

**Pennichuck
 East Utility**

**Merrimack River
 Watermain
 Crossing & Intake
 Project**

Merrimack and Litchfield,
 New Hampshire

SURVEY DATA SOURCES:
 1. BATHYMETRIC CONTOURS FROM SURVEY PERFORMED BY SUBSTRUCTURE INC. OF PORTSMOUTH, NH IN MAY 2016.
 2. TOPOGRAPHIC CONTOURS FROM LIDAR DEM OBTAINED FROM GRANIT IN JULY 2016.

January 18, 2017

Mark	Date	Description
PROJECT NO:		P-0597-4
FILE:		P0597_SITE.dwg
DRAWN BY:		ARS/BJL/NSC
CHECKED BY:		DC
APPROVED BY:		PMV

CONCEPTUAL SITE PLAN

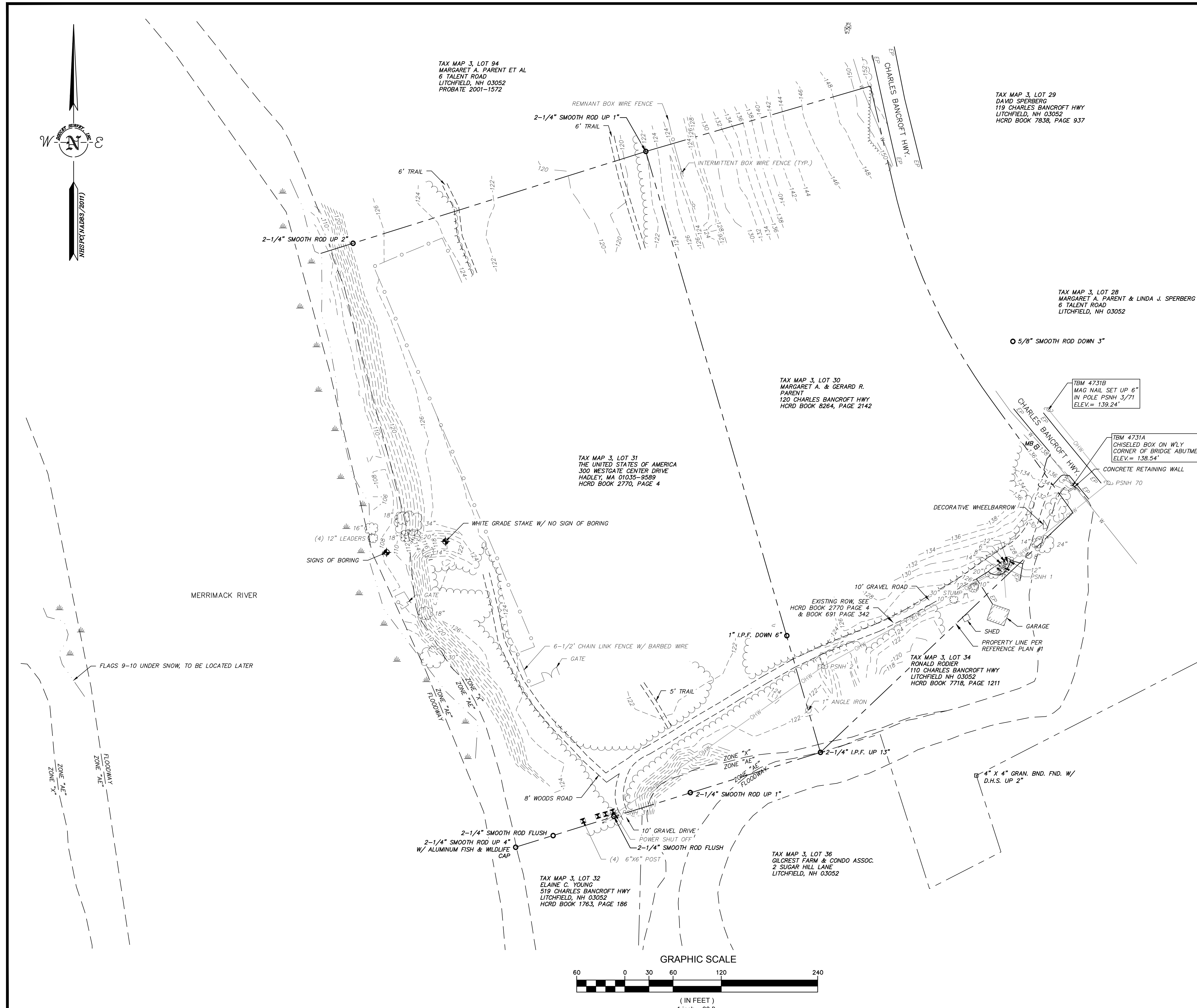
SCALE: AS SHOWN

NOTES:

- FIELD SURVEY PERFORMED BY EJS & SJH DURING DECEMBER 2016 USING A TRIMBLE S6 TOTAL STATION WITH A TRIMBLE TSC3 DATA COLLECTOR AND A SOKKIA B21 AUTO LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- JURISDICTIONAL WETLANDS WERE DELINEATED BY NORMANDEAU ASSOCIATES IN NOVEMBER 2016 USING THE METHODS OUTLINED IN THE TECHNICAL REPORT Y-87-1 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL, JANUARY 1987 AND THE INTERIM REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL: NORTHCENTRAL AND NORTHEAST REGION, OCTOBER 2009.
- FLOOD HAZARD ZONE: AS SHOWN.
- HORIZONTAL DATUM BASED ON NEW HAMPSHIRE STATE PLANE(2800) NAD83(2011) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- VERTICAL DATUM IS BASED ON APPROXIMATE NAVD88(GEIOD12A) (±.2') DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT 2' INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY, INC. WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.
- UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON OBSERVABLE PHYSICAL EVIDENCE AND PAINT MARKS FOUND ON-SITE.
- THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING: THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.
- ALL ELECTRIC, GAS, TEL. WATER, SEWER AND DRAIN SERVICES ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN ON THIS SITE USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.
- THE INTENT OF THIS PLAN IS TO SHOW THE LOCATION OF BOUNDARIES IN ACCORDANCE WITH AND IN RELATION TO THE CURRENT LEGAL DESCRIPTION, AND IS NOT AN ATTEMPT TO DEFINE UNWRITTEN RIGHTS, DETERMINE THE EXTENT OF OWNERSHIP, OR DEFINE THE LIMITS OF TITLE.
- DUE TO THE COMPLEXITY OF RESEARCHING ROAD RECORDS AS A RESULT OF INCOMPLETE, UNORGANIZED, INCONCLUSIVE, OBLITERATED, OR LOST DOCUMENTS, THERE IS AN INHERENT UNCERTAINTY INVOLVED WHEN ATTEMPTING TO DETERMINE THE LOCATION AND WIDTH OF A ROADWAY RIGHT OF WAY. THE EXTENT OF (THE ROAD(S)) AS DEPICTED HEREON IS/ARE BASED ON RESEARCH CONDUCTED AT HILLSBOROUGH COUNTY REGISTRY OF DEEDS AND THE NH DEPARTMENT OF TRANSPORTATION.
- WATER BOUNDARIES ARE DYNAMIC IN NATURE AND ARE SUBJECT TO CHANGE DUE TO NATURAL CAUSES SUCH AS EROSION OR ACCRETION.
- THIS SURVEY WAS PERFORMED IN WINTER CONDITIONS WITH SNOW COVER ON THE GROUND. A SITE CHECK IS RECOMMENDED IN THE SPRING IN ORDER TO ENSURE THE COMPLETENESS/ACCURACY OF THE INFORMATION SHOWN HEREON.

REFERENCE PLANS:

- "PARENT SUBDIVISION PLAN" DATED FEBRUARY 18, 2006 BY M.J. GRAINGER ENGINEERING, INC., HCRD PLAN #35134.
- "ATLANTIC SALMON SMOLT RELEASE FACILITY ESTATE OF F.L. CENTER TRACTS" DATED NOVEMBER 14, 1979 BY ROGER R. TORNSTROM", PROVIDED BY PENNICHUCK CORPORATION.



EXISTING CONDITIONS PLAN
FOR
TIGHE & BOND AND
PENNICHUCK CORPORATION
LITCHFIELD & MERRIMACK
NEW HAMPSHIRE

NO.	DATE	DESCRIPTION	BY

DRAWN BY:	W.D.C.	DATE:	01/09/17
CHECKED BY:	S.V.M.	DRAWING NO.:	4731A
JOB NO.:	4731	SHEET	1 OF 1

DOUCET SURVEY
Serving Your Professional Surveying & Mapping Needs
102 Kent Place, Newmarket, NH 03857 (603) 659-6560
2 Commerce Drive (Suite 202) Bedford, NH 03110 (603) 614-4060
10 Storer Street (Riverview Suite) Kennebunk, ME (207) 502-7005
<http://www.doucetsurvey.com>

FILE NAME: \\PROJ\PROJECTS\4731_CED\DRAWING\4731-08-TITLE.DWG, 01-09-17.dwg, PLOTTED: Monday, January 09, 2017 - 4:52pm

