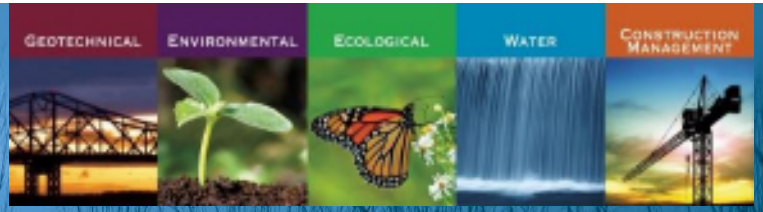
GZA GeoEnvironmental, Inc.



Public Presentation
Macallen Dam: Stability Analysis and Conceptual Design of Remedial Alternatives

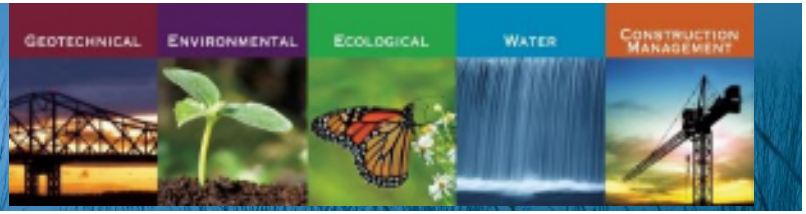
Proactive By Design.
Our Company Commitment

Newmarket Town Council

Wednesday, December 6

7:00 pm

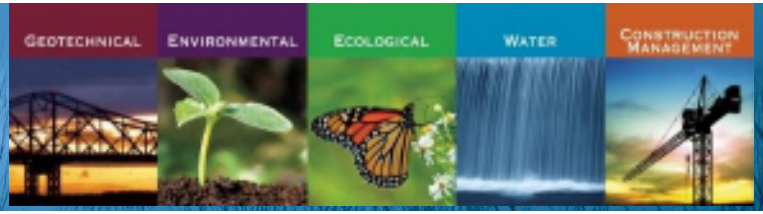
AGENDA



1. Background and Project History
2. Alternatives Analysis
3. Gate Automation Analysis
4. Dam Appurtenances Repairs and Rehabilitation
5. Conceptual Alternatives and Renderings
6. Preferred Alternative
7. Moving Forward (Next Steps)

Project Partners: Dam Study Committee, Town of Newmarket, NHDES

TASKS AND SCHEDULE



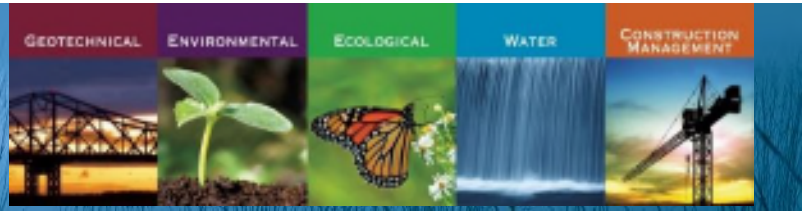
Task No.	Activity Description	Aug-17				Sep-17				Oct-17				Nov-17					Dec-17			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	5	1	2	3	4
1	Project Kick-Off Meeting/Initial Consultation																					
2	Engineering Analyses (Stability, Design, Hydraulics)																					
3	Submit Summary Report to Town and NHDES																					
4	Coordination with NHDES Dam Safety Bureau																					
5	Action Plan																					
6	Coordination Meetings and Public Presentation																					
7	Emergency Action Plan Update																					
8	Operations & Maintenancce Response Form Update																					
9	Gate Automation Analysis																					

BACKGROUND: LETTER OF DEFICIENCY (LOD)

- Fill, seed, mulch right side embankment
- Remove & Structurally patch concrete:
  - Left abutment gate structure / piers
  - Left side upstream training wall
- Investigate and repair right side training wall
- Submit permit, plans, and specifications for Rehabilitation of Dam
- Compete reconstruction/repair of Dam

Multiple LODs in past decade

BACKGROUND: PREVIOUS STUDIES



2010

Town Passes Warrant Article for Removal Feasibility Study

Overall Assessment Wright-Pierce

2011

2012

Additional H&H, Breach Study, & Incremental Damage Assessment Wright-Pierce

2013

Shift in Town policy to Repair Structure & Increase Spillway Capacity

2014

Final Feasibility Study Completed Gomez & Sullivan

2015

2016

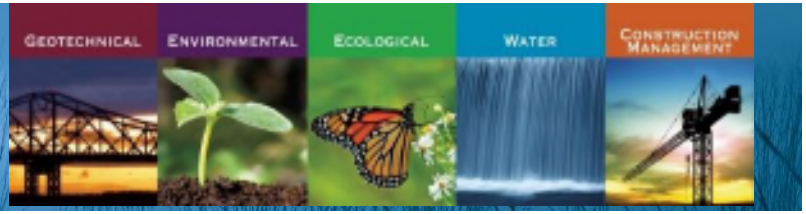
Refined H&H Analysis Gomez & Sullivan

NHDES Approved Design Flow

2017

GZA hired to perform conceptual design and stability analysis for dam remedial alternatives

OBJECTIVE AND PURPOSE



Objective: Develop concepts which bring the dam into compliance with NHDES Dam Bureau's Discharge Capacity requirements.

Purpose: Design dam rehabilitation concepts that:

- Enhance the safety of the dam
- Maintain the upstream impoundment
- Improve compliance with NH dam safety regulations
- Minimize aesthetic impacts

PROPERTY / SITE ACCESS

CONCEPTUAL ALTERNATIVES

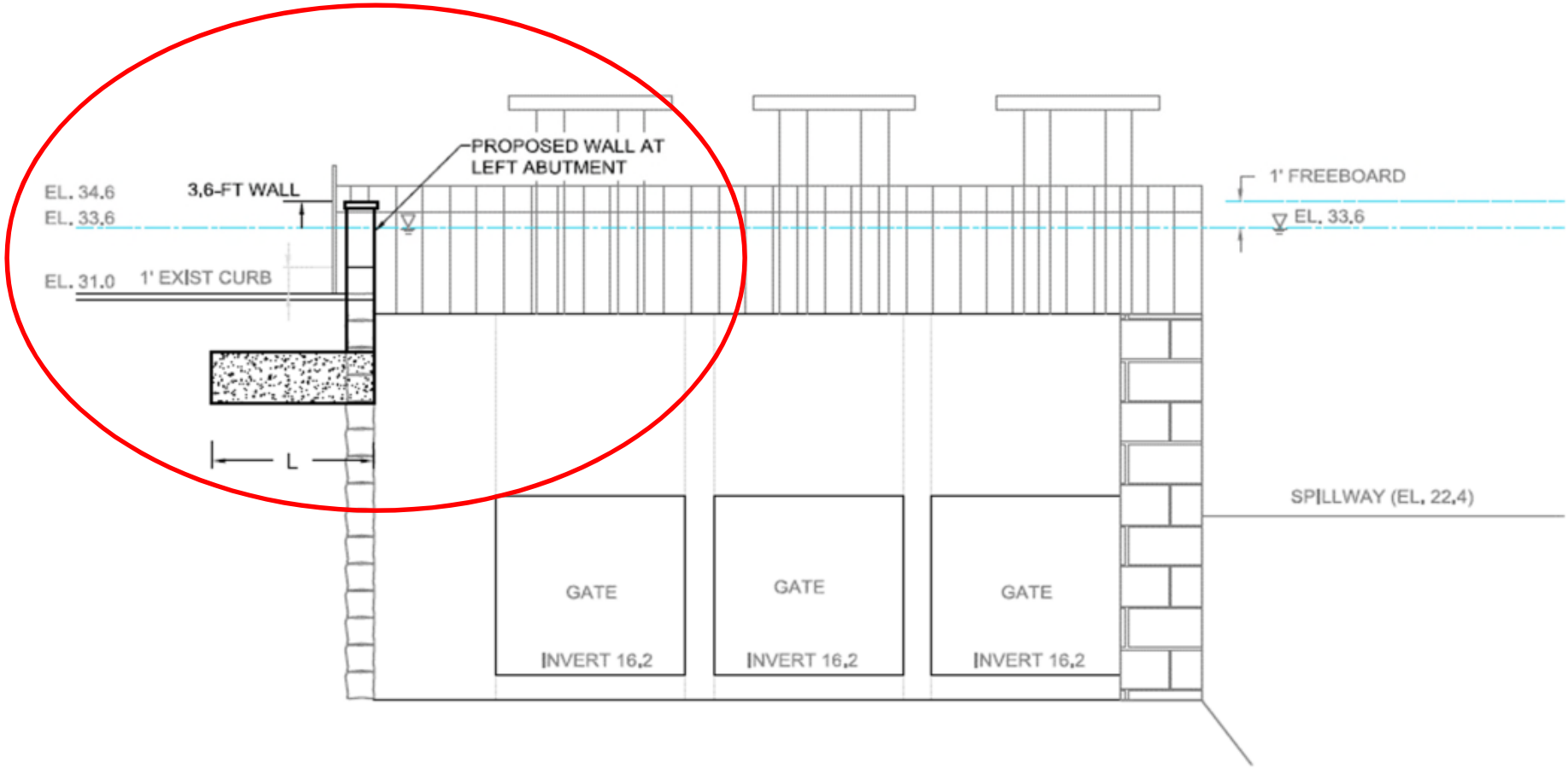
Raising Abutment Walls

- Option 1: 4’ Left Abutment Wall; 6’ Right Abutment Wall; No Fill
- Option 2: 4’ Left Abutment Wall; 4’ Right Abutment Wall; 2’ Fill
- Option 3: 4’ Left Abutment Wall; 2’ Right Abutment Wall; 4’ Fill

