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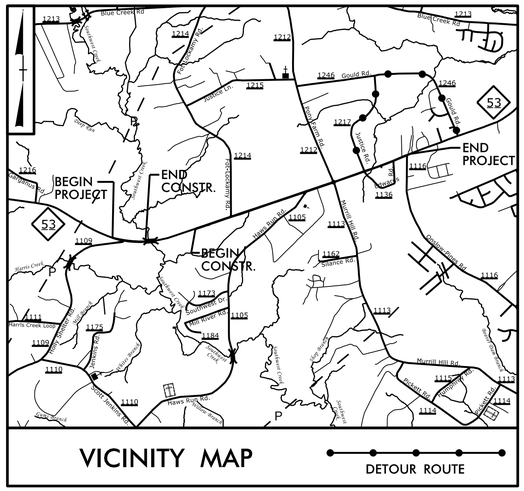
09/08/09

CONTRACT: C202176 TIP PROJECT: R-5023B, R-5023C, SF-4903F

See Sheet 1-A For Index of Sheets



STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

UTILITY CONSTRUCTION PLANS ONSLOW COUNTY

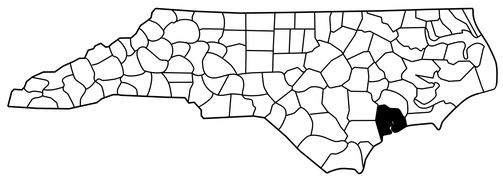
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5023B, R-5023C SF-4903F	UC-01	15

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZOEB
Docusigned by: Kevin C. Zoeb FOC1B0C37A6F4...
11/8/2016

LOCATION: *IMPROVEMENTS ALONG NC 53 FROM WEST OF SR 1109 (HOLLY SHELTER RD.) TO WEST OF BRIDGE OVER SOUTHWEST CREEK AND WEST OF SR 1214 (FOY-LOCKAMY RD.) TO EAST OF SR 1116 (ONSLOW PINES RD.)*

TYPE OF WORK: UTILITY CONSTRUCTION



GRAPHIC SCALES

30 15 0 30 60 PLANS

10 5 0 10 20 PROFILE (HORIZONTAL)

10 5 0 10 20 PROFILE (VERTICAL)

PROJECT LENGTH

MAP NO. 1 = 1.75 MILES (WBS NO. 41922.1.1
MAP NO. 2 = 0.15 MILES (WBS NO. 43463.11)

TOTAL = 1.90 MILES

INDEX OF SHEETS

UTILITY OWNERS ON PROJECT

WATER – ONSLOW WATER & SEWER AUTHORITY

SEWER – ONSLOW WATER & SEWER AUTHORITY

UTILITY DESIGN BY:
M A Engineering Consultants, Inc. NC License: F-0160
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221

NCDOT PROJECT ENGINEER:
DAVID LEONARD, P.E.

PREPARED FOR:
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION BRIDGE PROGRAM

$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-02

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

UTILITIES PLAN SHEET SYMBOLS

PROPOSED WATER SYMBOLS

- Water Line (Sized as Shown) — 12" WL
- 11¼ Degree Bend
- 22½ Degree Bend
- 45 Degree Bend
- 90 Degree Bend
- Plug
- Tee
- Cross
- Reducer
- Gate Valve — GV
- Butterfly Valve — BV
- Tapping Valve — TGV
- Line Stop — LS
- Line Stop with Bypass — LS/BP
- Blow Off — BO
- Fire Hydrant — PFH
- Relocate Fire Hydrant — RFH
- Remove Fire Hydrant — REM FH
- Water Meter — PWM
- Relocate Water Meter — RWM
- Remove Water Meter — REM WM
- Water Pump Station — PS(W)
- RPZ Backflow Preventer — PRPZ
- DCV Backflow Preventer — PBFP
- Relocate RPZ Backflow Preventer — RRPZ
- Relocate DCV Backflow Preventer — RBFP

PROPOSED SEWER SYMBOLS

- Gravity Sewer Line (Sized as Shown) — 12" SS
- Force Main Sewer Line (Sized as Shown) — 12" FSS
- Manhole (Sized per Note)
- Sewer Pump Station — PS(SS)

PROPOSED MISCELLANOUS UTILITIES SYMBOLS

- Power Pole
- Telephone Pole
- Joint Use Pole
- Telephone Pedestal — TEL PED
- Utility Line by Others (Type as Shown) — PROP O/H POW LINES
- Trenchless Installation — 12" TL INSTALL
- Encasement by Open Cut — 24" ENCAS BY OC
- Encasement — 24" ENCASEMENT
- Thrust Block
- Air Release Valve — AR
- Utility Vault — UV
- Concrete Pier — CP
- Steel Pier — SP
- Plan Note — NOTE
- Pay Item Note — PAY ITEM

EXISTING UTILITIES SYMBOLS

- Power Pole
- Telephone Pole
- Joint Use Pole
- Utility Pole
- Utility Pole with Base
- H-Frame Pole
- Power Transmission Line Tower
- Water Manhole
- Power Manhole
- Telephone Manhole
- Sanitary Sewer Manhole
- Hand Hole for Cable
- Power Transformer
- Telephone Pedestal
- CATV Pedestal
- Gas Valve
- Gas Meter
- Located Miscellaneous Utility Object
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.
- *Underground Power Line — P
- *Underground Telephone Cable — T
- *Underground Telephone Conduit — TC
- *Underground Fiber Optics Telephone Cable — T FO
- *Underground TV Cable — TV
- *Underground Fiber Optics TV Cable — TV FO
- *Underground Gas Pipeline — G
- Aboveground Gas Pipeline — A/G Gas
- *Underground Water Line — W
- Aboveground Water Line — A/G Water
- *Underground Gravity Sanitary Sewer Line — SS
- Aboveground Gravity Sanitary Sewer Line — A/G Sanitary Sewer
- *Underground SS Forced Main Line — FSS
- Underground Unknown Utility Line — ?UTL
- SUE Test Hole
- Water Meter
- Water Valve
- Fire Hydrant
- Sanitary Sewer Cleanout

*For Existing Utilities
- Utility Line Drawn from Record (Type as Shown)
- Designated Utility Line (Type as Shown)

REV: 2/1/2012

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-03

UTILITY DESIGN ENGINEER

MA Engineering CONSULTANTS, INC.
598 E. Chatham Street, Suite 137
Cary, N. C. 27511

UTILITY CONSTRUCTION

GENERAL NOTES:

1. THE PROPOSED UTILITY CONSTRUCTION SHALL MEET THE APPLICABLE REQUIREMENTS OF NC DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2012 AND THE ONWASA MANUAL FOR STANDARDS, SPECIFICATIONS AND DETAILS. IN THE EVENT OF A CONFLICT, THE MORE RESTRICTIVE REQUIREMENT SHALL GOVERN.

2. THE EXISTING UTILITIES BELONG TO

ONSLOW WATER & SEWER AUTHORITY (ONWASA)
CONTACT: CARL H. BAKER, PE
PHONE: 910-937-7521

3. ALL WATER LINES TO BE INSTALLED WITHIN COMPLIANCE OF THE RULES AND REGULATIONS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL AND NATURAL RESOURCES, DIVISION OF WATER RESOURCES - PUBLIC WATER SUPPLY SECTION. ALL SEWER LINES TO BE INSTALLED WITHIN COMPLIANCE OF THE RULES AND REGULATIONS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF WATER RESOURCES - WATER QUALITY SECTION. PERFORM ALL WORK IN ACCORDANCE WITH THE APPLICABLE PLUMBING CODES.

4. THE UTILITY OWNER OWNS THE EXISTING UTILITY FACILITIES AND WILL OWN THE NEW UTILITY FACILITIES AFTER ACCEPTANCE BY THE DEPARTMENT AND UTILITY OWNER. THE DEPARTMENT OWNS THE CONSTRUCTION CONTRACT AND HAS ADMINISTRATIVE AUTHORITY. COMMUNICATIONS AND DECISIONS BETWEEN THE CONTRACTOR AND UTILITY OWNER ARE NOT BINDING UPON THE DEPARTMENT OR THIS CONTRACT UNLESS AUTHORIZED BY THE ENGINEER. AGREEMENTS BETWEEN THE UTILITY OWNER AND CONTRACTOR FOR THE WORK THAT IS NOT PART OF THIS CONTRACT OR IS SECONDARY TO THIS CONTRACT ARE ALLOWED, BUT ARE NOT BINDING UPON THE DEPARTMENT.

5. PROVIDE ACCESS FOR THE DEPARTMENT PERSONNEL AND THE OWNER'S REPRESENTATIVES TO ALL PHASES OF CONSTRUCTION. NOTIFY DEPARTMENT PERSONNEL AND THE UTILITY OWNER TWO WEEKS PRIOR TO COMMENCEMENT OF ANY WORK AND ONE WEEK PRIOR TO SERVICE INTERRUPTION. KEEP UTILITY OWNERS' REPRESENTATIVES INFORMED OF WORK PROGRESS AND PROVIDE OPPROTUNITY FOR INSPECTION OF CONSTRUCTION AND TESTING.

6. THE PLANS DEPICT THE BEST AVAILABLE INFORMATION FOR THE LOCATION, SIZE, AND TYPE OF MATERIAL FOR ALL EXISTING UTILITIES. MAKE INVESTIGATIONS FOR DETERMINING THE EXACT LOCATION, SIZE, AND TYPE MATERIAL OF THE EXISTING FACILITIES AS NECESSARY FOR THE CONSTRUCTION OF THE PROPOSED UTILITIES AND FOR AVOIDING DAMAGE TO EXISTING FACILITIES. REPAIR ANY DAMAGE INCURRED TO EXISTING FACILITIES TO THE ORIGINAL OR BETTER CONDITION AT NO ADDITONAL COST TO THE DEPARTMENT.

7. MAKE FINAL CONNECTIONS OF THE NEW WORK TO THE EXISTING SYSTEM WHERE INDICATED ON THE PLANS, AS REQUIRED TO FIT THE ACTUAL CONDITIONS, OR AS DIRECTED.

8. MAKE CONNECTIONS BETWEEN EXISTING AND PROPOSED UTILITIES AT TIMES MOST CONVENIENT TO THE PUBLIC, WITHOUT ENDANGERING THE UTILITY SERVICE, AND IN ACCORDANCE WITH THE UTILITY OWNER'S REQUIREMENTS. MAKE CONNECTIONS ON WEEKENDS, AT NIGHT, AND ON HOLIDAYS IF NECESSARY.

9. ALL UTILITY MATERIALS SHALL BE APPROVED PRIOR TO DELIVERY TO THE PROJECT. SEE 1500-7, " SUBMITTALS AND RECORDS" IN SECTION 1500 OF THE STANDARD SPECIFICATIONS. THE UTILITY OWNER SHALL BE INCLUDED IN THE SUBMITTAL REVIEW AND ALLOWED 10 CALENDAR DAYS TO REVIEW THE SUBMITTALS FOR APPROVAL. MATERIALS SUPPLIED ON THE PROJECT THAT ARE NOT SPECIFICALLY IDENTIFIED ON THE PLANS OR IN NCDOT STANDARDS SHALL MEET THE STANDARD SPECIFICATIONS OF THE UTILITY OWNER.

10. CONTRACTOR SHALL NOTIFY NC ONE-CALL AT 1-800-632-4949 PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION ACTIVITY SUCH THAT ALL EXISTING UTILITIES CAN BE MARKED. FURTHERMORE, THE CONTRACTOR SHALL MAKE EVERY EFFORT TO CONTACT ANY UTILITY OWNERS THAT ARE NOT MEMBERS OF NC ONE-CALL AND HAVE FACILITIES RESIDING WITHIN THE PROJECT LIMITS.

PROJECT SPECIFIC NOTES:

1. ALL WATER LINE SHALL BE DUCTILE IRON RESTRAINED JOINT, PRESSURE CLASS 350.

2. ALL FORCE MAIN SEWER PIPE FOR OPEN TRENCH SHALL BE PVC C900 DR-18 RESTRAINED BELL JOINT.

2A. ALL FORCE MAIN SEWER PIPE INSTALLED WITHIN STEEL ENCASEMENT SHALL BE DUCTILE IRON RESTRAINED JOINT PIPE, SUCH AS TR-FLEX OR APPROVED EQUAL.

3. ALL FITTINGS SHALL BE DUCTILE IRON PRESSURE CLASS 350.

4. ALL FITTINGS (BENDS, TEES, CROSSES, REDUCERS, PLUGS, ETC.) SHALL BE ADEQUATELY RESTRAINED BY THE USE OF RESTRAINING GLANDS AND CAST IN PLACE CONCRETE THRUST RESTRAINTS AS DETAILED ON THESE PLANS AND IN THE SPECIAL PROVISIONS.

5. THE EXISTING 12" WATER LINE AND 4" FORCE MAIN SHALL BE RESTRAINED ON THE PORTION TO REMAIN. THE CONTRACTOR SHALL EXCAVATE THE EXISTING WATER OR FORCE MAIN LINE AND INSTALL THE BELL RESTRAINT CLAMPS AT EVERY BELL JOINT FOR THE DISTANCE NOTED IN THE TABLE ON SHEET UC-3C.

6. EXISTING FORCE MAIN SEWER LINE TO BE ABANDONED SHALL BE CAPPED AND FILLED WITH FLOWABLE FILL. EXISTING WATER LINE SHALL BE REMOVED FOR DOWN & UNDER RELOCATIONS, OTHERWISE CAPPED AND FILLED WITH FLOWABLE FILL.

7. WATER SERVICE LINES TO THE WATER METER SHALL BE ¾" P.E. SDR-9 AS PER DETAIL ON SHEET UC-3B. CONTRACTOR SHALL BE RESPONSIBLE FOR RECONNECTING THE RELOCATED WATER METERS TO THE EXISTING SERVICE LINES ON CUSTOMER PROPERTY AND MINIMIZE SERVICE DISRUPTION DURING THE TIE-IN PROCESS.