MERRIMACK RIVER WATER MAIN CROSSING

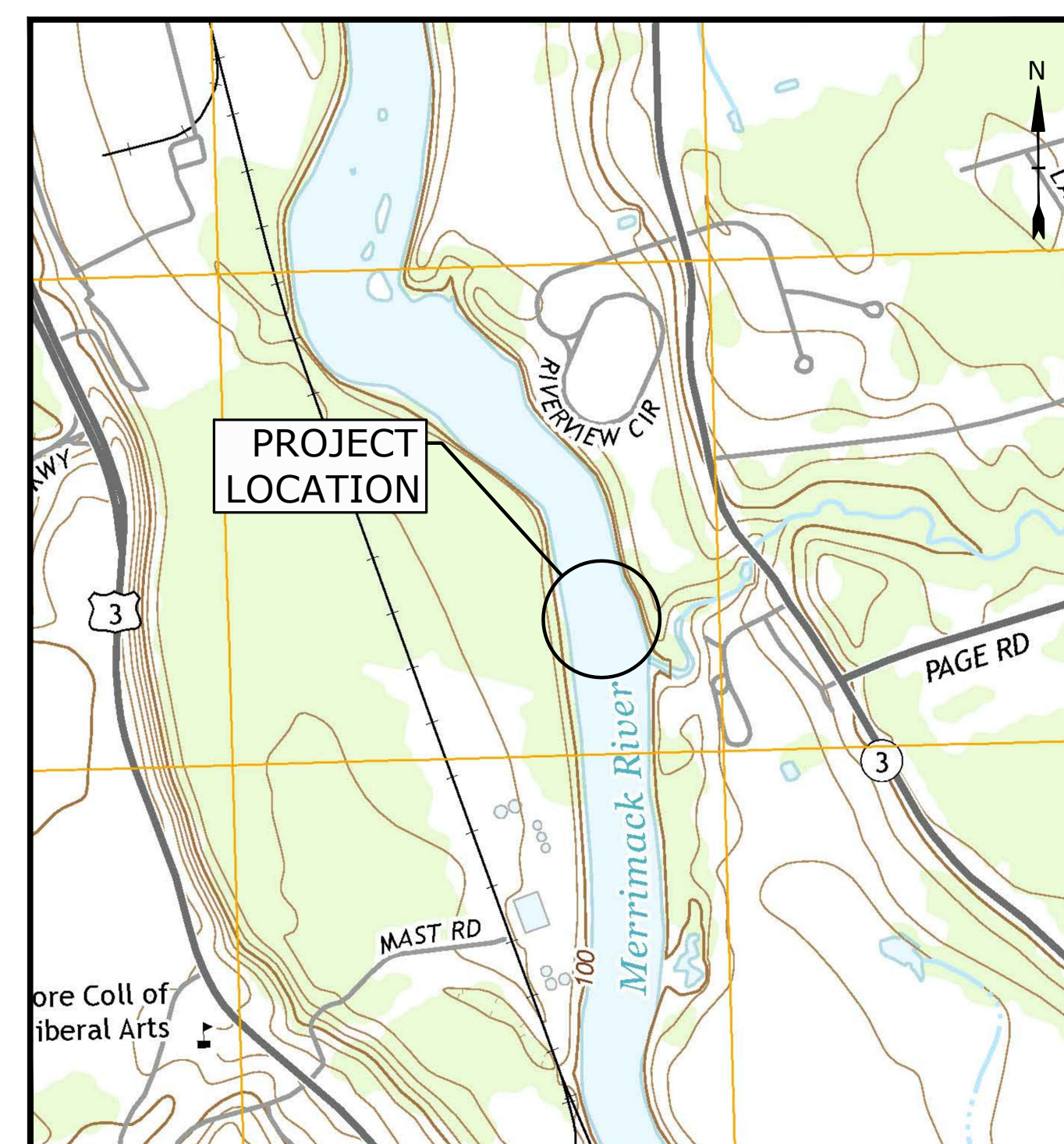
MERRIMACK, NEW HAMPSHIRE

PROJECT NO: P0597-4

JANUARY 18, 2017

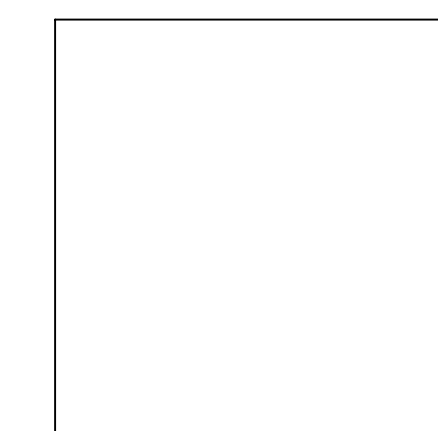
60% DESIGN

LIST OF DRAWINGS	
SHEET NO.	SHEET TITLE
	COVER SHEET AND INDEX
G-100	ABBREVIATIONS, LEGENDS, AND GENERAL NOTES
C-101	EXISTING CONDITIONS AND SITE PREPARATION PLAN
C-102	PROPOSED WATER MAIN CROSSING PLAN AND PROFILE
C-501	WATER MAIN CROSSING DETAILS

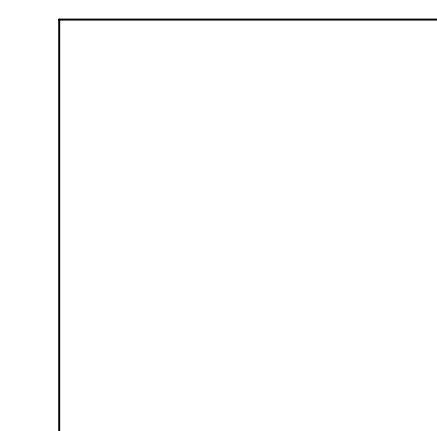


LOCATION MAP
SCALE: 1" = 2,000'

PREPARED BY:
Tighe & Bond
www.tighebond.com



DAVID CEDARHOLM P.E.



PETER M. VALINSKI P.E.

OWNER:
PENNICHUCK EAST UTILITY, INC.
MERRIMACK, NEW HAMPSHIRE

COMPLETE SET 5 SHEETS

LEGEND

	IRON ROD FOUND
	IRON PIPE FOUND
	DRILL HOLE FOUND
	ELECTRIC METER
	PAD MOUNTED TRANSFORMER
	MANHOLE
	CONCRETE BOUND WITH DRILL HOLE
	WATER GATE VALVE
	UTILITY POLE
	GUY POLE
	GUY WIRE
	DECIDUOUS TREE
	CONIFEROUS TREE
	SIGN (SINGLE POSTED)
	POST
	BORING LOCATION
	GRAVEL
	CLEAR AND GRUB LIMIT
	APPROXIMATE EXCAVATION LIMIT
	PROPERTY LINE
	EXISTING WATER MAIN
	UNDERGROUND ELECTRIC
	OVERHEAD ELECTRIC
	TREE LINE
	EXISTING FENCE
	INDEX CONTOURS
	APPROXIMATE EDGE OF WATER
	WETLAND LINE
	EROSION CONTROL BARRIER

ABBREVIATIONS

BOTTOM OF EXPLORATION	BOE	INVERT	INV
CAST IRON	CI	IRON PIPE	IP
CONCRETE	CONC	MECHANICAL JOINT	MJ
DIMENSION RATIO	DR	NOT IN THIS CONTRACT	NITC
DUCTILE IRON	DI	NOT TO SCALE	N.T.S.
ELEVATION	ELEV	PROPERTY LINE	P L
EROSION CONTROL	EC	STAINLESS STEEL	SS
GUY WIRE	GW	STATION	STA
GUY POLE	GP	STONE BOUND	SB
HIGH DENSITY POLYETHYLENE	HDPE	UTILITY POLE	UP
INTERIOR DIAMETER	ID	UTILITY STRUCTURE	UT
		WATER GATE VALVE	WV

PROJECT DESCRIPTION

THE PROJECT CONSISTS OF THE CONSTRUCTION OF A WATERMAIN CROSSING OF THE MERRIMACK RIVER, NH. THE PROPOSED 18-INCH SDR11 HDPE WATER MAIN WILL BE INSTALLED THROUGH A COMBINATION OF HORIZONTAL DIRECTIONAL DRILLING AND DIRECT BURY. GATE VALVES WILL BE INSTALLED ON EITHER SIDE OF THE CROSSING AND STUBS LEFT FOR CONTINUATION OF THE WATER MAIN BY OTHERS.

