

**This electronic collection of documents is provided  
for the convenience of the user  
and is Not a Certified Document –**

**The documents contained herein were originally issued  
and sealed by the individuals whose names and license  
numbers appear on each page, on the dates appearing  
with their signature on that page.**

**This file or an individual page  
shall not be considered a certified document.**



# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

## UTILITIES PLAN SHEET SYMBOLS

### PROPOSED WATER SYMBOLS

Water Line (Sized as Shown)	
11 1/4 Degree Bend	
22 1/2 Degree Bend	
45 Degree Bend	
90 Degree Bend	
Plug	
Tee	
Cross	
Reducer	
Gate Valve	
Butterfly Valve	
Tapping Valve	
Line Stop	
Line Stop with Bypass	
Blow Off	
Fire Hydrant	
Relocate Fire Hydrant	
Remove Fire Hydrant	
Water Meter	
Relocate Water Meter	
Remove Water Meter	
Water Pump Station	
RPZ Backflow Preventer	
DCV Backflow Preventer	
Relocate RPZ Backflow Preventer	
Relocate DCV Backflow Preventer	

### PROPOSED SEWER SYMBOLS

Gravity Sewer Line (Sized as Shown)	
Force Main Sewer Line (Sized as Shown)	
Manhole (Sized per Note)	
Sewer Pump Station	

### PROPOSED MISCELLANEOUS UTILITIES SYMBOLS

Power Pole	
Telephone Pole	
Joint Use Pole	
Telephone Pedestal	
Utility Line by Others (Type as Shown)	
Trenchless Installation	
Encasement by Open Cut	
Encasement	

Thrust Block	
Air Release Valve	
Utility Vault	
Concrete Pier	
Steel Pier	
Plan Note	
Pay Item Note	

NOTE  
PAY ITEM

### EXISTING UTILITIES SYMBOLS

Power Pole		*Underground Power Line	
Telephone Pole		*Underground Telephone Cable	
Joint Use Pole		*Underground Telephone Conduit	
Utility Pole		*Underground Fiber Optics Telephone Cable	
Utility Pole with Base		*Underground TV Cable	
H-Frame Pole		*Underground Fiber Optics TV Cable	
Power Transmission Line Tower		*Underground Gas Pipeline	
Water Manhole		Aboveground Gas Pipeline	
Power Manhole		*Underground Water Line	
Telephone Manhole		Aboveground Water Line	
Sanitary Sewer Manhole		*Underground Gravity Sanitary Sewer Line	
Hand Hole for Cable		Aboveground Gravity Sanitary Sewer Line	
Power Transformer		*Underground SS Forced Main Line	
Telephone Pedestal		Underground Unknown Utility Line	
CATV Pedestal		SUE Test Hole	
Gas Valve		Water Meter	
Gas Meter		Water Valve	
Located Miscellaneous Utility Object		Fire Hydrant	
Abandoned According to Utility Records		Sanitary Sewer Cleanout	
End of Information			

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

103000\_B-4761(15)UtilitiesEngineering\UC\Proc\B-4761\UC-02.sym.dgn

# UTILITY CONSTRUCTION

## GENERAL NOTES:

1. THE PROPOSED UTILITY CONSTRUCTION SHALL MEET THE APPLICABLE REQUIREMENTS OF THE NC DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2012.

2. THE EXISTING UTILITIES BELONG TO:

HALIFAX COUNTY  
CONTACT: GREG GRIFFIN  
PHONE: 252-583-1451

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 ENVIRONMENTAL HEALTH. 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 QUALITY. 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. 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 ADDITIONAL 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.

## PROJECT SPECIFIC NOTES:

1. PROPOSED WATER LINE FOR OPEN TRENCH CONSTRUCTION SHALL BE RESTRAINED JOINT DUCTILE IRON.

2. PROPOSED WATER LINE FOR TRENCHLESS INSTALLATION SHALL BE HDPE DR-9.

3. ALL WATER LINE FITTINGS, 4-INCHES THRU 12-INCHES IN DIAMETER, SHALL BE DUCTILE IRON.

4. THE EXISTING 8" LINE SHALL BE RESTRAINED ON THE PORTION TO REMAIN AFTER INSTALLATION. THE CONTRACTOR SHALL EXCAVATE THE EXISTING LINE AND INSTALL THE BELL RESTRAINT CLAMPS AT EVERY BELL JOINT FOR THE DISTANCE NOTED IN THE TABLE ON SHEET UC-3B.

