

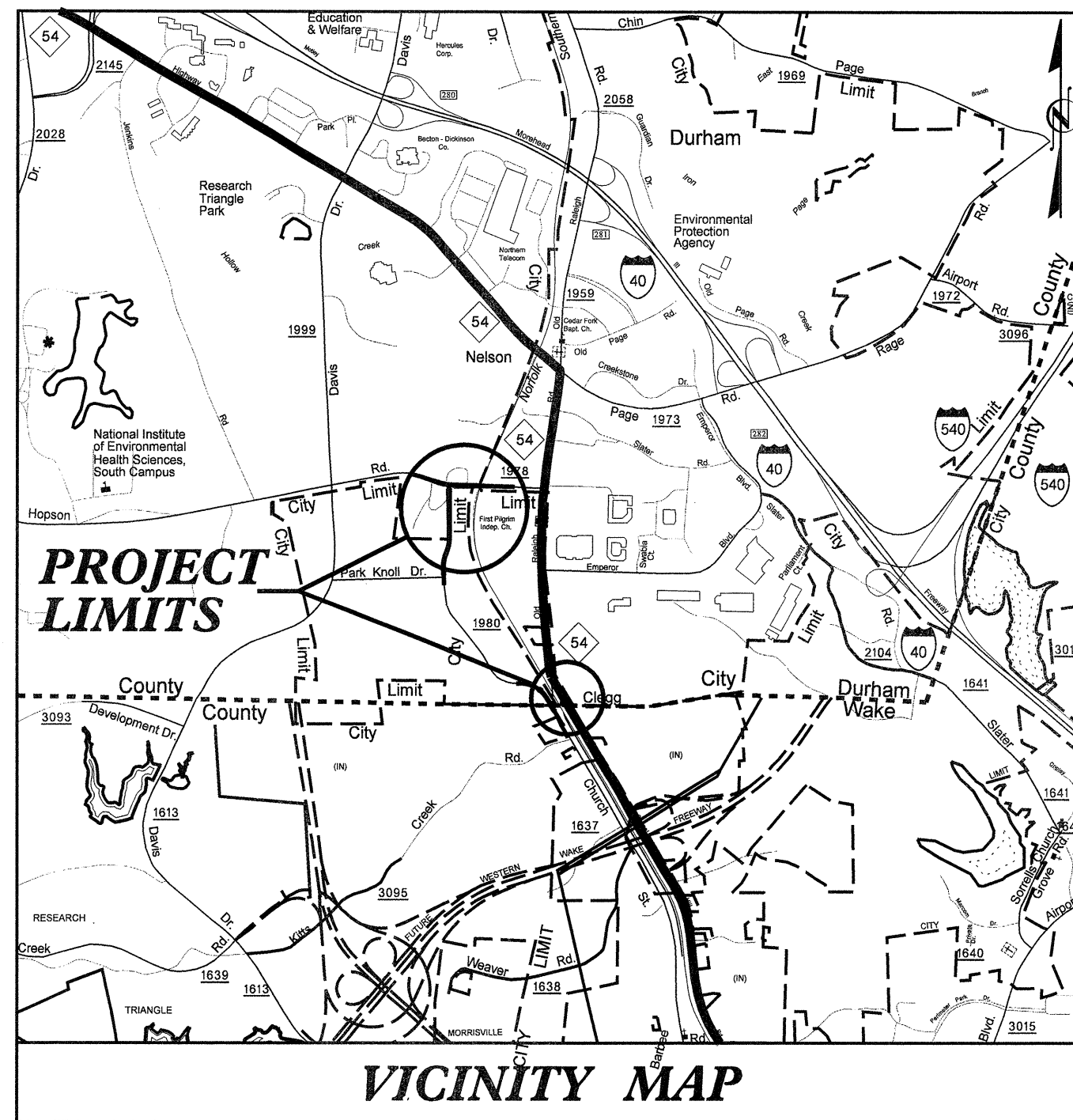
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4716B	UC-1	

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

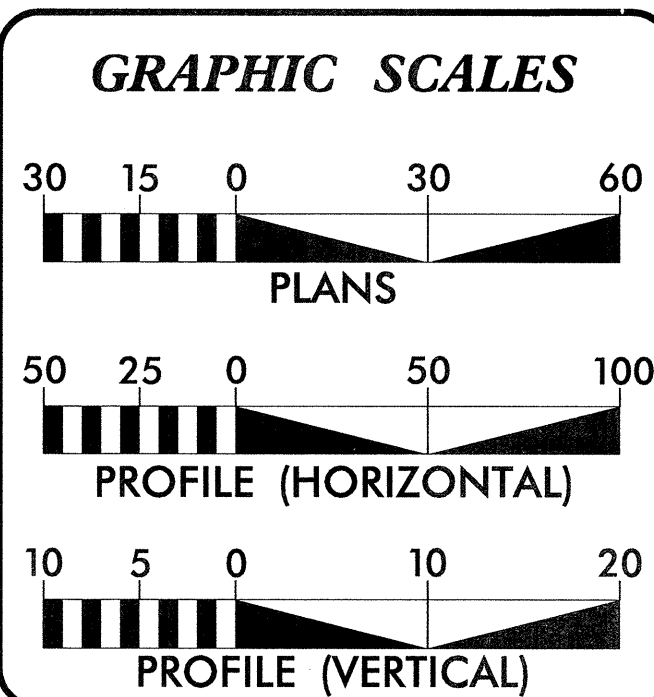
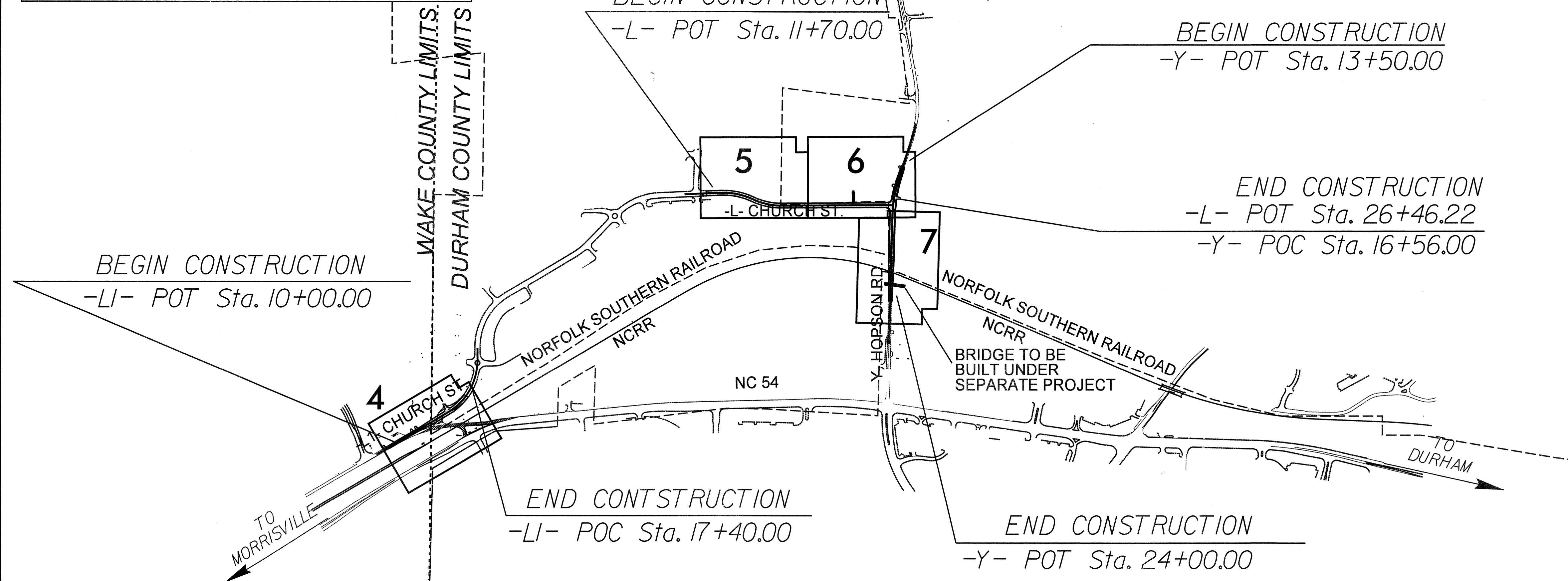
WAKE & DURHAM COUNTIES

LOCATION: HOPSON RD. AND CHURCH ST. EXTENSION IN DURHAM

TYPE OF WORK: UTILITIES CONSTRUCTION



TIP PROJECT: U-4716B



INDEX OF SHEETS

SHEET NO.	DESCRIPTION
UC-1	TITLE SHEET
UC-2	SYMBOLOLOGY SHEET
UC-3	GENERAL NOTES SHEET
UC-4 TO UC-7	PLAN SHEETS
UC-8	SEWER PROFILES
UC-9 TO UC-11	DETAILS

UTILITY OWNERS ON THIS PROJECT:

WATER - CITY OF DURHAM

SEWER - DURHAM COUNTY

UTILITY DESIGN ENGINEER

2012-07-31

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

RAIL DIVISION

UTILITY DESIGN BY:

MA Engineering CONSULTANTS, INC.
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221

Prepared for:

ENGINEERING & SAFETY BRANCH

MAIL: 1556 MAIL SERVICE CENTER RALEIGH, NC 27699-1556
DELIVERY: 860 CAPITAL BOULEVARD RALEIGH, NC 27603
PHONE: (919) 715-8803
FAX: (919) 715-8804

Note: Not to Scale

***S.U.E. = Subsurface Utility Engineering**

STATE OF NORTH CAROLINA
RAIL DIVISION

UTILITIES PLAN SHEET SYMBOLS

Water

Proposed Back Flow Preventor	
Relocate Back Flow Preventor	
Existing Water Valve	
Proposed Valve	
Proposed Tapping Valve	
Existing Water Meter	
Proposed Water Meter	
Proposed Water Meter / Vault	
Relocate Water Meter	
Remove Water Meter	REM WM
Existing Hydrant	
Prop Hydrant	
Relocate Hydrant	
Remove Hydrant	REM FH

Proposed RPZ Back Flow Preventor	
Relocate RPZ Back Flow Preventor	
Water Cross	
Water Plug	
Water Reducer	
Water Tee	
Water Pump Station	
Water Thrust Block	
Blow Off Valve	
Air Release Valve	
Water Line Stop	
Water Line Stop w Bypass	

Utility By Other Symbols

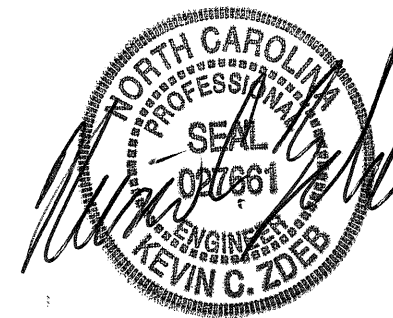

Proposed Tel Pole	
Proposed Power Pole	
Proposed Joint Use Power, Tel Pole	
Proposed Joint Use Power, CATV Pole	
Proposed Joint Use Power, Tel, CATV Pole	
Proposed Joint Use Tel, CATV Pole	

