Basal area based on DBH.

bittersweet is also common. The herbaceous layer is sparse, with median percent cover less than 25 percent.

Downstream of the foot bridge to Bacon Street the wooded riparian zone widens on the Mystic Valley parkway side. Prevalent tree species include white oak, red oak, maples, white ash, and elm. Trees in this area more mature than upstream of the weir, with oaks ranging to about 30 inch DBH.

Many of the species growing along the river are non native plants considered invasive in Massachusetts (MIPAG,2005). These include Norway maple, Tree of Heaven, European (glossy) buckthorn, oriental bittersweet, oriental barberry, oriental knotweed, garlic mustard, and purple loosestrife.

3.9.2 Aquatic Life

Fish

A list of fish known to occur in the Aberjona River within or near the study area is provided in Table 7. Sources of information include backpack electrofisher studies by the USGS in 1999 and 2000 and the Corps in 2003. The 2000 USGS study sampled a 150 meter reach downstream of the USGS weir. The Corps sampled between the weir and Ginn Park footbridge and in the channelized reach, approximately midway between the Waterfield Bridge and the USGS weir.

Table 7: Fish Species Reported from the Aberjona River in Winchester

Common Name	**Scientific Name**
American Eel	*Anguilla rostrata*
Bluegill	*Lepomis macrochirrus*
Brown Bullhead	*Ameriuiurus nubulosus*
Chain Pickerel	*Esox niger*
Golden Shiner	*Notemigonus crysoleucas*
Green Sunfish	*Lepomis cyanellus*
Largemouth Bass	*Micropterus salmoides*
Pumpkinseed	*Lepomis gibbosus*
Smallmouth Bass	*Micropterus dolomieu*
White Sucker	*Catostomus commersoni*
Yellow Perch	*Perca flavescens*

Prevalent species upstream of the weir included sunfish, smallmouth bass, largemouth bass, American eel, and yellow perch (Table 8). Only sunfish and American eel were captured upstream of the weir and fish were less abundant within the channelized reach.

Table 8: Summary of Fisheries Data Available for the Aberjona River in Winchester

Common Name	**Scientific Name**	**Fluvial Class**	**USGS 2000 (below weir)**		**Corps 2003 (below weir)**		**Corps 2003 (above weir)**	
			% of Total Catch		% of Total Catch		% of Total Catch	
			Number	Biomass	Number	Biomass	Number	Biomass
American Eel	*Anguilla rostrata*	FD	18	18	10	21	14	23
Blue Gill	*Lepomis macrochirrus*	G	42	37			29	7
Chain Pickerel	*Esox niger*	G			3	6		
Golden Shiner	*Notemigonus crysoleucas*	G	5	1				
Largemouth Bass	*Micropterus salmoides*	G	7	26				
Pumpkinseed	*Lepomis gibbosus*	G	16	3	55	37	57	71
Smallmouth Bass	*Micropterus dolomieu*	G			18	11		
White Sucker	*Catostomus commersoni*	FD	2	10	10	4		
Yellow Perch	*Perca flavescens*	G	11	4	5	22		
Total Number Collected			74		40		7	
Total Biomass Collected (g)			4804		554		161	
Level of effort (minutes electrofished)			n.a.		60		30	

The MA DFW places riverine fish into three categories: fluvial specialists (those that require flowing water such as dace and sculpin), fluvial dependents (species that require flowing water at some time, as during reproduction such as white suckers) and generalist (species that do not require flowing water such as bluegill). Rivers with a healthy fish community should exhibit ratios of approximately 50% fluvial specialists, 25% fluvial dependents, and 25% generalists. In the study area, the Aberjona fish community is strongly dominated by generalists both upstream and downstream of the USGS weir. Fluvial specialists are completely lacking.

Anadromous and Catandromous Fish

Anadromous species present in the Mystic River include alewife, blueback herring, American shad, and white perch. American eel, a catadromous species, is also present. Anadromous fish access to the Aberjona is limited by two dams, the Amelia Aerhardt Dam on the Mystic River, and the Mystic Lakes Dam, a dam between the Upper and Lower Mystic Lakes. The Amelia Aerhardt Dam is located 1.7 miles upstream of the mouth of the Mystic River. The dam has a dysfunctional fishway, but a locking protocol provides fish passage through the dam. The 6 ft. high Mystic Lakes Dam, does not have a fish ladder and poses a barrier to upstream migrating herring and alewife. The dam is in poor repair and its owner, the MA DCR, is developing plans to restore the dam which are expected to include provisions for fish passage. The Mystic River supports good runs of blueback herring but declining populations of alewife and few shad. American eel were once the most common fish in coastal Massachusetts streams, but eel populations throughout the coastal North Atlantic are in decline (ASMFC, 2000). USGS and Corps studies found that juvenile eel were common in the study area. Captured eel ranged in size from 9 to 241 g. Eel are omnivores and feed on insects, mollusks, crustaceans, worms and other fish.

Photograph 9: USGS gauging station weir.

The USGS weir (Photograph 9) poses a minor barrier to fish passage. The next major barrier is the stepped Center Fall Dams (Photograph 10). American eel and a large unidentified fish (possibly white sucker) can ascend this dam, but it would likely pose a significant barrier to herring and alewife.

Photograph 10: Center Falls Dam.

Essential Fish Habitat

The 1996 amendments to the Magnunson-Stevens Fishery Conservation Management Act strengthen the ability of the National Marine Fisheries Service and the New England Fishery Management Council to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed "essential fish habitat", and is broadly defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Mystic River is included within an essential fish habitat "square" that encompasses Boston Harbor and associated coastal rivers. This affects the following: South Boston, MA., Boston, MA., Chelsea River, Mystic River, Charles River, East Boston, MA., Chelsea, MA., Orient Heights, and most of Logan Airport. All species described for this habitat square (NOAA, 2006) are marine or estuarine species which do not occur in the Aberjona River.

Stream Macroinvertebrates

The USGS and MA Division of Watershed Management (MADWM) sampled macroinvertebrate communities downstream of the USGS weir in 1999 and 2000. USGS data from the summer of 2000 is provided in Table 9. Both studies indicate the benthic community is strongly dominated by filter feeding caddisflies (*Hydropsychidae*). Dipertans, fingernail clams, and oligiochaetes are also common. The community is dominated by organisms that feed on suspended or deposited forms of organic material. Scrapers, such as mayflies and stoneflies, are absent. The Aberjona station received the lowest score of biomonitoring stations in a Boston Harbor watershed survey and was classed as "moderately impacted" (MADWM, 2000).

Freshwater Mussels

The Corps conducted a freshwater mussel survey between the USGS weir and Bacon Street in 2003. Two species of freshwater mussel were found, the Eastern elliptio (*Elliptio complanata*) and Eastern floater (*Pyganodon cataracta*). Both species are common in eastern Massachusetts.

3.9.3 Wildlife

The narrow band of riparian vegetation along the Aberjona River between Waterfield Road and Bacon Street has some value as wildlife habitat. Approximately 4.5 acres of forested riparian habitat is present along the river. The riparian zone (including the river) ranges in width from 60 to 200 feet through the reach. The corridor is widest just upstream of the USGS weir and downstream of the footbridge, it is narrowest along the upper portion of the channelized reach where it is confined by a parking lot and the Mystic Valley Parkway. This study area is at the northern end of a 3/4 mile long riparian corridor that begins at the confluence of the Aberjona with the upper Mystic Lakes. The corridor is interrupted upstream of Waterfield Road as the river passes through ponds with developed shorelines and underneath recreation fields at the Winchester Highschool via a culvert. Functional riparian habitat is not reestablished until upstream of the fields,

Tabel 9: USGS Stream Macroinvertbate Data from the Aberjona River

Phylum/ Class	Order	Species	Abundance
Mollusca			
Bivalvia	Veneroida	*Sphaeriidae*	282
Bivalvia	Veneroida	*Pisidium sp.*	81
Bivalvia	Veneroida	*Musculium sp.*	244
Annelida			
Oligochaeta		*Megadrile*	40
Oligochaeta	Tubificida	*Naididae*	282
Oligochaeta	Tubificida	*Tubificidae*	40
Oligochaeta	Enchytraeida	*Enchytraeidae*	121
Hirudinea	Arhynchobdellae	*Erpobdellidae*	2
Arthropoda			
Arachnida		*Acari*	40
Malacostraca	Isopoda	*Caecidotea sp.*	81
Malacostraca	Amphipoda	*Crangonyx sp.*	40
Malacostraca	Amphipoda	*Gammarus sp.*	204
Insecta	Trichoptera	*Hydropsychidae*	2460
Insecta	Trichoptera	*Cheumatopsyche sp.*	2177
Insecta	Trichoptera	*Cheumatopsyche sp.*	40
Insecta	Trichoptera	*Hydropsyche sp.*	161
Insecta	Trichoptera	*Hydropsyche sp.*	3024
Insecta	Trichoptera	*Hydropsyche depravata group*	3750
Insecta	Coleoptera	*Stenelmis sp.*	40
Insecta	Diptera	*Diptera*	40
Insecta	Diptera	*Chironominae*	40
Insecta	Diptera	*Chironomini*	40
Insecta	Diptera	*Phaenopsectra/Tribelos sp.*	81
Insecta	Diptera	*Polypedilum sp.*	1048
Insecta	Diptera	*Rheotanytarsus sp.*	40
Insecta	Diptera	*Diamesinae*	40
Insecta	Diptera	*Orthocladiinae*	40
Insecta	Diptera	*Orthocladiinae*	121
Insecta	Diptera	*Cricotopus sp.*	121
Insecta	Diptera	*Cricotopus bicinctus group*	40
Insecta	Diptera	*Eukiefferiella sp.*	40
Insecta	Diptera	*Thienemannimyia group sp.*	202
Insecta	Diptera	*Simuliidae*	81
Insecta	Diptera	*Simulium sp.*	41
Insecta	Diptera	*Hemerodromia sp.*	121
Summary		**Taxa**	**Percent**
		Tricoptera	76.2
		Diptera	14
		Bivalvia	4
		Oligiochaeta	3.2
		Other	2.6

about 2/3 mile above the Waterfield Road Bridge. The largest nearby area of significant wildlife habitat is the Middlesex Fells Reservation, a 2575 acres natural area located 3/4 mile east of the study area.

Although the value of riparian habit in the study are is limited by size and proximity to human activity, the area does provide a green island in an otherwise densely developed urban setting. Species observed in the area or likely to occur include gray squirrel, painted turtle, snapping turtle, mallard duck, American robin, mockingbird, cardinal, blue jay, chickadee, hairy woodpeckers, tufted titmouse, nuthatch, goldfinch, house sparrow, and other species tolerant of urban conditions. It is also a resting area for migratory songbirds. Just downstream of Bacon Street the river broadens and provides some habitat for wading birds. The reach between the Waterfield Road and the USGS weir has occasional snags (standing dead trees) which provide habitat for cavity nesting species and foraging habitat for insectivorous birds such as nuthatch. The dominant tree species, Norway maple, oaks, and white ash, produce seeds which provide food for songbirds and/or small mammals. Many of the shrubs and vines growing along the Aberjona are good wildlife food plants. These include buckthorn, cherry, northern arrowroot, grape, Virginia creeper, and poison ivy. The food value of oriental bittersweet, a very common vine, is low.

There are no vernal pools near the study area so the riparian corridor is unlikely to provide habitat for tree frogs, mole salamanders, or other species that require vernal pools for breeding. Natural banks occur downstream of the USGS weir. Upstream of the weir banks are partially armored, very steep and provide little habitat or cover. Downed logs provide basking sites for turtles throughout the reach.

3.9.4 Rare or Protected Species

No state or federally listed rare or protected species are reported to occur within or near the project area (MA NHESP, 2006).

The USFWS and NMFS are currently evaluating a proposal to list American eel as a federally endangered or threatened species pursuant to the federal Endangered Species Act.

3.10 Cultural Resources

3.10.1 Historic Context

This narrative is taken from the historical background report of the Aberjona River prepared by Ellen Knight, date unknown.

The Mystic Lakes and Aberjona River were undoubtedly used by Native Americans for transportation and as a resource procurement area during the Pre-Contact Period. Artifacts including projectile points, arrowheads, knives, a half-grooved axe,

woodworking tool, and pestle have been collected at the Mystic Lakes and dated to roughly between 1400 B.C. and 2500 B.C.

The Mystic Lakes were known as a gathering place for Native Americans during the 19th Century, since Myopia Hill west of the Lakes, was the residence of the last squaw sachem living in this area. Natives continued to make annual visits following her death in 1650 and up through the 19th Century, passing from the Mystic Lakes or Middlesex Canal and camping in the area.

