



**Environmental Assessment - Appendices
Merrimack River Bank Stabilization
Chelmsford, Middlesex, MA**

4028-DR-MA

January 2018



FEMA

**U.S. Department of Homeland Security
Federal Emergency Management Agency Region I
99 High St, 6th Floor, Boston, MA 02110**

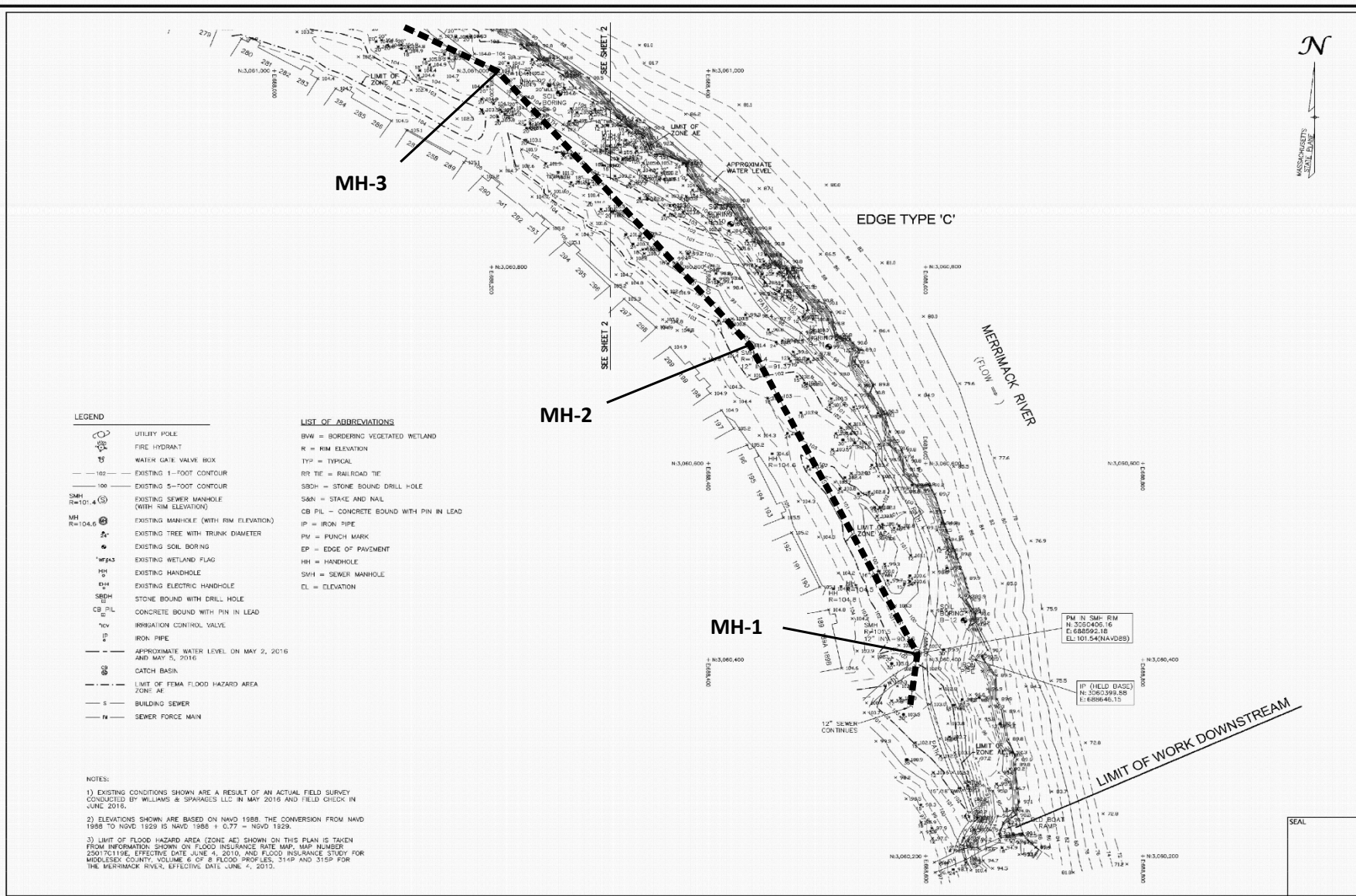
Table of Contents

Appendices A: Documents.....	1
Document A – Current Site Conditions Plans	2
Document B – Edge Type Plans.....	7
Document C – Floodplain and Wetland 8-Step.....	42
Document D – USFW IpaC Report.....	46
Appendices B: Figures	55
Figure A – Site Location Map	56
Figure B – Staging Area Map.....	57
Figure C – Soil Map	58
Figure D – Topographic Map.....	59
Figure E – Wetland Map.....	60
Figure F – Flood Map	61
Figure G – BioMap 2 Habitat Map	62
Figure H – Massachusetts Environmental Justice Communities Locations	63
Figure I – Chelmsford Zoning Map.....	64
Appendices C: Tables	65
Table A – Species of Conservation Concern.....	66
Table B – Census 2010 Minority Population.....	67
Table C – Economic Characteristics	68
Table D – RCRA Sites	66
Appendices D: Correspondences	65
Correspondence A – BRP WW 07 and 10 Water Quality Certification Application Cover Letter	66
Correspondence B – NAE-2016-1969 Merrimack River Bank Stabilization Application Cover Letter.....	67
Correspondence C – USFW Northern Long-eared Bat Rule 4(d) Notification Form	68
Correspondence D – NOAA NMFS Consultation and Concurrence.	69

Appendices A: Documents

Document A – Current Site Conditions Plans

Environmental Assessment Appendices
Merrimack River Bank Stabilization - Chelmsford



LEGEND

- UTILITY POLE
- FIRE HYDRANT
- WATER GATE VALVE BOX
- 102 EXISTING 1-FOOT CONTOUR
- 100 EXISTING 5-FOOT CONTOUR
- SMH (RIM) (S) EXISTING SEWER MANHOLE (WITH RIM ELEVATION)
- MH (RIM) (S) EXISTING MANHOLE (WITH RIM ELEVATION)
- EXISTING TREE WITH TRUNK DIAMETER
- EXISTING SOIL BORING
- EXISTING WETLAND FLAG
- EXISTING HANDHOLE
- EXISTING ELECTRIC HANDHOLE
- STONE BOUND WITH DRILL HOLE
- CONCRETE BOUND WITH PIN IN LEAD
- IRRIGATION CONTROL VALVE
- IRON PIPE
- APPROXIMATE WATER LEVEL ON MAY 2, 2016 AND MAY 5, 2016
- CATCH BASIN
- LIMIT OF FEMA FLOOD HAZARD AREA ZONE AE
- BUILDING SEWER
- SEWER FORCE MAIN

LIST OF ABBREVIATIONS

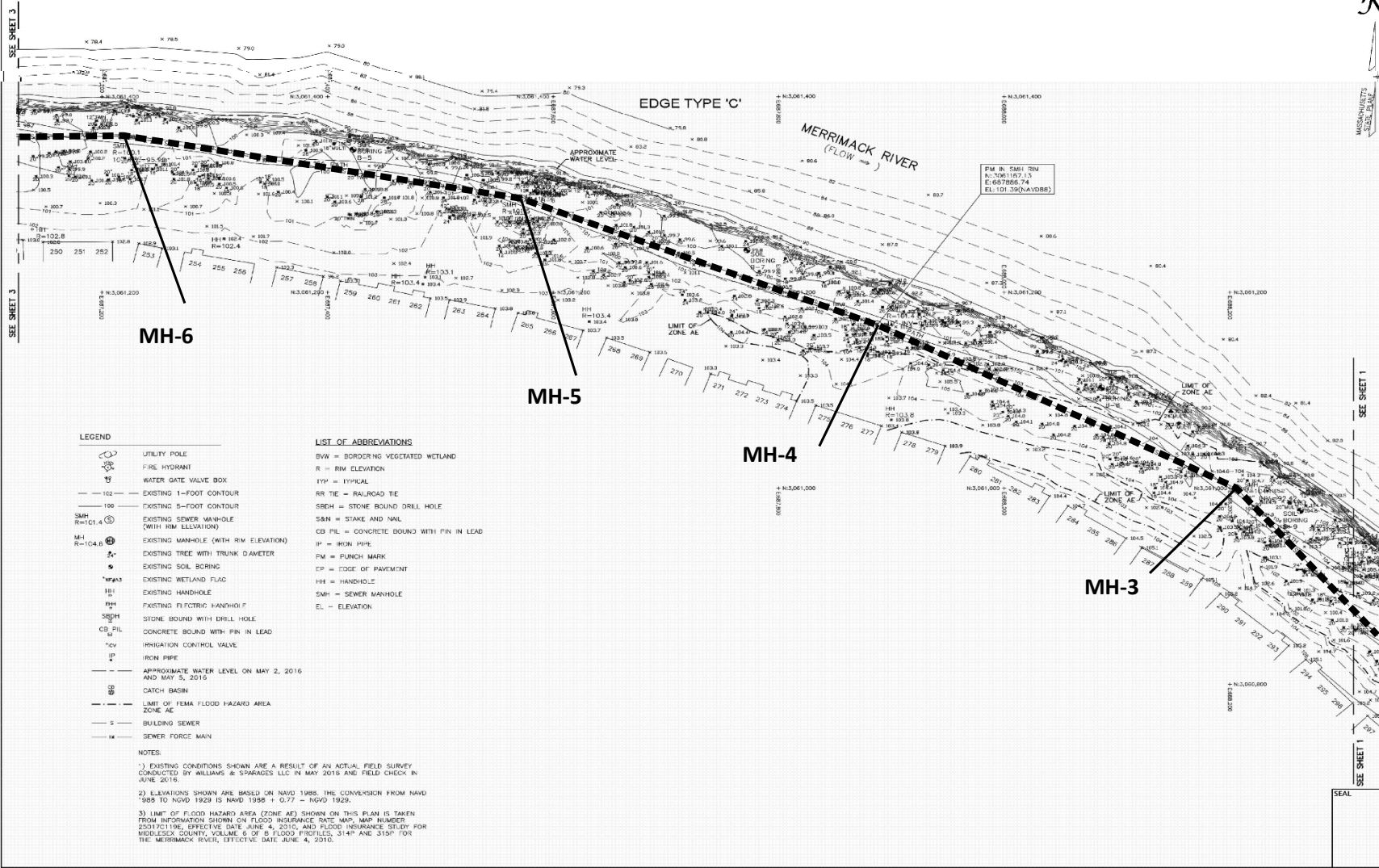
- BW = BORDERING VEGETATED WETLAND
- R = RIM ELEVATION
- TY = TYPICAL
- RR TIE = RAILROAD TIE
- SBDH = STONE BOUND DRILL HOLE
- S&N = STAKE AND NAIL
- CB PIL = CONCRETE BOUND WITH PIN IN LEAD
- IP = IRON PIPE
- PM = PUNCH MARK
- EP = EDGE OF PAVEMENT
- HH = HANDHOLE
- SMH = SEWER MANHOLE
- CL = ELEVATION

NOTES:

- 1) EXISTING CONDITIONS SHOWN ARE A RESULT OF AN ACTUAL FIELD SURVEY CONDUCTED BY WILLIAMS & SPRAGUES LLC IN MAY 2016 AND FIELD CHECK IN JUNE 2016.
- 2) ELEVATIONS SHOWN ARE BASED ON NAVD 1988. THE CONVERSION FROM NAVD 1988 TO NGVD 1929 IS NAVD 1988 + 0.77 = NGVD 1929.
- 3) LIMIT OF FLOOD HAZARD AREA (ZONE AE) SHOWN ON THIS PLAN IS TAKEN FROM INFORMATION SHOWN ON FLOOD INSURANCE RATE MAP, MAP NUMBER 25017C119E, EFFECTIVE DATE JUNE 4, 2010, AND FLOOD INSURANCE STUDY FOR MIDDLESEX COUNTY, VOLUME 6 OF 8 FLOOD PROFILES, 314P AND 316P FOR THE MERRIMACK RIVER, EFFECTIVE DATE JUNE 4, 2013.

<p>TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS WILLIAMSBURG CONDOMINIUMS 631 WELLMAN AVENUE, NORTH CHELMSFORD, MA 01863-1365</p>		<p>DRAWING: TP-1 SHEET 1 OF 4</p>
<p>Owner: WILLIAMSBURG CONDOMINIUMS 631 WELLMAN AVENUE NORTH CHELMSFORD, MA 01863-1365</p>		<p>DATE</p>
<p>Applicant: Same as owner</p>		<p>NO.</p>
<p>Designed By: N/A Drawn By: JWP Checked By: JWP Project Manager: CFS</p>		<p>SCALE: 1"=40'</p>
<p>Job File Number: CHEL-0023 Drawing File Folder: CHEL23</p>		<p>JUNE 29, 2016</p>
<p><input type="checkbox"/> Drawing issued for Review Only <input type="checkbox"/> Drawing issued for Permit <input type="checkbox"/> Drawing issued for Construction</p>		<p>SEAL</p>

Environmental Assessment Appendices
Merrimack River Bank Stabilization - Chelmsford



LEGEND

- UTILITY POLE
- FIRE HYDRANT
- WATER GATE VALVE BOX
- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- EXISTING SEWER MANHOLE (WITH RIM ELEVATION)
- EXISTING MANHOLE (WITH RIM ELEVATION)
- EXISTING TREE WITH TRUNK DIAMETER
- EXISTING SOIL BORING
- EXISTING WETLAND FLAG
- EXISTING HANDHOLE
- EXISTING ELECTRIC HANDHOLE
- STONE BOUND WITH DRILL HOLE
- CONCRETE BOUND WITH PIN IN LEAD
- IRRIGATION CONTROL VALVE
- IRON PIPE
- APPROXIMATE WATER LEVEL ON MAY 2, 2016 AND MAY 5, 2016
- CATCH BASIN
- LIMIT OF FEMA FLOOD HAZARD AREA ZONE AE
- BUILDING SEWER
- SEWER FORCE MAIN

LIST OF ABBREVIATIONS

- BVW = BORDERING VEGETATED WETLAND
- R = RIM ELEVATION
- ETP = TYPICAL
- RR TIE = RAILROAD TIE
- SBH = STONE BOUND DRILL HOLE
- SBM = STAKE AND NAIL
- CB FIL = CONCRETE BOUND WITH PIN IN LEAD
- IP = IRON PIPE
- FM = PUNCH MARK
- EP = EDGE OF PAVEMENT
- HH = HANDHOLE
- SMH = SEWER MANHOLE
- EL = ELEVATION

NOTES:

- 1) EXISTING CONDITIONS SHOWN ARE A RESULT OF AN ACTUAL FIELD SURVEY CONDUCTED BY WILLIAMS & SZARASZ LLC IN MAY 2016 AND FIELD CHECK IN JUNE 2016.
- 2) ELEVATIONS SHOWN ARE BASED ON NAVD 1988. THE CONVERSION FROM NAVD 1988 TO NAD 1983 IS NAVD 1988 + 0.77 = NAD 1983.
- 3) LIMIT OF FLOOD HAZARD AREA (ZONE AE) SHOWN ON THIS PLAN IS TAKEN FROM INFORMATION SHOWN ON FLOOD INSURANCE RATE MAP, MAP NUMBER 22032710E, EFFECTIVE DATE JUNE 4, 2010, AND FLOOD INSURANCE STUDY FOR MIDDLESEX COUNTY, VOLUME 6 OF 8 FLOOD PROFILES, 314* AND 315* FOR THE MERRIMACK RIVER, EFFECTIVE DATE JUNE 4, 2010.

TOPOGRAPHIC PLAN
SHOWING EXISTING CONDITIONS
WILLIAMSBURG CONDOMINIUMS
631 WELLMAN AVENUE, NORTH CHELMSFORD, MA 01863-1365

Owner:
WILLIAMSBURG CONDOMINIUMS
631 WELLMAN AVENUE
NORTH CHELMSFORD, MA 01863-1365

Applicant:
Same as owner

Designed By: N/A
Drawn By: MIP
Checked By: CFS
Project Manager: CFS

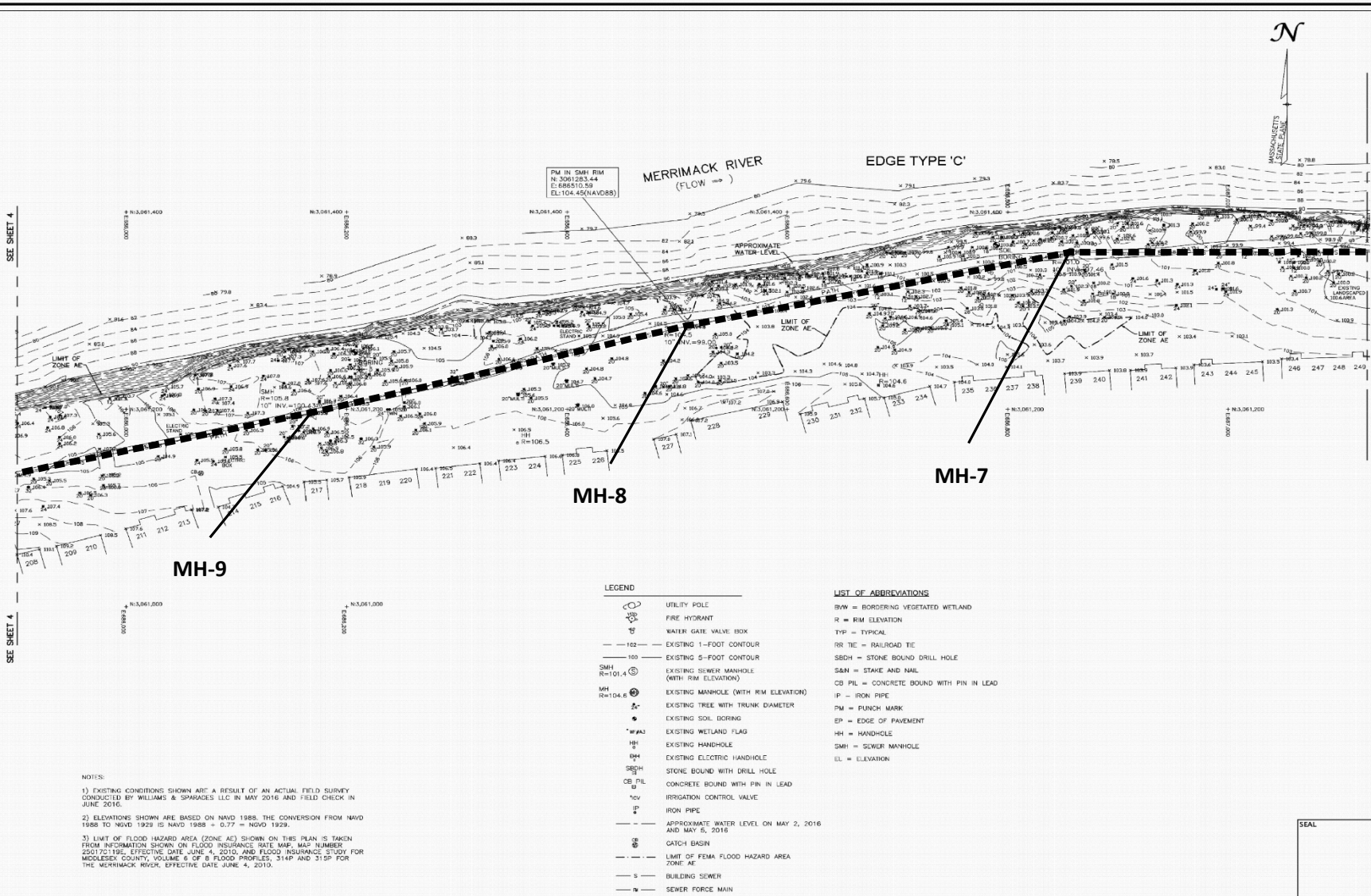
Job file Number: CHEL-0023
Drawing File Folder: CHEL23

- Drawing Issued for Review Only
- Drawing Issued for Permit
- Drawing Issued for Construction