Sewer

Existing Manhole	
Proposed UT Manhole	
Remove UT Manhole	REM UT MH
Abandon Utility Manhole	ABAND MH
Sewer Line Stop	
Sewer Line Stop w Bypass	

Sewer Cross	
Sewer Plug	
Sewer Reducer	
Sewer Tee	
Sewer Pump Station	
Sewer Thrust Block	

PUE Monument	
Concrete Pier	
Steel Pile Pier	
Test Hole (SUE)	
Prop Utility Vault	

PROJECT REFERENCE NO. U-4716B	SHEET NO. UC-3
SCALE: 1" = 30 FT	
UTILITY DESIGN ENGINEER	
	
2012-07-31	
	
598 East Chatham Street Suite 137 Cary, NC 27511 Phone: 919.297.0220 Fax: 919.297.0221	

UTILITY OWNERS ON THIS PROJECT:

- DURHAM COUNTY
UTILITY: 8" GRAVITY SEWER
8" SANITARY FORCE MAIN
18" SANITARY FORCE MAIN
CONTACT: TED CREDLE
PHONE: 919-544-8280
- CITY OF DURHAM
UTILITY: 12" WATER LINE
16" WATER LINE
CONTACT: ERIC HALSTEAD
PHONE: 919-560-4326 x30259

GENERAL NOTES:

- THESE PLANS ONLY ADDRESS RELOCATIONS FOR THE FOLLOWING UTILITIES: WATER, GRAVITY SANITARY SEWER, SANITARY FORCE MAIN.
- UTILITY OWNERS FOR ALL OTHER UTILITIES (TELEPHONE, POWER, GAS, CABLE TV, FIBER OPTIC, ETC.) SHALL PROVIDE THEIR OWN RELOCATION PLANS.
- REFER TO PLANS BY HNTB FOR ALL DESIGN AND DETAIL INFORMATION FOR PROPOSED DRAINAGE STRUCTURES, DITCHES, RAILROAD ALIGNMENT, AND ROAD ALIGNMENT.
- THE LOCATION, SIZE, AND MATERIAL TYPE OF THE EXISTING UTILITIES SHOWN ON THE PLANS HAVE BEEN OBTAINED FROM THE BEST AVAILABLE DATA AT THE TIME. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATION, ELEVATION, SIZE, DIRECTION, AND MATERIAL TYPE OF ALL EXISTING UTILITIES PRIOR TO ORDERING HIS MATERIALS.
- 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.
- THE EXISTING WATER AND SEWER FACILITIES ARE TO REMAIN IN PLACE AND FUNCTIONING UNTIL NEW FACILITIES ARE CERTIFIED AS COMPLETE BY THE NCDOT RESIDENT ENGINEER.
- ALL WATER AND SEWER IMPROVEMENTS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS OF THE NCDOT, DATED JULY 2012.
- CONTRACTOR IS REQUIRED TO COMPLY WITH 15A NCAC 18C.906 - RELATION OF WATER MAINS TO SEWERS.
- WATER AND SEWER IMPROVEMENTS SHALL BE CONSTRUCTED BY A NC LICENSED UTILITY CONTRACTOR.
- CONTRACTOR SHALL NOTIFY THE UTILITY OWNER 7 BUSINESS DAYS IN ADVANCE OF PERFORMING ANY TIE-IN WORK. CONTRACTOR SHALL NOTIFY ALL AFFECTED CUSTOMERS 24 HOURS IN ADVANCE OF SERVICE INTERRUPTIONS. CONTRACTOR SHALL NOTIFY ALL AFFECTED CRITICAL FACILITIES (I.E., CORRECTIONAL FACILITY, HOSPITAL, SCHOOLS, MEDICAL FACILITIES, DAY CARE CENTERS, ETC.) 72 HOURS IN ADVANCE OF SERVICE INTERRUPTION.
- CONTRACTOR SHALL NOT OPERATE ANY VALVES ON THE EXISTING WATER OR SANITARY SYSTEM. CONTRACTOR SHALL CONTACT UTILITY OWNER TO CONDUCT STRATEGIC OPERATION OF VALVES FOR SERVICE INTERRUPTION IN ORDER TO PERFORM SPECIFIC TIE-IN OPERATIONS.
- CONTRACTOR SHALL NOT OPERATE ANY VALVES ON THE EXISTING SANITARY FORCE MAIN SYSTEMS. CONTRACTOR SHALL CONTACT DURHAM COUNTY TO CONDUCT STRATEGIC SHUT DOWN OF PUMP STATIONS AND/OR OPERATION OF SEWER VALVES FOR SERVICE INTERRUPTION IN ORDER TO PERFORM SPECIFIC TIE-IN OPERATIONS.
- WHERE POURED IN PLACE CONCRETE THRUST BLOCKS ARE UTILIZED FOR THRUST RESTRAINT OF PIPE, THE CONTRACTOR SHALL NOT PRESSURIZE THE LINE FOR TESTING UNTIL THE CONCRETE REACHES ACCEPTABLE STRENGTH.

WATER LINE NOTES:

- ALL WATER LINE PIPE SHALL BE DUCTILE IRON WITH RESTRAINED JOINT CONSTRUCTION.
- ALL WATER LINE FITTINGS, 4-INCHES THROUGH 18-INCHES IN DIAMETER, SHALL BE DUCTILE IRON PIPE (CLASS 350).
- ALL FITTINGS (BENDS, TEES, CROSSES, REDUCERS, PLUGS, ETC.) SHALL BE ADEQUATELY RESTRAINED BY THE USE OF RESTRAINED JOINT CONSTRUCTION AND /OR CAST IN PLACE CONCRETE THRUST RESTRAINTS AS DETAILED ON THESE DRAWINGS, OR AS DIRECTED BY THE RESIDENT ENGINEER.
- ALL WATER SERVICES, 2-INCHES IN DIAMETER AND SMALLER, SHALL BE INSTALLED UNDER ACTIVE ROADS BY TRENCHLESS METHOD, AS DIRECTED BY THE NCDOT RESIDENT ENGINEER.
- ALL EXISTING WATER METERS TO REMAIN SHALL BE "RECONNECTED" TO THE PROPOSED WATER MAIN WITH NEW WATER SERVICE LINES.
- ALL EXISTING WATER METERS TO BE RELOCATED SHALL BE DIRECTLY CONNECTED TO THE EXISTING OR PROPOSED WATER MAIN WITH NEW SERVICE LINES.
- ALL NEW WATER SERVICE LINES SHALL BE CONSIDERED INCIDENTAL TO THE CONSTRUCTION OF NEW WATER METERS; RELOCATION OF EXISTING WATER METERS; AND RECONNECTION OF EXISTING WATER METERS.
- ALL NEW WATER METERS SHALL BE LOCATED AT THE RIGHT-OF-WAY LINE.
- CONTRACTOR SHALL CONNECT THE OUTLET SIDE OF RELOCATED WATER METER TO THE EXISTING CUSTOMER SERVICE LINE OUTSIDE OF THE RIGHT-OF-WAY LINE.
- CONTRACTOR SHALL RETURN ALL REMOVED WATER METERS TO THE UTILITY OWNER. CONTRACTOR SHALL PROPERLY DISPOSE OF ALL OTHER PARTS, PIPING, AND METER BOXES.
- EXISTING WATER SERVICE LINES BETWEEN THE EXISTING WATER MAIN AND THE REMOVED WATER METER SHALL BE ABANDONED IN PLACE OR REMOVED AS NEEDED, AS PER NCDOT SPECIFICATIONS.
- ALL HYDRANTS, RELOCATED OR PROPOSED, SHALL BE LOCATED INSIDE THE (PROPOSED OR EXISTING) RIGHT-OF-WAY LINE AS NOTED PER THE INSTALLATION DETAIL.
- HYDRANTS, LABELED HEREIN, TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR FOR PROPER DISPOSAL. THESE HYDRANTS SHALL NOT BE USED AS NEW HYDRANTS IN THE PROPOSED CONSTRUCTION, UNLESS OTHERWISE DIRECTED BY THE CITY OF DURHAM REPRESENTATIVE.
- RELOCATED HYDRANTS SHALL BE TESTED AFTER RELOCATION TO INSURE THE HYDRANT IS IN PROPER WORKING ORDER. IF THE RELOCATED HYDRANT DOES NOT OPERATE PROPERLY, THEN THE CONTRACTOR SHALL REMOVE THE RELOCATED HYDRANT AND INSTALL A NEW HYDRANT.

SANITARY FORCE MAIN NOTES:

- ALL PROPOSED SANITARY FORCE MAIN SHALL BE DUCTILE IRON WITH RESTRAINED JOINT CONSTRUCTION.
- THE DURHAM COUNTY FORCE MAINS CAN ONLY BE SHUTDOWN FOR 4 TO 5 HOURS AT A TIME, MONDAY TO FRIDAY. ANY LENGTH OF TIME BEYOND THAT AND THE CONTRACTOR WILL NEED TO EMPLOY A PUMP AND HAUL METHOD. ON WEEKENDS, SHUTDOWNS MAY BE POSSIBLE FOR UP TO 9 HOURS AT A TIME DUE TO THE LACK OF INDUSTRIAL ACTIVITY.
- WHEN NECESSARY, THE CONTRACTOR SHALL EMPLOY A PUMP AND HAUL METHOD TO BYPASS SECTIONS OF SANITARY FORCE MAIN UNDER CONSTRUCTION. CONTRACTOR SHALL PUMP WASTE FROM THE WET WELL OF THE PUMP STATION, UPSTREAM OF THE CONSTRUCTION, INTO A TANKER AND REINTRODUCE THE WASTE BACK INTO THE SAME SYSTEM AT A MANHOLE DOWNSTREAM OF THE CONSTRUCTION. CONTRACTOR SHALL COORDINATE ALL ASPECTS OF THIS OPERATION WITH DURHAM COUNTY PRIOR TO BEGINNING ANY SAID WORK. ALL TRANSPORTING OF WASTEWATER SHALL BE IN ACCORDANCE WITH THE RULES AND REGULATIONS OF NCDOT, THE LOCAL MUNICIPALITY, AND OTHER AGENCIES WITH JURISDICTION.

