

LOWELL REGIONAL WATER UTILITY LOWELL, MASSACHUSETTS

RESIDUALS HANDLING FACILITIES UPGRADE

CITY OF LOWELL PROJECT NO. IFB 15-38
WOODARD & CURRAN PROJECT NO. 227251.30



PROJECT LOCATION MAP

50 0 50 100
scale mile

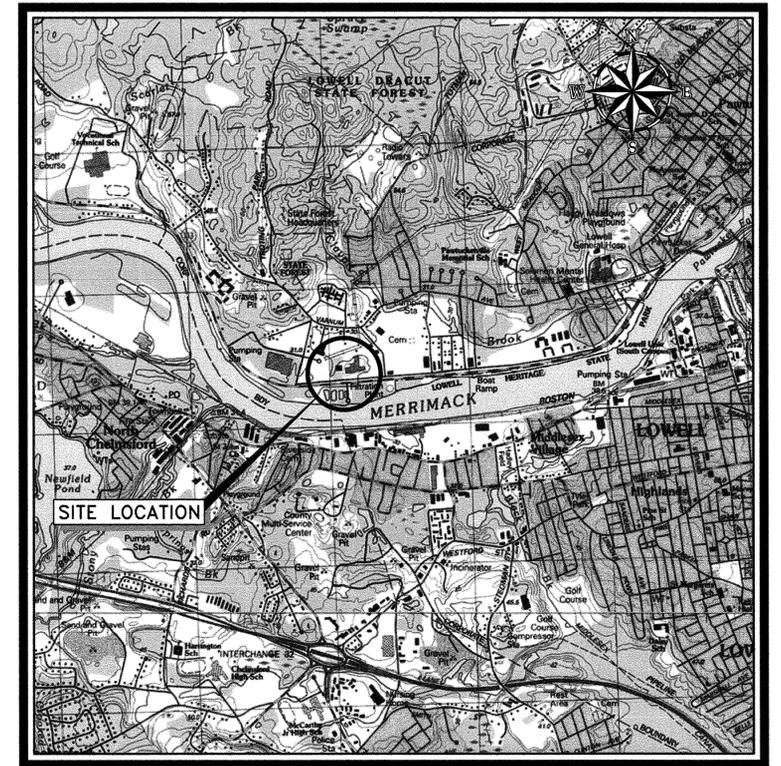
ISSUED FOR BID

SEPTEMBER 2014



40 Shattuck Road Suite 110 | Andover Massachusetts 01810
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COMMITMENT & INTEGRITY DRIVE RESULTS



SITE LOCATION MAP

SCALE: 1" = 2000'

SOURCE
U.S.G.S. QUADRANGLE, LOWELL, MASSACHUSETTS
1987, 15 MINUTE SERIES

LEGEND**

DESCRIPTION	EXISTING	PROPOSED
CONTOUR (1' OR 2' INTERVAL)	---122---	---122---
CONTOUR (INDEX)	---120---	---120---
SANITARY SEWER	S	S
FORCE MAIN		
STORM DRAIN	SD	SD
UNDERDRAIN	UD	UD
WATER MAIN	W	W
UNDERGROUND ELECTRIC	E	E
UNDERGROUND TELEPHONE	T	T
UNDERGROUND TELEVISION	TV	TV
GAS LINE	G	G
OVERHEAD ELECTRIC	OE	OE
ABANDONED SEWER		
ABANDONED WATER MAIN		
RESIDUALS	R	R
CULVERT		
HOUSE SERVICE / LATERAL		
PROPERTY LINE		
RIGHT OF WAY	R/W	R/W
EASEMENT		
EDGE OF VEGETATION		
FENCE	X	X
CENTERLINE		
RETAINING WALL		
STONEWALL		
CURB		
EDGE OF PAVEMENT		
EDGE OF GRAVEL		
GUARDRAIL		
DRAINAGE DITCH / SWALE		
SANITARY SEWER MANHOLE	○	●
SANITARY SEWER SERVICE CLEANOUT	○∞	●∞
STORM DRAIN MANHOLE	○	●
CATCH BASIN	■	■
TELECOMM MANHOLE	○	●
TELECOMM SERVICE BOX	□	■
ELECTRIC MANHOLE	○	●
TRANSFORMER	⊗	⊗
UTILITY POLE W/GUY	⊗	⊗
UTILITY POLE	⊗	⊗
LIGHTPOST	⊗	⊗
GAS METER BOX	⊗	⊗
GAS VENT	⊗	⊗
GAS GATE	⊗	⊗
WATER GATE	⊗	⊗
CURB STOP	⊗	⊗
HYDRANT	⊗	⊗
WATER WELL	⊗	⊗
WATER METER BOX	⊗	⊗
SIGN	⊗	⊗
MAILBOX	⊗	⊗
FLAGPOLE	⊗	⊗
WETLAND HATCHING		
CONIFEROUS TREE		
DECIDUOUS TREE		
STONE CHECK DAM		
SURVEY STATION		
IRON PIN		
MONUMENTS		
SPOT ELEVATION		
TEST PIT & NUMBER		
BORING & NUMBER		

**THIS IS A GENERAL LEGEND. NOT ALL ITEMS APPEAR ON THESE DRAWINGS

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C-501 CIVIL DETAILS 2
C-502 CIVIL DETAILS 3

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I-208 SCADA PANEL PLC EXPANSION MODULES DIGITAL & ANALOG INPUTS
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***INCLUDED AS APPENDIX TO SPECIFICATIONS**

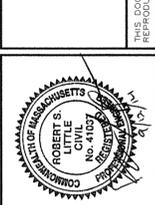
ABBREVIATIONS

⊙	AT	G	GAS	S	SEWER
ADJ.	ADJUSTABLE	GALV.	GALVANIZED	SLOPE	SLOPE
ALUM.	ALUMINUM	H	HATCH	S.S.	STAINLESS STEEL
APA	AMERICAN PLYWOOD ASSOCIATION	H	HEIGHT	SCH.	SCHEDULE
APPROX.	APPROXIMATE	HOR.	HORIZONTAL	SECT	SECTION
ASS'Y	ASSEMBLY	HORIZ.	HORIZONTAL	SHLDR.	SHOULDER
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS	HP	HIGH POINT	SHT.	SHEET
B	BEAM	HP	HIGH POINT	SP. AL.	SPECIAL ALUMINUM
B	BORING	HVAC	HEATING, VENTILATING AND AIR CONDITIONING	SQ.	SQUARE
BLDG.	BUILDING	IMFO	INTEGRALLY MOLDED FLANGED OPENING	SUP.	SUPPORT
BOT	BOTTOM	INV.	INVERT	TEMP.	TEMPERATURE
C	COLUMN	L	LENGTH	THD.	THREADED
C.E.	CONTINUOUS END	L.L.V.	LONG LEG VERTICAL	TMS	TEMPORARY BENCH MARK
CB	CATCH BASIN	LB	POUND	TOC	TOP OF CONCRETE
CJ	CONTROL JOINT	LG.	LONG	TP	TEST PIT
CK	CHECKED	LP	LOW POINT	TYP.	TYPICAL
CLR.	CLEAR	M.O.	MASONRY OPENING	U.N.O.	UNLESS NOTED OTHERWISE
CLF	CHAIN LINK FENCE	MAX.	MAXIMUM	UGE	UNDERGROUND ELECTRIC
CMP	CORRUGATED METAL PIPE	MECH.	MECHANICAL	UGT	UNDERGROUND TELEPHONE
CMU	CONCRETE MASONRY UNIT	MH	MANHOLE	UV	ULTRAVIOLET
COL.	COLUMN	MIN.	MINIMUM	V	VELOCITY
CONC.	CONCRETE	MPH	MILES PER HOUR	VERT.	VERTICAL
CONT.	CONTINUOUS	MR	MONORAIL	W	WATER
COR	CORNER	MW	MONITORING WELL	W	WIDE
CORR.	CORRUGATED	N	NORTHING	W/	WITH
CPE	CORRUGATED POLYETHYLENE	NIC	NOT IN CONTRACT	YR.	YEAR
CU	COPPER	N.T.S.	NOT TO SCALE		
D	DIAMETER	#	NUMBER		
D.E.	DISCONTINUOUS END	NO.	NUMBER		
D.I.	DUCTILE IRON	NOM.	NOMINAL		
DES.	DESIGNED	O.C.	ON CENTER		
DIA.	DIAMETER	O.C.E.F.	ON CENTER EACH FACE		
DIAG.	DIAGONALLY	O.C.E.W.	ON CENTER EACH WAY		
DISCONT.	DISCONTINUOUS	O.D.	OUTSIDE DIAMETER		
DR	DRAWN	O.I.T.	OPERATOR INTERFACE TERMINAL		
DRI	DOUBLE RING INFILTRATOR	QZ.	QUARTZ		
DRWGS.	DRAWINGS	R	PLATE		
E	EASTING	R	PROPERTY LINE		
E.A.	EACH	PC	POINT OF CURVATURE		
EFFL.	EFFLUENT	PCC	POINT OF COMPOUND CURVE		
EL.	ELEVATION	PF	PER CUBIC FOOT		
ELECT.	ELECTRICAL	PE	POLYETHYLENE		
ELEV.	ELEVATION	PIV	POST INDICATOR VALVE		
EMBED.	EMBEDMENT	PRC	POINT OF REVERSE CURVE		
EQ.	EQUALIZATION	PSI	PER SQUARE INCH		
EXP.	EXPANSION	PT	POINT OF TANGENCY		
F	FOOTING	PVC	POLYVINYL CHLORIDE		
FD	FLOOR DRAIN	PZ	PIEZOMETER		
FF	FINISH FLOOR	RCP	REINFORCED CONCRETE PIPE		
FIN	FINISH	REINF.	REINFORCEMENT		
FIN. FLR.	FINISH FLOOR	RIBS	RAPID INFILTRATION BASINS		
FL	FLANGE				
FM	FORCE MAIN				
FRP	FIBERGLASS REINFORCED PLASTIC				
FT.	FOOT				
FTG.	FOOTING				
FTG.	FITTING				

GENERAL NOTES

- PROVIDE ALL MATERIALS AND LABOR AS REQUIRED TO PERFORM THE WORK INDICATED ON THE DRAWINGS AND IN THE SPECIFICATIONS. ALL WORK TO BE COMPLETED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL CODES.
- THE LOCATION, TYPE AND SIZE OF EXISTING PIPES, DUCTS, CONDUITS, UTILITIES AND UNDERGROUND STRUCTURES SHOWN ON THE DRAWINGS ARE NOT WARRANTED TO BE EXACT, NOR IS IT WARRANTED THAT ALL UNDERGROUND STRUCTURES ARE SHOWN. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS, SIZES AND DEPTHS.
- COORDINATE CONSTRUCTION ACTIVITIES WITH THE LOWELL REGIONAL WATER UTILITY (LRWU), LOWELL REGIONAL WASTEWATER UTILITY, LOWELL DEPARTMENT OF PUBLIC WORKS, LOWELL ENGINEERING DEPARTMENT, MASSDOT, UTILITY COMPANIES AND THE ENGINEER.
- ENSURE CONSTRUCTION OPERATIONS DO NOT INTERFERE WITH THE LRWU'S ABILITY TO MEET DEMAND. COORDINATE ANY PROCESS DISTURBANCES WITH LRWU. PROVIDE A MINIMUM OF TWO WEEKS NOTICE PRIOR TO ANY REQUIRED SHUT DOWNS.
- RESTORE ALL AREAS DISTURBED BY CONTRACTOR'S OPERATIONS TO ORIGINAL CONDITION UNLESS NOTED OTHERWISE (GRAVEL, CONCRETE, PAVEMENT, GRASS, ETC.).
- ALL NEW BURIED PIPE SHALL HAVE MINIMUM 5 FEET OF COVER UNLESS NOTED OTHERWISE OR APPROVED BY THE ENGINEER. BURIED PIPE WITH LESS THAN 5 FEET OF COVER SHALL HAVE A MINIMUM OF 4" OF RIGID INSULATION WITH AN R-VALUE OF R-20 INSTALLED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- TAKE ALL NECESSARY PRECAUTIONS TO PREVENT EQUIPMENT FLUIDS FROM REACHING ANY WATER RESOURCE AREA. FLUID DISCHARGED INADVERTENTLY SHALL BE IMMEDIATELY CLEANED FROM THE WATER RESOURCE USING WHATEVER MEANS REQUIRED, AS DETERMINED BY THE ENGINEER.
- LOCATION OF EXISTING UTILITIES, BUILDINGS, AND EQUIPMENT LAYOUTS ARE BASED ON BEST INFORMATION AVAILABLE. INFORMATION INCLUDES PLANS PROVIDED BY OWNER AND UTILITY COMPANIES AND SURVEY INFORMATION.
- CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO START OF CONSTRUCTION.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO STRUCTURES AND EQUIPMENT NOT SCHEDULED FOR REMOVAL.
- EXISTING FACILITIES (I.E. GUARDRAILS, TREES, POLES, SIGNS, LIGHT POLES, MAIL BOXES, ETC.) SHALL BE REMOVED AND REPLACED IN KIND, IN ACCORDANCE WITH LOCAL AND STATE REQUIREMENTS, OR PROTECTED AS REQUIRED DURING CONSTRUCTION. THE ASSOCIATED COSTS ARE CONSIDERED INCIDENTAL TO THE PROJECT.
- CONTRACTOR TO PROVIDE TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH TRAFFIC MANAGEMENT PLAN, INCLUDED IN SPECIFICATIONS AND LOCAL REQUIREMENTS. THE CONTRACTOR MUST MAINTAIN CONTINUOUS TRAFFIC FLOW (MINIMUM OF ONE LANE EACH DIRECTION) DURING CONSTRUCTION.
- WHERE NEW WATER MAINS OR APPURTENANCES ARE TO BE CONNECTED TO EXISTING PIPE, CONTRACTOR SHALL CUT AND REMOVE THE EXISTING PIPE AS NECESSARY TO INSTALL THE NEW WORK. CONTRACTOR SHALL TEST PIT LOCATIONS WHERE NEW MAINS CONNECT TO EXISTING MAINS TO VERIFY PIPE AND MATERIAL TYPE.
- FINAL LOCATIONS FOR NEW WATER MAINS, HYDRANTS, VALVES AND FITTINGS SHALL BE ESTABLISHED IN THE FIELD BY THE ENGINEER.
- CONTRACTOR IS RESPONSIBLE TO NOTIFY THE LOWELL REGIONAL WATER UTILITY, LOWELL REGIONAL WASTEWATER UTILITY, LOWELL DEPARTMENT OF PUBLIC WORKS, LOWELL ENGINEERING DEPARTMENT, AND UTILITY COMPANIES PRIOR TO COMMENCING WORK TO ALLOW SUFFICIENT TIME TO LOCATE AND MARK THE LOCATION OF ALL BURIED UTILITIES. CONTRACTOR SHALL ALSO CONTACT "DIG SAFE", TELEPHONE NO. 888-344-7233, AT LEAST 72 HOURS PRIOR TO CONSTRUCTION. REPAIR OF ANY DAMAGED UTILITY WILL BE INCIDENTAL TO THE CONTRACT.
- BRACING OF UTILITY POLES, WHERE REQUIRED, SHALL BE INCIDENTAL TO THE INSTALLATION OF THE PIPING AND CONDUIT, NO SEPARATE PAYMENT SHALL BE MADE.
- THE CONTRACTOR SHALL NOT STORE TOOLS, VEHICLES, MATERIALS, SUPPLIES, OR EQUIPMENT ON DRAINAGE STRUCTURES OR WITHIN 100 FEET OF WETLANDS OR RIVERFRONT RESOURCE AREAS.
- THE CONTRACTOR SHALL NOT OPERATE EXISTING VALVES OR HYDRANTS.
- THE LRWU WILL OPERATE EXISTING VALVES AND HYDRANTS TO ISOLATE SECTIONS OF THE WORK. CONTRACTOR TO PROVIDE A MINIMUM 48-HOUR ADVANCE NOTICE TO LRWU WHEN REQUESTING OPERATION OF EXISTING VALVES AND HYDRANTS.
- SAW CUT ALL DRIVEWAYS, WALKWAYS, AND SIDEWALKS AT EDGE OF RIGHT OF WAY TO TRANSITION EXISTING GRADE TO FINISH GRADE.
- ALL CITY OF LOWELL ORDINANCES APPLY.
- SIDEWALK RESTORATION TO INCLUDE REPLACEMENT IN KIND OF EXISTING PRIOR TO CONSTRUCTION WITH RESPECT TO WIDTH AND MATERIALS. ALL SIDEWALK RESTORATION SHALL BE CONSTRUCTED TO THE SPECIFICATIONS SET FORTH IN THE COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF PUBLIC SAFETY, AAB, "RULES AND REGULATIONS" WHICH APPEAR IN THE CODE OF MA REG (C) 521 LMR 1.00.
- EQUIPMENT ELECTRICAL AND CONTROL WIRING SHOWN SCHEMATICALLY ON THE DRAWINGS SHALL BE FIELD LOCATED WITH APPROVAL BY THE ENGINEER. CONTRACTOR SHALL COORDINATE ACTUAL LOCATION WITH THE LRWU AND THE ENGINEER PRIOR TO INSTALLATION.
- PIPING SHALL BE INSTALLED IN A MANNER TO PRESERVE AS MUCH WORKING SPACE AS POSSIBLE AROUND EQUIPMENT. UNLESS INDICATED OTHERWISE, INSTALL PIPING LEVEL TO FLOOR AND PARALLEL WITH WALLS AND EQUIPMENT.
- CONTRACTOR SHALL PROVIDE A DETAILED CONSTRUCTION SCHEDULE WITH THE ENGINEER AND LRWU FOR APPROVAL.
- ELEVATIONS SHOWN REFER TO CITY OF LOWELL DATUM. CITY OF LOWELL DATUM IS NAVD88 MINUS 54.39'.
- ALL PERFORATED PVC PIPE SHALL BE SOLVENT WELDED. SEE SPECIFICATION SECTION 33 46 16.19 PIPE UNDERDRAINS