Early colonial settlers built dams and erected mills along the river in Winchester. This construction was a precursor to flooding of adjacent areas and caused a general stagnation of the river further exacerbated by the industrial period.

The Middlesex Canal (1803) and more significantly, the railroad (1835) led in the industrial era in Winchester. The railroad crossed the river at three points and cut through the Aberjona Pond. The presence of a river and railroad led to both the river and Horn Pond Brook becoming lined with factories and tanneries.

During the 19th Century, the river was marshy and swampy, and the marshes were characterized as "mosquito- and vermin-ridden." The river was also polluted by industrial waste and dumping. The town attempted to alleviate these conditions with river improvement programs from the 1890s through the 1930s as well as the construction of metropolitan sewers.

The portion of the project with Corps involvement (Waterfield Road to Bacon Street) was formerly a winding, swampy stream with islands and extra channels cut by the railroad and mill owners. As part of the river improvement programs of the period, Winchester and Boston removed the industry below the town center, reshaped the upper end of the river, created two parks (Ginn Field and Manchester Field), and lastly, built the Mystic Valley Parkway. Today, only the section of channel below Mystic Avenue still adheres to the original parkway design.

3.10.2 Affected Environment

The Public Archaeology Laboratory, Inc. (PAL), under contract to ENSR, conducted an archaeological and historic architectural assessment for flood improvement projects within the Aberjona River watershed in Winchester, Massachusetts as part of preparation of a Draft Environmental Impact Report (DEIR) for the state. Of the 17 individual projects that PAL evaluated, only **Project #2 (Waterfield Road to Bacon Street)** will be studied by the Corps under its Section 205 program and hence, is the subject of this Environmental Assessment. The following information is taken from the DEIR dated February 15, 2006 and the SDEIR dated February 15, 2007, both prepared by ENSR for the town of Winchester.

Description of Proposed Work and Area of Potential Effect – Project #2: Waterfield Road to Bacon Street

The Waterfield Road to Bacon Street improvement would enlarge the Aberjona River channel along this reach to an average 39-foot bottom width. Currently, the bottom widths along this section of the river range from 15-20 feet. A United States Geological Service (USGS) gauge is located along this section of the river and would be replaced with the cooperation of the USGS. There is also a footbridge in this section that would need to be reconstructed to span the wider river section. Based on a review of the current project maps, project impacts from the Corps project will be limited to the loss of about 18,000 square feet of upland parkland and the removal of the USGS gauge.

3.10.3 Historic Architectural Assessment

The Winchester Center Historic District, which is listed on the National Register of Historic Places, extends south to Waterfield Road, the northern edge of the project area boundary. Contributing properties within or immediately adjacent to the boundary include the Waterfield Road Bridge, the Unitarian Church at 476 Main Street, the McCall Jr. High School, 458 Main Street, and the U.S. Post Office at 48 Waterfield Road.

Mystic Valley Parkway, part of the Metropolitan Park System of Greater Boston, was listed on the National Register of Historic Places in January 2006 and is located within the area of potential effect for this project. The Parkway was constructed in the 1890's and extends from Winchester through Arlington, Medford, and Revere. The 7.7 mile long parkway is significant as one of the earliest river parkways designed for the Metropolitan Park Commission by Olmsted, Olmsted, and Eliot and its successor firm, Olmsted Brothers, and is emblematic of that firm's principles of parkways creation.

Seven additional, previously inventoried properties are located adjacent to, but not within, the project area boundary:

Unitarian Church at 476 Main Street
Cutting Lumber Yard Homes, 89/91 Mystic Valley Parkway
2/4 Cutting Street
9/11 Cutting Street
27/29 Mystic Avenue
30 Mystic Avenue
Philemon W. Symmes House, 34/36 Mystic Avenue

Four additional properties are located in the project area:

Bacon Street Bridge (1922) – a single arch stone bridge constructed of various sized rectangular granite blocks laid in a regular pattern. It was designed by Ralph S. Vinal and built by J.R. Worcester and Co. in 1922 and rehabilitated in 1996.

USGS Stream Gauging Station – a small, rectangular concrete building located on the east bank of the Aberjona River along Mystic Valley Parkway near the

intersection with Mystic Avenue. This gauging station appears to be at least 50 years old and is planned to be replaced during this proposed work.

Concrete Dam and Pedestrian Bridge – Adjacent to this gauging station is a small concrete dam with a continuous spillway and a small vertical face that is on a shallow angle from the vertical, with pockets for a plank overflow control. At the time of the site inspection, no wood plank was present and the overall drop of the dam was no more than 2 feet. The adjacent timber pedestrian bridge appears to have been constructed within the last ten years and is built of pressure treated lumber with a shallow arch and a simple timber railing.

Kellaway Landscape Elements – Herbert Kellaway, a Boston landscape architect and former employee of the Olmsted firm was contracted by the town of Winchester to make recommendations for the "improvement" of the Aberjona River, both along its alignment with the newly established Mystic Valley Parkway as well as the river course north of Main Street to the Winchester/Woburn town line. Kellaway's recommendations included the practical problems of pollution, poor water flow and seasonal flooding together with suggestions to improve the aesthetic and recreational aspects of the river. Most of Kellaway's recommendations were implemented including the landscape elements at the Waterfield Bridge which is part of Project #2. Kelleway's surviving landscape elements may be eligible for listing on the National Register.

Archaeological Assessment

A review of archaeological site files for the town of Winchester at the Massachusetts Historical Commission (MHC) identified two pre-Contact period sites and one post-Contact period site within a one-mile radius of the project reach. The Everett Site, a Late Archaic occupation, lies along the western shore of Upper Mystic Lake on the old Everett estate. The material from this site includes one felsite Atlantic point, two Fox Creek points, and a hammerstone collected from this location in 1880. The Sandy Point site is located on the northern end of Upper Mystic Lake and is comprised of three findspots of non-diagnostic felsite and quartz chipping debris.

The Baconville Industrial Complex lies between Mystic Valley Parkway and Grove Street near the northern inlet to Upper Mystic Lake. This district comprised the factory and worker housing complex built by the Bacon family in 1824. The factory produced felt and wadding and was the first large-scale industry in Winchester. No archaeological evaluation or excavations have been conducted at the complex, although there is the potential for archaeological sites associated with the locations for the former mill buildings to exist.

A large segment of the Middlesex Canal runs through the center of Winchester roughly 0.5 miles west of the project corridor. Completed in 1803, the Middlesex Canal is significant as a major Federal Period (1775-1830) internal transportation improvement and an outstanding engineering achievement of the early 19th Century. Operating 27.25

miles between Boston and Lowell, the Middlesex Canal is the second oldest transportation canal constructed in Massachusetts behind the South Hadley Canal completed in 1795.

There are no pre- or post-Contact archaeological sites located within the current area of potential effect. It is likely however, that the Aberjona River functioned as an important transportation corridor to the Mystic Lakes region during the pre-Contact era and was also the location of historic period mill industries during the 18th and 19th Centuries. Archaeological survey of intact portions of the river channel has the potential to contribute information on both the pre- and post-Contact periods of the Aberjona River.

According to PAL's review of the history of the Aberjona River in this reach, up until the mid-20th Century, Ginn Field (southern portion of Waterfield Road to Bacon Street project area) was an unimproved tract of land with a shallow pool at its south end. In 1938, the Works Progress Administration (WPA) graded the area and laid out a playground and several tennis courts. Because the full extent of the grading activities is unknown, it is possible that intact archaeological resources may exist within intact portions of Ginn Field in the southern portion of the project area. Similarly, the park-like portions of the walkway alignment along the eastern and western riverbank of the project corridor may contain intact archaeological deposits within soil strata that were not disturbed during the construction of the Mystic Valley Parkway during the 1890's.

The north portion of the project area (Mystic Avenue to Waterfield Road) encompasses a heavily altered segment of the river. Until the mid-20th Century, the original river channel curved rather sharply to the east, closely paralleling what is the current alignment of the Mystic Valley Parkway. During the 19th Century, the area between the railroad tracks and the river housed a substantial industrial complex including a tannery, coal, freight, and lumber yards, a livery, and a series of tenement buildings within a few feet of the riverbank. By the 1890s, however, this complex was razed to make room for a park called Manchester Field. This configuration held until 1946 when the river was straightened between Mystic Avenue and Waterfield Road in order to rebuild Manchester Field in its present location.

Despite this level of landscape disturbance, there is the potential for the survival of structural elements associated with the former industrial complex. An area of particular sensitivity includes the small park south of Waterfield Road and east of the MBTA parking lot along both sides of the river. Given the size and complexity of the former tannery building and auxiliary structures, it is possible that substantial foundation remains may survive beneath deep fill deposits in that location.

3.11 Socio-Economic Resources

3.11.1 General Setting

Although there are many flood problem reaches along the Aberjona River throughout the town, the downtown Winchester retail/business reach was the only area that the USACE could address under its authorities. This reach contains over fifty commercial, public, and residential structures, which together contain about 180 businesses as well as the town hall, the town fire and DPW buildings, a senior center, Winchester High School, and a post office.

Socio-economic statistics for Winchester are provided in Table 6. Like other communities in the Mystic River watershed, Winchester is densely developed, with a

Table: 10: Socio-economic information for Winchester, MA.

Statistic	Winchester	Massachusetts
Population (2000)	20,810	6.3 million
Population Density (persons per square mile land area, 2000)	3,346	810
Median Household Income ($, 1999)	94,049	50,502
% of Individuals below Poverty Level, 1999	2.6	9.3
Percent Unemployment (2005)	3.2	4.8
Percent non-white (1999)	6.9	15.5
Median Age (1999)	41.1	35
Percent Adults with College or Advanced Degree	70.5	40.4
Average SAT Score (2005)	1128	1009
Percent SAT Participation (2005)	93	67
Median Home Value ($, 2003)	670,000	300,767

population density well above the Massachusetts average. Winchester is an affluent community, with a household income and home values well above statewide medians. Two-thirds of employed residents are in managerial or professional occupations. The MA EOEA has mapped Environmental Justice (EJ) populations across the state. These areas are neighborhoods with high minority, non-English speaking, low-income, and foreign-born populations. Such areas are the focus of EOEA's EJ Policy, which was developed to use state resources to ensure that EJ populations receive a strong voice in environmental decision-making. No part of Winchester is designated as an environmental justice population (MAGIS, 2006).

3.11.2 Infrastructure

Public infrastructure in the vicinity of the study area is shown in Figure 7. A portion of the Mystic Valley Parkway, an historic parkway designed by Fredrick Law Olmsted, runs through Winchester and along the Aberjona from Waterfield Road to Bacon Street. The parkway is a two lane road with room for parking and walkways along both travel lanes. The parkway is landscaped with scattered shade trees (Photograph 11).

Photograph 11: Pathway along the Mystic Valley Parkway

On the west side of the river is a B&M railroad easement. The tracks are used by the MBTA Lowell Commuter Rail line, the AMTRAK Downeast Passenger Train, and freight trains. The Winchester Center MBTA station is located south of Waterfield Road. The Wedgmere station is located just downstream of Bacon Street. The Town of Winchester maintains two parking lots along the river. These include a permit lot with 130 spaces (Photograph 12) and an hourly pay lot with 28 spaces. Permit fees are $25/month. The permit lot is generally full to capacity or near capacity on weekdays. Both parking lots generate revenue for the Town.

Photograph 12: Permit Parking Lot (the Aberjona River is to the left)

The Town of Winchester is served by the MWRA sewer system. Four sewer lines run parallel to the river in the study area. A four ft. diameter line on the east side of the river runs upstream to the south end of Manchester field and diverges from the river. Three lines, the 1913 and 1894 MWRA lines and the Mystic valley sewer, occur between the west side of the river and the B&M railroad easement. The 1913 and 1894 MWRA lines run very close to the edge of the river in places at a depth 5 - 6 feet below ground level. The MWRA lines are 5’6”x 5’9” and 33”x 37” in size. Other public facilities subject to flooding include the Winchester post office, the Winchester High School, and recreational fields (see below).

3.11.3 Recreational Resources

Ginn Field is a 4.5 acre turfed area with playing fields (see Photograph 8). It is used for little league, soft ball, and youth programs. The field is accessed by a footbridge from the Mystic Valley Parkway or by a narrow road that runs from the Town of Winchester permit lot. The area includes a small parking area, a playground, and a basketball court.

On the east side of the Mystic Valley Parkway is Manchester Field and Knowlton Stadium. This facility includes playing fields, a ¼ mile running track, a basketball court, and bleacher seating on approximately 10 aces of land. The fields are used for high school baseball, football, soccer, and track and field. Both Ginn Field and Manchester Field are within the 100 year floodplain.