GENERAL NOTES

- EXISTING UTILITY LOCATIONS AND LAND ELEVATIONS ARE BASED ON A GROUND SURVEY CONDUCTED BY DOUCET SURVEY IN JANUARY 2017. PRIOR TO CONSTRUCTION, DETERMINE THE EXACT LOCATION OF UTILITIES BY TEST PIT, OR OTHER METHODS WHERE REQUIRED, WHEN AUTHORIZED BY THE ENGINEER. VERTICAL DATUM IS BASED ON NAVD88. STREAM BED ELEVATIONS ARE BASED ON A BATHYMETRIC SURVEY BY SUBSTRUCTURE, INC. IN MAY 2015.
- BORING LOCATIONS SHOWN ARE APPROXIMATE ONLY AND BORINGS ARE NOT GUARANTEED TO REPRESENT THE EXISTING CONDITIONS.
- PROVIDE SEDIMENTATION AND EROSION CONTROL MEASURES PRIOR TO BEGINNING ANY CONSTRUCTION.
- MAINTAIN EROSION CONTROL DEVICES THROUGHOUT CONSTRUCTION. INSPECT AFTER EACH RAINSTORM AND DURING MAJOR STORM EVENTS TO DETERMINE THAT ALL SEDIMENTATION AND EROSION CONTROL MEASURES ARE ADEQUATELY IN PLACE AND EFFECTIVE.
- WHERE HEAVY EQUIPMENT WILL CROSS EXISTING BELOW GRADE UTILITIES PROVIDE PROTECTION OF BELOW GRADE UTILITIES BY STEEL PLATING OR OTHER MEANS AS NECESSARY.
- STORE ALL FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE FROM THE SITE TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON WORK HOURS.
- PROVIDE A SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS SUCH AS BOOMS OR BLANKETS, AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS.
- THE INTAKE PUMP STATION MUST REMAIN IN SERVICE THROUGHOUT CONSTRUCTION. MAINTAIN ACCESS TO THE INTAKE PUMP STATION BY THE OWNER THROUGHOUT CONSTRUCTION.