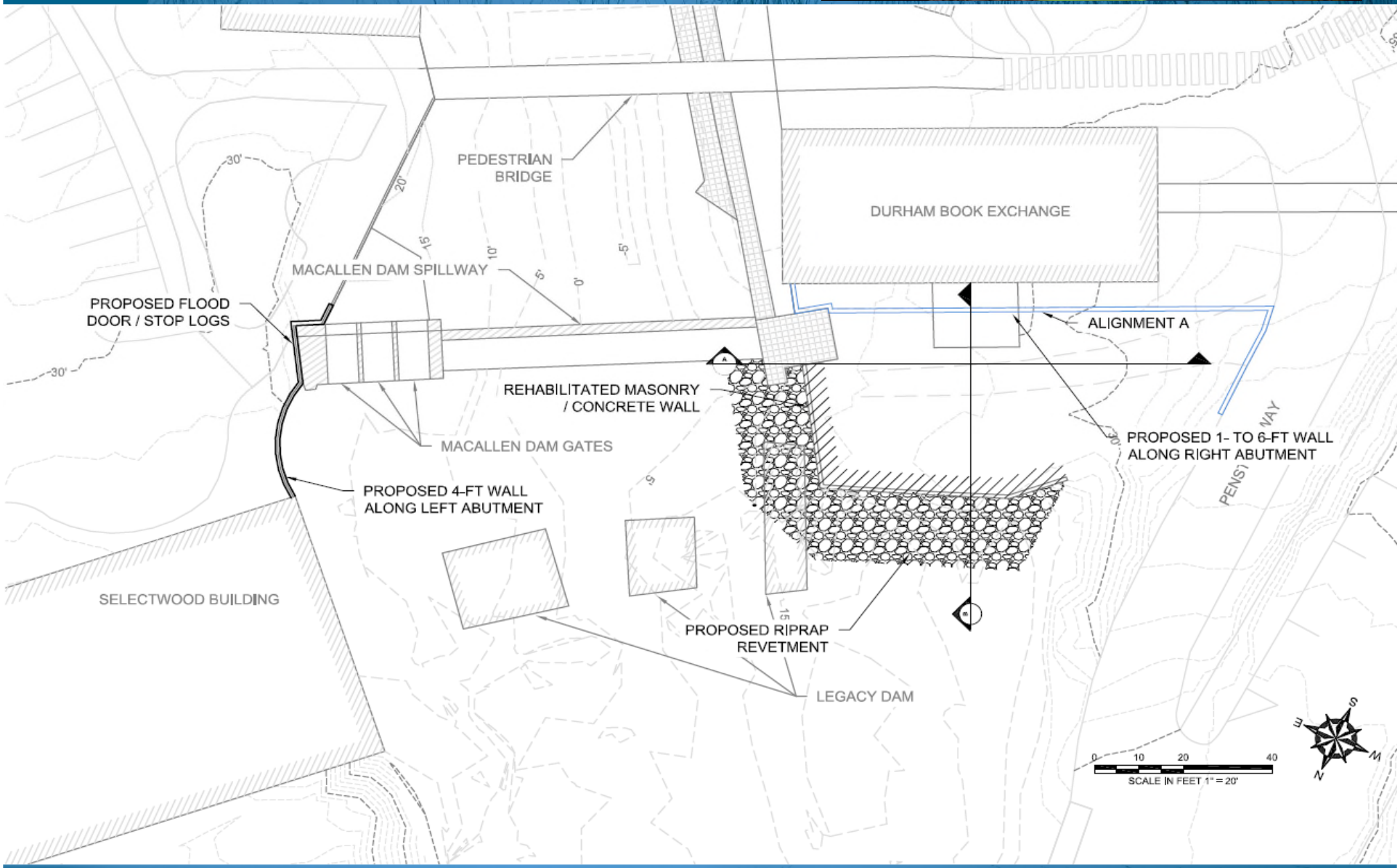
Wall Alignments (Right Abutment)

- Alignment A: Offset 6’ from Warehouse
- Alignment B: Offset 25’ from Warehouse
- Alignment C: Offset 35’ from Warehouse (Along Masonry Wall)