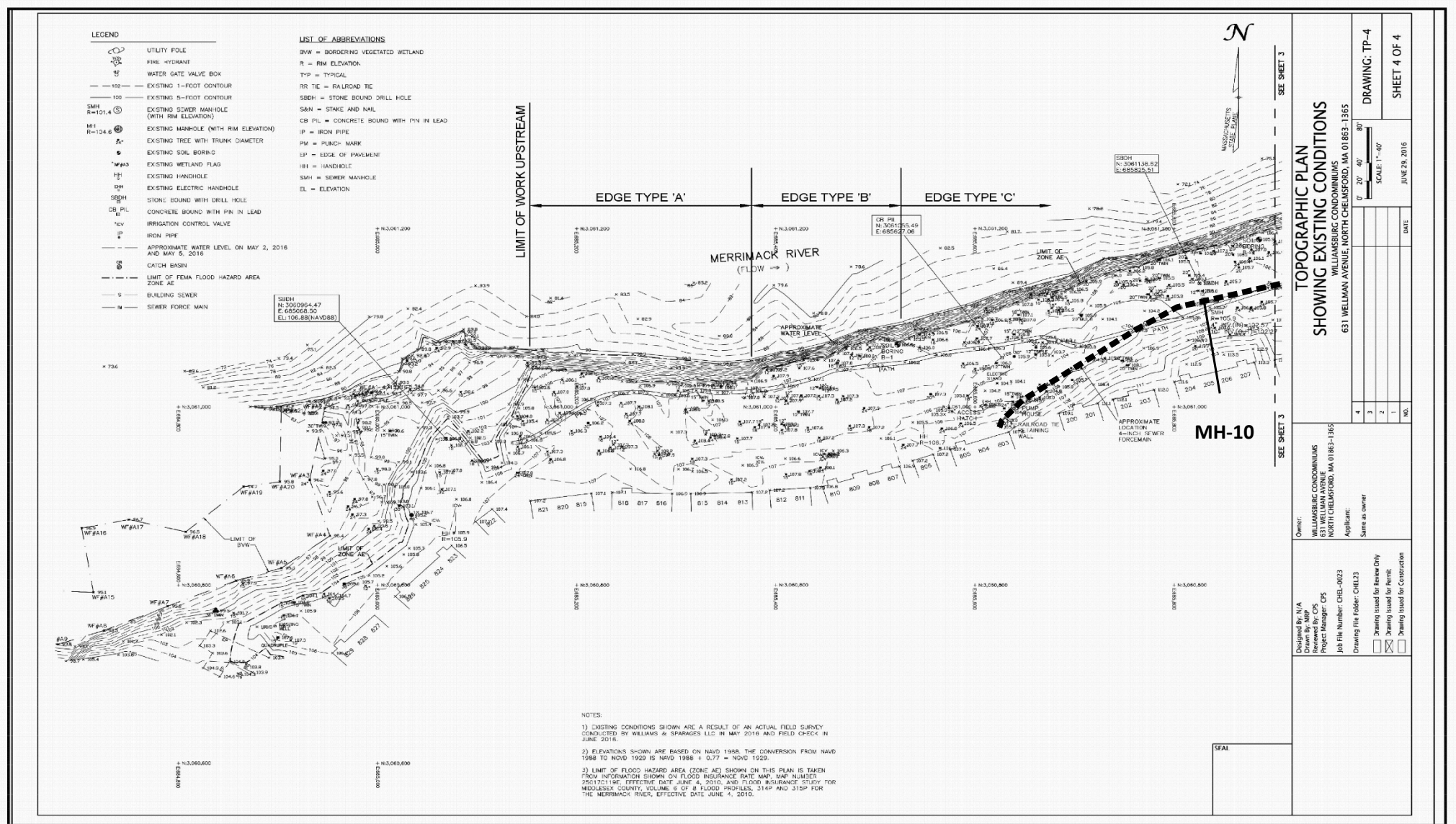
4	NO.	DATE
3		
2		
1		

DRAWING: TP-2
SCALE: 1"=40'
JUNE 20, 2016
SHEET 2 OF 4

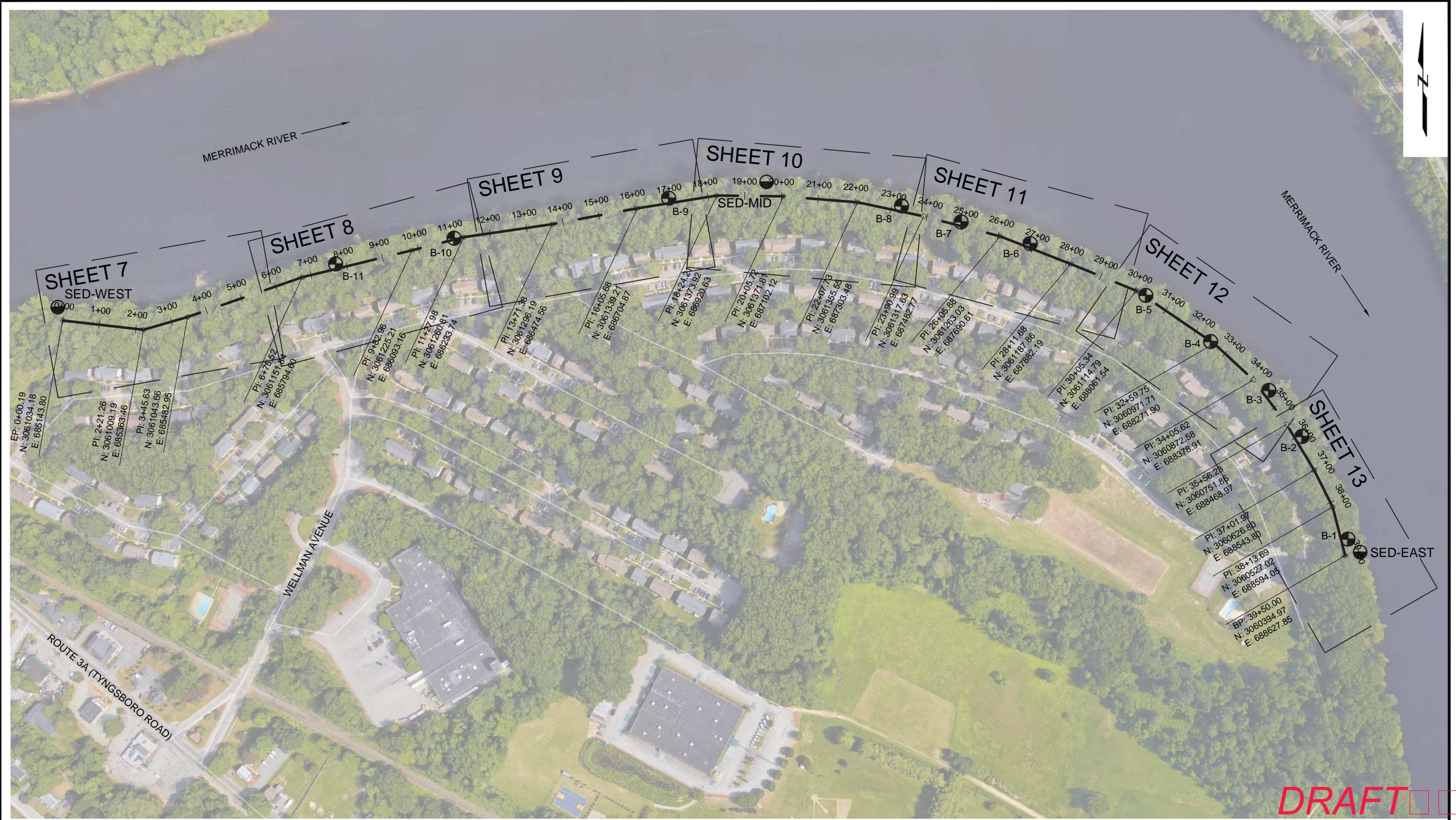
Environmental Assessment Appendices
Merrimack River Bank Stabilization - Chelmsford



Environmental Assessment Appendices
Merrimack River Bank Stabilization - Chelmsford



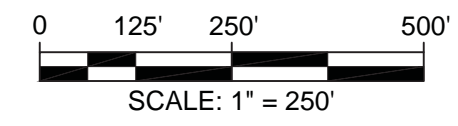
Document B – Edge Type Plans



DRAFT

NOTES: □ □
 1. BORINGS LOCATED USING EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND: □ □
 ● B-9 GEI BORING LOCATION



Merrimack Riverbank Stabilization
 Wellman Avenue
 North Chelmsford, Massachusetts

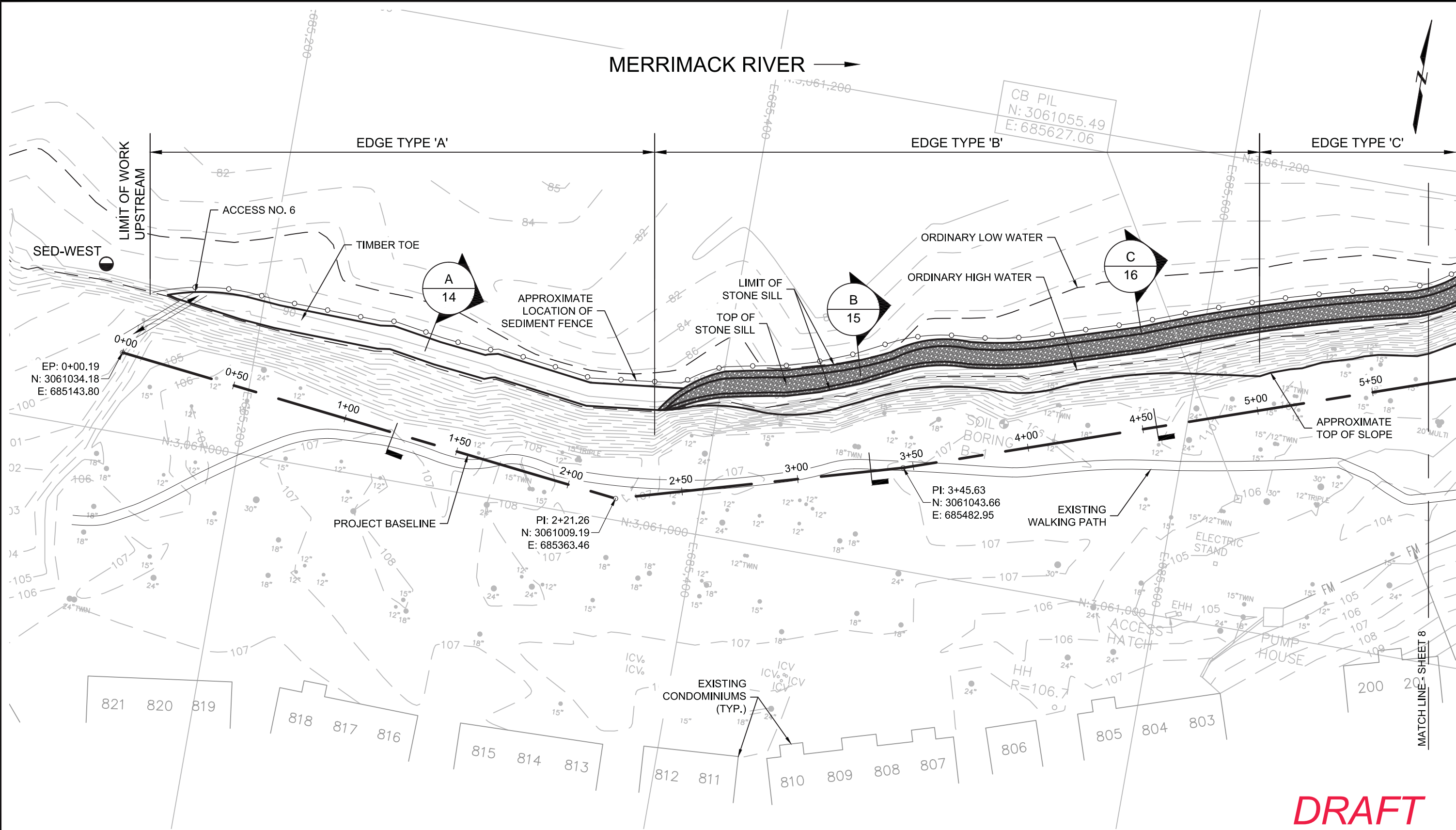
Town of Chelmsford
 Chelmsford, Massachusetts



SITE OVERVIEW

Project 1603860 November 2016 Sheet 6 of 39

MERRIMACK RIVER



CB PIL
N: 3061055.49
E: 685627.06

A
14

B
15

C
16

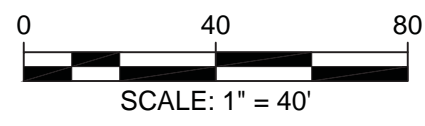
EP: 0+00.19
N: 3061034.18
E: 685143.80

PI: 2+21.26
N: 3061009.19
E: 685363.46

PI: 3+45.63
N: 3061043.66
E: 685482.95

NOTES:
1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 B-9 GEI BORING LOCATION
 SED GEI SEDIMENT SAMPLE LOCATION



Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

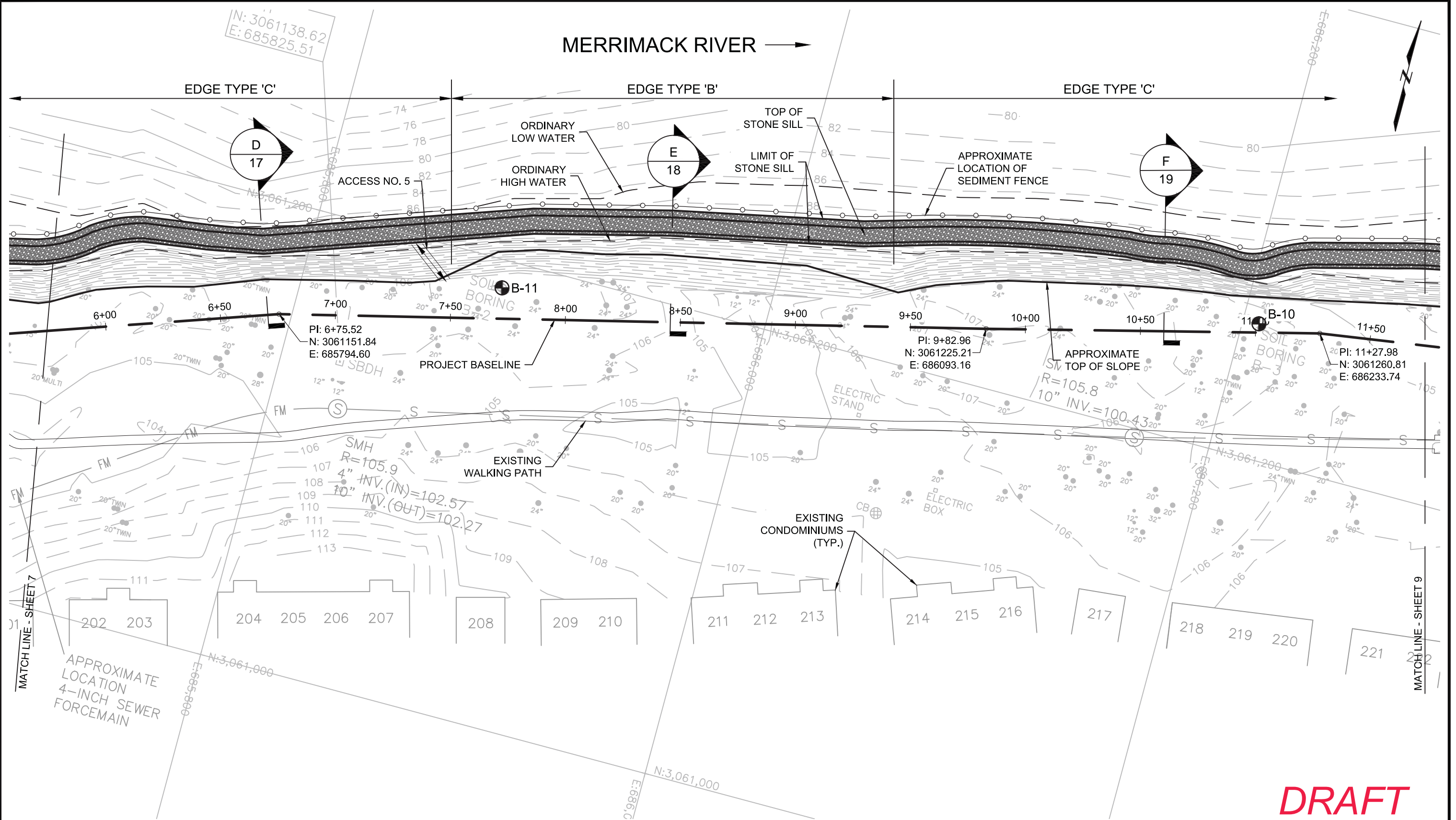


SITE PLAN
(1 OF 7)

Project 1603860 November 2016 Sheet 7 of 39

DRAFT

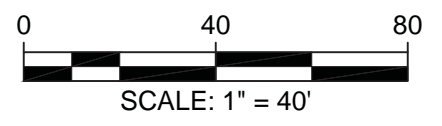
MERRIMACK RIVER




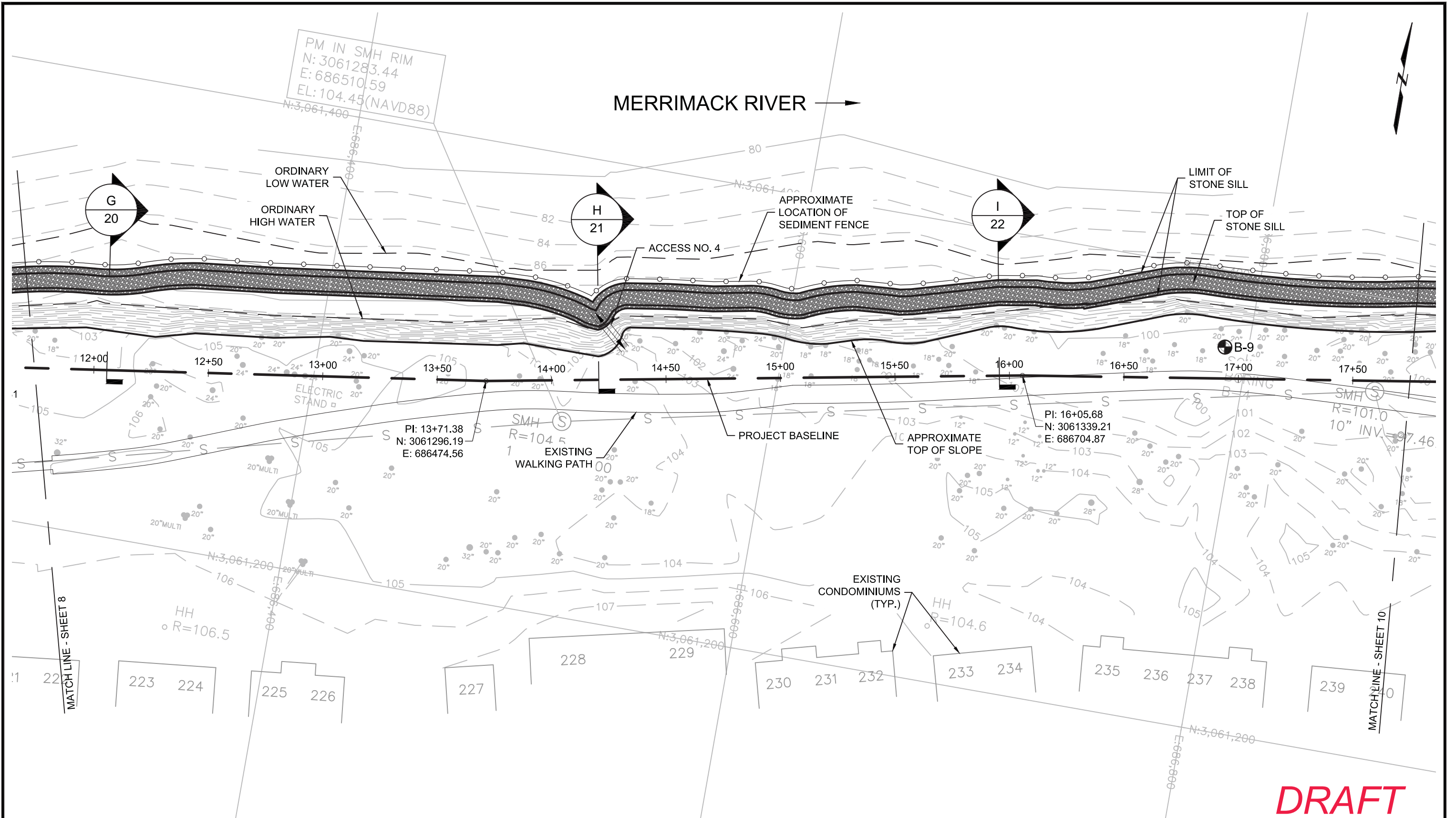
DRAFT

NOTES:
 1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 ● B-9 GEI BORING LOCATION
 ● SED GEI SEDIMENT SAMPLE LOCATION



Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		SITE PLAN (2 OF 7)
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 8 of 39



MERRIMACK RIVER

PM IN SMH RIM
 N: 3061283.44
 E: 686510.59
 EL: 104.45 (NAVD88)

G
20

H
21

I
22

B-9

PI: 13+71.38
 N: 3061296.19
 E: 686474.56

PI: 16+05.68
 N: 3061339.21
 E: 686704.87

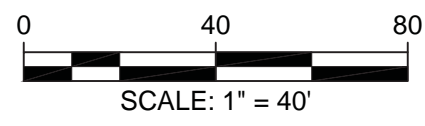
SMH
 R=101.0
 10" INV
 97.46

HH
 R=106.5

HH
 R=104.6

NOTES:
 1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 ● B-9 GEI BORING LOCATION
 ● SED GEI SEDIMENT SAMPLE LOCATION



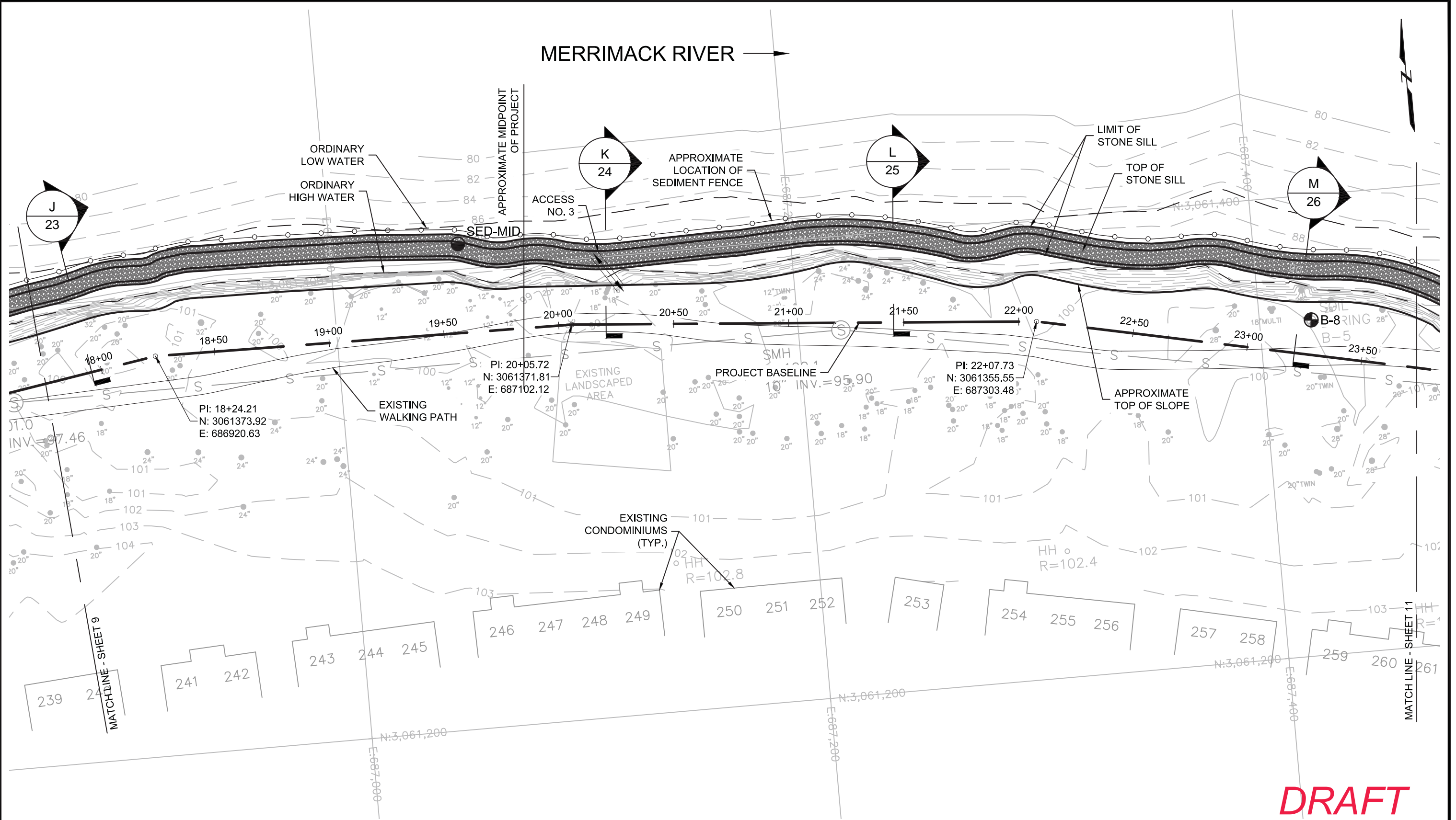
Merrimack Riverbank Stabilization
 Wellman Avenue
 North Chelmsford, Massachusetts
 Town of Chelmsford
 Chelmsford, Massachusetts