Pathways along the Mystic Valley Parkway are used by walkers, bicyclists, and runners. A footbridge provides access to Ginn Field and allows walkers and hikers to loop back to downtown Winchester along the west side of the Aberjona River.

Usage of pathways along the Mystic Valley Parkway near Waterfield Road was monitored during three 30 minute periods on Thursday April 27, 2006 (Table 11). The weather was mild and sunny. Both pedestrians and bicyclists favored the west side (Aberjona River side) of the parkway.

Table 11: Use of Mystic Valley Parkway pathways.		
Location	Adults Per Hour	
	Runners/Walkers	Bicyclists
East Side of Parkway	9.3	1.3
West Side of Parkway (River)	13.3	6.0

3.11.4 Flood Damages

General

Photograph 13: Winchester Post Office during October 1996 flood.

The Aberjona River has a long history of flooding, with floods reported in 1855, 1886, 1936, 1955, 1962, 1968, 1996, 1998, 2001, and 2004. The causes of flooding include historic filling in of wetlands and floodplains which provided natural storage areas for floodwaters, building in inappropriate locations, undersized channels and bridge culverts, and lack of maintenance. Because the river flows directly through the densely developed town center, flooding along the river impacts a large proportion of the town's population. Areas flooded include the downtown business district, residential neighborhoods, Winchester High School, parking areas for the MBTA commuter rail station, public roads, and athletic fields. Flooding severely disrupts business activities and local transportation, and causes school closures. Estimated damages caused by the last four flood events totaled more than 16 million dollars (ENSR, 2006).

Quantitative Flood Damage Analysis

Expected annual damages were calculated for the project using the Corps HEC-FDA program. Structure elevation data, stage-damage functions, structure assessments, and hydrologic data were input into the program. Expected annual flood losses were determined by weighing recurring flood losses by their annual probability of occurrence. Recurring flood losses are those damages and costs that would occur as a result of specific storms. Total expected annual losses for a flood zone are the summation of the products of recurring losses for all potential storm events and their probability of occurrence. Expected annual losses incorporate events from the 1-year (100% annual chance of 78 occurrences) event to the 500-year (0.2% annual change of occurrence – rare) event. The Economic Analysis Appendix attached to this report further explains the USACE's flood damage assessment methodologies.

In the absence of flood control improvements, periodic flooding will continue to threaten the health and safety of the residents and business' of Winchester. The public municipality as well as property owners will continue to suffer the economic hardships that result from flood loses. Using this methodology, at current price levels, the annual loss for the without project condition is estimated at $290,000.

3.12 Air Quality

Ambient air quality is protected by Federal and state regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

The entire State of Massachusetts, including Winchester, is designated as a non-attainment area for ozone. Effective June 15, 2004, all of Eastern Massachusetts was designated by the EPA as moderate non-attainment areas for the 8-hour ozone standard.

3.13 Expected Future Conditions without a Project

Flooding will continue to adversely affect the study area and cause economic losses. Other measures planned by the Town of Winchester to reduce flooding will be implemented and reduce flood damages. Continued development in the Aberjona watershed will increase the volume and rate of runoff during storm events. Winchester may undertake selected tree removal from the channelized reach to improve conveyance and lessen further damage to granite block protection. The USGS will eventually upgrade the gauging station and remove the weir. The Mystic Lakes Dam will be rebuilt and provided with fish passage, allowing alewife and other anadromous fish to reach the Center Falls Dam. Recommended measures to improve Aberjona River water quality in the 303d report (MADEP, 1999) will be implemented and water quality improved. Despite improvements in water quality, however, the fluvial dependent fish will remain

rare. Ginn Field will continue to be used for recreation and the extent of riparian habitat between Waterfield Road and Bacon Street will remain the same.

4.0 Environmental Consequences

4.1 Overview

The recommended plan will provide flood stage/damage reduction benefits for both the business district of downtown Winchester and area homes situated along the Aberjona River . Additionally, the future risk, duration and severity of large floods impacting the community will be significantly reduced. The plan would realize $4,900 in net annual benefits, and a Benefit-to-Cost Ratio (BCR) of 1.1.

The recommended plan (Figure 1) will considerably alter an 1200 ft. section of the Aberjona River and adjacent land between the river and the Mystic Valley Parkway. The river channel will be widened from about 20 to 39 feet at the expense of existing greenspace between the river bank and parkway. Approximately 0.5 acres of parkland along the river (mostly turf with scattered trees) will be converted to riparian habit. The channel configuration will include a low flow channel; a terrace vegetated with low shrubs, and a walkway. The embankment along the east side of the river will no longer be wooded with trees and tree cover along the eastern bank will be reduced. Removal of the USGS weir will restore Aberjona River between the weir and Center Falls Dam to a free flowing condition. Removal of the weir is expected to reduce water depth within a 20 ft channel during moderate flows (20 cfs) conditions from existing 3 - 4 feet to about 1.5 ft.

4.2 Hydrology

Table 12 shows the 10-year, 50-year, 100-year, and 500-year flood elevations for the existing condition, Option 3 (32 ft. channel), and the proposed channel improvement (Option 4). Peak flood elevations are shown at four “damage zones”. All four damage zones are located downstream of the confluence with Horn Pond Brook. The damage zones are as follows: Zone 4 is immediately upstream of the B&M Railroad near Shore Road, water levels are the same at this zone as at Horn Pond Brook at Main Street; Zone 3 is immediately upstream of Mount Vernon Street; Zone 2 is immediately upstream of Main Street; and Zone 1 is immediately upstream of Waterfield Road.

The analysis shows drops of peak flood elevation for both Options at all damaged areas, with the greatest reductions occurring for 10-year and 50-year events at damage Zones 1 and 2. Both Options also reduce 100 year and 500 year flood elevations at most locations. Plan 4 results in slightly reduced flood stages at Zones 1 and 2 relative to Plan 3. The two plans have similar flood reduction benefits in Zones 3 and 4.

Table 12. Peak Flood Elevations (feet above NAVD88) Without and With-Project (32 & 39-Foot Wide Channels) at Various Damage Zones				
Damage Zone	Recurrence Interval	Peak Flood Elevation		Drop In Peak Elevation (feet) (Plan 3/Plan 4)
		Existing Condition (NAVD88)	With Channel Improvements (Plan 3/Plan 4)	
4	10-year	19.6	19.2/19.2	0.4/0.4
	50-year	22.8	22.4/22.4	0.4/0.4
	100-year	25.2	24.2/24.2	1.0/1.0
	500-year	26.2	26.2	0.0/0.0
3	10-year	18.6	18.4/18.4	0.2/0.2
	50-year	22.2	21.3/21.3	0.9/0.9
	100-year	24.9	23.6/23.6	1.3/1.3
	500-year	25.2	25.2/25.2	0.0/0.0
2	10-year	17.8	17.2/16.7	0.6/1.1
	50-year	20.3	19.4/19.0	0.9/1.3
	100-year	21.3	20.4/20.0	0.9/1.3
	500-year	23.5	23.2/22.4	0.3/1.1
1	10-year	17.0	14.8/14.4	2.2/2.6
	50-year	19.5	18.0/17.7	1.5/1.8
	100-year	20.4	19.4/19.0	1.0/1.4
	500-year	22.4	21.9/21.9	0.5/0.5

Modeling shows no significant increases to flood stages at areas downstream of the Mystic Lakes with the proposed alternatives when compared to the existing scenario.

The recommended plan will have no impact on flow volume during low flow periods. The plan includes a 20 ft. wide low flow channel. Channel configuration will be further refined during design to ensure a deepwater channel under low flow conditions.

4.3 Water Quality

4.3.1 Construction

During construction segments of the bank undergoing excavation and restoration will be isolated from the river by coffer dams composed of sheet piling or other material such as stacked Jersey barriers and sand bags. This will allow most of the work to be done without affecting water quality. If areas isolated by coffer dams must be dewatered, the water will be treated to remove suspended sediment and discharged back into the river.

Some turbidity may be generated during installation and removal of coffer dams. Construction activities are expected to have no adverse impact on concentration of dissolved oxygen, nutrients, water temperature, or on other water quality parameters.

Special care will be needed to avoid damaging MWRA sewer lines. A discharge from the sewer line would impair water quality in the Aberjona River, the Mystic Lakes, and possibly the Mystic River.

Over topping of coffer dams by high flows also poses a risk to water quality. If this occurred while the banks were partially excavated, soil could be eroded and transported downstream. The risk of overtopping will be reduced by working during a low flow period and by designing the coffer dam to withstand at least a 1 – 2 year return frequency storm event.

Some turbidity will be generated during removal of the USGS weir. Because little fine grained material has settled behind the weir the temporary increase in turbidity is expected to be moderate. Removal of the weir is not expected to significantly impact DO levels or other water quality parameters.

4.3.2 Post Construction

The Aberjona River is a warmwater urban stream. The recommended plan will reduce shading of the channel by vegetation and thus could contribute to stream warming. Removal of the USGS gauging station, however, will reduce retention time in the reach between the weir and Central Falls Dam which will decrease potential for stream warming as water passes through the reach. The river will continue to receive some shade from the west bank, and some shade from vegetated engineered embankments along the Mystic Valley Parkway side of the river. Removal of granite paving blocks on the east side of the river will reduce heat transfer from the blocks to the water. Under existing conditions, the river warms as it passes through impounded areas upstream of the Center Falls Dam. Warming upstream of the Center Falls Dam is likely to exceed any warming that might occur downstream of Waterfield Road as a result of the flood control project.

Under existing conditions the Aberjona River is aerated as it passes over the USGS weir. The amount of aeration that occurs as water flows over weirs and other low head structures is difficult to predict. Spillways having the same basic geometric design, but may exhibit widely divergent aeration depending upon conditions at the toe or apron (Butts and Evans, 1983) and flows. Aeration at the Aberjona USGS weir during summer low flow has not been measured. In late December of 2006, DO was only slightly (about 0.2 mg/l) higher downstream of the weir. Flow rate at the time was 33 cfs. This suggests removal of the weir will not significantly reduce DO concentration in the river downstream of the structure, at least during moderate flows.

The proposed was evaluated for compliance with Section 404 of the Federal Clean Water Act (see Attachment). The evaluation concluded that the proposed action is in compliance with Section 404(b)(1) guidelines.

4.4 Sediment and Soil Quality

4.4.1 Construction

Approximately 9,100 cubic yards of material will be excavated during construction and transported off-site for disposal or reuse. Based upon existing information, material removed will include sediments, surface soils and subsoil material consisting of sands, gravels, cobbles, and boulders. The material will be handled and disposed or reused according to state and federal waste regulations and policies. Chemical testing indicates that for most material taken from the banks there is little or no restrictions in terms of potential disposal and/or reuse. Disposal of soils 1P (0-49") and 4R (0-22") would have to be directed towards a lined landfill. Additional confirmatory soil and sediment testing may be required during design.

4.4.2 Post Construction

Construction is expected to initially improve sediment and soil quality in the disturbed areas. Existing surface soils and sediments will be removed and replaced with material likely to have lower concentration of metals, PAHs, and pesticides. Gradually, however, concentrations of contaminants in sediments and soils will increase due to deposition from the Aberjona River, urban runoff, and atmospheric deposition.

4.5 Biological Resources

4.5.1 Aquatic Life

Construction

Construction activities will disturb approximately 1200 feet of the Aberjona River. Progressing from upstream to downstream, sections of the work area will be isolated from the rest of the river by temporary "cells" created by sheet pile, Jersey barriers, or other materials. Fish trapped within these areas may be lost as these areas are dewatered, exposed to poor water quality (low DO, high turbidity), or injured by construction activities. Losses of American eel and other fish would be reduced by electrofishing the cells before dewatering and relocating any captured fish downstream of the work area.

Removal of the USGS weir will temporarily increase turbidity in the Aberjona downstream of the weir. Most of the material disturbed is expected to be sands or gravels which would quickly settle out downstream. Sediment deposition could have an adverse effect on invertebrates and fish close to the weir. Disturbed areas will be quickly recolonized by invertebrates and fish. Affects on aquatic life downstream of the footbridge are expected to be negligible. There will be no impact to essential fish habitat in the Mystic River estuary.

Post Construction

Aquatic habitat in the channelized area will be altered by project construction. During normal flows, the channel width will remain about the same, but water depth in the channel will be about 1.5 ft compared to 3 - 4 feet under existing conditions. The reach will be less pool like, and primarily run, with perhaps some riffle. Lack of underwater survey information for the reach makes more precise prediction impossible. Habitat structure underwater will be altered as well. Granite blocks which have slipped off the bank and logs with provide cover for fish will be removed. Project plans will include some measures to add underwater cover such as boulder clusters, but opportunities for providing cover will be limited by the need to maintain flow conveyance.