8. CONTRACTOR SHALL NOTIFY THE ENGINEER AND OWNER A MINIMUM OF 7 DAYS IN ADVANCE OF A PLANNED SERVICE INTERRUPTION.

PROJECT QUANTITIES:

Job Name: R-5023B **Date: 11/15/2016**

Item Number	Description	Quantity	
Water			
5326200000-E	12" WATER LINE	178	LF
5558000000-E	12" VALVE	2	EA
5649000000-E	RECONNECT WATER METER	8	EA
5672000000-E	RELOCATE FIRE HYDRANT	2	EA
5804000000-E	ABANDON 12" UTILITY PIPE	153	LF
Sewer			
5835000000-E	8" ENCASEMENT PIPE	42	LF
5871500000-E	TRENCHLESS INSTALLATION OF 8" IN SOIL	21	LF
5871510000-E	TRENCHLESS INSTALLATION OF 8" NOT IN SOIL	21	LF

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-3A

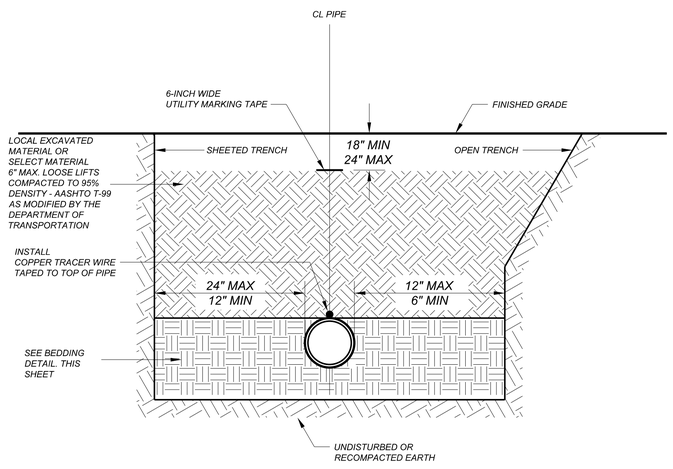
UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZDEB

DocuSigned by: Kevin C. Zdeb F0C1B5D7A86B4...

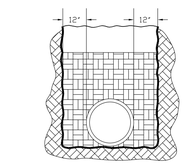
11/8/2016

M A Engineering Consultants, Inc.
598 East Chatham Street - Suite 137
Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221
NC License: F-0160

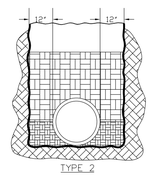


NOTES:
1. ALL SHORING & TRENCHING SHALL COMPLY WITH OSHA SAFETY STANDARDS FOR THE CONSTRUCTION INDUSTRY.
2. BELL HOLES NOT SHOWN.
3. ALL BACKFILL MATERIAL SHALL BE FREE OF ROCKS, FOREIGN MATERIAL, AND FROZEN EARTH.

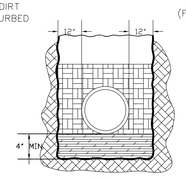
GENERAL TRENCH DETAIL
NTS



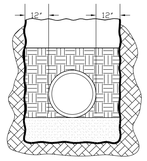
TYPE 1
(NOTE 1)
FLAT BOTTOM TRENCH WITH LOOSE DIRT
(FLAT BOTTOM IS DEFINED AS UNDISTURBED EARTH)



TYPE 2
FLAT BOTTOM TRENCH WITH BACKFILL LIGHTLY CONSOLIDATED TO CENTERLINE OF PIPE
(FLAT BOTTOM IS DEFINED AS UNDISTURBED EARTH)



TYPE 3
PIPE BEDDED IN 4" MINIMUM LOOSE SOIL WITH BACKFILL LIGHTLY CONSOLIDATED TO TOP OF PIPE
(LOOSE SOIL IS DEFINED AS NATIVE SOIL EXCAVATED FROM THE TRENCH, FREE OF ROCK, ORGANIC MATERIAL, FOREIGN MATERIALS AND FROZEN EARTH.)



TYPE 4
PIPE BEDDED IN SAND, GRAVEL, OR CRUSHED STONE TO A DEPTH OF 1/8 PIPE DIAMETER, 4" MINIMUM WITH BACKFILL COMPACTED TO TOP OF PIPE.
(APPROXIMATELY 80 PERCENT STANDARD PROCTOR, AASHTO T-99)

TYPE 5
PIPE BEDDED TO IT'S CENTERLINE IN COMPACTED GRANULAR MATERIAL, 4" MINIMUM UNDER PIPE. COMPACTED GRANULAR OR SELECT MATERIAL TO TOP OF PIPE. (APPROXIMATELY 90 PERCENT STANDARD PROCTOR, AASTO T-99)
(SELECT MATERIAL IS DEFINED AS NATIVE SOIL EXCAVATED FROM THE TRENCH, FREE OF ROCKS, ORGANIC MATERIAL, FOREIGN MATERIALS AND FROZEN EARTH)

NOTES:
1. FOR NORMAL PIPE SIZES 14 INCH AND LARGER, CONSIDERATION SHOULD BE GIVEN TO THE USE OF LAYING CONDITIONS OTHER THAN TYPE 1.
2. CONSIDERATION OF THE PIPE-ZONE EMBEDMENT CONDITIONS INCLUDED IN THIS FIGURE MAY BE INFLUENCE BY FACTORS OTHER THAN PIPE STRENGTH. FOR ADDITIONAL INFORMATION ON PIPE BEDDING AND BACKFILL, SEE ANSI/AWWA C600.

PIPE BEDDING DETAIL

MAXIMUM TRENCH WIDTH AT TOP OF PIPE

NOMINAL PIPE SIZE (INCHES)	TRENCH WIDTH (INCHES)	NOMINAL PIPE SIZE (INCHES)	TRENCH WIDTH (INCHES)
4	28	20	44
6	30	24	48
8	32	30	54
10	34	36	60
12	36	42	66
14	38	48	72
16	40	54	78
18	42		

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PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-3B

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZDEB

DocuSigned by: Kevin C. Zdeb F0C1B5C37A66451...

11/8/2016

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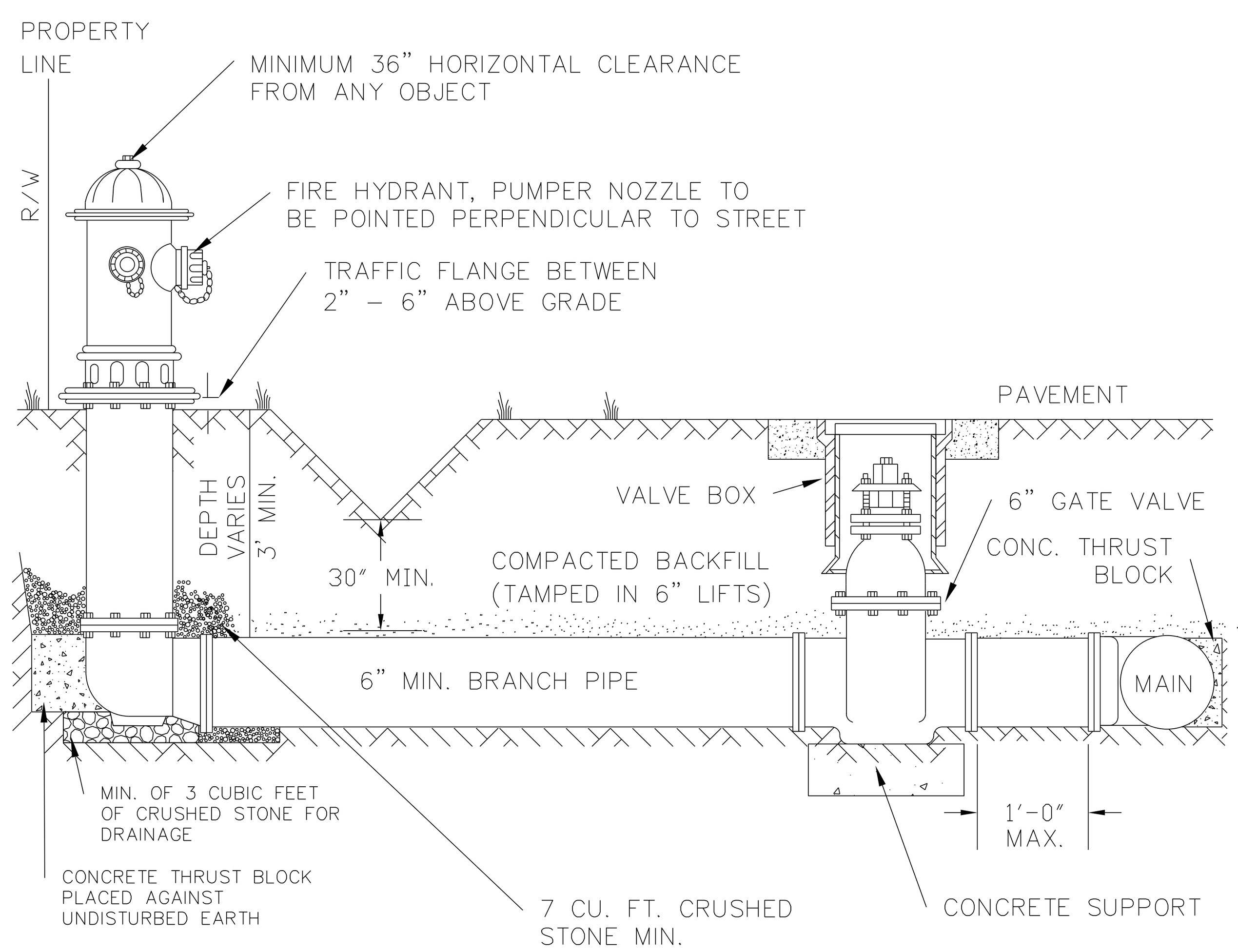
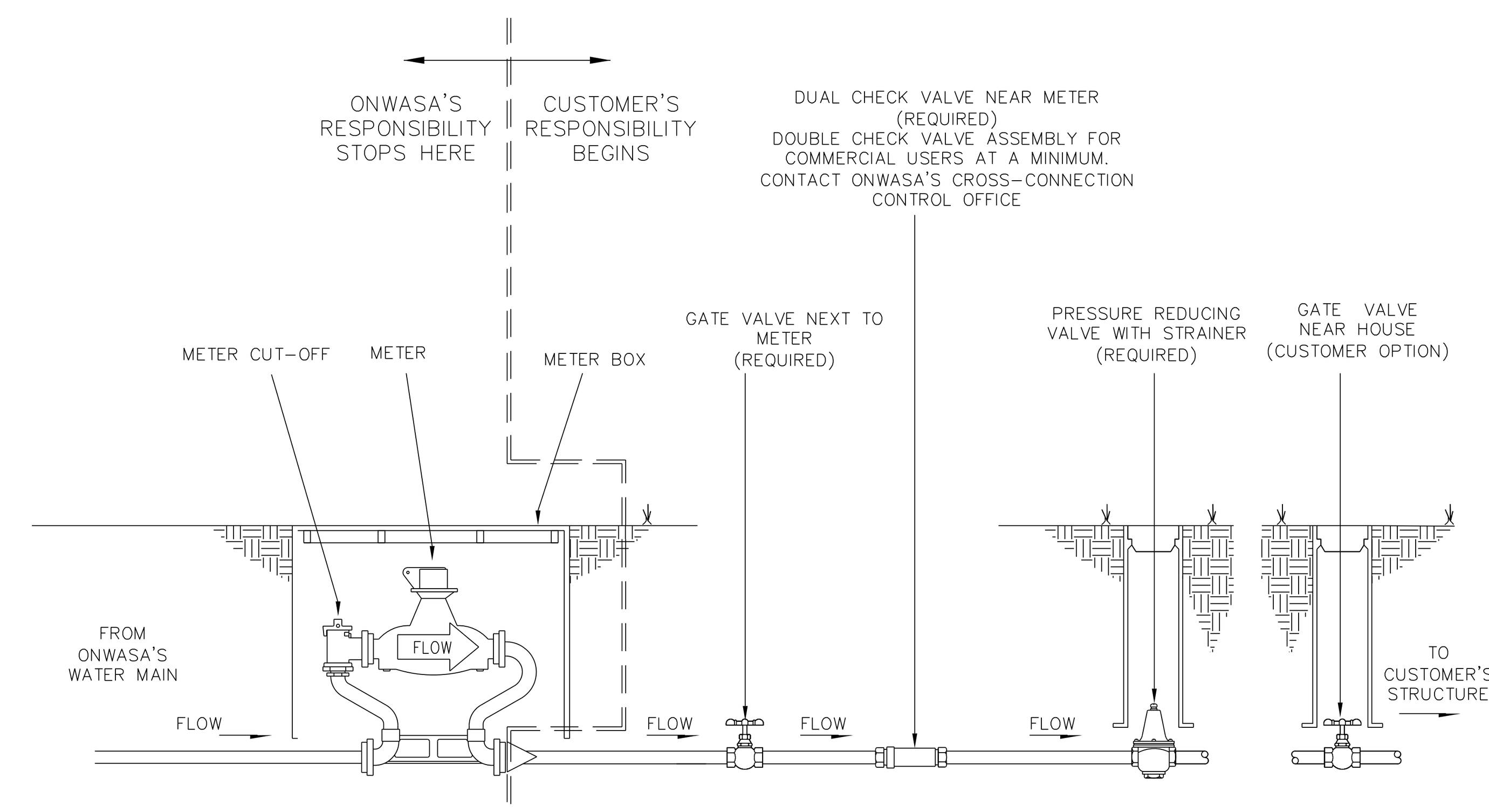
598 East Chatham Street - Suite 137
Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221
NC License: F-0160



NOTES:
1. FIRE HYDRANT MANUFACTURER SHALL BE AS REQUIRED BY PROJECT SPECIFICATIONS.
2. FIRE HYDRANT SHALL BE INSTALLED USING HYDRANT TEE.
3. BRANCH PIPE SHALL BE DUCTILE IRON.
4. FIRE HYDRANTS WILL BE INSTALLED IN TRUE VERTICAL POSITION.
5. ALL JOINTS ON FIRE HYDRANT ASSEMBLIES SHALL BE RESTRAINED.
6. ALL FIRE HYDRANTS SHALL BE LOCATED WITHIN DEDICATED STREET RIGHT-OF-WAY OR A 20-FOOT PUBLICLY DEDICATED PERMANENT UTILITY EASEMENT TO ONWASA.
7. INSTALL BOLLARD GUARD POST AS PER DRAWINGS OR CONDITIONS MANDATE.

