I. INTRODUCTION

In January 2004, the Reviviendo Gateway Initiative (RGI) Steering Committee launched the Canal and Alleys Campaign to address the need for improvement of this historic infrastructure. Residents, artists, mill owners, business people, and many others identified the potential to transform the North Canal and alleyways into environmental and cultural assets with real economic benefits. The campaign built on prior interest and activities, including the 2002 Urban RiverVisions Charrette, a neighborhood-led alleyway cleanup in 2003, and "ArtWalk on the North Canal", a series of sculptural installations. Over the past year and a half the campaign has succeeded in sparking widespread interest in the canal and alleyways, and the process of restoration is well underway. Below is a brief timeline of activities and progress to date:

- **April 2004: Canals and Alleys Campaign featured in Boston Globe Northwest**
  -Entitled "Seeing treasures beyond the blight", the story included photos and historic background about Lawrence and RGI.
- **June 2004: New RGI study highlights strategies for canal redevelopment**
  -MIT intern presents a series of case studies on canal redevelopment, based on examples from around the world.
- **June 2004: Groundwork Lawrence and the RGI Steering Committee host ribbon-cutting for the City's first "Green Alleyway"**
  -Supported with a grant from the Massachusetts Office of Coastal Zone Management, the new garden features native plants and flowers, a mural, granite benches, and play space for neighborhood children.
- **June 2004: RGI Steering Committee hosts meeting with Enel North America**
  -Enel's Director of Corporate Affairs pledges to work with RGI on redevelopment of the canal and alleys.
- **October 2004: RGI hosts first North Canal Cleanup**
  -In an unprecedented collaboration, RGI and the Essex Company/Enel team up to organize the first North Canal Cleanup. With the water in the canal lowered for the event, approximately 100 volunteers remove ten tons of debris from the canal bed, cut back brush from the canal walls, and plant flower bulbs around the canal bridges.
- **October 2004: RGI hosts first North Canal Fall Festival**
  -RGI hosts the first North Canal Fall Festival on Halloween Weekend. Festival events include a Farmer's Market on the corner of Canal and Union Streets, pumpkin-carving and lantern-making at the Essex Art Center, and trick-or-treating around the North Canal.
- **January 2005: Architectural Heritage Foundation and Groundwork Lawrence submit joint application for $300,000 grant from National Park Service "Save America's Treasures" program.**

  -Funding would support in-depth research on the historic bridges over the North Canal, as well as stabilization work.

- **April 2005: City of Lawrence submits application for $50,000 to support canal research through the Urban RiverVisions Implementation Grant program.**

  -Funding would support a legal and engineering study of the head gates and intake structures along the North Canal.

Building on these accomplishments, the following report provides a summary of the specific context and opportunities for restoration of the North Canal in Lawrence. The report is intended as a guide to help determine next steps and secure the resources needed for this work.

II. CONTEXT

History of the North Canal
The North Canal in Lawrence, Massachusetts, was designed by Charles S. Storrow, the Chief Engineer for the Essex Company, and built between 1845 and 1858. Storrow also designed the Great Stone Dam, and was the architect for many of the City's first mills, churches, and schools. In addition to his engineering work, Storrow served as the first Mayor of Lawrence in 1853. His vast array of projects on behalf of the Essex Company represent some of the most important works of city planning and engineering of the mid-nineteenth century.

The North Canal is just over as mile long, and runs east-west from below the Stone Dam to the foot of the Spicket River. The Canal is 100 feet wide at its origin narrowing to 60 feet at the waste weir where it drops into the Spicket River. The Canal was built for the express purpose of providing waterpower to the mills along its banks. This waterpower was dependent on the volume and speed of water entering the canal from the Merrimack River, which was controlled through a series of locks and gates. In 1858, the Essex Company advertised the sale of twelve lots along the North Canal to the highest bidder. Each lot came with "1/3 of a mill power," which was a measure of the waterpower available to the property. Owners were expected to pay water rent of $300 per year to the Essex Company with additional power available at same rate. In one of the original indenture documents from the Essex Company, a “mill power” was described as follows:

> "Each Mill Power is declared to be the right to draw from the nearest canal or water course of the [Essex Company] and through the land to be granted so much water as shall give a power equal to thirty cubic feet of water per second when the head and fall is twenty five feet; and no more is to be drawn in any one second nor is the same to be drawn more than sixteen hours in each day of twenty four hours, and in order to prevent disputes as to the power of each Mill privilege in the variations of the height of water from changes of the season or other causes, it is understood and declared that the quantity of water shall be varied in proportion to the variation to the height one foot being allowed and deducted from the height of the actual head and fall and also from that with which it is compared before computing the proportion between them, thus on a

head and fall of thirty feet the quantity of water to be used would be twenty four cubic feet and 24-29ths of a cubic foot per second."

The North Canal was entered into the National Historic Register in 1975, and is also part of the North Canal Historic District created in 1984. According to the National Park Service (the federal agency in charge of administering the National Historic Register program), listing in the Register confers the following benefits:

- Recognition that a property is of significance to the Nation, the State, or the community.
- Consideration in planning for Federal or federally assisted projects.
- Eligibility for Federal tax benefits.
- Qualification for Federal assistance for historic preservation, when funds are available.

Waterpower Regulation and Licensing

The Federal Energy Regulatory Commission (FERC) is the agency that regulates the use of hydropower in the United States. FERC issues licenses for dams and hydroelectric facilities, and inspects these facilities to ensure they meet the terms and conditions of their license agreements. In Lawrence, three entities currently hold FERC hydropower licenses:

Data from FERC website, updated on 9/22/03

Project	Project Name	Capacity (Megawatts)	Issued	Expires	RIVER	OWNER NAME
02800	LAWRENCE	16800	12/04/1978	11/30/2028	MERRIMACK R	LAWRENCE HYDRO ASSOC ET AL
02927	AQUAMAC	250	03/01/2001	02/28/2031	S MERRIMACK CNL(MERR R)	AQUAMAC CORP.
02928	MERRIMACK	1250	03/01/2001	02/28/2031	S MERRIMAC CNL(MERR R)	MERRIMACK PAPER COMPANY INC.

The Lawrence Hydroelectric Project, located at the southern end of the Stone Dam, was developed in 1981 and acquired by Consolidated Hydro, Inc. (CHI) in 1986. CHI has recently been acquired by Enel North America, a division of Enel SPA, an Italian energy company. Enel operates and maintains the Lawrence hydroelectric project in connection with their 24-MW Boott Project in Lowell, Massachusetts, also on the Merrimack. Enel North America's Northeastern Operations include 60 hydro and wind projects totaling 195 MW in Connecticut, Maine, Massachusetts, New Hampshire, New York, Pennsylvania, and Vermont. Enel's North American operations include a total of 85 power plants across the United States as well as three plants in Canada. The Lawrence Hydroelectric Project, with a generating capacity of 17 Megawatts, is one of Enel's top five energy-producing facilities in the United States and provides nearly one-tenth of Enel's Northeast power output.

In addition to the FERC licenses currently on file, a separate hydropower license was issued to North Canal Waterworks (NCW) in 1982. In 1994, NCW requested that their license be

surrendered on the grounds that it was no longer economically viable. The report filed by FERC in 1995 stated that:

> The NCW project receives its water pursuant to a 1981 Surplus Water Agreement between NCW and Essex Company. Under this agreement, the project receives a maximum of 2,000 cfs, via the North Canal, which parallels the Merrimack River. The project only receives water when there is an excess of that needed to serve fishery, municipal, manufacturing, and other upstream hydroelectric project needs. As a result of these higher priority and conflicting uses, only limited amounts of water are generally available to the project. The North Canal also provides fire protection and a small amount of industrial process water. Project flows are discharged back into the Merrimack River. The project has not operated since April 1989. The licensee states that the project has not been economically viable for several years because the costs of necessary facility repairs, replacements, and maintenance, as well as environmental enhancements required under the license, are prohibitive relative to current and future project revenues. The surrender will entail no alterations to project structures.
>
> Because the NCW project only operates when Merrimack River flows exceed 10,258 cfs, and all other hydroelectric and other withdrawal demands are satisfied, surrender of the project will not increase the quantity of water available to these existing uses. Instead, surrender of the license will result in an increase in the frequency and duration of spill at Essex Dam just upstream. The surrender would not affect the availability of water in the North Canal for industrial uses or fire protection. This water would continue to be provided by the Essex Company through the North Canal gatehouse.

Based on this application, the NCW license surrender was accepted by FERC in September 1995.

III. ELEMENTS OF CANAL RESTORATION

The North Canal includes several constituent elements, each of which is vital to overall restoration and enhancement of the canal corridor. The implementation of canal improvements will likely include overlapping phases of research, engineering/design, and construction for each of these elements, as described below.

Canal Bridges[1]

There are nine historic bridges over the North Canal that represent a variety of important 19th century engineering types, including a number of early metal truss structures as well as concrete and steel beam designs. The truss types include some of the earliest experiments in patented truss design, that of the Moseley and lenticular trusses. The bridges also span the

[1] *Includes text excerpted from Save America's Treasures grant application, prepared by Architectural Heritage Foundation and Groundwork Lawrence, January 2005.*

transition from pin-connected to riveted construction and collectively provide an overview of the evolution of bridge construction and engineering. Of these nine bridges, only two are in fair condition and remain in use. The other seven have been blocked off from use by jersey barriers or fencing, and their structural soundness is in question. It is evident that years of deferred maintenance have taken their toll on these bridges; three are in very poor condition and one is in danger of collapsing into the canal. At a minimum, all of the bridges need existing conditions assessments, structural analysis and cosmetic improvements. To address these issues, the following activities are recommended:

Part One: Research and Planning

1. Establish ownership for each of the bridges where this is in question, and work with owners to plan for maintenance.
2. Develop long-term preservation plan that is coordinated with community goals for the North Canal Historic District by working with city officials, bridge and mill owners and community residents.

Part Two: Physical Improvements

1. Where appropriate, perform Existing Conditions Assessment and Structural Analysis of bridges.
2. Prepare recommendations for repair and restoration.
3. Where necessary, undertake emergency stabilization measures.
4. Implement recommendations for repair and restoration, or preservation in place.

Bridge No. 6
Present Owner: Newark Atlantic
Date of Construction: > 1868
Historic Use: access to island
Condition: poor

Comments: One of 9 remaining lenticular pony truss bridges in Massachusetts, constructed by Bering Iron Bridge Co.