PROJECT REFERENCE NO. <i>B-4761</i>	SHEET NO. <i>UC-3</i>
DESIGNED BY: JKC	
DRAWN BY: JKC	
CHECKED BY: KCZ	
APPROVED BY: KCZ	
REVISED:	
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151	

## UTILITY CONSTRUCTION

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

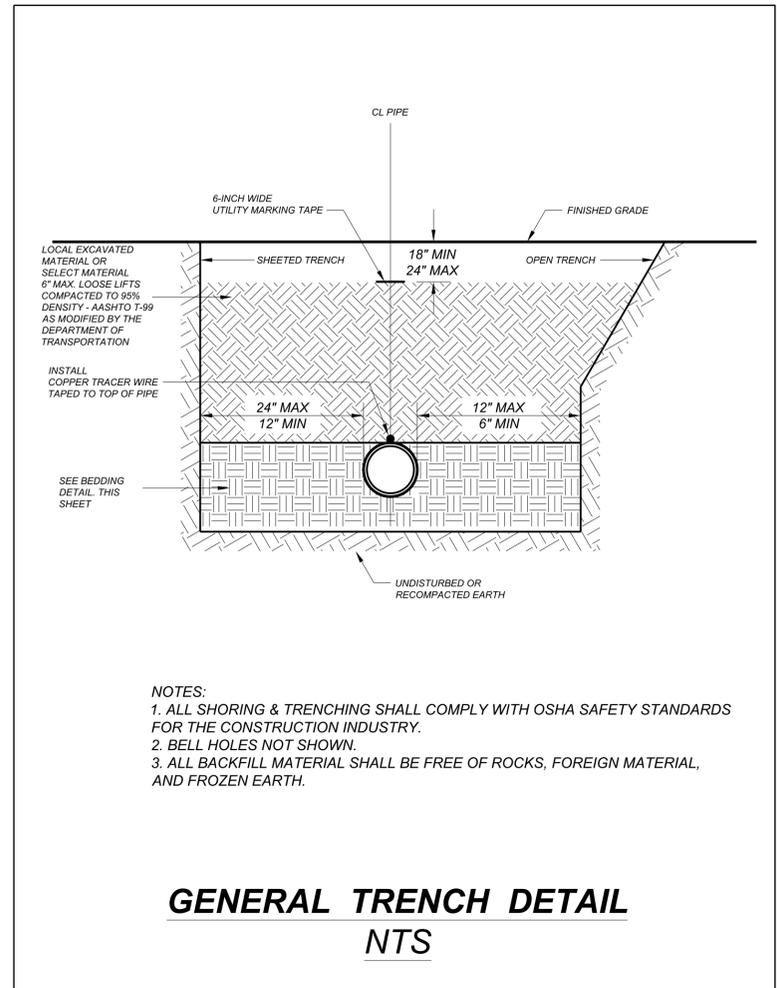
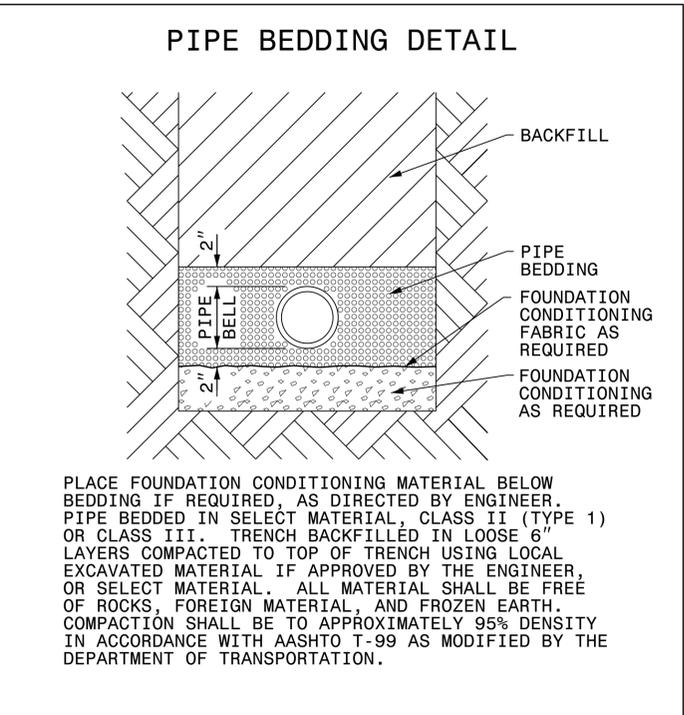
REVISIONS