The fish community will be similar to the community downstream of the weir as described in Section 3.9.2 and dominated by sunfish, bass, and other habitat generalists. American eel will continue to inhabit the area. Although the reach will be less pond-like, warm water temperature resulting from heating in upstream ponds and urban runoff, will likely preclude colonization of the area by fluvial specialists such as sculpin or dace. Removal of the weir may improve upstream migration for anadromous fish, but the Center Falls Dam will remain a barrier to further upstream migration until a fish ladder is installed. There will be no impact to essential fish habitat in the Mystic River estuary.

4.5.2 Riparian and Wetland Vegetation

Construction

All riparian vegetation will be cleared from 1,200 feet along the east side of the river and 400 feet along the west side of the river. Approximately 0.75 acre of existing wooded riparian habitat will be cleared, including about 425 trees. Additional trees growing on or within the granite block protection on the west side of the river will also be cleared. A narrow fringe of federal wetland vegetation growing along the top of the protection will be affected. This wetland fringe is zero to 1 ft wide and less than 2000 sf. will be impacted. The minor loss of wetland will be fully mitigated (see below) and is not considered a significant impact. Vegetation growing on or within the granite block structure is not considered a federal wetland resource. No mudflat will be affected. The cleared area will be replaced with 1.0 acre of bank and floodplain terrace planted with shrubs. The terrace will be 1-2 ft above the normal river elevation and will support wetland vegetation. The current design leaves no room to plant trees on the top of the bank along the east side of the river.

Post Construction

Vegetation growing within the east bank of the river will be limited to shrubs which do not have a significant impact on flood flow conveyance. From time to time the Town of Winchester will need to selectively clear shrubs and trees that grow above a maximum allowable size threshold. The net effect will be replacement of the existing forested

riparian community with a shrub community growing on the bank and floodplain terrace. There will be a net 0.25 acre increase in riparian habitat. This includes a loss of 0.75 acres of wooded habitat and a 1.0 acre increase in scrub-shrub vegetation. Construction of the 20 ft. wide terrace will create approximately 0.5 acre of new riparian scrub/shrub wetland. The new wetland terrace will more than compensate for the loss of the existing fringe wetland present above the granite block protection.

4.5.3 Wildlife

Construction

Construction activity will disturb wildlife inhabiting the work area for about 4 months. Some loss of nesting wildlife may occur since clearing will likely occur in May before all nesting birds are likely to have fledged. As discussed for fish, turtles may be trapped within dewatered cells and where possible will be captured and relocated to the free flowing river.

Post Construction

Habitat value of the area will be very low for several years while shrub cover develops within the widened river channel. Eventually, low trees and shrubs growing along the river will provide habitat for both resident and migratory songbirds. Species using the area will change in response to changes in vegetation. Loss snags will reduce foraging and nesting by species such as chickadees and nuthatches. Food supply for birds and small mammals which use seed from mast producing trees (i.e. maple, oak, and ash) will decline. Habitat for birds which prefer shrub habitat will be enhanced. Dogwoods, willows and other wetland shrubs will provide cover, nesting, and foraging (insects, fruit, and seed) habitat. As discussed above, the narrow size of the riparian corridor and proximity to the Mystic Valley Parkway and the Winchester permit parking lot currently limits the value of the area for wildlife habitat. Post construction, the riparian corridor will be slightly wider, but disturbance of the area by people using the depressed walking path will further compromise value of the area for wildlife. The net effect of the project on wildlife will likely be neutral, with a 0.25 acre increase in riparian habitat and 1.0 acre of new shrub habitat balanced against loss of tree cover, loss of mast producing vegetation, snags and cavity trees, and increased disturbance by people.

4.5.4 Rare or Protected Species

No rare or protected species are known to occur in the study area.

4.6 Cultural Resources

4.6.1 Historic Architectural Resources

The proposed project is unlikely to impact historical properties identified adjacent to, but outside of the project boundary. No further review of the project for those properties is recommended.

PAL recommends that intensive survey be conducted for the Bacon Street Bridge and USGS Stream Gaging Station to evaluate whether these properties are eligible for listing in the National Register of Historic Places.

No further evaluation is recommended for the dam or the pedestrian bridge.

The proposed project has the potential to impact the Waterfield Road Bridge which is a contributing element within the Winchester Center Historic District. The bridge is a cast concrete single shallow arch structure with small spandrel walls. The superstructure has a decorative parapet of tapered balusters topped with a cap, all constructed of cast concrete. The bridge was designed by Herbert Kellaway and constructed circa 1914. Any plans that require alterations to the bridge should be submitted to the MHC for review during the early design stage of the project. However, at this time, alterations to the bridge are neither expected or projected as part of the Corps project.

Additionally, a portion of the Mystic Valley Parkway bisects the project area between Waterfield Road and Bacon Street. The Parkway dates to the 1890's and was recently nominated to the National Register. The project has the potential to impact portions of the Parkway in Winchester. As project design develops, plans should be submitted to the MHC for review and approval in the early stages of the process. At the completion of the surveys for the above referenced resources, a formal determination of effect on historic architectural resources, including the Mystic Valley Parkway, will be made at that time. Adverse effects will be mitigated through the development of a Memorandum of Agreement in consultation with the Massachusetts Historical Commission.

All of these properties are depicted on Figure 1a (Location of Project Elements 1, 2, and 17) of PAL's Technical Memorandum, Historic Architectural Assessment for the Aberjona River Flood Control Project, Winchester, Massachusetts dated January 23, 2006 and included as Appendix C (Archaeological and Historical Resources Report) of the MEPA Draft EIR prepared for the town of Winchester by ENSR Corporation.

4.6.2 Archaeological Resources

Based on the results of the site file search and walkover survey, an intensive (locational) survey is recommended for those areas assessed as archaeologically sensitive within the Waterfield Road to Bacon Street project area, specifically a somewhat rectangular area on both sides of the river and south of Waterfield Road; an irregularly shaped area on the east bank of the river and directly across from Mystic Avenue; and an elongated area on the western bank of the river extending roughly south from the Ginn Road athletic fields to Bacon Street. Following completion of these archaeological studies, a formal determination of effect on archaeological resources will be formulated. As above for historic architectural resources, adverse effects will be mitigated through the

development of a Memorandum of Agreement in consultation with the Massachusetts Historical Commission.

These areas are depicted on Figure 2 of PAL's Technical Memorandum, Archaeological Assessment for the Aberjona River Flood Control Project, Winchester, Massachusetts dated January 20, 2006 and included as Appendix C (Archaeological and Historical Resources Report) of the MEPA Draft EIR prepared for the town of Winchester by ENSR Corporation. The Massachusetts State Historic Preservation Officer has concurred with these recommendations. We have received no response from the Wampanoag Tribe concerning this project.

4.7 Socio-Economic Resources

4.7.1 Flood Damages

The recommended plan will provide flood stage/damage reduction benefits for the business district of downtown Winchester and residential areas. The recommended plan's annual flood damage reduction (benefit) for the community is estimated at $68,000. The implementation of the recommended plan would realize $4,900 in net annual benefits, and a Benefit-to-Cost Ratio (BCR) of 1.1. Disruption to transportation, schools, and commerce caused by flooding will be reduced.

4.7.2 Infrastructure

The recommended plan will alter approximately 0.4 acres of public parkland along the Mystic Valley Parkway. Existing trees, lawn, and a pathway will be lost to accommodate enlargement of the river channel. Although a breadown lane will remain, approximately 45 parking spaces along the parkway will likely be permanently lost. The project will have no effect on Town of Winchester parking areas or the MWRA sewer lines that run along the west side of the Aberjona River.

4.7.3 Recreation and Aesthetics

Construction

Construction activities will disrupt use of walkways along the Mystic Valley parkway and use of some recreational facilities at Ginn Field. The Ginn Field basketball court and adjacent parking area will be used as a staging area for construction equipment and construction offices. The Town of Winchester may close the adjacent playground during construction but use of the Ginn Field athletic fields is expected to be unaffected. The Ginn Field footbridge will remain open. People using the pathway along the river side of the Mystic Valley Parkway will be diverted to sidewalks on the east side of the parkway. Use of Manchester Field and Knowlton Stadium will be unaffected.

Post Construction

Loss of the tree-lined open space along the Aberjona River will have a long term negative aesthetic impact along an 850 ft. length of the Mystic Valley Parkway. This impact is unavoidable.

The depressed sidewalk will replace the existing walkway along the Mystic Valley Parkway. Most people will probably continue to favor walking on this side of the river but some may prefer to cross the parkway and use the sidewalk along Manchester Field. The proximity of the depressed sidewalk to the parkway (see Figure 1), however, is far from ideal. People using the sidewalk will be exposed to road noise, exhaust, and road spray. Relocating the sidewalk further down the embankment could buffer pedestrians from these impacts. The depressed sidewalk will be isolated from view and the flood wall at the top of the embankment will likely be subject to damage by graffiti.

4.7.4 Traffic

The Mystic Valley Parkway will remain open during the 4 month construction period. Occasional traffic delays will occur to accommodate truck traffic and movement of other construction equipment. Approximately 1000 round trips of dump trucks out of Winchester will be required to remove material excavated from the enlarged river channel. A police detail will be continually present during construction to insure public safety and improve traffic flow.

4.7.5 Environmental Justice and Protection of Children

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of an agency's programs, policies, and activities on minority populations and low-income populations. The proposed project is not expected to pose impacts upon any minority or low-income neighborhoods adjacent to or in the vicinity of the project pursuant to Executive Order 12898. Construction of the proposed project will be beneficial to all citizens of Winchester. The project would have no adverse impact on environmental justice populations in surrounding towns mapped by the MA EOE. Therefore, no disproportionately high and adverse impacts specific to any minority or low-income neighborhood would occur as a result of the proposed project.

Executive Order 13045 "Protection of Children from Environmental Health Risks and Safety Risks" requires federal agencies to examine proposed actions to determine whether they will have disproportionately high human health or safety risks on children. During the construction phase of the proposed project, heavy construction equipment and vehicles will be transported to and stored at the site. The staging area will include the parking area at Ginn field and part of the field. Use of the Ginn Field playground and fields will be curtailed during construction. The actual site will be fenced off to prevent unauthorized personnel from entering the work area (including children). In addition,

there will be a temporary increase in truck traffic transporting materials to and from the site. These trucks will be limited to public roadways and increased traffic will be of short duration and temporary. Therefore, the proposed project is not expected to cause any disproportionate direct, or indirect or cumulative environmental health or safety risks to children.

4.8 Air Quality

U.S. Army Corps of Engineers guidance on air quality compliance is summarized in Appendix C of the Corps Planning Guidance Notebook (ER1105-2-100, Appendix C, Section C-7, pg. C-47). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA state implementation plans for geographic areas designated as non-attainment and maintenance areas under the CAA. The EPA General Conformity Rule to implement Section 176 (c) is found at 40 CFR Part 93.

Clean Air Act compliance, specifically with USEPA's General Conformity Rule, requires that all Federal agencies, including Department of the Army, to review new actions and decide whether the actions would worsen an existing National Ambient Air Quality Standards (NAAQS) violation, cause a new NAAQS violation, delay the State Implementation Plan (SIP) attainment schedule of the NAAQS, or otherwise contradict the State's SIP.

The Commonwealth of Massachusetts is authorized by the USEPA to administer its own air emissions permit program, which is shaped by its SIP. The SIP sets the basic strategies for implementation, maintenance, and enforcement of the NAAQS. The SIP is the federally enforceable plan that identifies how that state will attain and/or maintain the primary and secondary NAAQS established by the USEPA. In Massachusetts, Federal actions must conform to the Massachusetts state implementation plan or Federal implementation plan. The Corps must evaluate and determine if the proposed action (construction and operation) will generate air pollution emissions that aggravate a non-attainment problem or jeopardize the maintenance status of the area for ozone. When the total direct and indirect emissions caused by the operation of the Federal action/facility are less than threshold levels established in the rule (40 C.F.R. § 93.153), a Record of Non-applicability (RONA) is prepared and signed by the facility environmental coordinator.

Construction would occur over a total period of about 4 months, with work being done in the summer and fall. Construction activity at the proposed project site would require excavators, a crane, dump trucks, pickup-trucks, front-end loaders, and other construction equipment.

During construction, equipment operating at Winchester will emit pollutants that contribute to increased levels of criteria pollutants such as carbon monoxide, nitrogen oxides, and ozone. The emissions for construction vehicles and related equipment will have an insignificant impact to local air quality.