Excerpt from Save America's Treasures grant application

Canal Walls

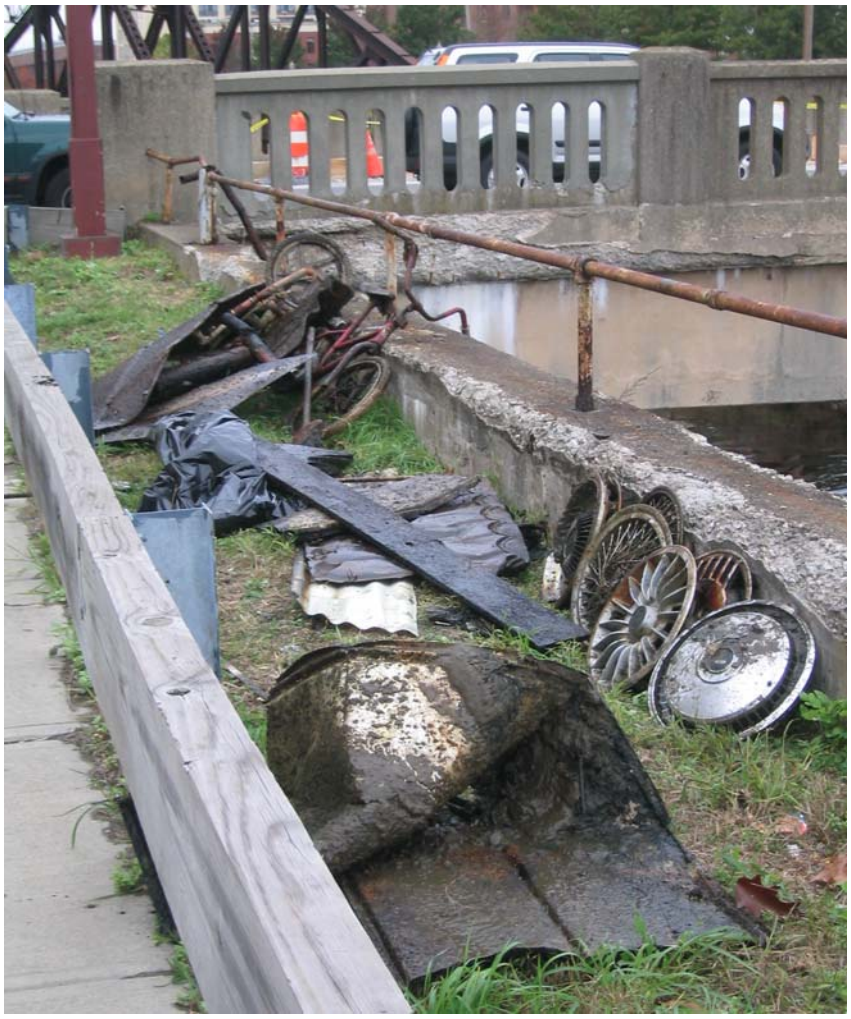
The canal walls are essentially intact in most places, with the exception of an area that has caved in around the Everett Mill penstock. The primary need at present is to trim back the brush and plant growth. The canal's dry-stone construction technique allows weeds to grow in the crevices between stones, and these weeds have proliferated in some sections of the canal. The weeds are primarily located above the water line though a few marshy plants have grown in below the water as well. During the North Canal Cleanup in October 2004,

volunteers trimmed brush from the walls along a small section next to the Union Street bridge. This work was done while standing on the lower embankment, but it may be possible to trim the brush from a canoe when the water is at its normal level. In either case, it appears feasible to remove most of the existing brush by clipping it to the face of the wall (it is important not to pull the weeds, as this could cause structural instability). Future brush trimming work can be performed by volunteers with the appropriate equipment and safety precautions.

Weeds growing from south wall of the canal

Canal Bed

The bed of the North Canal is littered with years of accumulated trash and debris, as can be seen when the water is lowered for repairs. During the North Canal Cleanup in October 2004, volunteers removed approximately ten tons of trash from a 600-foot long section of the canal. If this section is representative, that would mean there is approximately 90 tons of trash still in the canal. At a standard rate of $48/ton, it could cost between $2500 and $5000 to



Trash removed from the North Canal, October 2004.

dispose of all of the trash that now sits in the canal bed, depending upon how much of it can be recycled. As demonstrated at the North Canal cleanup last October, the process of removing trash from the canal bed can be difficult and somewhat dangerous, since the water cannot be completely lowered. Workers must be equipped with safety goggles, waders, and heavy gloves to prevent cuts and scrapes. Various tools and supplies are also required, including ladders, dumpsters, trash bags, metal hooks, ropes and baskets for lifting items out of the canal. While this can be accomplished with volunteers, it requires very careful attention to safety procedures.