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ISSUED FOR BID	DESCRIPTION	CHECKED BY: RL	DATE
REV	DESCRIPTION	27/25/13-500/DWG	3/12/14
DESIGNED BY: SHL			
DRAWN BY: DE			

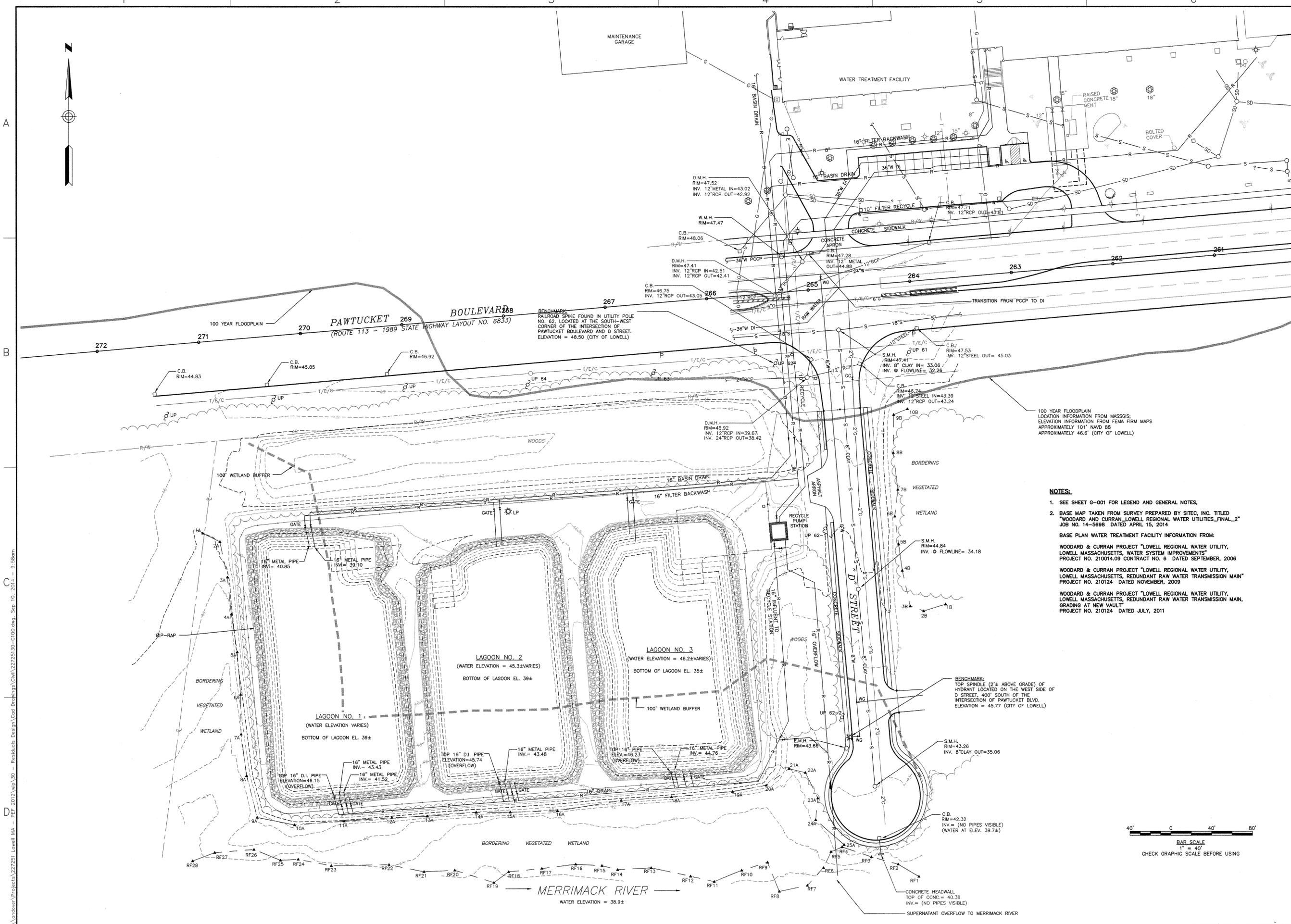
SHEET INDEX, GENERAL NOTES, LEGEND AND ABBREVIATIONS

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 1 OF 16

G-001



NOTES:

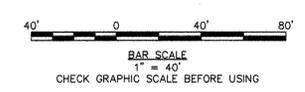
- SEE SHEET G-001 FOR LEGEND AND GENERAL NOTES.
- BASE MAP TAKEN FROM SURVEY PREPARED BY SITEC, INC. TITLED "WOODARD AND CURRAN, LOWELL REGIONAL WATER UTILITIES_FINAL_2" JOB NO. 14-5698 DATED APRIL 15, 2014

BASE PLAN WATER TREATMENT FACILITY INFORMATION FROM:

WOODARD & CURRAN PROJECT "LOWELL REGIONAL WATER UTILITY, LOWELL MASSACHUSETTS, WATER SYSTEM IMPROVEMENTS" PROJECT NO. 210014.09 CONTRACT NO. 6 DATED SEPTEMBER, 2006

WOODARD & CURRAN PROJECT "LOWELL REGIONAL WATER UTILITY, LOWELL MASSACHUSETTS, REDUNDANT RAW WATER TRANSMISSION MAIN" PROJECT NO. 210124 DATED NOVEMBER, 2009

WOODARD & CURRAN PROJECT "LOWELL REGIONAL WATER UTILITY, LOWELL MASSACHUSETTS, REDUNDANT RAW WATER TRANSMISSION MAIN, GRADING AT NEW VAULT" PROJECT NO. 210124 DATED JULY, 2011



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DESIGNED BY: SHL
DRAWN BY: JDE
227251.30-0006

EXISTING SITE PLAN

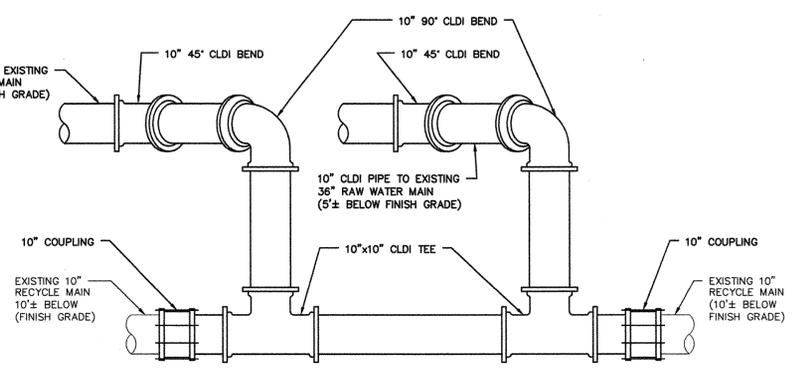
LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: 1"=40'
SHEET: 2 OF 16

C-100

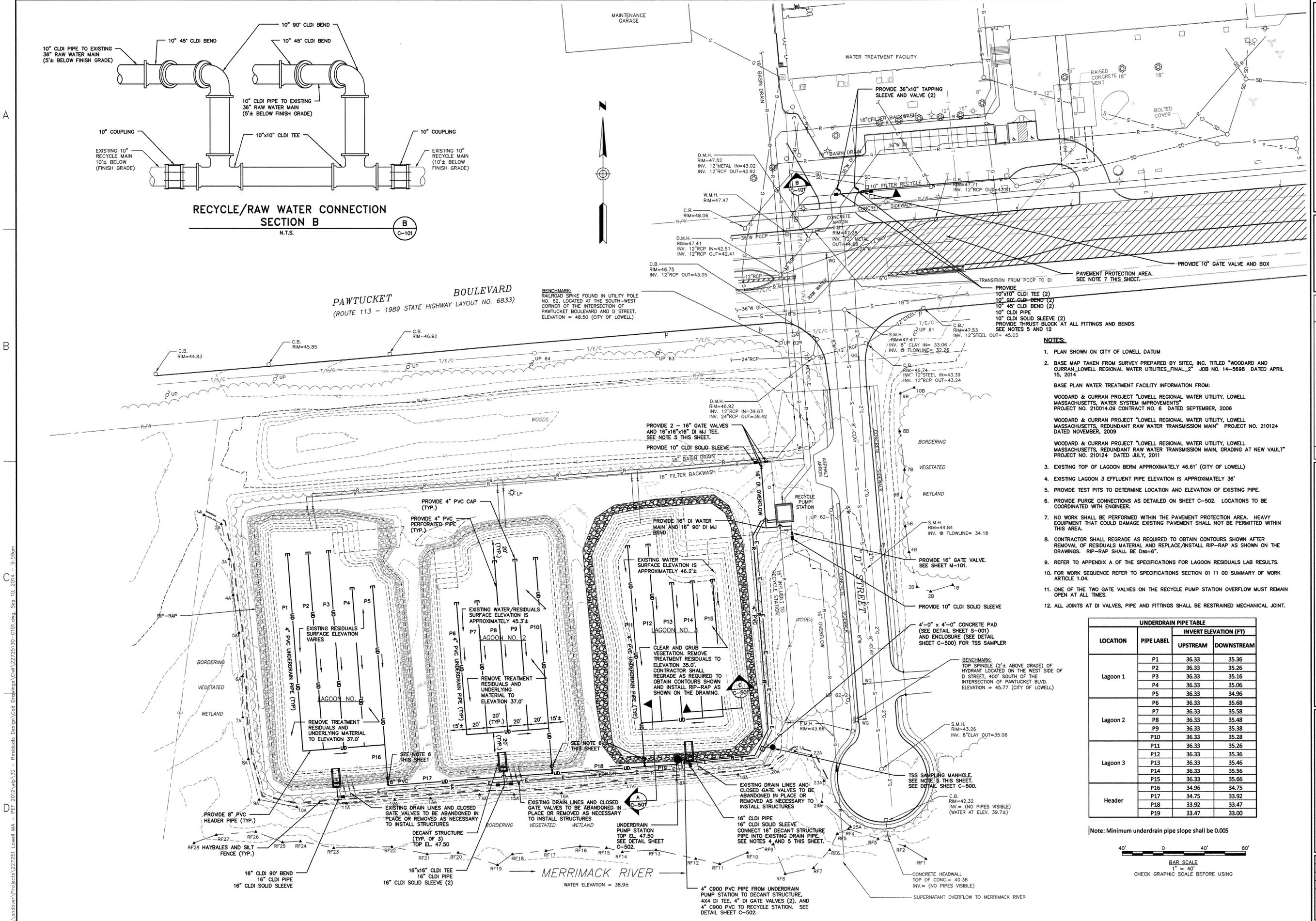
\\andover\Projects\227251\Drawings\Civil\227251-30-C100.dwg, Sep 10, 2014, 9:58am



RECYCLE/RAW WATER CONNECTION SECTION B
N.T.S.

BENCHMARK: RAILROAD SPIKE FOUND IN UTILITY POLE NO. 62, LOCATED AT THE SOUTH-WEST CORNER OF THE INTERSECTION OF PAWTUCKET BOULEVARD AND D STREET. ELEVATION = 48.50 (CITY OF LOWELL)

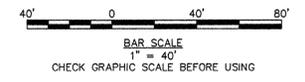
PAWTUCKET BOULEVARD
(ROUTE 113 - 1989 STATE HIGHWAY LAYOUT NO. 6833)



- NOTES:**
- PLAN SHOWN ON CITY OF LOWELL DATUM
 - BASE MAP TAKEN FROM SURVEY PREPARED BY SITEC, INC. TITLED "WOODARD AND CURRAN, LOWELL REGIONAL WATER UTILITIES_FINAL_2" JOB NO. 14-5698 DATED APRIL 15, 2014
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WOODARD & CURRAN PROJECT "LOWELL REGIONAL WATER UTILITY, LOWELL MASSACHUSETTS, REDUNDANT RAW WATER TRANSMISSION MAIN, GRADING AT NEW VAULT" PROJECT NO. 210124 DATED JULY, 2011
 - EXISTING TOP OF LAGOON BERM APPROXIMATELY 46.61' (CITY OF LOWELL)
 - EXISTING LAGOON 3 EFFLUENT PIPE ELEVATION IS APPROXIMATELY 36'
 - PROVIDE TEST PITS TO DETERMINE LOCATION AND ELEVATION OF EXISTING PIPE.
 - PROVIDE PURGE CONNECTIONS AS DETAILED ON SHEET C-502. LOCATIONS TO BE COORDINATED WITH ENGINEER.
 - NO WORK SHALL BE PERFORMED WITHIN THE PAVEMENT PROTECTION AREA. HEAVY EQUIPMENT THAT COULD DAMAGE EXISTING PAVEMENT SHALL NOT BE PERMITTED WITHIN THIS AREA.
 - CONTRACTOR SHALL REGRADE AS REQUIRED TO OBTAIN CONTOURS SHOWN AFTER REMOVAL OF RESIDUALS MATERIAL AND REPLACE/INSTALL RIP-RAP AS SHOWN ON THE DRAWINGS. RIP-RAP SHALL BE D₅₀=6".
 - REFER TO APPENDIX A OF THE SPECIFICATIONS FOR LAGOON RESIDUALS LAB RESULTS.
 - FOR WORK SEQUENCE REFER TO SPECIFICATIONS SECTION 01 11 00 SUMMARY OF WORK ARTICLE 1.04.
 - ONE OF THE TWO GATE VALVES ON THE RECYCLE PUMP STATION OVERFLOW MUST REMAIN OPEN AT ALL TIMES.
 - ALL JOINTS AT DI VALVES, PIPE AND FITTINGS SHALL BE RESTRAINED MECHANICAL JOINT.

UNDERDRAIN PIPE TABLE			
LOCATION	PIPE LABEL	INVERT ELEVATION (FT)	
		UPSTREAM	DOWNSTREAM
Lagoon 1	P1	36.33	35.36
	P2	36.33	35.26
	P3	36.33	35.16
	P4	36.33	35.06
	P5	36.33	34.96
Lagoon 2	P6	36.33	35.68
	P7	36.33	35.58
	P8	36.33	35.48
	P9	36.33	35.38
	P10	36.33	35.28
Lagoon 3	P11	36.33	35.26
	P12	36.33	35.36
	P13	36.33	35.46
	P14	36.33	35.56
	P15	36.33	35.66
Header	P16	34.96	34.75
	P17	34.75	33.92
	P18	33.92	33.47
	P19	33.47	33.00

[Note: Minimum underdrain pipe slope shall be 0.005



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2	DRAWN BY: JDE			227251-30-C01	

PROPOSED SITE PLAN

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: 1"=40'
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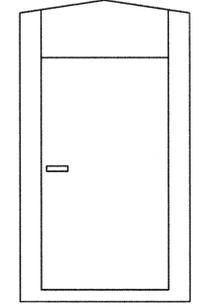
C-101

FIBERGLASS TSS MONITORING STATION NOTES:

1. PROVIDE A ONE PIECE MOLDED FIBERGLASS REINFORCED POLYESTER INSULATED BUILDING AS MANUFACTURED BY JACOBS MANUFACTURING CORP BUILDINGS, OR ENGINEER APPROVED EQUAL. BUILDING SHALL HAVE THE FOLLOWING OVERALL EXTERIOR DIMENSIONS 4' WIDE BY 4' DEEP BY A SIDE WALL CLEARANCE OF 7" AT THE EYE HEIGHT. BUILDING SHALL CONTAIN ONE 36" BY 78" SINGLE DOOR.
2. BUILDING SHALL WITHSTAND 125 MPH WIND LOAD AND A 50 PSF SNOW LOAD. FIBERGLASS REINFORCED PLASTIC BUILDINGS SHALL BE OF ONE PIECE MOLDED CONSTRUCTION WITH COMPOSITE WALLS AND ROOFS. EXTERIOR SURFACE SHALL BE GEL-COATED TAN WITH A SMOOTH FINISH FREE FROM FIBER PATTERS, ROUGHNESS OR OTHER IRREGULARITIES.
3. EXTERIOR LAMINATE WHICH IS CHEMICALLY BONDED TO THE GEL-COAT SHALL BE A MINIMUM OF 1/8" THICK. THE LAMINATE CONSISTING OF POLYESTER RESIN AND CHOPPED STRAND FIBERGLASS SHALL HAVE A MINIMUM GLASS CONTENT OF 30%.
4. A MINIMUM OF 1" THICK INSULATION SHALL BE USED FOR THE CORE MATERIAL AND SHALL HAVE AN R-6 VALUE. THE CORE MATERIAL SHALL BE RIGID CLOSED CELL, SELF-EXTINGUISHING POLYISOCYANURATE FOAM WITH A DENSITY OF 2 POUNDS PER CUBIC FOOT.
5. THE MOLDING SHALL BE CONTINUOUS FORMING A ONE PIECE MOLDED COMPOSITE SHELTER WITH AN INTEGRAL 4" WIDE INTERNAL MOUNTING FLANGE AROUND THE PERIMETER. THE FLANGE SHALL BE PRE-DRILLED TO 12" CENTERS WITH A 5/8" DIAMETER HOLE FOR BOLTING TO A CONCRETE PAD. A ONE PIECE MOLDED FIBERGLASS COMPOSITE DOOR SHALL BE 1-3/4" THICK AND TYPICAL TO MATERIALS OF CONSTRUCTION OF THE WALLS. THE DOOR SHALL BE MOUNTED USING A CONTINUOUS STAINLESS STEEL HINGE. THE DOOR SHALL BE PROVIDED WITH A STAINLESS STEEL LEVER AND DEADBOLT LOCK. COORDINATE KEYING REQUIREMENTS WITH THE OWNER. THE DOOR GASKET SHALL BE EXTRUDED CLOSED CELL NEOPRENE RUBBER BULB AND PROVIDE A WEATHER TIGHT SEAL. A MINIMUM OF TWO CADMIUM PLATED LIFTING EYES SHALL BE PROVIDED FOR LIFTING THE BUILDING. FRP BUILDING SHALL BE A WOOD FREE STRUCTURE.
6. THE BUILDING SHALL BE PROVIDED COMPLETE WITH A JUNCTION BOX, 1 DUPLEX 15A RECEPTACLE IN WEATHERPROOF BOX AND INTERIOR VAPOR TIGHT INCANDESCENT FIXTURE WITH SWITCH.