60% DESIGN

**Merrimack
River Water
Main Crossing**

Pennichuck East
Utility

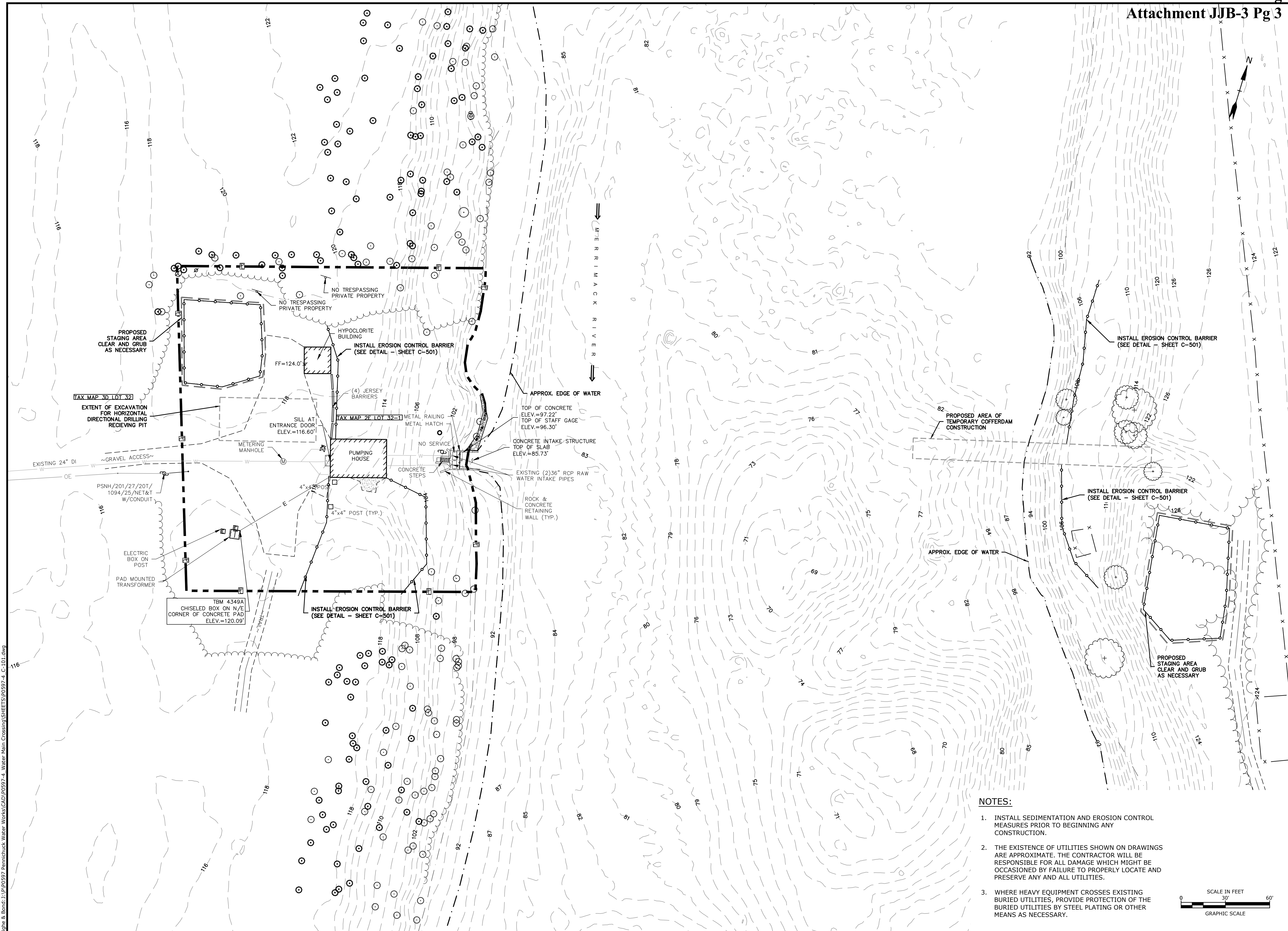
Merrimack,
New Hampshire

MARK	DATE	DESCRIPTION

ABBREVIATIONS, LEGENDS,
AND GENERAL NOTES

SCALE: AS SHOWN

G-100



60% DESIGN

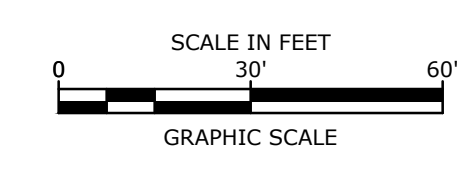
Merrimack River Water Main Crossing

Pennichuck East Utility

Merrimack, New Hampshire

NOTES:

1. INSTALL SEDIMENTATION AND EROSION CONTROL MEASURES PRIOR TO BEGINNING ANY CONSTRUCTION.
2. THE EXISTENCE OF UTILITIES SHOWN ON DRAWINGS ARE APPROXIMATE. THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE WHICH MIGHT BE OCCASIONED BY FAILURE TO PROPERLY LOCATE AND PRESERVE ANY AND ALL UTILITIES.
3. WHERE HEAVY EQUIPMENT CROSSES EXISTING BURIED UTILITIES, PROVIDE PROTECTION OF THE BURIED UTILITIES BY STEEL PLATING OR OTHER MEANS AS NECESSARY.



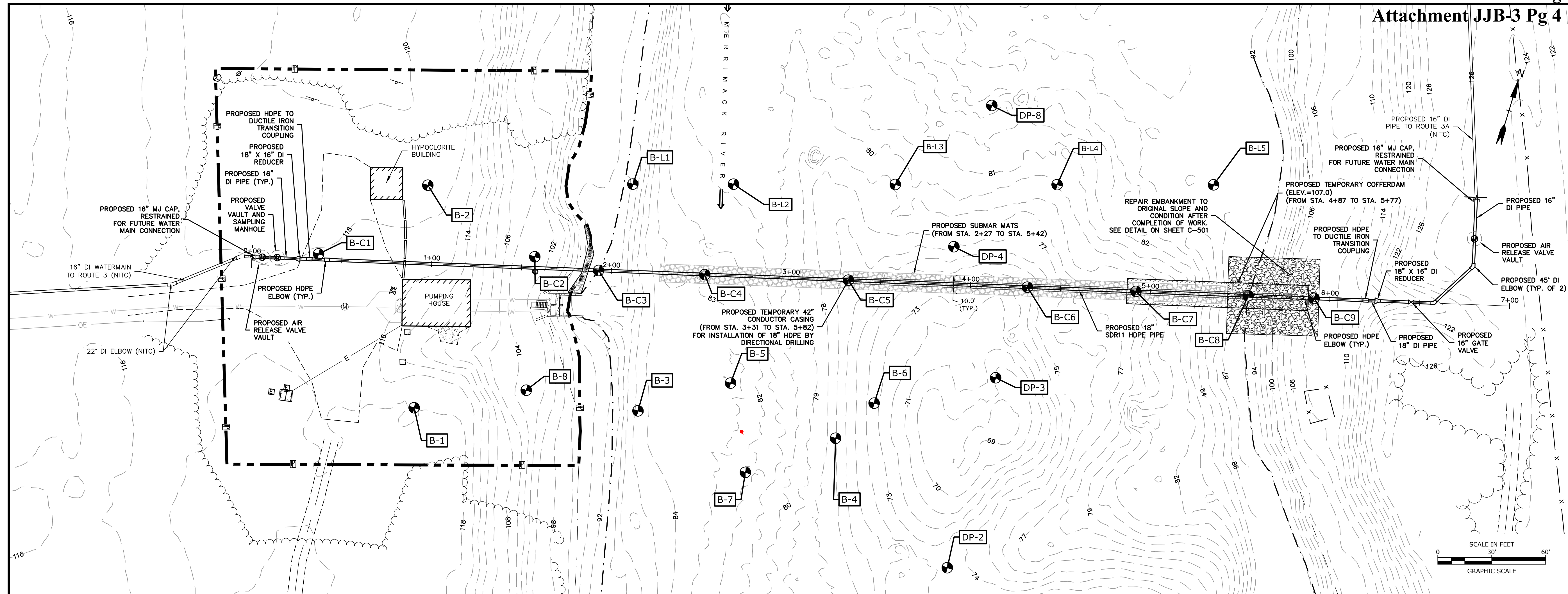
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EXISTING CONDITIONS AND SITE PREPARATION PLAN

SCALE: AS SHOWN

C-101

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 Plotted On: Jan 18, 2017 10:56am By: ARS
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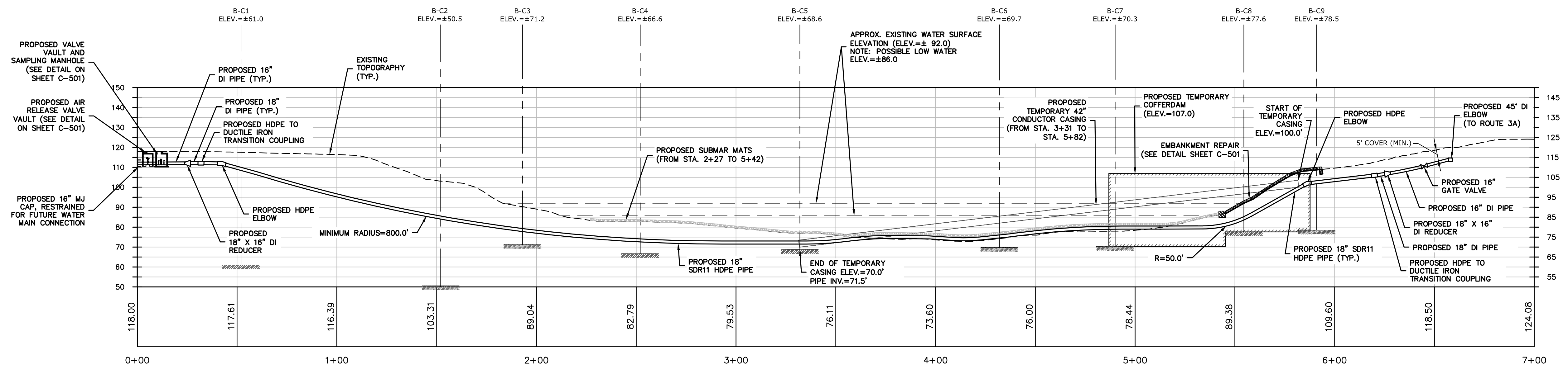