Construction of the proposed project could cause a temporary reduction in local ambient air quality because of fugitive dust and emissions generated by construction equipment. The extent of dust generated would depend on the level of construction activity and dryness. Proper dust suppression techniques would be employed to avoid creating a nuisance for nearby residents during dry and windy weather.

In order to minimize air quality effects during construction, all construction operations would comply with applicable provisions of the Commonwealth of Massachusetts air quality control regulations pertaining to dust, odors, construction, noise, and motor vehicle emissions. No direct or indirect increases or other changes in local or regional air quality are likely to occur with the construction and operation of the proposed project.

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. Federal agencies make this demonstration by performing a conformity review. The conformity review is the process used to evaluate and document project-related air pollutant emissions, local air quality impacts and the potential need for emission mitigation. A conformity review must be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. Non-attainment areas are geographic regions where the air quality fails to meet the NAAQS.

The project is located in Middlesex County, Massachusetts. Middlesex County is considered to be non-attainment for ozone, receiving a “moderate” classification under the new 8-hour ozone air quality classification. The General Conformity thresholds for ozone in a moderate non-attainment area have an emission rate threshold of 50 tons per year (tons/year) of VOC (volatile organic compounds) and 100 tons/year of NO_x (nitrogen oxides) (40 CFR 51.853, 7-1-03).

To conduct a general conformity review and emission inventory for the proposed project, a list of construction equipment was identified. The New England District prepared calculations of the worst-case project specific emissions of NOx and VOCs to determine whether project emissions would be under the General Conformity Trigger Levels (see Attachment). Because of the small scale of the project, several simplifying assumptions were applied in performing the calculations to prepare a worst-case analysis. The actual emissions would most likely be much lower, but in no case above the calculated values. For instance, the load factor is the average percentage of rated horsepower used during a source’s operational profile. To simplify the calculations, we used a worst-case estimate of 1.0, or 100 percent, for all equipment. We used 12 hours per day as worst-case hours of operation for most equipment. We used the total construction duration minus non-work days (i.e. holidays, weekends, and weather days) to estimate days of operation, rather than the specific days of operation for each piece of equipment. Based on these calculations, the worst-case NOx emissions was 24.4 tons and the worst-case VOC

emissions was 3.5 tons. In both cases, the total construction emissions were below the General Conformity Trigger Levels.

The determination of whether or not a project is regionally significant is if its emissions exceed 10% of the state's total emissions budget for the criteria pollutants (40 CFR 93.153 (i)). Table IV – 1 of the 2002 Eastern Massachusetts Supplement to the July 1998 Ozone Attainment State Implementation Plan Submittal (MADEP, 2002), lists the total emissions inventories for emissions sources in the state for various years, and predicts estimated inventories for 2007. As noted, the emissions for project are estimated to be 3.5 and 24.4 tons *per year* for both VOCs and NOx respectively. These inventories are calculated as tons per summer day (tpsd) and show that for mobile sources alone, total values of 117.1 tpsd of VOCs and 243.3 tpsd of NOx are predicted for 2007. These values show that *in less than one day*, mobile sources alone within the area of Eastern Massachusetts would exceed the yearly estimated emissions for both VOCs and NOx for the proposed flood control project. Therefore the estimated emissions for the proposed project are below 10% of the total emissions inventory for the Commonwealth of Massachusetts. The activity does not reach the threshold levels established by the USEPA rule, and is not regionally significant, and therefore the conformity rule is inapplicable here.

4.9 Relative Impacts of Alternative Plans

This section briefly compares the environmental consequences of the recommended versus alternative plans (see Section 2.2 for description of alternative plans). All the plans have similar impacts on stream habitat, water quality, and aquatic life. They differ mainly in cost, flood control benefits, the fate of the pathway and parking along the river side of the Mystic Valley Parkway, and the type of vegetation that would grow in restored riparian habitat. Plan 3 was rejected because it does not provide adequate flood control benefits. Plan 2 was eliminated from detailed consideration because the Town of Winchester required a sidewalk along the river side of the Mystic Valley Parkway for public safety. This leaves Plan 1 and the recommended plan. These plans have similar flood control benefits and both maintain a sidewalk on the river side of the parkway. Plan 1 involves construction of a floodwall and is much more costly than the recommended plan. The sidewalk would be at normal grade in Plan 1 and below grade (less desirable) in the recommended plan. Plan 1 would preserve parking along the riverside of the parkway and allow for planting trees along the parkway to retain some of its aesthetic and historic landscape character. The benefits and impacts of the plans are summarized in Table 13.

4.10 Cumulative Impacts

There are no other current or anticipated future actions related or unrelated to this project which would adversely affect stream habitat, riparian habitat, or parkland along the Aberjona River in Winchester. After more than a century of development that reduced the extent of wetland and riparian habitat in the study area (see Section 3.2), this project

Table 13: Comparison of Alternatives

Alternative	Annual Benefits, Cost & BCR	Aquatic Habitat	Riparian Vegetation	Sidewalk	Parking	Aesthetics
Plan 1 39 ft channel with wall	B: $68,000 C: $81,600 BCR: 0.8	20 ft low flow channel	Trees (west bank) and shrubs.	Relocated closer to Mystic Valley Parkway.	Parking along river (west) side of parkway.	Landscape trees along parkway.
Plan 2 39 ft channel with slope	N.A.	20 ft low flow channel.	Trees (west bank) and shrubs.	Only on west side of Mystic Valley Parkway. Not acceptable to Sponsor.	No safe parking along river (west) side of parkway.	Trees along top of slope.
Plan 3 32 ft channel with slope	B: $37,800 C: $41,800 BCR: 0.9	20 ft low flow channel.	Trees and shrubs.	Relocated closer to Mystic valley Parkway.	Parking along river (west) side of parkway.	Trees along top of slope.
Plan 4 39 ft channel with slope & depressed sidewalk	B: $ 68,000 C: $63,100 BCR: 1.1	20 ft low flow channel.	Trees (west bank) and shrubs	Below grade along Mystic Valley Parkway.	No safe parking along river (west) side of parkway.	No trees along parkway. Guardrail only.

will be the first to result in a net increase in riparian habitat. Other recently completed or anticipated actions related to this project (see section 2.3) will also have positive impacts on riverine habitat. These include the recent removal of a dam upstream of the project area. The Massachusetts Rivers Protection Act provides strong protection to land near perennial streams and makes future development of riparian habitat along the Aberjona River unlikely.

The project would result in the conversion of some parkland (turf) along the Mystic Valley Parkway to riparian habitat. From a recreational perspective this is undireserable. Loss or conversion of public parkland to other uses is discouraged by Article 97 of the Massachusetts constitution and is subject to review by the Massachusetts Executive Office of Environmental Affairs. The local sponsor may be required to mitigate for impacts of the recommended plan to parkland along the Mystic Valley Parkway. No other current or proposed actions are expected to impact parkland along the Mystic Valley Parkway.

5.0 Measures to Minimize Adverse Consequences

The following plans will be developed and implemented to reduce adverse environmental affects of the recommend plan:

a. Excavated Materials Management Plan

A plan will be developed for the handling, dewatering, testing, transport, and disposal of excavated material. Handling and disposal options will vary with soil/sediment quality as discussed in Section 3.7. The plan will include measures to minimize space required for staging areas.

b. Erosion/Sedimentation Control and Wastewater Management Plan

A plan will be developed to protect water quality and minimize sediment transport during excavation work and removal of the USGS weir. Wastewater generated by dewatering processes will be treated to remove sediment before discharge back in to the Aberjona River. The plan will describe the treatment plan design, operation, performance standards, and monitoring and reporting requirements. The plan will describe measures to manage runoff from staging areas, and control erosion from disturbed areas. The plan will also include a spill control plan that will be implemented if petroleum products, other hazardous materials, or wastewater from the MWRA sewer system is inadvertently released into the environment.

c. Invasive Species Monitoring and Control Plan

This plan will describe measures to prevent establishment of invasive species in the widened channel area.

d. Traffic Control and Recreation Management Plan

A plan to minimize construction impacts on traffic and recreational use (walking, biking) of project area will be developed. The plan will be fully coordinated with the Winchester police and parks departments. The following issues and others identified during plans and specifications will be addressed: 1) use of traffic control officers, 2) timing and location of road and lanes closures, 3) signal timing adjustments, 4) use of traffic control signs, 5) measures to avoid delays to emergency vehicles, 6) temporary relocation of paths for recreational use, 7) time of work restrictions (evenings, weekends), 7) truck queuing locations, 8) idling of truck engines, 9) location of contractor parking areas, and 10) coordination during construction with police and parks department personnel. The plan will be reviewed and approved by the Sponsors and city and state transportation officials.

e. Noise impacts

A plan to minimize noise impacts on nearby institutions and residences will be prepared.

f. Fish/Wildlife Relocation Plan

A plan to relocate any American eel, other fish, and turtles isolated from the Aberjona River by construction cells will be developed and implemented.

g. Historic and/or Archaeological Impacts

At the completion of the referenced historic architectural and archaeological investigations, impacts to significant cultural resources will be evaluated during the design phase of the project. Additionally, impacts to the Mystic Valley Parkway, a National Register Historic Site, would be evaluated at this time. Coordination with the MA SHPO will continue and if adverse impacts are identified, a Memorandum of Agreement will be prepared which will document mitigation measures to be undertaken as a result.

6.0 Study Coordination

6.1 General

Coordination efforts during this feasibility study and an associated Environmental Impact Report prepared for MA Environmental Protection Act compliance have included numerous meetings with resource agencies to discuss alternative plans and their impacts. Several public information meetings were also held in Winchester to discuss alternative flood reduction plans. These meetings were well attended by both area and local residents.

The following is a list of agencies and groups that were coordinated with during the course of the study:

Federal Agencies
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- National Marine Fisheries Service

Commonwealth of Massachusetts
- Department of Environmental Management
- Department of Conservation and Recreation
- Department of Environmental Protection
- Massachusetts Division of Marine Fisheries
- Massachusetts Executive Office of Environmental Affairs
  - MEPA Office and Office of Coastal Zone Management

Town of Winchester
- Conservation Commission
- Planning and Engineering Office
- Board of Health
- Town Counsel
- Office of the Selectmen
- Town Manager

Citizens Group
- Friends of the Mystic River
- Project Impact

6.2 Correspondence

During preparation of the draft EA coordination letters were sent to the following agencies:

- U.S. Fish and Wildlife Service New England Field Office
- National Marine Fisheries Service
- United States Environmental Protection Agency, Region I
- Massachusetts Division of Marine Resources
- Massachusetts Office of Coastal Zone Management
- Massachusetts MEPA Office
- Massachusetts DEP Wetlands and Waterways
- Massachusetts Historical Commission

A request for Fish and Wildlife Coordination Act Report (FCAR) was sent to the United State Fish and Wildlife Service - New England Field Office in February of 2007. In the FCAR, dated October 4, 2007, the USFWS indicated no objection to the project with regard to the Fish and Wildlife Coordination Act. A copy of the FCAR is attached to the EA.

6.3 Public Notice

A public notice announcing the availability of the Environmental Assessment for public review was issued on xxx. The notice was sent to approximately xx parties, including all those known to have an interest in the Aberjona River project and general mailing lists maintained by New England District Regulatory Division. A copy of the public notice is provided as an attachment.

6.4 Availability of Draft Decision Document and EA

Copies of the draft decision document and EA were sent to the following federal, state, and local government agencies:

List to be added

Copies of the draft Decision Document and EA were available for public review at several locations: the Winchester Public Library, Winchester Town Clerk, and the Town of Winchester Engineering Department. Copies of the documents were also available on CD at the public information meetings and upon request. The entire report was also available on the Corps of Engineers New England District website.

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8.0 COMPLIANCE WITH FEDERAL ENVIRONMENTAL STATUTES, EXECUTIVE MEMORANDUM, AND EXECUTIVE ORDERS

8.1 FEDERAL STATUTES.

1. Archaeological Resources Protection Act of 1979, as amended, 16 USC 470 et seq.

Compliance: Not applicable. Project will not excavate or remove archaelogical reosuces located on public or Indian lands.

2. Preservation of Historic and Archeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq.

Compliance: Project has been coordinated with the State Historic Preservation officer. Impacts to archaeological resources will be mitigated.

3. American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.

Compliance: Not applicable. Project will not impact access by Native Americans to sacred sites, possession of sacred objects, or freedom to worship through ceremonials and traditional rites.

4. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Public notice of the availability of this report to the Environmental Protection Agency is required for compliance pursuant to Sections 176c and 309 of the Clean Air Act.

5. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.