ANYTIME SITE WORK, CONSTRUCTION, ROAD WORK, OR ANY OTHER WORK CHANGES THE GRADE OF THE FIRE HYDRANT, THE CONTRACTOR IS RESPONSIBLE FOR ADJUSTING THE FIRE HYDRANT TO STAY WITHIN COMPLIANCE.

FIRE HYDRANT DETAIL



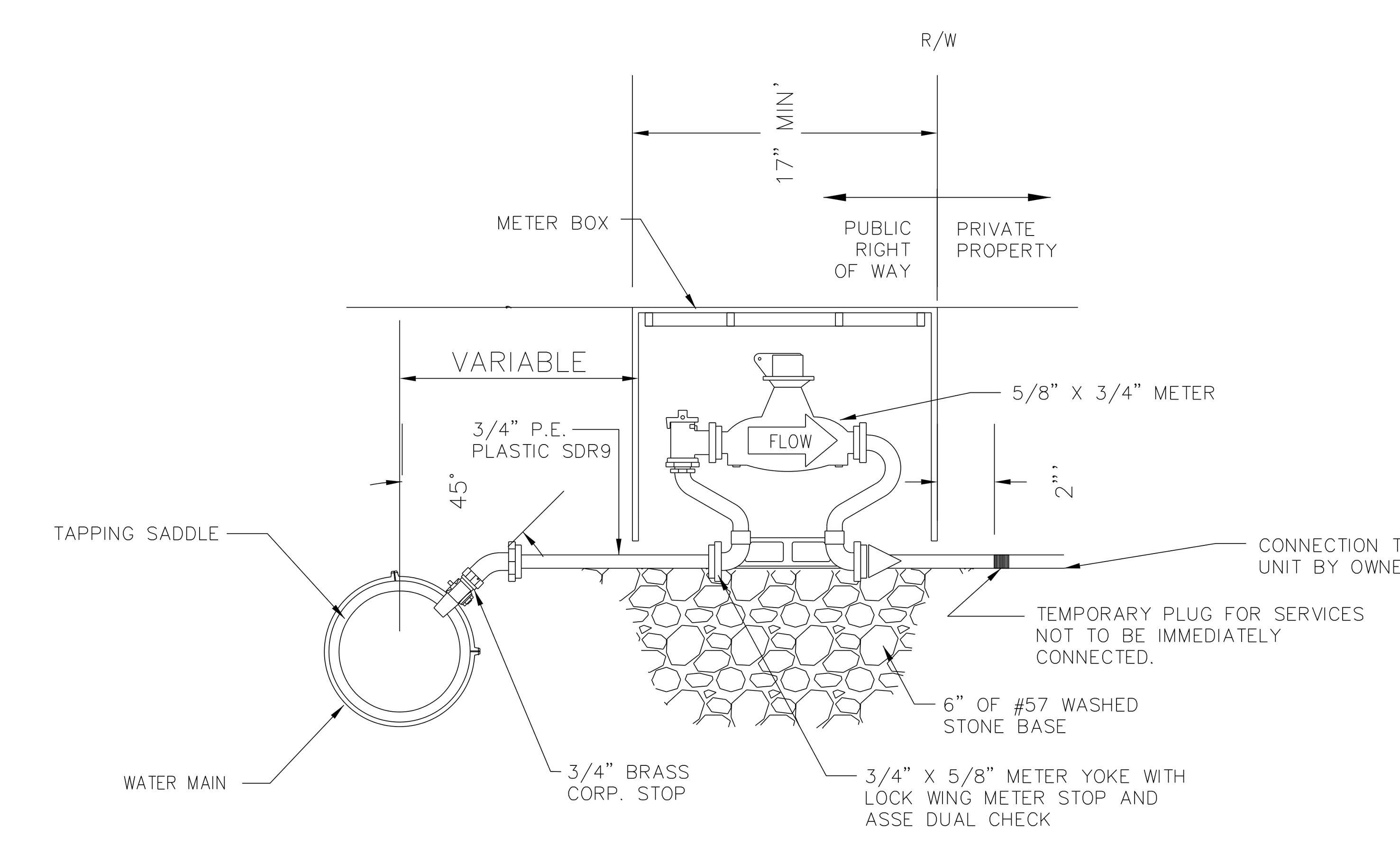
North Carolina Plumbing Code Section 608 requires a gate valve, backflow prevention and a pressure reducing valve on all connections with the Public Water Supply.

1. A gate valve, backflow device in the form of a Dual Check Valve for residential (Double Check Valve Assemblies for commercial at a minimum), and a pressure reducing valve MUST be installed directly behind the meter (see diagram above).
2. An additional gate valve located near the house is recommended, but not required.
3. All materials shall be pressure rated to one hundred-fifty (150 psi).
4. The water meter will be locked upon installation. Please contact the Onslow Water and Sewer Authority (ONWASA) twenty-four (24) hours in advance to schedule the inspection of the valves.
5. All valves MUST be installed prior to unlocking the meter.

Meter Placement Note:

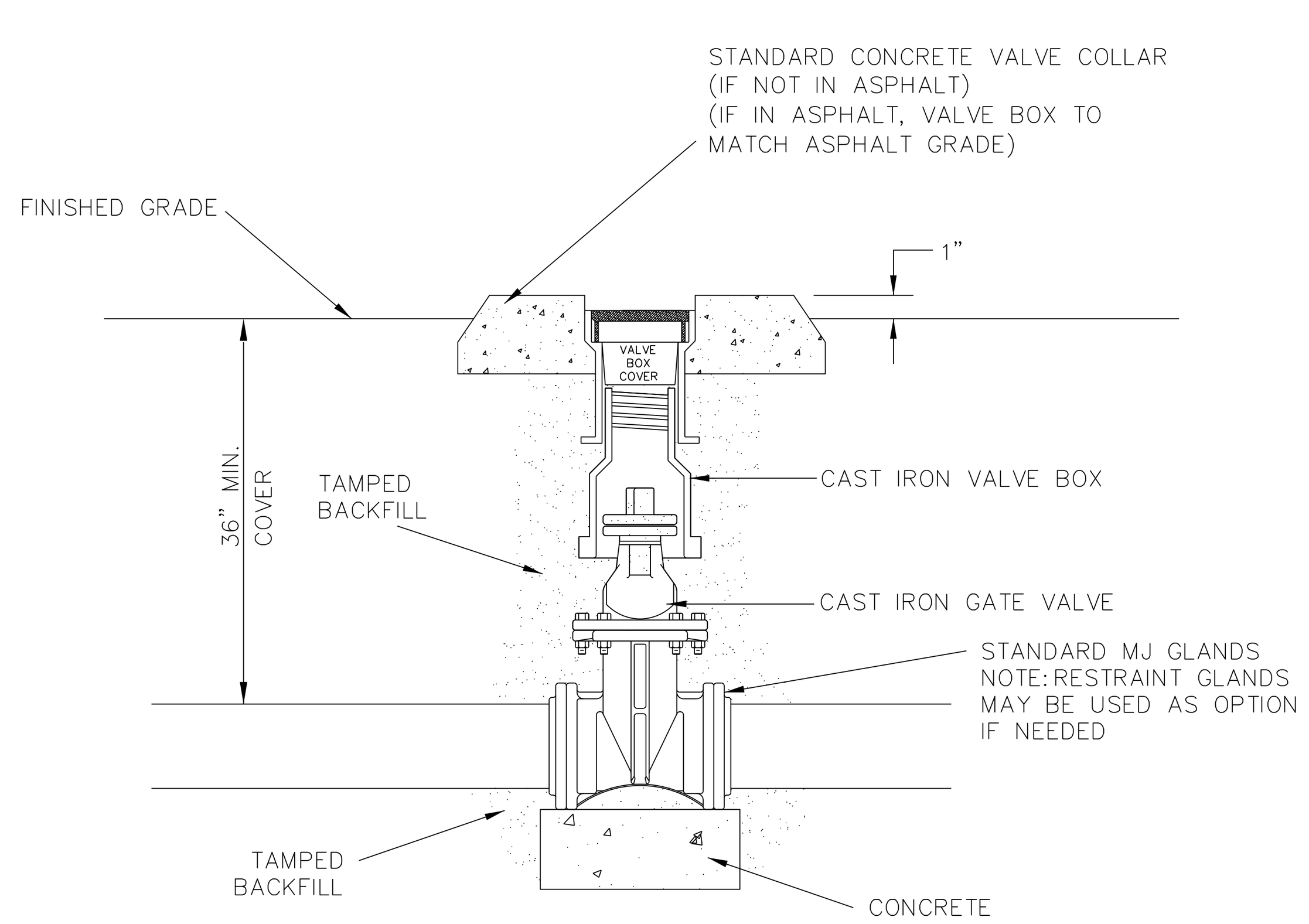
Place the blue flag approximately thirty (30) feet from the center of the road Utility Right of Way for proper placement of ONWASA's water meter. All efforts will be made to install the meter where it is marked; however, ONWASA reserves the right to place the meter in the most feasible location to all parties involved. If the blue flag is not placed in a feasible location, it may result in a delay of installation.

METER INSTALLATION DETAIL



NOTE: METER BOX TO BE SUPPORTED ON BRICK OR BLOCK

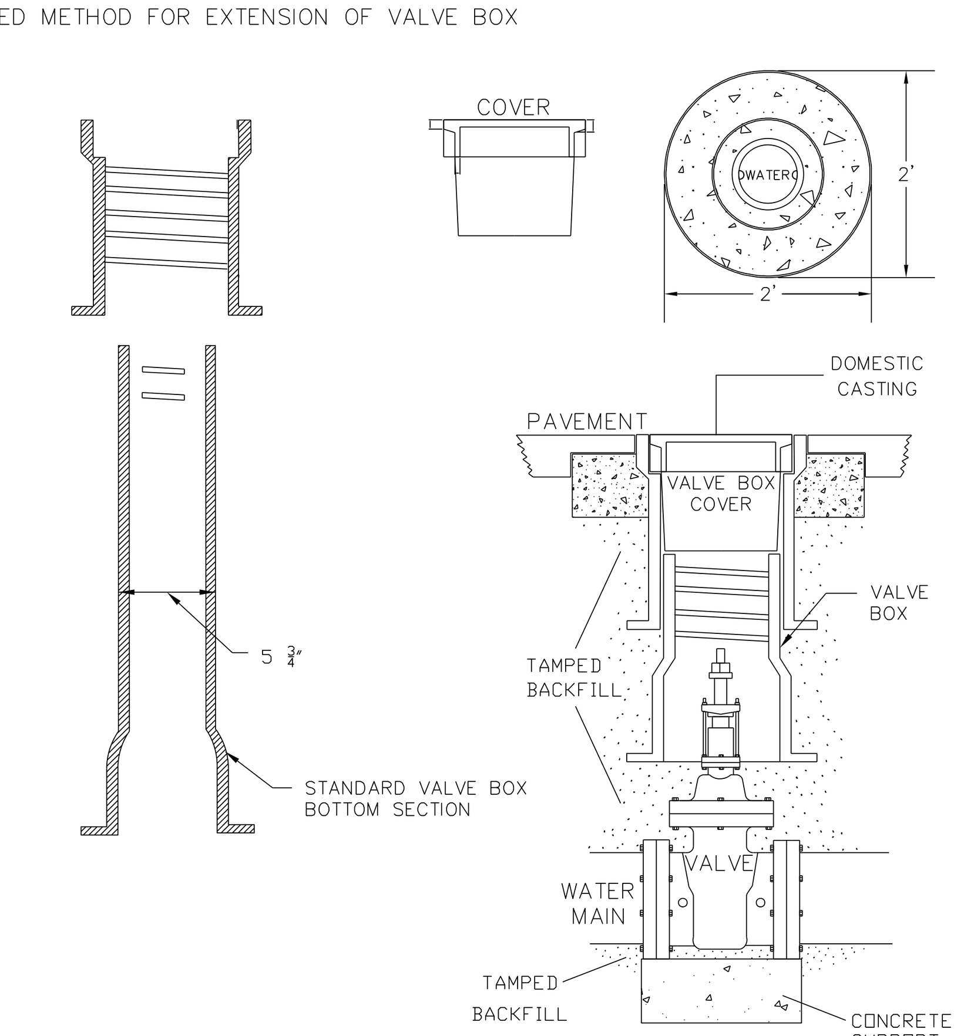
WATER METER DETAIL



IN LINE VALVE DETAIL

NOTE: CONCRETE VALVE COLLAR REQUIRED ON ALL VALVES.