0371DEL_P17-18



MA Engineering CONSULTANTS, INC.
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221

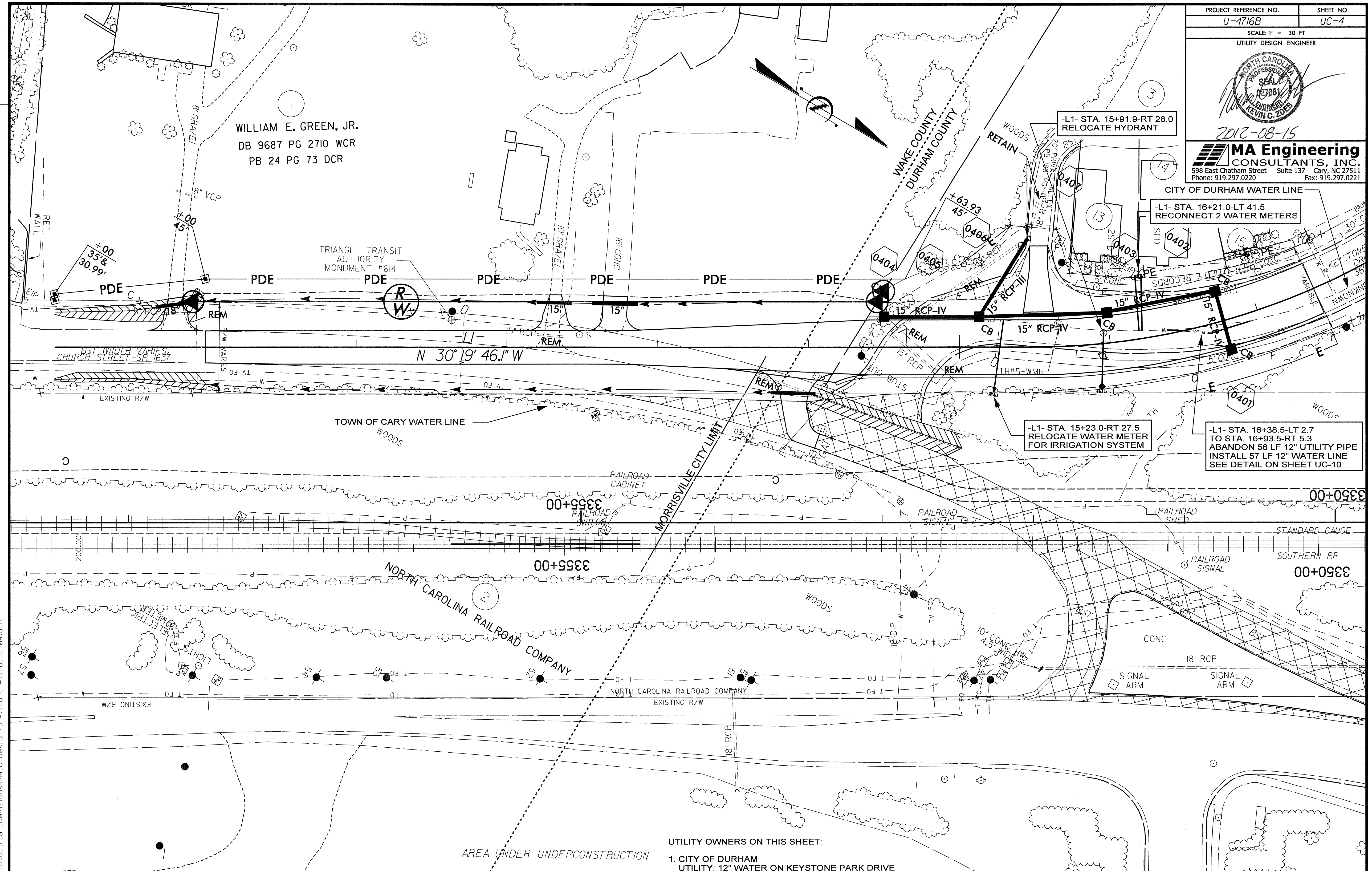
CITY OF DURHAM WATER LINE

-L1- STA. 15+91.9-RT 28.0
RELOCATE HYDRANT

-L1- STA. 16+21.0-LT 41.5
RECONNECT 2 WATER METERS

-L1- STA. 15+23.0-RT 27.5
RELOCATE WATER METER
FOR IRRIGATION SYSTEM

-L1- STA. 16+38.5-LT 2.7
TO STA. 16+93.5-RT 5.3
ABANDON 56 LF 12" UTILITY PIPE
INSTALL 57 LF 12" WATER LINE
SEE DETAIL ON SHEET UC-10



AREA UNDER UNDERCONSTRUCTION

- UTILITY OWNERS ON THIS SHEET:
1. CITY OF DURHAM
UTILITY: 12" WATER ON KEYSTONE PARK DRIVE
CONTACT: ERIC HALSTEAD
PHONE: 919-560-4326 x30259
 2. TOWN OF CARY
UTILITY: 12" WATER ON CHURCH STREET
CONTACT: GLEN HARRELL
PHONE: 919-460-4933

- NOTES:
1. ALL WATER PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 2. THE TOWN OF CARY WATER LINE ALONG CHURCH STREET AND ACROSS THE RAILROAD R/W TO BE RELOCATED UNDER PROJECT U-4716A/C PRIOR TO CONSTRUCTION OF THE PROPOSED DITCHES DEPICTED ALONG CHURCH STREET.

- UTILITY OWNERS ON THIS SHEET:
- CITY OF DURHAM
UTILITY: 16" WATER
ON KEYSTONE PARK DRIVE EXTENSION
CONTACT: ERIC HALSTEAD
PHONE: 919-560-4326 x30259
 - DURHAM COUNTY
UTILITY: 8" & 12" GRAVITY SEWER / 8" FORCE MAIN
ON KEYSTONE PARK DRIVE EXTENSION
CONTACT: TED CREDLE
PHONE: 919-544-8280

FOR PROFILE OF 8" SANITARY FORCE MAIN
REFER TO SHEET UC-8

FAYE B. PROCTOR
DB 2428 PG 411
PB 94 PG 59

KEYSTONE EAST ASSOCIATES LLC
DB 3003 PG 885
PB 174 PG 82

0371DEL P17-18

KEYSTONE PARK ASSOC. LLC
DB 5505 PG 513
PB 133 PG 112

LIBERTY DURHAM LLC
DB 5781 PG 674
PB 152 PG 373

FENCE WILL BE PLACED
BY PROPERTY OWNER

DURHAM COUNTY
PUMP STATION SITE

BEGIN CONSTRUCTION
-L- POT Sta. 11+50.00

BEGIN GRADE
-L- POT Sta. 11+70.00

-L- STA. 11+72.97-RT 12.16
TO STA. 12+27.72-RT 12.92
ABANDON 55 LF OF 12" UTILITY PIPE
INSTALL 60 LF OF 12" WATER LINE
REFER TO DETAIL ON SHEET UC-9

-L- STA. 14+66.15-LT 26.0
RELOCATE WATER METER

-L- STA. 15+18.90-RT 7.88
8-INCH SAN. FORCE MAIN
22.5 DEG BEND
TIE TO EXISTING

-L- STA. 15+25.40-RT 7.30
TO STA. 17+56.66-LT 10.65
HORIZONTAL
RADIUS = 800'

-L- STA. 18+90.23-LT 15.10
8-INCH SAN. FORCE MAIN
45 DEG BEND
TIE TO EXISTING

-L- STA. 18+83.53-LT 8.20
8-INCH SAN. FORCE MAIN
45 DEG BEND

-L- STA. 13+26.23-RT 29.32
RELOCATE FIRE HYDRANT

-L- STA. 15+88.78-RT 28.89
RELOCATE FIRE HYDRANT

-L- STA. 18+07.90-RT 29.24
RELOCATE FIRE HYDRANT

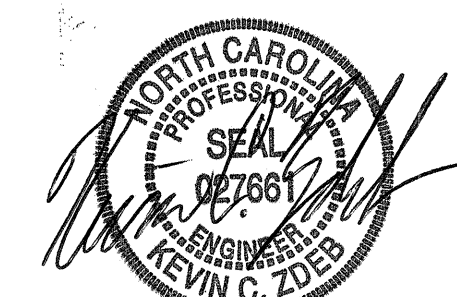
373 LF OF 8-INCH
D.I. SAN. FORCE MAIN

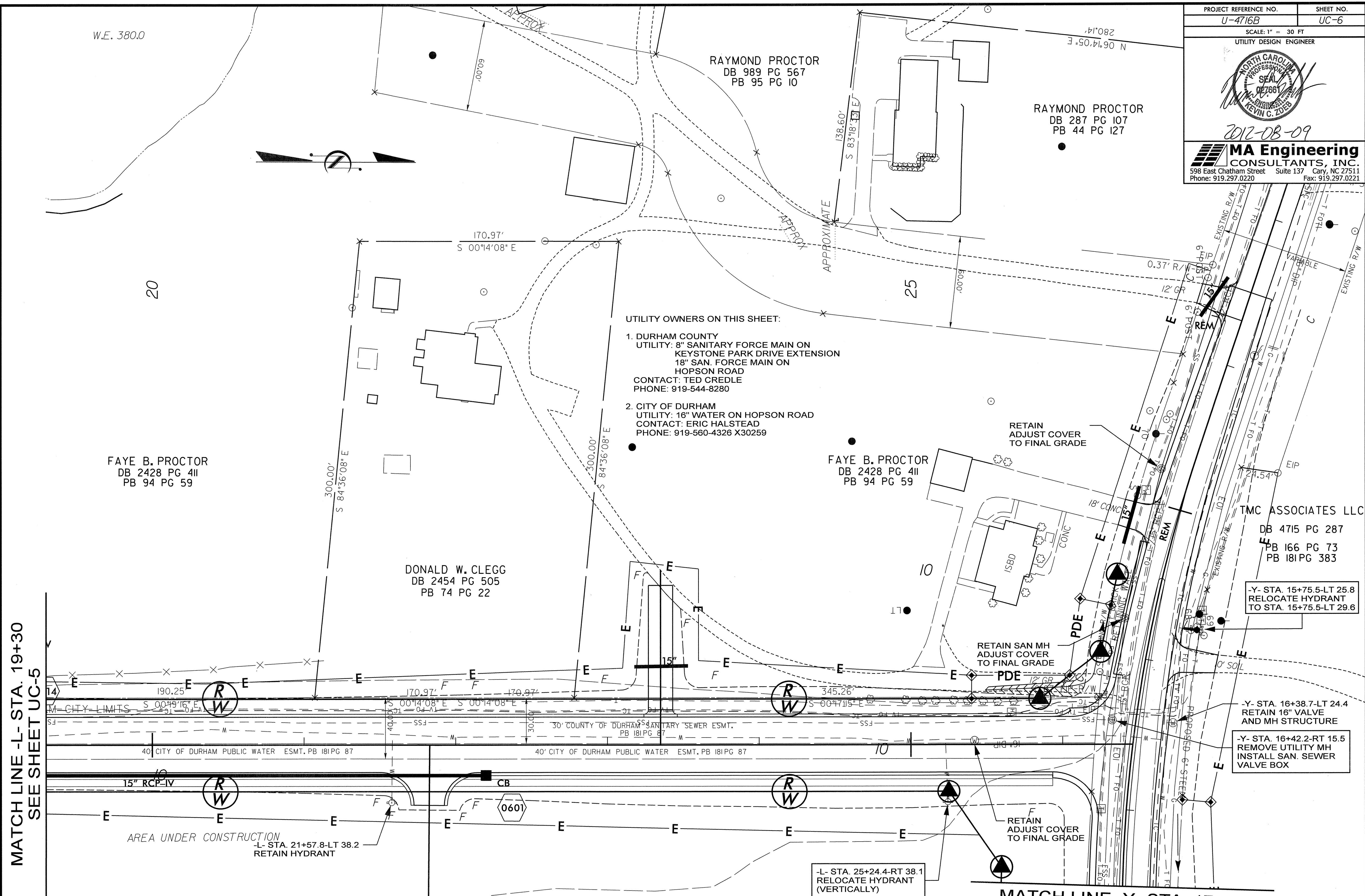
ABANDON 371 LF OF
8-INCH UTILITY PIPE

- NOTES:
- ALL WATER PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 - ALL SANITARY FORCE MAIN PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 - REFER TO ROADWAY DESIGN PLANS FOR PUMP STATION SITE IMPROVEMENTS, INCLUDING: FENCE WORK, CURB CUT, DRIVEWAY AND EASEMENT EXTENSION.
 - POSSIBILITY OF ENCOUNTERING WEATHERED ROCK DURING EXCAVATION OF THE PROPOSED TRENCH FOR THE NEW 8" SANITARY FORCE MAIN.