Head Gates and Penstocks

Workers operating head gate machinery

The head gates, penstocks and related intake structures located along the North Canal are a vital element in the historic water power system. Water from the canal entered the raceways through these structures, and traveled underground to provide power to the mills. Today, most of the head gates and penstocks are not in use and many of them are in moderate to extreme disrepair. The head gate by the Everett Mill has collapsed and poses a very serious threat to public safety. The wooden trash racks that surround the head gates are also in disrepair, and one of the last remaining wooden "houses" surrounding the head gates burned down several years ago. Most of the lift equipment that once raised and lowered the gates is rusting in place and may not survive much longer without restoration. One of the primary obstacles to preserving these structures is the lack information about ownership, since it is unclear whether they are the responsibility of the Essex Company or the mill owners. The first step is therefore to conduct legal research and prepare an inventory/analysis of the existing intake structures and their condition. This scope of work is summarized below.

1) Conduct a visual assessment and documentation of existing conditions of head gates, trash racks and intake structures along the length of the North Canal.
2) Conduct legal research to determine ownership, easements and obligations related to the head gates, trash racks and intake structures along the length of the North Canal.

Deliverables

- ✓ Written report summarizing findings of the visual assessment, including an overview of the historic design and use of these structures, maps and photographs, and recommendations for future repair and maintenance;

- ✓ Written report summarizing findings of the legal research, including copies of all contracts, easement agreements, and other pertinent legal documents, as well as conclusions regarding existing ownership and responsibility.

Raceways

The underground raceways that supplied water to the mills are invisible to passers-by, but are integral to the canal system. Historically, the water level in the North Canal was higher than it is today, and the wooden structures that support the raceway tunnels were submerged. When the water level was lowered by several feet, these wooden structures were exposed and began to rot, which has created structural problems both within and above the raceways. For example, the raceway under the Duck Mill was causing areas of the parking lot above it to heave and collapse. Over the long term, all of the raceways will need to be blocked off, filled, or rebuilt in order to assure the safety of the buildings and land above them. In addition, the water level in the canal cannot be raised to its original level without first addressing the condition of the raceways, since additional water pressure could cause even greater structural damage. To address this, each mill owner will need to make a decision about the raceways related to their building and take appropriate action. Recently, the Essex Company coordinated with several mill owners to lower the water level and allow for detailed analysis and repairs of their raceways.

Spillway

The spillway at the eastern end of the North Canal is a wooden and steel structure that includes a walkway/bridge and a series of gates that can be raised or lowered to change the water level in the canal. The water height changes dramatically from the western to the eastern side of the spillway, where it drops over a beautiful stone waterfall before joining the Spicket River at the mouth of the Merrimack. The spillway is currently fenced off from public access and is generally in poor condition. Trash has accumulated at the end of the canal by the spillway as items tend to drift downstream and get caught by the gates. With the appropriate repairs, the spillway could serve as a major public amenity connecting Canal Street and the Gateway site with the eastern end of Island Street.

Spillway with the water level lowered

The Essex Company is planning to conduct repairs to the spillway during the summer and fall of 2005.

North and South Banks

The north bank of the canal consists of a narrow grassy slope, a low wooden guard rail, concrete sidewalk, and planter strip with mature trees, as well as antique lighting and benches. The walkway is maintained by the Lawrence Heritage State Park and is generally in very good condition. In contrast, the south bank of the canal has not been refurbished and needs significant investment to become usable as a pedestrian thoroughfare. Although ownership of this land is not entirely clear, it appears that Guilford Rail owns the right-of-way, as the land was originally occupied by a rail line. The south bank and rail right-of-way have great potential for enhancement, which would help to knit together the mill islands, the bridges, and Canal Street. To accomplish this, the City or a public entity will need to secure ownership/access rights to the land and work with mill owners and the Essex Company to design and implement coordinated landscape improvements.

North Canal walkway looking east toward Union Street

North Canal Gatehouse

The North Canal Gatehouse is a complex of buildings and land at the westernmost tip of the mill islands, immediately adjacent to the Stone Dam. There are several buildings on the site including the gatehouse, which houses the control mechanisms that regulate the flow of water into the canal; a small wooden building facing the street that is currently leased to a non-profit organization called NACA; and a former carriage house that now contains a small

Looking west from the North Canal gatehouse

exhibit about the history of the Merrimack River. The exhibit is only available for viewing by special appointment with the Lawrence Heritage State Park, and most people are unaware that it exists since there is no exterior signage. In addition to the buildings and a small parking area, there is a triangle of open land at the tip of the island. This land is currently overgrown and fenced off but could be a magnificent area for picnicking and passive recreation, with views across the Dam and the Merrimack River.

