

Ipswich River Coastal Bank Stabilization Pilot Project Ipswich, MA

**DRAFT Task 3 Report
January 30, 2017**



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1. Introduction

This memorandum describes the proposed bank stabilization projects for six Areas of Concern (AOC) along the northern bank of the Ipswich River in downtown Ipswich, MA. These AOCs are areas where bank erosion is occurring, and were identified and described in a previously prepared memorandum by Horsley Witten Group (HW), dated December 27, 2016. The information provided in this memorandum aims to provide a basis for the Town and the project Steering Committee to prioritize the AOCs and proposed projects, and select which AOCs should to focus on for further design as part of this project.

The six Areas of Concern (AOCs) identified by the Town of Ipswich are described in Table 1 and presented on a site map on Sheet 1 in Appendix A. Area 1 is a combination of the individual sites previously identified as 1A, 1B and 1C; in this memorandum we have combined these sites for discussion and design purposes. Table 2 presents a summary of the proposed bank restoration designs for each site. The basic concept plans for each site are provided in Appendix A, and a planning-level construction cost estimate for each site is presented in Appendix B, based on the initial concept plans.

This information together presents a summary of the bank stabilization and restoration designs for the purposes of facilitating a discussion among the project Steering Committee members. The next step in this project is to prioritize the proposed project sites and select up to 2 sites to pursue further. Once these are selected, HW will prepare 30% design plans in preparation for the permit process, which we understand would begin with the town submitting an application to the state for review under the Massachusetts Environmental Policy Act (MEPA).

Table 1. Summary of Existing Conditions for Bank Erosion Areas of Concern

Area of Concern	Site Description	Likely Cause of Observed Erosion	Severity of Erosion (L, M, H)	Risk to Public Infrastructure from Erosion? (L, M, H)	Relative Threat to Ipswich River Water Quality? (L, M, H)	Current Uses? (Observed, from Ipswich WAC)
1	River bank along Water Street. Undercutting and damage from existing stormwater runoff, particularly at 1C. Boat storage and foot traffic at 1A and 1B.	<ul style="list-style-type: none"> • Pedestrian access to the river • Kayak/dinghy boat storage. • Undercutting of the bank from river flow. • Unmanaged stormwater draining off Water Street. 	H	M Drainage Road	H	<ul style="list-style-type: none"> • Mooring access • Dinghy tie-up • Non-motorized boat haul/launch • Swimming/Wading • Dog swimming • Fishing • Boat passenger drop off
2	River bank just south of Green Street. Significant erosion of the bank into the river, just south (upstream) of the old structural retaining wall.	<ul style="list-style-type: none"> • Pedestrian access to the river • Flow in the river, and scouring due to nearby bridge and remnant bridge or dam retaining wall along bank 	M	M Sewer	M (If sewer line were compromised)	<ul style="list-style-type: none"> • Limited dog swimming
3	Water access from the path, defined by existing exposed tree roots on either edge.	<ul style="list-style-type: none"> • Pedestrian access to the river 	L	L	L	<ul style="list-style-type: none"> • Wading • Dog swimming • Fishing
4	The existing drainage outfall is rusted out, causing severe undercutting and erosion in the bank.	<ul style="list-style-type: none"> • Scour and undercutting of the bank from failing drainage pipe 	H	H Drainage	M Sediment Untreated stormwater	<ul style="list-style-type: none"> • Wading • Dog swimming • Fishing
5A	Exposed sewer trunk line along northern river bank.	<ul style="list-style-type: none"> • Scour from heavy river flows 	M	M Sewer	M (If sewer line were compromised)	<ul style="list-style-type: none"> • Dog swimming
5B	Exposed sewer siphon crosses the river from south to north.	<ul style="list-style-type: none"> • Scour from heavy river flows 	H	H Sewer	H (If sewer line were compromised)	<ul style="list-style-type: none"> • No activity noted
6	The riverbank is undercut in the area downstream of the Riverwalk along the back of the parking areas serving the Market Street businesses.	<ul style="list-style-type: none"> • Undercutting of the bank from river flow 	L	L	L	<ul style="list-style-type: none"> • This site was not discussed by WAC • Fishing likely (well worn footpaths down the bank were observed)

2. Proposed Restoration Approaches for Each Area of Concern

HW developed conceptual designs for the AOCs that were previously identified by the town of Ipswich and discussed in Task 2 of this project. The proposed bank stabilization concepts are briefly described below and summarized in Table 2. The conceptual design plans are presented in Appendix A and a construction cost for each AOC is presented in Appendix B.