MATCH LINE -L- STA. 19+30
SEE SHEET UC-6

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PROJECT REFERENCE NO. U-4716B	SHEET NO. UC-6
SCALE: 1" = 30 FT UTILITY DESIGN ENGINEER	
	
2012-08-09	
MA Engineering CONSULTANTS, INC. 598 East Chatham Street Suite 137 Cary, NC 27511 Phone: 919.297.0220 Fax: 919.297.0221	



UTILITY OWNERS ON THIS SHEET:

- DURHAM COUNTY
UTILITY: 8" SANITARY FORCE MAIN ON KEYSTONE PARK DRIVE EXTENSION
18" SAN. FORCE MAIN ON HOPSON ROAD
CONTACT: TED CREDLE
PHONE: 919-544-8280
- CITY OF DURHAM
UTILITY: 16" WATER ON HOPSON ROAD
CONTACT: ERIC HALSTEAD
PHONE: 919-560-4326 X30259

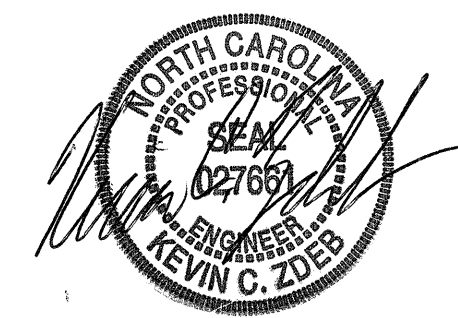

MATCH LINE -L- STA. 19+30
SEE SHEET UC-5

MATCH LINE -Y- STA. 17+50
SEE SHEET UC-7

- NOTES:
- ALL WATER PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 - ALL SANITARY FORCE MAIN PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 - REFER TO SHEET UC-10 FOR OFFSET SANITARY AIR RELEASE VALVE DETAIL.

KEYSTONE EAST ASSOCIATES LLC
DB 3003 PG 885
PB 174 PG 82

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PROJECT REFERENCE NO. U-4716B	SHEET NO. UC-7
SCALE: 1" = 30 FT UTILITY DESIGN ENGINEER	
	
2012-08-09	
	
598 East Chatham Street Suite 137 Cary, NC 27511 Phone: 919.297.0220 Fax: 919.297.0221	

TMC ASSOCIATES LLC
DB 4715 PG 287
PB 166 PG 73
PB 181 PG 383

-Y- STA. 18+17.3-LT 21.0
TO STA. 18+70.2-LT 21.1
ABANDON 53 LF OF 16" UTILITY PIPE
INSTALL 55 LF OF 16" WATER LINE
SEE DETAIL ON SHEET UC-9

MATCH LINE -Y- STA. 17+50
SEE SHEET UC-6

-Y- STA. 18+10.2-RT 12.8
TO STA. 18+70.50-RT 14.3
ABANDON 61 LF OF 18" UTILITY PIPE
INSTALL 64 LF OF 18" SAN. FORCE MAIN
SEE DETAIL ON SHEET UC-9



- NOTES:
1. ALL WATER PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 2. ALL SANITARY FORCE MAIN PIPE SHALL BE RESTRAINED JOINT CONSTRUCTION.
 3. THE CITY OF DURHAM WATER LINE AND DURHAM COUNTY FORCE MAIN ALONG HOPSON ROAD CROSSING THROUGH THE RAILROAD R/W TO BE RELOCATED UNDER PROJECT U-4716A/C.
 4. POSSIBILITY OF ENCOUNTERING WEATHERED ROCK DURING EXCAVATION OF THE PROPOSED TRENCH FOR THE NEW 16" WATER LINE AND 18" SANITARY FORCE MAIN.

KEYSTONE EAST ASSOCIATES LLC
DB 3003 PG 885
PB 174 PG 82

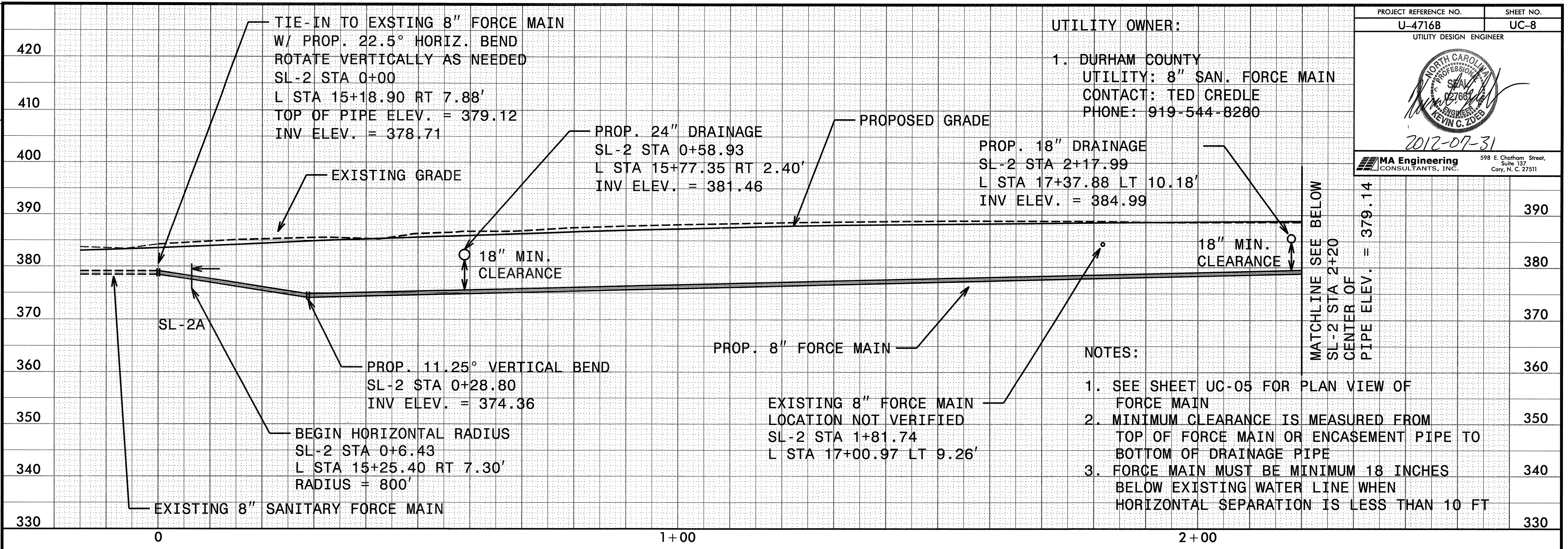
NORTH CAROLINA RAILROAD CO
DB 4432 PG 331

- UTILITY OWNERS ON THIS SHEET:
1. DURHAM COUNTY
UTILITY: 18" SAN. FORCE MAIN
CONTACT: TED CREDLE
PHONE: 919-544-8280
 2. CITY OF DURHAM
UTILITY: 16" WATER LINE
CONTACT: ERIC HALSTEAD
PHONE: 919-560-4326 x30259

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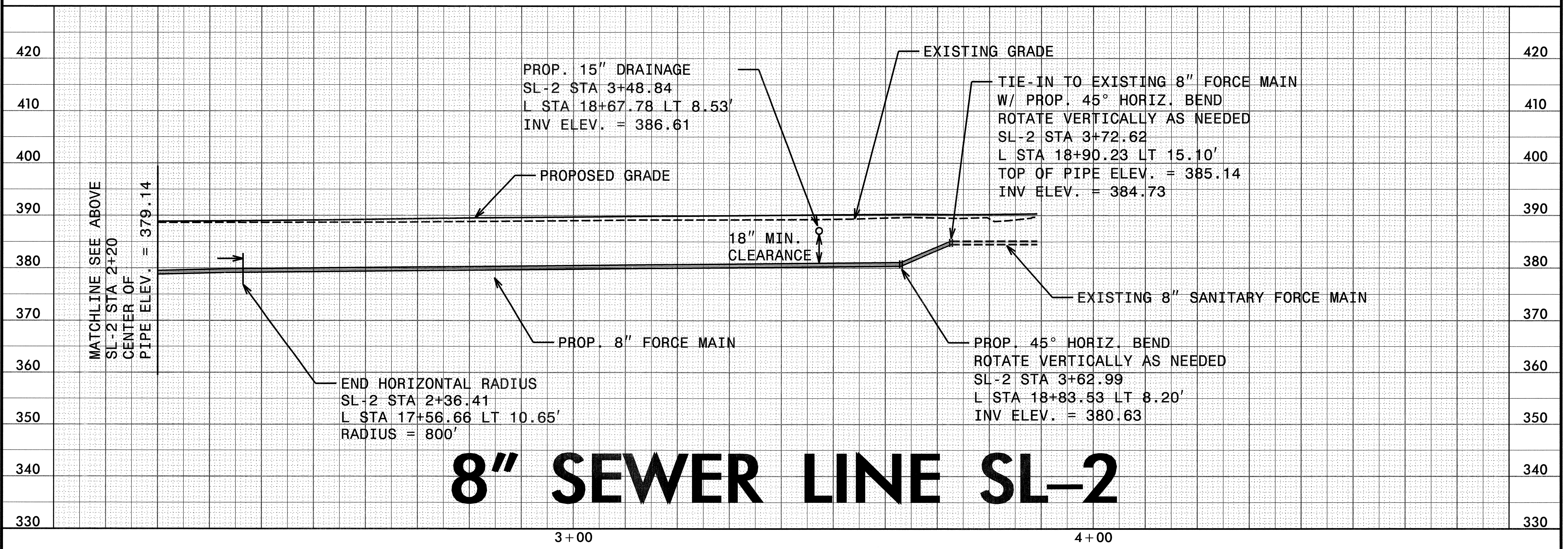
PROJECT REFERENCE NO. U-4716B	SHEET NO. UC-8
UTILITY DESIGN ENGINEER	
	