APPROVED METHOD FOR EXTENSION OF VALVE BOX



VALVE BOX DETAIL

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RESTRAINED JOINT TABLE FOR 4", 6" & 12" PVC PIPE

FITTING	REQUIRED RESTRAINED LENGTH (FT) OF PVC PIPE BY DEPTH OF COVER							
HORIZONTAL BENDS	**3 FT**	**4 FT**	**5 FT**	**6 FT**	**7 FT**	**8 FT**	**9 FT**	**10 FT**
4 INCH DIA - 11.25 DEG	2	2	2	1	1	1	1	1
4 INCH DIA - 22.5 DEG	4	3	3	3	2	2	2	2
4 INCH DIA - 45 DEG	7	6	5	5	4	4	4	3
4 INCH DIA - 90 DEG	16	14	12	11	10	9	8	7
6 INCH DIA - 11.25 DEG	3	2	2	2	2	2	2	1
6 INCH DIA - 22.5 DEG	5	4	4	3	3	3	3	2
6 INCH DIA - 45 DEG	10	8	7	6	6	5	5	5
6 INCH DIA - 90 DEG	22	19	17	15	13	12	11	10
12 INCH DIA - 11.25 DEG	5	4	3	3	3	3	2	2
12 INCH DIA - 22.5 DEG	9	7	7	6	5	5	4	4
12 INCH DIA - 45 DEG	17	15	13	12	10	8	9	8
12 INCH DIA - 90 DEG	41	35	31	27	25	22	20	19
VERTICAL DOWN BENDS	**3 FT**	**4 FT**	**5 FT**	**6 FT**	**7 FT**	**8 FT**	**9 FT**	**10 FT**
4 INCH DIA - 11.25 DEG	6	5	4	4	3	3	3	3
4 INCH DIA - 22.5 DEG	12	10	8	7	6	6	5	5
4 INCH DIA - 45 DEG	24	20	17	15	13	12	11	10
6 INCH DIA - 11.25 DEG	8	7	6	5	5	4	4	4
6 INCH DIA - 22.5 DEG	17	14	12	10	9	8	7	7
6 INCH DIA - 45 DEG	34	28	24	21	18	16	15	14
12 INCH DIA - 11.25 DEG	15	13	11	10	8	8	7	6
12 INCH DIA - 22.5 DEG	31	25	21	19	17	15	14	12
12 INCH DIA - 45 DEG	63	52	44	38	34	31	28	25
VERTICAL UP BENDS	**3 FT**	**4 FT**	**5 FT**	**6 FT**	**7 FT**	**8 FT**	**9 FT**	**10 FT**
4 INCH DIA - 11.25 DEG	2	2	2	1	1	1	1	1
4 INCH DIA - 22.5 DEG	4	3	3	3	2	2	2	2
4 INCH DIA - 45 DEG	7	6	5	5	4	4	4	3
6 INCH DIA - 11.25 DEG	3	2	2	2	2	2	2	1
6 INCH DIA - 22.5 DEG	5	4	4	3	3	3	3	2
6 INCH DIA - 45 DEG	10	8	7	6	6	5	5	5
12 INCH DIA - 11.25 DEG	5	4	3	3	3	3	2	2
12 INCH DIA - 22.5 DEG	9	7	7	6	5	5	4	4
12 INCH DIA - 45 DEG	17	15	13	12	10	10	9	8
DEAD ENDS / VALVES	**3 FT**	**4 FT**	**5 FT**	**6 FT**	**7 FT**	**8 FT**	**9 FT**	**10 FT**
4 INCH DIA	45	38	33	29	27	24	22	20
6 INCH DIA	63	54	47	42	37	34	31	29
12 INCH DIA	118	101	88	79	71	64	59	54

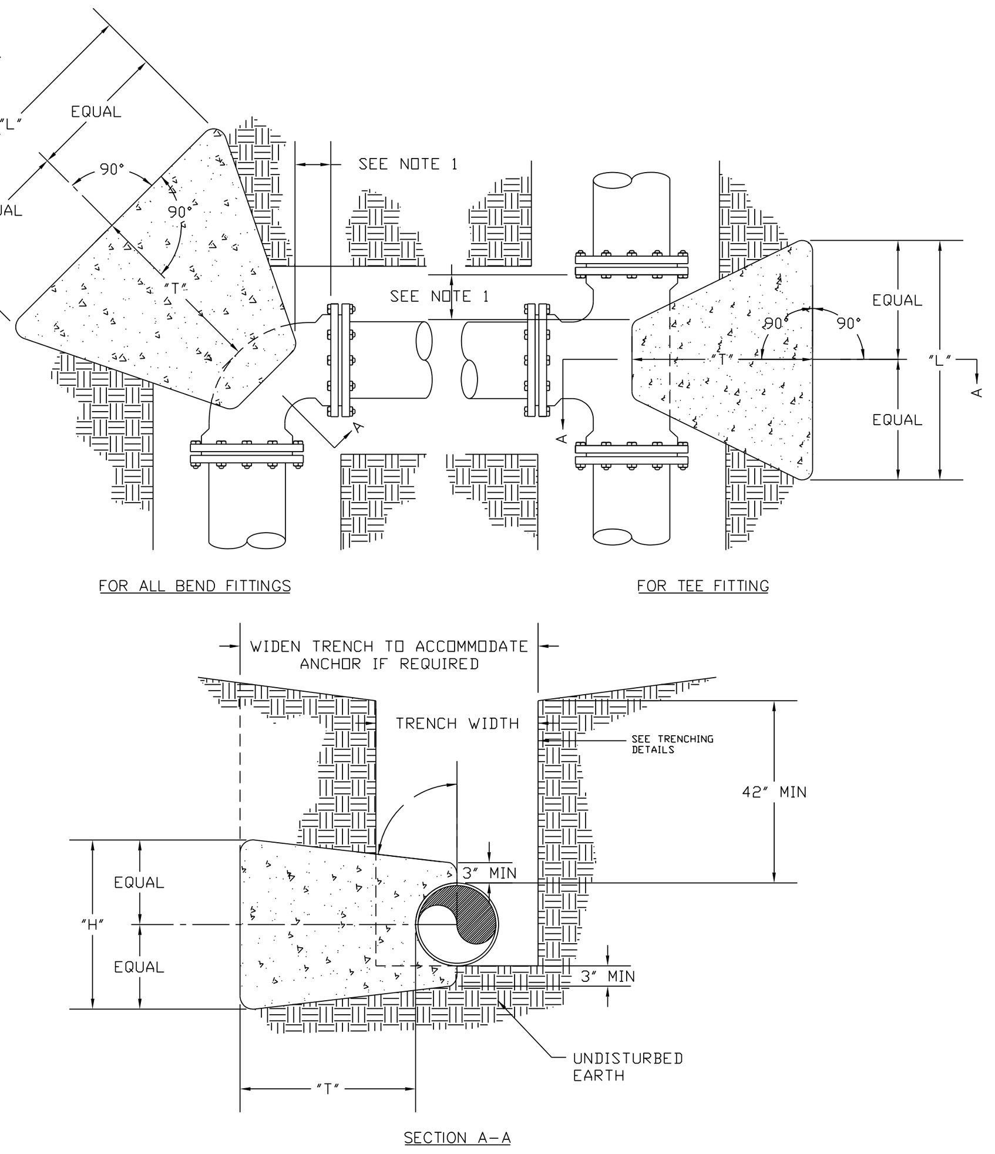
ASSUMPTIONS

LAYING CONDITION = TYPE 4 DESIGN PRESSURE = 200 PSI (TEST PRESSURE)

SOIL DESIGNATION = GC = COHESIVE-GRANULAR SAFETY FACTOR = 1.5

NOTES

1. RL = RUN LENGTH BETWEEN FIRST JOINTS OF PIPE ALONG THE RUN LINE OF TEE.
2. RESTRAINED LENGTH IS MEASURED AS FOLLOWS:
   A. HORIZONTAL/VERTICAL BENDS: ALONG EACH SIDE OF BEND.
   B. HORIZONTAL/VERTICAL BENDS - OFFSET: ALONG THE OUTER SIDE OF EACH BEND. ALL PIPE BETWEEN THE TWO BENDS SHALL BE RESTRAINED JOINT.
   C. DEAD ENDS: ALONG PIPE FROM THE PLUG.
   D. VALVES: ALONG THE PIPE IN EACH DIRECTION FROM THE VALVE .
   E. REDUCERS: ALONG THE LARGER PIPE.
   F. TEES: ALONG THE BRANCH PIPE FROM THE TEE .
3. WHEN IT IS NOT POSSIBLE TO INSTALL THE RESTRAINED LENGTHS AS NOTED BY THIS TABLE, CONTRACTOR SHALL INSTALL THE APPROPRIATE CONCRETE THRUST RESTRAINTS AS PER THE DETAILS HEREIN.



NOTES:

1. CONCRETE BLOCKING IS TO BE FORMED TO ENSURE ACCESSIBILITY TO FITTINGS AND POURED AGAINST UNDISTURBED EARTH.
2. ALL FITTINGS SHALL BE WRAPPED IN POLYETHYLENE TO PREVENT CONCRETE FROM CONTACTING FITTINGS, BOLTS, OR ENDS OF MECHANICAL JOINT BENDS.
3. CONCRETE TO BE MINIMUM 3,000 PSI @ 28 DAYS.
4. WHEN SACKRETE IS TO BE USED, IT SHALL BE PROPERLY MIXED PER MANUFACTURER SPECIFICATIONS.
5. FOR REQUIRED DIMENSIONS, SEE THRUST BLOCKING DETAIL 2

THRUST BLOCKING DETAIL 1

TEST PRESSURE = 150 PSI

PIPE SIZE	TYPE FITTING	DIMENSIONS (FT) "L"	"H"	"T"	VOLUME CONCRETE CU. YD.
<4 INCHES	11 1/4°	----	----	----	----
	22 1/2°	1.00	1.00	1.50	0.06
	45°	1.00	1.00	1.50	0.06
	90°	1.00	1.00	2.50	0.09
	TEE	1.00	1.00	2.00	0.07
4 INCHES	11 1/4°	1.00	1.00	2.50	0.09
	22 1/2°	1.00	1.00	2.50	0.09
	45°	1.00	1.00	2.50	0.09
	90°	1.50	1.50	2.50	0.15
	TEE	1.50	1.50	2.00	0.12
6 INCHES	11 1/4°	1.50	1.50	2.50	0.15
	22 1/2°	1.50	1.50	2.50	0.15
	45°	1.50	1.50	2.50	0.15
	90°	2.00	2.00	3.00	0.28
	TEE	2.00	2.00	2.50	0.23
8 INCHES	11 1/4°	2.00	2.00	2.50	0.23
	22 1/2°	2.00	2.00	2.50	0.23
	45°	2.00	2.00	2.75	0.25
	90°	3.00	2.00	3.00	0.39
	TEE	3.00	2.00	2.50	0.32
12 INCHES	11 1/4°	2.00	2.00	3.00	0.28
	22 1/2°	2.00	2.00	3.00	0.28
	45°	3.00	2.50	3.00	0.47
	90°	4.50	3.00	3.50	0.94
	TEE	4.50	3.00	3.00	0.81
16 INCHES	11 1/4°	2.00	2.00	3.00	0.28
	22 1/2°	3.00	2.00	3.00	0.39
	45°	4.00	3.00	3.50	0.84
	90°	6.50	3.50	3.50	1.54
	TEE	6.50	3.50	3.00	1.32