Area of Concern 1A/1B/1C

The proposed design at this site presents a living shoreline design. Coir fiber rolls would be installed at the toe of the undercut bank for stabilization purposes, and then a salt marsh would be enhanced and expanded in the shallow nearshore area. The salt marsh would be stabilized and protected behind a widely-spaced boulder sill in combination with a double row of coir fiber rolls. Some of the boulders are already in the area and could be rearranged for purposes of this project. The boulder sill would extend the full length of the project area, and the living shoreline (salt marsh) area would be centered around the shallower area around the Summer Street outfall.

Area of Concern 2

The proposed design at this site is centered around the idea of continuing pedestrian access to the river's edge while stabilizing the severe erosion that is occurring at this location upriver of the existing retaining wall (a remnant from a prior dam at the site). Boulders would be used as a revetment at the back of the site at the approximate high tide elevation to create a small vertical bank down the slope. Below the boulders would be a living shoreline terrace, which would be defined on the downslope side by a row of coir fiber rolls and then a boulder sill at approximately mean tide elevation. A rustic stairway of timber and crushed stone would be installed to traverse the new restored bank. Below the boulder sill and living shoreline terrace, the path would continue toward the water with several boulder stepping stones.

Area of Concern 3

The proposed design at this site is relatively simple, and aimed at stabilizing the existing pedestrian pathway to the water's edge. Coir fiber rolls would be installed along the toe of the undercut bank on the sides of the existing pathway, pressed in among existing exposed roots that form a chute toward the water. Boulders would be installed between the coir fiber rolls to act as stepping stones and to stabilize the pathway. All installation would occur approximately between the low tide and high tide elevations of the bank.

Area of Concern 4

The proposed design at this site is predicated on the assumption that the existing failing drain pipe will be replaced, as part of Coneco's stormwater improvements design. The bank stabilization design includes extending the drainage pipe further out toward the river and re-grading the bank to support that pipe. A new concrete headwall would be installed at the outfall, and a small rip-rap-stabilized scour pool would be installed below the outfall. A row of coir fiber rolls would be installed at the toe of the slope around the area of the outfall, where undercutting is occurring, and a second row of coir fiber rolls

would be installed slightly up the bank along the river's edge (see design graphic in Appendix A). The area between the fiber rolls would form a terrace of living shoreline marsh area. Boulders would be installed at variable distances (approximately between 6 and 12 feet) at the base of this restoration work to provide reinforcing stabilization of the bank and to break up the flows in the area.

Area of Concern 5A

The proposed design at this site is to place and embed a series of 2-foot boulders on the downslope side of the existing more recently exposed sewer trunk line along the bank of the river. Granular fill would be used to cover only the more recently exposed pipe and graded in to the bank of the river, in order to provide protective cover for the pipe.

Area of Concern 5B

The stabilization of the sewer siphon across the riverbed at this site would require significant infrastructure repair or replacement, given the apparent existing conditions of the pipe. HW did not provide a stabilization design for this site, as such infrastructure repairs or replacement are beyond the scope of this project.

Area of Concern 6

The proposed design at this site is relatively simple and involves placing a row of coir fiber logs at the toe of the undercut bank, and then installing intermittent boulders just down slope of the logs to provide additional stabilization and protection for the bank.