2012-07-31	
	
598 E. Chatham Street, Suite 137 Cary, N. C. 27511	

UTILITY OWNER:
1. DURHAM COUNTY
UTILITY: 8" SAN. FORCE MAIN
CONTACT: TED CREDLE
PHONE: 919-544-8280



- NOTES:
1. SEE SHEET UC-05 FOR PLAN VIEW OF FORCE MAIN
 2. MINIMUM CLEARANCE IS MEASURED FROM TOP OF FORCE MAIN OR ENCASEMENT PIPE TO BOTTOM OF DRAINAGE PIPE
 3. FORCE MAIN MUST BE MINIMUM 18 INCHES BELOW EXISTING WATER LINE WHEN HORIZONTAL SEPARATION IS LESS THAN 10 FT

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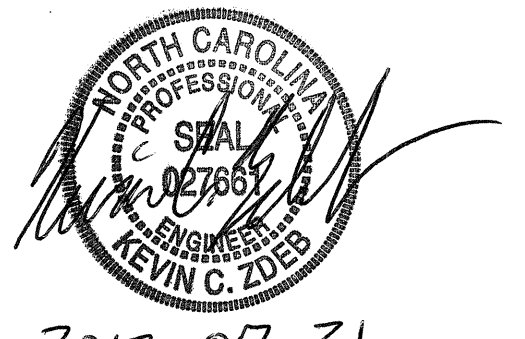


8" SEWER LINE SL-2

3+00 4+00

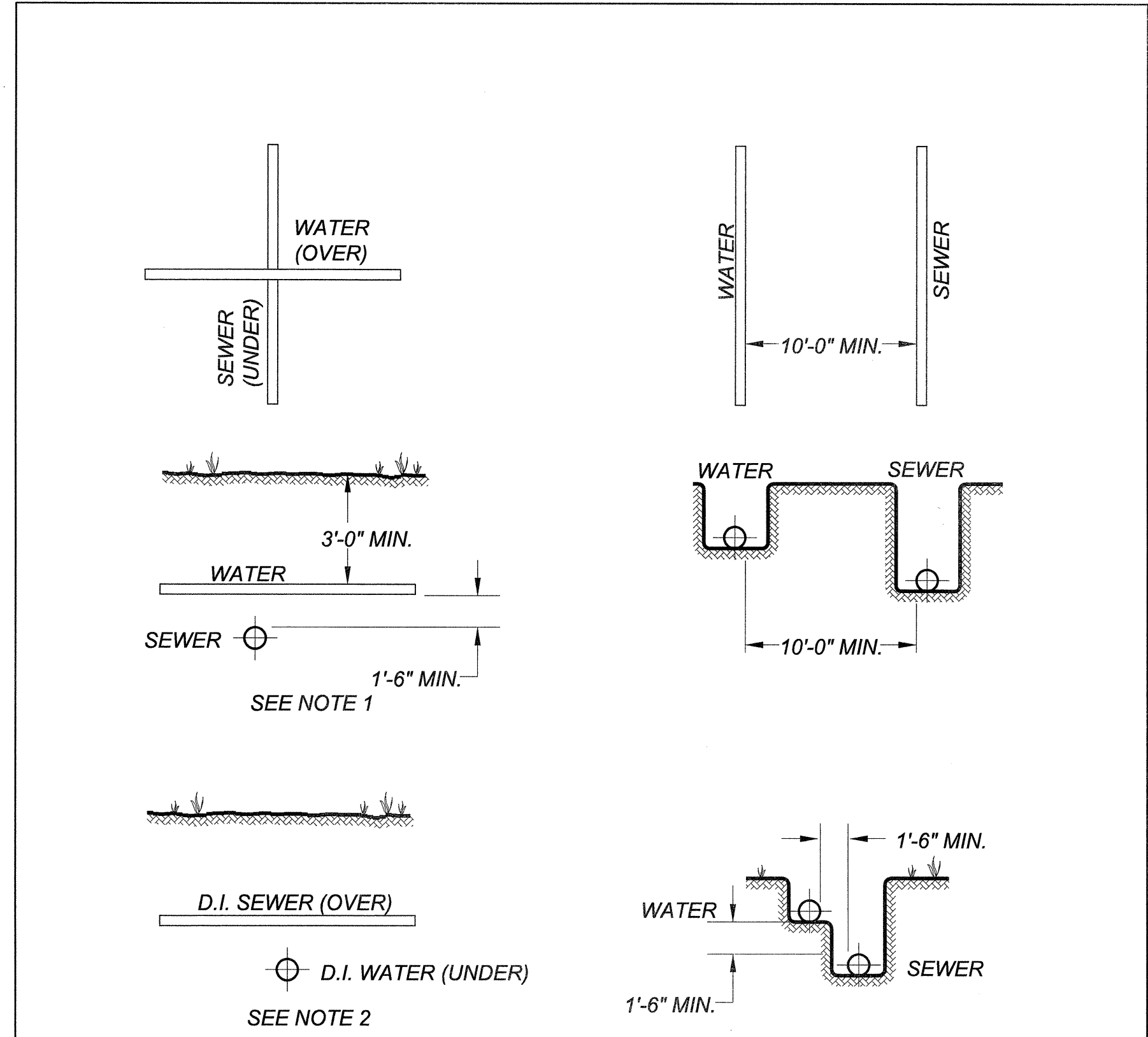
PROJECT REFERENCE NO. U-4716B SHEET NO. UC-9

UTILITY DESIGN ENGINEER



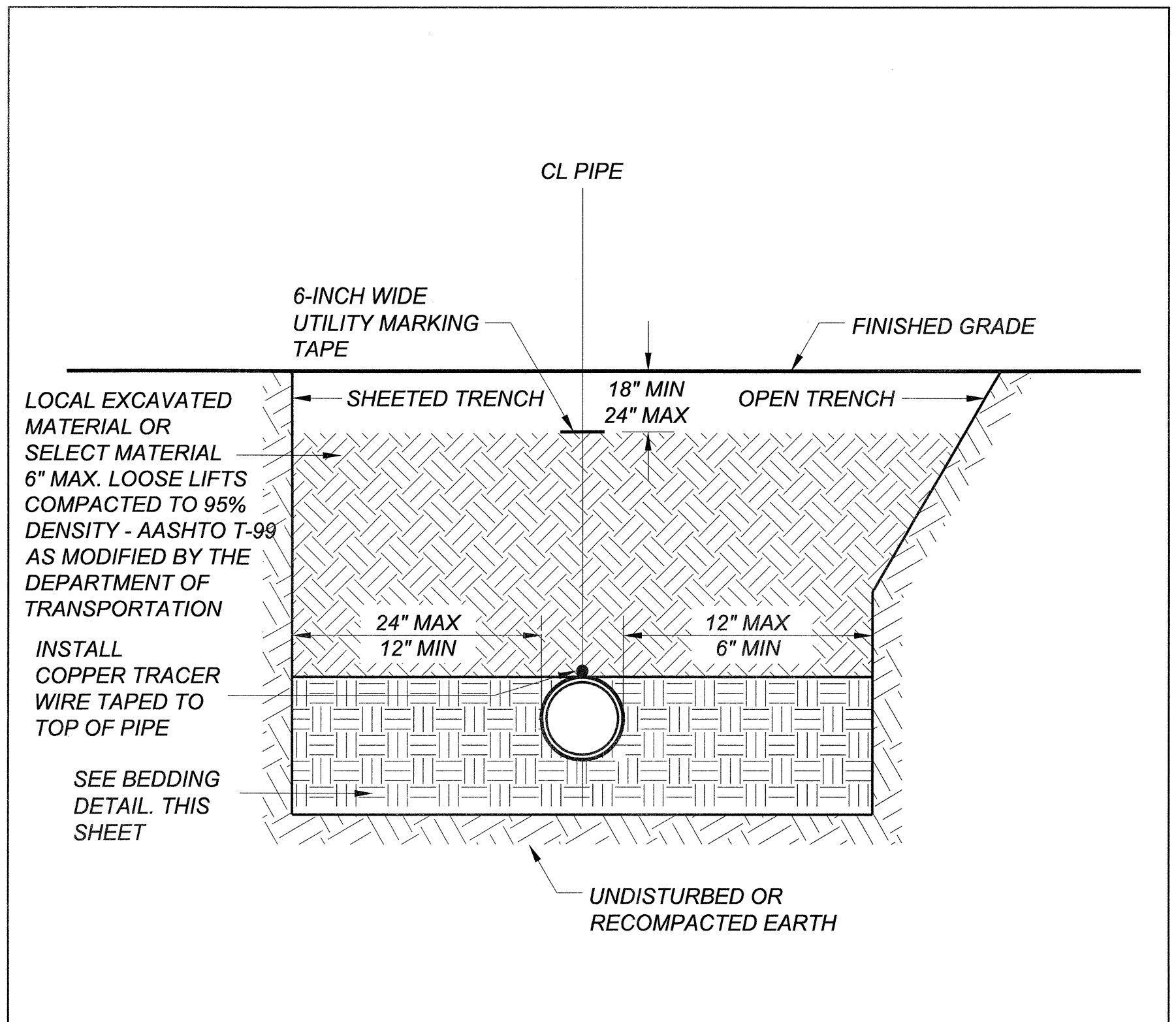
2012-07-31

MA Engineering
CONSULTANTS, INC.
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221



- NOTES:**
- WHERE THE WATER MAIN IS INSTALLED ABOVE THE SEWER, BUT LESS THAN 18" CLEAR, BOTH THE WATER AND THE SEWER MAINS SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH WATER MAIN STANDARD JOINTS FOR A LATERAL DISTANCE OF AT LEAST 10 FEET ON EACH SIDE OF THE POINT OF CROSSING.
 - WHERE THE WATER PIPE IS LAID UNDER SEWER, BOTH THE WATER AND THE SEWER MAINS SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH WATER MAIN STANDARD JOINTS FOR A LATERAL DISTANCE OF AT LEAST 10 FEET ON EACH SIDE OF THE POINT OF CROSSING.
 - "SEWER" SHALL BE CONSIDERED TO MEAN EITHER SANITARY SEWER OR STORM SEWER.