5/14/2016

PROJECT REFERENCE NO.	SHEET NO.
B-4761	UC-3A
DESIGNED BY: JKC	
DRAWN BY: JKC	
CHECKED BY: KCZ	
APPROVED BY: KCZ	
REVISED:	
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151	

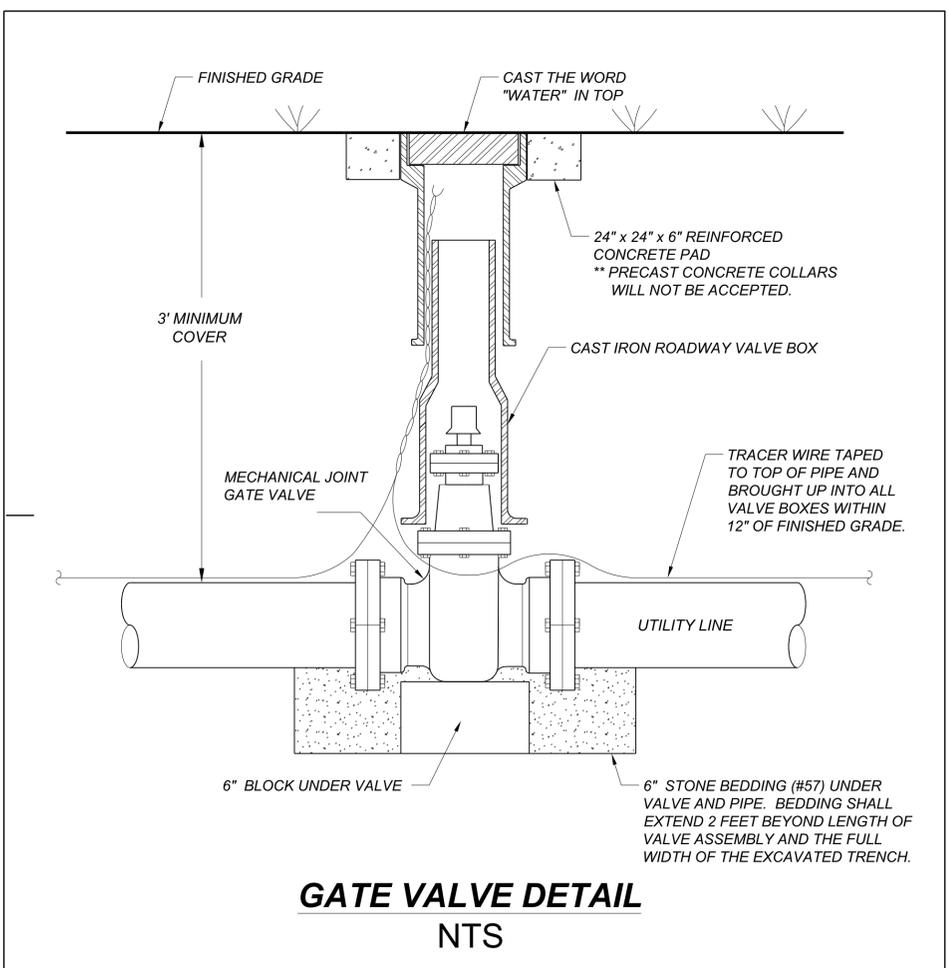
**UTILITY CONSTRUCTION**

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**



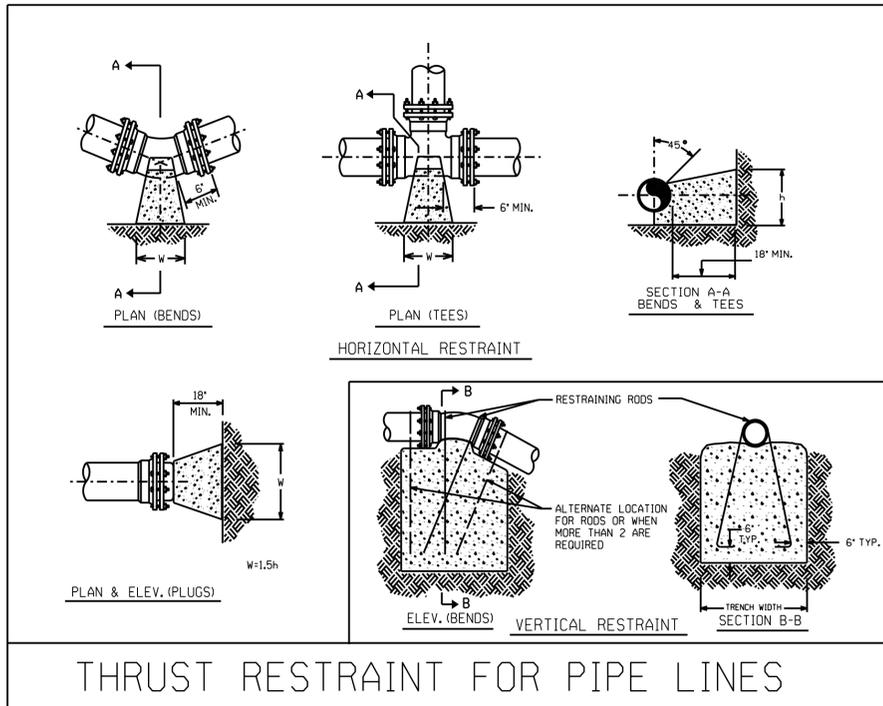
#### MAXIMUM TRENCH WIDTH AT TOP OF PIPE

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		



N:\103000\B-4761\Utilities\Engineering\UC\Proj\B-4761\ut-UC-03A.dgn  
 5/14/2016 10:30:00 AM

5/14/99



**PVC PIPE RESTRAINED JOINT DESIGN TABLE**

FITTING	REQUIRED RESTRAINED LENGTH (FT) OF PVC PIPE BY DEPTH OF COVER							
	3 FT	4 FT	5 FT	6 FT	7 FT	8 FT	9 FT	10 FT
<b>HORIZONTAL BENDS</b>								