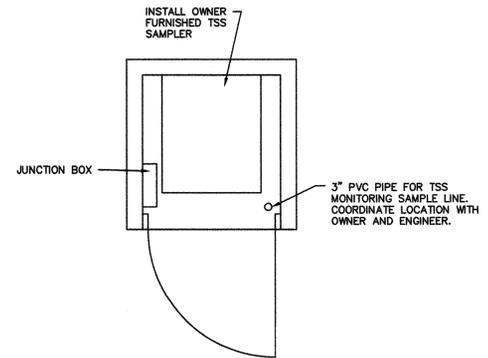
LAMINATE PROPERTIES	VALUE	TEST METHOD
TENSILE STRENGTH	19,000 PSI	ASTM D638
FLEXURAL STRENGTH	32,100 PSI	ASTM D790
SHEAR STRENGTH	12,000 PSI	ASTM D732
BARCOL HARDNESS	60	ASTM D2583
IMPACT	12 FT ILBS/INCH	ASTM D256
HEAT DISTORTION POINT	175 DEG F	ASTM D384
DENSITY/SPECIFIC GRAVITY	93.6 PCF/1.5	ASTM D792
BURNING CHARACTERISTICS	<150 FLAME SPREAD <1000 SMOKE DENSITY	ASTM D792

NOTE:
MINIMUM ROOF PITCH SHALL BE 2:12



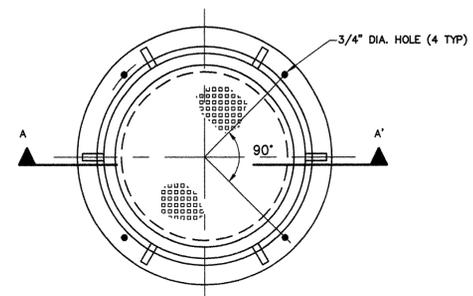
TSS MONITORING STATION FRONT ELEVATION

SCALE: 1/2" = 1'-0"

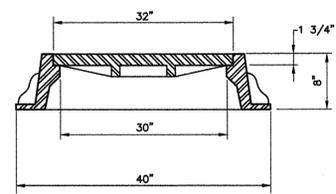


TSS MONITORING STATION FLOOR PLAN

SCALE: 1/2" = 1'-0"



PLAN

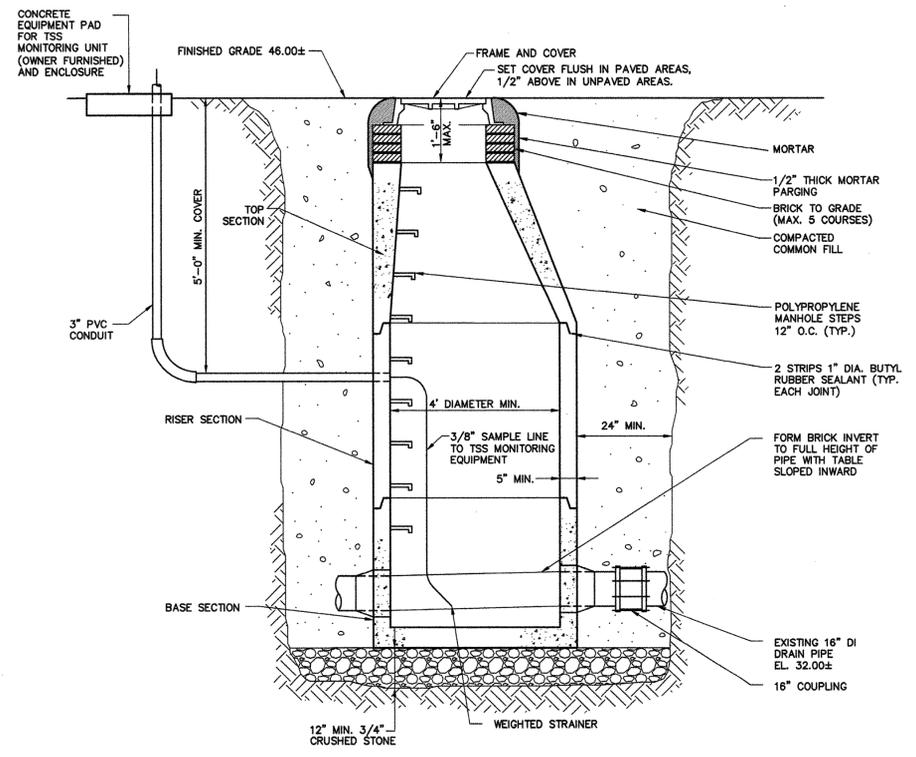


SECTION A-A'

NOTE:
• PROVIDE WATERTIGHT MANHOLE COVERS AS SHOWN ON THE DRAWINGS, OR AS DIRECTED BY THE ENGINEER.

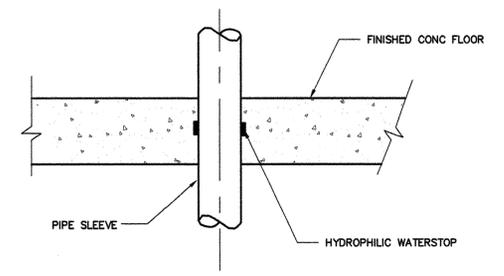
MANHOLE FRAME & COVER

N.T.S.



TSS SAMPLING MANHOLE DETAIL

N.T.S.



NOTES:
• FLOOR SLEEVES FOR UNINSULATED PIPE SHALL BE SDR 35 PVC PIPE WITH CONTINUOUS WATERSTOP COLLAR AS FOLLOWS: 1/4" X 2"

CONCRETE FLOOR PIPE PENETRATION DETAILS

N.T.S.

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				RL	2/27/2014

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DRAWN BY: JDE

CIVIL DETAILS 1

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

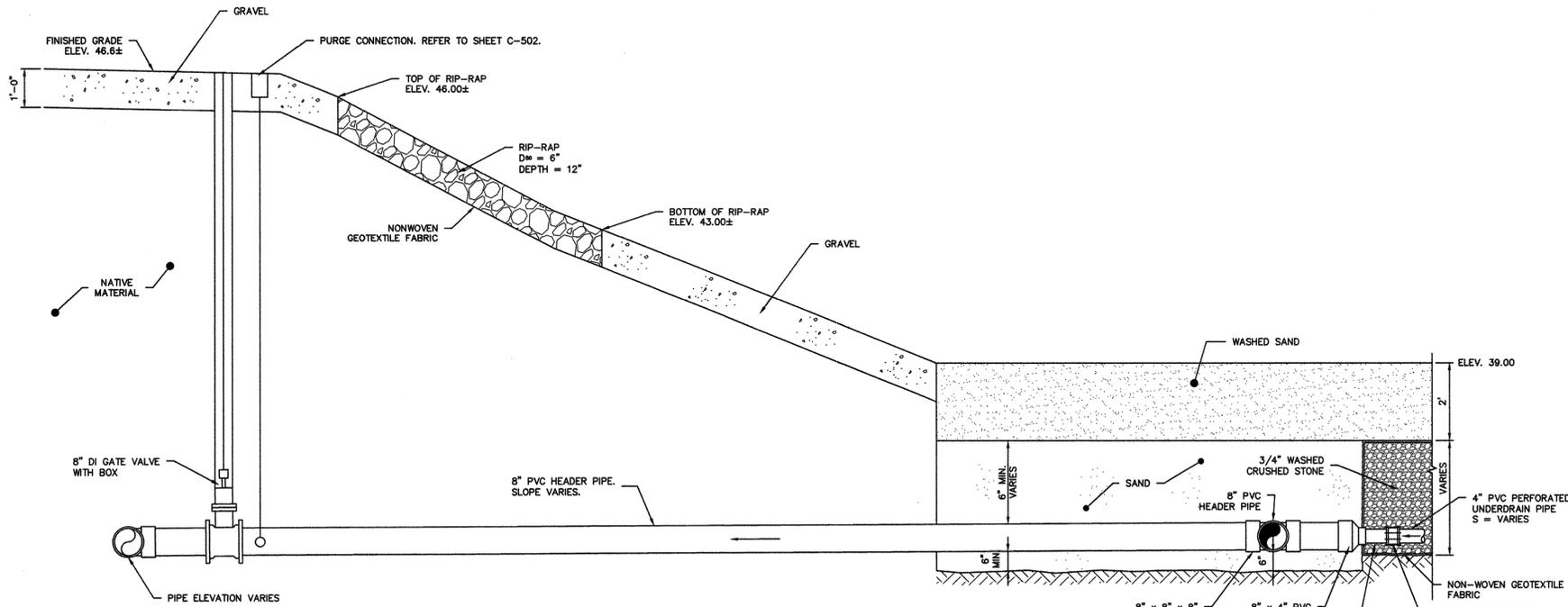
RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 4 OF 16

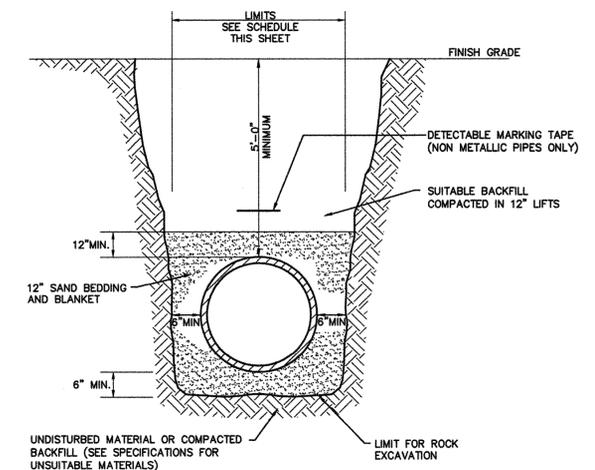
C-500

1 2 3 4 5 6

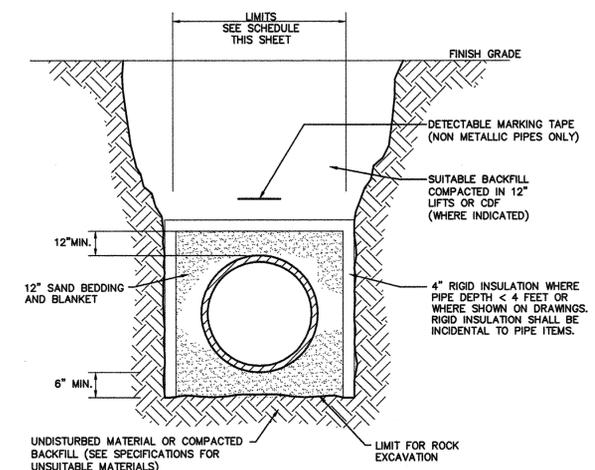
TRENCH, PAVEMENT & ROCK WIDTH LIMITS					
TRENCH DEPTH	NOMINAL PIPE DIAMETER (D)	TRENCH WIDTH	TEMPORARY AND BINDER PAVEMENT	PERMANENT TOP PAVEMENT	ROCK EXCAVATION
<12'	LESS THAN 24"	4' - 0"	4' - 0"	6' - 0"	4' - 0"
<12'	24 TO 30"	5' - 0"	5' - 0"	7' - 0"	5' - 0"
<12'	GREATER THAN 30"	6' - 0"	6' - 0"	8' - 0"	6' - 0"
12' TO 16'	LESS THAN 24"	5' - 0"	5' - 0"	7' - 0"	5' - 0"
12' TO 16'	24 TO 30"	6' - 0"	6' - 0"	8' - 0"	6' - 0"
12' TO 16'	GREATER THAN 30"	7' - 0"	7' - 0"	9' - 0"	7' - 0"
>16'	LESS THAN 24"	6' - 0"	6' - 0"	8' - 0"	6' - 0"
>16'	24 TO 30"	7' - 0"	7' - 0"	9' - 0"	7' - 0"
>16'	GREATER THAN 30"	8' - 0"	8' - 0"	10' - 0"	8' - 0"



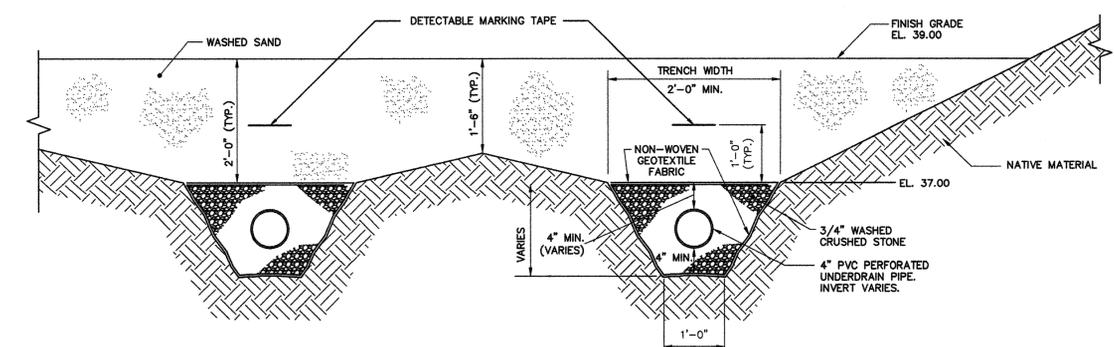
UNDERDRAIN PIPE/RIP-RAP SECTION A
N.T.S. (A) C-101



TYPICAL TRENCH DETAIL
N.T.S.

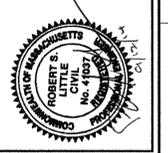


TYPICAL TRENCH DETAIL FOR PIPE INSULATION
N.T.S.