**TYPICAL PIPE CROSSING AND PARALLELS
NTS**

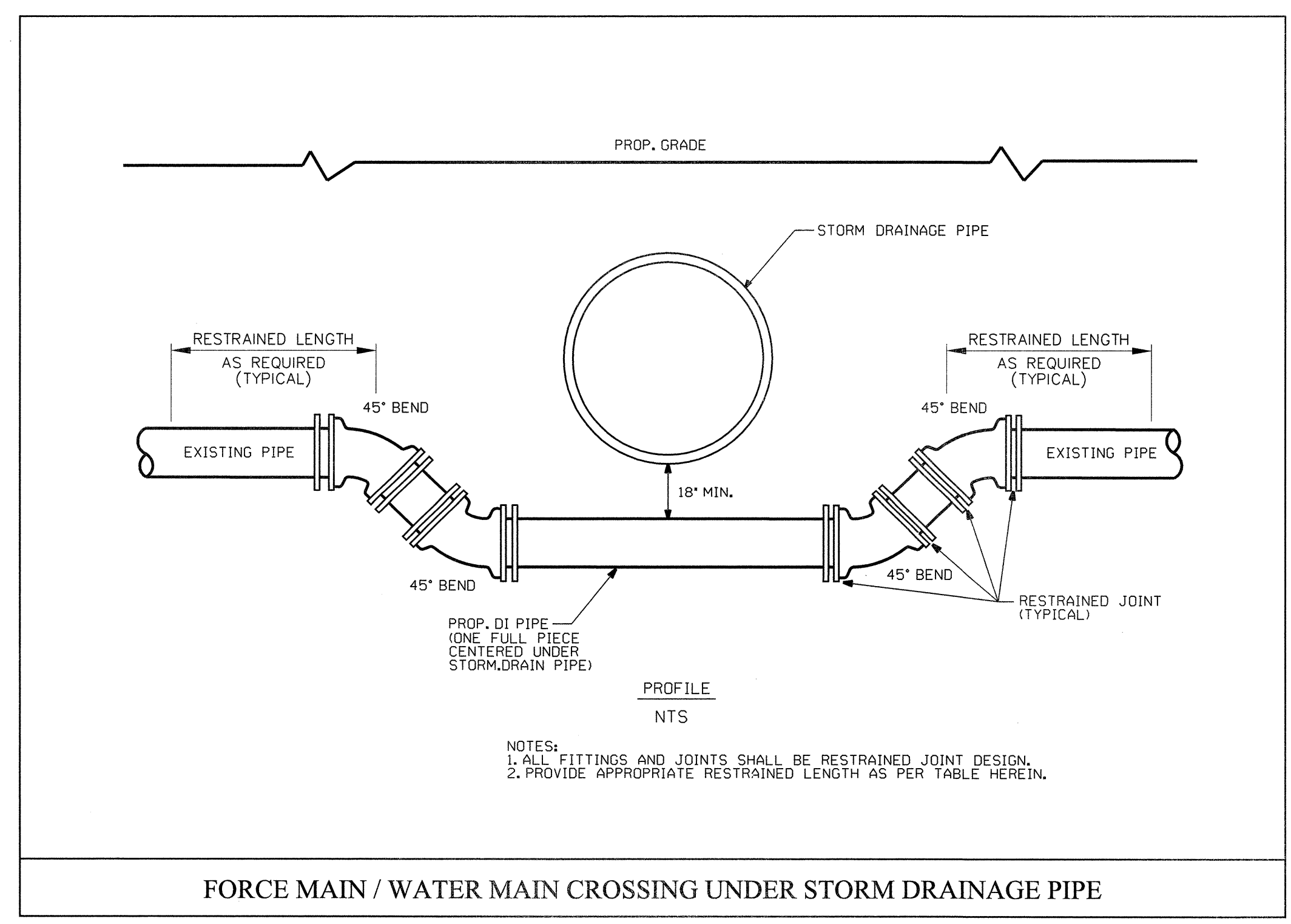
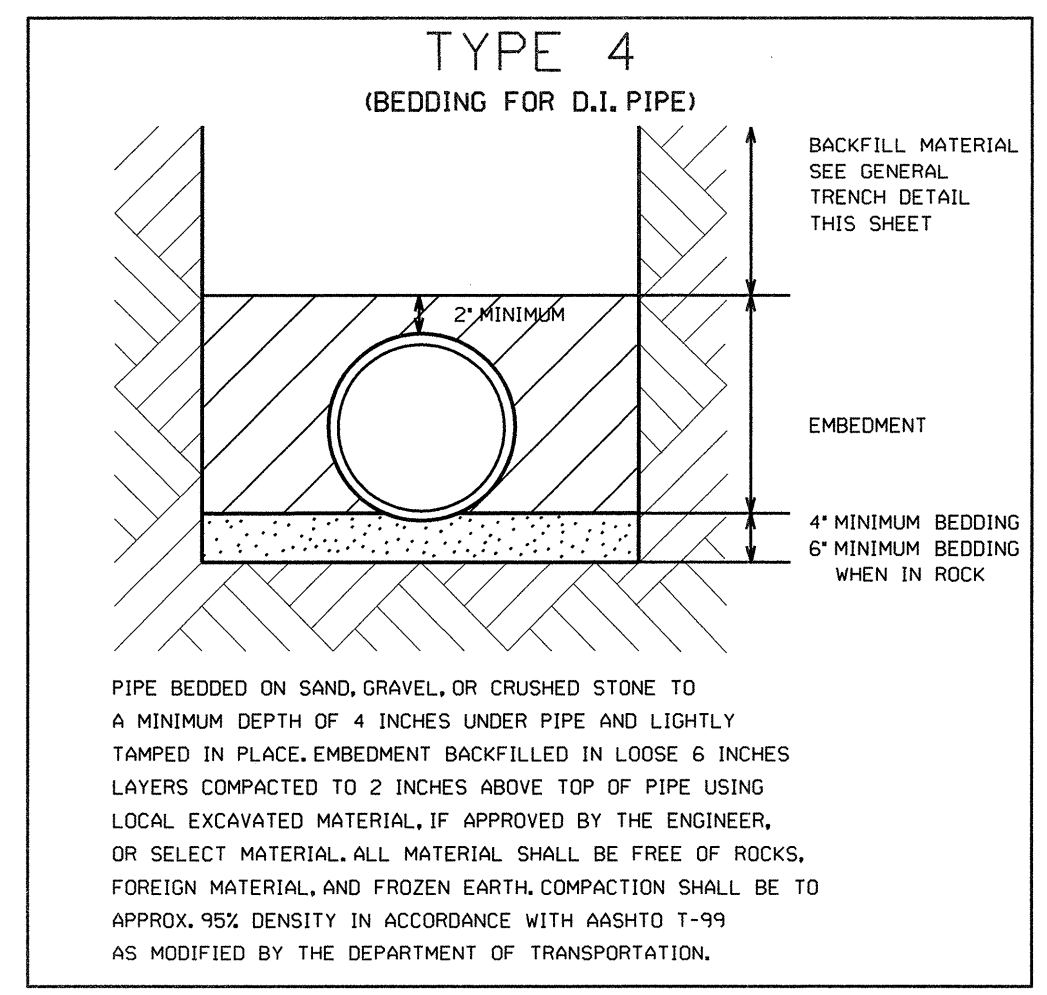


- NOTES:**
- ALL SHORING & TRENCHING SHALL COMPLY WITH OSHA SAFETY STANDARDS FOR THE CONSTRUCTION INDUSTRY.
 - BELL HOLES NOT SHOWN.
 - ALL BACKFILL MATERIAL SHALL BE FREE OF ROCKS, FOREIGN MATERIAL, AND FROZEN EARTH.