Compliance: A Section 404(b)(1) Evaluation and Compliance Review will been incorporated into the project report. An application shall be filed for State Water Quality Certification pursuant to Section 401 of the Clean Water Act.

6. Coastal Zone Management Act of 1782, as amended, 16 U.S.C. 1451 et seq.

Compliance: Not applicble. The project is not located in the coastal zone.

7. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with the U.S. Fish and Wildlife Service determined no formal consultation requirements pursuant to Section 7 of the Endangered Species Act.

8. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Compliance: Applicable only if report is being submitted to Congress. Project in not in an estuary.

9. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Public notice of availability to the project report to the National Park Service (NPS) and Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

10. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the FWS, NMFS, and State fish and wildlife agencies signifies compliance with the Fish and Wildlife Coordination Act.

11. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Public notice of the availability of this report to the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

12. Marine Protection, Research, and Sanctuaries Act of 1971, as amended, 33 U.S.C. 1401 et seq.

Compliance: Not applicable. Project does not involve the transportation or disposal of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

13. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Compliance: Coordination with the State Historic Preservation Office signifies compliance.

14. Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3000-3013, 18 U.S.C. 1170

Compliance: Regulations implementing NAGPRA will be followed if discovery of human remains and/or funerary items occur during implementation of this project.

15. National Environmental Policy Act of 1969, as amended, 42 U.S.C 4321 et seq.

Compliance: Preparation of this Environmental Assessment signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

16. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for projects or programs authorized by Congress. The proposed flood control and aquatic ecosystem restoration project is being conducted pursuant to the Congressionally-approved authority.

17. Watershed Protection and Flood Prevention Act as amended, 16 U.S.C 1001 et seq.

Compliance: Floodplain impacts have been considered in project planning.

18. Wild and Scenic Rivers Act, as amended, 16 U.S.C 1271 et seq.

Compliance: Not applicable. This project is not located on a designated Wild and Scenic River.

19. Magnuson-Stevens Act, as amended, 16 U.S.C. 1801 et seq.

Compliance: Not applicable.

20. Farmland Protection Policy Act, 7 U.S.C. 4201 et. seq.

Compliance: Not. applicable. The project will not contribute to the conversion of farmland to nonagricultural uses.

8.2 Executive Orders

1. Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971

Compliance: Coordination with the State Historic Preservation Officer signifies compliance.

2. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

Compliance: Project will be designed to minimize adverse effects on floodplain. Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a) (2) (ii).

3. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: The proposed action includes all practicable measures to minimize harm to wetlands. Public notice of the availability if this report for public review fulfills the requirements of Executive Order 11990, Section 2 (b).

4. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not applicable. Applies to projects located outside the United States.

5. Executive Order 12898, Environmental Justice, 11 February 1994.

Compliance: Based on the findings in the EA, the proposed project is not expected to have a disproportionately high and adverse impact to minority or low income populations surrounding the project area.

6. Executive 13007, Accommodation of Sacred Sites, 24 May 1996

Compliance: Not applicable. Project is not on Federal lands where agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites.

7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. 21 April, 1997.

Compliance: Based on the findings in the EA, the proposed project will not create a disproportionate environmental health or safety risk for children.

8. Executive Order 13112, Invasive Species

Compliance: Project will not cause or promote introduction or spread of invasive species in the United States.

9. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000.

Compliance: Consultation with Indian Tribal Governments, where applicable, and consistent with executive memoranda, DoD Indian policy, and USACE Tribal Policy Principles signifies compliance.

8.3 Executive Memorandum

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not applicable. The project does not involve or impact agricultural lands.

2. White House Memorandum, Government-to-Government Relations with Indian Tribes, 29 April 1994.

ATTACHMENT A

Finding of No Significant Impact (FONSI)

DRAFT
FINDING OF NO SIGNIFICANT IMPACT

Local Flood Protection Project
Aberjona River
Winchester, Massachusetts

The Aberjona River flows through the densely-developed town center of Winchester, Massachusetts. Over the past decade the Winchester has experienced four floods (October 1996, June 1998, March 2001, and March 2004) which disrupted the community and led to significant economic losses. The frequency of the flooding along the Aberjona has prompted the Town of Winchester to ask the U.S. Army Corps of Engineers (ACOE) to investigate the causes of, and possible solutions to, the problem.

Alternatives considered included and several channel widening plans. The recommended plan consists of widening the Aberjona River channel bottom to a maximum width of 39 feet. The widening would extend downstream 1,200 lf from the Waterfield Road Bridge (see Environmental Assessment, Figure 1). The project includes the relocation of the Mystic Valley Parkway's drainage outfalls, pedestrian sidewalk and the removal of the USGS concrete weir abutments. The weir would be replaced by the USGS with an electrical sensing probe. The widened channel will include a 20 foot wide and 2 foot deep low flow channel and a floodplain terrace. Slopes will be stabilized by a cellular confinement system. A 6 ft wide sidewalk will be incorporated into the slope. Where the parkway narrows closest to the river a 4 foot high modular wall section will be constructed at the top of bank. The vertical wall will support the parkway while allowing for the depressed sidewalk to be constructed (see Environmental Assessment, Figure 1).

Construction would proceed in small segments downstream from the Waterfield Road Bridge. Construction will be accomplished during the low flow season. Initially, all trees growing along the east bank of the river will be cleared. Trees growing along the west bank within or below existing granite block slope protection will also be removed. Granite block protection along the west bank will be repositioned as required. Granite block within the river, snags, and other obstructions within the channel will be removed. After clearing of vegetation, construction will be accomplished within a series of sheet pile cells or other temporary water control measures. Coffer dams cells will be dewatered. The water will be filtered and discharged into the river. Material will be excavated using a long-reach excavator from the parkway side of the river. Excavated material will be reused or delivered to an upland (non-wetland) site for disposal. Once the initial excavation section is completed the contractor will construct a 1 on 1 bioengineered side slope along the riverbank base for stabilization. The restored slope and floodplain terrace will be seeded and planted with shrubs.

No significant adverse impacts to the environment are anticipated. My determination of a Finding of No Significant Impact is based on the Environmental Assessment and the following considerations:

a) Construction may result in a localized, short-term increase in suspended solid load in the Aberjona River. Sediment loading will be minimized by working in cells isolated from the river, by employing standard erosion control techniques, and by scheduling the construction during the low flow season.

b) No adverse long term effects on stream temperature or other water quality parameters are expected.

c) The project will result in a net increase of vegetated riparian habitat.. The existing forested riparian community, however, will be replaced with a shrub dominated community. Except for a narrow fringe along the river, no vegetated wetland will be disturbed. Construction of the floodplain terrace will result in a net increase of wetland habitat.

d) There will be no significant long-term adverse impacts on aquatic habitat. Removal of the USGS gauging station weir will return the river to a more free flowing condition and improve fish passage for resident and anadromous species.

e) This project will have no impact on any Federal or state listed rare or endangered species.

f) Unavoidable adverse affects on recreation will be mitigated by incorporating a sidewalk into the restored channel side slope.

g) The project area could contain significant archaeological or architectural resources. An intensive level archaeological survey and additional historic documentation studies will be conducted during development of Plans and Specifications. Aesthetics along the Mystic Valley Parkway, a roadway listed on the National Registry of Historic Places, will be adversely affected. As project design develops, plans will be submitted to the Massachusetts Historical Commission for review and approval in the early stages of the process. The project may require a Memorandum of Agreement to assist in avoiding, minimizing, or mitigating for adverse affects.

h) Measures listed in Section 5.0 of the Environmental Assessment to minimize adverse environmental consequences will be implemented.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the Aberjona River Local Flood Control Project is not a major Federal action significantly affecting the quality of the human environment. Therefore, I have determined that this project is exempt from the requirement to prepare an Environmental Impact Statement.

_____ _____

Date

Curtis L. Thalken
Colonel, Corps of Engineers
District Engineer

ATTACHMENT B

404(b)(1) Evaluation

NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS, WALTHAM, MA
CLEAN WATER ACT SECTION 404(b)(1) EVALUATION

PROJECT: Winchester, Massachusetts Local Protection Project

PROJECT MANAGER: Mr. Robert Russo EXT. 978-318-8553

FORM COMPLETED BY: Mr. Michael Penko EXT. 978-318-8139

PROJECT DESCRIPTION:

Option 4 was selected as the recommended plan (see Environmental Assessment, Figure 1). The plan will widen the river's channel to a maximum width of 39 ft for 1,200 lf downstream from the Waterfield Road Bridge. The project includes the relocation of the Mystic Valley Parkway's drainage outfalls and the removal of the USGS concrete weir. The USGS will replace the weir with an electrical sensing probe. Existing granite revetment along the east side of the river will be removed and replaced with an engineered slope using a cellular confinement system (geocell). The toe of the geocell will be covered with riprap to resist scouring. Geocells will be vegetated with shrubs. The bottom of the channel will consist of an 20 ft wide vegetated shelf and a 2 foot deep 20 ft. wide low flow channel. To provide sufficient flowage capacity, a 400 ft section of the embankment along the west sided of the river may also need to be cleared and stabilized with a geocell system. The extent of clearing required within this section will be determined during design. The design, however, will avoid clearing trees on the upper slopes of the west bank to the greatest practical extent. Along the remainder of the west bank, all trees growing below or within the granite block protection will be cleared. Trees in good health growing above the granite block protection will remain. Most construction will occur in the dry, within a series of temporary cells constructed using a portable coffer dam system. Construction will occur from upstream to downstream and would take about three to four months to complete. All work will occur from the east bank, minimizing risk to the MWRA sever line, impacts to vegetation on the west side of the river, and the Town of Winchester permit parking lot. Test results (see Environmental Assessment, Section 3.7.2) indicate excavated material (9,100 CY) will be mostly clean sand with some gravel and rock. It will be transported offsite for reuse or disposal at a landfill. The restored slope and floodplain terrace will be seeded and planted with shrubs. There will be a net 0.25 acre increase in vegetated riparian habitat and a net 0.5 acre increase in vegetated (scrub-shrub) wetland. During preparation of plans and specifications, plans will be developed to manage excavated materials, control erosion and sedimentation, monitor and control invasive species, and relocate fish and wildlife from temporarily dewatered areas of the Aberjona River.

NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS, CONCORD, MA

PROJECT: Aberjona, MA Local Flood protection Project

CLEAN WATER ACT
Evaluation of Section 404(b)(1) Guidelines

1. Review of Compliance (Section 230.10(a)-(d)).

a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose;

__X__ YES ___ NO

b. The activity does not appear to:
1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA;
2) jeopardize the existence of Federally listed threatened and endangered species or their critical habitat; and
3) violate requirements of any Federally designated marine sanctuary,

__X__ YES ___ NO

c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values;

__X__ YES ___ NO

d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

__X__ YES ___ NO

2. Technical Evaluation Factors (Subparts C-F).

	N/A	Not Signif-icant	Signif-icant*
a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C).			
1) Substrate.	_____	__X__	_____
2) Suspended particulates/turbidity.	_____	__X__	_____

3) Water.		X	
4) Current patterns and water circulation		X	
5) Normal water fluctuations.		X	
6) Salinity gradients.	X		

b. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D).

1) Threatened and endangered species.	X		
2) Fish, crustaceans, mollusks and other aquatic organisms in the food web.		X	
3) Other wildlife.		X	

c. Potential Impacts on Special Aquatic Sites (Subpart E).

1) Sanctuaries and refuges.	X		
2) Wetlands.		X	
3) Mud flats.		X	
4) Vegetated shallows.		X	
5) Coral reefs.	X		
6) Riffle and pool complexes.	X		

d. Potential Effects on Human Use Characteristics (Subpart F).

1) Municipal and private water supplies.	X		
2) Recreational and Commercial fisheries.		X	
3) Water-related recreation.		X	
4) Aesthetics.		X	
5) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves.	X		

3. Evaluation and Testing (Subpart G).

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Only those appropriate are checked.)

1) Physical characteristics	X
2) Hydrography in relation to known or anticipated sources of contaminants	X
3) Results from previous testing of the material or similar material in the vicinity of the project	X
4) Known, significant sources of persistent pesticides from land runoff or percolation	
5) Spill records for petroleum products or designated hazardous	

substances (Section 311 of CWA)..... _____
6) Public records of significant introduction of contaminants from industries, municipalities, or other sources..... _____
7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities..... _____
8) Other sources (specify)..... _____

List appropriate references. See 2007 Environmental Assessment for the Winchester, MA Local Flood Control Project.

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria.