SITE PLAN
 (3 OF 7)
 Project 1603860 November 2016 Sheet 9 of 39

DRAFT

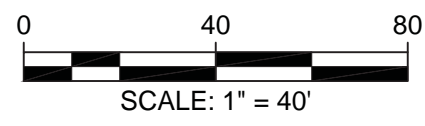
MERRIMACK RIVER




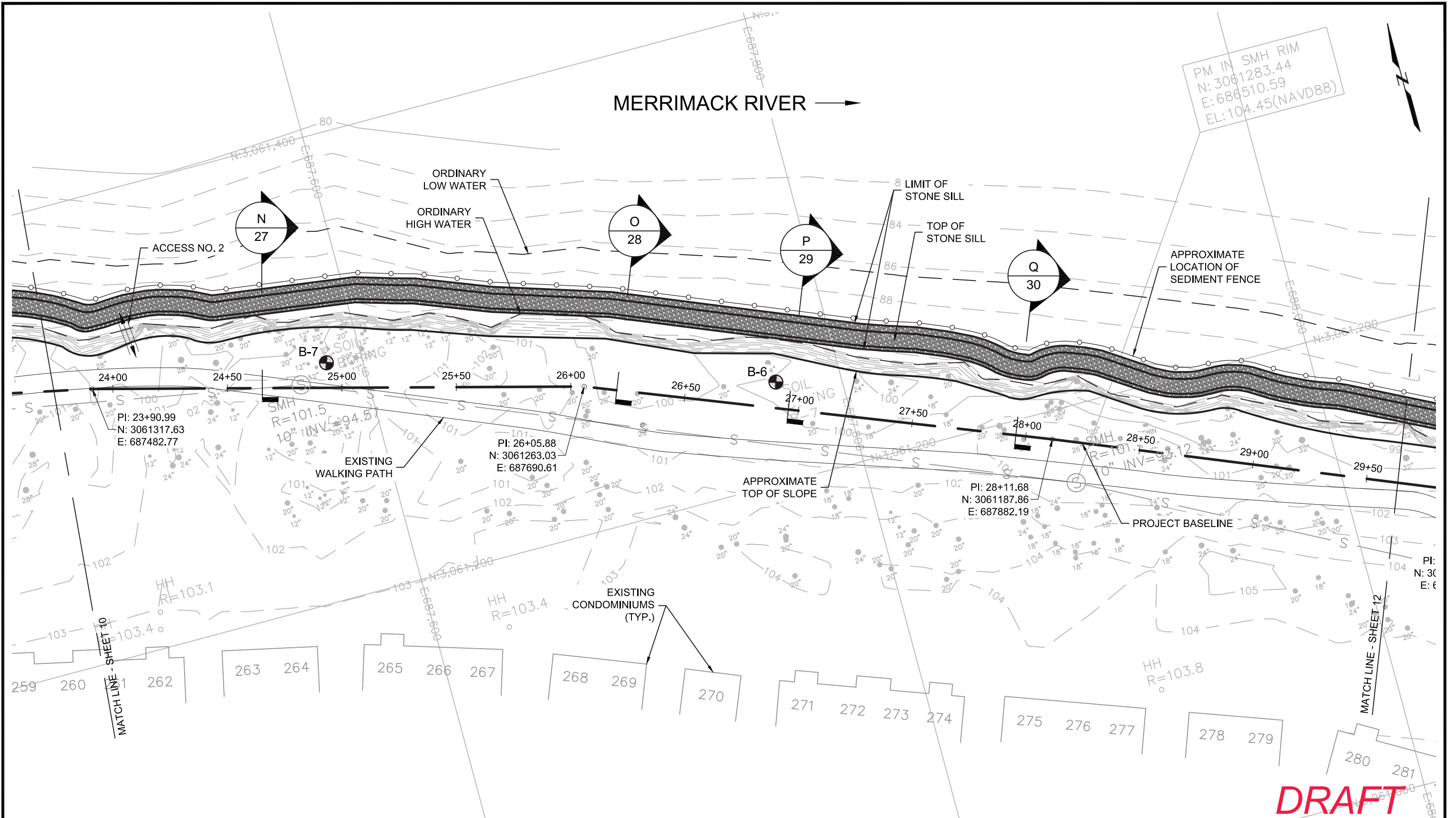
DRAFT

NOTES:
 1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 ● B-9 GEI BORING LOCATION
 ● SED GEI SEDIMENT SAMPLE LOCATION



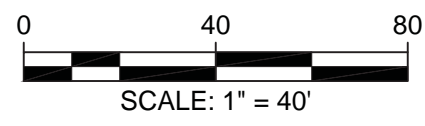
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		SITE PLAN (4 OF 7)
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 10 of 39




DRAFT

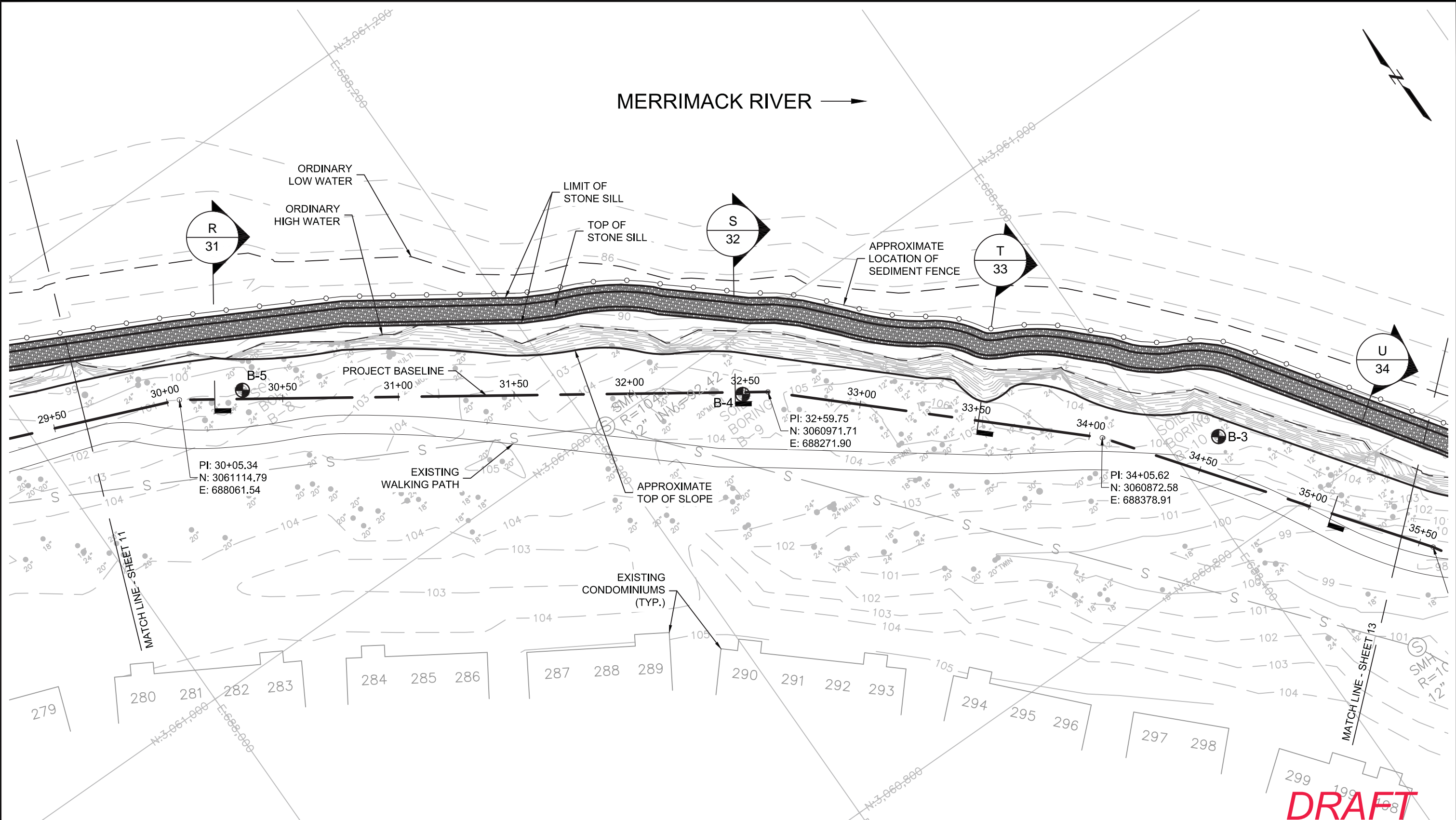
NOTES:
 1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 ● B-9 GEI BORING LOCATION
 ● SED GEI SEDIMENT SAMPLE LOCATION



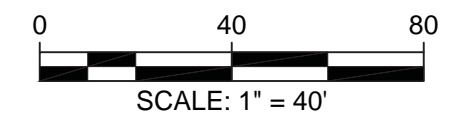
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		SITE PLAN (5 OF 7)
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 11 of 39

MERRIMACK RIVER →



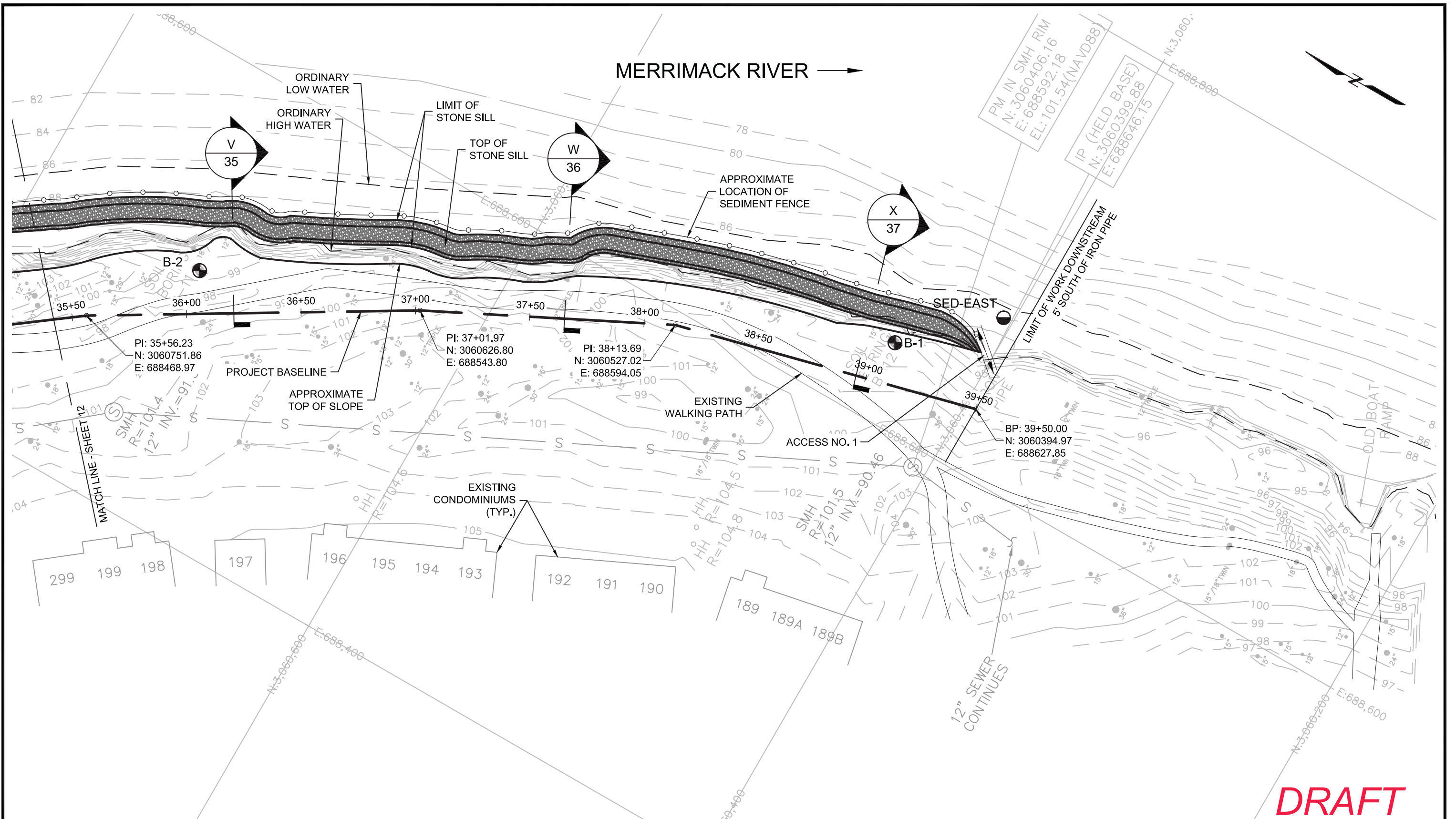
NOTES:
 1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 ● B-9 GEI BORING LOCATION
 ● SED GEI SEDIMENT SAMPLE LOCATION



Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		SITE PLAN (6 OF 7)
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 12 of 39

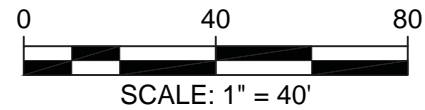
DRAFT




DRAFT

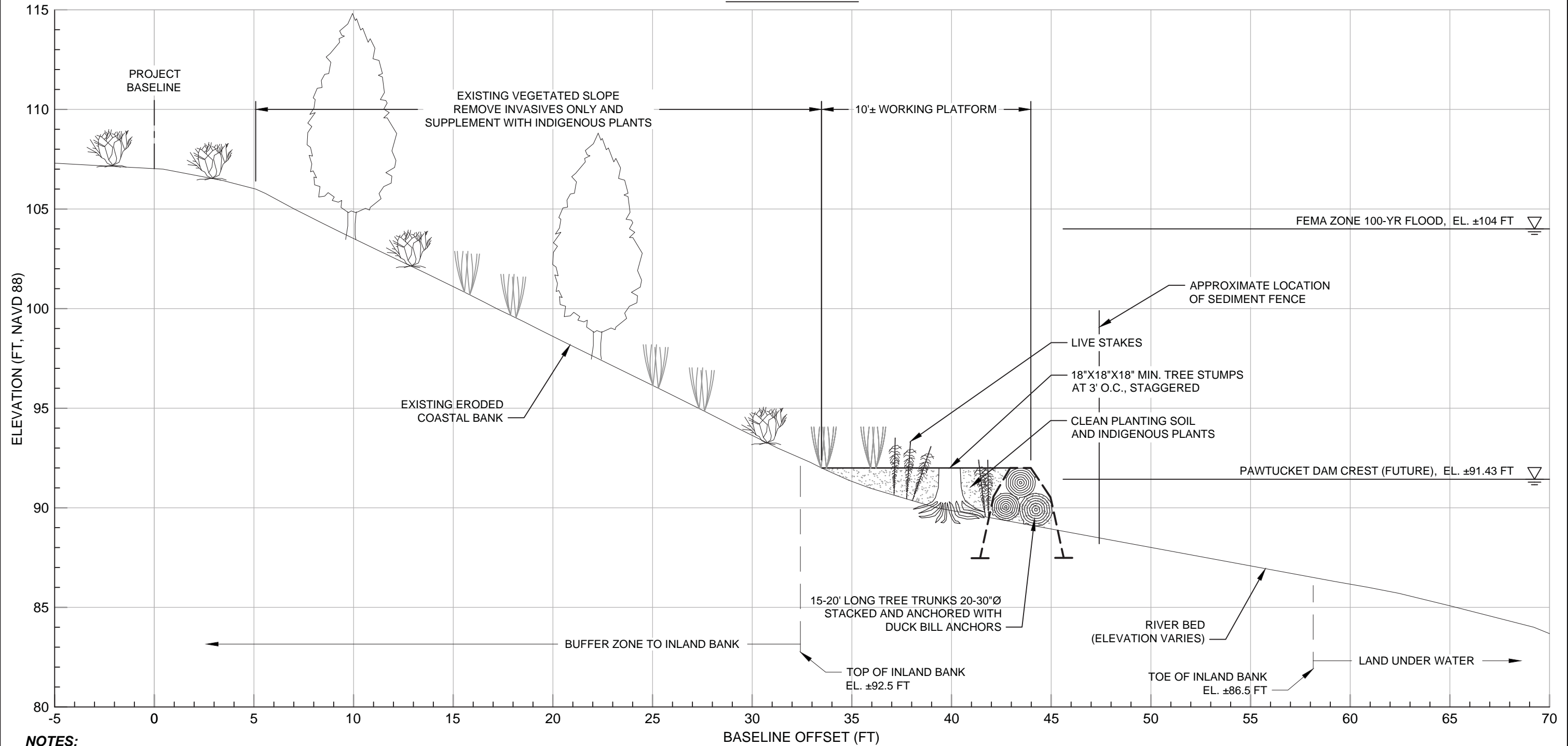
NOTES:
 1. EXISTING SURVEY DATA FROM DRAWING SP-1 "TOPOGRAPHIC PLAN SHOWING EXISTING CONDITIONS" DATED JUNE 20, 2016 PROVIDED BY WILLIAMS & SPARAGES, LLC.

LEGEND:
 ● B-9 GEI BORING LOCATION
 ● SED GEI SEDIMENT SAMPLE LOCATION



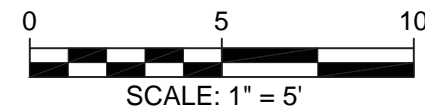
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		SITE PLAN (7 OF 7)
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 13 of 39

STA. 1+22



NOTES:

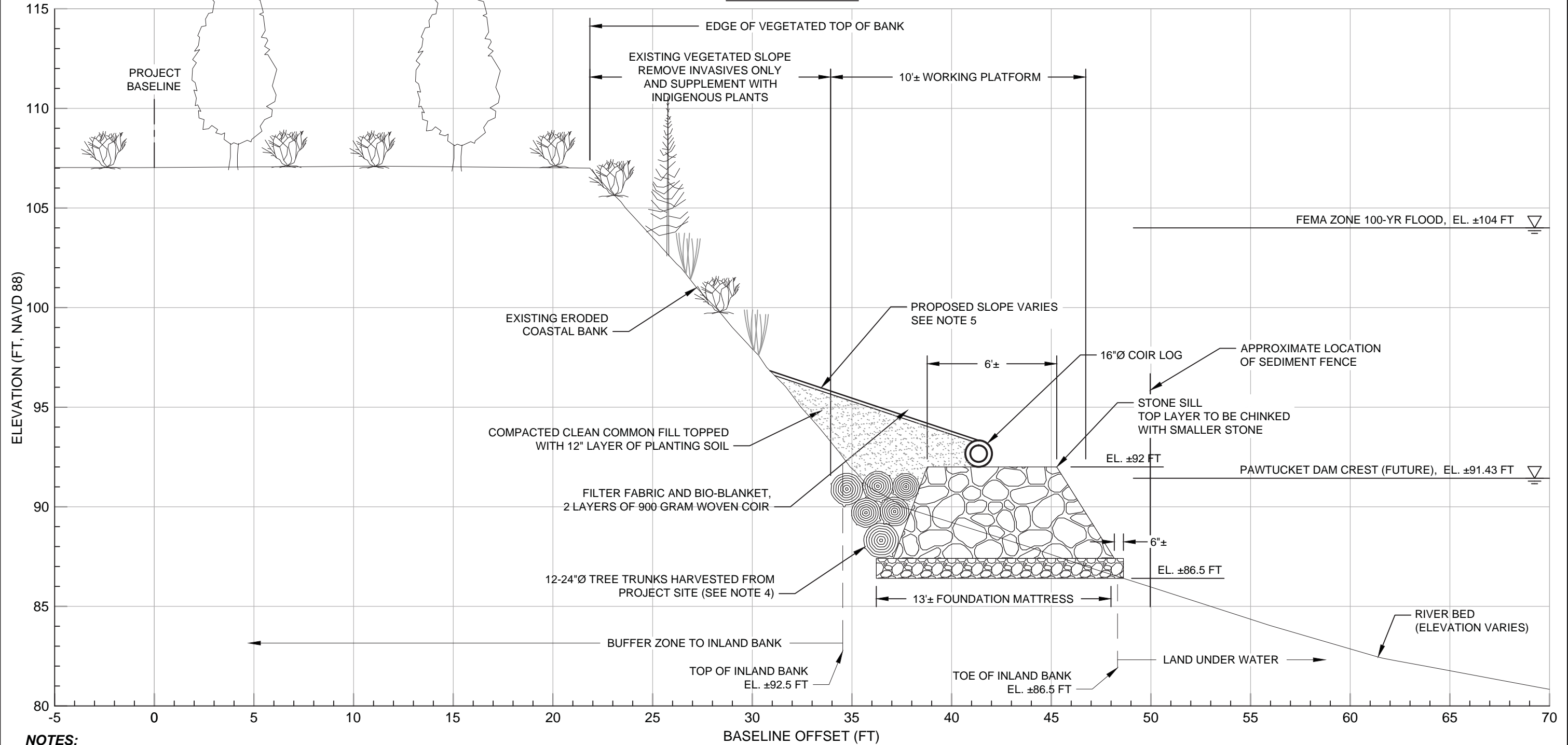
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

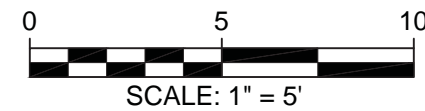
Chelmsford River Bank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'A' MINIMAL DISTURBANCE SECTION A
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 14 of 39

STA. 3+32




NOTES:

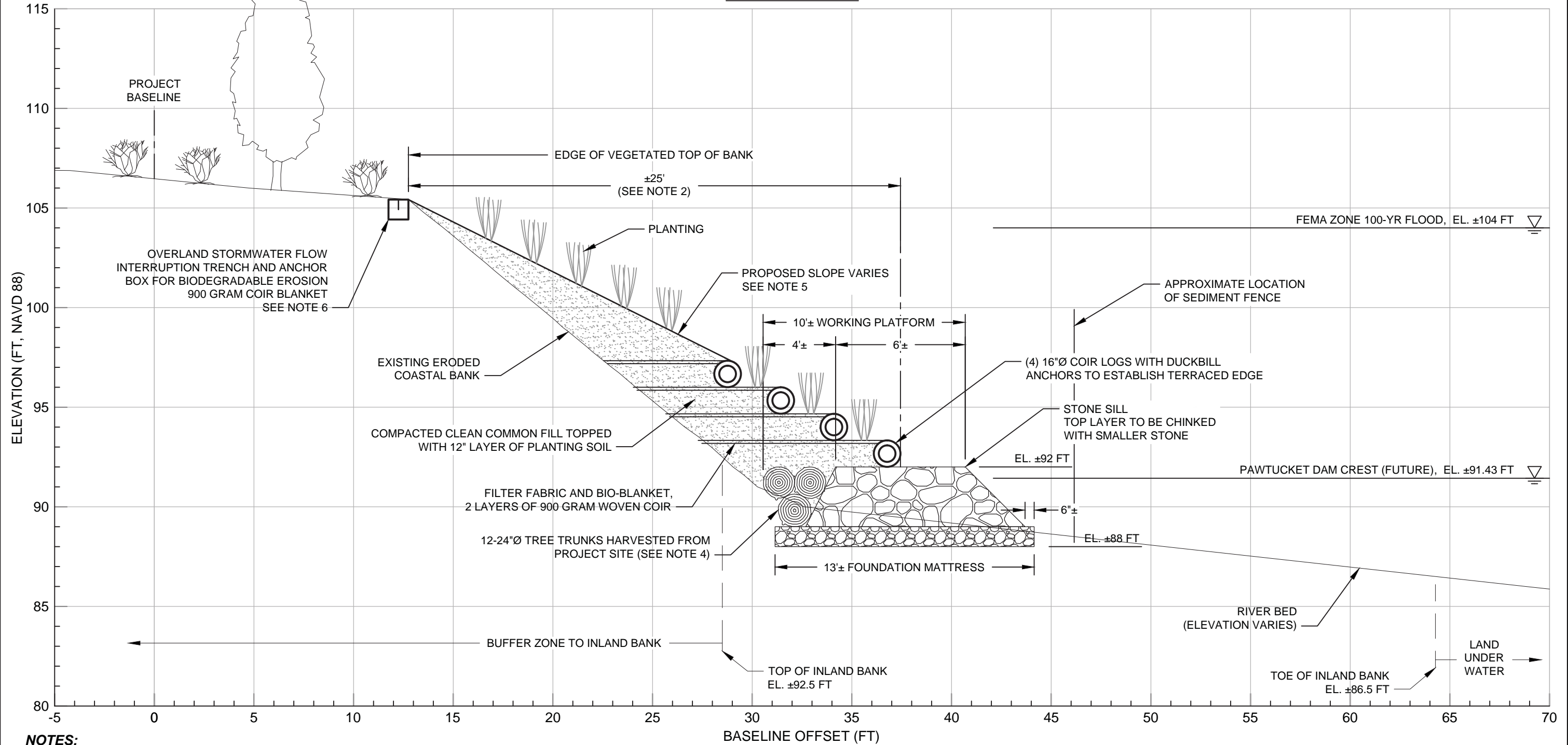
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Chelmsford River Bank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'B' MODERATE DISTURBANCE SECTION B
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 15 of 39

STA. 4+56



NOTES:

1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

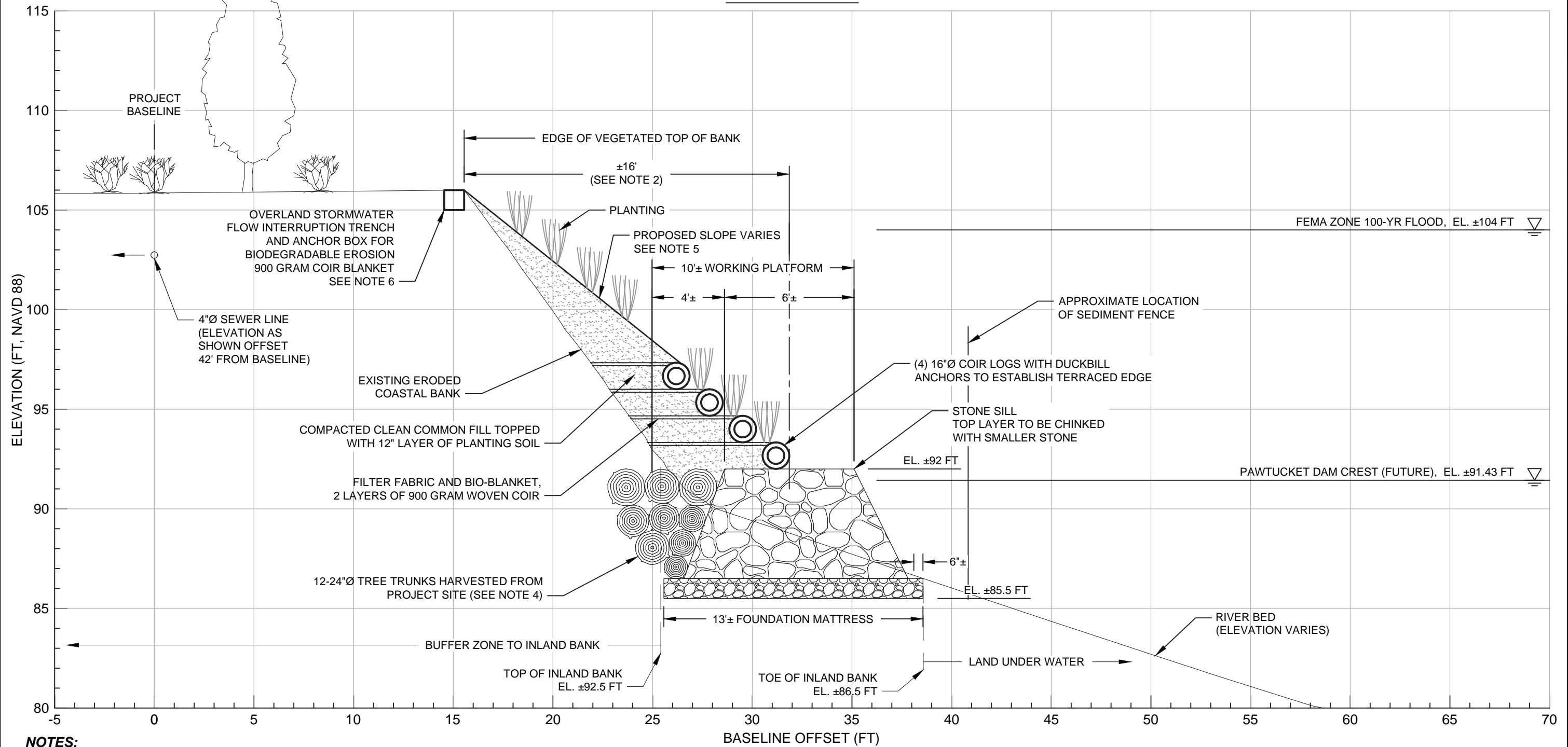


Project 1603860

EDGE TYPE 'B'
MODERATE DISTURBANCE
SECTION C

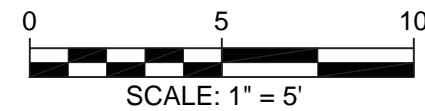
November 2016 Sheet 16 of 39

STA. 6+71



NOTES:

1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

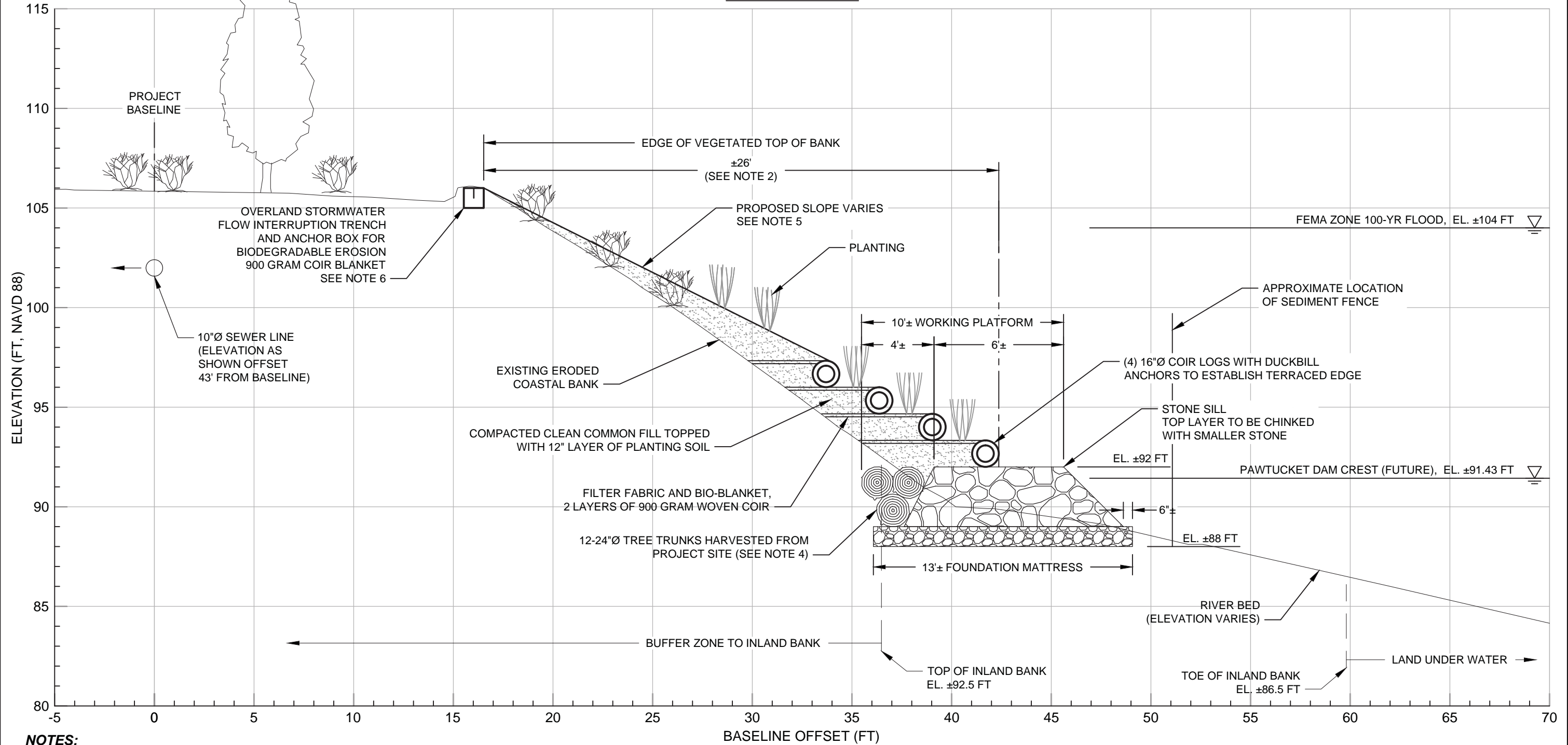


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION D

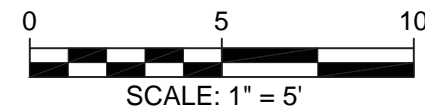
November 2016 Sheet 17 of 39

STA. 8+46




NOTES:

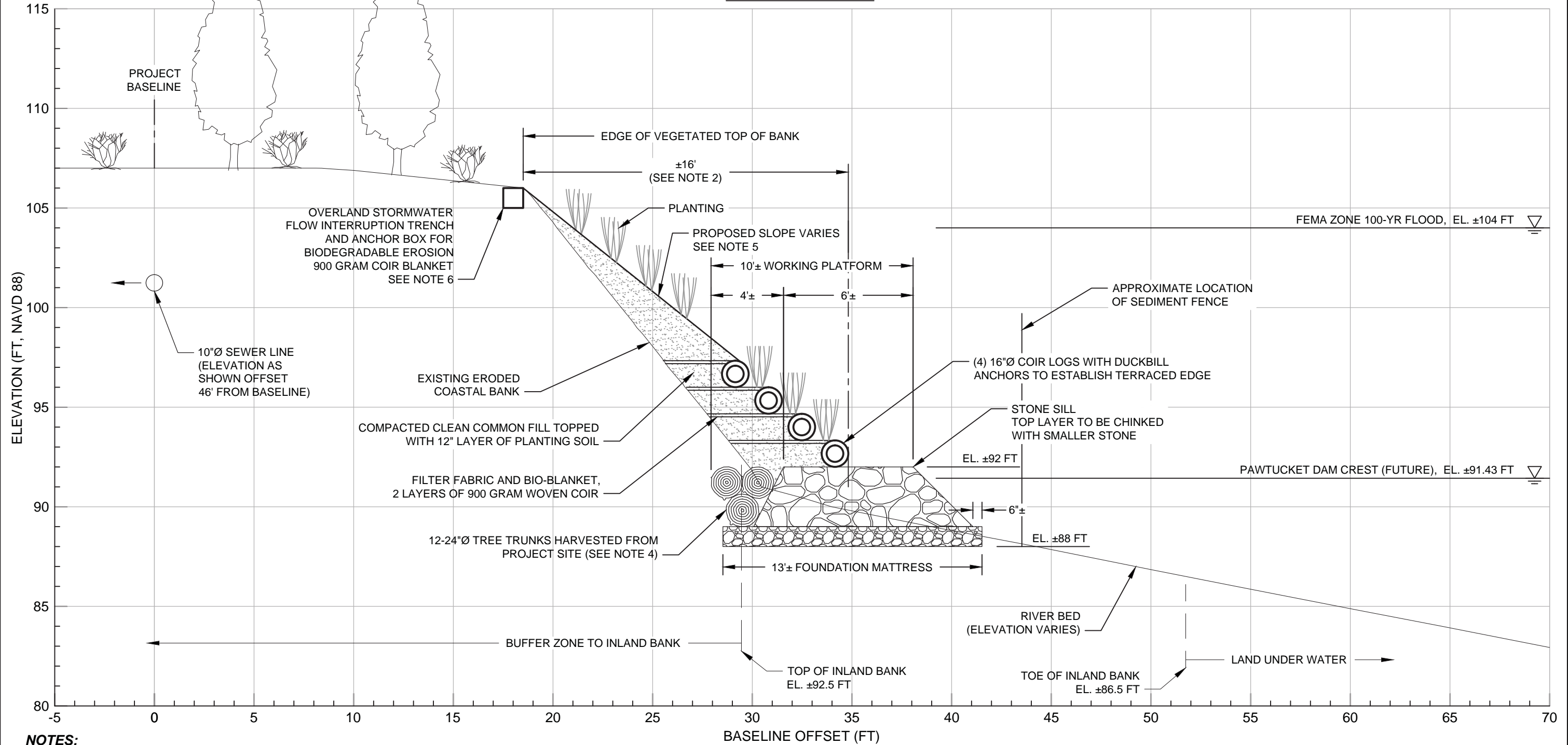
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

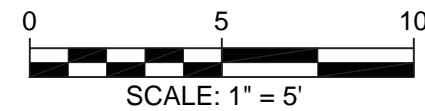
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'B' MODERATE DISTURBANCE SECTION E
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 18 of 39

STA. 10+60



NOTES:

1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

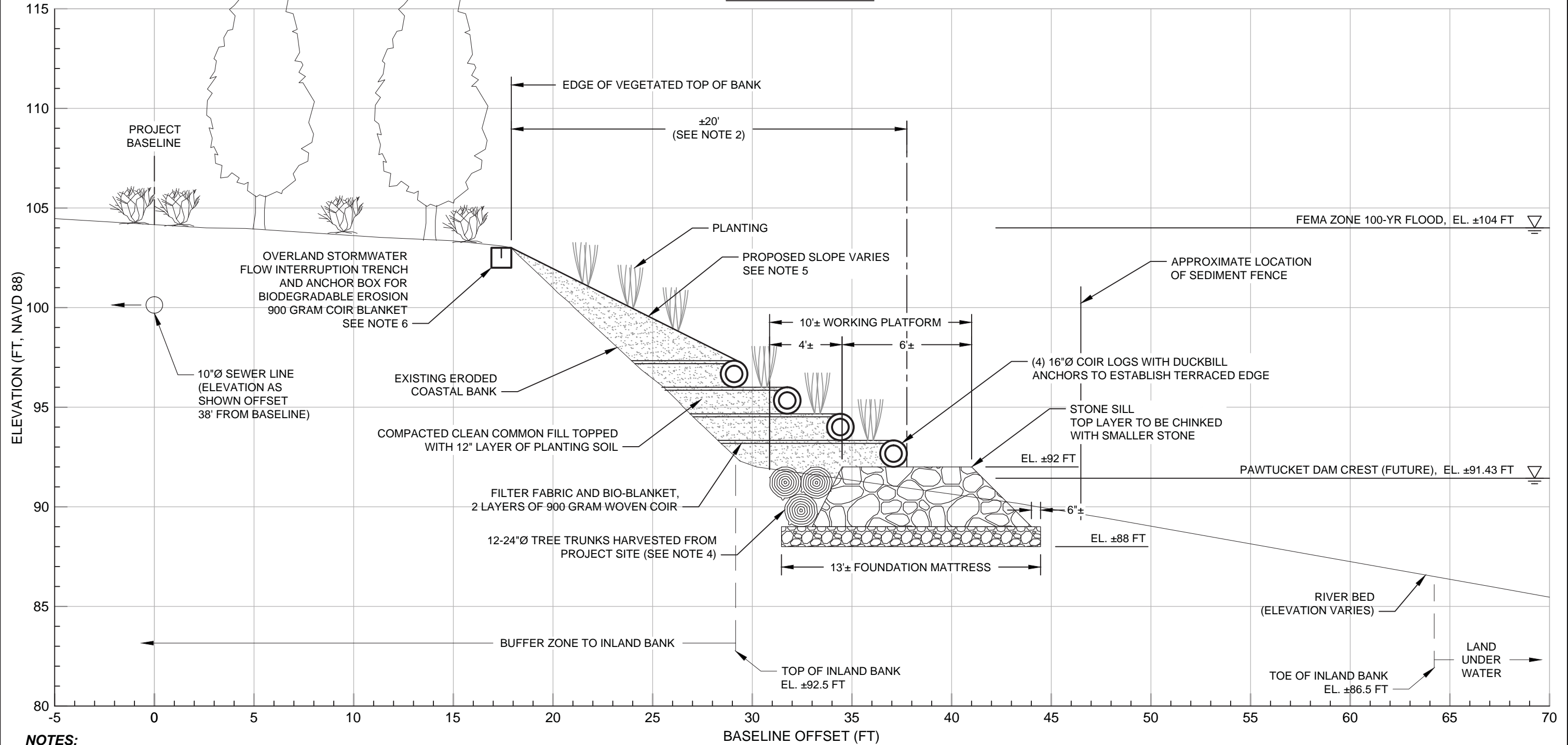


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION F

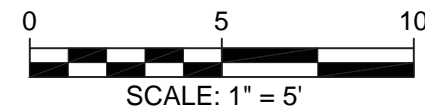
November 2016 Sheet 19 of 39

STA. 12+06



NOTES:

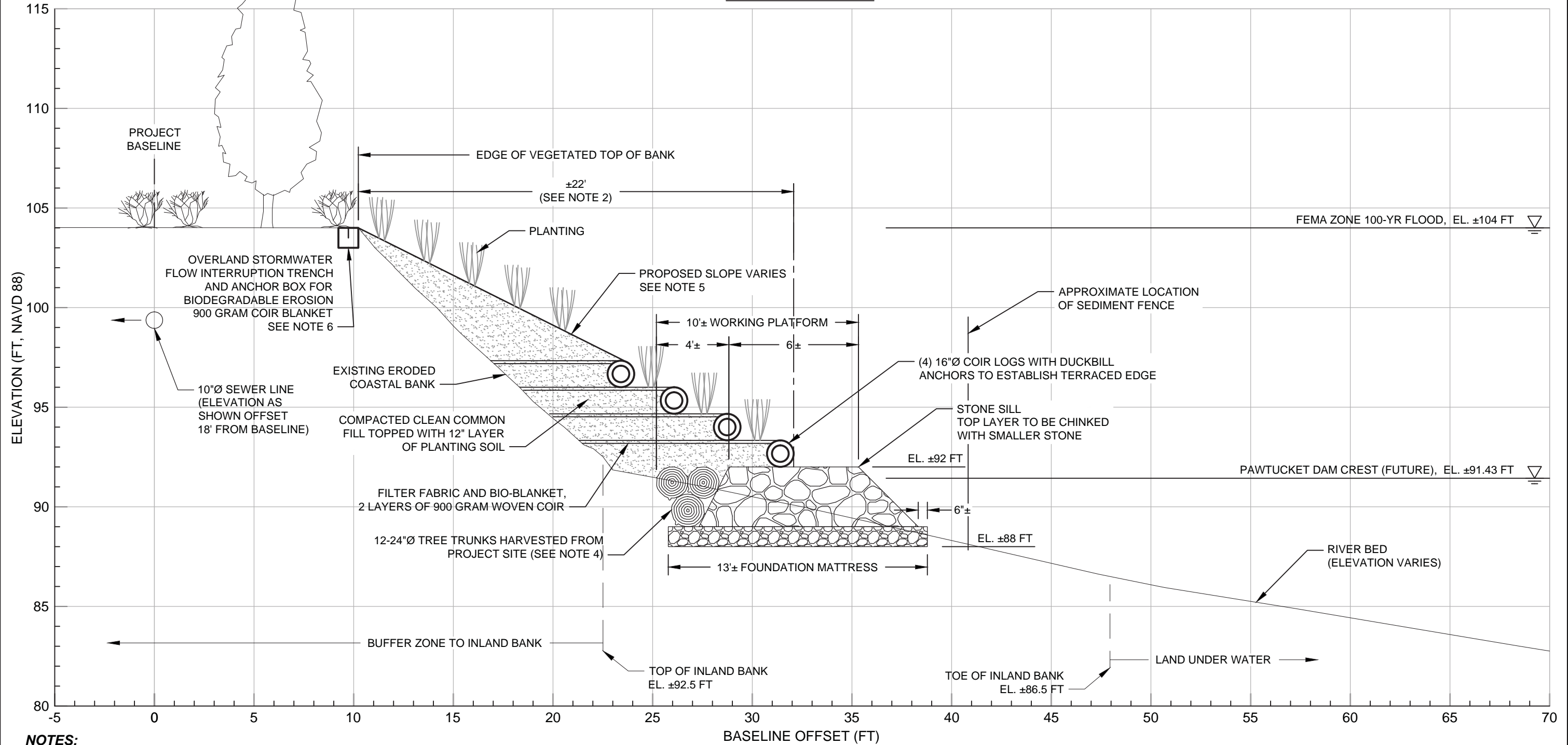
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

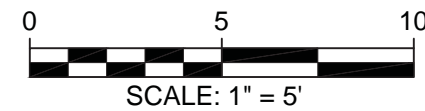
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION G
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 20 of 39

STA. 14+21



NOTES:

- ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
- MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
- ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
- HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
- PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
- OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