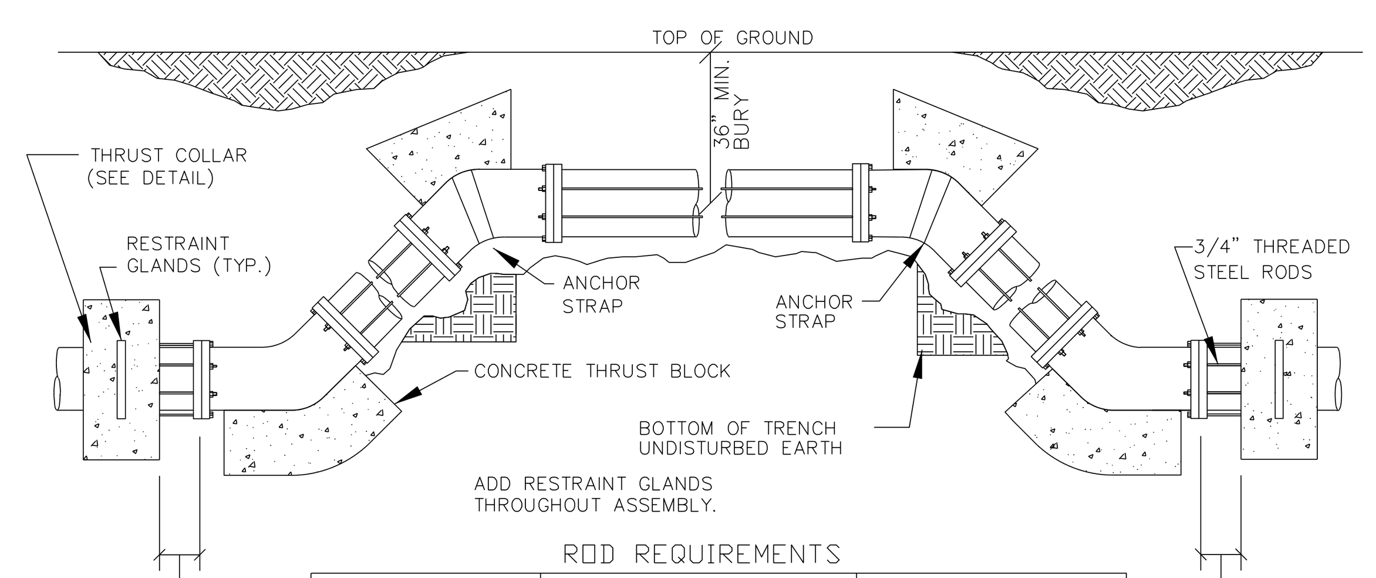
TEST PRESSURE = 200 PSI

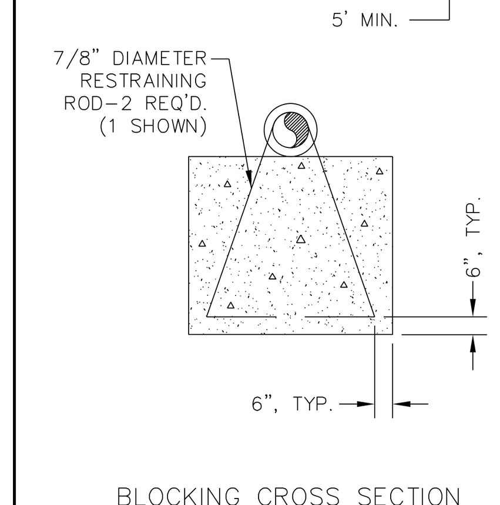
PIPE SIZE	TYPE FITTING	DIMENSIONS (FT) "L"	"H"	"T"	VOLUME CONCRETE CU. YD.
<4 INCHES	11 1/4°	1.00	1.00	1.00	0.04
	22 1/2°	1.00	1.00	1.50	0.06
	45°	1.00	1.00	1.50	0.06
	90°	1.50	1.50	2.50	0.15
	TEE	1.50	1.50	2.00	0.12
4 INCHES	11 1/4°	1.00	1.00	2.50	0.09
	22 1/2°	1.00	1.00	2.50	0.09
	45°	1.50	1.50	2.50	0.15
	90°	1.50	1.50	2.50	0.15
	TEE	1.50	1.50	2.00	0.12
6 INCHES	11 1/4°	1.50	1.50	2.50	0.15
	22 1/2°	1.50	1.50	2.50	0.15
	45°	1.50	1.50	2.50	0.15
	90°	2.50	2.00	3.00	0.33
	TEE	2.50	2.00	2.50	0.28
8 INCHES	11 1/4°	2.00	2.00	2.50	0.23
	22 1/2°	2.00	2.00	2.50	0.23
	45°	2.00	2.00	2.75	0.23
	90°	4.00	2.00	3.00	0.50
	TEE	4.00	2.00	2.50	0.42
12 INCHES	11 1/4°	2.00	2.00	3.00	0.28
	22 1/2°	3.00	2.00	3.00	0.39
	45°	4.00	2.50	3.00	0.61
	90°	5.50	3.00	3.50	1.13
	TEE	5.50	3.00	3.00	0.97
16 INCHES	11 1/4°	2.00	2.00	3.00	0.28
	22 1/2°	4.00	2.00	3.00	0.50
	45°	5.50	3.00	3.50	1.13
	90°	7.50	4.00	3.50	2.01
	TEE	7.50	4.00	3.00	1.72

CHART NOTES:

1. IF BLOCKING EXCAVATION IS IN LIGHTLY COMPACTED FILL AREAS, OR IN AREAS WHERE BOULDERS OR STUMPS HAVE BEEN REMOVED, BLOCKING SIZE MUST BE RE-SIZED FOR THE SPECIFIC LOCATION/CIRCUMSTANCE BY A NC LICENSED PROFESSIONAL ENGINEER.
2. BLOCKING SIZES SHOWN IN THESE TABLES ASSUME THE FOLLOWING:
   a. BLOCKING IS CONSTRUCTED IN RESIDUAL SOILS AS SHOWN IN DETAIL
   b. SOIL BEARING PRESSURE = 2000 PSF
   c. VELOCITY OF FLOW = 15 FPS
3. THIS DETAIL NOT APPLICABLE TO REDUCING BENDS.
4. NEITHER THE WEIGHT OF THE CONCRETE BLOCKING NOR FRICTION BETWEEN CONCRETE BLOCKING AND SOIL WAS ADDED INTO BLOCKING SIZES COMPUTATION. THEREFORE, BLOCKING SIZE IS CONSERVATIVE.

THRUST BLOCKING DETAIL 2





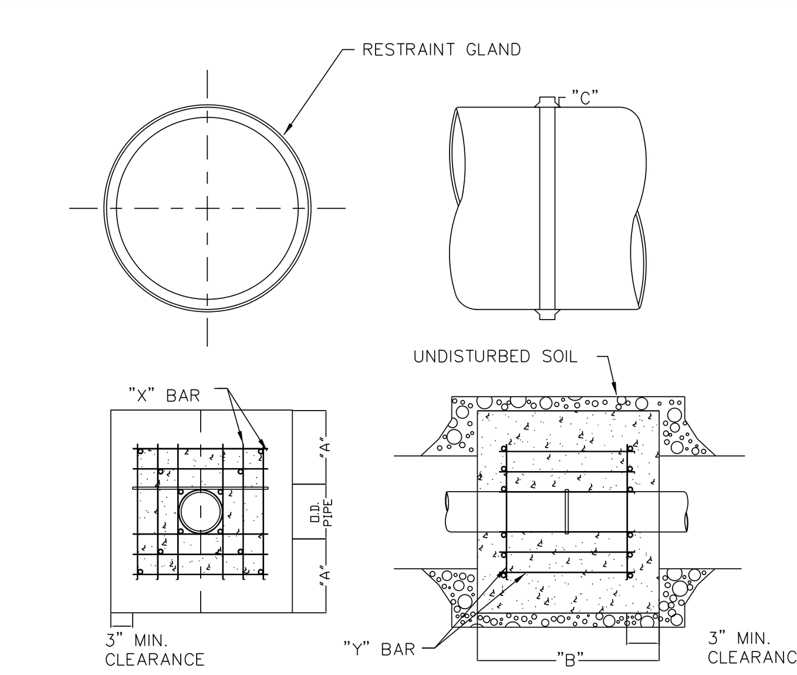
ROD REQUIREMENTS

SIZE OF BEND	STATIC THRUST IN POUNDS	NO. OF RODS REQUIRED
6"	4,328	4
8"	7,694	4
12"	17,312	4
16"	30,779	8
24"	69,252	8

GENERAL NOTES:

1. ALL FITTINGS SHALL BE WRAPPED IN POLYETHYLENE TO PREVENT CONCRETE FROM CONTACTING FITTINGS, BOLTS, OR ENDS OF MECHANICAL JOINT BENDS.
2. EACH FITTING SHALL BE SECURED BY TWO FORMS OF RESTRAINT. RESTRAINING GLANDS AND CONCRETE THRUST BLOCKING ARE PREFERRED. WEDGE-ACTION RESTRAINT GLANDS (I.E. MEGALUGS) ARE APPROVED ONLY FOR USE ON DUCTILE IRON PIPE. FULL-CIRCUMFERENTIAL PIPE RESTRAINT GLANDS (I.E. GRIP RINGS) MAY BE USED ON PVC OR DUCTILE IRON PIPE. ALL RESTRAINT GLANDS SHALL BE SPECIFICALLY DESIGNED FOR USE ON THE TYPE OF PIPE FOR WHICH THEY ARE BEING INSTALLED. OTHER FORMS OF RESTRAINT SUCH AS THREADED ROD, BELL RESTRAINT HARNESSES, ETC. MAY BE APPROVED BY ONWASA ON A CASE-BY-CASE BASIS.
3. IF APPROVED FOR USE BY ONWASA, STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED.
4. MUST USE DUCTILE IRON EYE BOLTS WHERE NECESSARY.

THRUST BLOCKING DETAIL 3



REINFORCING REQUIREMENTS

I.D. PIPE	REBAR SIZE	"X" BAR LENGTH	"X" BAR WEIGHT	"Y" BAR LENGTH	"Y" BAR WEIGHT	NO. REQUIRED
6" - 36"	#5	2'-2"+ O.D. PIPE	1.043 LBS/FT	1'-1"	1.1 LBS. EACH	X-24, Y-12
48" & greater	#6	3'-0"+ O.D. PIPE	1.502 LBS/FT	1'-3"	1.9 LBS. EACH	X-24, Y-12

THRUST COLLAR, AND THRUST SCHEDULE

I.D. PIPE	"A"	"B"	"C-6"-16", 20"-24", 30"-36", 48"
6" - 36"	1'-4"	1'-7"	2" 3" 4"
48" & greater	1'-8"	1'-9"	6"

NOTES:

1. CONCRETE SHALL BE 3000 PSI AND TRANSIT MIXED.
2. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
3. TRENCH BOTTOM WIDTH IN VICINITY OF THRUST BLOCK INSTALLATION SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD EMBEDMENT DETAIL.
4. BACKFILL TAMPED IN 6" LIFTS PER STANDARD EMBEDMENT DETAIL.

THRUST BLOCKING DETAIL 4

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-3C

UTILITY DESIGN ENGINEER

DocuSigned by: Kevin C. Zoeb

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 027661 KEVIN C. ZOEB

11/8/2016

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8/10/2016
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PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-3D

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZOEB

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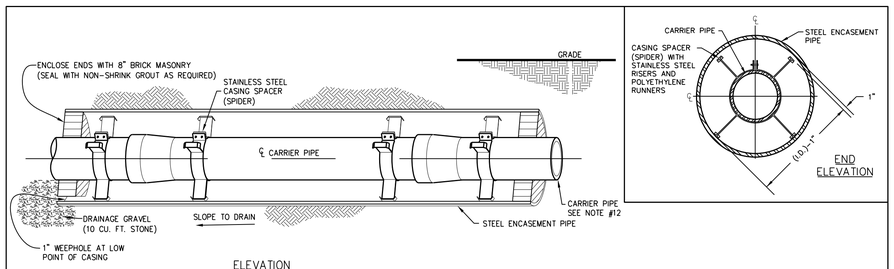
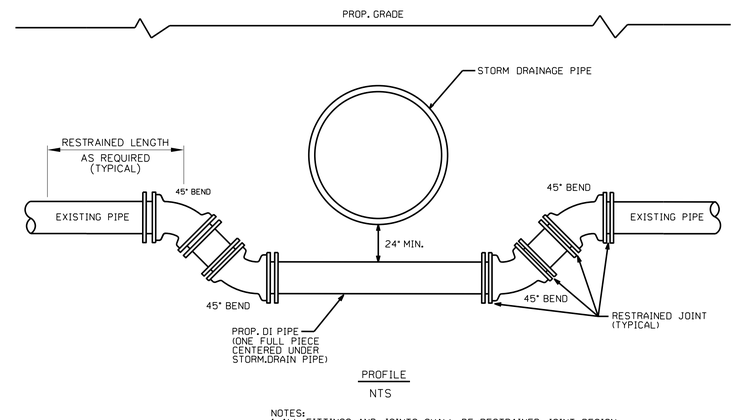


NOTES:

1. CASING SPACERS "SPIDERS" SHALL BE USED FOR SUPPORT OF THE CARRIER PIPE WITHIN THE STEEL ENCASEMENT PIPE. SPIDERS SHALL BE CENTERED AND RESTRAINED. SPIDERS SHALL HAVE A STAINLESS STEEL SHEE AND STAINLESS STEEL RISERS WITH POLYETHYLENE RUNNERS. MANUFACTURED BY CASCADE WATERWORKS MFG. COMPANY, OR APPROVED EQUAL.
2. A MINIMUM SPACING OF 2 SPIDERS PER JOINT OF CARRIER PIPE SHALL BE REQUIRED IN ORDER TO PREVENT SAGGING OF CARRIER PIPE. REFER TO THE MANUFACTURER'S RECOMMENDATIONS FOR SPACING AND SIZE OF SPACERS BASED ON THE SIZE AND TYPE OF THE CARRIER PIPE.
3. THE SPIDERS SHALL BE SPACED EVENLY ALONG THE CARRIER PIPE SUCH THAT EACH SPIDER SUPPORTS THE SAME UNIT WEIGHT OF THE CARRIER MAIN.
4. REFER TO PLAN SHEETS AND PROFILE SHEETS FOR LENGTH AND DIAMETER OF PROPOSED STEEL ENCASEMENT PIPES FOR EACH CROSSING.
5. THE TOP OF ENCASEMENT PIPE SHALL PROVIDE THE FOLLOWING MINIMUM BURY DEPTHS: 3 FEET BELOW THE TRAVEL SURFACE OF ROADWAYS, AND; 2 FEET BELOW PAVED OR UNPAVED DITCH ELEVATIONS, UNLESS OTHERWISE NOTED ON THE PLANS.
6. THE INSIDE DIAMETER OF THE ENCASEMENT PIPE SHALL BE AT LEAST 2 INCHES GREATER THAN THE LARGEST OUTSIDE DIAMETER OF THE CARRIER PIPE JOINTS OR COUPLINGS FOR CARRIER PIPE LESS THAN 6 INCHES IN DIAMETER; AND AT LEAST 4 INCHES GREATER FOR CARRIER PIPE 6 INCHES AND LARGER IN DIAMETER.
8. ALL JOINTS BETWEEN THE SECTIONS OF ENCASEMENT PIPE SHALL BE FULLY WELDED AROUND THE COMPLETE CIRCUMFERENCE OF THE PIPE.
9. FOR EXISTING UTILITY PIPE INSTALLATIONS, THE STEEL ENCASEMENT PIPE SHALL BE A SPLIT STEEL ENCASEMENT PIPE MADE UP OF TWO (2) SEMI-CIRCULAR SECTIONS JOINED BY A CONTINUOUS WELD FROM ONE END TO THE OTHER WITHOUT ANY TRACEABLE VOIDS. JOINTS BETWEEN HORIZONTAL SECTIONS OF ENCASEMENT PIPE SHALL BE FULLY WELDED AROUND THE COMPLETE CIRCUMFERENCE OF THE PIPE.
10. STEEL ENCASEMENT PIPES SHALL BE EITHER SMOOTH WALL OR SPIRAL WELDED AND HAVE A SPECIFIED MINIMUM YIELD STRENGTH OF AT LEAST 35,000 PSI.
11. UNCOATED AND UNPROTECTED STEEL ENCASEMENT PIPE SHALL HAVE A MINIMUM WALL THICKNESS AS NOTED BELOW FOR THE FOLLOWING OUTSIDE DIAMETER OF PIPES:

0.188 INCHES FOR 12" AND SMALLER	0.312 INCHES FOR 26"
0.250 INCHES FOR 14"	0.312 INCHES FOR 28"
0.250 INCHES FOR 16"	0.312 INCHES FOR 30"
0.250 INCHES FOR 18"	0.375 INCHES FOR 36"
0.250 INCHES FOR 20" & 22"	0.500 INCHES FOR 42"
0.250 INCHES FOR 24"	0.500 INCHES FOR 48"

STEEL ENCASEMENT PIPE UNDER ROADS



NOTES:
1. ALL FITTINGS AND JOINTS SHALL BE RESTRAINED JOINT DESIGN.
2. PROVIDE APPROPRIATE RESTRAINED LENGTH AS PER TABLE HEREIN.