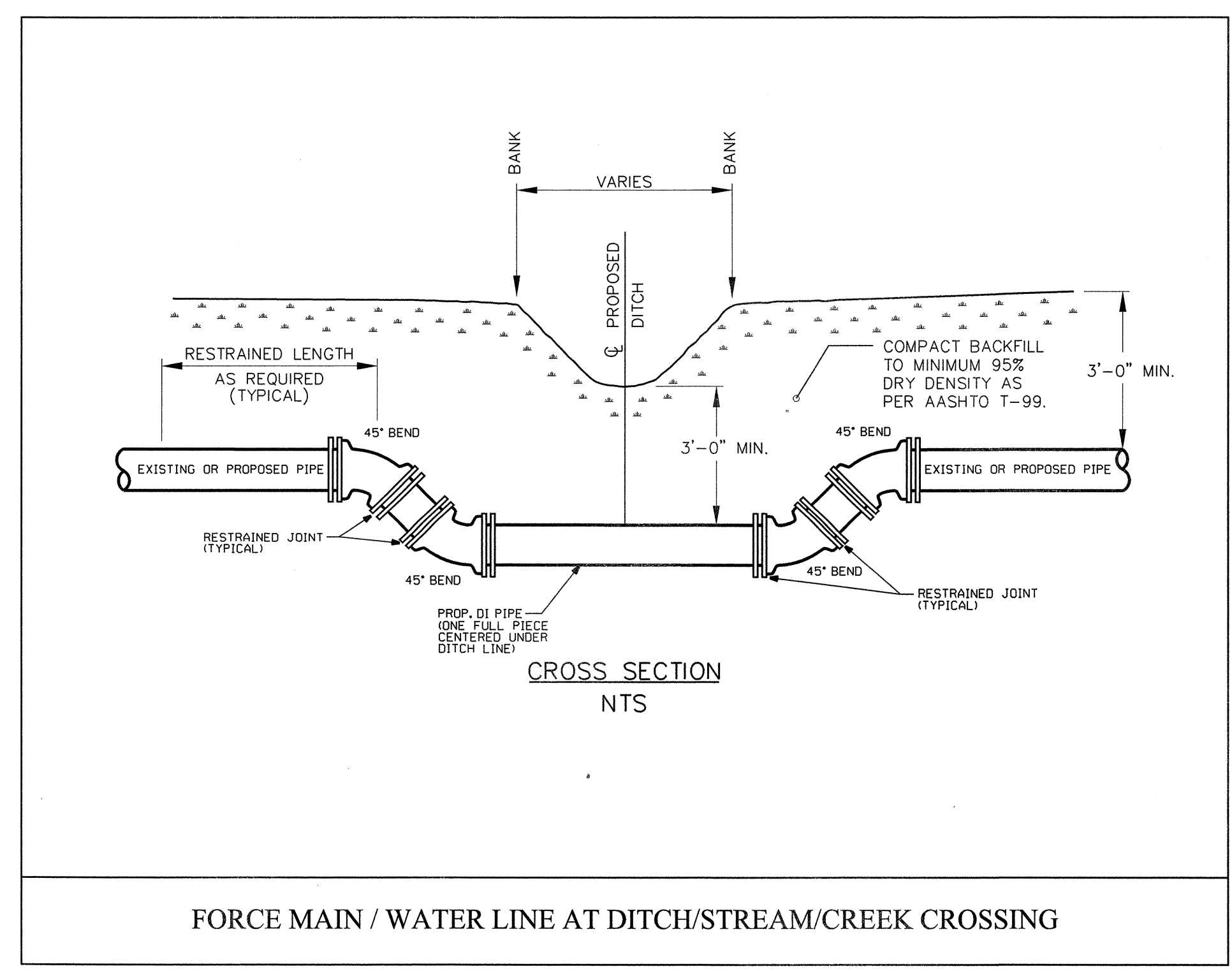
**GENERAL TRENCH DETAIL
NTS**

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		



FORCE MAIN / WATER MAIN CROSSING UNDER STORM DRAINAGE PIPE



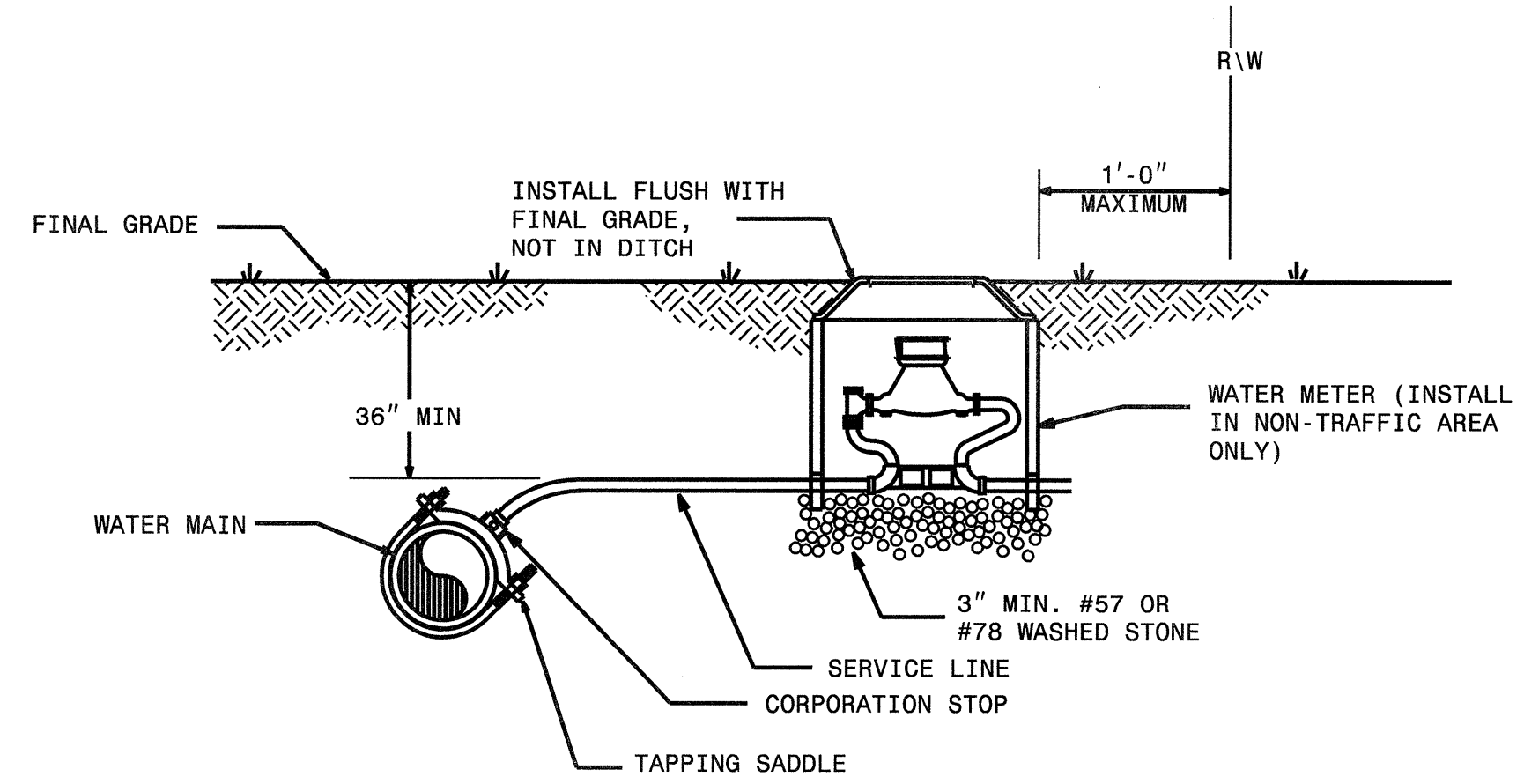
FORCE MAIN / WATER LINE AT DITCH/STREAM/CREEK CROSSING

TRENCH & PIPE CROSSING DETAILS

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR
WATER METER

SHEET 1 OF 1
1515.01



NOTES:

1. THIS DETAIL SHOWS THE TYPICAL FINAL WATER METER CONFIGURATION AFTER INSTALLATION OF A PROPOSED WATER METER, RECONNECTION OF AN EXISTING WATER METER, OR RELOCATION OF A WATER METER.

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR
WATER METER

SHEET 1 OF 1
1515.01

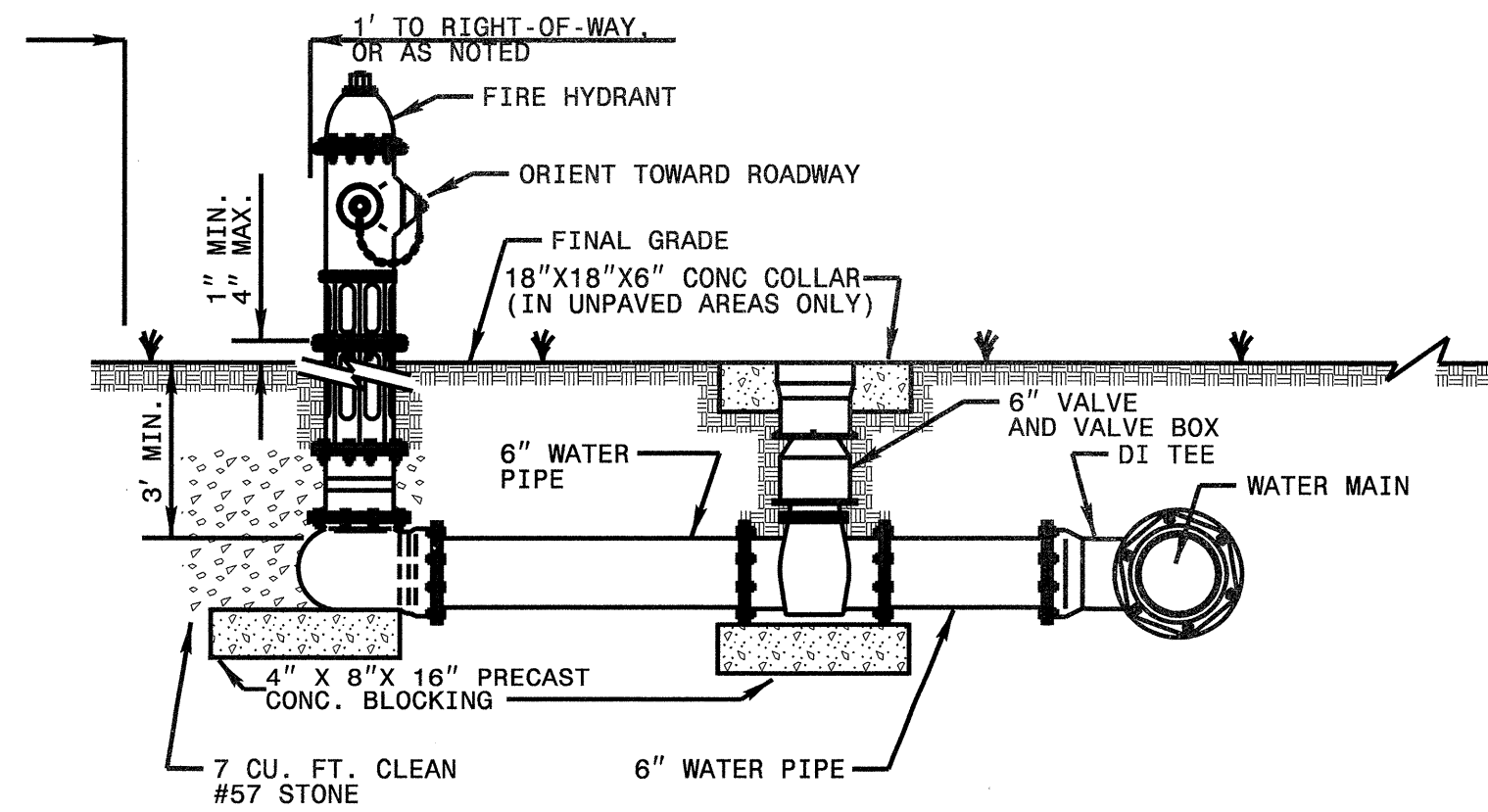
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR
FIRE HYDRANT

SHEET 1 OF 1
1515.02

NOTES:

1. THIS DETAIL SHOWS THE TYPICAL FINAL FIRE HYDRANT CONFIGURATION AFTER INSTALLATION OF A PROPOSED FIRE HYDRANT, RECONNECTION OF AN EXISTING FIRE HYDRANT, OR RELOCATION OF A FIRE HYDRANT.
2. KEEP DRAIN PORTS FREE FROM OBSTRUCTION.
3. RESTRAIN ALL PIPE JOINTS AND FITTINGS. ACCEPTABLE TYPES OF RESTRAINT INCLUDE RESTRAINING GLANDS, RESTRAINED, PUSH-ON JOINTS; AND 3/4" BITUMINOUS COATED, ALL-THREAD RESTRAINING RODS. THRUST BLOCKS ARE NOT AN ACCEPTABLE TYPE OF RESTRAINT.
4. FOR RELOCATED OR RECONNECTED FIRE HYDRANTS VERIFY THE VALVE IS RESTRAINED TO THE MAIN. PROVIDE APPROPRIATE RESTRAINT.
5. HYDRANT LOCATION APPLIES TO PROPOSED AND RELOCATED FIRE HYDRANTS.
6. LOCATE FIRE HYDRANT WITH 3' HORIZONTAL CLEARANCE FROM ABOVE GROUND OBJECTS.
7. PROVIDE A MINIMUM OF 3' COVER OVER ALL SECTIONS OF HORIZONTAL PIPE. USE FITTINGS AS NECESSARY.
8. TAPPING SLEEVES MAY BE USED ON EXISTING MAINS IN LIEU OF DI TEES.
9. LOCATE FIRE HYDRANT OUTSIDE OF THE VEHICLE RECOVERY AREA, ADJACENT TO THE R/W LINE, OR IN A PROTECTED AREA.