4. Disposal Site Delineation (Section 230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

1) Depth of water at disposal site..... ____
2) Current velocity, direction, and variability at disposal site..... ____
3) Degree of turbulence..... _____
4) Water column stratification..... _____
5) Discharge vessel speed and direction..... _____
6) Rate of discharge..... _____
7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)..... ____
8) Number of discharges per unit of time..... _____
9) Other factors affecting rates and patterns of mixing (specify)..... __X_

List appropriate references. See Environmental Assessment.

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or mixing zone are acceptable.

__X_ YES ___ NO

5. Actions To Minimize Adverse Effects (Subpart H).

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.

__X_ YES ___ NO

6. Factual Determination (Section 230.11).

A review of appropriate information as identified in items 2 - 5 above indicates that there is minimal potential for short or long term environmental effects of the proposed discharge as related to:

a. Physical substrate (review sections 2a, 3, 4, and 5 above). _X_ YES ___ NO

b. Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5). _X_ YES ___ NO

c. Suspended particulates/turbidity (review sections 2a, 3, 4, and 5). _X_ YES ___ NO

d. Contaminant availability (review sections 2a, 3, and 4). _X_ YES ___ NO

e. Aquatic ecosystem structure, function and organisms(review sections 2b and c, 3, and 5). _X_ YES ___ NO

f. Proposed disposal site (review sections 2, 4, and 5). c, 3, and 5). _X_ YES ___ NO

g. Cumulative effects on the aquatic ecosystem. _X_ YES ___ NO

h. Secondary effects on the aquatic ecosystem. _X_ YES ___ NO

7. Findings of Compliance.

The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines.

_____ _____

Date

Curtis L. Thalken
Colonel, Corps of Engineers
Commanding

ATTACHMENT C

Air Quality Compliance

RECORD OF NON-APPLICABILITY (RONA)

Emissions Calculations for:

Aberjona River Flood Control Project
Winchester, Massachusetts

GENERAL CONFORMITY - RECORD OF NON-APPLICABILITY

Project/Action Name:	**Aberjona River Flood Control Project, Winchester Massachusetts**
Project/Action Point of Contact:	*Jay Mackay, Chief Environmental Resources Section* *phone: 978-318-8142*

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because:

Total direct and indirect emission from this project/action are estimated at less than 100 tons for Ozone, and are below the conformity threshold value established at 40 CFR 93.153(b) of 100 tons/year of Ozone;

AND

The project/action is not considered regionally significant under 40 CFR 93.153(i).

Supporting documentation and emissions estimates are:

(X) ATTACHED
(X) APPEAR IN THE NEPA DOCUMENTATION (Section 6.8)
( ) OTHER

SIGNED_____
Jay Mackay, Evaluation Branch

General Conformity Review and Emission Inventory for Aberjona Flood Control Project

Construction Duration: 4 months (120 days)

Table 1. Project Emission Sources and Estimated Power

hp-hr = # of engines*hp*LF*hrs of operation

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile.

Equipment/Engine Category	# of engines	hp	LF	hrs/day	days of operation	hp-hr
Asph Sealcoater 200 Gal 108" W	1	20	1.00	12	5	1200
Track Excavator 70ft. Reach	1	166	1.00	12	75	149400
Crane Hyd TRK MTD 90T/114' Boom	1	192	1.00	12	10	23040
Dewatering Pump 12" Diesel	1	32	1.00	12	40	15360
LDR, BH, WH 1.25CY FE Bkt	1	86	1.00	12	75	77400
LDR, BH, WH 0.80CY FE Bkt	1	60	1.00	12	75	54000
Roller, VIB, DD, SP 6.0 T	1	130	1.00	12	5	7800
TRK Flatbed, 8'x12'	1	330	1.00	12	20	79200
TRK Rear Dump Body, 12 CY	8	240	1.00	12	75	1728000
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	2	137	1.00	12	80	263040
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	1	175	1.00	12	5	10500

Table 2. Emission Estimates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)
Emissions (tons) = Emissions (g) * (1 ton/907200 g)

NOx Emissions Factor for Off-Road Construction Equipment is 9.20 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
Asph Sealcoater 200 Gal 108" W	1200	9.20	0.01
Track Excavator 70ft. Reach	149400	9.20	1.52
Crane Hyd TRK MTD 90T/114' Boom	23040	9.20	0.23
Dewatering Pump 12" Diesel	15360	9.20	0.16
LDR, BH, WH 1.25CY FE Bkt	77400	9.20	0.78
LDR, BH, WH 0.80CY FE Bkt	54000	9.20	0.55
Roller, VIB, DD, SP 6.0 T	7800	9.20	0.08
TRK Flatbed, 8'x12'	79200	9.20	0.80
TRK Rear Dump Body, 12 CY	1728000	9.20	17.52
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	263040	9.20	2.67
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	10500	9.20	0.11
	Total NOx Project Emissions (tons) =		**24.43**

Table 3. Emission Estimates (VOCs)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)
Emissions (tons) = Emissions (g) * (1 ton/907200 g)

VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
Asph Sealcoater 200 Gal 108" W	1200	1.30	0.00
Track Excavator 70ft. Reach	149400	1.30	0.21
Crane Hyd TRK MTD 90T/114' Boom	23040	1.30	0.03
Dewatering Pump 12" Diesel	15360	1.30	0.02
LDR, BH, WH 1.25CY FE Bkt	77400	1.30	0.11
LDR, BH, WH 0.80CY FE Bkt	54000	1.30	0.08
Roller, VIB, DD, SP 6.0 T	7800	1.30	0.01

TRK Flatbed, 8'x12'	79200	1.30	0.11
TRK Rear Dump Body, 12 CY	1728000	1.30	2.48
TRK, HWY 8,800GVW 4x4 3/4T-PKUP	263040	1.30	0.38
TRK,WTR,OF-HY, 5000 Gal W/CAT613-C	10500	1.30	0.02
	Total VOCs Project Emissions (tons) =		**3.45**

Table 4. Pollutant Emissions from Employee Vehicles

Assumptions:			
	Average trip distance (1 way) =	25	miles
	Average NOx vehicle emission factor =	0.96	g/mile
	Average VOC vehicle emission factor =	0.84	g/mile
	Work crew comprised of	10	people
	Every member of the work crew drives their own vehicle.		
	Project construction period =	120	days
	Project construction occurs 5 days per week.	5	days/week
	There are 10 holidays in a calendar year.	10	holidays/year
	There are 30 weather days (no work) in a year.	10	weather days/year

Actual work days = Construction Period - Weekend Days off - Holidays off - Weather Days off

Actual work days = 80

NOx Calculation: # of workers * # of work days * 2 trips/work day * # of miles/trip * 0.96 g of NOx/mile

Total NOx resulting from employee vehicles = 0.04 tons

VOC Calculation: # of workers * # of work days * 2 trips/work day * # of miles/trip * 0.84 g of VOC/mile

Total VOCs resulting from employee vehicles (tons) = 0.04

ATTACHMENT D

Final Coordination Act Report (FCAR)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087

October 4, 2007

Reference:

Project	Location
Local Flood Protection Project Aberjona River	Winchester, MA

Mr. John R. Kennelly
Chief of Planning
U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Dear Mr. Kennelly:

This is in response to your letter requesting a final Fish and Wildlife Coordination Act report in relation to the subject project in Winchester, Massachusetts. The proposed project involves widening a previously channelized section of the river and removal of a USGS gauging station weir to alleviate flooding in Winchester's downtown area.

Based on our review of the information provided, we have no objection to this project with regard to the Fish and Wildlife Coordination Act. Accordingly, these comments do not preclude future evaluation and recommendations by the U.S. Fish and Wildlife Service, pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401: 16 U.S.C. 661 et seq.), should project conditions change.

Thank you for your coordination. Please contact us at 603-223-2541 if we can be of further assistance.

Sincerely yours,

Michael J. Amaral
Acting Supervisor
New England Field Office

ATTACHMENT E

Public Notice

Public Notice

U.S. Army Corps
Of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751

Date: November __, 2007

Comment Period Closes: November __, 2007

Planning Branch, Engineering/Planning Division

Aberjona River Flood Control Study

Winchester, Massachusetts

Interested parties are hereby notified that the U.S. Army Corps of Engineers has prepared an Environmental Assessment for a proposed flood damage reduction study in Winchester, Massachusetts. The study was conducted under the provisions of the Section 205 Continuing Authorities Program of the 1948 Flood Control Act, as amended. Comments are requested within 30 days of the date of this notice.

Project Description: Major floods have occurred in the Aberjona River basin in 1936, 1955, 1962, 1968, 1969, 1979, 1996, 1998, and 2001. A particularly severe flood in October 1996 was caused by a large rainfall following a period of wet conditions, and the area received a Presidential Disaster Declaration as a result of the flooding. Numerous homes, the high school and Winchester's retail/business downtown area were damaged by flooding from the Aberjona River. Although there are many flood problem reaches throughout the town, the downtown Winchester retail/business reach was the only area that the Corps could address under its authorities. This reach contains over fifty commercial, public, and residential structures, which together contain about 180 businesses as well as the town hall, the town fire and DPW buildings, a senior center, Winchester High School, and a post office. Figure 1 shows the area that was investigated.

To reduce the flood impacts to the community, 1200 ft. of the Aberjona River channel will be widened from about 20 ft to 39 ft. The widening will extend 1200 ft downstream of Waterfield Road Bridge and terminate just beyond the existing USGS Winchester gage. The widened reach runs along the Mystic Valley Parkway and some parkland would be lost to construct the channel. Figures 2 and 3 show the features of the proposed project.

The channel widening will involve the excavation of approximately 12,000 CY of riverbank material, mostly along the left bank of the Aberjona River. Along both sides of the river an existing granite block retaining wall will be removed and replaced with a bioengineered stabilization slope. At the location where the Mystic Valley Parkway is closest to the river, a 4-foot high, 850 l.f. modular/concrete wall would be constructed adjacent to the parkway to support the embankment. A sidewalk along the Mystic Valley Parkway will be relocated away from the widened river and be placed along the parkway.

The channel's existing low (summer) flow depth will be maintained by a 20 foot wide channel which would step up 2 feet into the new flood conveyance widened channel. The channel will be planted with herbaceous species, shrubs, and (at higher elevations) trees. Construction is projected to occur in 2009. The work is expected to take up to four months to complete. A private contractor under contract to the Corps would perform the work.

The following alternatives were also considered as solutions as part of this study's alternative analysis process.

Nonstructural
- Relocate Flood Prone Structures
- Land Treatment
- Pre Flood Measures
- No Action

Structural
- Flood Flow Bypass
- Upstream Flood Storage Potential
- Channel Modifications
- Earthen Dike and Floodwalls

With the exception of channel modifications, all of the flood reduction alternatives investigated during the study process were either found to be impractical or prohibitively expensive. The Environmental Assessment and Draft Detailed Project Report prepared for this investigation further explains the plan formulation and alternative selection process.