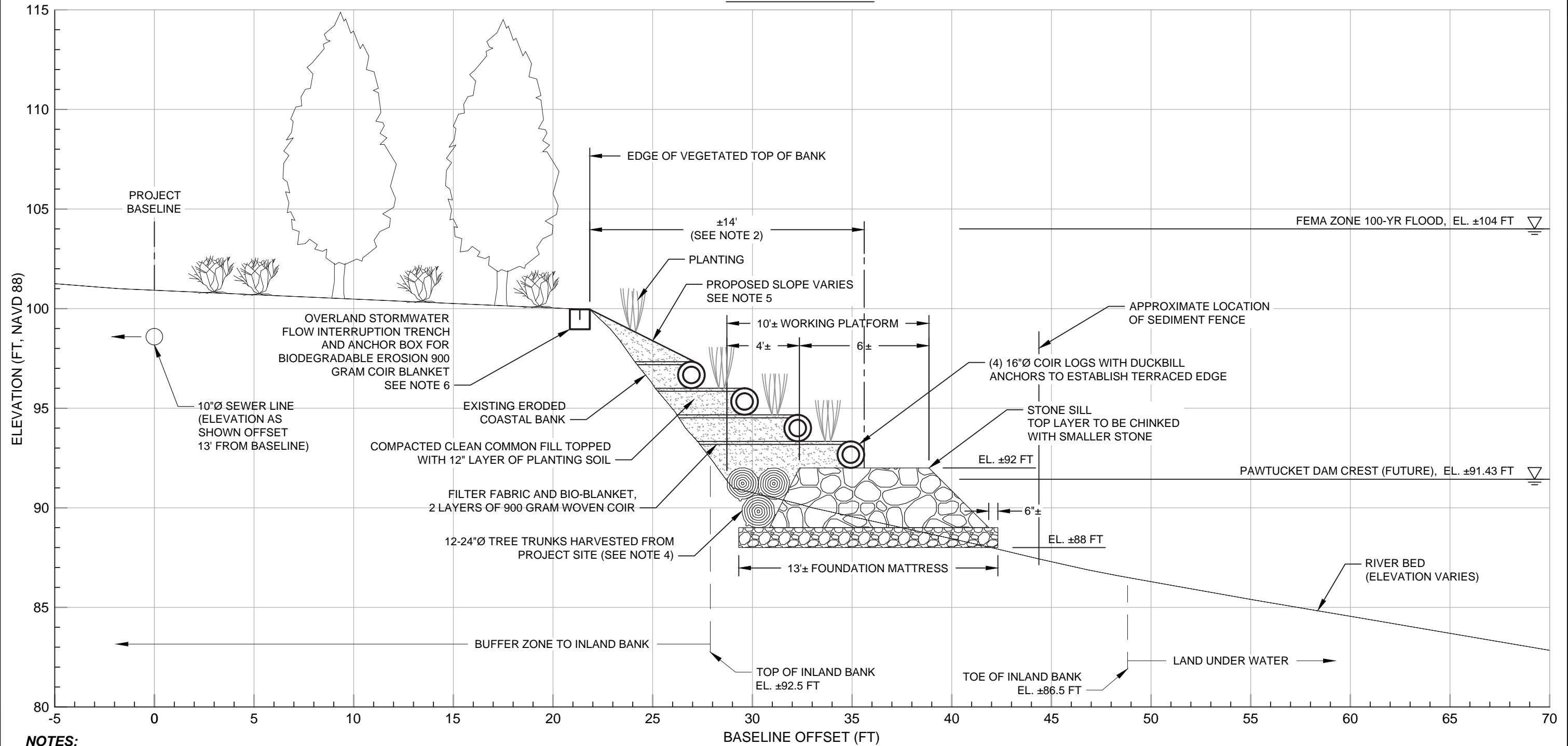


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION H

November 2016 Sheet 21 of 39

STA. 15+96



NOTES:

- ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
- MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
- ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
- HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
- PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
- OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts
Town of Chelmsford
Chelmsford, Massachusetts

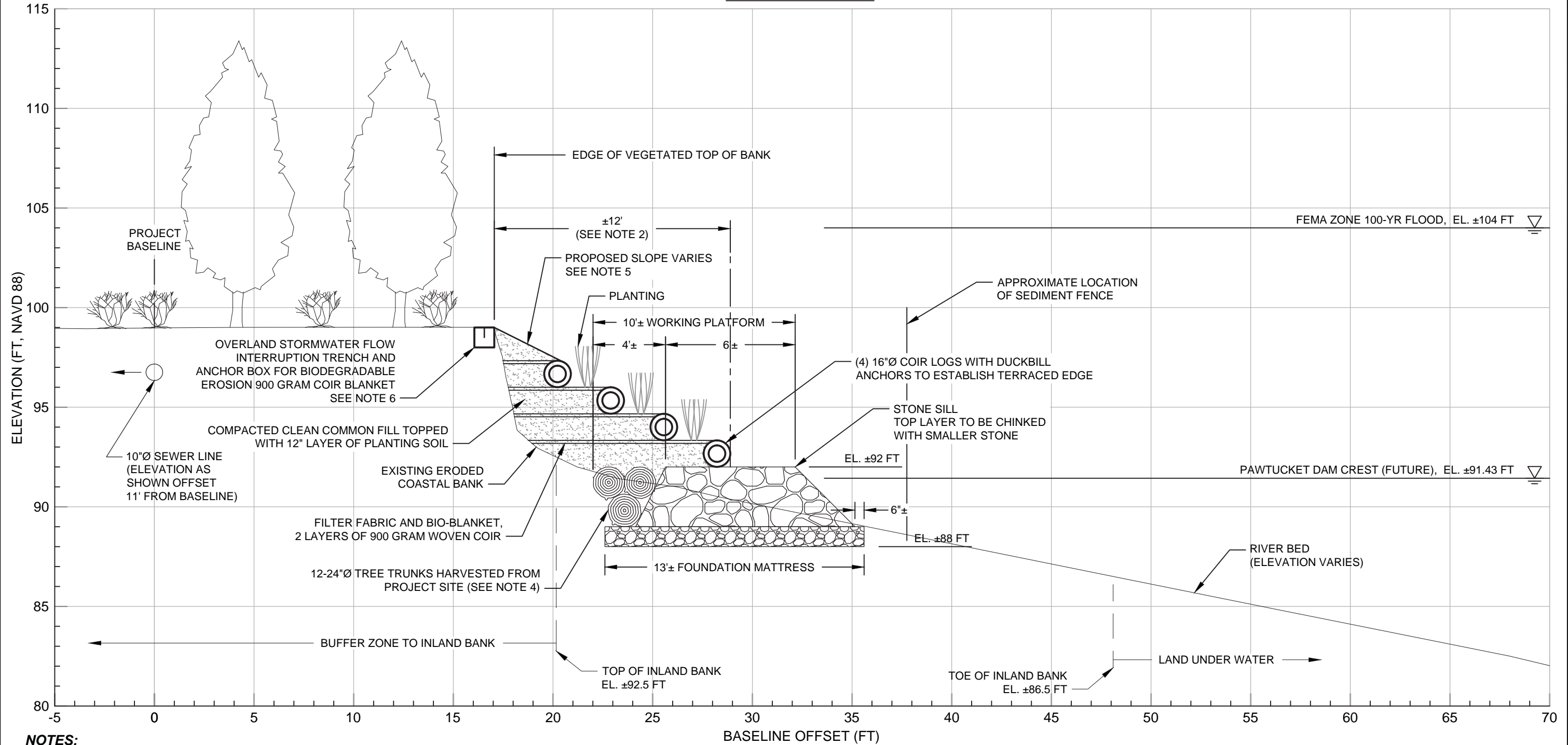


EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION I

Project 1603860

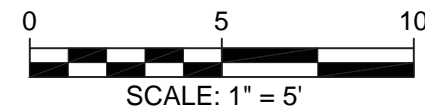
November 2016 Sheet 22 of 39

STA. 20+21



NOTES:

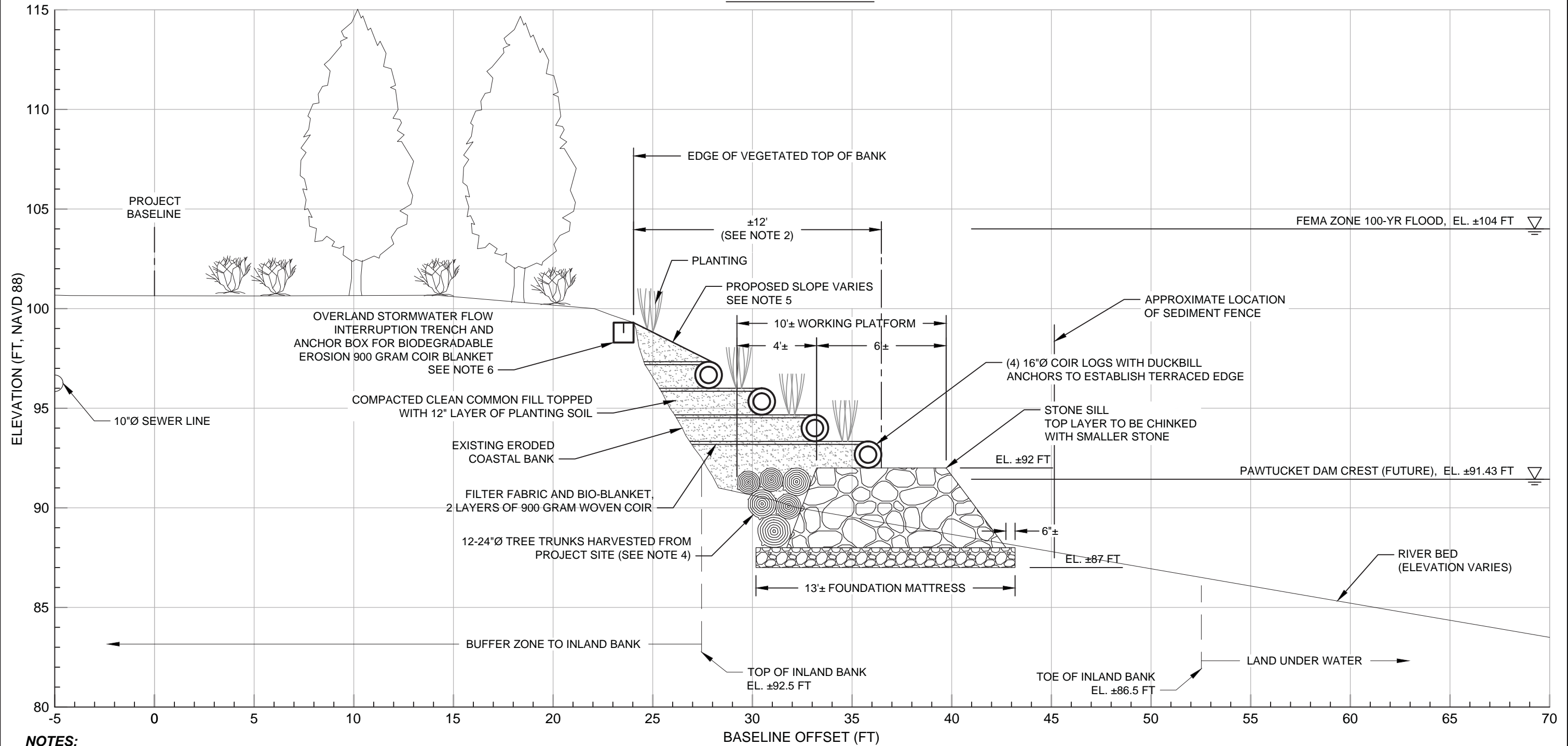
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

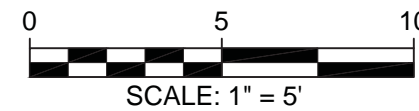
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION K
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 24 of 39

STA. 21+46



NOTES:

- ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
- MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
- ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
- HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
- PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
- OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

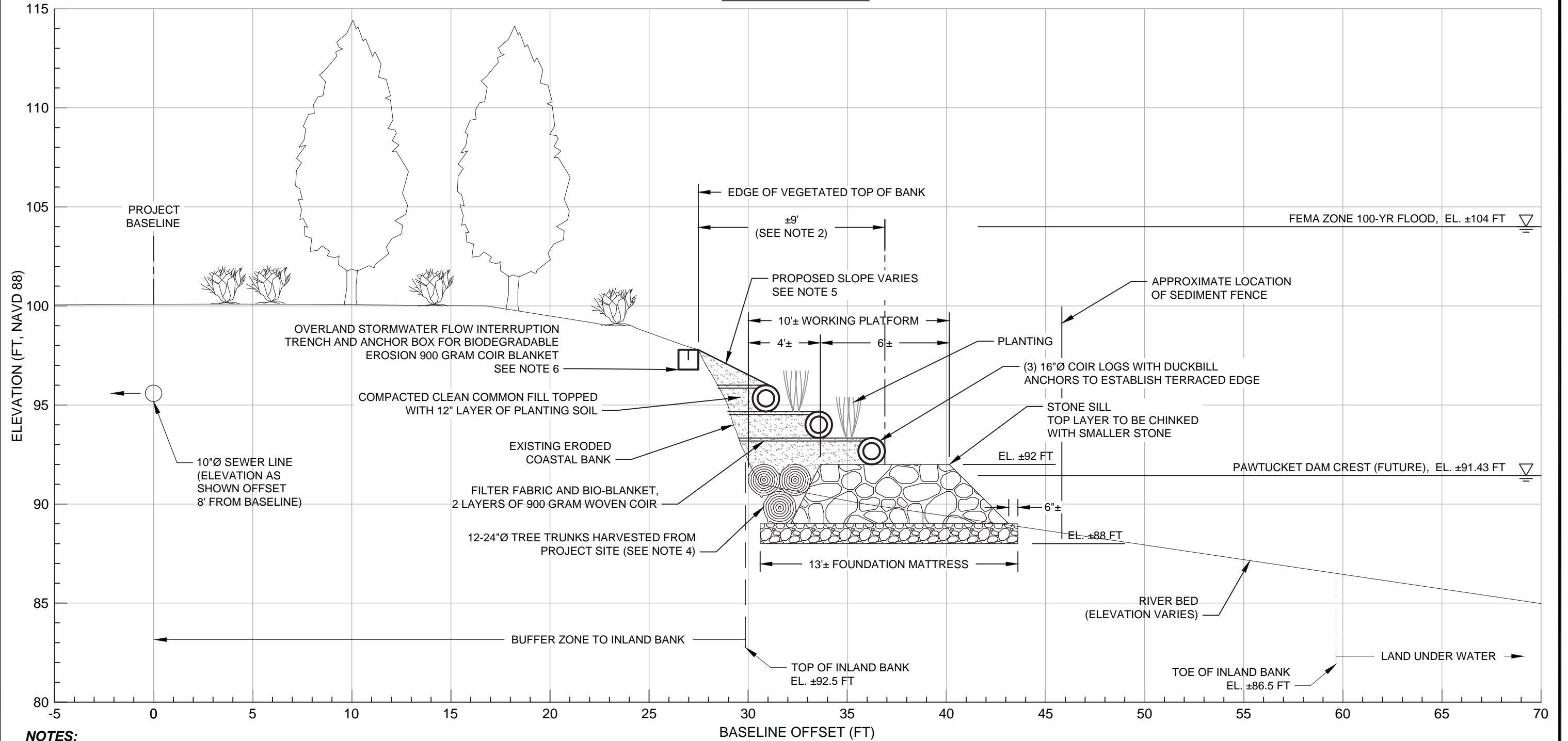


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION L

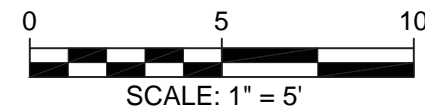
November 2016 Sheet 25 of 39

STA. 23+21



NOTES:

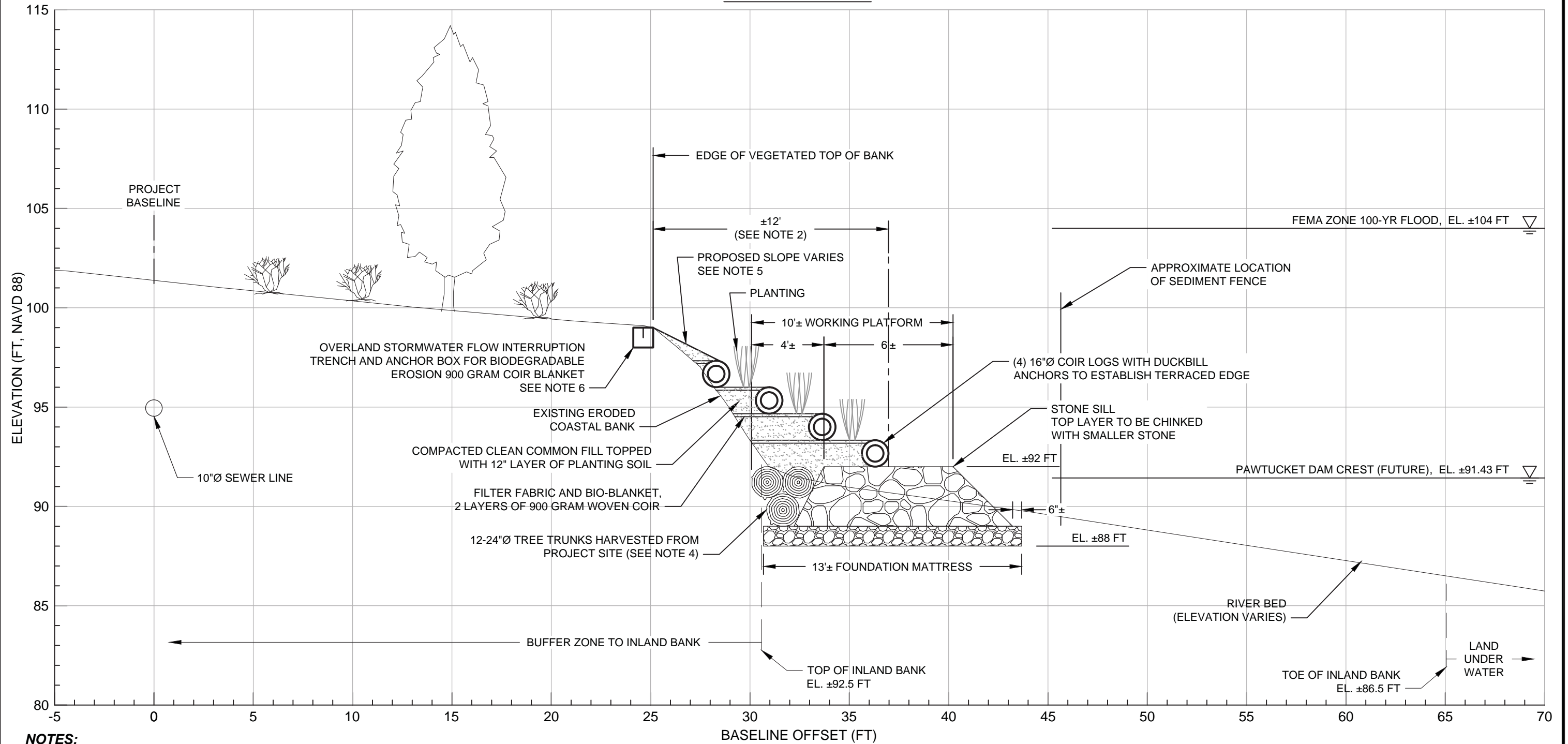
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

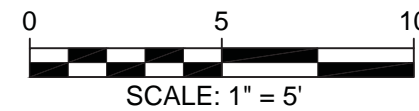
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION M
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 26 of 39

STA. 24+65



NOTES:

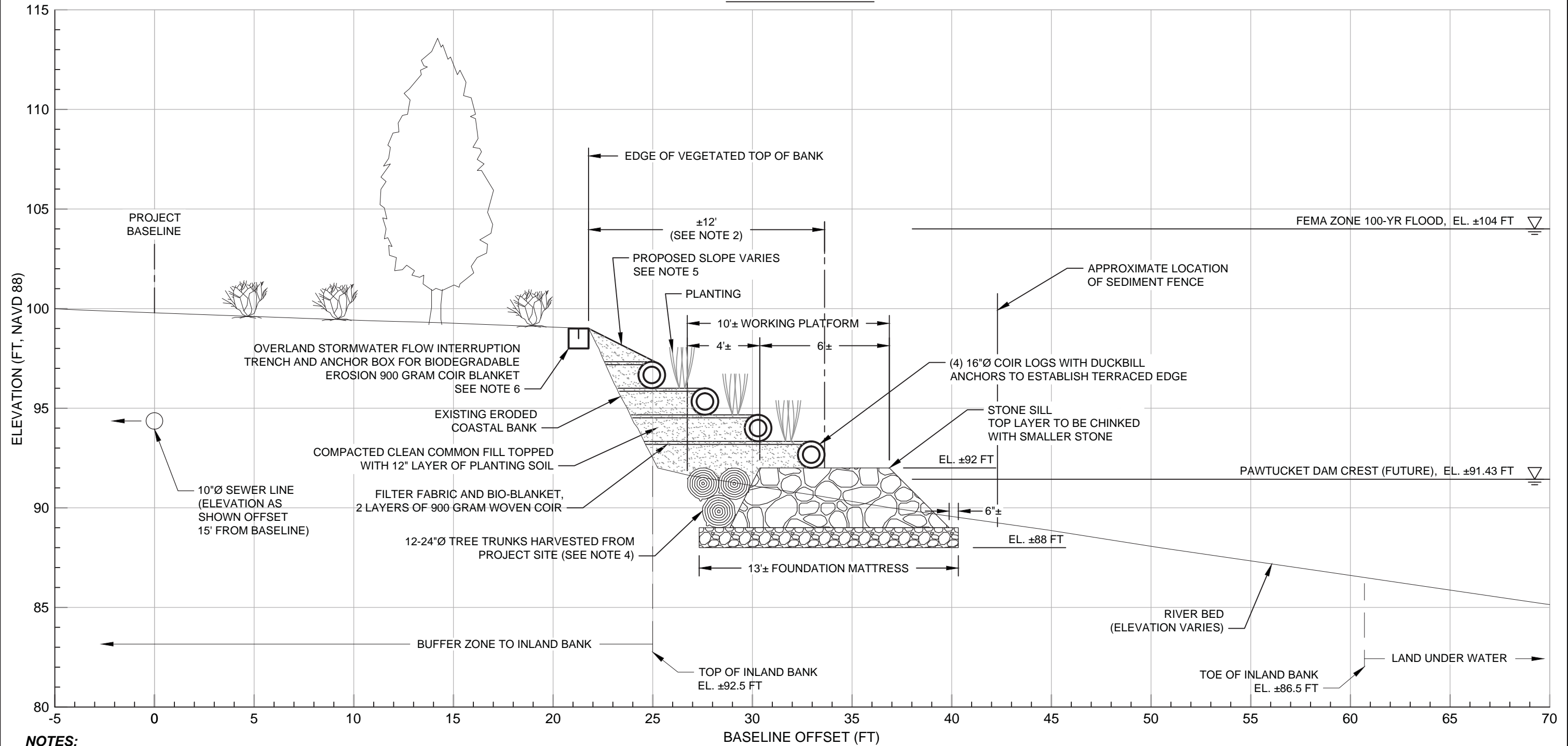
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION N
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 27 of 39