TYPICAL PERFORATED UNDERDRAIN TRENCH SECTION
N.T.S. (C) C-101

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	DRAWN BY: JDE	227251-500 (5/20/14)

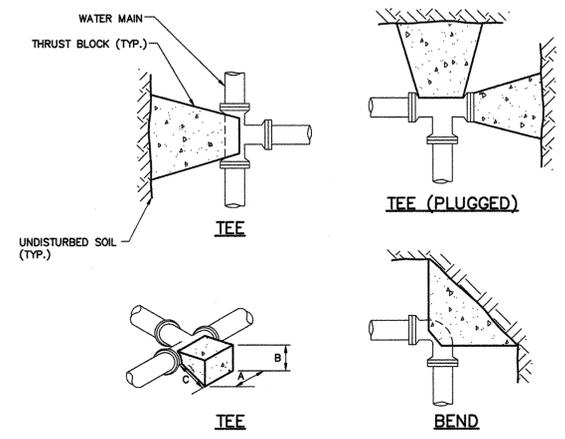
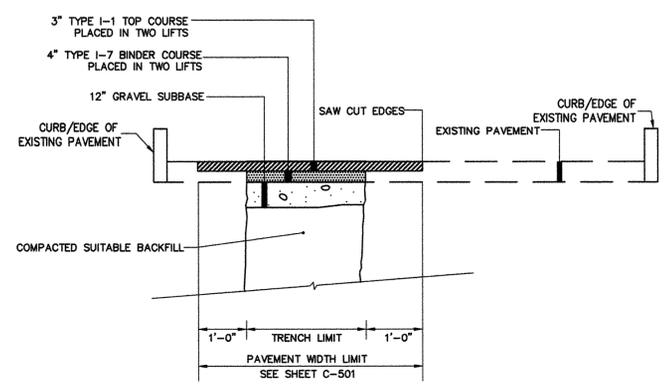
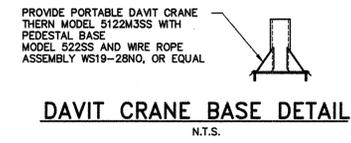
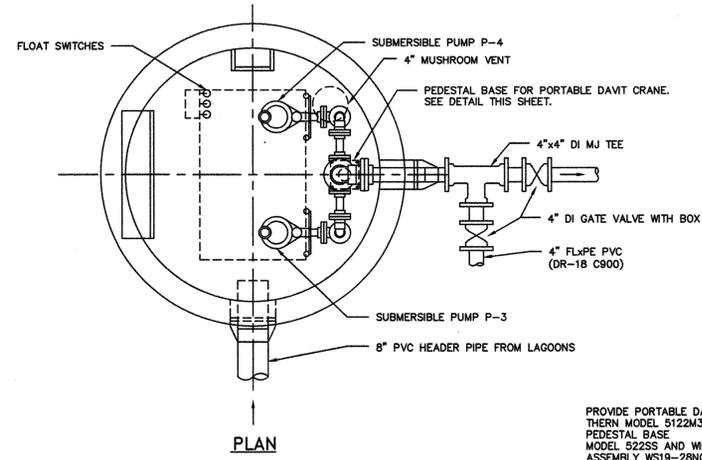
CIVIL DETAILS 2

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS
RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 5 OF 16

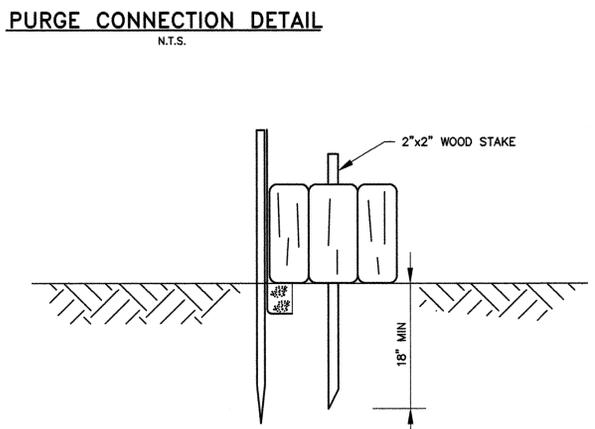
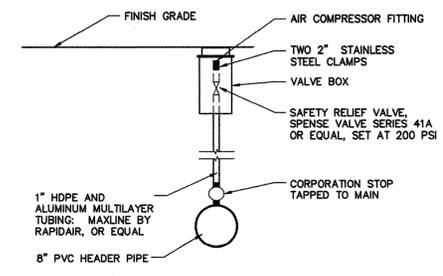
C-501

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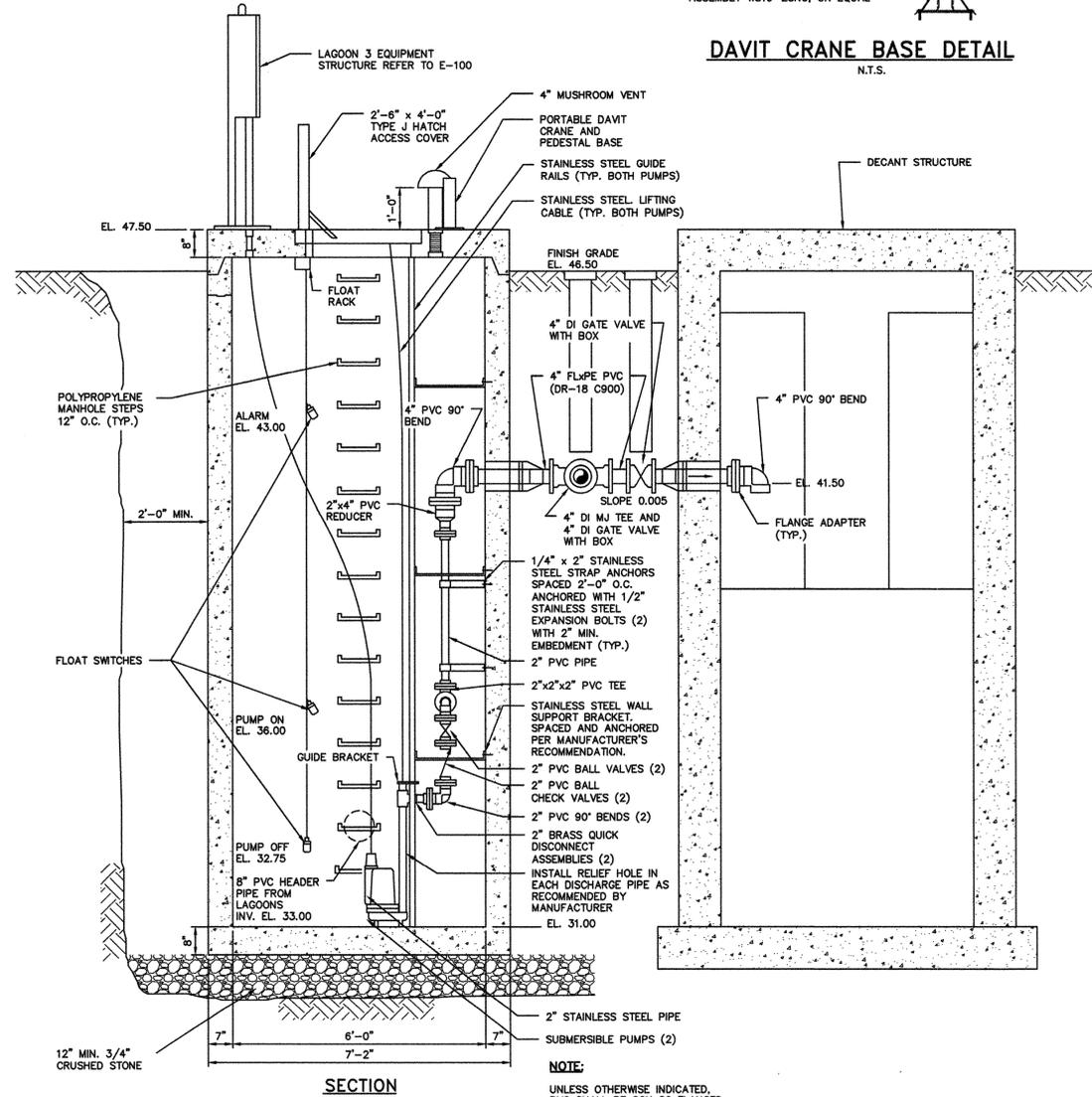
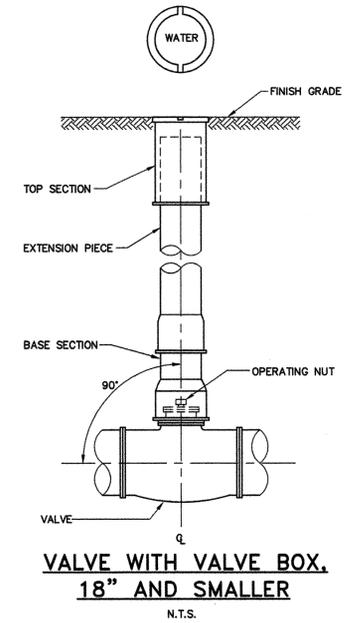


NOMINAL PIPE SIZE (INCHES)	MAXIMUM PIPE OD (INCHES)	REQUIRED BEARING AREA (SQ FT)					
		90 DEG	60 DEG	45 DEG	30 DEG	22.30 DEG	11.25 DEG
3	3.96	2.0	1.4	1.1	0.7	0.5	0.3
4	4.80	2.9	2.0	1.6	1.1	0.8	0.4
6	6.90	6	4	3	2.2	1.6	0.8
8	9.05	10	7	6	4	3	1.4
10	11.10	15	11	8	6	4	2.1
12	13.20	22	15	12	8	6	3
14	15.30	29	21	16	11	8	4
16	17.40	38	27	20	14	10	5
18	19.50	48	34	26	17	13	7
20	21.60	58	41	32	21	16	8
24	25.80	83	59	45	30	23	12
30	32.00	128	90	69	47	35	18
36	38.30	183	130	99	67	51	25

- NOTES:
1. MAXIMUM TEST PRESSURE = 1.5x150 PSI
2. MINIMUM ALLOWABLE SOIL BEARING PRESSURE = 2000 PSF
3. BEARING AREA = AxB
4. C SHALL BE GREATER THAN A/2 AND B/2
5. WRAP FITTINGS WITH POLYETHYLENE PRIOR TO CONSTRUCTING THRUST BLOCKS. NO JOINTS SHALL BE COVERED WITH CONCRETE.

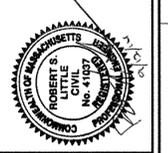


- NOTES:
1. INSTALL FABRIC ON UPHILL SIDE OF SUPPORT POSTS.
2. SILT FENCE WILL NOT BE USED IN DRAINAGE WAYS.
3. CONTRACTOR TO REMOVE SILT AS NECESSARY TO MAINTAIN FABRIC EFFECTIVENESS.



UNDERDRAIN PUMP STATION STRUCTURE DETAILS
SCALE: 1/2"=1'-0"

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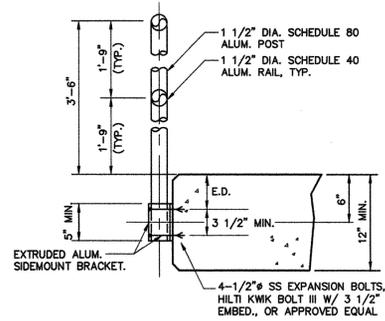
CIVIL DETAILS 3

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS
RESIDUALS HANDLING
FACILITIES UPGRADE

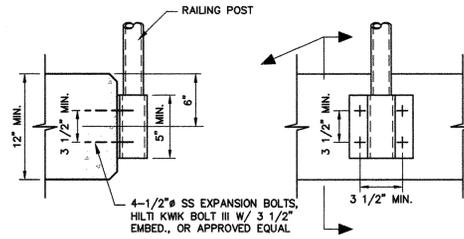
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DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 6 OF 16

C-502

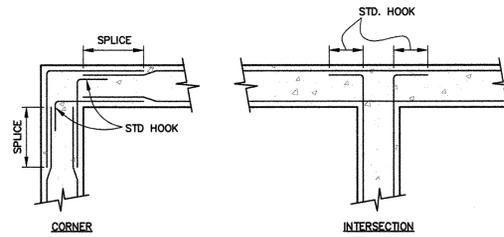
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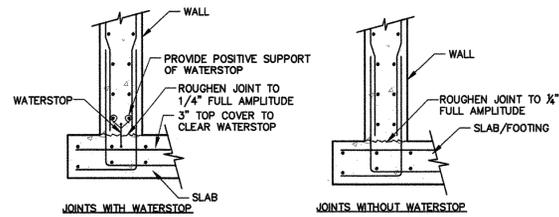
RAILING DETAIL
N.T.S.



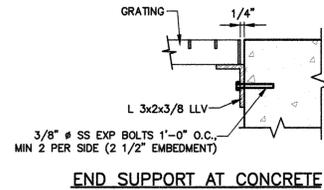
TYPICAL RAILING CONC. MOUNT DETAIL
N.T.S.



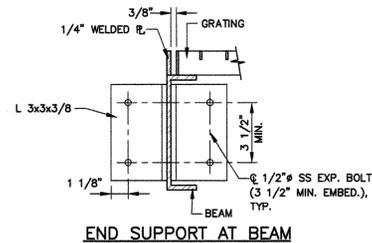
WALL REINF. DETAILS
N.T.S.



CONSTRUCTION JOINT DETAILS (U.N.O.)
N.T.S.

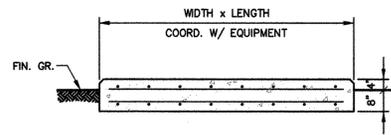


END SUPPORT AT CONCRETE

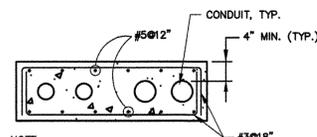


END SUPPORT AT BEAM

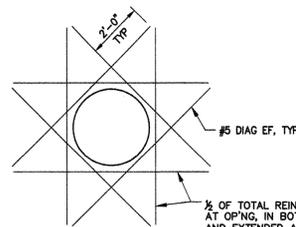
GRATING SUPPORT DETAILS
N.T.S.



EXTERIOR EQUIPMENT PAD
N.T.S.



TYPICAL DUCTBANK REINFORCING DETAIL
N.T.S.



ADDITIONAL REINFORCEMENT AT OPENINGS
N.T.S.

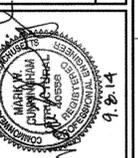
GENERAL NOTES

- GENERAL**
 - THE CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS, INCLUDING DIMENSIONS, AND SHALL NOTIFY THE ENGINEER OF ANY AND ALL DISCREPANCIES BEFORE PROCEEDING ON THE AFFECTED PORTION OF THE WORK.
 - THE STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE DRAWINGS AND SPECIFICATIONS OF ALL DISCIPLINES WHICH SHALL BE REFERRED TO FOR SIZES AND LOCATIONS OF ALL OPENINGS, PENETRATIONS, CONDUIT, ALL EQUIPMENT, ETC.
- CAST-IN-PLACE CONCRETE**
 - DESIGN IS IN ACCORDANCE WITH ACI 350-06, "CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES".
 - ALL CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4500 PSI, UNLESS NOTED OTHERWISE.
 - REINFORCING STEEL SHALL COMPLY WITH ASTM A615, GRADE 60.
 - CONSTRUCTION JOINTS OTHER THAN AS SHOWN ON THE DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.
 - WATERSTOPS SHALL BE CONTINUOUS.
 - EXPOSED CORNERS OF PADS, WALLS, AND BEAMS SHALL BE FORMED WITH 3/4-INCH CHAMFER.
 - AT SURFACES WHERE CONCRETE IS EXPOSED TO WEATHER OR MOISTURE, REINFORCING BAR ACCESSORIES SHALL BE PLASTIC TIPPED.
 - CONCRETE CLEAR COVER: 2", EXCEPT 3" WHERE CAST AGAINST EARTH, AND 3" WHERE REQUIRED TO CLEAR WATERSTOP.
 - REINFORCEMENT SPLICE LENGTHS: 24".