Figure 1 – Study Area

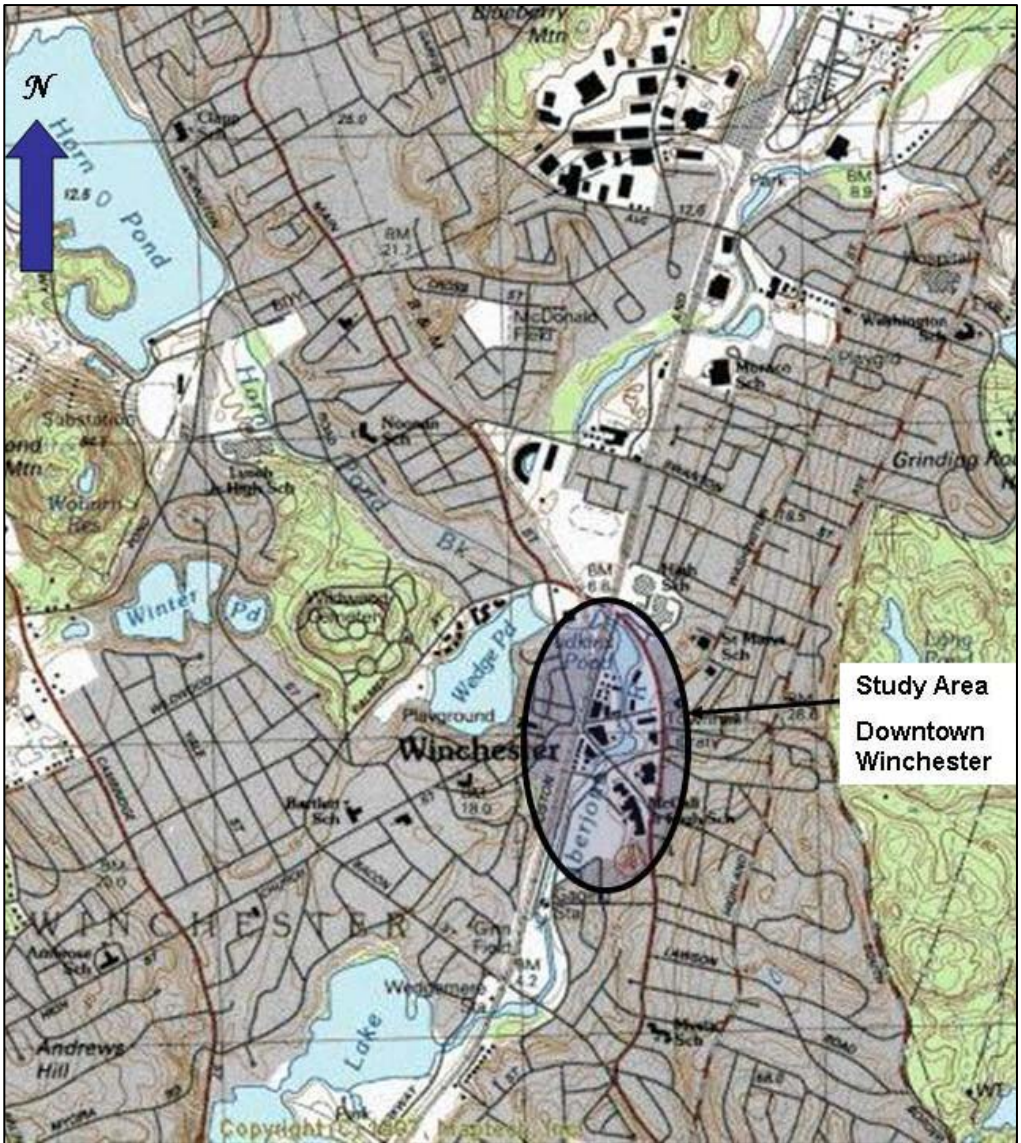


Figure 2 –Plan View Layout
Not to Scale

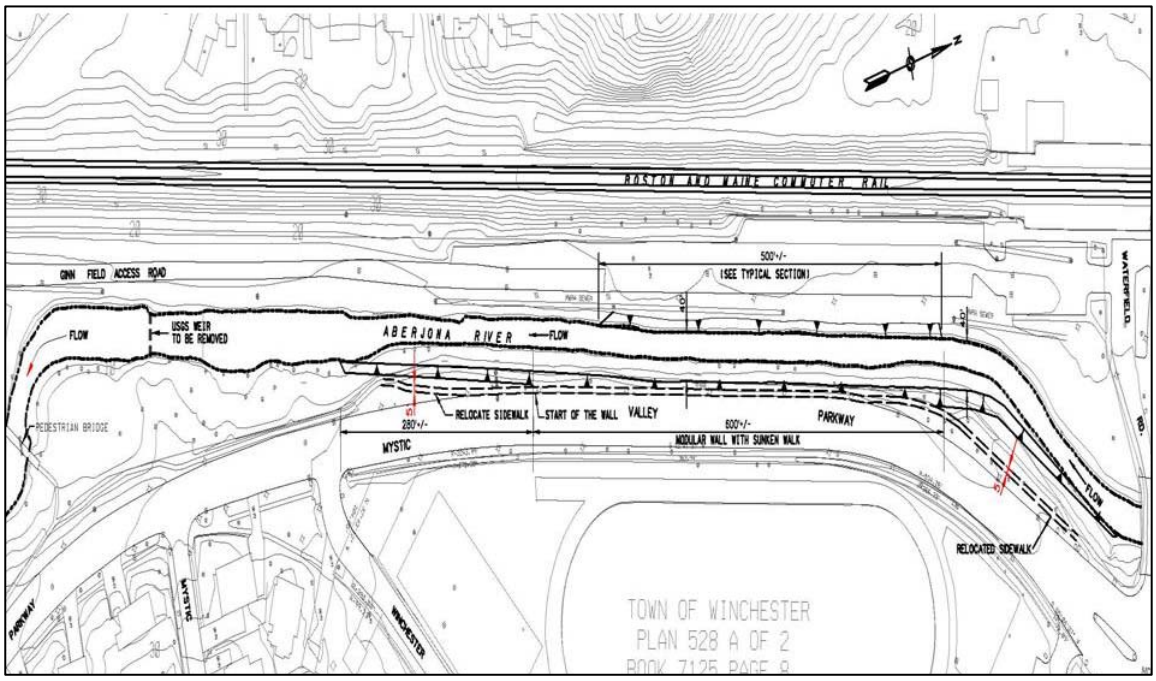
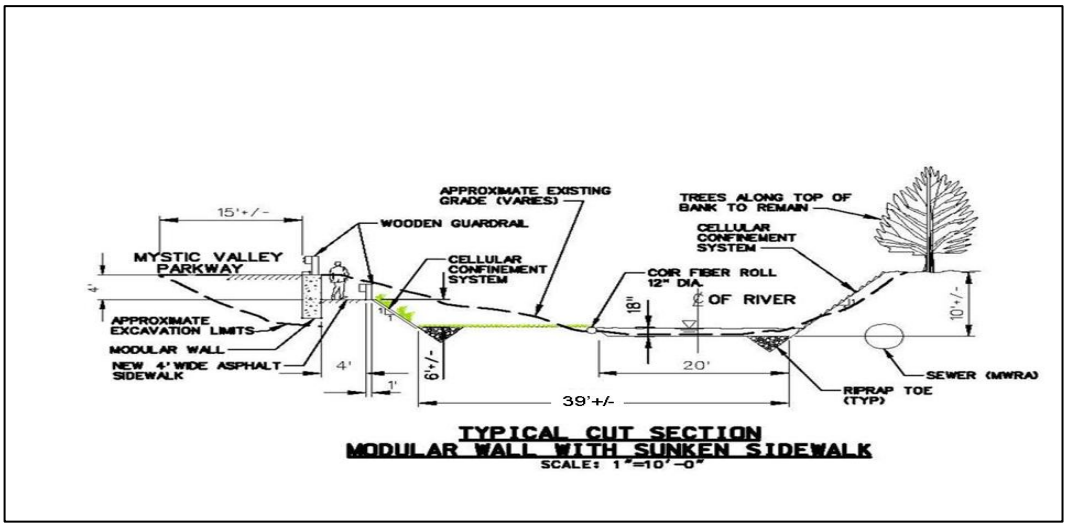


Figure 2, Typical Cut Section
(looking downstream)



Environmental Benefits and Adverse Impacts: In addition to flood damage reduction, the recommended plan would increase vegetated riparian habitat, and remove an obstruction (USGS gauging station weir) which causes ponding within a 1200 ft. section of the river. Anticipated long-term adverse impacts include the partial loss of riparian canopy along the river, and loss of landscaped parkland and parking spaces along the Mystic

Valley Parkway. Construction will interfere with recreational use of the area and increase local traffic congestion.

A draft Environmental Assessment and Finding of No Significant Impact have been prepared for this project and are available for review (see below). A preliminary determination has been made that an Environmental Impact Statement is not required under the provisions of the National Environmental Policy Act.

Endangered Species: No impacts to state or federally threatened or endangered species are expected.

Cultural Resources: Historic and archaeological resource surveys will be conducted during the Plans and Specifications phase of the project. Impacts to significant historic, architectural and archaeological properties including the Mystic Valley Parkway will be addressed at that time. A Memorandum of Agreement will be prepared, if necessary, to mitigate for any impacts to these resources in consultation with the Massachusetts Historical Commission and interested parties to be determined..

Federal Consistency with Coastal Zone Management: The proposed activities are outside the coastal zone and not under review under the State of Massachusetts' federally approved Coastal Zone Management Program.

Clean Water Act: No work will be performed until certification has been received from the Massachusetts Department of Environmental Protection, as required under Section 401 of the Clean Water Act of 1977. A Clean Water Act Section 404 (b)(1) Evaluation has been prepared for the recommended plan. No wetlands will be lost. There will be a net increase in vegetated riparian habitat.

Compliance: This recommended plan is in compliance with all applicable Federal environmental laws and regulations (see Attachment A).

Coordination: The proposed work is being coordinated with the following Federal, State, and Local agencies:

Federal	Commonwealth of Massachusetts
U. S. Fish and Wildlife Service U. S. Environmental Protection Agency U.S. National Marine Fisheries Service U.S. Geological Survey	Executive Office of Environmental Affairs Department of Environmental Management Department of Environmental Protection MA Historical Commission MA Department of Fish, Wildlife, and Law Enforcement MA Division of Marine Fisheries MA Natural Heritage and Endangered Species Program Metropolitan District Commission
City of Winchester	
Conservation Commission Board of Selectmen Engineering Department	

Availability of the Draft Decision Document and Environmental Assessment: Copies of the reports are available at several locations (see Attachment B) and on the internet at www.nae.usace.army.mil (click on "Projects" and follow links). Additional information and copies of the reports on compact disc (CD) may be obtained from the Engineering/Planning Division of the U.S. Army Corps of Engineers, Mr. Mike Penko, Environmental Manager (978-318-8139) and Mr. Robert Russo, Project Manager (978-318-8553, or by sending an email to michael.penko@usace.army.mil.

Public Comments: Comments on the draft decision document and Environmental Assessment are invited from all concerned parties and should be directed to the District Engineer at 696 Virginia Road, Concord, MA 01742, ATTN: Engineering/Planning Division (Mr. Robert Ruso, 978-318-8553), within 30 days of this notice. Any person who has an interest, which may be affected, by the proposed project may request a public hearing. The request must be submitted in writing to me within 30 days of the date of this notice and must clearly set forth the interest and the manner in which the interest may be affected.

Compliance: Consultation with Federally Recognized Indian Tribes, where appropriate, signifies compliance.

9.0 REQUIRED ENVIRONMENTAL PERMITS, EVALUATIONS, AND CERTIFICATIONS

Environmental approvals required to implement the recommend plan and regulatory authorities are listed below. The Corps of Engineers will obtain those required under the Federal Clean Water Act. Others will be acquired by the local sponsor.

9.1 Federal Responsibility

Water Quality Certification pursuant to Section 401 of the Clean Water Act and Massachusetts Water Quality Regulations (314 CMR 9.00 et. seq.). [Issued by Massachusetts Department of Environmental Protection]

404(b)(1) Evaluation pursuant to Section 404 of the Federal Clean Water Act. [Issued by U.S. Army Corps of Engineers, New England District]

9.2 Local Sponsor Responsibility

Order of Conditions pursuant to the Massachusetts Wetlands Protection Act (310 CMR 10.00 et. seq.) [Issued by Winchester Conservation Commission]

Chapter 91 License pursuant to Massachusetts Waterways Regulations (309 CMR 9.00 et. seq.). [Issued by Massachusetts Department of Environmental Management]

Certificate indicating compliance with the Massachusetts Environmental Policy Act (301 CMR 11.00). [Issued by the Massachusetts Executive Office of Environmental Affairs]

Article 97 Land Disposition [Compliance review coordinated by the Massachusetts Executive Office of Environmental Affairs]

Attachment A

PERTINENT FEDERAL LAWS, REGULATIONS AND DIRECTIVES

American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.

Archaeological Resources Protection Act of 1979, as amended, 16 U.S.C. 470 et seq.

Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972), 33 U.S.C. 1251 et seq.

Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-1

National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.

National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Preservation of Historic and Archaeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq. This amends the Reservoir Salvage Act of 1960 (16 U.S.C. 469).

Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Wild and Scenic Rivers Act, as amended, 16 U.S.C 1271 et seq.

Executive Order 11988, Floodplain Management, May 24, 1977 amended by Executive Order 12148, July 20, 1979

Executive Order 11990, Protection of Wetlands, May 24, 1977

Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971 (36 FR 8921, May 15, 1971).

Executive Order 13007, Accommodations of Sacred Sites, May 24, 1996.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994.

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, April 21, 1997.

White House Memorandum, Government-to-Government Relations with Indian Tribes, April 29, 1994.

Attachment B

Copies of the draft Decision Document and Environmental Assessment are available for viewing at the following locations:

Winchester Town Clerk Mary Ellen Lannon 1st Floor, Town Hall 71 Mt. Vernon Street Winchester, MA 01890 Office Hours: Monday-Friday 8:00 - 4:00 *781-721-7130*
Town of Winchester Engineering Department Lower Level, Town Hall 71 Mt. Vernon Street Winchester, MA 01890 *Contact: Bob Conway at 781-721-7120*
Winchester Public Library 80 Washington St Winchester, MA 01890 *Contact: Reference Desk: 617-721-7171*

Note: The documents are also available on the internet at www.nae.usace.army.mil