8 INCH DIA - 11.25 DEG	3	3	3	2	2	2	2	2
8 INCH DIA - 22.5 DEG	6	5	5	4	4	4	3	3
8 INCH DIA - 45 DEG	12	11	9	8	7	7	6	6
8 INCH DIA - 90 DEG	29	25	22	19	17	16	14	13
<b>VERTICAL DOWN BENDS</b>								
8 INCH DIA - 11.25 DEG	11	9	8	7	6	5	5	5
8 INCH DIA - 22.5 DEG	22	18	15	13	12	11	10	9
8 INCH DIA - 45 DEG	45	37	31	27	24	21	19	18
<b>VERTICAL UP BENDS</b>								
8 INCH DIA - 11.25 DEG	3	3	3	2	2	2	2	2
8 INCH DIA - 22.5 DEG	6	5	5	4	4	4	3	3
8 INCH DIA - 45 DEG	12	11	9	8	7	7	6	6
<b>DEAD ENDS / VALVES</b>								
8 INCH DIA	83	71	62	55	49	45	41	38

**ASSUMPTIONS**  
 LAYING CONDITION = TYPE 4  
 SOIL DESIGNATION = GC = COHESIVE-GRANULAR  
 DESIGN PRESSURE = 200 PSI (TEST PRESSURE)  
 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.