Table 2. Summary of Proposed Restoration Approaches for Each Area of Concern

Area of Concern	Proposed Restoration Approach	Linear Feet of Bank Restoration (LF)	Area of Riverbank Restoration (SF)	Planning Level Construction Cost Estimate	Maintenance Burden (L, M, H)	Public Access (Limited/ No Change/ Enhanced)	Requires Concurrent Upgradient Stormwater Improvements (Y/N)	Recommended Priority Level (L, M, H)
1 (A,B,C)	<ul style="list-style-type: none"> Coconut Coir Logs Living Shoreline, Marsh Boulder Sill 	537	6,407	\$130,200	Medium <ul style="list-style-type: none"> Supplementary planting as needed Inspections and possible resetting of boulders and coir logs after storm events 	Limited	Yes (significant)	High
2	<ul style="list-style-type: none"> Coconut Coir Logs Revetment Boulder Sill Living Shoreline, Marsh 	51	681	\$14,400	Low <ul style="list-style-type: none"> Supplementary planting as needed Inspections and possible resetting of boulders and coir logs after storm events 	Enhanced	Yes (minor)	Medium
3	<ul style="list-style-type: none"> Coconut Coir Logs Boulder Revetment 	16	143	\$2,040	Low <ul style="list-style-type: none"> Inspections and possible resetting of boulders and coir logs after storm events 	Enhanced	No	Low
4	<ul style="list-style-type: none"> Coconut Coir Logs Boulder Sills Living Shoreline, Marsh Rip Rap splash pad 	142	1,951	\$57,600	Medium <ul style="list-style-type: none"> Supplementary planting as needed Inspections and possible resetting of boulders and coir logs after storm events 	No change	Yes (significant)	High
5A	<ul style="list-style-type: none"> Boulder Retaining Wall 	33	236	\$12,960	Low <ul style="list-style-type: none"> Inspections and possible resetting of boulders after storm events 	No change	No	High
6	<ul style="list-style-type: none"> Coconut Coir Logs Living Shoreline, Marsh Boulder Revetment 	190	1,505	\$21,480	Low <ul style="list-style-type: none"> Supplementary planting as needed Inspections and possible resetting of boulders and coir logs after storm events 	No change*	No	Low

* During the preparation of this memorandum, we learned that the Town is considering developing a public riverwalk in this area. The possible riverwalk was not included in our restoration approach.

Appendix A. Concept Designs

Appendix B. Planning Level Cost Estimates

Based on the conceptual designs for each proposed restoration design, HW developed planning-level construction cost estimates for materials, construction labor, final design and permitting. These estimates are presented below. They include a standard contingency of 30% (at this level of design) to address the potential for design changes and labor or material cost increases between now and the time of construction. They also include an additional contingency of 20% for the cost of engineering design, permitting and construction administration services.

**COASTAL RESILIENCY & RIVERBANK RESTORATION
AREA 1**

IPSWICH, MA

**10% COST ESTIMATE
January 30, 2017**

Quantities listed are estimates only and not guaranteed to approximate the actual amounts to be used.

No.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
Bio Swales					
1.0	COCONUT COIR FIBER LOGS	596	LF	\$30.00	\$17,880.00
2.0	BOULDER SILLS	1,392	SF	\$20.00	\$27,840.00
3.0	LIVING SHORELINE	2,509	SF	\$15.00	\$37,635.00
Subtotal					\$83,355.00

ESTIMATED PROJECT COST

Contingency 30%

ESTIMATED PROJECT COST WITH CONTINGENCY

Engineering, Permitting and Construction Admin. (CA) 20%

TOTAL PROJECT COST

\$	83,355
\$	25,100
\$	108,500
\$	21,700
\$	130,200

**COASTAL RESILIENCY & RIVERBANK RESTORATION
AREA 2**

IPSWICH, MA

**10% COST ESIMATE
January 30, 2017**

Quantities listed are estimates only and not guaranteed to approximate the actual amounts to be used.