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STRUCTURAL NOTES AND DETAILS

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 7 OF 16

S-001

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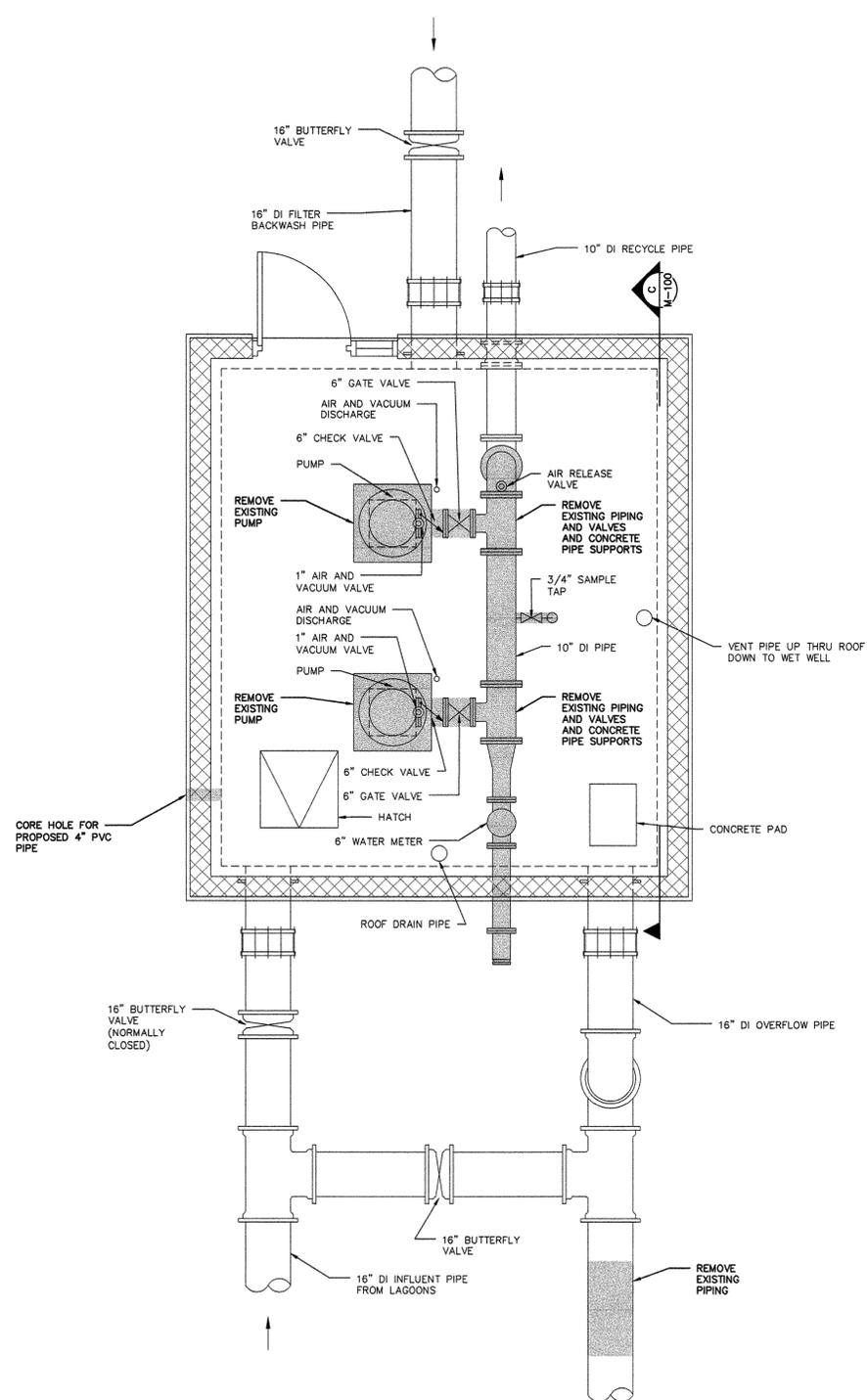
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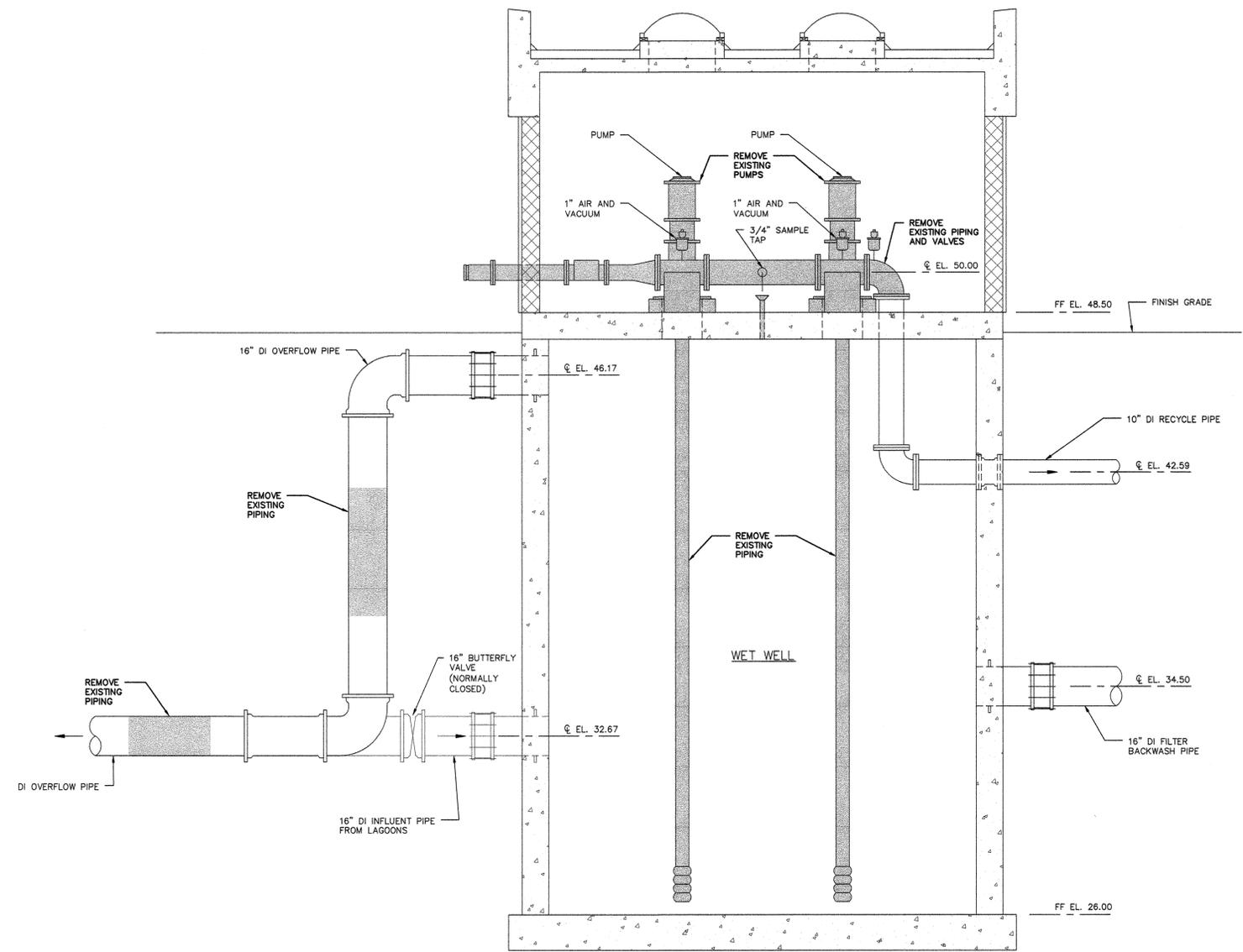
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C

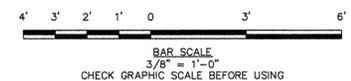
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RECYCLE PUMP STATION PLAN
SCALE: 3/8"=1'-0"



SECTION C
SCALE: 3/8" = 1'-0"
M-100



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**RECYCLE PUMP STATION
DEMOLITION PLAN AND SECTION**

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: 3/8"=1'-0"
SHEET: 9 OF 16

M-100

1

2

3

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A

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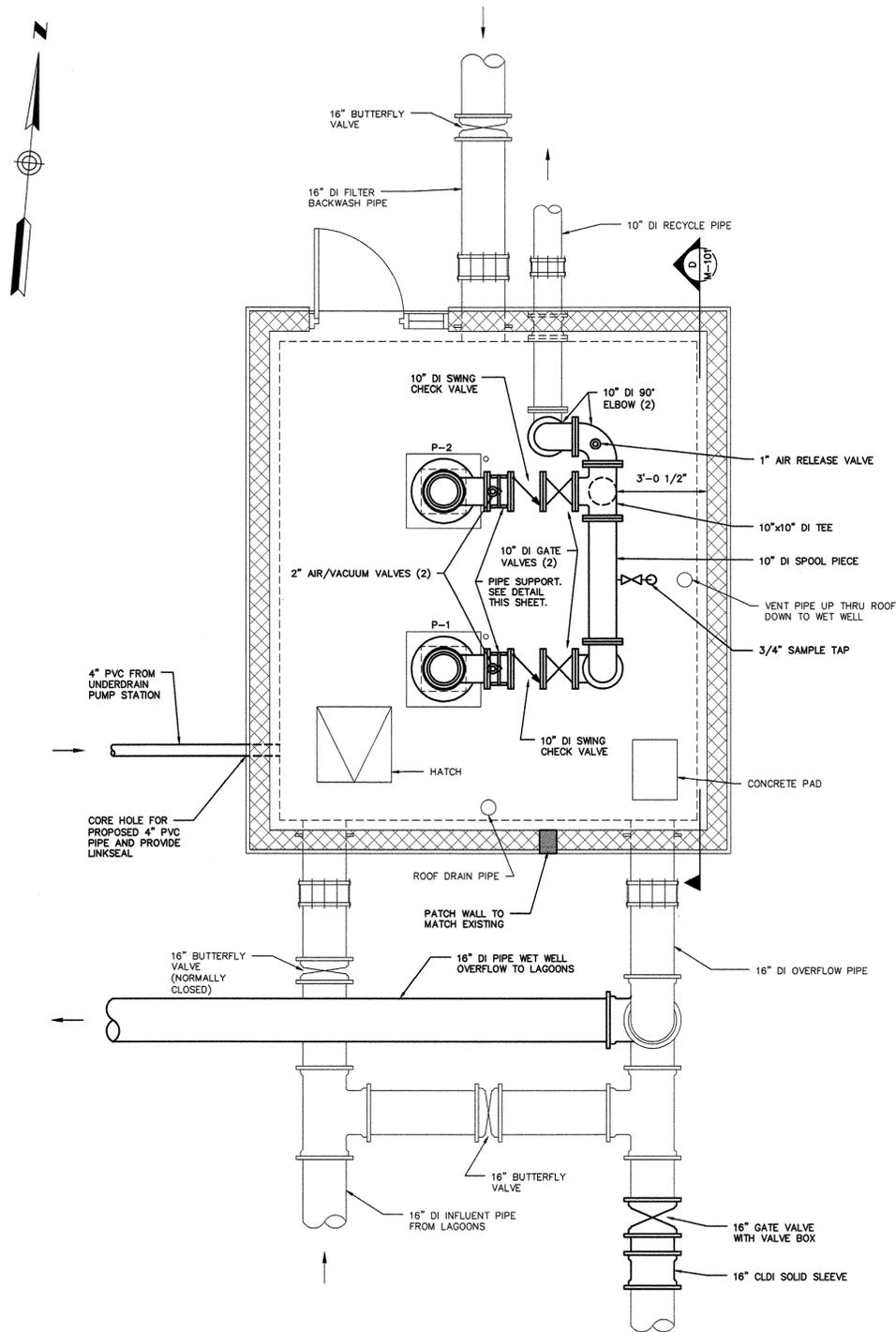
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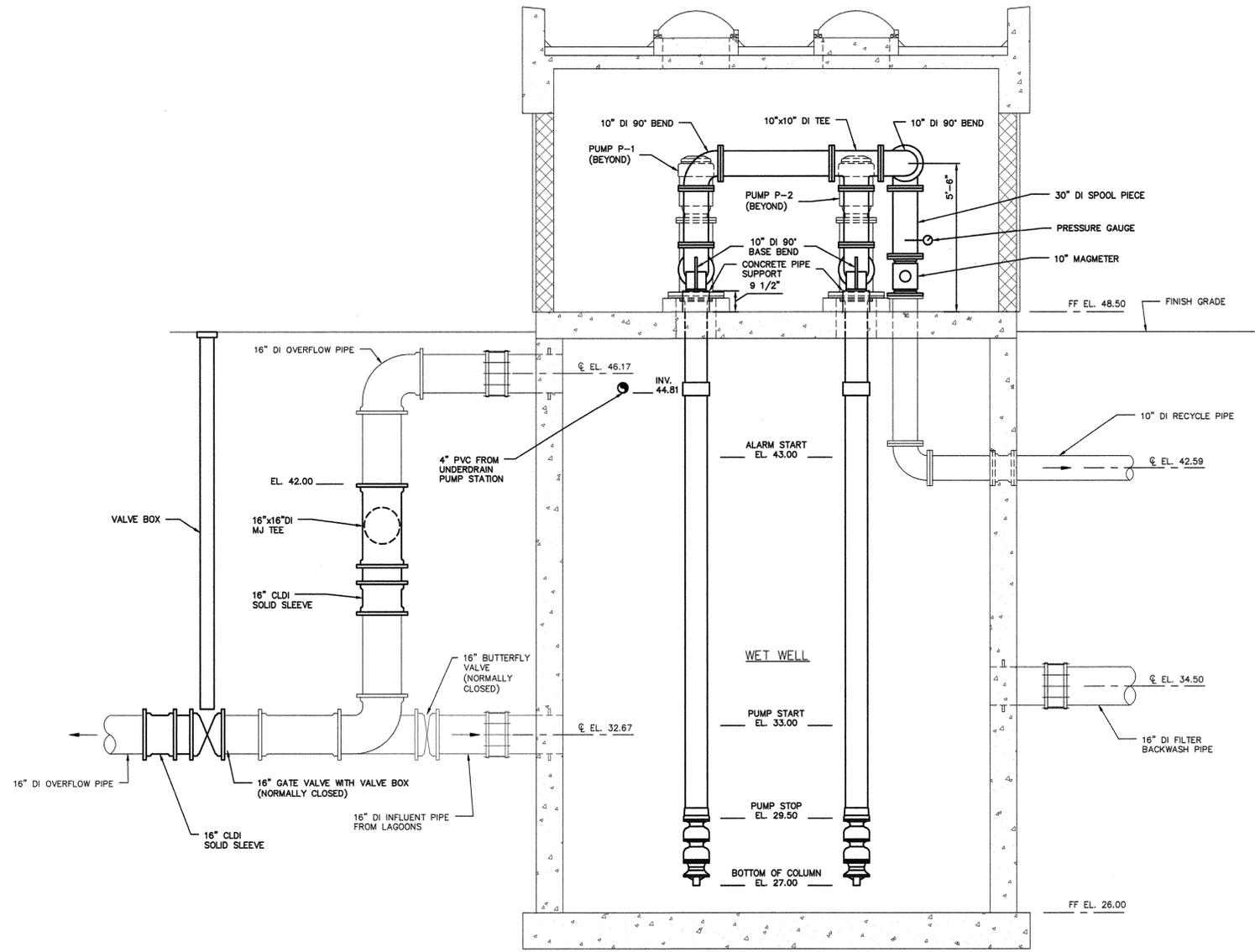
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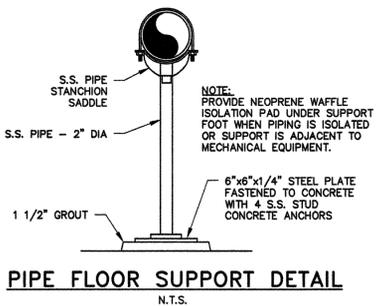
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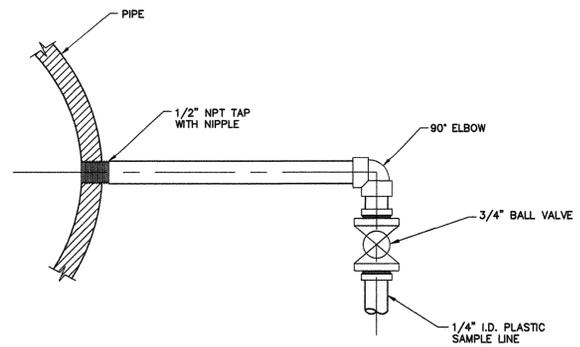
RECYCLE PUMP STATION PLAN
SCALE: 3/8"=1'-0"



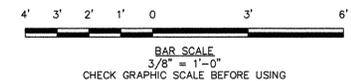
SECTION D
SCALE: 3/8" = 1'-0"
M-101



PIPE FLOOR SUPPORT DETAIL
N.T.S.



SAMPLE TAP DETAIL
N.T.S.



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**RECYCLE PUMP STATION
MECHANICAL PLAN AND SECTION**

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: 3/8"=1'-0"
SHEET: 10 OF 16

M-101

GENERAL

- HOME RUN, ARROWS INDICATE NUMBER OF CIRCUITS, CROSS LINES INDICATE NUMBER OF WIRES, OTHER THAN TWO (2) PLUS BOND, WIRE SIZE NOT SHOWN INDICATES #12AWG MIN.
- INDICATES CIRCUIT NUMBER
- PANEL DESIGNATION
- WIRING IN RACEWAY
- WIRING IN RACEWAY CONCEALED UNDERGROUND OR UNDERSLAB, MINIMUM 3/4" C
- WIRING IN RACEWAY CONCEALED UNDERGROUND, MINIMUM 3/4" C
- CONDUIT AND CABLE ID TAG
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT STUB
- EY CONDUIT SEAL
- FLEXIBLE NON-METALLIC CONDUIT
- PANELBOARD
- CONTROL PANEL
- AUTOMATIC TEMPERATURE CONTROL PANEL
- INTRINSIC SAFETY BARRIER PANEL
- POWER COMPANY METER
- LOCAL SELECTOR SWITCH
- H/O/A - HAND/OFF/AUTO
- H/O/R - HAND/OFF/REMOTE
- L/O/R - LOCAL/OFF/REMOTE
- PUSHBUTTON STATION, WITH "EM" EMERGENCY
- JUNCTION BOX
- MOTORIZED DAMPER
- THERMOSTAT
- RELAY
- DOOR BELL/BUZZER AND TRANSFORMER - MTD CL UP 7'-0" AFF
- EQUIPMENT TAGS
- KEYED NOTE TAG
- REVISION TRIANGLE
- BRACKET

POWER

- NON-FUSED SAFETY SWITCH
- FUSED SAFETY SWITCH
- NON-FUSED DISCONNECT/MAGNETIC MOTOR STARTER
- MANUAL MOTOR SWITCH (MOTOR RATED SWITCH), TOGGLE OPERATED, SINGLE PHASE, 1 OR 2 POLE AS REQUIRED
- ENCLOSED CIRCUIT BREAKER W/AMPERE RATING
- ELECTRIC MOTOR, NUMBER INDICATES HORSEPOWER RATING, "F" INDICATES FRACTIONAL LESS THAN 1/20HP OR 100W
- TRANSFORMER
- POWER POLE
- DUPLEX RECEPTACLE, NEMA 5-20R - MTD CL UP 24" OR AS NOTED, "WP" WEATHER PROOF, "G" PROTECTED BY GFCI RECEPTACLE OR BREAKER UPSTREAM, "H" MOUNTED 0'-6" BELOW CEILING, "TV" MOUNT 7'-6" UP
- DOUBLE DUPLEX RECEPTACLE, NEMA 5-20R - MTD CL UP 24" OR AS NOTED
- SINGLE RECEPTACLE, NEMA 5-20R - MTD CL UP 24" OR AS NOTED
- GFCI DUPLEX RECEPTACLE, NEMA 5-20R - MOUNTED CL UP 48" OR 6" ABOVE COUNTER
- DOUBLE DUPLEX GFCI RECEPTACLE, NEMA 5-20R - MOUNTED CL UP 48" OR 6" ABOVE COUNTER
- FLUSH FLOOR OUTLET, DUPLEX RECEPTACLE, NEMA 5-20R
- MULTI SERVICE FLUSH FLOOR BOX WITH DUPLEX RECEPTACLE AND PROVISIONS FOR DATA
- POWER RECEPTACLE, NEMA CONFIGURATION AS NOTED OR AS REQUIRED FOR EQUIPMENT SERVED.
- FLUSH CEILING MTD DEVICE BOXES, ONE W/ DUPLEX RCPT FOR PROJECTOR POWER AND ONE FOR DATA TO SERVE OH PROJECTOR. RUN ONE 1 1/2" C TO JBOX LOCATED AT FRONT OF ROOM FOR PROJECTOR CABLE PATHWAY. VERIFY FINAL LOCATION W/ OWNER PRIOR TO ROUGH IN.
- MULTI-OUTLET POWER STRIP, MOUNT 0'-6" ABOVE COUNTERTOP, RECEPTACLE SPACING AS NOTED.