60% DESIGN

Merrimack River Water Main Crossing

Pennichuck East Utility

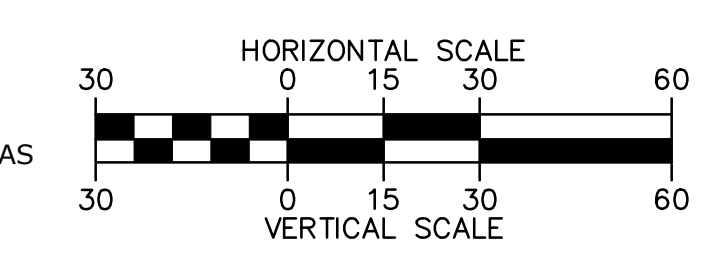
Merrimack, New Hampshire



MERRIMACK RIVER CROSSING PROFILE

NOTES:

1. THE PROPOSED 42" CONDUCTOR CASING IS TO BE INSTALLED TEMPORARILY TO ALLOW FOR INSTALL OF THE 18" HDPE PIPE FROM STATION 0+35 THROUGH 3+65, BY HORIZONTAL DIRECTIONAL DRILLING.
2. REFER TO SECTION 01310 FOR SUGGESTED SEQUENCE OF CONSTRUCTION.
3. EXCEPT WHERE THE WATER MAIN SITS ON THE RIVER BED, A 5' MINIMUM COVER SHALL BE MAINTAINED.
4. EROSION CONTROLS INDICATED ON SHEET C-101 SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION.
5. WATER FROM DEWATERING OF EXCAVATIONS SHALL BE PUMPED THROUGH A DEWATERING BAG BEFORE DISCHARGING. SEE DETAIL SHEET C-501.
6. CONTRACTOR TO INSTALL CHLORINATION TAPS ON WATER MAIN FOR DISINFECTION AND SHALL PLUG TAPS AS REQUIRED AFTER COMPLETION OF DISINFECTION



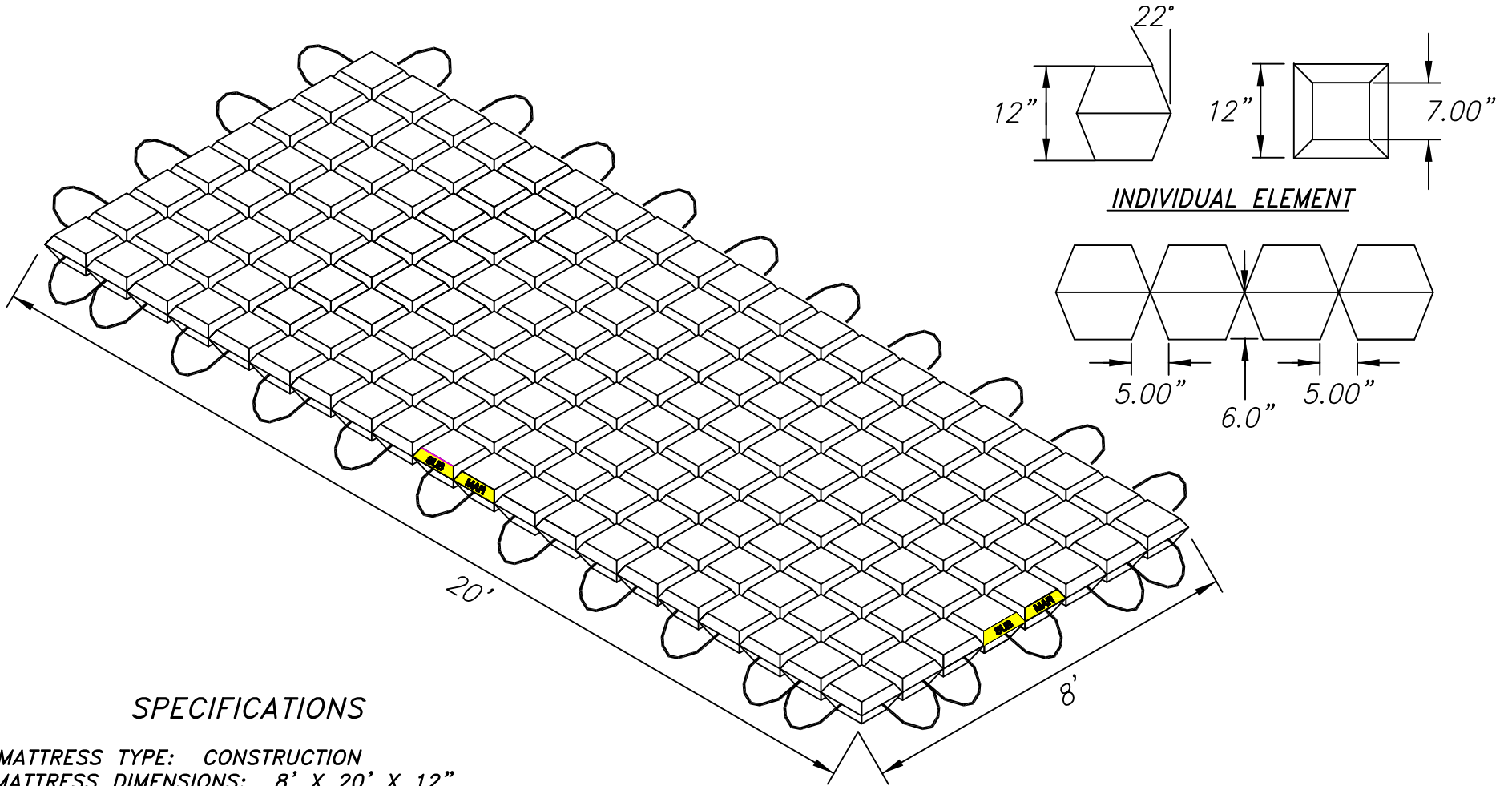
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MARK	DATE	DESCRIPTION
PROJECT NO:	P0597-4	
DATE:	1/18/2017	
FILE:	P0597-4_C-102.DWG	
DRAWN BY:	ARS/BJL/NSC	
CHECKED:	DC	
APPROVED:	PMV	