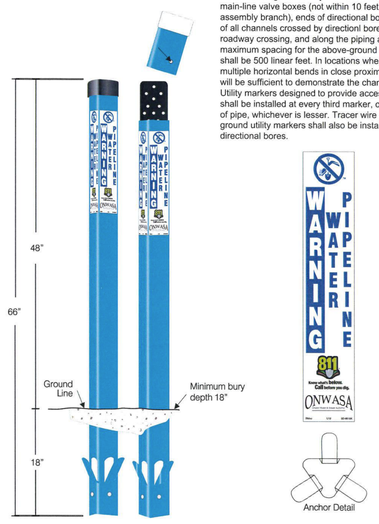
FORCE MAIN / WATER MAIN CROSSING UNDER STORM DRAINAGE PIPE

Parts List
1 - Rhino # TVF66UB - Rhino TriView Flex™, 66" Blue with Black Cap OR
1 - Rhino # TVTI66UW2 - Rhino TriView™ Test Station, 66", 2 Inside Terminals, Blue with White Cap
1 - Cap Lock - TS-LOCK for Test Stations
3 - Decal # SD-8516K Custom Decals

NOTES:
The TriGrip Anchor Flaps™ shall be extended priorty to burial of the post. Soil shall be compacted during placement of marker post.

All materials shall be provided by Rhino Marking & Protection Sytems, Inc.

Install above-ground utility markers at horizontal bends, main-line valve boxes (not within 10 feet of a fire hydrant assembly branch), ends of directional bores, bank edge of all channels crossed by directionl bores, each side of a roadway crossing, and along the piping alignment. The maximum spacing for the above-ground utility markers shall be 500 linear feet. In locations where there are multiple horizontal bends in close proximity, one marker will be sufficient to demonstrate the change in direction. Utility markers designed to provide access to tracer wire shall be installed at every third marker, or every 1000 feet of pipe, whichever is lesser. Tracer wire accesible above-ground utility markers shall also be installed at ends of directional bores.



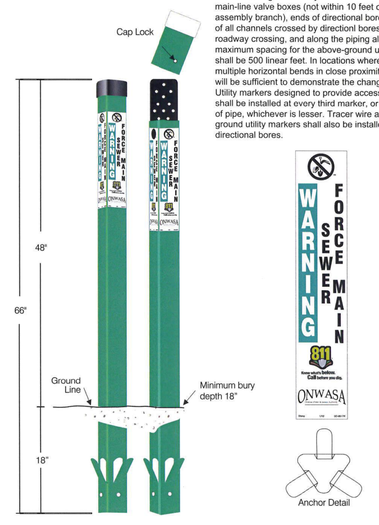
STANDARD UTILITY MARKER FOR WATER MAINS

Parts List
1 - Rhino # TVF66GB - Rhino TriView Flex™, 66" Green with Black Cap OR
1 - Rhino # TVTI66GW2 - Rhino TriView™ Test Station, 66", 2 Inside Terminals, Green with White Cap
1 - Cap Lock - TS-LOCK for Test Stations
3 - Decal # SD-8517K Custom Decals

NOTES:
The TriGrip Anchor Flaps™ shall be extended priorty to burial of the post. Soil shall be compacted during placement of marker post.

All materials shall be provided by Rhino Marking & Protection Sytems, Inc.

Install above-ground utility markers at horizontal bends, main-line valve boxes (not within 10 feet of a fire hydrant assembly branch), ends of directional bores, bank edge of all channels crossed by directionl bores, each side of a roadway crossing, and along the piping alignment. The maximum spacing for the above-ground utility markers shall be 500 linear feet. In locations where there are multiple horizontal bends in close proximity, one marker will be sufficient to demonstrate the change in direction. Utility markers designed to provide access to tracer wire shall be installed at every third marker, or every 1000 feet of pipe, whichever is lesser. Tracer wire accesible above-ground utility markers shall also be installed at ends of directional bores.



STANDARD UTILITY MARKER FOR FORCE MAINS

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-04

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZOEB

11/8/2016

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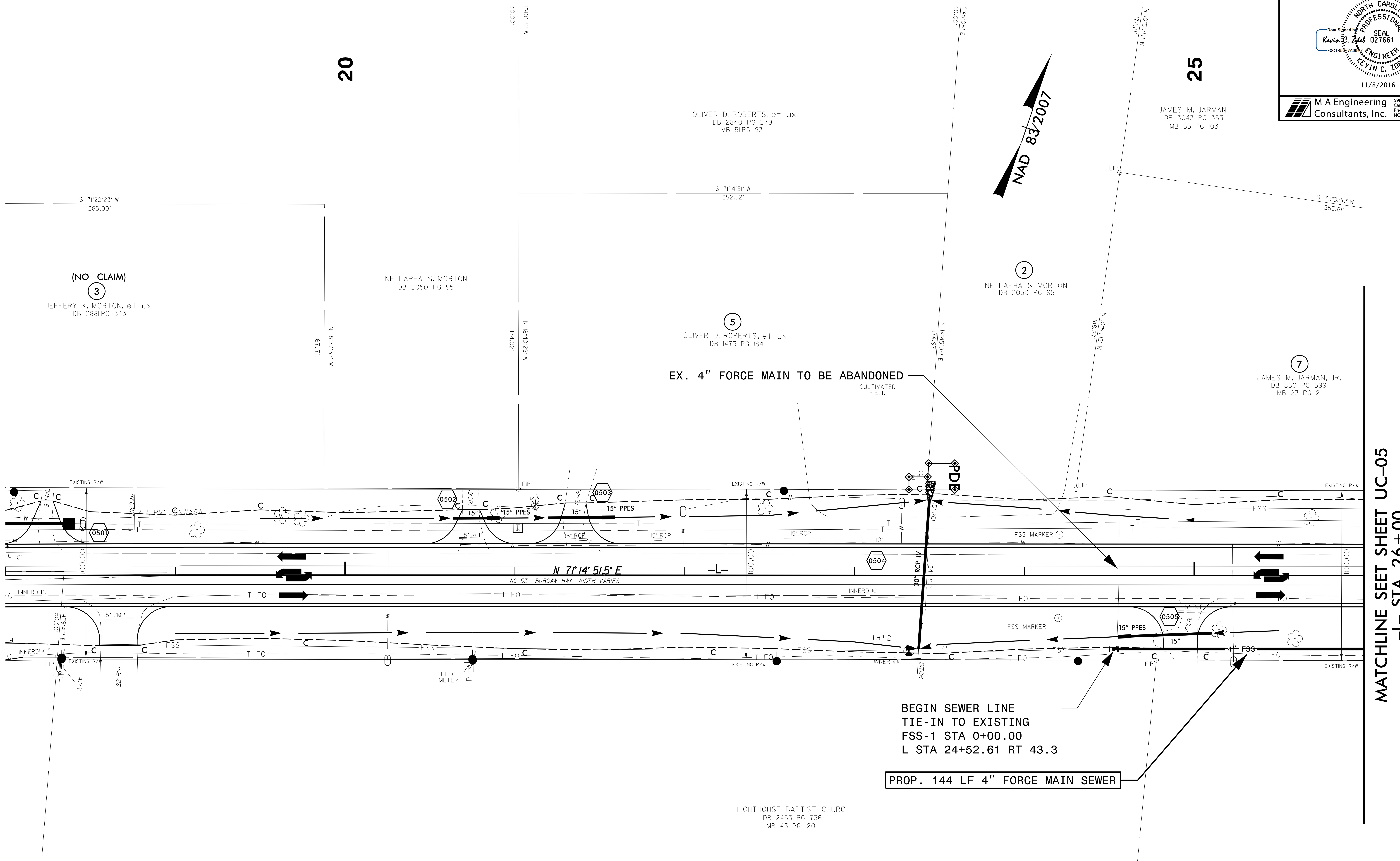

PLAN (scale: 30 15 0 30 60)

NOTES:

1. WATER LINE CONFLICTS FROM BEGINNING OF PROJECT TO SR 1212 (PONY FARM RD) ARE ADDRESSED BY OTHERS UNDER A SEPARATE PROJECT.
2. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. PROPOSED FORCE MAIN SHALL BE PVC C900 DR-18.
4. REFER TO PROJECT NOTE 5 ON SHEET UC-03 FOR JOINT RESTRAINT REQUIREMENTS ON THE EXISTING FORCE MAIN.

UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   4" FORCE MAIN SEWER
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-05

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZOEB

Kevin C. Zoeb

11/8/2016

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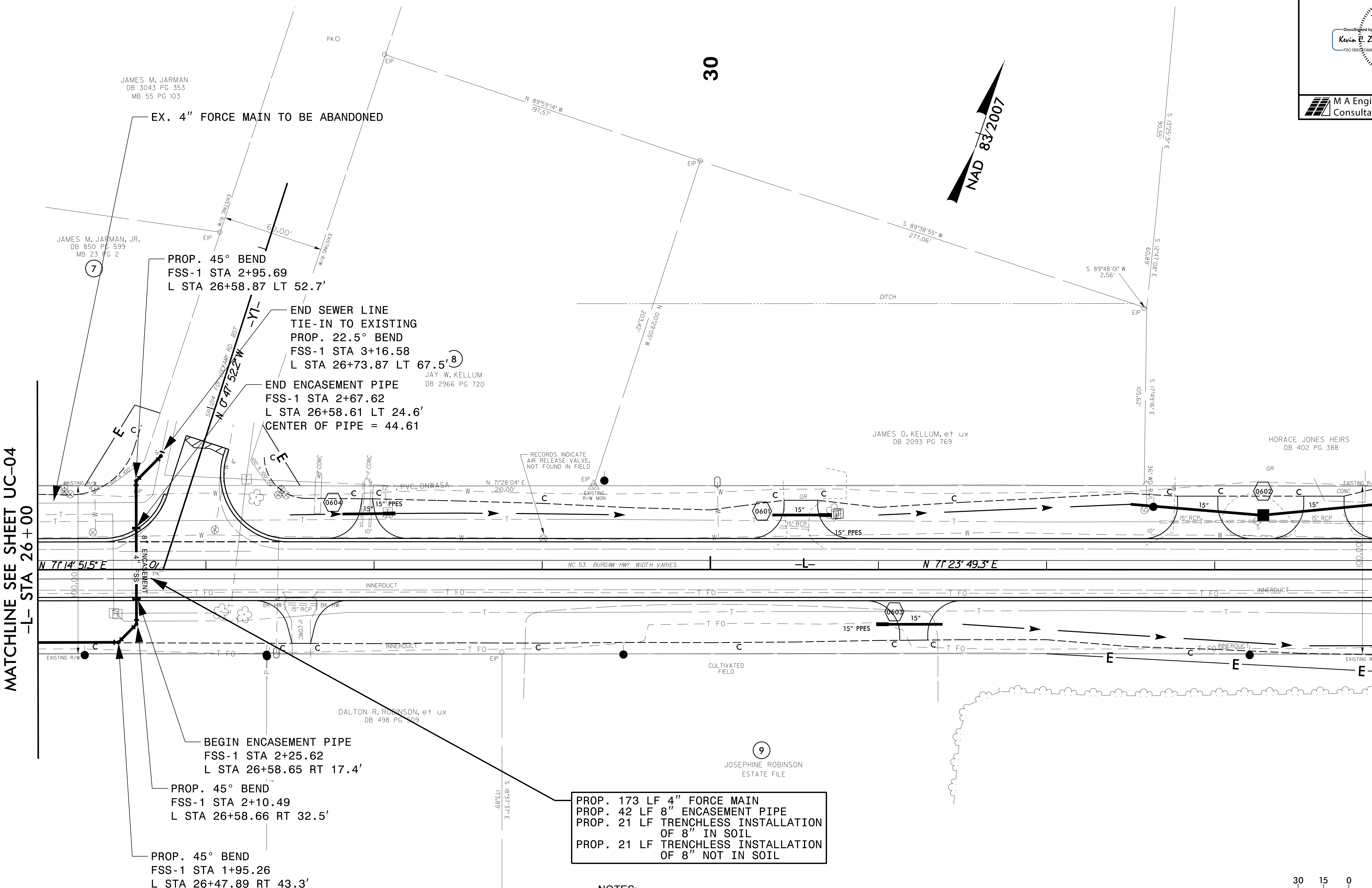

NOTES:

1. WATER LINE CONFLICTS FROM BEGINNING OF PROJECT TO SR 1212 (PONY FARM RD) ARE ADDRESSED BY OTHERS UNDER A SEPARATE PROJECT.
2. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. PROPOSED FORCE MAIN FOR OPEN TRENCH CONSTRUCTION SHALL BE PVC C900 DR-18 RESTRAINED JOINT.
4. PROPOSED FORCE MAIN TO BE INSTALLED WITHIN STEEL ENCASEMENT SHALL BE DUCTILE IRON RESTRAINED JOINT PIPE. SEE NOTE 2A ON SHEET UC-03.
5. REFER TO PROJECT NOTE 5 ON SHEET UC-03 FOR JOINT RESTRAINT REQUIREMENTS ON EXISTING FORCE MAIN.