MISCELLANEOUS

- DETAIL #
- SECTION CALL OUT
- DETAIL TITLE
- DETAIL CALL OUT

LIGHTING

- 2x4 FLUORESCENT FIXTURE
- ASSOCIATED CONTROL DEVICE
- FIXTURE TYPE (SEE LIGHT FIXTURE SCHEDULE)
- 1x4 FLUORESCENT FIXTURE
- 2x2 FLUORESCENT FIXTURE
- FIXTURE WIRE TO UNSWITCHED NORMAL CIRCUIT
- FIXTURE WIRE TO UNSWITCHED EMERGENCY CIRCUIT
- FIXTURE WIRE TO SWITCHED EMERGENCY CIRCUIT
- DOWN LIGHT
- FLUORESCENT STRIP
- WALL MOUNTED FIXTURES
- POLE MOUNTED SITE LIGHTING FIXTURE
- FIXTURE TYPE (SEE LIGHT FIXTURE SCHEDULE)
- FLOOD LIGHT
- EXIT SIGN, CEILING MOUNTED, ARROW INDICATES EGRESS DIRECTION, SHADING INDICATES SIGN FACE. NUMERAL INDICATES BATTERY UNIT CONNECTED
- EXIT SIGN, WALL MOUNTED 7'-6" AFF OR 0'-6" ABOVE DOOR, SHADING INDICATES SIGN FACE. NUMERAL INDICATES BATTERY UNIT CONNECTED TO.
- DUAL HEAD EMERGENCY LIGHT BATTERY PACK WITH NUMBER OF HEADS AS INDICATED - WALL MOUNTED MTD 7'-6" AFF. NUMERAL INDICATES BATTERY ID NUMBER.
- TANDEM EMERGENCY LIGHT BATTERY PACK & EXIT SIGN - WALL MOUNTED MTD 7'-6" AFF OR 0'-6" ABOVE DOOR. NUMERAL INDICATES BATTERY ID NUMBER.
- REMOTE EMERGENCY LIGHTING HEAD - WALL MOUNTED MTD 7'-6" AFF. NUMERAL INDICATES BATTERY UNIT CONNECTED TO.
- SINGLE POLE TOGGLE SWITCH - MTD CL UP 4'-0" AFF
- DOUBLE POLE TOGGLE SWITCH - MTD CL UP 4'-0" AFF
- 3-WAY TOGGLE SWITCH - MTD CL UP 4'-0" AFF
- 4-WAY TOGGLE SWITCH - MTD CL UP 4'-0" AFF
- WALL MOUNTED OCCUPANCY SENSOR - MTD CL UP 4'-0" AFF
- TOGGLE SWITCH WITH PILOT LIGHT - MTD CL UP 4'-0" AFF
- DIMMER SWITCH - MTD CL UP 4'-0" AFF
- LOW VOLTAGE SWITCH - MTD CL UP 4'-0" AFF
- OCCUPANCY SENSOR
- o. INDICATES CONTROLLED FIXTURE
- PHOTOCELL
- LIGHTING CONTRACTOR
- MOTION SENSOR

FIRE ALARM DIAGRAM SYMBOLS

- FACFP FIRE ALARM CONTROL PANEL
- FAA FIRE ALARM ANNUNCIATOR
- FCFPS FIELD CHARGER POWER SUPPLY
- FM FIRE ALARM MASTER BOX
- KNOX BOX
- FIRE ALARM MANUAL PULL STATION - WALL MTD CL UP 4'-0"
- FIRE ALARM AUDIBLE/VISIBLE NOTIFICATION APPLIANCE CANDELA (CD) POWER PER NFPA 72 OR AS NOTED - WALL MTD BOTTOM UP 80" AFF. "H" HORN, "V" VOICE.
- FIRE ALARM VISUAL NOTIFICATION APPLIANCE CANDELA (CD) POWER PER NFPA 72 OR AS NOTED - WALL MTD BOTTOM UP 80" AFF
- CEILING MOUNTED SMOKE DETECTOR
- CEILING MOUNTED HEAT DETECTOR
- DUCT SMOKE DETECTOR
- S=SUPPLY, R=RETURN
- SPRINKLER SYSTEM FLOW SWITCH
- SPRINKLER SYSTEM TAMPER SWITCH
- SPRINKLER SYSTEM PRESSURE SWITCH
- FIRE ALARM SYSTEM MAGNETIC DOOR HOLDER
- MONITOR MODULE
- CONTROL MODULE
- RELAY MODULE

COMMUNICATIONS

- TELEPHONE BACKBOARD
- PROVISIONS FOR TELEPHONE OUTLET, TWO-GANG WALL BOX WITH ONE 1" C STUB TO ABOVE ACCESSIBLE CEILING - MTD CL UP SAME AS ASSOCIATED RECEPTACLE
- W-INDICATES WALL MOUNTED AT 80" AFF
- P-INDICATES PAYPHONE MOUNTED AT 4'-0" AFF
- X-INDICATES NUMBER OF JACKS, SINGLE BOX
- PROVISIONS FOR DATA OUTLET, TWO-GANG WALL BOX WITH ONE 1" C STUB TO ABOVE ACCESSIBLE CEILING - MTD CL UP SAME AS ASSOCIATED RECEPTACLE. SUBSCRIPTS AS NOTED ABOVE.
- PROVISIONS FOR TELEPHONE & DATA OUTLET, TWO-GANG WALL BOX WITH ONE 1" C STUB TO ABOVE ACCESSIBLE CEILING - MTD CL UP SAME AS ASSOCIATED RECEPTACLE. SUBSCRIPTS AS NOTED ABOVE.
- PROVISIONS FOR SCADA SYSTEM OUTLET, TWO-GANG WALL BOX WITH ONE 1" C STUB TO ABOVE ACCESSIBLE CEILING - MTD CL UP SAME AS ASSOCIATED RECEPTACLE
- CEILING MOUNTED TELEPHONE SYSTEM OUTLET
- CEILING MOUNTED DATA SYSTEM OUTLET
- CEILING MOUNTED VOICE & DATA OUTLET
- FLUSH TELEPHONE FLOOR OUTLET
- FLUSH DATA FLOOR OUTLET
- FLUSH VOICE & DATA FLOOR OUTLET
- TELEVISION COAXIAL OUTLET, MOUNTED UP SAME AS ASSOCIATED RECEPTACLE

SECURITY

- SECURITY PANEL
- DOOR INTRUSION SWITCH
- ELECTRIC DOOR STRIKE
- CARD READER
- KEY PAD
- MOTION DETECTOR
- SECURITY CAMERA
- PTZ = PAN/TILT/ZOOM

INTERCOM & PAGING SYSTEM

- CEILING MOUNTED SPEAKER
- PAGING SYSTEM CONTROL PANEL
- PAGING SYSTEM HANDSET

INSTRUMENTATION

- FIELD MOUNTED INSTRUMENT
- INSTRUMENT IDENTIFICATION TYPE
- INSTRUMENT LOOP #
- VENDOR SUPPLIED INSTRUMENT
- INSTRUMENT IDENTIFIER:
- AE ANALYSIS ELEMENT
- AIT ANALYSIS INDICATING TRANSMITTER
- AT ANALYSIS TRANSMITTER
- DPS DIFFERENTIAL PRESSURE SWITCH
- FCV FLOW CONTROL VALVE
- FE FLOW ELEMENT
- FI FLOW INDICATING TRANSMITTER
- FT FLOW TRANSMITTER
- FS FLOW SWITCH
- LE LEVEL ELEMENT
- LIT LEVEL INDICATING TRANSMITTER
- LT LEVEL TRANSMITTER
- LSH LEVEL SWITCH HIGH
- LSL LEVEL SWITCH LOW
- MOV MOTOR OPERATED VALVE
- PE PRESSURE ELEMENT
- PIT PRESSURE INDICATING TRANSMITTER
- PT PRESSURE TRANSMITTER
- PS PRESSURE SWITCH
- SV SOLENOID VALVE
- TE TEMPERATURE ELEMENT
- TT TEMPERATURE INDICATING TRANSMITTER
- TT TEMPERATURE TRANSMITTER
- ZS PROXIMITY SWITCH

MISC TERMINALS

- ARROW, SMALL
- ARROW, LARGE
- ARROW, TRIANGULAR
- CONTINUE, SMALL
- CONTINUE, LARGE
- DOT, SMALL
- DOT, MEDIUM
- DOT, LARGE
- POLARITY SQUARE
- SCREW TERMINAL
- TERMINAL POINT, SMALL
- TERMINAL POINT, LARGE
- TERMINAL POINT, SQUARE
- SHIELD
- SHIELD W/TERMINAL POINT

ONE-LINE DIAGRAM SYMBOLS

- HV VOLTAGE DRAWOUT TYPE POWER CIRCUIT BREAKER ELECTRICALLY OPERATED
- MV VOLTAGE DRAWOUT TYPE POWER CIRCUIT BREAKER WITH MANUAL CONTROL SWITCH
- LOW VOLTAGE CIRCUIT BREAKER
- AF - AMP FRAME
- AT - AMP TRIP
- EO - ELECTRICALLY OPERATED
- ST - SHUNT TRIP
- GF - GROUND FAULT
- EO - ELECTRICALLY OPERATED
- DISCONNECT, ISOLATION OR SAFETY SWITCH
- FUSED DISCONNECT SWITCH
- MAGNETIC MOTOR STARTER, NUMERAL INDICATES NEMA SIZE FWR UNLESS OTHERWISE NOTED.
- FVR - FULL VOLTAGE REVERSING
- RVAT - REDUCING VOLTAGE AUTO TRANSFORMER
- ZS - TWO SPEED
- YD - WYE DELTA REDUCED VOLTAGE STARTER
- CAPACITOR
- VFD = VARIABLE FREQUENCY DRIVE
- SS = SOLID STATE STARTER
- DC = DC VARIABLE DRIVE
- NUMERAL INDICATES AMP RATING
- POWER TRANSFORMER
- OA - LIQUID TYPE SELF COOLED
- AA - DRY TYPE SELF COOLED
- FA - FAN COOLED
- CONNECTION
- POTENTIAL TRANSFORMER RATIO NUMBER REQUIRED
- CURRENT TRANSFORMER RATIO PHASE
- MOTOR, NUMERAL INDICATES HORSEPOWER
- GENERAL LOAD, NUMERAL INDICATES LOAD IN KVA
- GENERATOR
- ATS - AUTOMATIC TRANSFER SWITCH
- MTS - MANUAL TRANSFER SWITCH
- METER
- A - AMMETER
- V - VOLTMETER
- W - WATTMETER
- KWH - KILOWATT HOUR
- KVAR - KILOVAR METER
- VAR - VAR METER
- HZ - FREQUENCY METER
- PF - POWER FACTOR METER
- LINE OR LOAD REACTOR
- NUMERAL INDICATES % IMPEDENCE
- DIGITAL POWER MONITOR
- METER TRANSFER SWITCH
- AS - AMMETER SWITCH
- VS - VOLTMETER SWITCH
- SPD - SURGE PROTECTION DEVICE
- ENDN = ETHERNET TO DEVICENET LINKING DEVICE
- DPS = DEVICENET POWER SUPPLY
- MEDIUM VOLTAGE CABLE TERMINATION
- DRAWOUT DEVICE
- LIGHTNING ARRESTOR
- KEY INTERLOCK

GROUNDING

- DENOTES BARE COPPER GROUND CABLE. (SIZE 4/0 UNLESS OTHERWISE NOTED)
- DENOTES 3/4" X 10'-0" LONG GROUND ROD. (10'-0" MINIMUM LENGTH)
- DENOTES CABLE TO CABLE CADWELL EXOTHERMIC CONNECTION OR APPROVED EQUAL.
- DENOTES CADWELL EXOTHERMIC CABLE CONNECTION TO BOLT CONNECTION
- DENOTES GROUND TERMINAL CONNECTION ON EQUIPMENT
- DENOTES PITIAL RISER UP THROUGH GRAVEL FOR CONNECTION TO EQUIPMENT. PROVIDE MINIMUM OF 12' AND COIL FOR CONNECTION AT A LATER DATE.
- GROUND

CONTROL DIAGRAM SYMBOLS

- NOTE: ALL CONTROL SYMBOLS ARE DRAWN ASSUMING DE-ENERGIZED CIRCUITS, EMPTY TANKS, UNPRESSURIZED LINES, ETC.
- OPEN ON INCREASE
- CLOSE ON INCREASE
- PRESSURE SWITCH
- LEVEL SWITCH
- FLOW SWITCH
- TEMPERATURE SWITCH
- NORMALLY CLOSED
- NORMALLY OPEN
- PUSH BUTTON
- INSTANTANEOUS CONTACT
- TIMED CLOSE CONTACT
- TIMED OPEN CONTACT
- LIMIT SWITCH
- SELECTOR SWITCH: QUANTITY OF ARROWS INDICATES NUMBER OF POSITIONS. XOO INDICATES UPPER CONTACT CLOSED IN LEFT POSITION AND OPEN IN CENTER AND RIGHT POSITIONS
- INTERNAL WIRING
- FIELD WIRING
- RELAY COIL

ABBREVIATIONS

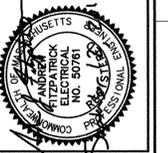
- A,AMP AMPERES
- AC ALTERNATING CURRENT
- AF ABOVE FINISHED FLOOR
- AFG ABOVE FINISHED GRADE
- AHJ AUTHORITY HAVING JURISDICTION
- AIC AMPERE INTERRUPT CAPACITY
- AWG AMERICAN WIRE GAUGE
- BFG BELOW FINISHED GRADE
- CATV CABLE TELEVISION
- CB CIRCUIT BREAKER
- CCTV CLOSED CIRCUIT TELEVISION
- CL CENTER LINE
- CMT CIRCUIT
- CP CONTROL PANEL
- CPT CONTROL POWER TRANSFORMER
- CT CURRENT TRANSFORMER
- CU COPPER
- CJ ELECTRICAL CONTRACTOR
- EMT ELECTRIC METALLIC TUBING
- FA FIRE ALARM ANNUNCIATOR
- FACP FIRE ALARM CONTROL PANEL
- FBO FURNISHED BY OTHERS
- FWE FURNISHED WITH EQUIPMENT
- G.C. GENERAL CONTRACTOR
- GEN GENERATOR
- GFCI GROUND FAULT CIRCUIT INTERRUPTER
- G.GND GROUND
- HP HORSEPOWER
- HZ FREQUENCY IN CYCLES/SECOND
- IG ISOLATED GROUND
- IMT INTERMEDIATE METALLIC CONDUIT
- JBOX JUNCTION BOX
- KILO K
- KCMIL 1000 CIRCULAR MILS
- KVA KILOVOLT AMPERE
- KVAR KILOWATT AMPERE REACTIVE
- KW KILOWATT
- KWH KILOWATT HOUR
- MCC MOTOR CONTROL CENTER
- MCB MAIN CIRCUIT BREAKER
- MF MANUFACTURER
- MH MANHOLE
- MLO MAIN LUGS ONLY
- MTR MOUNTED
- MOTOR MOTOR
- MV MEDIUM VOLTAGE
- NC NORMALLY CLOSED
- NEC NATIONAL ELECTRIC CODE
- NEUT NEUTRAL
- NO NORMALLY OPEN
- OL OVERLOAD ELEMENT
- PF POWER FACTOR
- PH PHASE
- PRI PRIMARY
- PT POTENTIAL TRANSFORMER
- PVC POLYVINYL CHLORIDE
- RGS RIGID STEEL CONDUIT
- RTD RESISTANCE TEMPERATURE DETECTOR
- SEC SECONDARY
- SS STAINLESS STEEL
- SV SOLENOID VALVE
- TEMP TEMPERATURE
- TVSS TRANSIENT VOLTAGE SURGE SUPPRESSOR
- TYP TYPICAL
- UE UNDERGROUND ELECTRIC
- UG UNDERGROUND
- UPS UNINTERRUPTED POWER SUPPLY
- V VOLTS
- VA VOLT-AMPERES
- VAR VOLT-AMPERE REACTIVE
- W WATT
- WM WATT METER
- WP WEATHER PROOF
- XFMR TRANSFORMER
- XP EXPLOSION PROOF