PROPOSED WATER MAIN CROSSING PLAN AND PROFILE

SCALE: AS SHOWN

C-102



SPECIFICATIONS

MATTRESS TYPE: CONSTRUCTION
MATTRESS DIMENSIONS: 8' X 20' X 12"
MATTRESS WEIGHT: AIR 13,200 POUNDS
CONCRETE DENSITY: 145 LBS. PER CU. FT., 4,000 PSI
160 ELEMENTS: 5/8" ULTRA VIOLET STABILIZED COPOLYMER
EXTRUDED FIBER ROPE, MINIMUM TENSILE STRENGTH 9,500 POUNDS

805 Dunn Street
 Houma, LA 70360
 Ph. 985-868-0001
 Fax 985-851-0108
 Email: submar@submar.com
 Website: www.submar.com



SUBMAR
 STANDARD 8.00'x20.00'
 MAT DETAIL

12" CONCRETE MATTRESS

THESE CONCEPTUAL DRAWINGS ARE PREPARED BY SUBMAR
 FOR ESTIMATING PURPOSES ONLY AND ARE NOT CONSTRUCTION DRAWINGS.
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DATE: 01/03/13	CHECKED BY: DWD	DRAWN BY: KPF	SCALE: N.T.S.	CONTACT:	PHONE. #:
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Oil & Gas

Offshore



Synergy with Nature

Submar introduced concrete mat technology to the Gulf of Mexico in 1990. Prior to that, pipeline operators in the Gulf used inefficient sand/cement bags for pipeline crossings. Since Submar's mat technology introduction, sand/cement bag pipeline crossings have become virtually obsolete. Submar mats have been used successfully for pipeline separation, stabilization and protection for over two decades. Articulating concrete mat crossings are accepted as the new standard by DOT, MMS Contractors and Pipeline Operators.

The Submar Construction Mat is superior in quality of construction, long-term value and safety.



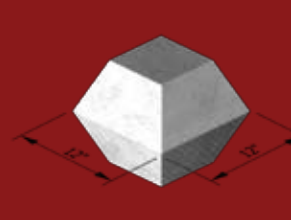
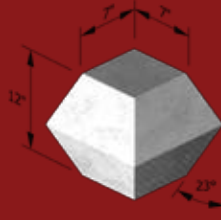
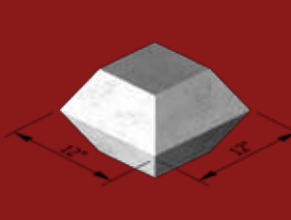
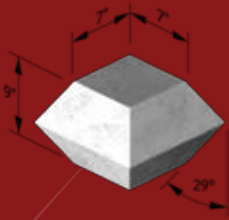
Construction Mats Application

- Pipeline Protection
- Pipeline Stabilization
- Pipeline Separation and Cover
- Pre-Lay Crossings
- Post-Lay Crossings
- Scour and Erosion Protection
- Free Span Correction
- Pipeline Vortex Shedding
- Rig Pads
- Pipeline and Umbilical Anchoring
- Valve Protection
- Pipeline Weight Coating
- Reusable Offshore Foundation
- Pipeline Thermal Expansion

For over two decades Submar has achieved success in the offshore oil and gas market by providing an environmentally and technically superior product. The combination of consistent manufacturing, outstanding technical support and 24-hour customer service is the Nature of Submar.



9" Element



12" Element

Patented Non-Shielding / Non-Abrasive Padding

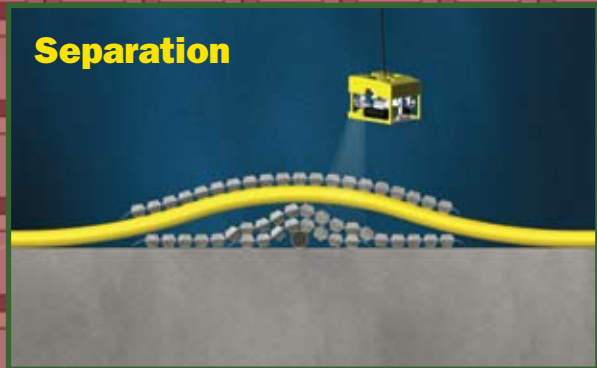
Submar's porous pads will not effect or shield off a Cathodic Protection System.