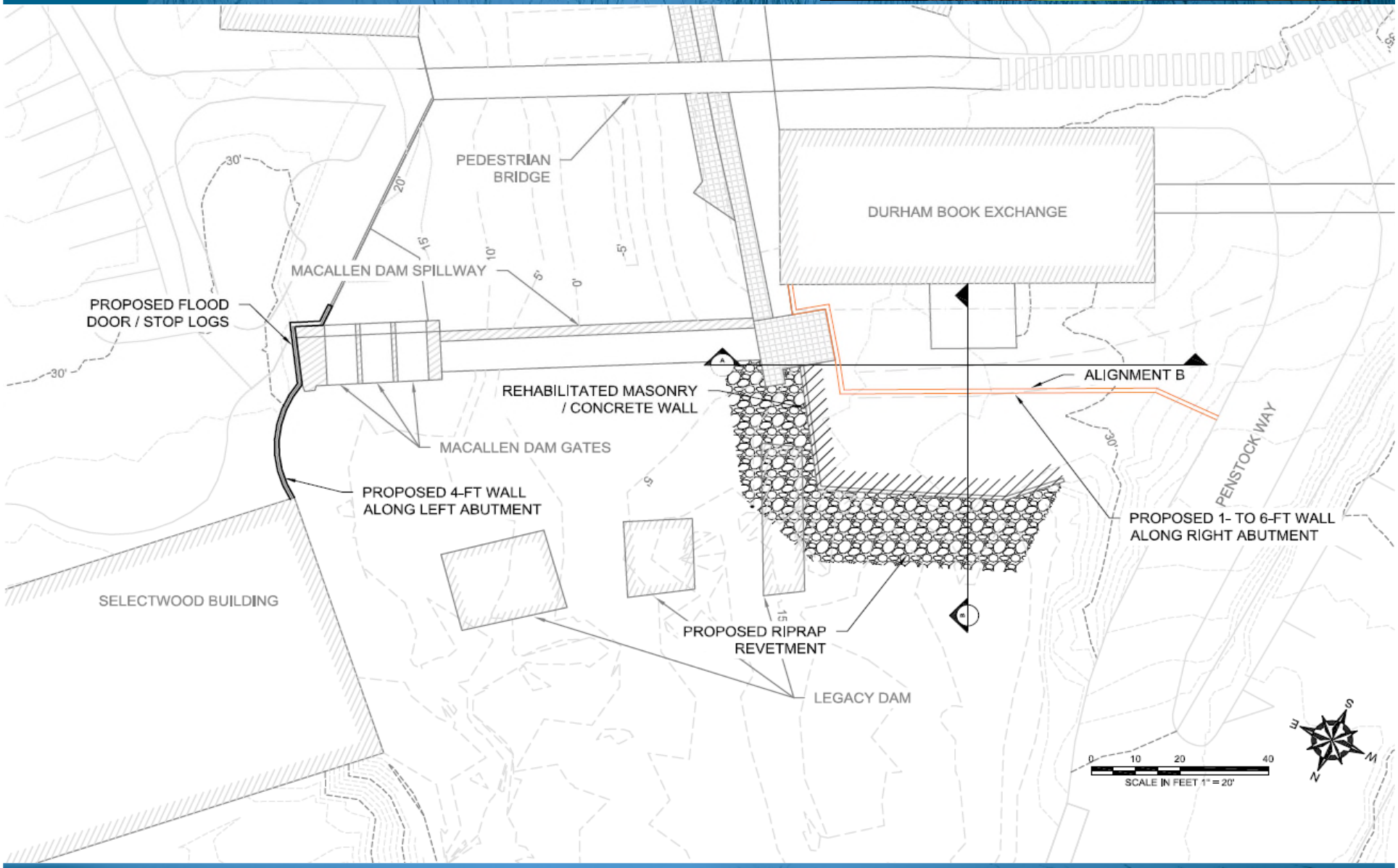
LEFT ABUTMENT
ALL OPTIONS 1, 2, 3



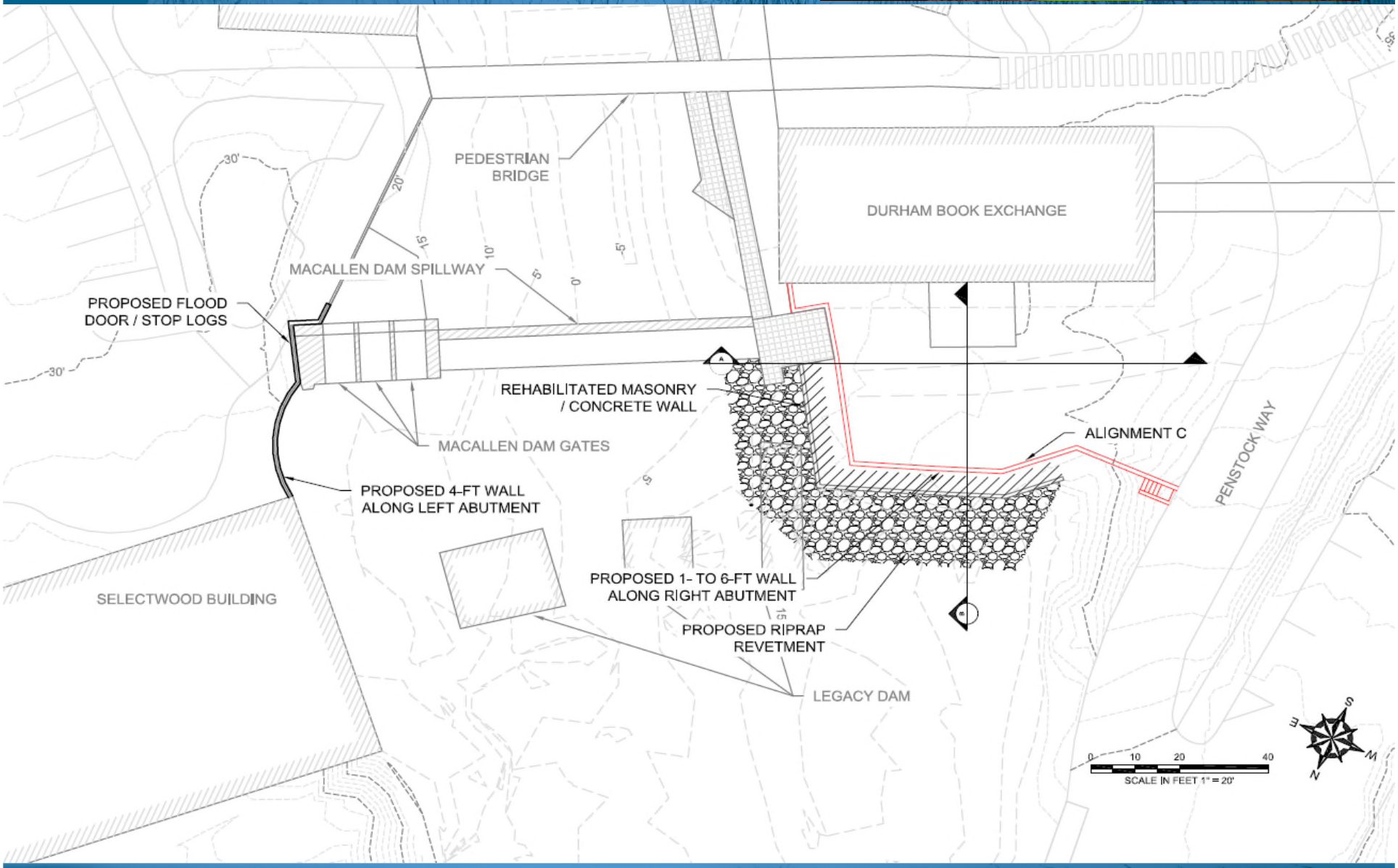
ALIGNMENT A


PEDESTRIAN BRIDGE
DURHAM BOOK EXCHANGE
MACALLEN DAM SPILLWAY
PROPOSED FLOOD DOOR / STOP LOGS
ALIGNMENT A
REHABILITATED MASONRY / CONCRETE WALL
MACALLEN DAM GATES
PROPOSED 1- TO 6-FT WALL ALONG RIGHT ABUTMENT
PROPOSED 4-FT WALL ALONG LEFT ABUTMENT
SELECTWOOD BUILDING
PROPOSED RIPRAP REVETMENT
LEGACY DAM
PENST WAY
30'
20'
15'
10'
5'
0'
-5'
0 10 20 40
SCALE IN FEET 1" = 20'
N
E
S
W

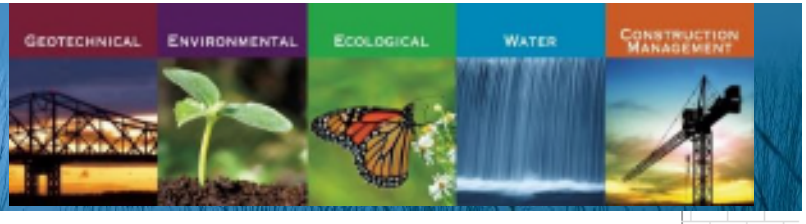
ALIGNMENT B

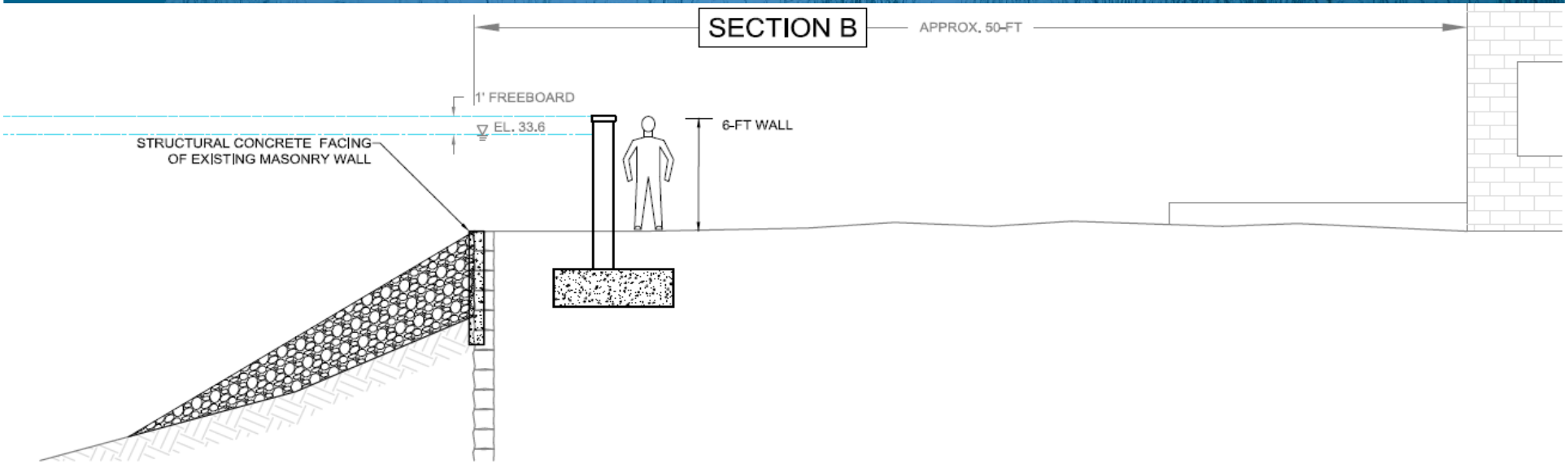

PEDESTRIAN BRIDGE
DURHAM BOOK EXCHANGE
MACALLEN DAM SPILLWAY
PROPOSED FLOOD DOOR / STOP LOGS
REHABILITATED MASONRY / CONCRETE WALL
ALIGNMENT B
MACALLEN DAM GATES
PENSTOCK WAY
PROPOSED 4-FT WALL ALONG LEFT ABUTMENT
PROPOSED 1- TO 6-FT WALL ALONG RIGHT ABUTMENT
SELECTWOOD BUILDING
PROPOSED RIPRAP REVETMENT
LEGACY DAM
30'
20'
15'
10'
5'
0'
-5'
0 10 20 40
SCALE IN FEET 1" = 20'
N
E
S
W