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2	DESIGNED BY: A.J.F.	
3	CHECKED BY: P.W.	
4	DRAWN BY: G.W.	
5	22725130 E-001.DWG	

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 11 OF 16

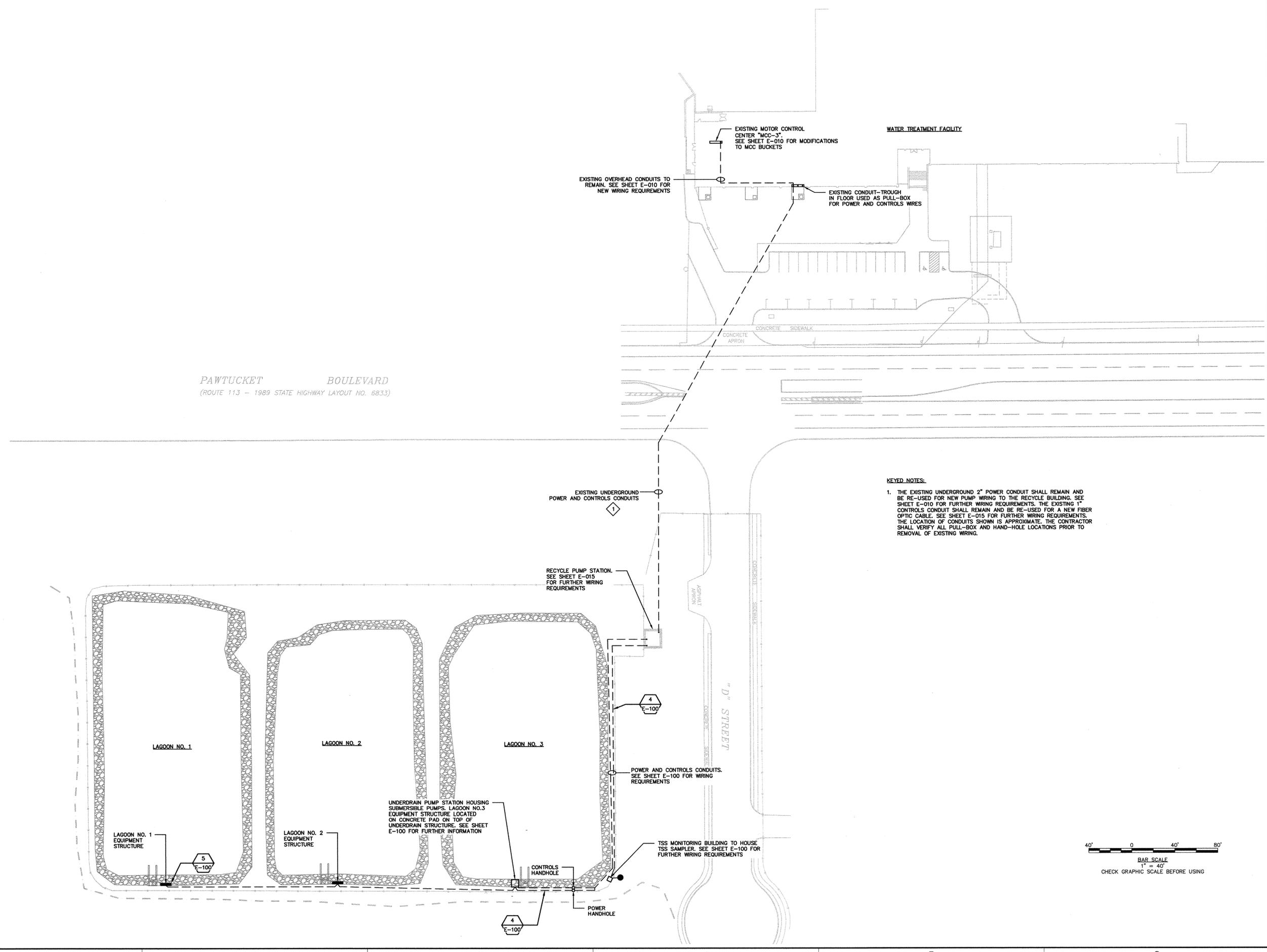
E-001

A

B

C

D



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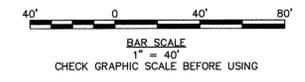
ELECTRICAL SITE PLAN

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

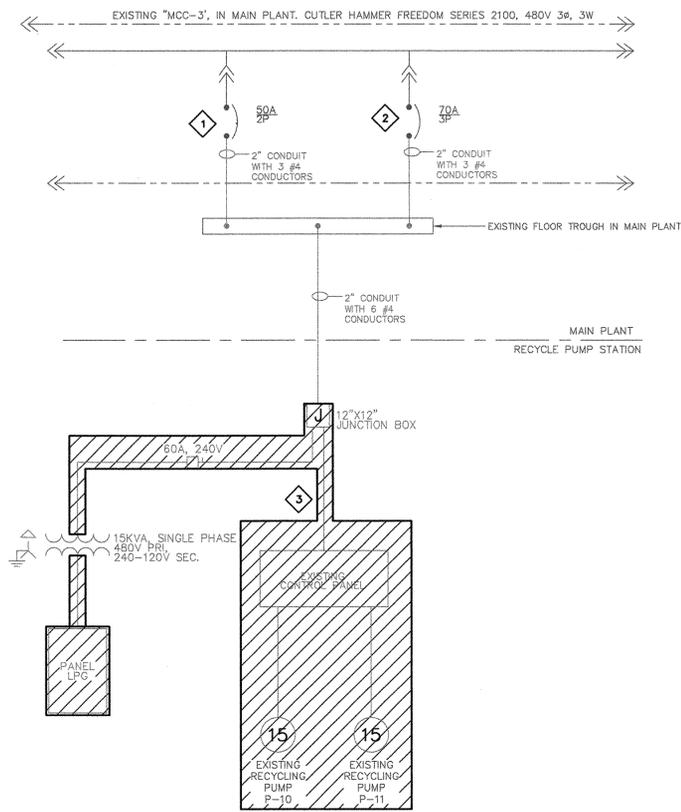
JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 12 OF 16
E-005

\\ANDOVER\Projects\227251 - Residuals Handling\3D - Residuals Design\Cad Drawings\Electrical\227251.30_E-005.dwg, Sep 10, 2014 - 1:08pm
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KEYED DEMOLITION NOTES:

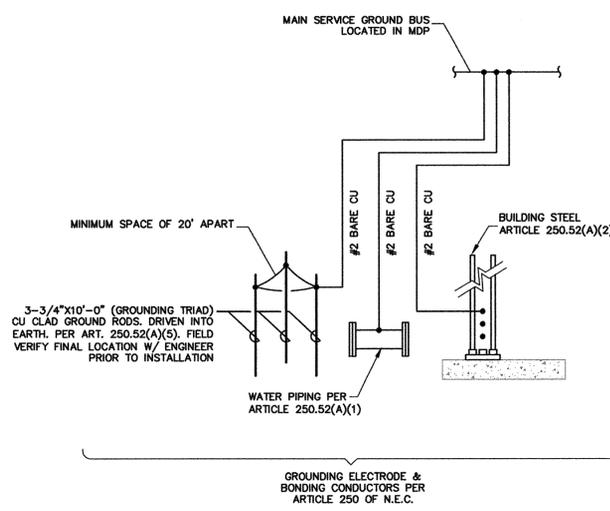
- DISCONNECT THE EXISTING CONDUCTORS FROM THE 50 AMP BUCKET CIRCUIT BREAKER AND REMOVE ALL WIRING FROM THE BREAKER TO THE JUNCTION BOX LOCATED IN THE RECYCLING BUILDING. THE 50 AMP CIRCUIT BREAKER AND CONDUIT BACK TO THE TROUGH SHALL REMAIN. PROVIDE NEW LABEL INDICATING "SPARE."
- REMOVE THE EXISTING 100A BUCKET CIRCUIT BREAKER AND ALL ASSOCIATED HARDWARE IN PREPARATION FOR THE INSTALLATION OF A NEW BUCKET. REMOVE THE CONDUCTORS FROM THE EXISTING CONDUIT BACK TO THE RECYCLING PUMP STATION JUNCTION BOX.
- ALL EQUIPMENT, CONDUIT, AND CONDUCTORS SHOWN DASHED SHALL BE DISCONNECTED AND REMOVED.



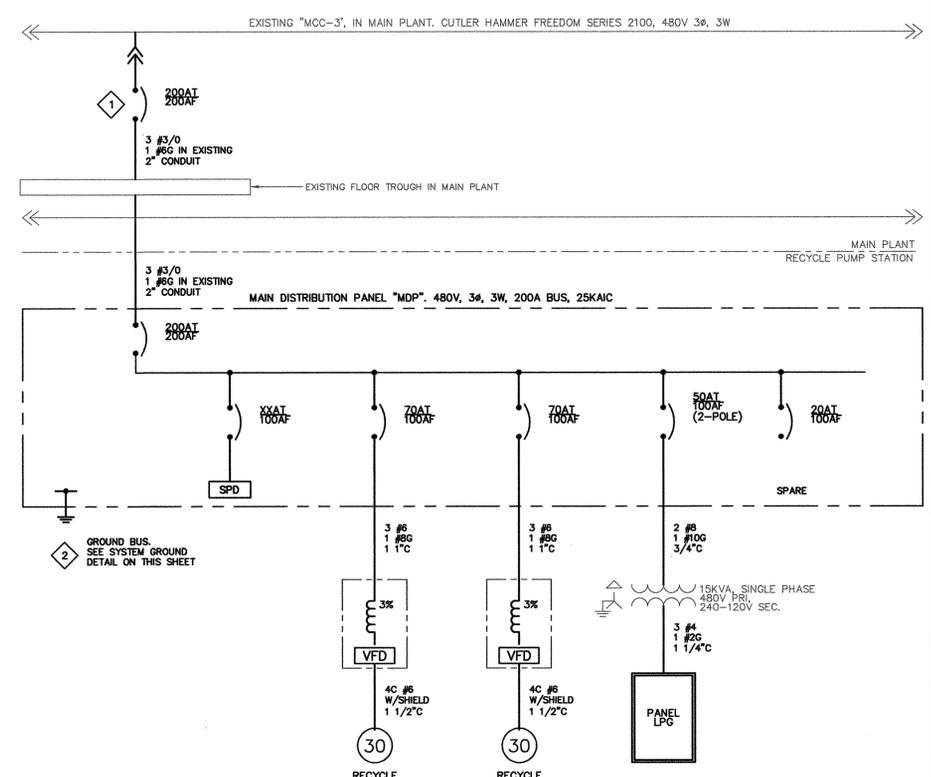
PARTIAL ONE-LINE DIAGRAM DEMOLITION

KEYED NEW PLAN NOTES:

- PROVIDE A 200A PLUG-IN UNIT CIRCUIT BREAKER BUCKET WITH OPERATING HANDLE, BUS STABS, DOOR AND ALL NECESSARY HARDWARE FOR THE NEW FEEDER BREAKER TO THE RECYCLE PUMP STATION.
- THE MAIN DISTRIBUTION PANEL SHALL CONTAIN AN ISOLATED NEUTRAL BUS AND AN EQUIPMENT GROUND BUS. THE EQUIPMENT GROUND CONDUCTOR SHALL BE CONNECTED TO THE GROUNDING ELECTRODE SYSTEM PER ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE FOR A REMOTE BUILDING.



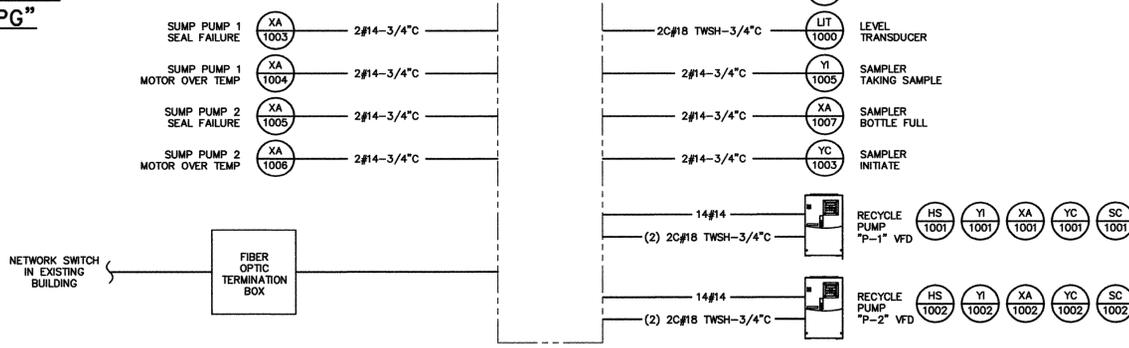
SYSTEM GROUNDING DETAIL
SCALE: N.T.S.



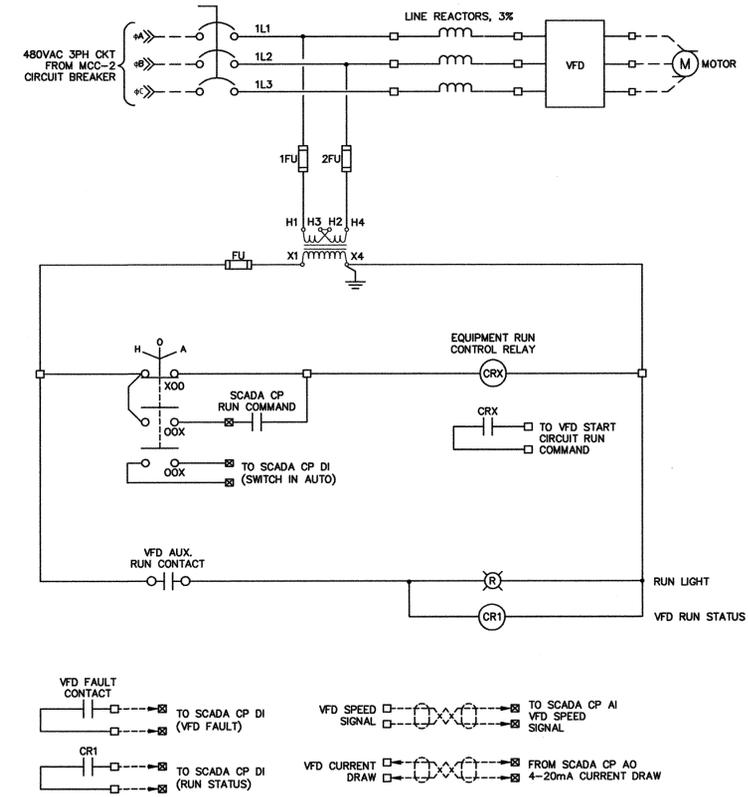
PARTIAL ONE-LINE DIAGRAM NEW PLAN

DIRECTORY	BRKR	POLE	CKT #	KVA	KVA LOADS		CKT #	POLE	BRKR	DIRECTORY
					A	B				
EXISTING CIRCUIT	20	1	1	1.00	1.50	0.5	2	1	20	EXISTING CIRCUIT
EXISTING CIRCUIT	20	1	3	1.00	2.20	1.20	4	2	20	LIGHTING POLE
EXISTING CIRCUIT	20	1	5	0.50	1.70	1.20	6			
EXISTING CIRCUIT	20	1	7	0.50	1.70	1.20	8	2	20	LIGHTING POLE
MAG METER	15	1	9	0.50	1.70	1.20	10			
LAGOON RECEPTACLE	20	1	11	0.60	1.80	1.20	12	2	20	LIGHTING POLE
SUBMERSIBLE PUMPS	20	1	13	0.60	1.80	1.20	14			
TSS SAMPLER	20	1	15	1.00	1.50	0.50	16	1	20	SMOKE DETECTORS
SPARE	20	1	17		0.00		18	1	20	SPARE
SPARE	20	1	19		0.00		20	1	20	SPARE
SPARE	20	1	21		0.00		22	1	20	SPARE
SPARE	20	1	23		0.00		24	1	20	SPARE
SUBTOTAL				6.70	7.20	SUBTOTAL				
VOLTAGE:	120/240	TOTAL KVA		13.90	PANEL NAME:		LPG			
MAIN BREAKER:	80	TOTAL AMPS		58	LOCATION:		RECYCLE PUMP STATION			
BUSES:	100				MOUNTING:		SURFACE			
PH & WIRES:	1PH 3W				AIC RATING:		22 Kcalc			
NOTES:										