STA. 26+20




NOTES:

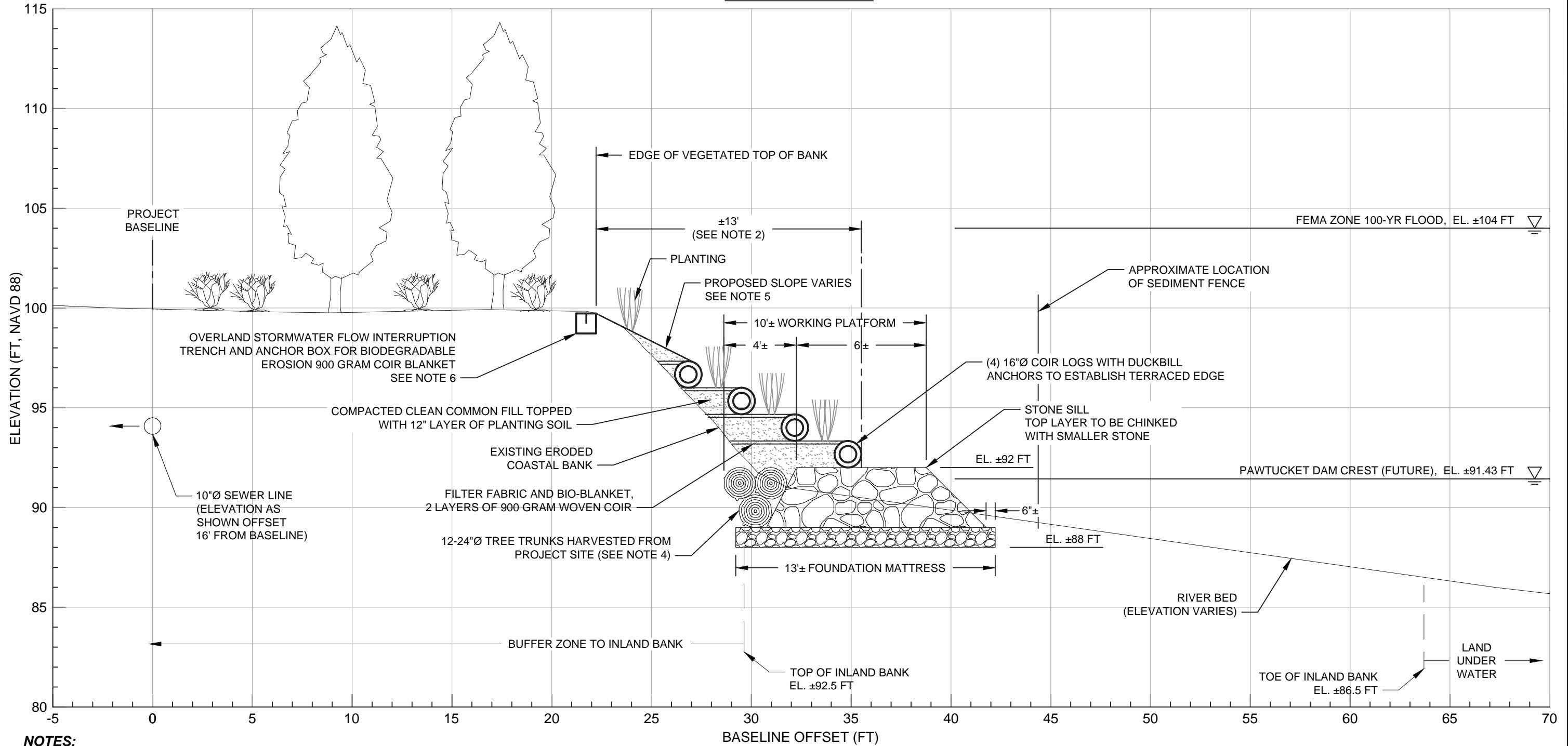
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION O
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 28 of 39

STA. 26+96




NOTES:

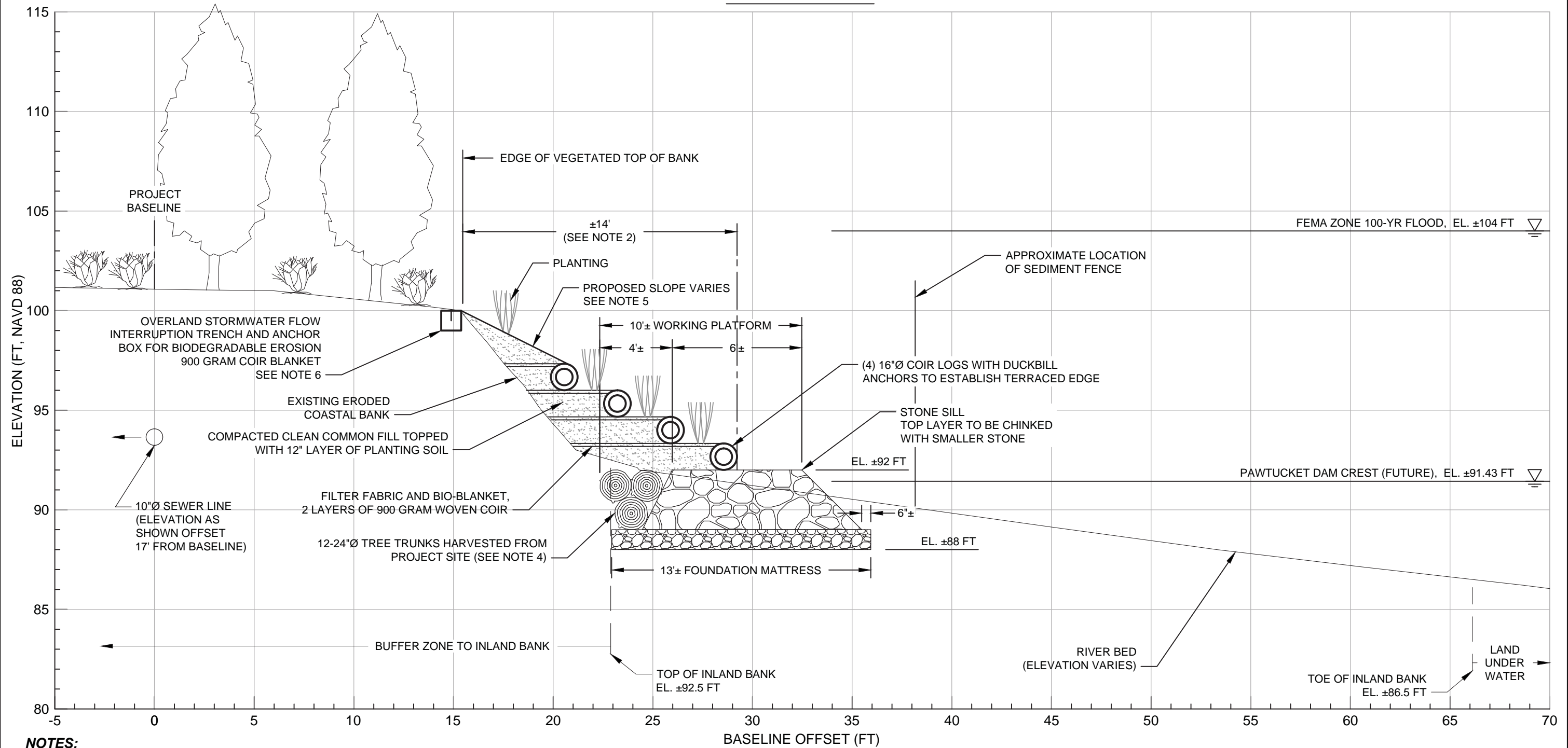
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

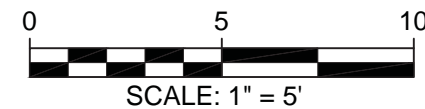
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION P
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 29 of 39

STA. 27+96



NOTES:

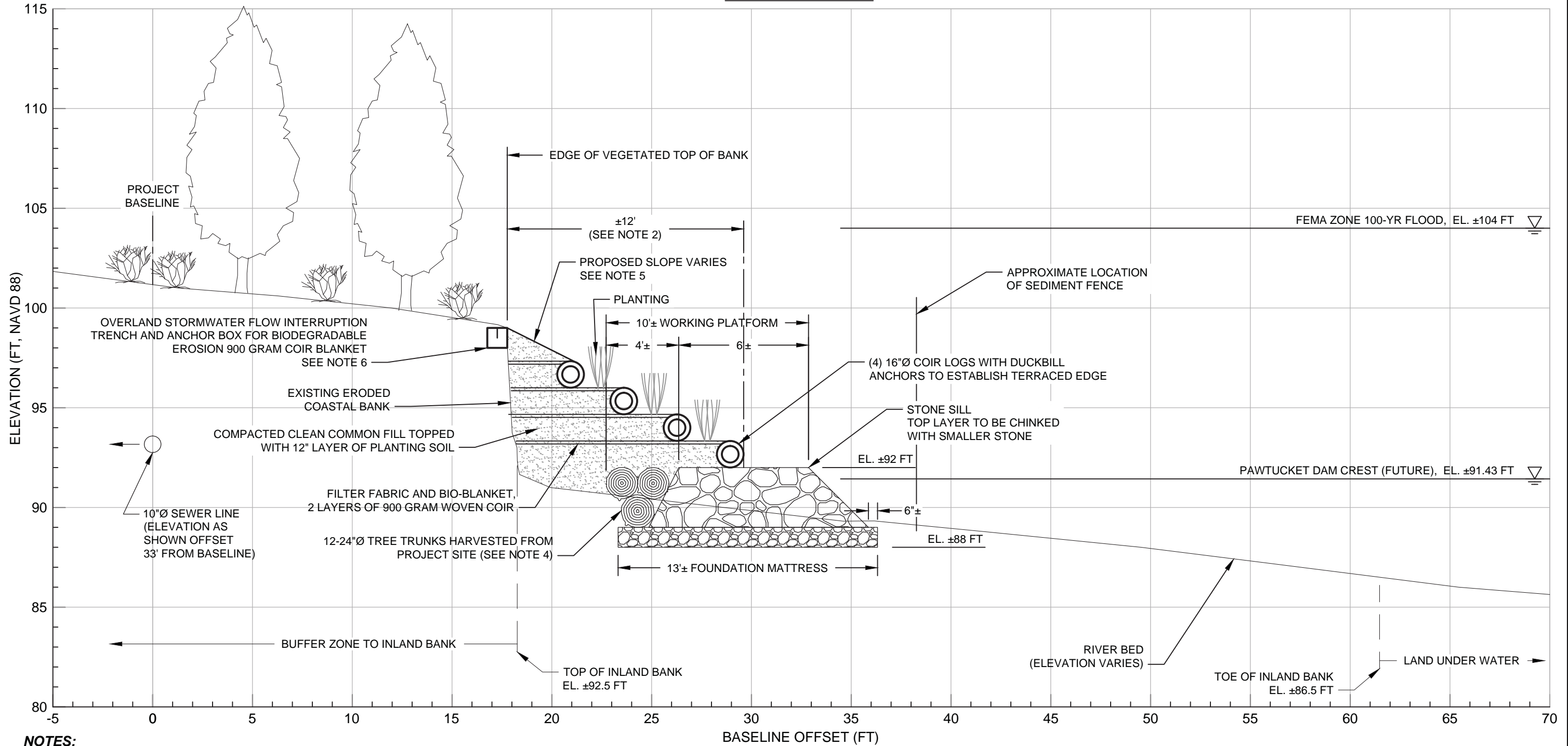
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

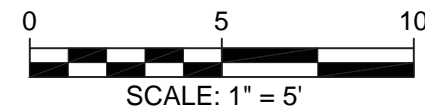
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION Q
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 30 of 39

STA. 30+21




NOTES:

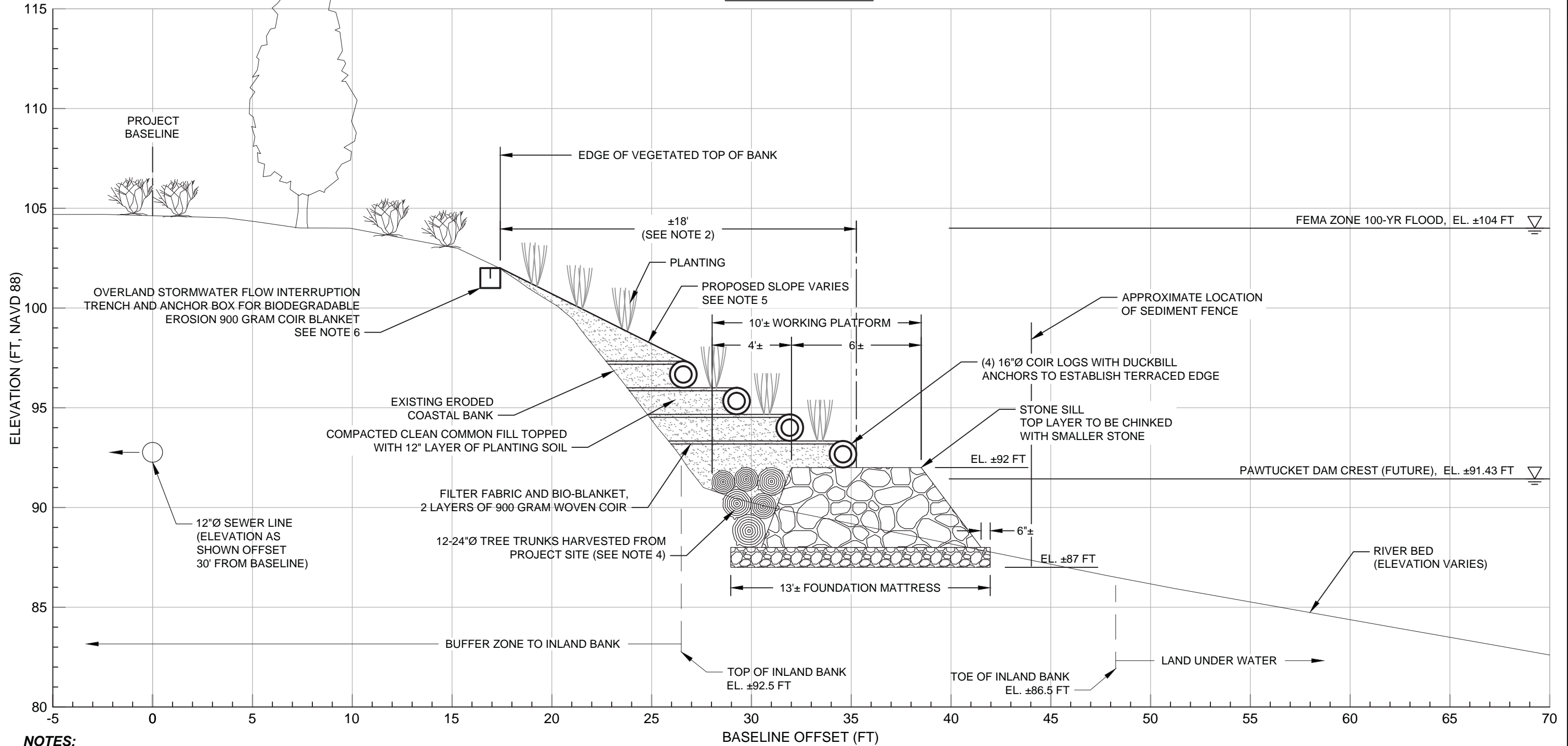
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

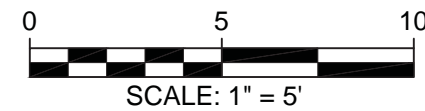
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION R
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 31 of 39

STA. 32+46



NOTES:

1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

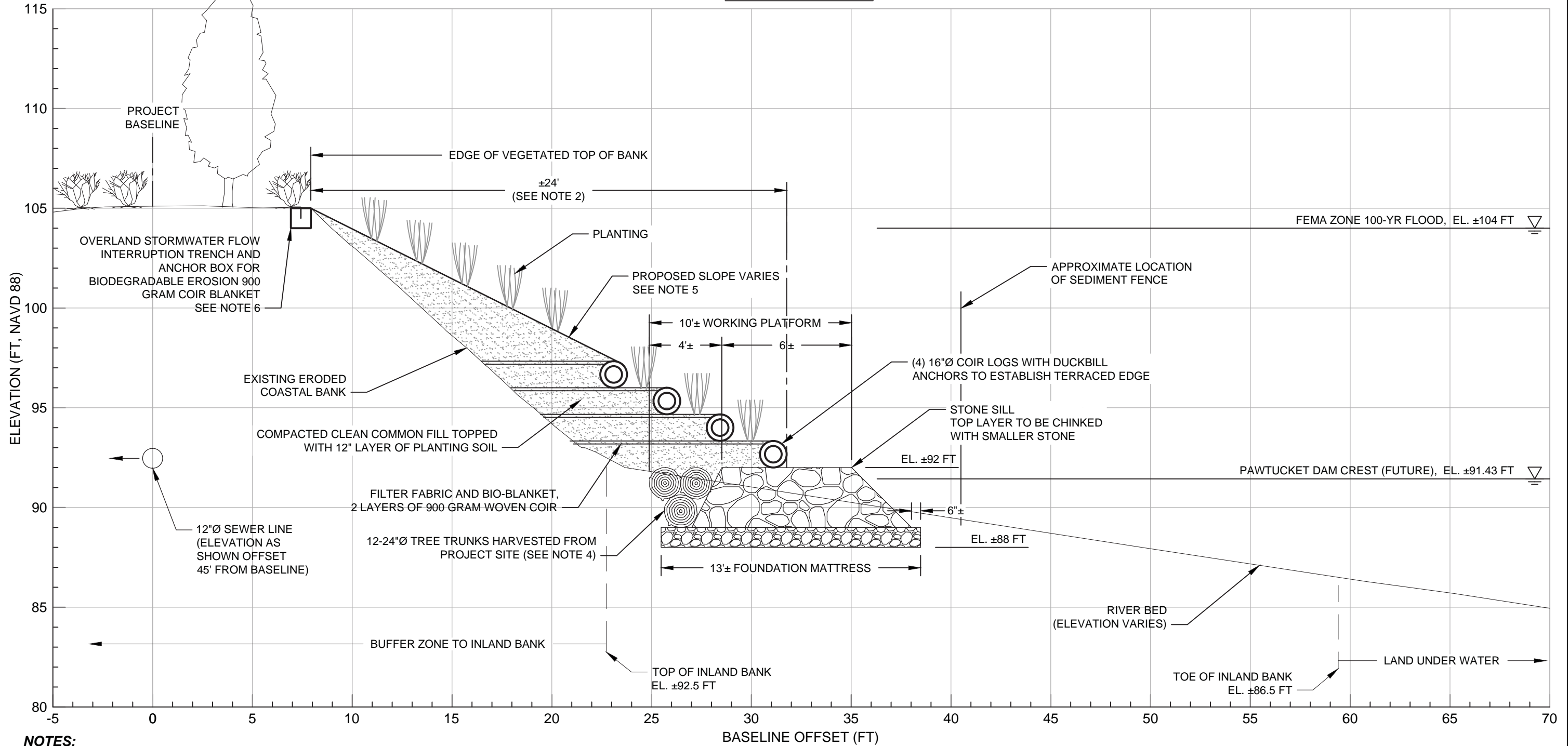


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION S

November 2016 Sheet 32 of 39

STA. 33+52



NOTES:

- ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
- MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
- ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
- HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
- PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
- OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts

Town of Chelmsford
Chelmsford, Massachusetts

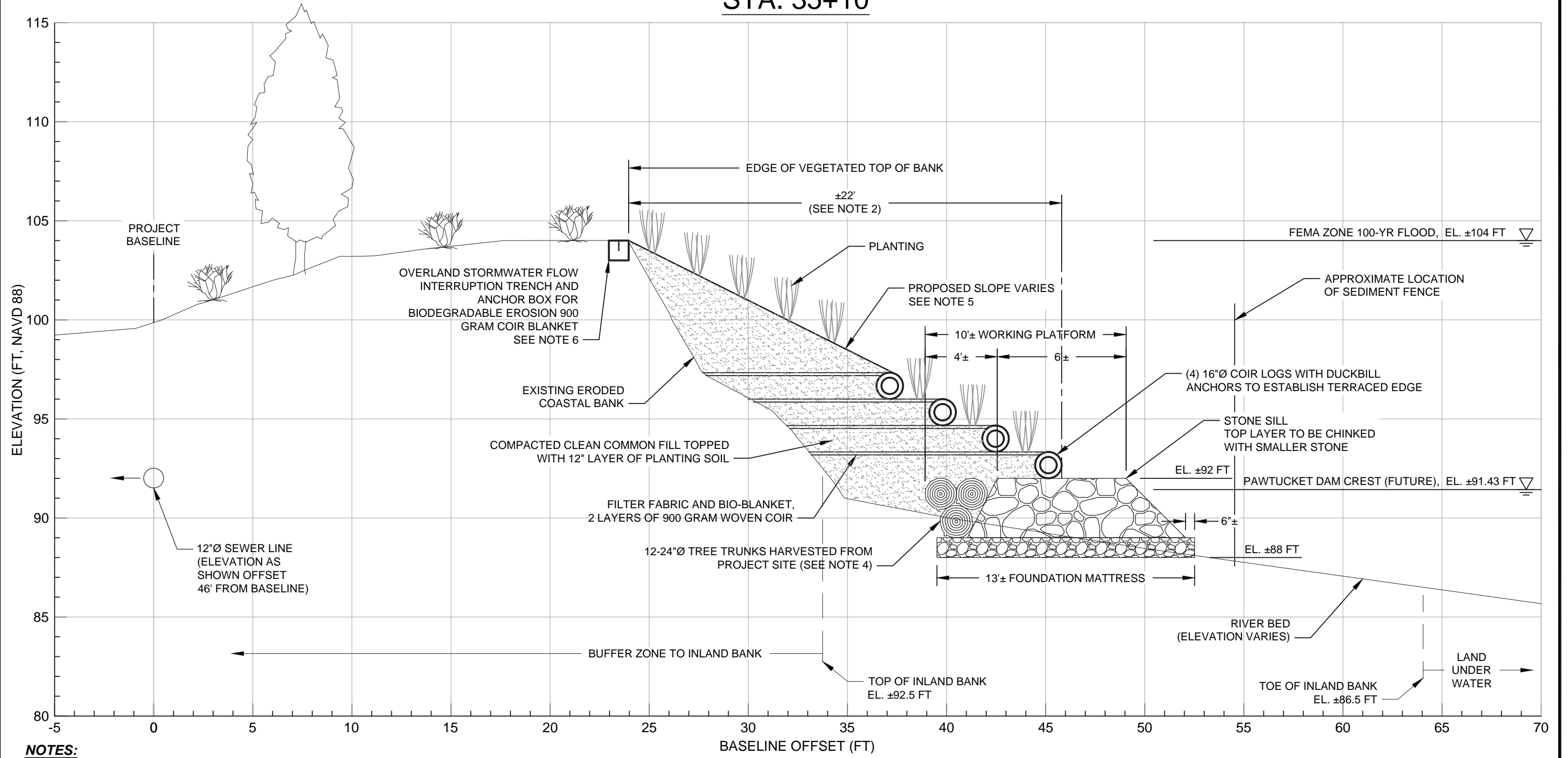


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION T

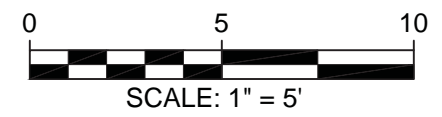
November 2016 Sheet 33 of 39

STA. 35+10




NOTES:

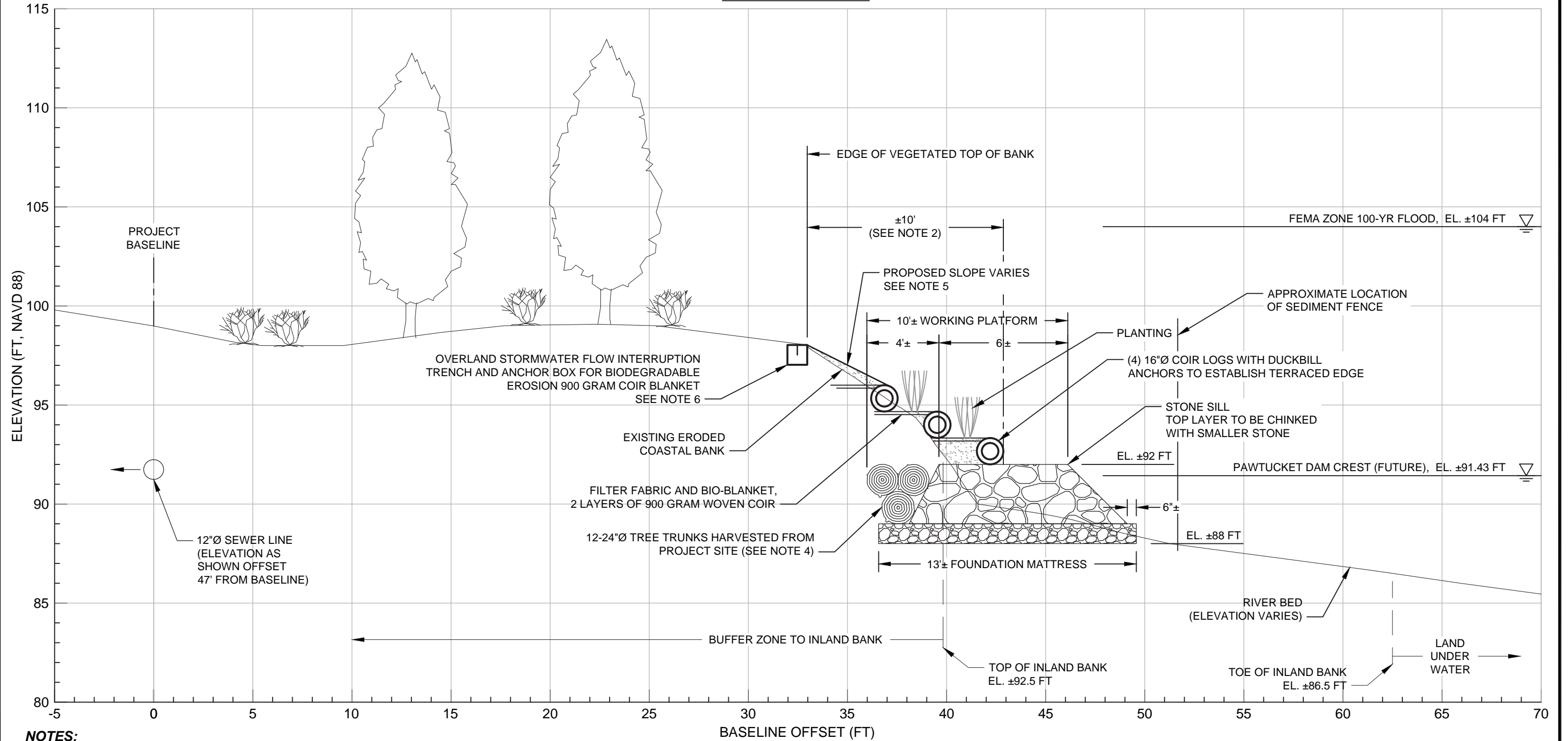
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

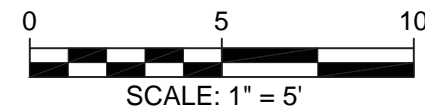
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION U
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 34 of 39

STA. 36+21



NOTES:

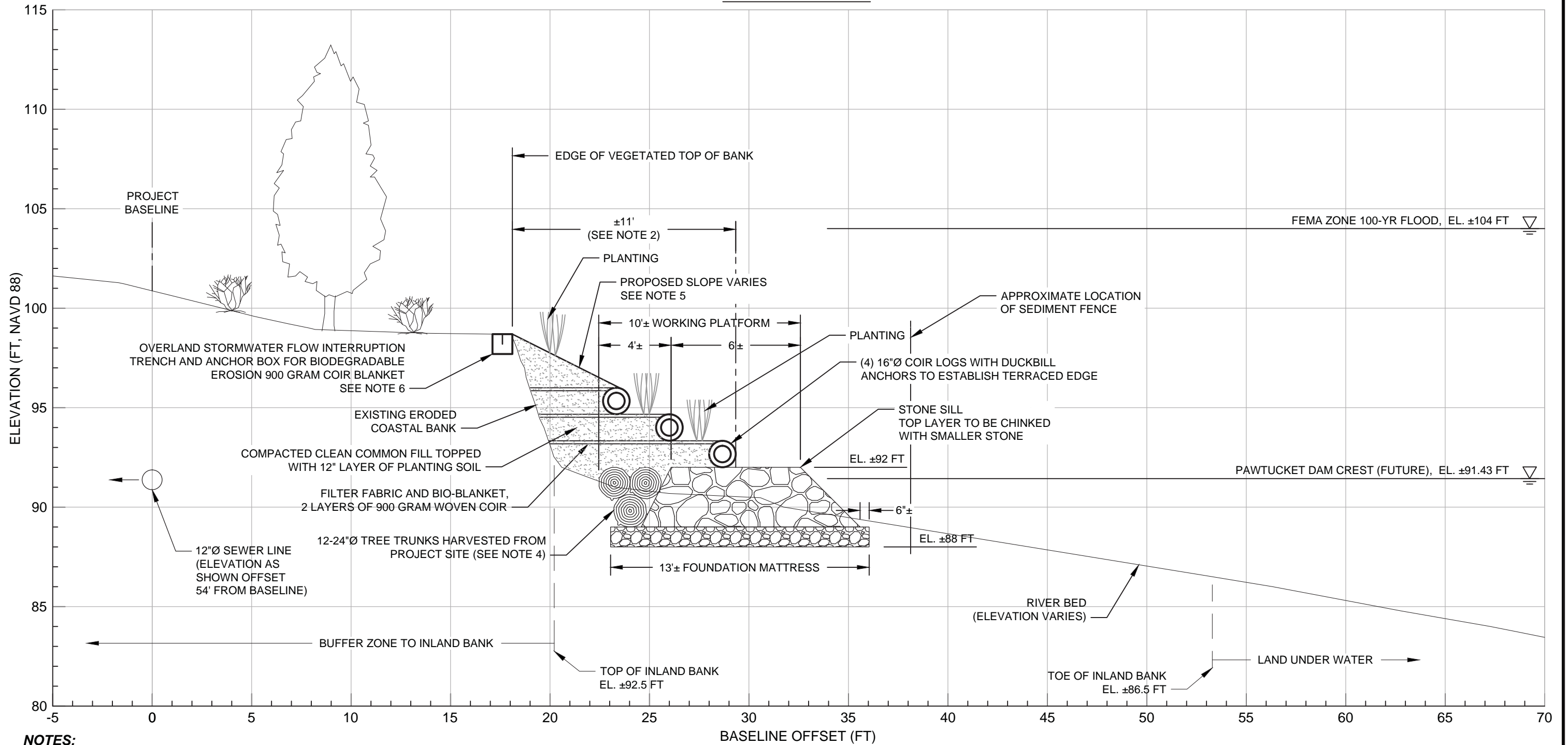
1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

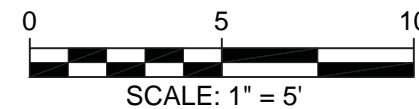
Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION V
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 35 of 39

STA. 37+65



NOTES:

- ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
- MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
- ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
- HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
- PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
- OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization
Wellman Avenue
North Chelmsford, Massachusetts
Town of Chelmsford
Chelmsford, Massachusetts

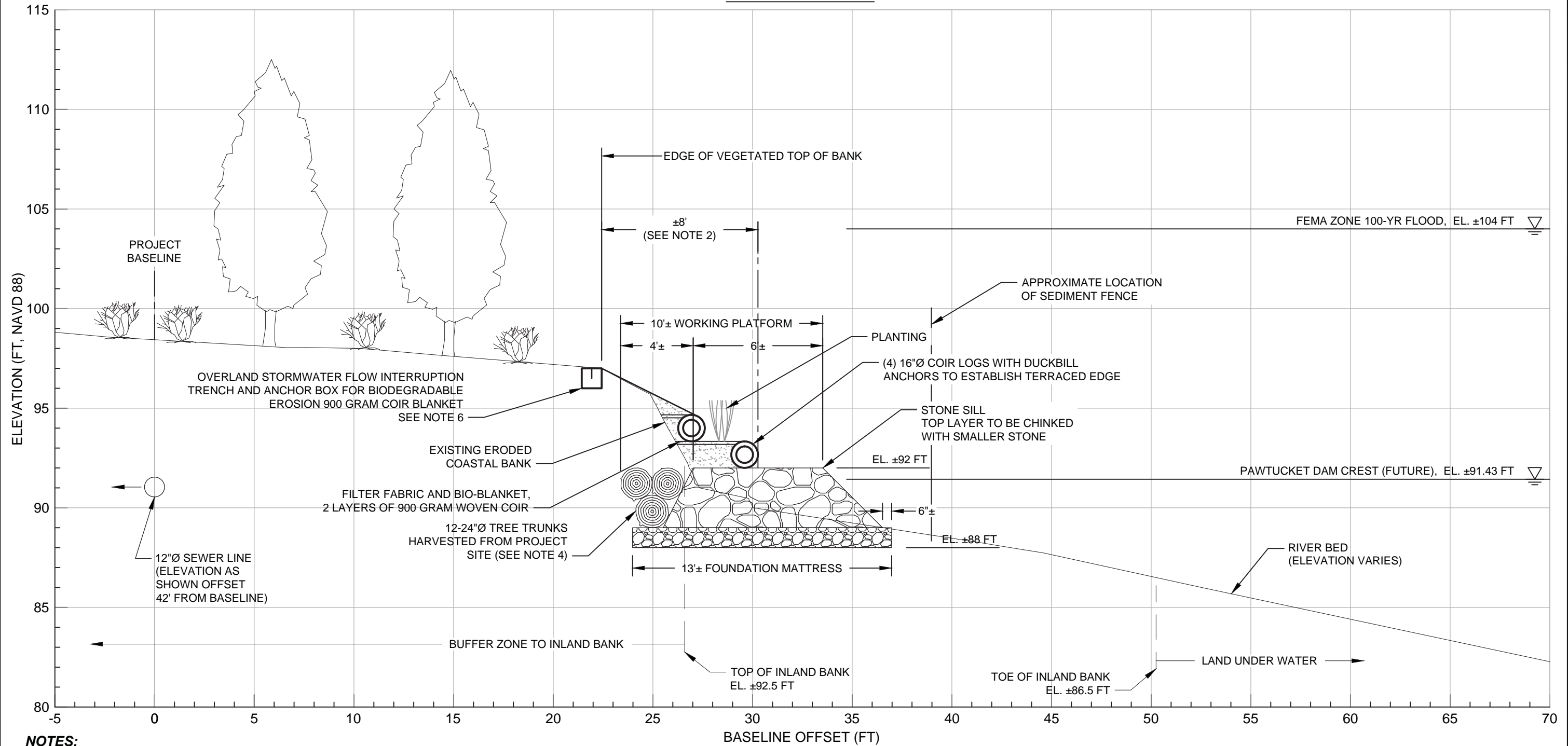


Project 1603860

EDGE TYPE 'C'
MAJOR DISTURBANCE
SECTION W

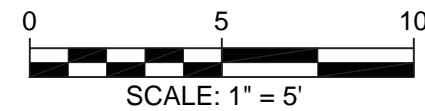
November 2016 Sheet 36 of 39

STA. 38+96




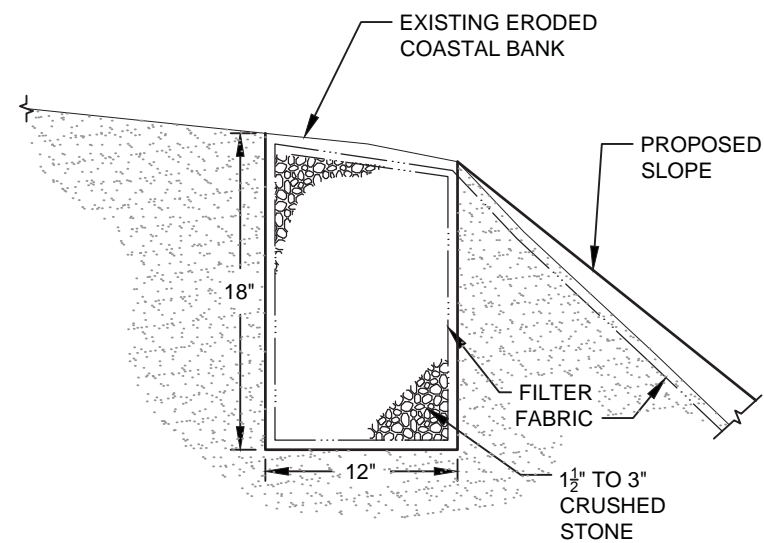
NOTES:

1. ALL WORK TO BE DONE FROM THE RIVER BY UTILIZING THE WORKING PLATFORM AS A BASE.
2. MAINTAIN AN APPROXIMATELY 20' DISTANCE FROM THE TOP OF THE EXISTING ERODED COASTAL BANK TO THE CENTER OF THE RIP RAP BERM TO MINIMIZE TREE REMOVAL AND ACHIEVE A 2H:1V PREFERRED SLOPE.
3. ELEVATIONS SHOWN ARE SUBJECT TO CHANGE BASED ON EXISTING FIELD CONDITIONS OBSERVED DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY GEI AND EPSILON OF SIGNIFICANT DISCREPANCIES IN EXPECTED CONDITIONS PRIOR TO CONTINUING WORK.
4. HARVESTED TREE TRUNKS SHALL BE BUNDLED AND PLACED ADJACENT TO THE RIP RAP BERM/SILL TO EXTEND THE WORKING PLATFORM. TREE TRUNKS ARE FOR TEMPORARY USE DURING CONSTRUCTION AND SHALL BE REMOVED AND REPLACED WITH SAND FILL.
5. PROPOSED RIVER EDGE STABILIZATION WILL VARY IN SLOPE FROM A MAXIMUM OF 3H:1V TO A MINIMUM OF 1.5H:1V. THIS ACTION WILL PREVENT EXCESSIVE ENCROACHMENT INTO THE RIVER AND WILL MAINTAIN A REASONABLE ALIGNMENT.
6. OVERLAND STORMWATER TRENCH LOCATION TO BE DETERMINED IN THE FIELD. ESTIMATED LENGTH OF 2,000' REQUIRED.



DRAFT

Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		EDGE TYPE 'C' MAJOR DISTURBANCE SECTION X
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 37 of 39

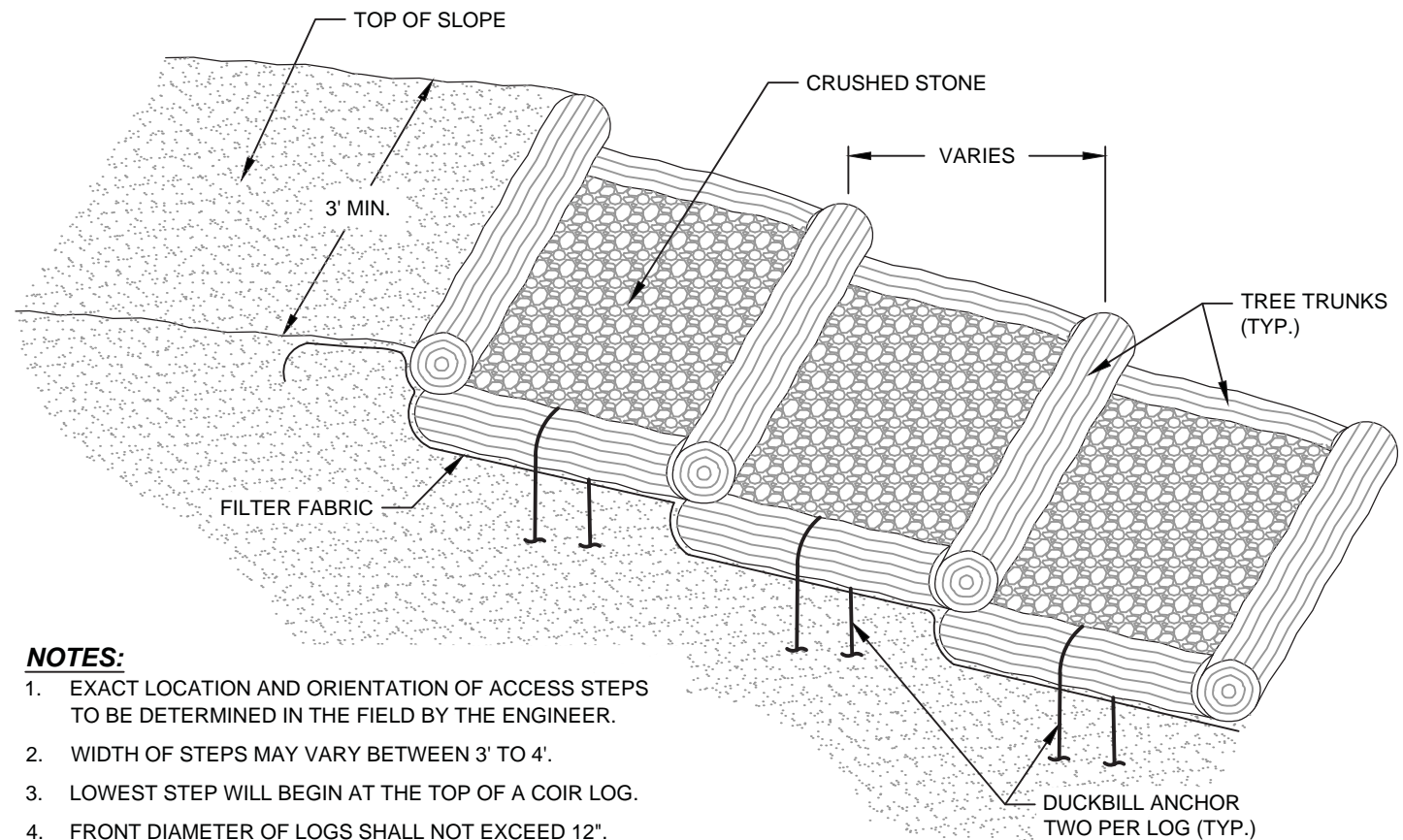


NOTES:

1. STORMWATER INTERRUPTION TRENCH SHALL BE INSTALLED ALONG THE TOP OF THE SLOPE TO PREVENT OVERLAND FLOW. LOCATION WILL BE DETERMINED AT THE SITE TO MINIMIZE IMPACT ON EXISTING TREE ROOTS.