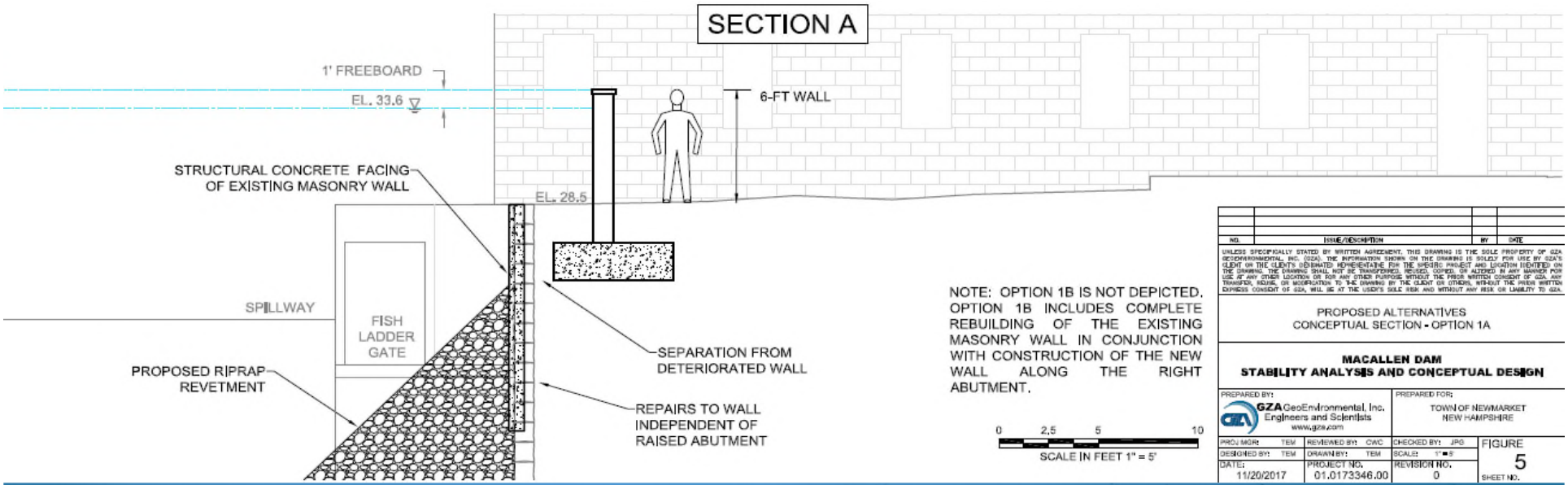
ALIGNMENT C


PEDESTRIAN BRIDGE
DURHAM BOOK EXCHANGE
MACALLEN DAM SPILLWAY
PROPOSED FLOOD DOOR / STOP LOGS
REHABILITATED MASONRY / CONCRETE WALL
MACALLEN DAM GATES
ALIGNMENT C
PENSTOCK WAY
PROPOSED 4-FT WALL ALONG LEFT ABUTMENT
SELECTWOOD BUILDING
PROPOSED 1- TO 6-FT WALL ALONG RIGHT ABUTMENT
PROPOSED RIPRAP REVETMENT
LEGACY DAM
SCALE IN FEET 1" = 20'

OPTION 1A:
6' WALL, NO FILL







NOTE: OPTION 1B IS NOT DEPICTED. OPTION 1B INCLUDES COMPLETE REBUILDING OF THE EXISTING MASONRY WALL IN CONJUNCTION WITH CONSTRUCTION OF THE NEW WALL ALONG THE RIGHT ABUTMENT.

0 2.5 5 10
SCALE IN FEET 1" = 5'

NO.	ISSUE/DESCRIPTION	BY	DATE

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PROPOSED ALTERNATIVES
CONCEPTUAL SECTION - OPTION 1A

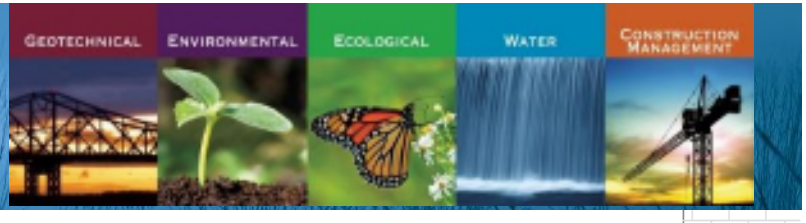
MACALLEN DAM
STABILITY ANALYSIS AND CONCEPTUAL DESIGN

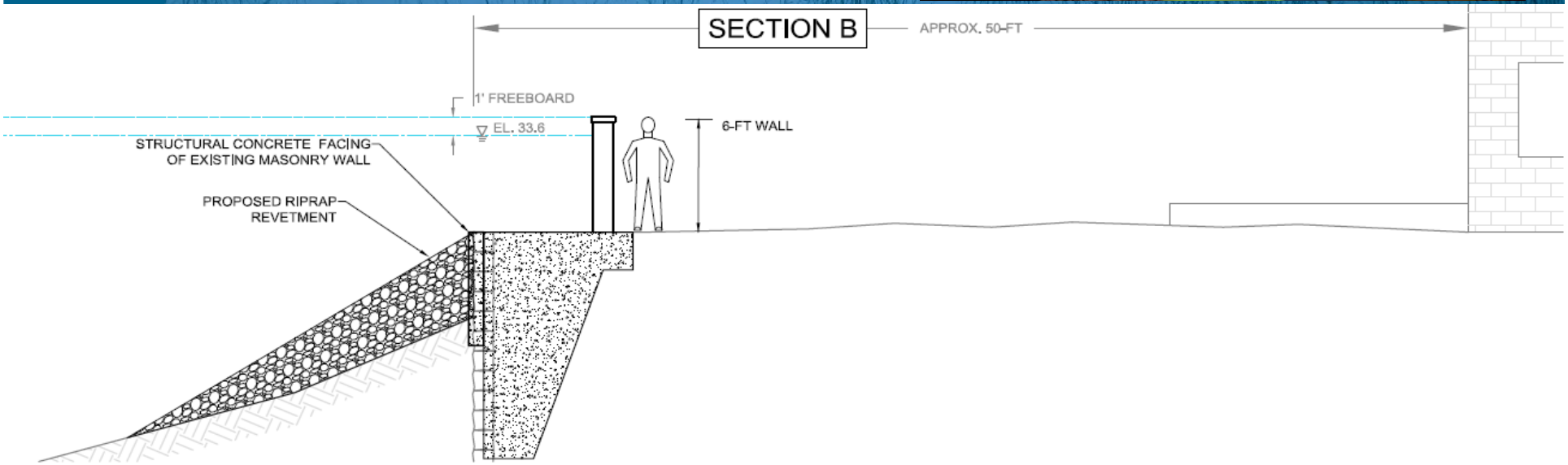
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

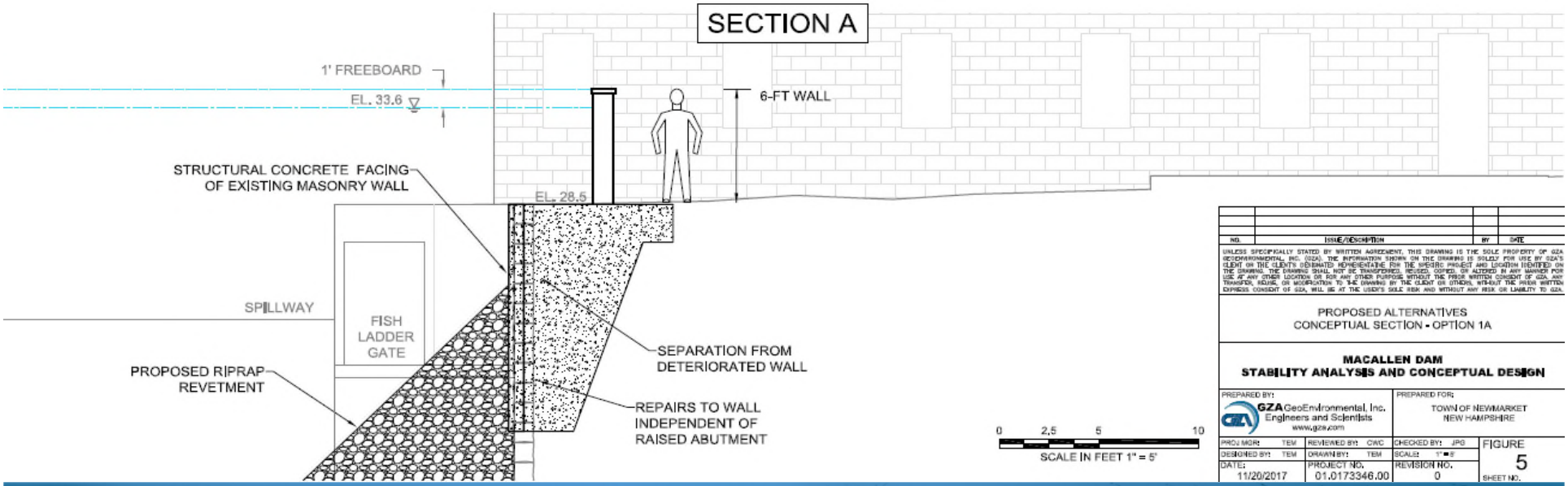
PREPARED FOR: TOWN OF NEWMARKET NEW HAMPSHIRE

PROJ MGR: TEM	REVIEWED BY: CWC	CHECKED BY: JPG	FIGURE		
DESIGNED BY: TEM	DRAWN BY: TEM	SCALE: 1" = 5'	5		
DATE: 11/20/2017	PROJECT NO. 01.0173346.00	REVISION NO. 0	SHEET NO.		