PROJECT REFERENCE NO.	SHEET NO.
B-4761	UC-3B
DESIGNED BY: JKC	
DRAWN BY: JKC	
CHECKED BY: KCZ	
APPROVED BY: KCZ	
REVISED:	
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151	

**UTILITY CONSTRUCTION**

**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

**BASED ON TEST PRESSURE OF 200 P.S.I.**

PIPE SIZE	DEGREE OF BEND	LBS. STATIC THRUST *	HORIZONTAL RESTRAINT (ALL AREAS GIVEN ARE IN SQUARE FEET)								VERTICAL RESTRAINT (ALL VOLUMES GIVEN ARE IN CUBIC YARDS)**							
			ALLOWABLE SOIL BEARING (PSF)								PIPE SIZE	RESTRAINING RODS NO./REQ'D	DIA.	DEGREE OF BEND				
1000	2000	3000	4000	5000	6000	7000	8000	11/4°	22 1/2°	45°								
4"	11/4°	616	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	45°	2,465	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
	90°	4,244	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
	TEE/PLUG	3,063	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
6"	11/4°	1,485	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	45°	6,109	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
	90°	9,939	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
	TEE/PLUG	7,068	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
8"	11/4°	2,523	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	45°	9,619	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
	90°	17,773	18	9	9	9	9	9	9	9	9	9	9	9	9	9	9	
	TEE/PLUG	12,459	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	
10"	11/4°	3,846	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	45°	15,028	15	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
	90°	27,768	28	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
	TEE/PLUG	19,432	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
12"	11/4°	5,533	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	45°	21,641	22	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
	90°	39,394	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
	TEE/PLUG	28,394	28	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
14"	11/4°	7,543	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	45°	29,255	29	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
	90°	54,245	54	27	27	27	27	27	27	27	27	27	27	27	27	27	27	
	TEE/PLUG	38,435	38	19	19	19	19	19	19	19	19	19	19	19	19	19	19	
16"	11/4°	9,853	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	45°	38,271	38	19	19	19	19	19	19	19	19	19	19	19	19	19	19	
	90°	70,482	70	35	35	35	35	35	35	35	35	35	35	35	35	35	35	
	TEE/PLUG	50,282	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	

\* INCLUDES 1.25 SAFETY FACTOR  
 \*\* INCLUDES 1.50 SAFETY FACTOR

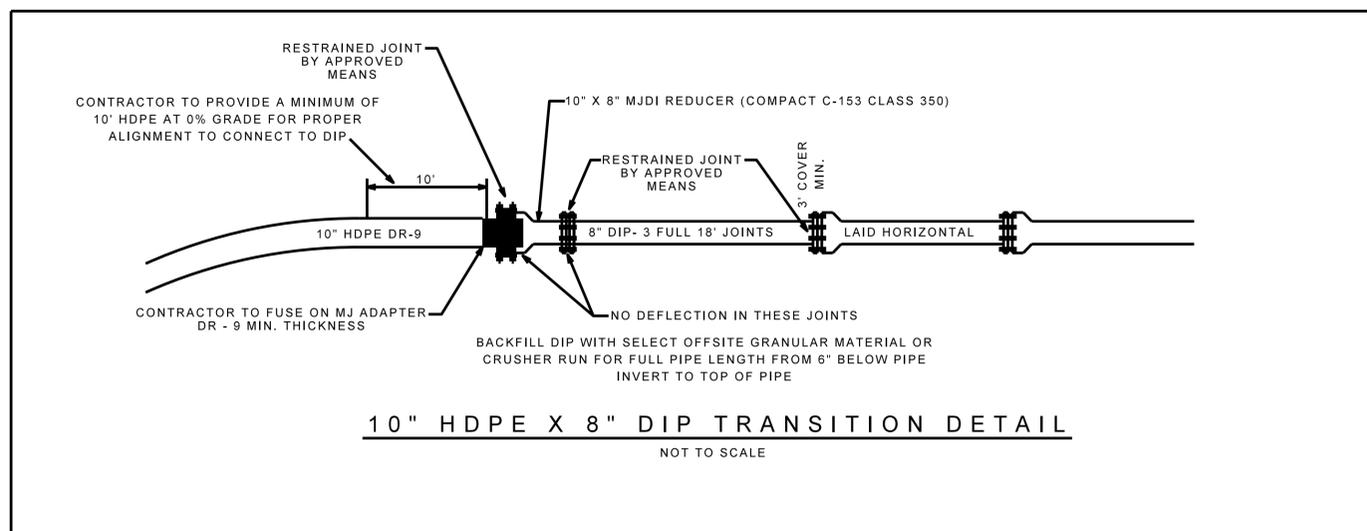
**GENERAL NOTES:**  
 1. CONCRETE SHALL BE CLASS "B".  
 2. CONCRETE SHALL NOT CONTACT BOLTS ENDS OF MECHANICAL JOINT FITTINGS.  
 3. CONSULT WITH ENGINEER FOR CONCRETE REQUIREMENTS ON MAINS LARGER THAN 16 INCHES.  
 4. ALLOWABLE SOIL BEARING SHALL BE DETERMINED BY THE ENGINEER.