Unit		Dimensions			Concrete Density (LBS / cu. ft.)	Mat Weight Air (LBS)	Mat Weight Submerged (LBS)
Size	Style	L	W	H			
9"	Closed	8'	20'	9"	145	10,500	6,000
12"	Closed	8'	16'	12"	145	10,500	6,000
12"	Closed	8'	20'	12"	145	13,125	7,500

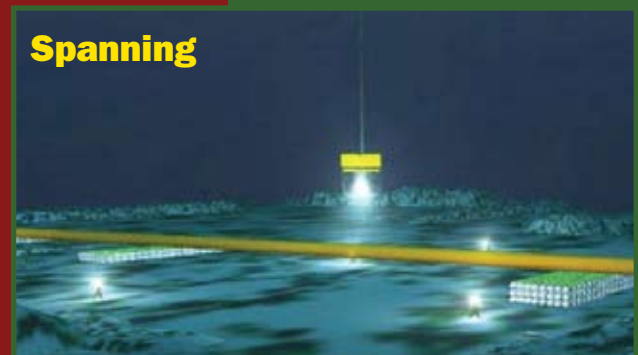
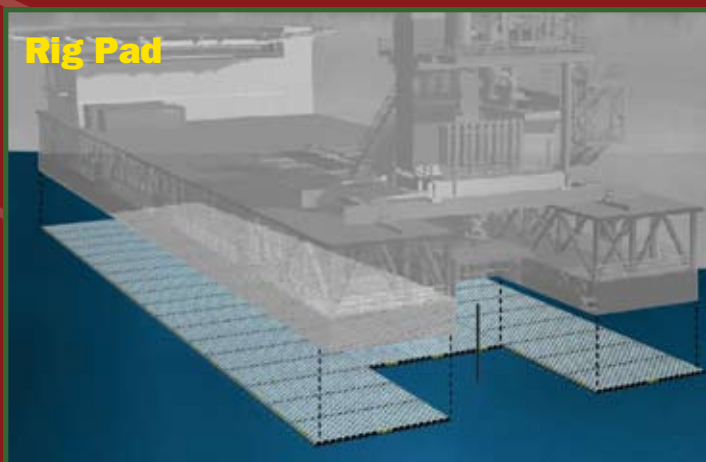
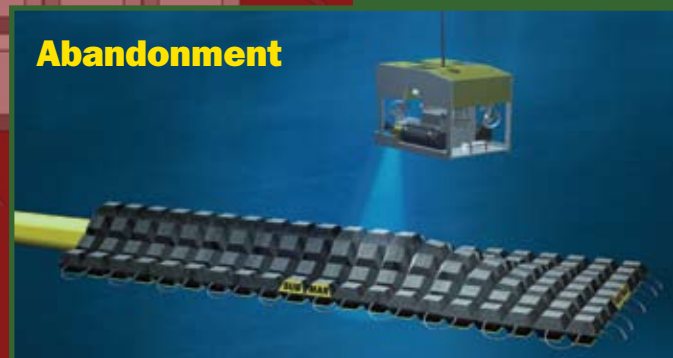
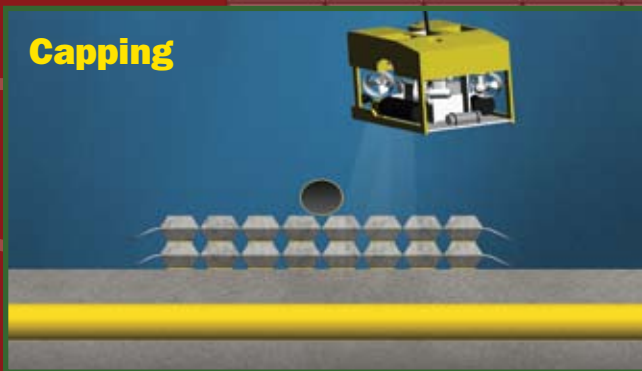
*Compressive Strength: 4000 PSI (Minimum)

**5/8" Ultraviolet Stabilized Copolymer Extruded Fiber Rope, Minimum 9,500 LBS Tensile Strength



Submar mats can be supplied with patented 'Non-Shielding', 'Non-Abrasive' pads. These pads were developed especially to protect thin filmed epoxy coated pipelines from coming in contact with Submar's concrete mats. The pads are 7-1/2" x 7-1/2" square and are made of heavy duty, 3/8" P.V.C.

Patent Numbers: 5,722,795
5,846,023 & 5,944,44



Mechanical Frame Specifications

Frame Style	Dimensions		Maximum Hook Height with Mat (ft)	Empty Frame Weight (tons)	Maximum Number of Mats Per Load	Maximum Loaded Frame Weight (tons)
	L (ft)	W (ft)				
Single	8	20	24	1.75	2	12.25
Dual	8	40	36	4.00	5	30.25
Triple	8	60	42	8.00	7	44.75

Single



Dual



Triple



Submar's Mechanical Mat Deployment Frame Operating Procedure

1. Position Mechanical Deployment Frame on top of mattress ensuring straps are free.
2. Activate the handle until pins are approximately 1" from closed position (1), enabling all 20 straps to be positioned on pins (one strap from each side of mat per pin).
3. Place straps through lifting ropes on mattress making sure they are not twisted. Return strap eyelet through the guide (2) on the handling frame to load pins (3).
4. Activate handle to maximum closed position, taking care not to wedge straps on end of pins. Move safety latch to lock position (4).
5. To release the mattress, the safety latch must be lifted upward and the handle pulled outward to the open position (5).

Patent Numbers: 6,139,220 & 6,106,194

NYLON STRAP

Submar's Patented Installation Frames

- ROV / Diver Friendly
- Safe / Fast Release
- Quick Deployment
- Fail Safe
- Environmentally Safe
- Reduces Bottom Time

Submar's patented mechanical frames promote safety and saves time and money offshore. ROV friendly frames are safer than using divers in deep water and the quick release handle allows mat release time to be cut by hours. The dual and triple frames are capable of installing multiple Submar mats at one time saving hours of redeployment and overall days at sea.



REPRESENTED LOCALLY BY

805 Dunn Street
Houma, Louisiana 70360
985.868.0001 • fax: 985.851.0108
email: submar@submar.com
www.submar.com