OPTION 1B:
6’ WALL - REPLACE, NO FILL







OPTION 1, ALIGNMENT A:

OPTION 1, ALIGNMENT B:

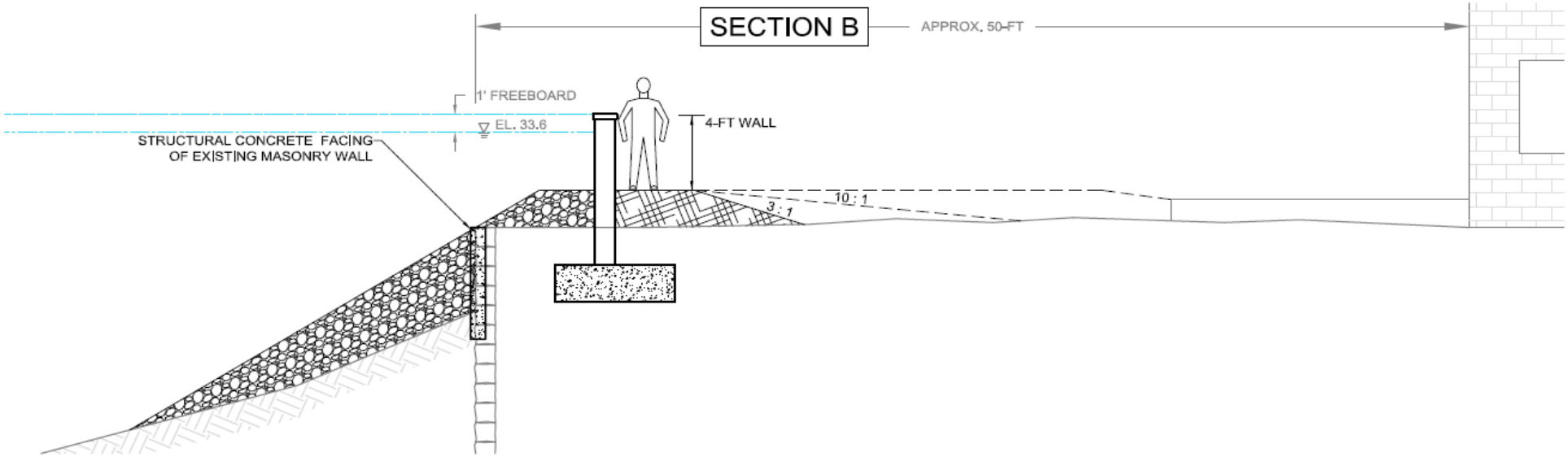
OPTION 1, ALIGNMENT C:

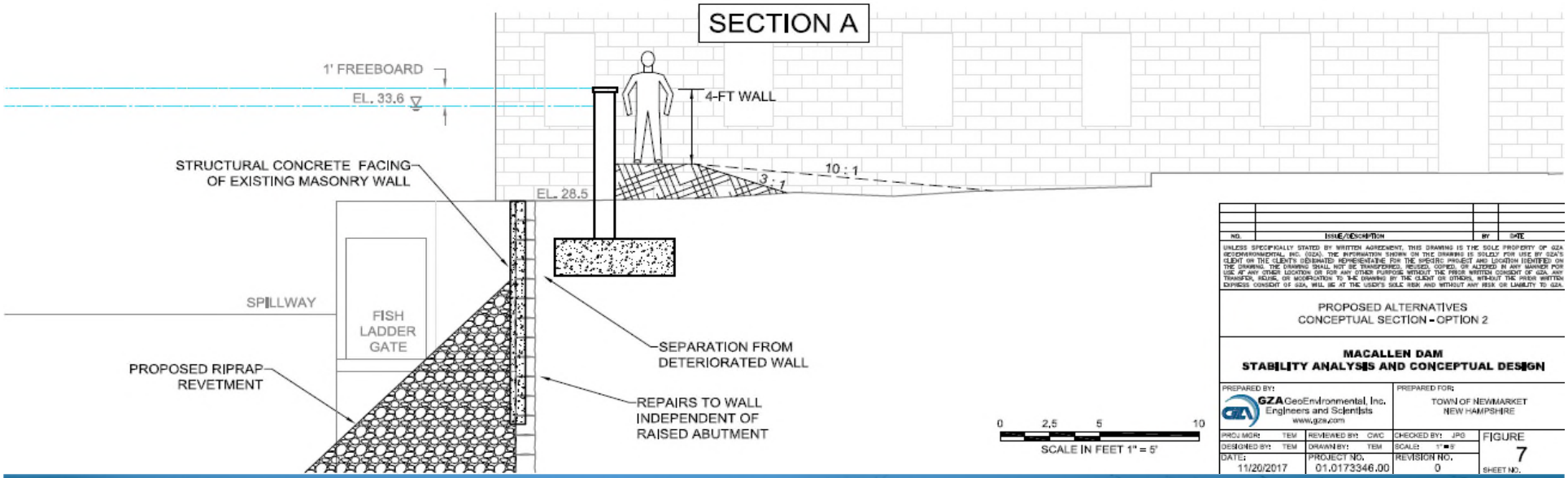
OPTION 1, ALIGNMENT C:

OPTION 1, ALIGNMENT C:

OPTION 1: LEFT ABUTMENT
OPTIONS 1, 2, & 3

OPTION 2:
4' WALL, 2' FILL



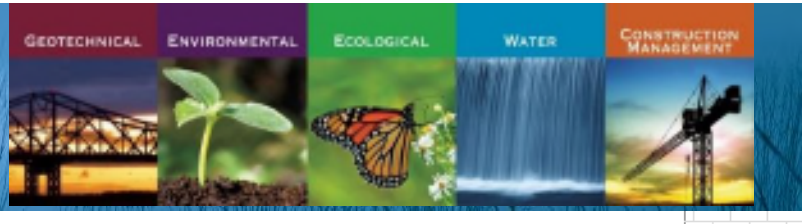


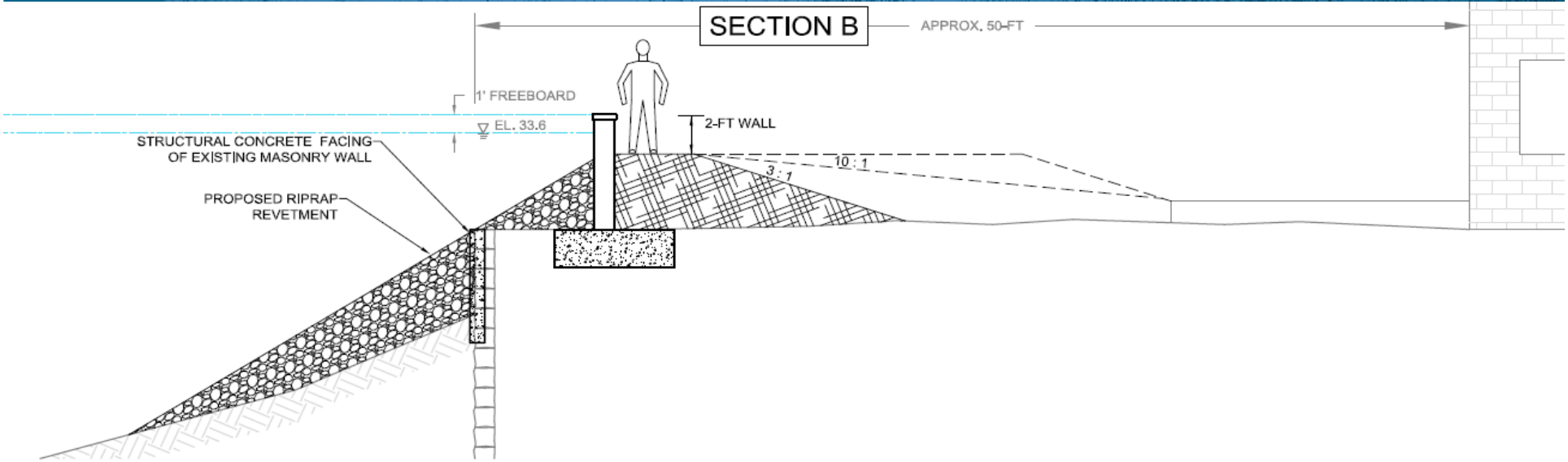
OPTION 2, ALIGNMENT C:

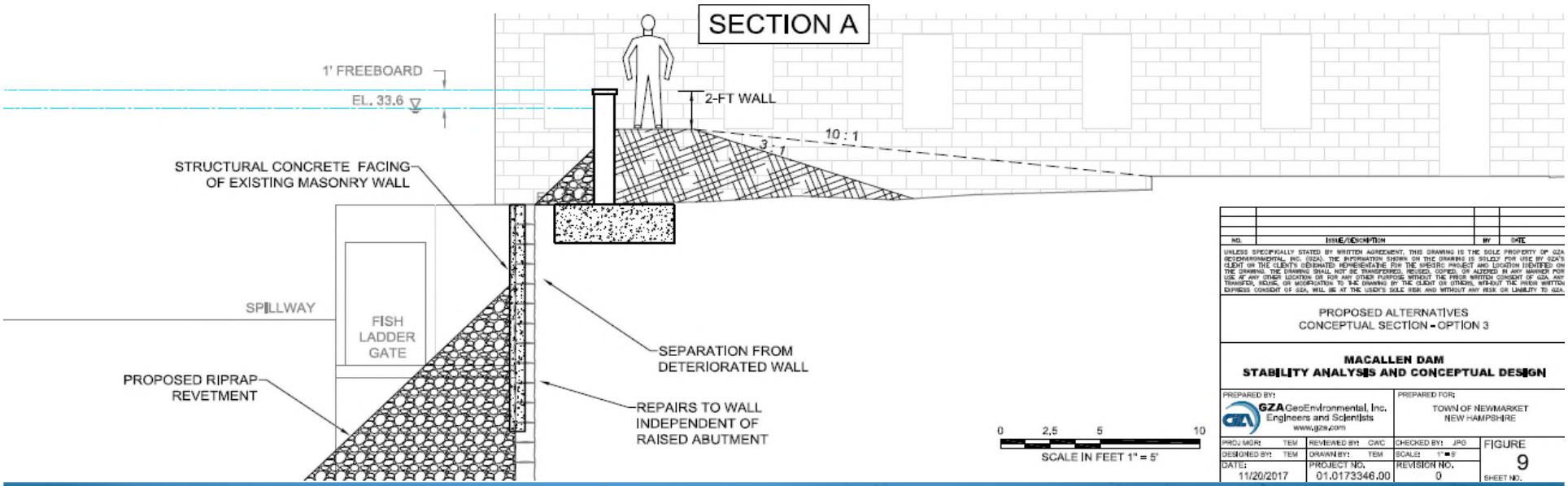
OPTION 2, ALIGNMENT C:

OPTION 2, ALIGNMENT C:

OPTION 3:
2' WALL, 4' FILL







OPTION 3, ALIGNMENT C:

OPTION 3, ALIGNMENT C:

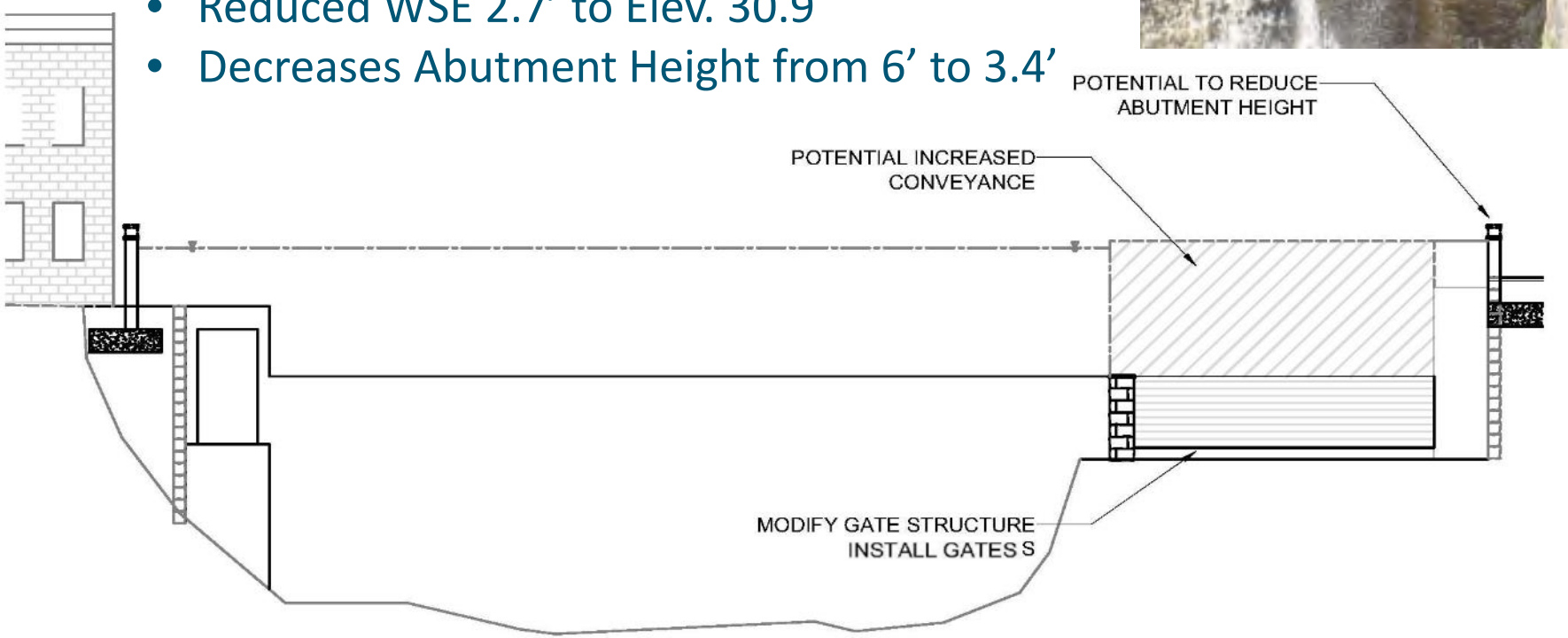
OPTION 3, ALIGNMENT C:

EXISTING GATE STRUCTURE CONDITIONS

- Three (3) Wooden Slide Gates
- Gate Approaching 100-year Lifespan
- Deteriorated Condition
  - Won’t Seat Properly
  - Leakage
  - Hole in Wooden Gate

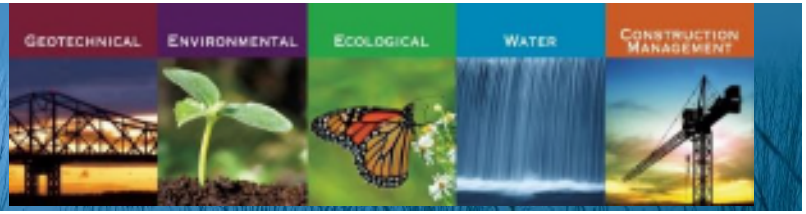
GATE AUTOMATION: INCREASE GATE CAPACITY

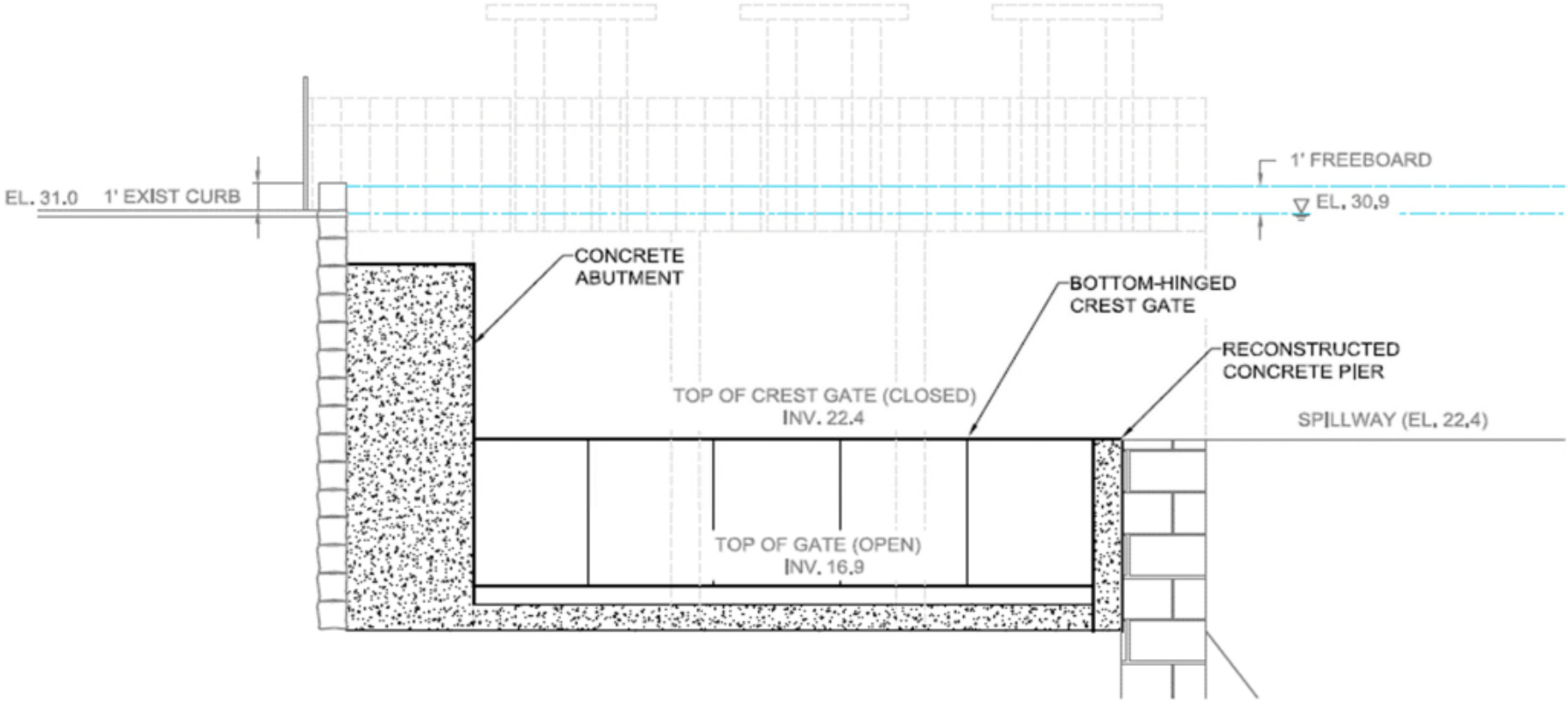
- 22’ wide, 5.5’ tall Crest Gate
- “Fail Safe” Operation / Automation
- Increase Capacity of Dam
  - Existing Conveyance Area = 147 ft^2
  - Proposed Conveyance Area = 381 ft^2
  - Reduced WSE 2.7’ to Elev. 30.9
  - Decreases Abutment Height from 6’ to 3.4’