Open Space & Trail Connections

Improvements to the North Canal corridor should be designed to maximize pedestrian connections between existing and potential open spaces and trails. Specifically, there are tremendous opportunities for new parkland at the North Canal Gatehouse on the west end of the canal and the former Ferrous Technology site on the east end. These two areas could become anchor parks for a mile-long loop walk along both sides of the canal. New canalside trails should also be designed to link up with the recently-renovated Pemberton Park on the West Island, as well as future trails along the banks of the Merrimack and Spicket Rivers.

IV. PARTNERSHIPS

The task of restoring the North Canal is a long-term effort that will require continued collaboration between the Essex Company, the City, mill owners, and the community in order to succeed. There has already been substantial success in establishing a strong working partnership with the Essex Company. As evidence of this, the Essex Company co-hosted the first North Canal Cleanup in October 2004, and is supporting a Groundwork application to bring an AmeriCorps*NCCC team to Lawrence in October 2005 to implement more extensive canal improvements. More recently, the Architectural Heritage Foundation (AHF) has joined the RGI Steering Committee and is collaborating with Groundwork and the City to secure additional resources for canal restoration. The Lawrence Heritage State Park and local mill owners are also key partners in planning and advocacy for the North Canal. Finally, the strong support of Lawrence's state and federal delegation is essential to securing the necessary resources for canal restoration.

V. SUMMARY OF FUNDING OPPORTUNITIES FOR CANAL RESTORATION & ENHANCEMENT

**Note: In addition to the public funding sources listed below, there are numerous private foundations that support historic preservation programs and activities.*

Program	***Agency/ Funder***	***Notes***	***Contact Information***
FEDERAL GRANTS			
Save America's Treasures Grants	Department of Interior (National Park Service)	Grants range in size from $250,000 to $1 million and require a 1:1 non-federal match. *****Note: Architectural Heritage Foundation and Groundwork Lawrence submitted a joint application for $300,000 for (FY 2006 through FY 2008) to support the restoration of canal bridges.*****	www.saveamericastreasures.org/funding.htm For additional information, contact the NPS at (202) 513-7270, ext. 6 or Save America's Treasures at the National Trust at (202) 588-6202.
AmeriCorps* NCCC (National Civilian Community Corps)	Corporation for National and Community Service	AmeriCorps*NCCC members perform team-based service projects in six different areas--environment, education, public safety, unmet needs, homeland security, and disaster relief--in communities in all 50 states and U.S. territories. *****Note: Groundwork Lawrence is preparing an application to NCCC for a team of volunteers to assist with canal cleanup during the fall of 2005.*****	www.americorps.org/nccc/ Joe Cook, Assistant Project Director AmeriCorps*NCCC, Northeast Region P.O. Box 27, / Bldg. 15 Perry Point, MD 21902 1-800-949-1003 ext. 6852 fax 1-410-642-1888 e-mail: jcook@cns.gov
Community Development Block Grants (CDBG)	U.S. Dept. of Housing and Urban Development	Lawrence CDBG funding is currently frozen for FY05.	For more information, contact Fred Carberry, Director, Office of Planning & Development at (978) 794-5891.
STATE GRANTS			
RiverVisions Implementation Grants (FY05 and FY06)	Dept. of Conservation and Recreation	Provides funding to support implementation of the EOEA RiverVisions Charrettes Examples of eligible activities include: zoning review and modifications; park planning, design, and construction; trail planning, design, and construction; streetscape design and enhancements; brownfield assessments; mill building re-use feasibility; creation of design guidelines; and improving access to water resources. It is intended that funded activities will assist the community in accessing additional grant and funding resources.	www.urbanrivervisions.org For more information, contact Kurt Gaertner at (617) 626-1154.