**REVISIONS**

NO.	DATE	DESCRIPTION

SHEET 2 OF 2

**THRUST RESTRAINT FOR WATER MAINS**



8.17.17/19

NOTES:

- 1. ALL PIPE FOR OPEN TRENCH CONSTRUCTION SHALL BE DUCTILE IRON RESTRAINED JOINT.
- 2. ALL PIPE FOR TRENCHLESS INSTALLATION SHALL BE HDPE DR-9.

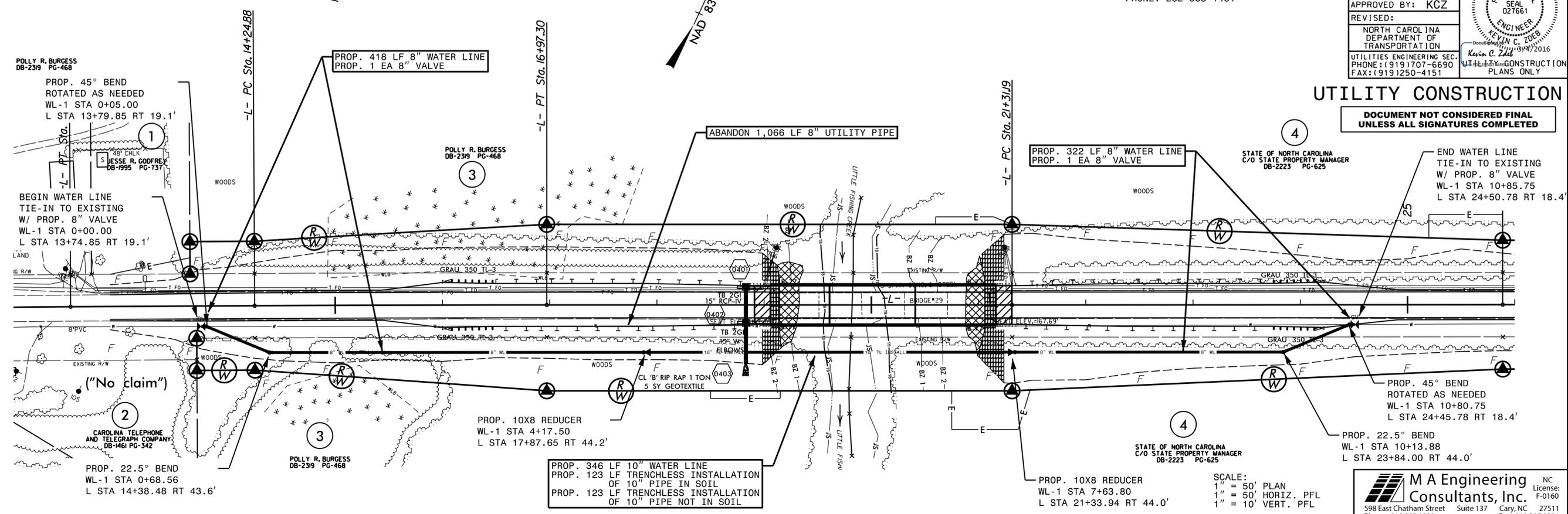
UTILITY OWNERS ON THIS PROJECT

1. HALIFAX COUNTY PUBLIC UTILITIES  
 UTILITY: 8" WATER LINE  
 CONTACT: GREG GRIFFIN  
 PHONE: 252-583-1451

PROJECT REFERENCE NO. B-4761	SHEET NO. UC-4
DESIGNED BY: JKC	
DRAWN BY: JKC	
CHECKED BY: KCZ	
APPROVED BY: KCZ	
REVISED:	
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151	

UTILITY CONSTRUCTION

**DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED**



SCALE:  
 1" = 50' PLAN  
 1" = 50' HORIZ. PFL  
 1" = 10' VERT. PFL

**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

REVISIONS