STORMWATER FLOW TRENCH

SCALE: 1" = 1'



NOTES:

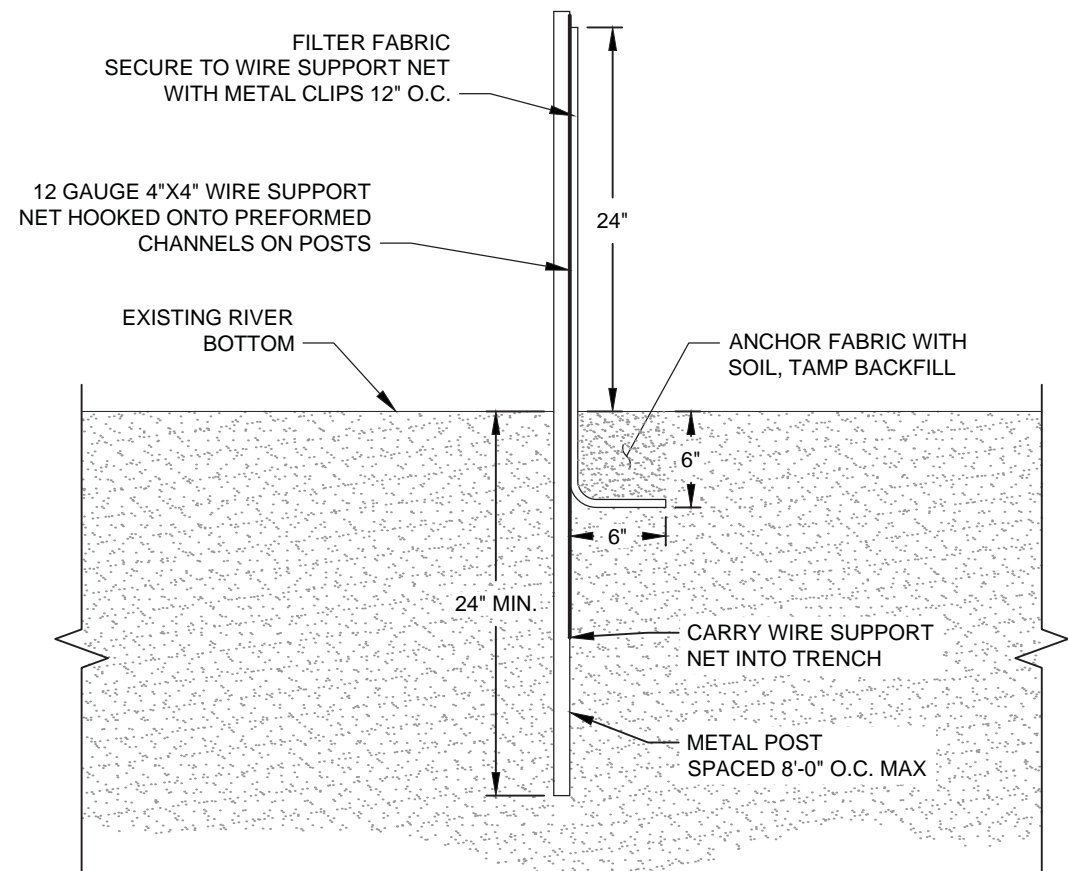
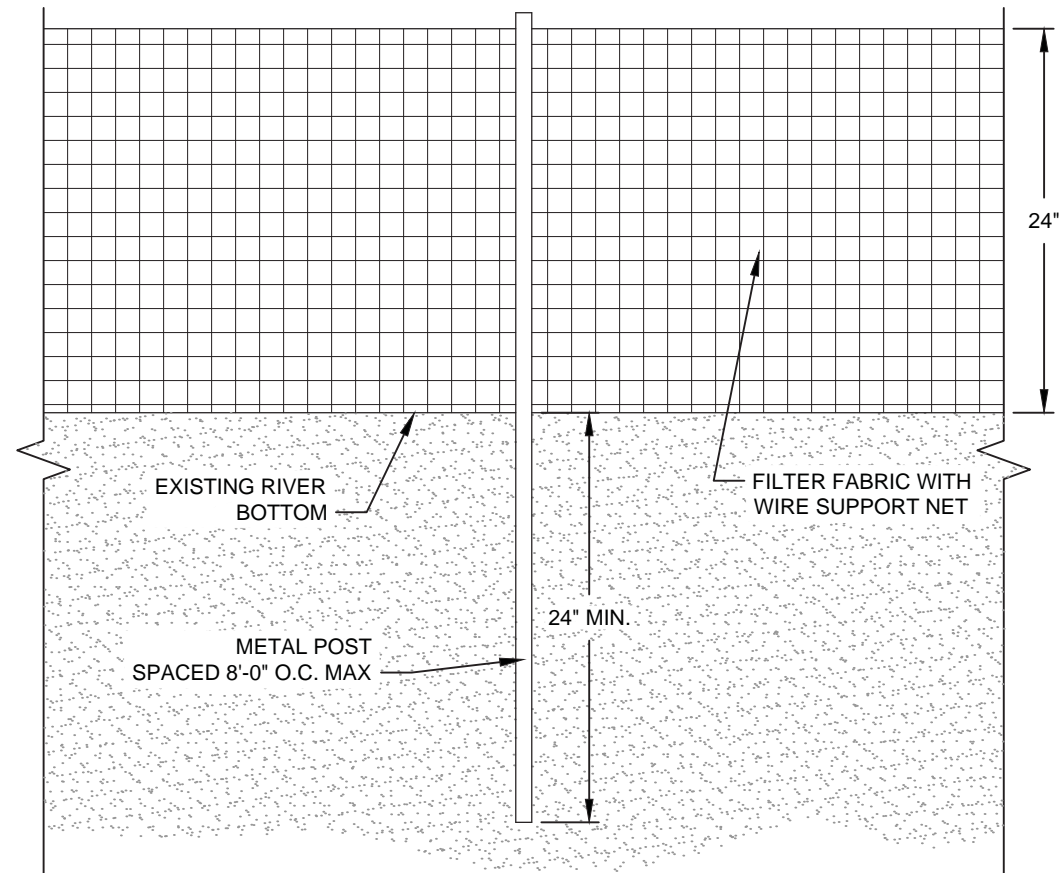
1. EXACT LOCATION AND ORIENTATION OF ACCESS STEPS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
2. WIDTH OF STEPS MAY VARY BETWEEN 3' TO 4'.
3. LOWEST STEP WILL BEGIN AT THE TOP OF A COIR LOG.
4. FRONT DIAMETER OF LOGS SHALL NOT EXCEED 12".

TYPICAL ACCESS STEAIRS

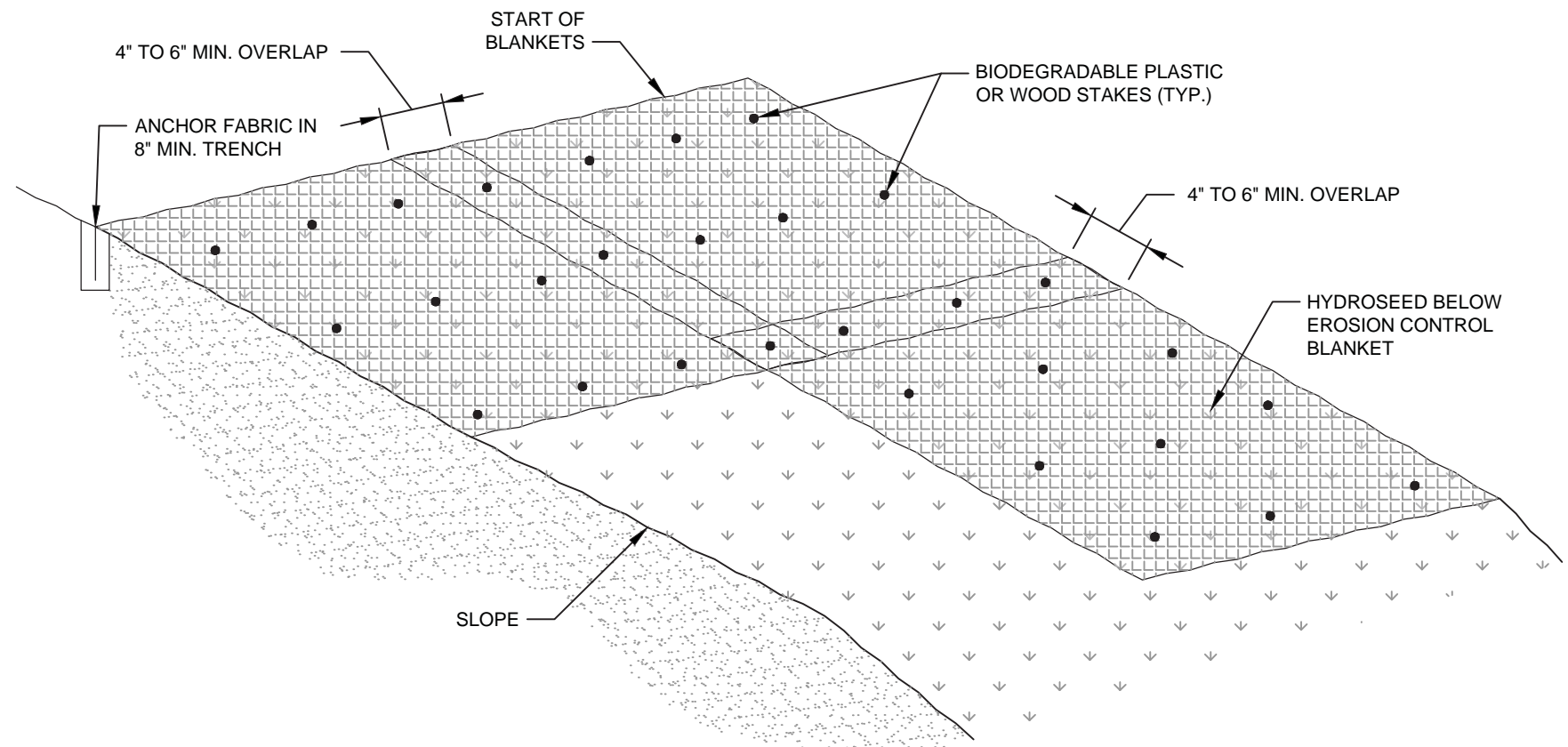
SCALE: 1" = 2'

DRAFT

Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		CONSTRUCTION DETAILS (1 OF 2)
Town of Chelmsford Chelmsford, Massachusetts	Project 1603860	November 2016 Sheet 38 of 39



SEDIMENT FENCE
SCALE: 1" = 1'



NOTES:

1. PLACE AND PREPARE TOPSOIL AND HYDROSEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING FABRIC IN 8" MIN. TRENCH, BACKFILLING, AND COMPACTING.
3. UNROLL EROSION CONTROL BLANKETS DOWN OR HORIZONTALLY ACROSS THE SLOPE FOR GRASS-LINED SWALE INSTALLATION. UNROLL BLANKETS IN DIRECTION OF WATER FLOW. OVERLAP ALL ADJACENT BLANKETS END OVER END (SHINGLE STYLE). MINIMIZE DISTURBANCE OF HYDROSEED DURING FIBER ROLL INSTALLATION. REPLACE DAMAGED AREAS WITH HAND BROADCAST SEED.
4. SECURELY FASTEN EROSION CONTROL BLANKETS TO THE 6" TOPSOIL LAYER AND SUBGRADE USING BIODEGRADABLE PLASTIC OR WOOD STAKES. STAKES SHALL BE OF SUFFICIENT LENGTH TO SECURE TO THE SUBGRADE. STAKE SPACING AND PATTERN SHALL BE AS RECOMMENDED BY THE MANUFACTURER. STAKE SPACING AND PATTERN SHOWN HEREIN IS FOR ILLUSTRATION PURPOSES ONLY.

EROSION CONTROL BLANKET

SCALE: 1" = 2'

DRAFT

Merrimack Riverbank Stabilization Wellman Avenue North Chelmsford, Massachusetts		CONSTRUCTION DETAILS (2 OF 2)
Town of Chelmsford Chelmsford, Massachusetts		Project 1603860

Document C – Floodplain and Wetland 8-Step

EXECUTIVE ORDER 11988 Floodplain Management and 11990 Wetlands Protection

TITLE: Merrimack River Bank Stabilization

DESCRIPTION OF PROJECT: The proposed SOW includes bioengineering bank stabilization that would stabilize the bank using a mixture of structural components such as a stone toe and natural components such as timber, coir rolls, and living vegetation. There are three stabilization techniques proposed for each edge type which include:

- Bank Support for Edge Type A: Work involves installation of timber toe protection and vegetation management, including up-limbing of trees, on the slope. The approximate width of this treatment is 10 feet. Bank Support is proposed for approximately 250 linear feet.
- Bank Repair for Edge Type B: Work involves installation of stone sill along the toe of slope to one foot above ordinary high water, and placing soil behind the sill which would establish a shallow slope. One or more coir log would be placed on top of the stone sill to hold the soil in place to establish a +3:1 slope. Stabilization will be done using seed sowing, erosion control blankets, and native shrubs. Typical offset from the toe of slope to the centerline of the stone sill is approximately 7.5 feet and the offset to the outboard limit of the stone sill is approximately 14 feet. Bank Repair is proposed for approximately 450 lf
- Bank Reconstruction for Edge Type C: Work involves installation of a stone sill along the toe of slope to approximately 0.5 feet above ordinary high water mark and restoring the entire slope cross-section with the installation of several rows of coir fiber rolls and fabric wrapped soils cells in a step-wise manner to establish a 2:1 slope. Revegetation of the soils cells with native trees and shrubs would provide soil stabilization. The offset from the toe of the slope to centerline of stone sill is approximately 7.5 feet and ranges from 1 to 12 feet. The out board offset of the stone sill is approximately 14 feet and ranges from 7.5 to 18.5 feet. Bank Reconstruction is proposed for approximately 3,250 linear feet.

In all edge type zones, trees on the slope and along the top of the slope that are deemed in imminent danger of toppling would be removed. Work will be done landward and therefore, will not have water egress points and anchoring locations. Work would occur in approximately 3,950 linear feet of inland bank and approximately 145,250 square feet of riverfront area and bordering land. 59,250 square feet of the 145,205 square feet will occur in waters of the US with an approximately 13 foot wide by 2 foot deep by 3,700 foot long excavation. Reusing of excavated soils would occur and therefore, no off site fill will be brought in. Project is located between the Merrimack River and Wellman Ave in Chelmsford, MA (42.647644, -71.392505 to 42.645174, -71.379039).

STEP 1 Determine whether the proposed action is located in the 100-year floodplain (500-year floodplain for critical actions)

YES the project is located in the 100 Year floodplain as mapped by FIRM Panel No.

25017C01193E date: 06/04/2010. This project is located within the AE Zone (100-year) and Floodway AE zone.

Wetland. The proposed action is located in a wetland mapped by USFW Dated 04/18/2017.

STEP 2 Notify the public at the earliest possible time of the intent to carry out an action in a floodplain and involve the affected and interested public in the decision-making process.

The public notice was provided by FEMA of Public Assistance projects by cumulative public notice after the major disaster declaration.

STEP 3 Identify and evaluate practicable alternatives to locating the proposed action in a floodplain (including alternatives sites, actions and the "no action" option). If a practicable alternative exists outside the floodplain FEMA must locate the action at the alternative site.

Alternative Options

- 1. No Action Alternative** –If no action is taken, the bank of the Merrimack River would continue to erode potentially exposing the adjacent sewer line to the river. This could cause the line to fail and contaminate the river with untreated sewage.
- 2. Proposed Alternative** – The proposed alternative of bioengineering bank stabilization would mitigate against erosion and sewer line exposure. This would mitigate against potential sewage contamination in the river.
- 3. Alternative within the floodplain** – The proposed alternative of rock rip rap installation would mitigate against erosion and sewer line exposure. This would mitigate against potential sewage contamination in the river.
- 4. Alternative outside the floodplain** – It would be costly and unfeasible to relocate the sewer line outside the floodplain. The line would not function for the community that requires it due to the distance from the floodplain.

STEP 4 Identify the potential direct and indirect impacts associated with the occupancy or modification of floodplains and the potential direct and indirect support of floodplain development that could result from the proposed action. 44CFR Part 9.10

Alternative Options

- 1. No Action Alternative** – If no action is taken, the bank would continue to erode potentially exposing the adjacent sewer line to the river. This could cause the line to fail and contaminate the river with untreated sewage.
- 2. Proposed Alternative** – Would reduce the rate of erosion at the bank protecting the sewer line from exposure.
- 3. Alternative within the floodplain** – Would reduce the rate of erosion at the bank protecting the sewer line from exposure.
- 4. Alternative outside the floodplain** – N/A

STEP 5 Minimize the potential adverse impacts and support to or within floodplains to be identified under Step 4, restore and preserve the natural and beneficial values served by floodplains.

Alternative Options

1. **No Action Alternative** – If no action is taken the bank could erode up to the sewer line exposing to the river water and cause potential contamination.
2. **Proposed Alternative** –By using bioengineering techniques the bank work would reduce erosion rates while keeping the floodplain in a natural state
3. **Alternative within the floodplain** – By using rock rip rap the bank work would reduce erosion rates but would not keep the floodplain in a natural state.
4. **Alternative outside the floodplain** – N/A

STEP 6 Reevaluate the proposed action to determine first, if it is still practicable in light of its exposure to flood hazards or impacts on wetlands, the extent to which it will aggravate the hazards to others, and its potential to disrupt floodplain and wetland resources and second, if alternatives preliminarily rejected at Step 3 are practicable in light of the information gained in Steps 4 and 5. FEMA shall not act in a floodplain unless it is the only practicable location.

Alternative Options

1. **No Action Alternative** – This choice would continue to leave the area vulnerable to sewer line exposure and failure.
2. **Proposed Alternative** – This is the best alternative to mitigate against erosion and sewer line exposure while keeping the floodplain in a natural state.
3. **Alternative within the floodplain** – Though this alternative would mitigate against erosion and sewer line exposure the floodplain would be altered from a natural to a built up state.
4. **Alternative outside the floodplain** – N/A

STEP 7 Prepare and provide the public with a finding and public explanation of any final decision that the floodplain is the only practicable alternative.

A public notice will be provided by FEMA by cumulative public notice after the close of the major disaster declaration.

STEP 8 Review the implementation and post - implementation phases of the proposed action to ensure that the requirements stated in Section 9.11 are fully implemented.

It has been determined by FEMA that the Proposed Alternative is the most practicable Alternative available.

CONDITIONS TO BE PLACED ON ACTION: Applicant must coordinate with the local

floodplain administrator and must obtain any required approval prior to initiating work. All coordination pertaining to these activities and applicant compliance with any conditions should be documented and copies forwarded to the state and FEMA for inclusion in the permanent project files.

1. Applicant is working in a floodway and must apply for a no-rise certification and follow all requirements per 44 CFR 60.3(d).
2. If deviations from the proposed scope of work (including conditions) result in design changes, the need for additional ground disturbance, additional removal of vegetation, or result in any other unanticipated changes to the physical environment, the Grantee must contact FEMA, and a re-evaluation under NEPA and other applicable environmental laws will be conducted by FEMA.

Document D – USFW IpaC Report

IPaC Information for Planning and Consultation U.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as trust resources) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location


Middlesex County, Massachusetts



Local office

New England Ecological Services Field Office

☎ (603) 223-2541

 (603) 223-0104

70 Commercial Street, Suite 300
Concord, NH 03301-5094

<http://www.fws.gov/newengland>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ are managed by the [Endangered Species Program](#) of the U.S. Fish and Wildlife Service.

-
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC

also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service³. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed->

[species/](#)

[birds-of-conservation-concern.php](#)

- Conservation measures for birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Year-round bird occurrence data <http://www.birdscanada.org/birdmon/default/datasummaries.jsp>

The migratory birds species listed below are species of particular conservation concern (e.g. [Birds of Conservation Concern](#)) that may be potentially affected by activities in this location. It is not a list of every bird species you may find in this location, nor a guarantee that all of the bird species on this list will be found on or near this location. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To view available data on other bird species that may occur in your project area, please visit the [AKN Histogram Tools](#) and [Other Bird Data Resources](#). To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

NAME	SEASON(S)
American Bittern <i>Botaurus lentiginosus</i> https://ecos.fws.gov/ecp/species/6582	Breeding
American Oystercatcher <i>Haematopus palliatus</i> https://ecos.fws.gov/ecp/species/8935	Breeding
Bald Eagle <i>Haliaeetus leucocephalus</i> https://ecos.fws.gov/ecp/species/1626	Year-round
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i> https://ecos.fws.gov/ecp/species/9399	Breeding
Blue-winged Warbler <i>Vermivora pinus</i>	Breeding
Canada Warbler <i>Wilsonia canadensis</i>	Breeding
Least Bittern <i>Ixobrychus exilis</i> https://ecos.fws.gov/ecp/species/6175	Breeding
Olive-sided Flycatcher <i>Contopus cooperi</i> https://ecos.fws.gov/ecp/species/3914	Breeding

Peregrine Falcon	<i>Falco peregrinus</i> https://ecos.fws.gov/ecp/species/8831	Breeding
Pied-billed Grebe	<i>Podilymbus podiceps</i>	Breeding
Prairie Warbler	<i>Dendroica discolor</i>	Breeding
Purple Sandpiper	<i>Calidris maritima</i>	Wintering
Short-eared Owl	<i>Asio flammeus</i> https://ecos.fws.gov/ecp/species/9295	Wintering
Willow Flycatcher	<i>Empidonax traillii</i> https://ecos.fws.gov/ecp/species/3482	Breeding
Wood Thrush	<i>Hylocichla mustelina</i>	Breeding

What does IPaC use to generate the list of migratory bird species potentially occurring in my specified location?

Landbirds:

Migratory birds that are displayed on the IPaC species list are based on ranges in the latest edition of the National Geographic Guide, Birds of North America (6th Edition, 2011 by Jon L. Dunn, and Jonathan Alderfer). Although these ranges are coarse in nature, a number of U.S. Fish and Wildlife Service migratory bird biologists agree that these maps are some of the best range maps to date. These ranges were clipped to a specific Bird Conservation Region (BCR) or USFWS Region/Regions, if it was indicated in the 2008 list of Birds of Conservation Concern (BCC) that a species was a BCC species only in a particular Region/Regions. Additional modifications have been made to some ranges based on more local or refined range information and/or information provided by U.S. Fish and Wildlife Service biologists with species expertise. All migratory birds that show in areas on land in IPaC are those that appear in the 2008 Birds of Conservation Concern report.

Atlantic Seabirds:

Ranges in IPaC for birds off the Atlantic coast are derived from species distribution models developed by the National Oceanic and Atmospheric Association (NOAA) National Centers for Coastal Ocean Science (NCCOS) using the best available seabird survey data for the offshore Atlantic Coastal region to date. NOAA/NCCOS assisted USFWS in developing seasonal species ranges from their models for specific use in IPaC. Some of these birds are not BCC species but were of interest for inclusion because they may occur in high abundance off the coast at different times throughout the year, which potentially makes them more susceptible to certain types of development and activities taking place in that area. For more refined details about the abundance and richness of bird species within your project area off the Atlantic Coast, see the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other types of taxa that may be helpful in your project review.

About the NOAAANCCOS models: the models were developed as part of the NOAAANCCOS project: [Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#). The models resulting from this project are being used in a number of decision-support/mapping products in order to help guide decision-making on activities off the Atlantic Coast with the goal of reducing impacts to migratory birds. One such product is the [Northeast Ocean Data Portal](#), which can be used to explore details about the relative occurrence and abundance of bird species in a particular area off the Atlantic Coast.

All migratory bird range maps within IPaC are continuously being updated as new and better information becomes available.

Can I get additional information about the levels of occurrence in my project area of specific birds or groups of birds listed in IPaC?

Landbirds:

The [Avian Knowledge Network \(AKN\)](#) provides a tool currently called the "Histogram Tool", which draws from the data within the AKN (latest, survey, point count, citizen science datasets) to create a view of relative abundance of species within a particular location over the course of the year. The results of the tool depict the frequency of detection of a species in survey events, averaged between multiple datasets within AKN in a particular week of the year. You may access the histogram tools through the [Migratory Bird Programs AKN Histogram Tools](#) webpage.

The tool is currently available for 4 regions (California, Northeast U.S., Southeast U.S. and Midwest), which encompasses the following 32 states: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin.

In the near future, there are plans to expand this tool nationwide within the AKN, and allow the graphs produced to appear with the list of trust resources generated by IPaC, providing you with an additional level of detail about the level of occurrence of the species of particular concern potentially occurring in your project area throughout the course of the year.

Atlantic Seabirds:

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAAANCCOS [Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Facilities

Wildlife refuges

Any activity proposed on [National Wildlife Refuge](#) lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location overlaps the following wetlands:

RIVERINE

[R2UBH](#)

A full description for each wetland code can be found at the National Wetlands Inventory website: <https://ecos.fws.gov/ipac/wetlands/decoder>

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the

image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.