30 15 0 30 60

PLAN

UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   4" FORCE MAIN SEWER
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-06

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZOEB

Kevin C. Zoeb

11/8/2016

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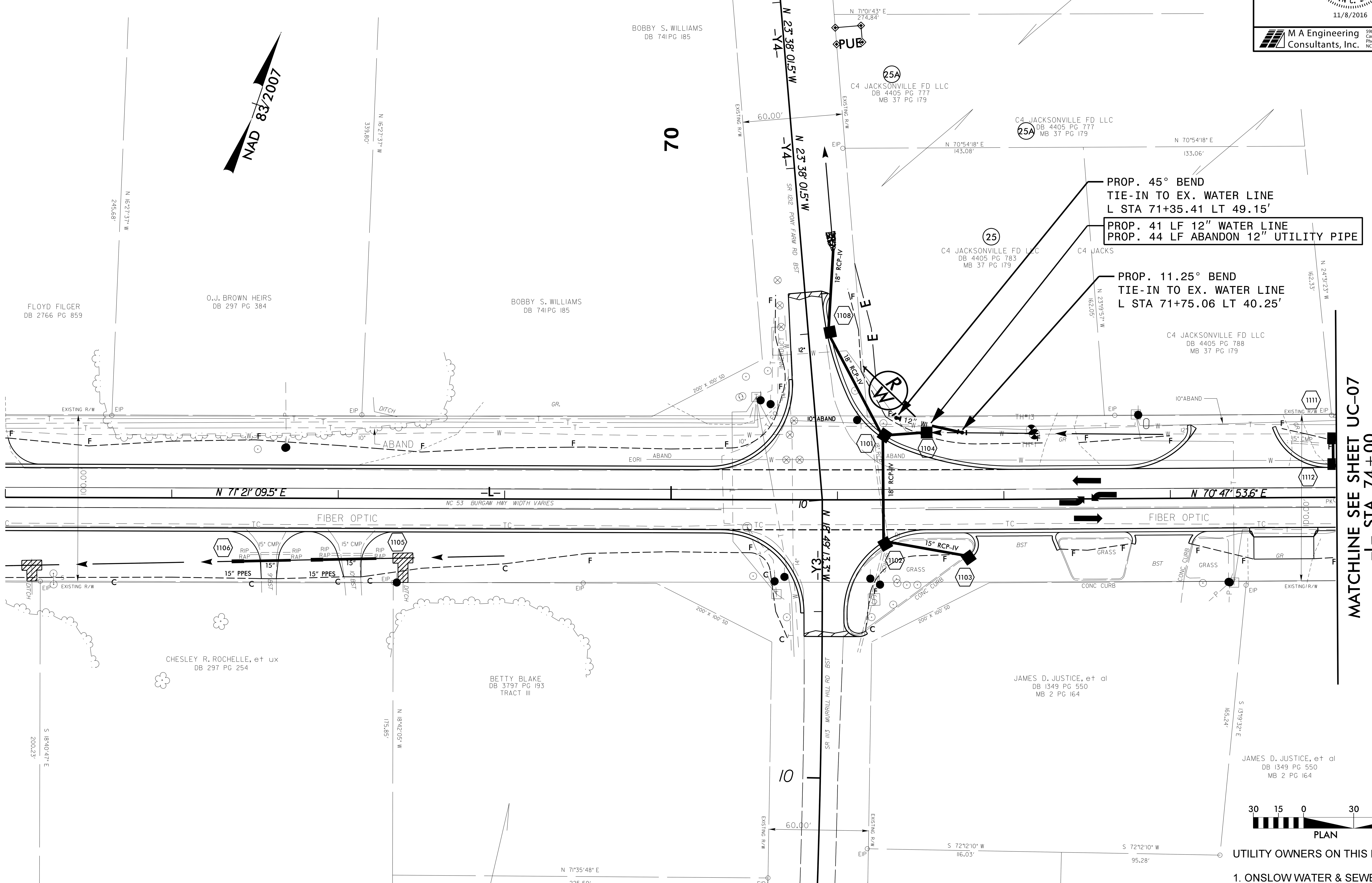
NOTES:

1. WATER LINE CONFLICTS FROM BEGINNING OF PROJECT TO SR 1212 (PONY FARM RD) ARE ADDRESSED BY OTHERS UNDER A SEPARATE PROJECT.
2. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. PROPOSED WATER LINE SHALL BE DUCTILE IRON RESTRAINED JOINT.
4. REFER TO PROJECT NOTE 5 ON SHEET UC-03 FOR JOINT RESTRAINT REQUIREMENTS ON EXISTING WATER LINE.



UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-07

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZIDEK

DocuSigned by: Kevin C. Zidek F0C1B5D7A66A4...

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75

80

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
2. FOR RECONNECT WATER METER, SEE NOTE 7 ON SHEET UC-03 AND DETAIL ON SHEET UC-3B.

N 17°07'37" W
630.33'

S 40°18'33" E
675.92'

NAD 83/2007

MATCHLINE SEE SHEET UC-06 –L– STA 74+00

MATCHLINE SEE SHEET UC-08 –L– STA 82+00

(27) WILLIAM S. TERRELL, JR.
DB 3189 PG 739
MB 2 PG 164

LEWIS J. KOLLMEYER, et ux
DB 1021 PG 42

SUSAN CASTELLANOS
NDR

EXISTING R/W MON
20' R/W SHIFT
2SFD
EXISTING R/W
EIP
ELEC METER
ECM
EXISTING R/W
TH #2
TH #3
TH #4
PK
15" RCP-IV
18" RCP-IV
10" ABAND
12" ABAND
15" CMP
15" RCP
CONC HW
BLK HW
N 70°41'53.6" E
N 70°54'36.1" E
NC 53 BURGAW HWY WIDTH VARIES
FIBER OPTIC
80.00'
100.00'
1201
1202
1203
1204
1205
1209
1210
1211
1212
1213
1214
1215
SOIL
GR
TC
BK WALL #1
BK WALL #2
BK WALL #3

PROP. 1 EA RECONNECT WATER METER

JAMES D. JUSTICE, et al
DB 1349 PG 550
MB 2 PG 164

DAVID L. LYON, et ux
DB 1274 PG 310

N 18°15'30" W
124.35'

N 19°09'41" W
147.04'

N 76°56'20" E
213.09'

S 19°09'41" E
242.30'

TIMOTHY W. ANDERSON
DB 4028 PG 388

(28) SOVEREIGN GRACE BAPTIST CHURCH
DB 730 PG 67
TRACT II

WALTON CEMETERY
NDR

N 19°09'41" W
68.79'

N 35°45'11" W
146.20'

N 73°44'41" W
102.50'

S 77°30'19" W
74.40'

FRANCES D. KINEV
DB 1055 PG 956

30 15 0 30 60
PLAN

UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

8/10/2016
10:31:05 AM
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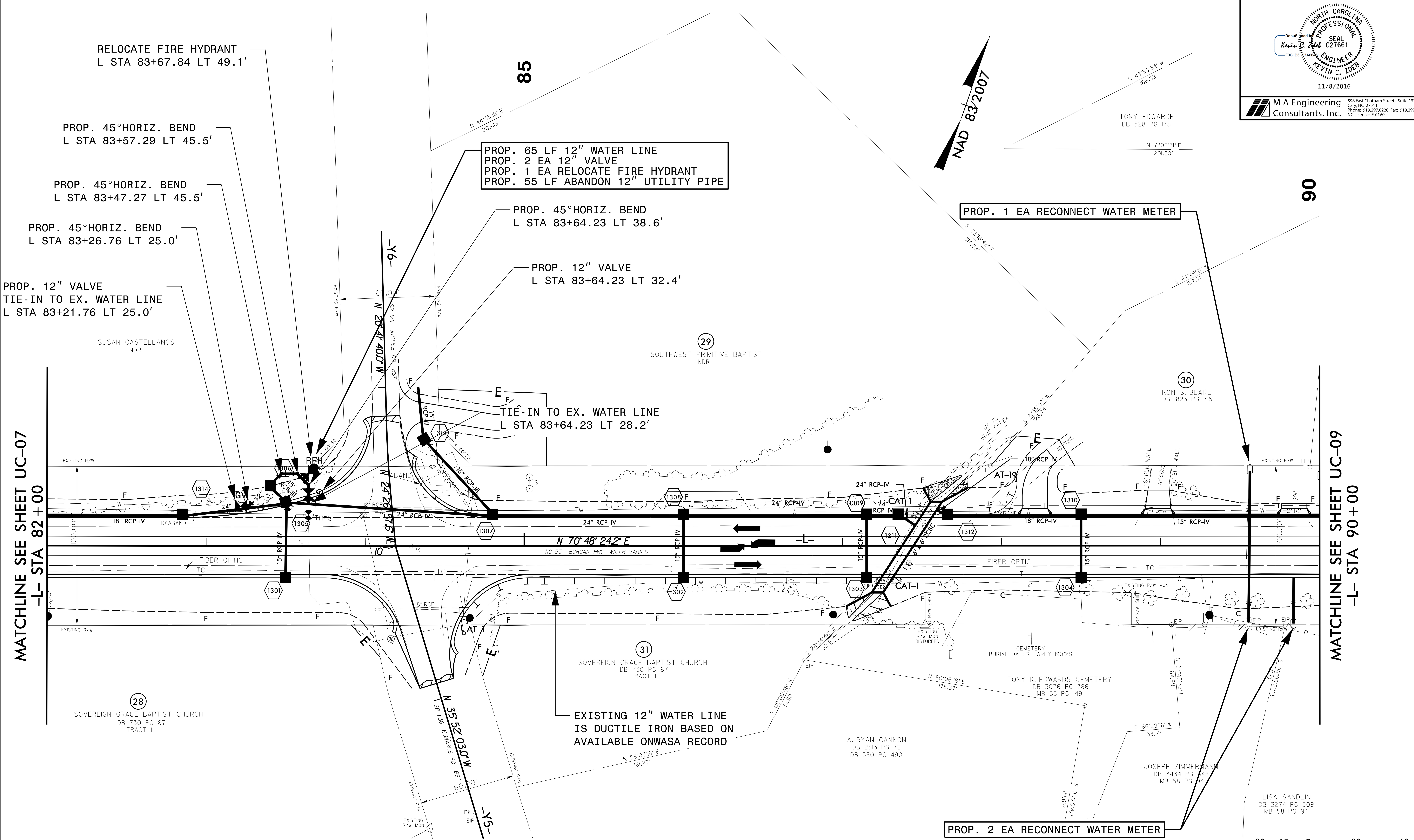
PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-08

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 027661 KEVIN C. ZOEB

11/8/2016

M A Engineering Consultants, Inc.
598 East Chatham Street - Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221
NC License: F-0160


RELOCATE FIRE HYDRANT
L STA 83+67.84 LT 49.1'
PROP. 45°HORIZ. BEND
L STA 83+57.29 LT 45.5'
PROP. 45°HORIZ. BEND
L STA 83+47.27 LT 45.5'
PROP. 45°HORIZ. BEND
L STA 83+26.76 LT 25.0'
PROP. 12" VALVE
TIE-IN TO EX. WATER LINE
L STA 83+21.76 LT 25.0'
PROP. 65 LF 12" WATER LINE
PROP. 2 EA 12" VALVE
PROP. 1 EA RELOCATE FIRE HYDRANT
PROP. 55 LF ABANDON 12" UTILITY PIPE
PROP. 45°HORIZ. BEND
L STA 83+64.23 LT 38.6'
PROP. 12" VALVE
L STA 83+64.23 LT 32.4'
TIE-IN TO EX. WATER LINE
L STA 83+64.23 LT 28.2'
PROP. 1 EA RECONNECT WATER METER
PROP. 2 EA RECONNECT WATER METER
EXISTING 12" WATER LINE
IS DUCTILE IRON BASED ON
AVAILABLE ONWASA RECORD
MATCHLINE SEE SHEET UC-07
-L- STA 82+00
MATCHLINE SEE SHEET UC-09
-L- STA 90+00
NAD 83/2007
85
90
SUSAN CASTELLANOS
NDR
SOUTHWEST PRIMITIVE BAPTIST
NDR
RON S. BLARE
DB 1823 PG 715
TONY EDWARDE
DB 328 PG 178
SOVEREIGN GRACE BAPTIST CHURCH
DB 730 PG 67
TRACT I
SOVEREIGN GRACE BAPTIST CHURCH
DB 730 PG 67
TRACT II
TONY K. EDWARDS CEMETERY
DB 3076 PG 786
MB 55 PG 149
CEMETERY
BURIAL DATES EARLY 1900'S
A. RYAN CANNON
DB 2513 PG 72
DB 350 PG 490
JOSEPH ZIMMERMANN
DB 3434 PG 148
MB 58 PG 94
LISA SANDLIN
DB 3274 PG 509
MB 58 PG 94
N 70° 48' 24.2" E
NC 53 BURGAW HWY WIDTH VARIES
-Y6-
-Y5-
FIBER OPTIC
PLAN
30 15 0 30 60

NOTES:

1. PROPOSED WATER LINE SHALL BE DUCTILE IRON RESTRAINED JOINT.
2. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. FOR RECONNECT WATER METER, SEE NOTE 7 ON SHEET UC-03 AND DETAIL ON SHEET UC-3B.
4. FOR RELOCATE FIRE HYDRANT, SEE DETAIL ON SHEET UC-3B.
5. SEE PROJECT NOTE 5 ON SHEET UC-03 FOR JOINT RESTRAINT REQUIREMENTS ON EXISTING WATER LINE.

UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-09

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 027661 KEVIN C. ZOEB

11/8/2016

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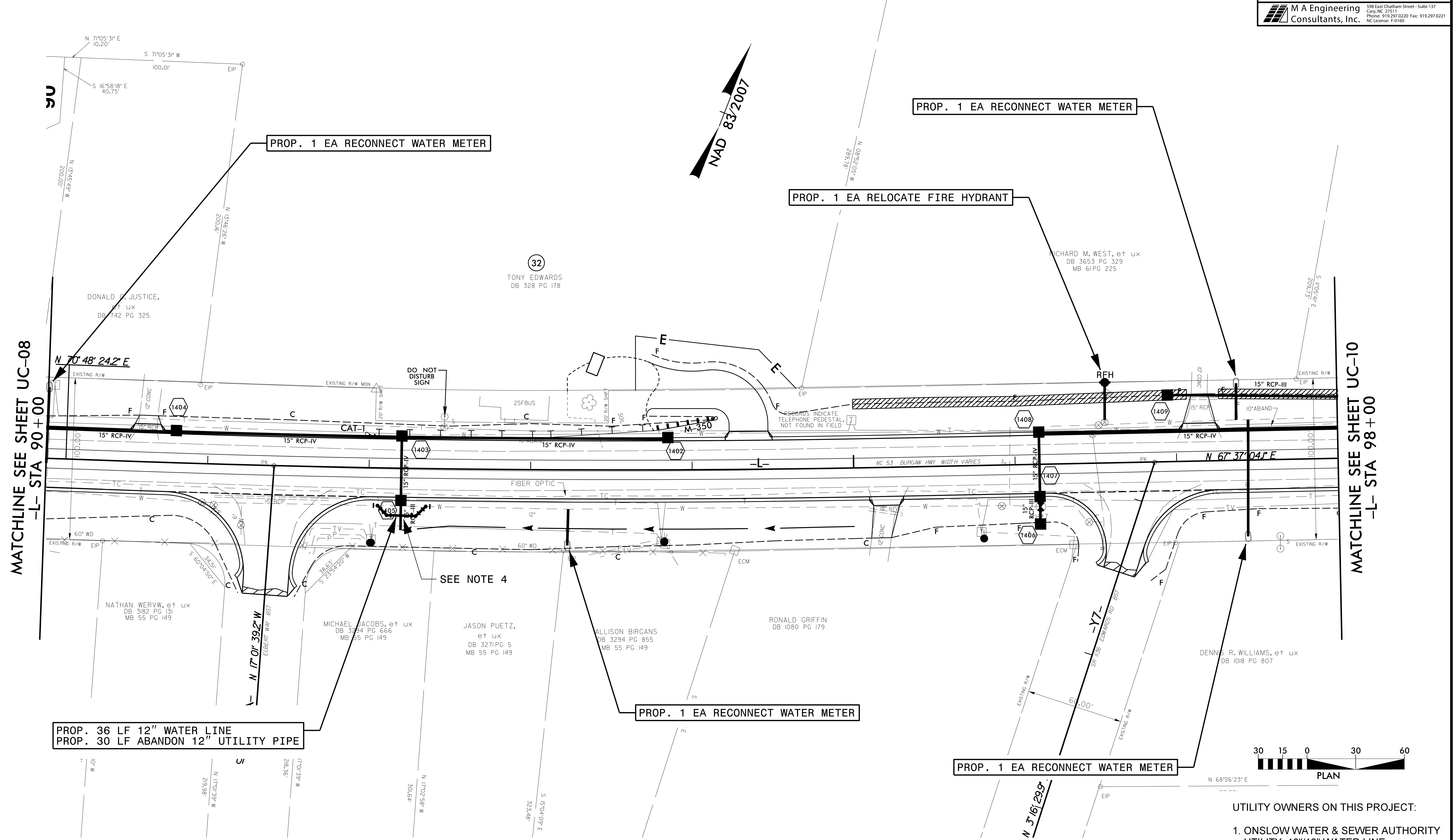
Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221
NC License: F-0160

NOTES:

1. PROPOSED WATER LINE SHALL BE DUCTILE IRON RESTRAINED JOINT.
2. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. FOR RECONNECT WATER METER, SEE NOTE 7 ON SHEET UC-03 AND DETAIL ON SHEET UC-3B.
4. FOR DOWN & UNDER RELOCATION OF 12" WATER LINE IN CONFLICT WITH PROPOSED DRAINAGE, SEE DETAIL ON SHEET UC-3D.
5. FOR RELOCATE FIRE HYDRANT, SHEET DETAIL ON SHEET UC-3B.
6. REFER TO PROJECT NOTE 5 ON SHEET UC-03 FOR JOINT RESTRAINT REQUIREMENTS ON EXISTING WATER LINE.



UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-10

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 027661 KEVIN C. ZDEB

Kevin C. Zdeb

11/8/2016

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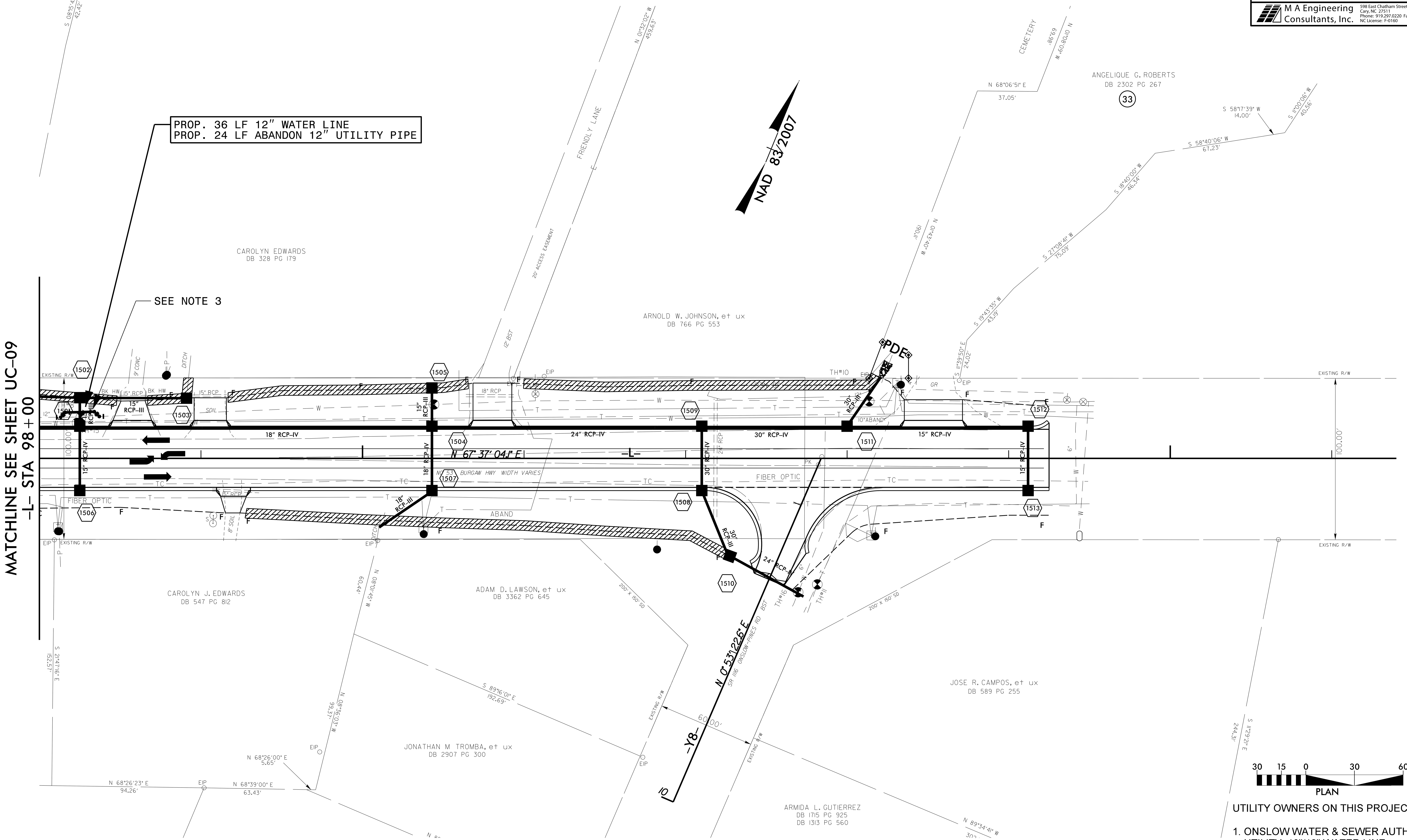
NC License: F-0160

NOTES:

1. PROPOSED WATER LINE SHALL BE DUCTILE IRON RESTRAINED JOINT.
2. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. FOR DOWN & UNDER RELOCATION OF 12" WATER LINE IN CONFLICT WITH PROPOSED DRAINAGE, SEE DETAIL ON SHEET UC-3D.
4. REFER TO PROJECT NOTE 5 ON SHEET UC-03 FOR JOINT RESTRAINT REQUIREMENTS ON EXISTING WATER LINE.



30 15 0 30 60

PLAN

UTILITY OWNERS ON THIS PROJECT:

1. ONSLOW WATER & SEWER AUTHORITY
   UTILITY: 10"/12" WATER LINE
   CONTACT: CARL H. BAKER, PE
   PHONE: (910) 937-7521

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	UC-11

UTILITY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027661 ENGINEER KEVIN C. ZOEB
Kevin C. Zoeb
11/8/2016

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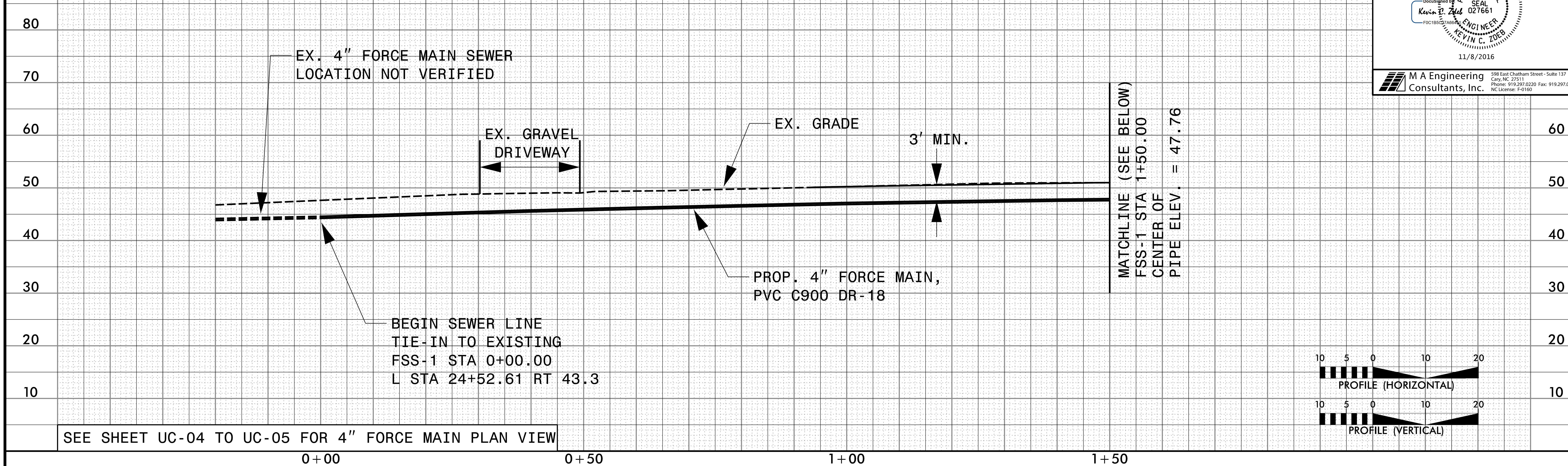
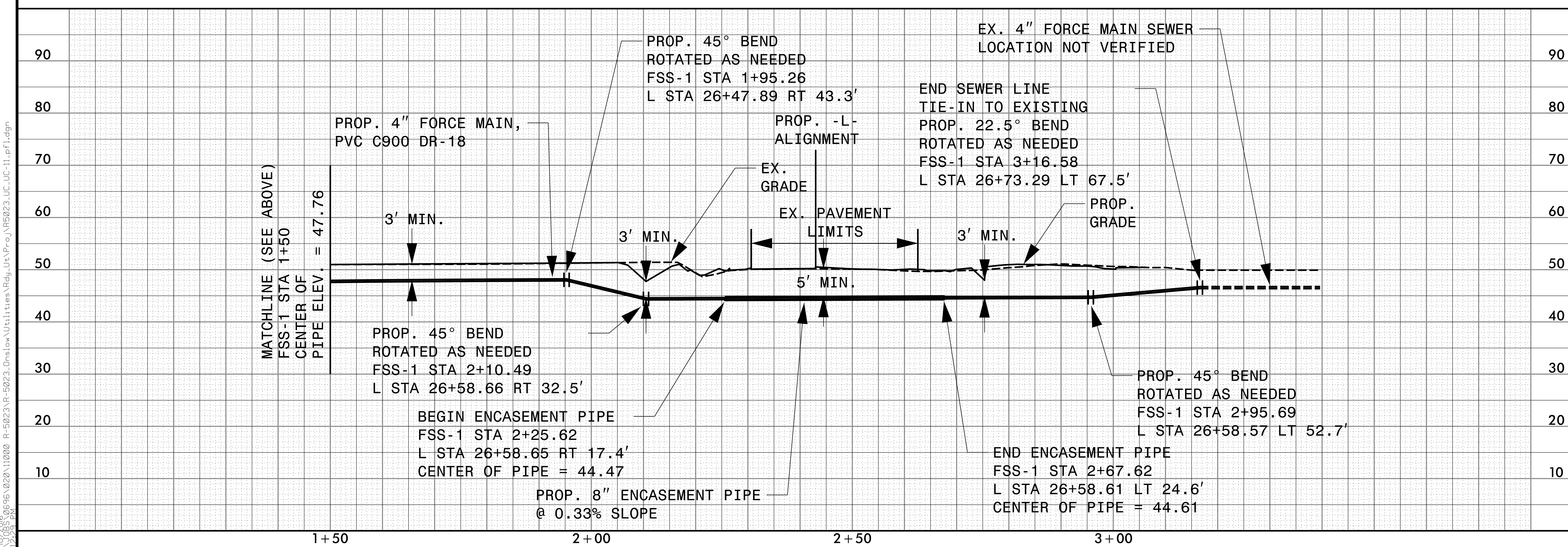
4" FORCE MAIN





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8/10/2016
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