		*****Note: City of Lawrence submitted an application for $50,000 in FY05 to support legal and engineering research on the North Canal.*****	
Massachusetts Preservation Projects Fund	Massachusetts Historical Commission	The Massachusetts Preservation Projects Fund (MPPF) is a state-funded 50% reimbursable matching grant program established in 1984 to support the preservation of properties, landscapes, and sites (cultural resources) listed in the State Register of Historic Places. Applicants must be a municipality or non-profit organization. Eligible activities include feasibility studies involving the preparation of plans and specifications, historic structures reports, and certain archaeological investigations, as well as construction activities including stabilization, protection, rehabilitation, and restoration. The Massachusetts Preservation Projects Fund is currently funded for grant rounds through fiscal year 2007. Requests for pre-development projects can range from $5,000 to $30,000; requests for development or acquisition projects may range from $7,500 to $100,000. Work completed prior to grant award is ineligible for funding consideration. A unique feature of the program allows applicants to request up to 75% of total construction costs if there is a commitment to establish a historic property maintenance fund by setting aside an additional 25% over their matching share in a restricted endowment fund. Emergency funds are available at the Secretary's discretion for stabilization of resources considered in imminent danger. There are no deadlines for the submission of emergency fund requests.	http://www.sec.state.ma.us/mhc/mhcmppf/mppfidx.htm Massachusetts Historical Commission Massachusetts Archives Building 220 Morrissey Boulevard Boston, MA 02125-3314 Phone: 617-727-8470 Fax: 617-727-5128 E-mail: Paul.Holtz@sec.state.ma.us
Public Works and Economic Development	Executive Office of Transportation	Promotes economic development through improvement to streets, sidewalks, and other specified infrastructure. Eligible activities include design, construction, and/or reconstruction of existing and/or newly relocated streets, sidewalks, and related infrastructure.	www.mass.gov/dhcd For additional information, contact Pamela Russell at EOT, (617) 973-7000.
Community Development Action Grants (CDAG)	Dept. of Housing and Community Development	Stimulates economic development activities that will leverage private investment, create jobs, and help blighted neighborhoods. Eligible activities include installation, improvement, construction, alteration and rehabilitation of publicly owned and managed properties such as building facades, streets, sidewalks, rail spurs, and water and sewer lines.	www.eot.state.ma.us For additional information, contact Cyrus Field at DHCD at (617) 573-1449.
Rails to Trails	Executive Office of Transportation	EOT's Rail Unit works with its constituent agencies to plan for and secure funding for rights-of-way acquisition and trail development through the federal Transportation Enhancements Program.	For additional information, contact Maeve Vallely-Bartlett at (617) 973-7891.

Greenways and Trails Demonstration Grant Program	Dept. of Conservation and Recreation	Provides grants to non-profit organizations, municipalities and regional planning associations to support innovative greenway and trail programs.	www.mass.gov/dcr For more information, contact Jennifer Howard at (413) 586-8706 x. 18
Historic Landscape Preservation Initiative	Dept. of Conservation and Recreation	Provides matching grants, sponsors special initiatives and offers technical assistance and training to municipalities to support the preservation of historically significant landscapes in Massachusetts.	www.mass.gov/dcr For more information, contact Joanna Doherty at (617) 626-1390.
Urban Self-Help Grants	Dept. of Conservation and Recreation	Assists cities and towns in acquiring and developing land for park and outdoor recreation purposes.	www.mass.gov/dcr For more information, contact Melissa Cryan at (617) 626-1171.
REGIONAL GRANTS			
Essex National Heritage Area Partnership Grants	Essex National Heritage Area	Grants range in size from $1,000 to $15,000. Grant Categories include Heritage Education, Heritage Interpretation and Programming, Heritage Preservation, Trails & Greenways	www.essexheritage.org For additional information, contact Bill Steelman, Director of Heritage Preservation at (978) 740-0444.