PANEL SCHEDULE
PANEL "LPG"



SCADA PANEL WIRING DIAGRAM



RECYCLE PUMPS
P-1 & P-2
VFD WIRING DIAGRAM

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ELECTRICAL ONE-LINE & WIRING DIAGRAMS

LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

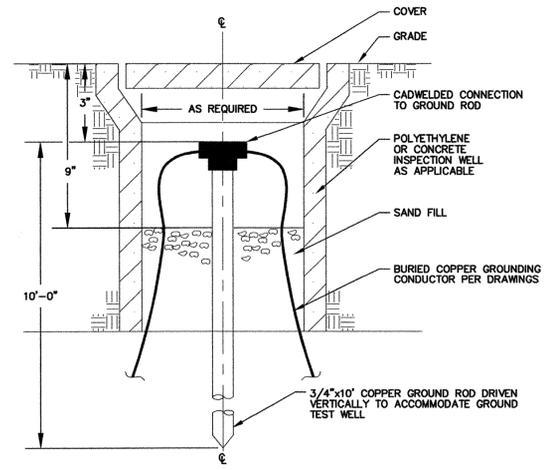
RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 13 OF 16

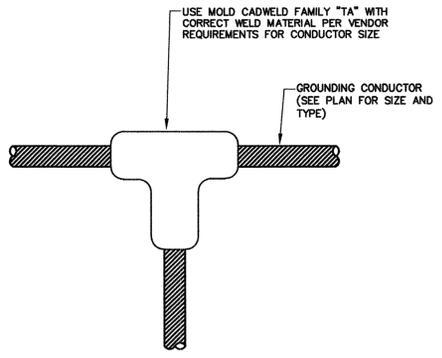
E-010

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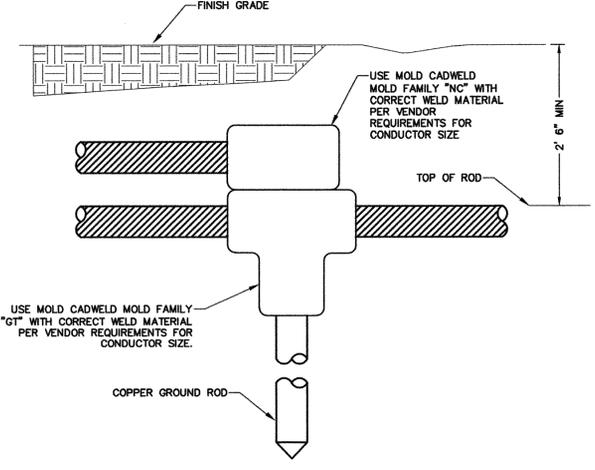
- NOTES:**
1. INSPECTION WELLS IN ROADWAYS SHALL ADHERE TO AASHTO H20 LOADING REQUIREMENTS.
 2. WELLS SHALL BE FLUSH TYPE PRECAST CONCRETE, OR POLYMER CONCRETE PER AREA OF INSTALLATION. PROVIDE BOLTED DOWN COVERS WITH DESCRIPTION "GROUND ROD". PROVIDE STEEL COVERS FOR WELLS IN TRAFFIC AREAS.
 3. TOP OF GROUND INSPECTION WELL SHALL BE LEVEL WITH FINISHED GRADE.



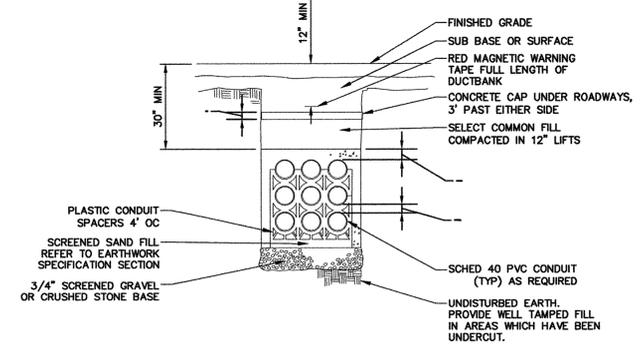
1
E-015
TYPICAL GROUND INSPECTION WELL DETAIL
SCALE: N.T.S.



2
E-015
TEE THERMOWELD CONNECTION
SCALE: N.T.S.

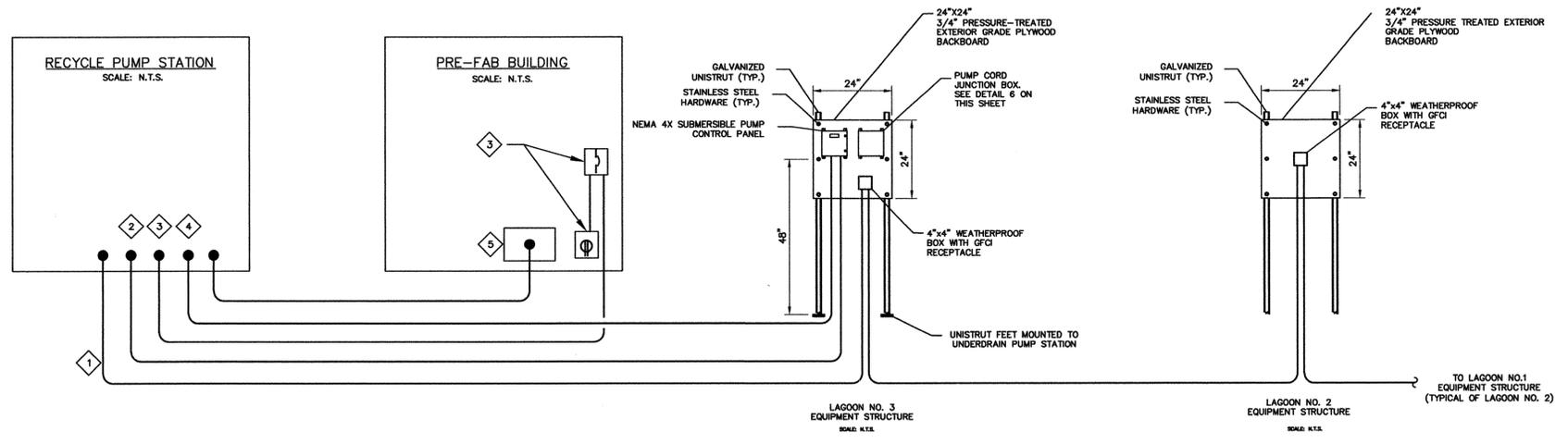


3
E-015
GROUND ROD INSTALLATION
SCALE: N.T.S.

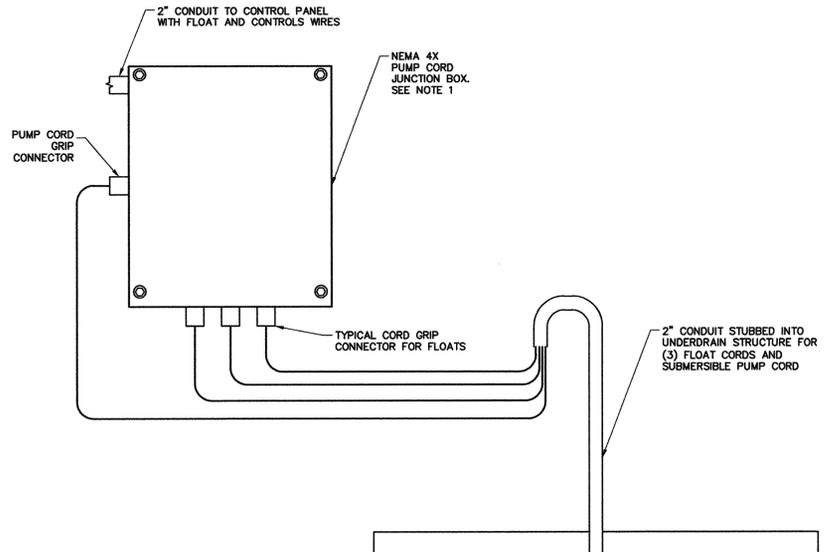


4
E-005
UNDERGROUND DUCTBANK DETAIL
SCALE: N.T.S.

- KEYED NOTES:**
1. PROVIDE 2 #10, 1 #10G, 3/4\"/>



5
E-005
SITE LAGOON WIRING DETAIL
SCALE: N.T.S.



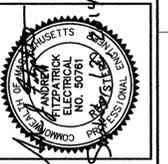
- NOTES:**
1. PROVIDE CENTRIPRO-ITT NEMA 4X FIBERGLASS JUNCTION BOX, PART NUMBER AE-14, WITH CORD GRIPS FOR PUMP AND CONTROLS WIRES AND 2\"/>

6
E-100
PUMP CORD JUNCTION BOX DETAIL
SCALE: N.T.S.

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ELECTRICAL DETAILS

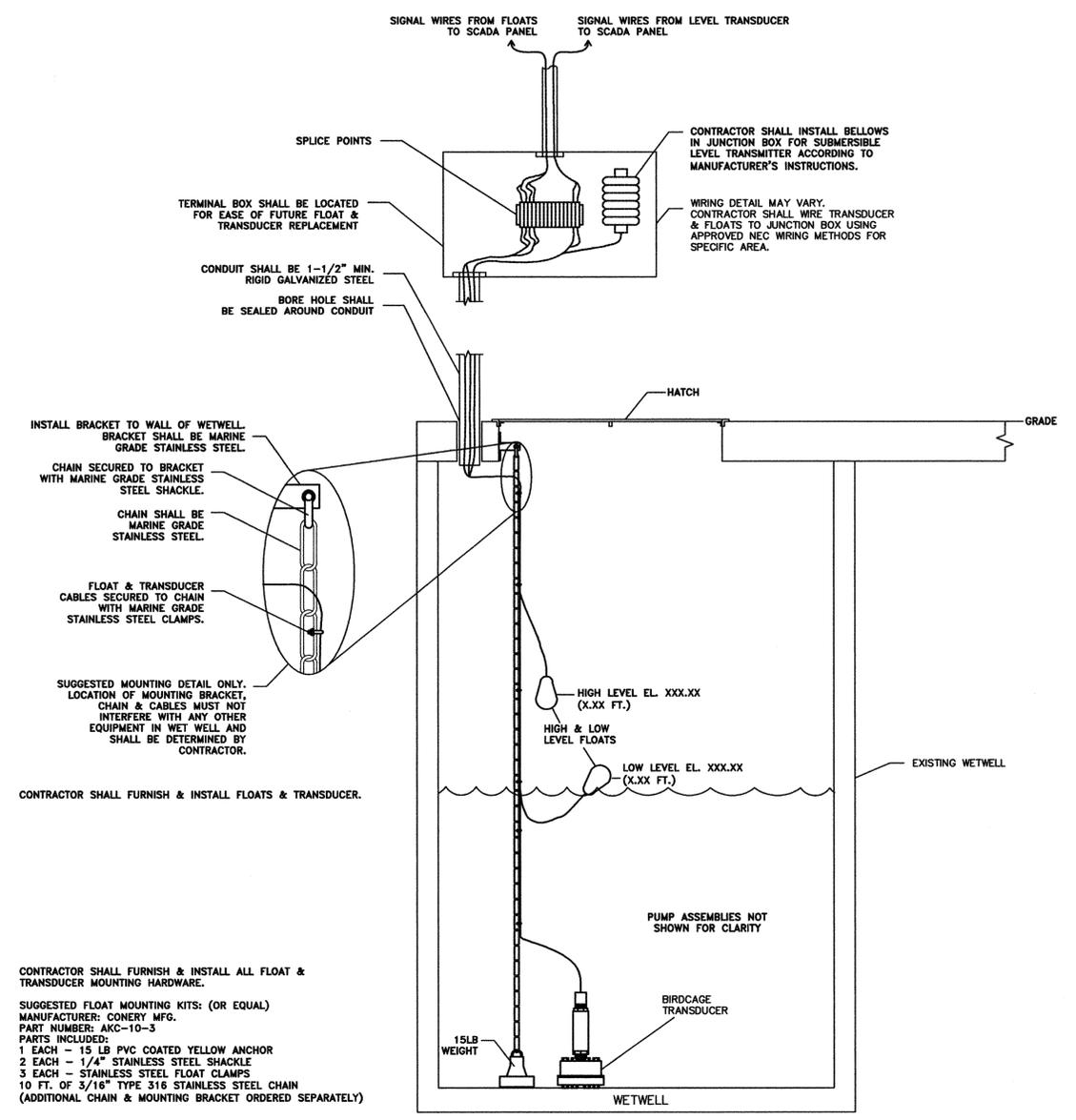
LOWELL REGIONAL WATER UTILITY
LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
FACILITIES UPGRADE

JOB NO.: 227251.30
DATE: SEPTEMBER 2014
SCALE: AS NOTED
SHEET: 15 OF 16

E-100

V:\ANDOVER\Projects\227251 - Residuals Design\Drawings\Electrical\227251.30 - E-100.dwg, Sep 10, 2014, 1:08pm



INSTALL BRACKET TO WALL OF WETWELL. BRACKET SHALL BE MARINE GRADE STAINLESS STEEL.
 CHAIN SECURED TO BRACKET WITH MARINE GRADE STAINLESS STEEL SHACKLE.
 CHAIN SHALL BE MARINE GRADE STAINLESS STEEL.
 FLOAT & TRANSDUCER CABLES SECURED TO CHAIN WITH MARINE GRADE STAINLESS STEEL CLAMPS.
 SUGGESTED MOUNTING DETAIL ONLY. LOCATION OF MOUNTING BRACKET, CHAIN & CABLES MUST NOT INTERFERE WITH ANY OTHER EQUIPMENT IN WET WELL AND SHALL BE DETERMINED BY CONTRACTOR.

CONTRACTOR SHALL FURNISH & INSTALL FLOATS & TRANSDUCER.

CONTRACTOR SHALL FURNISH & INSTALL ALL FLOAT & TRANSDUCER MOUNTING HARDWARE.
 SUGGESTED FLOAT MOUNTING KITS: (OR EQUAL)
 MANUFACTURER: CONERY MFG.
 PART NUMBER: AKC-10-3
 PARTS INCLUDED:
 1 EACH - 15 LB PVC COATED YELLOW ANCHOR
 2 EACH - 1/4" STAINLESS STEEL SHACKLE
 3 EACH - STAINLESS STEEL FLOAT CLAMPS
 10 FT. OF 5/16" TYPE 316 STAINLESS STEEL CHAIN
 (ADDITIONAL CHAIN & MOUNTING BRACKET ORDERED SEPARATELY)

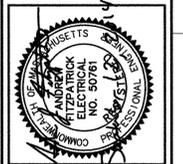
- GENERAL NOTES:**
1. ALL WORK SHALL CONFORM TO WIRING METHODS FOR THE SPECIFIC AREA AS INDICATED IN THE NATIONAL ELECTRICAL CODE.
 2. CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT ASSOCIATED WITH LEVEL CONTROLS AS SHOWN ON THIS DRAWING INCLUDING FLOATS, TRANSDUCER AND ALL HARDWARE TO PROPERLY SECURE & CONNECT THESE UNITS, I.E. JUNCTION BOXES, SPLICE POINTS, CONDUITS, FITTINGS, STAINLESS STEEL BRACKETS, CHAINS, CABLE CLAMPS, STAINLESS STEEL PIPE CLAMPS, ETC.
 3. DETAIL SHOWN FOR DIAGRAMMATIC PURPOSES ONLY. CONTRACTOR SHALL FIELD VERIFY SITE CONDITIONS PRIOR TO ANY WORK PERFORMED.
 4. WETWEL PENETRATIONS AND EQUIPMENT MOUNTING DETAILS ARE DIAGRAMMATIC. THE INTENT IS TO MAKE THE LEVEL TRANSDUCER & FLOATS EASILY ACCESSIBLE FOR SERVICING.
 5. ALL EQUIPMENT MOUNTING HARDWARE IN WETWELL SHALL BE TYPE 316 STAINLESS STEEL.

7 WETWELL LEVEL CONTROL EQUIPMENT INSTALLATION DETAIL
 E-015 SCALE: N.T.S.

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REV	ISSUED FOR BID	DESCRIPTION	DATE	CHECKED BY: A.F.	DESIGNED BY: GW	DRAWN BY: PO
			9/12/14			

ELECTRICAL DETAILS

LOWELL REGIONAL WATER UTILITY
 LOWELL, MASSACHUSETTS

RESIDUALS HANDLING
 FACILITIES UPGRADE

JOB NO.: 227251.30
 DATE: SEPTEMBER 2014
 SCALE: AS NOTED
 SHEET: 16 OF 16

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