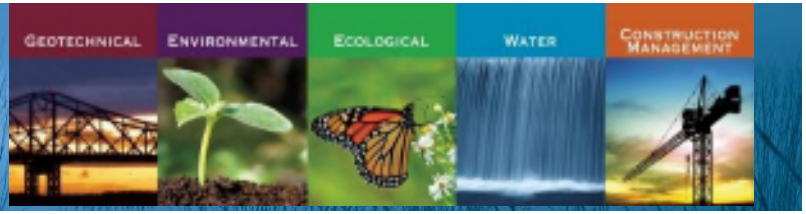
LOOKING UPSTREAM

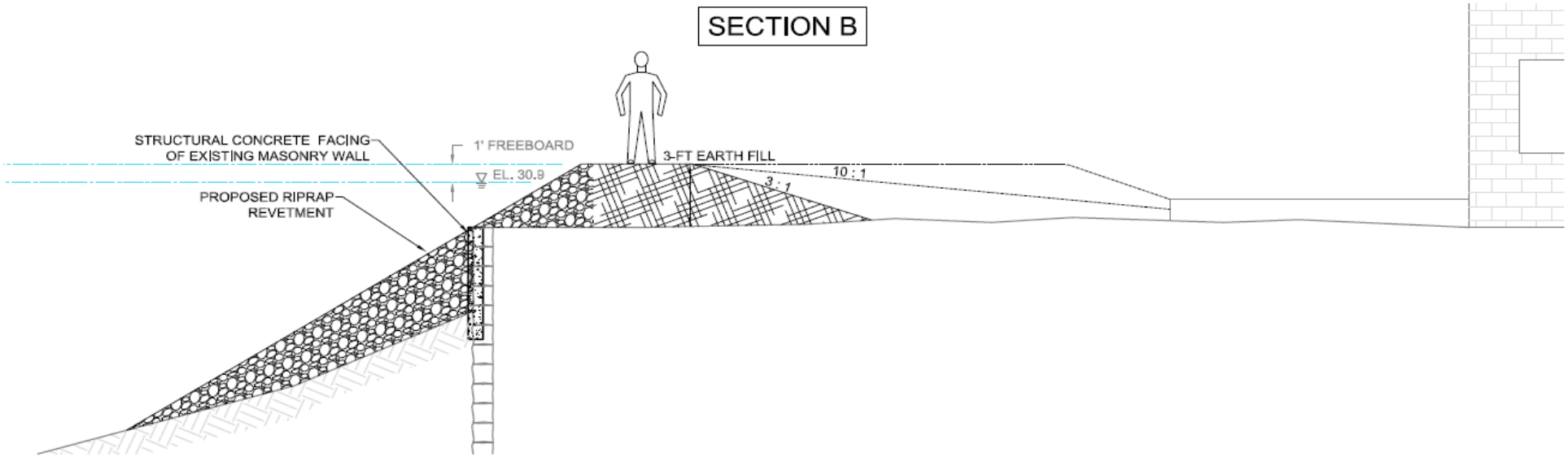
CREST GATE INSTALLATION: GATE STRUCTURE

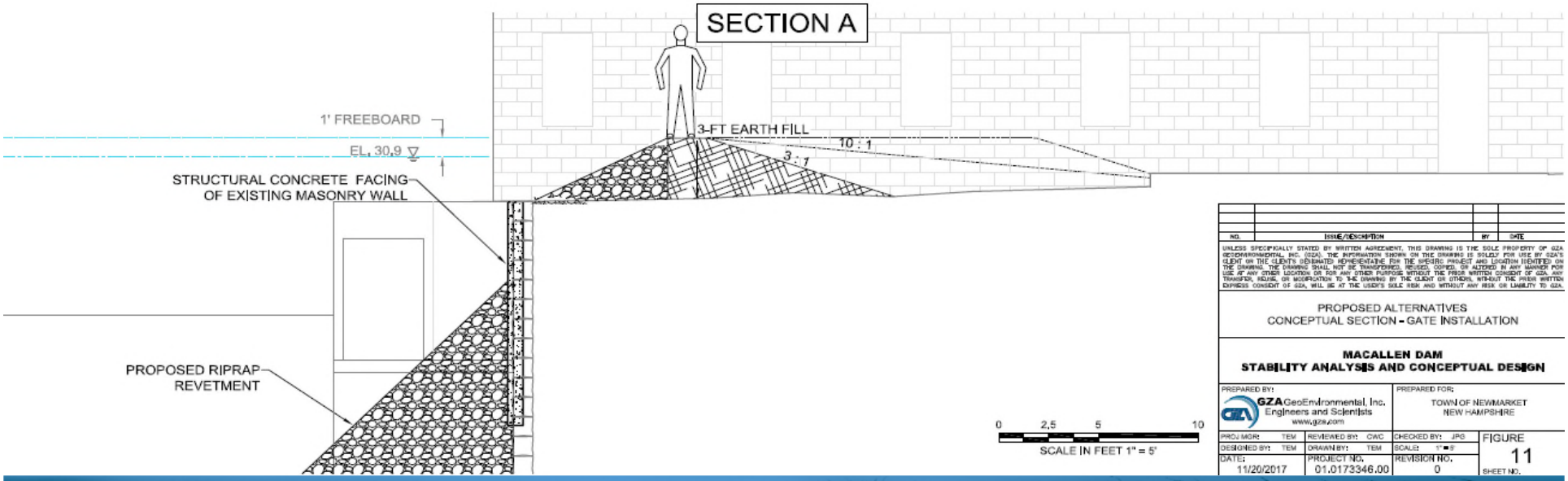




CREST GATE INSTALLATION: RIGHT ABUTMENT







CREST GATE INSTALLATION:

CREST GATE INSTALLATION:

CREST GATE INSTALLATION:

CREST GATE INSTALLATION:

CREST GATE ALTERNATIVES
PNUEMATIC GATE

Obermeyer Spillway Gate system.
Image Source: Obermeyer hydro, Inc. website.