No.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1.0	COCONUT COIR FIBER LOGS	40	LF	\$30.00	\$1,200.00
2.0	BOULDER SILLS	144	SF	\$20.00	\$2,880.00
3.0	LIVING SHORELINE	290	SF	\$15.00	\$4,350.00
4.0	TIMBER STEPS WITH CRUSHED STONE	1	LUMP SUM	\$5,000.00	\$5,000.00
Subtotal					\$8,430.00

ESTIMATED PROJECT COST

Contingency 30%

ESTIMATED PROJECT COST WITH CONTINGENCY

Engineering, Permitting and Construction Admin. (CA) 20%

TOTAL PROJECT COST

\$	8,430
\$	2,600
\$	12,000
\$	2,400
\$	14,400

**COASTAL RESILIENCY & RIVERBANK RESTORATION
AREA 3**

IPSWICH, MA

**10% COST ESTIMATE
January 30, 2017**

Quantities listed are estimates only and not guaranteed to approximate the actual amounts to be used.

No.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1.0	COCONUT COIR FIBER LOGS	10	LF	\$30.00	\$300.00
4.0	BOULDER SILLS	50	SF	\$20.00	\$1,000.00
Subtotal					\$1,300.00

ESTIMATED PROJECT COST

Contingency 30%

ESTIMATED PROJECT COST WITH CONTINGENCY

Engineering, Permitting and Construction Admin. (CA) 20%

TOTAL PROJECT COST

\$	1,300
\$	390
\$	1,700
\$	340
\$	2,040

**COASTAL RESILIENCY & RIVERBANK RESTORATION
AREA 4**

IPSWICH, MA

**10% COST ESIMATE
January 30, 2017**

Quantities listed are estimates only and not guaranteed to approximate the actual amounts to be used.

No.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1.0	COCONUT COIR FIBER LOGS	200	LF	\$30.00	\$6,000.00
2.0	BOULDER SILLS	650	SF	\$20.00	\$13,000.00
3.0	RIP RAP PAD	1	LS	\$1,500.00	\$1,500.00
4.0	EXTEND PIPE AND NEW HEADWALL	1	LS	\$5,000.00	\$5,000.00
5.0	LIVING SHORELINE	760	SF	\$15.00	\$11,400.00
Subtotal					\$36,900.00

ESTIMATED PROJECT COST

Contingency 30%

ESTIMATED PROJECT COST WITH CONTINGENCY

Engineering, Permitting and Construction Admin. (CA) 20%

TOTAL PROJECT COST

\$	36,900
\$	11,100
\$	48,000
\$	9,600
\$	57,600

**COASTAL RESILIENCY & RIVERBANK RESTORATION
AREA 5**

IPSWICH, MA

**10% COST ESTIMATE
January 30, 2017**

Quantities listed are estimates only and not guaranteed to approximate the actual amounts to be used.

No.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1.0	GRANULAR FILL	10	CY	\$30.00	\$300.00
2.0	BOULDER RETAINING WALL	40	SF	\$200.00	\$8,000.00
Subtotal					\$8,300.00

ESTIMATED PROJECT COST		\$ 8,300
Contingency	30%	\$ 2,490
ESTIMATED PROJECT COST WITH CONTINGENCY		\$ 10,800
Engineering, Permitting and Construction Admin. (CA)	20%	\$ 2,160
TOTAL PROJECT COST		\$ 12,960

**COASTAL RESILIENCY & RIVERBANK RESTORATION
AREA 6**

IPSWICH, MA

**10% COST ESIMATE
January 30, 2017**

Quantities listed are estimates only and not guaranteed to approximate the actual amounts to be used.

No.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
1.0	COCONUT COIR FIBER LOGS	190	LF	\$30.00	\$5,700.00
2.0	BOULDER SILLS	400	SF	\$20.00	\$8,000.00
Subtotal					\$13,700.00

ESTIMATED PROJECT COST		\$ 13,700
Contingency	30%	\$ 4,200
ESTIMATED PROJECT COST WITH CONTINGENCY		\$ 17,900
Engineering, Permitting and Construction Admin. (CA)	20%	\$ 3,580
TOTAL PROJECT COST		\$ 21,480