- Bottom-hinged crest gate
- Air-Filled Rubber Bladder supports entire crest gate width
- Accurate automatic pond level control even under power failure conditions
- “Fail-Safe” operation
- Steel plates on upstream edge
- Success in cold climates
- Requires control house
- 30+ years Life Expectancy

CREST GATE ALTERNATIVES
PNUEMATIC GATE

Obermeyer Spillway Gate system. Jackson Falls Dam, Nashua, NH

Image Source: GZA Phase I Inspection

CREST GATE ALTERNATIVES
HYDRAULIC GATE

Hydraulically-Operated Crest Gate system. Otis Reservoir Dam, Otis, MA
Image Source: GZA Construction Observation

- Bottom-hinged crest gate
- Hydraulic piston controls steel crest gate
- Precise control of water levels
- “Fail-Safe” operation
- Steel plates on upstream edge
- Requires control house
- Success in cold climates
- Increased life expectancy
- Increased cost (+ $250,000)
- 60 – 100 year Life Expectancy

CREST GATE ALTERNATIVES
HYDRAULIC GATE

Hydraulically-Operated Crest Gate system.
Image Source: Steel Fab, Inc. Crest Gate Brochure

DAM REPAIRS

Photo A, Crack behind ladder

Photo F

Leakage at gate structure

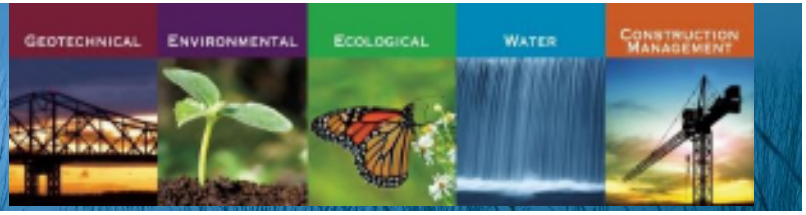
Photo J

ESTIMATES OF PROBABLE COST

Option 1	$1.46M
Option 2	$1.43M
Option 3	$1.22M
Pneumatic Gate	$1.23M
Hydraulic Gate	$1.54M

- Cost for replacement of existing gates:
  $140K for gate + $120k for structure repairs
  (included in Options 1, 2, and 3)

ESTIMATES OF PROBABLE COST

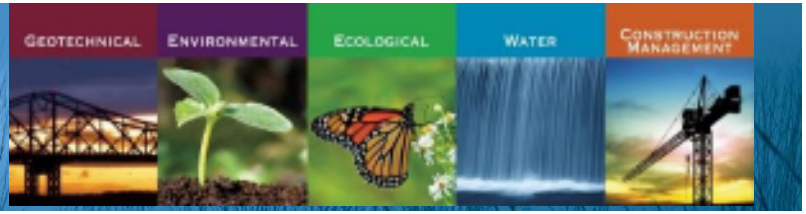


ESTIMATES OF PROBABLE COST						
ITEM NO.	DESCRIPTION	OPTION 1	OPTION 2	OPTION 3	PNUEMATIC GATE	HYDRAULIC GATE
1	Mobilization/Demobilization	$66,000	$66,000	$66,000	$66,000	$66,000
2	Temporary Erosion and Sediment Control	$19,800	$19,800	$19,800	$19,800	$19,800
3	Right Side Temporary Dewatering and Water Control	$73,500	$73,500	$73,500	$73,500	$73,500
4	Left Abutment Parapet Wall	$158,800	$158,800	$158,800		
5	Right Abutment Parapet Wall	$356,200	$292,100	$114,400		
6	Right Abutment Earth Fill		$42,100	$56,400	$42,100	$42,100
7	Existing Right Abutment Wall Repairs	$162,800	$162,800	$162,800	$162,800	$162,800
9	New Steel Slide Gates	$138,600	$138,600	$138,600		
10	Gate Structure Repairs & Left Side Water Control	$123,600	$123,600	$123,600		
11	Left Side Water Control & Pumping	$22,000	$22,000	$22,000	$71,800	$71,800
12	Demolition of Existing Gate Structure				$104,200	$104,200
13	Obermeyer Crest Gate				$403,200	
14	Hydraulic Crest Gate					$645,900
15	Site Restoration	$39,600	$39,600	$39,600	$39,600	$39,600
	Estimated Construction Costs	$1,161,000	$1,139,000	$976,000	$983,000	$1,226,000
	25% contingency	$290,300	$284,800	$244,000	$245,800	$306,500
	Total:	**$1,460,000**	**$1,430,000**	**$1,220,000**	**$1,230,000**	**$1,540,000**

Engineering Studies and Design:	$60,000 - $100,000
Permitting:	$60,000 - $70,000
Construction-Phase Services:	$100,000 - $140,000
Estimated Total:	**$220,000 - $310,000**

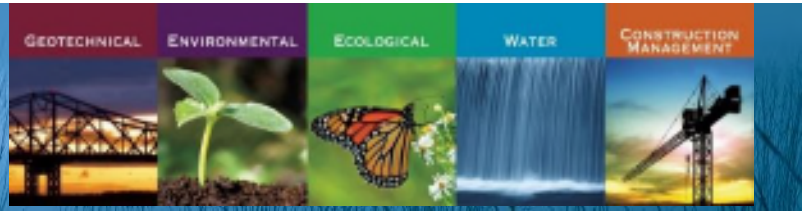
Note: Estimates rounded up to the $10k

MOVING FORWARD
NEXT STEPS

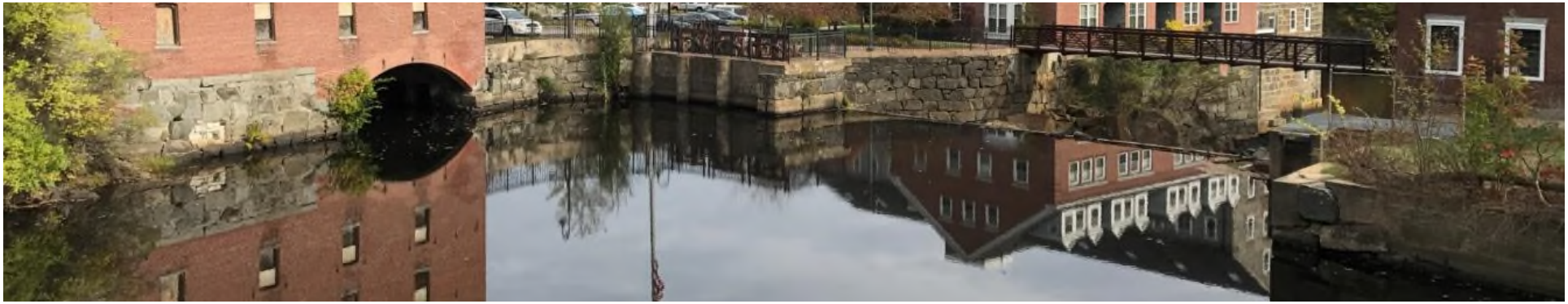


Fall 2017	NHDES approval of Concept Design (Summary Report)
Winter 2018	Public Hearing; Town Approval of Preferred Alternative
Spring 2018	Council Approval of Funds for Final Design/Permitting
Summer 2018	Begin Engineering, Final Design, & Permitting
Fall 2018	Start of Town's CIP and Budget Process
March 2019	Town Meeting Vote on Bond for Construction
Spring 2019	Construction Bidding Process; Order Gates*
Summer 2019	Permits Received
Summer 2019	Contract Award; Construction Begins
Fall 2019	Construction Ends (Late October*)
Winter 2020	Reporting and Project Closeout

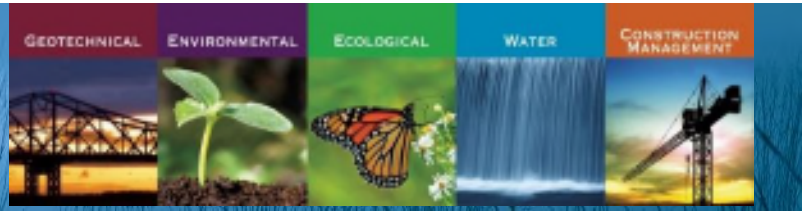
PERMITTING AND REGULATORY COMPLIANCE



1. Dam Permit
2. Wetlands Permit
3. Shoreland Permit (250’)
4. Corps State Programmatic General Permit
5. NPDES Construction General Permit
6. Local Permitting
7. FEMA Floodway No-Rise Certificate



PERMITTING AND REGULATORY COMPLIANCE



Permitting Item	Cost Estimate
1. Wetland Delineation/Characterization and Shoreland Field Documentation	$2,000
2. NH Licensed Land Survey	$3,000
3. Major Impact Wetland Permit (without fees)	$5,000
4. Wetland Permit Fee	$2,700
5. Phase IA Archeological Assessment	$5,000
6. Army Corps Permitting (includes pre-application meeting)	$3,000
7. Local Permitting (if not waived)	$3,000
8. Local Meetings (for wetland and designated river permitting)	$4,000
9. Shoreland Permit	$3,000
10. Shoreland Permit Fee	$750
11. Dam Permit	$10,000
12. Dam Permit Fee	$4,000
13. FEMA Floodway Analysis	$5,000
Subtotal	$50,450
Contingency (10%)	$5,050
Total	**$55,500**

Assumptions:

1. Project is anticipated to be classified as a Major Impact Project due to impacts to streambank likely exceeding 50 linear feet. As a result, Historical Review and a Stamped Survey will be required.

2. Lamprey River is a New Hampshire Designated River and is also considered "Wild and Scenic". As a result, presentation of the wetland application to the advisory committee and inclusion of comments will be required.

3. Rare Species Study and Phase 1B/2/3 Archaeological Studies are not anticipated as part of dam rehabilitation.

4. Wetland Mitigation Costs are not expected to be required as part of the dam rehabilitation. Final Design will be coordinated with permitting to mitigate wetland impacts to the maximum extent possible.

Questions?