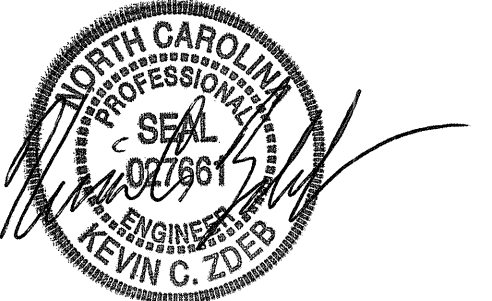


STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR
FIRE HYDRANT

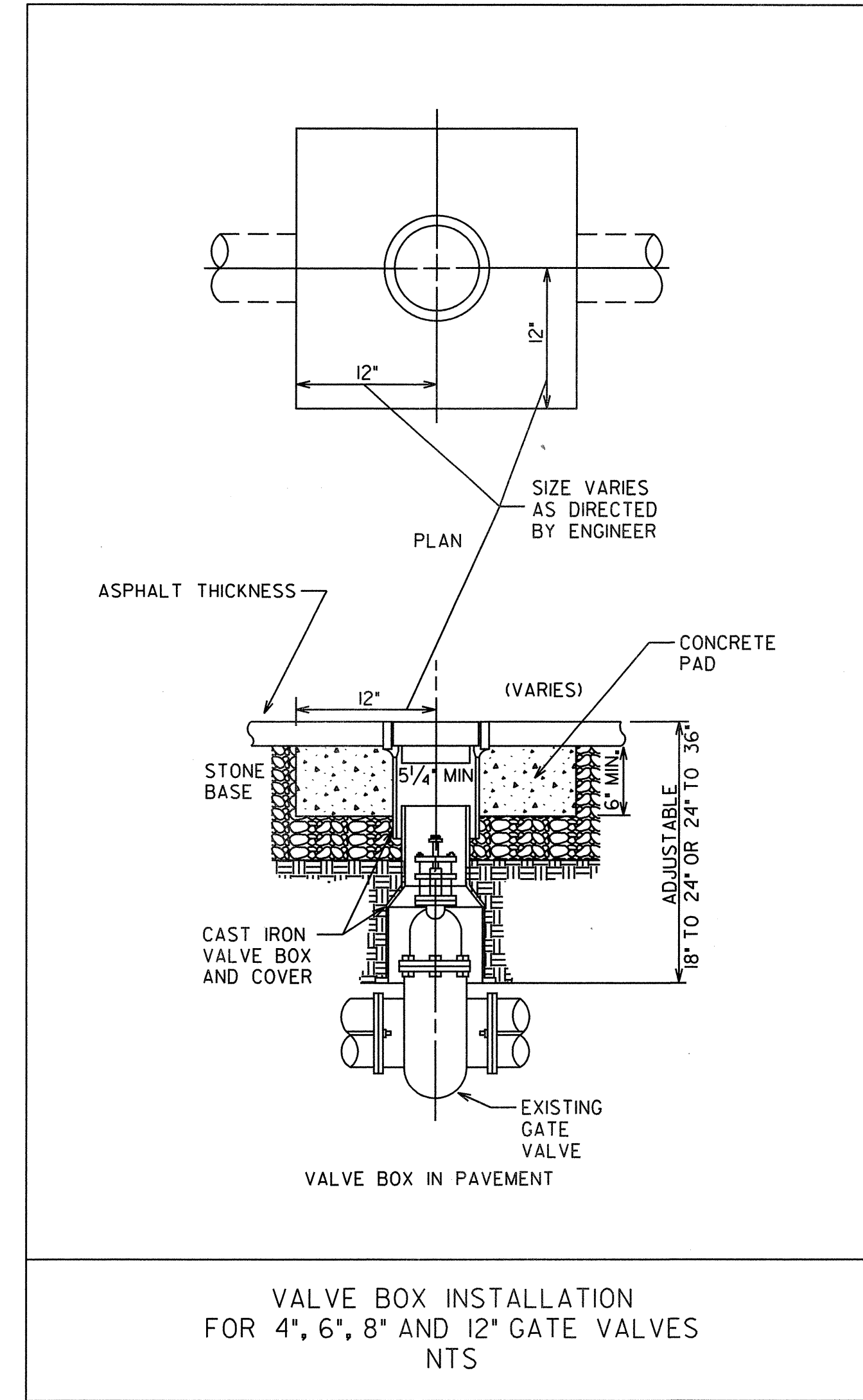
SHEET 1 OF 1
1515.02

UTILITY DESIGN ENGINEER



2012-07-31

MA Engineering
CONSULTANTS, INC.
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221



VALVE BOX INSTALLATION
FOR 4", 6", 8" AND 12" GATE VALVES
NTS



2012-07-31

MA Engineering
CONSULTANTS, INC.
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221

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

HORIZONTAL RESTRAINT (ALL AREAS GIVEN ARE IN SQUARE FEET)										VERTICAL RESTRAINT (ALL VOLUMES GIVEN ARE IN CUBIC YARDS)**							
PIPE SIZE	DEGREE OF BEND	LBS. STATIC THRUST *	ALLOWABLE SOIL BEARING (PSF)								PIPE SIZE	RESTRAINING RODS		DEGREE OF BEND			
			1000	2000	3000	4000	5000	6000	7000	8000		NO. REQ'D	DIA.	11/4°	22 1/2°	45°	
4"	11/4°	616	1	1	1	1	1	1	1	1	4"	2	1/2"	0.25	0.50	0.75	
	22 1/2°	1,226	2	2	2	2	2	2	2	2		2	1/2"	0.50	1.0	1.75	
	45°	2,405	4	4	4	4	4	4	4	4		8"	2	5/8"	0.75	1.50	3.0
	TEE/PLUG	3,143	3	2	1	1	1	1	1	1		10"	2	3/4"	1.25	2.25	4.50
6"	11/4°	1,385	2	2	2	2	2	2	2	2	6"	2	3/4"	1.75	3.25	6.50	
	22 1/2°	2,758	4	4	4	4	4	4	4	4		14"	4	5/8"	2.25	4.50	8.75
	45°	5,409	8	8	8	8	8	8	8	8		16"	4	3/4"	3.0	6.0	11.50
	TEE/PLUG	7,068	7	4	3	2	2	1	1	1		**INCLUDES 1.50 SAFETY FACTOR					
8"	11/4°	2,424	3	3	3	3	3	3	3	3							
	22 1/2°	4,904	6	6	6	6	6	6	6	6							
	45°	9,619	10	10	10	10	10	10	10	10							
	TEE/PLUG	12,568	9	6	4	3	2	2	2	2							
10"	11/4°	3,846	4	4	4	4	4	4	4	4							
	22 1/2°	7,661	8	8	8	8	8	8	8	8							
	45°	15,028	15	15	15	15	15	15	15	15							
	TEE/PLUG	19,635	20	10	7	5	4	3	3	2							
12"	11/4°	5,443	5	5	5	5	5	5	5	5							
	22 1/2°	11,032	11	11	11	11	11	11	11	11							
	45°	21,641	22	22	22	22	22	22	22	22							
	TEE/PLUG	28,274	28	14	9	7	6	5	4	4							
14"	11/4°	7,544	8	8	8	8	8	8	8	8							
	22 1/2°	15,016	15	15	15	15	15	15	15	15							
	45°	29,456	29	29	29	29	29	29	29	29							
	TEE/PLUG	38,485	38	19	13	10	8	6	5	5							
16"	11/4°	9,894	10	10	10	10	10	10	10	10							
	22 1/2°	19,612	20	20	20	20	20	20	20	20							
	45°	38,471	38	38	38	38	38	38	38	38							
	TEE/PLUG	50,265	50	25	17	13	10	8	7	6							

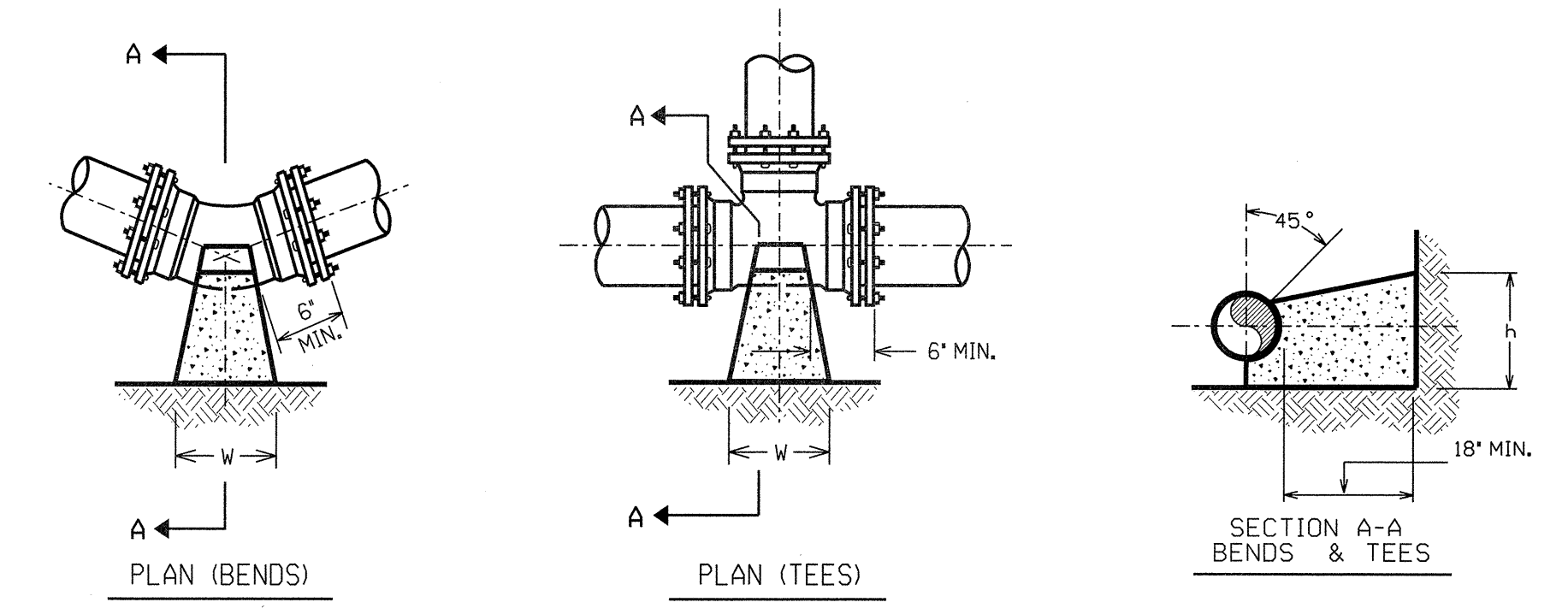
- * INCLUDES 1.25 SAFETY FACTOR
- GENERAL NOTES:
 1. CONCRETE SHALL BE CLASS "B".
 2. CONCRETE SHALL NOT CONTACT BOLTS ENDS OF MECHANICAL JOINT FITTINGS.
 3. CONSULT WITH ENGINEER FOR CONCRETE REQUIREMENTS ON MAINS LARGER THAN 16 INCHES.
 (FOR VERTICAL & HORIZONTAL BENDS)
 4. ALLOWABLE SOIL BEARING SHALL BE DETERMINED BY THE ENGINEER.

REVISIONS	
NO.	DESCRIPTION

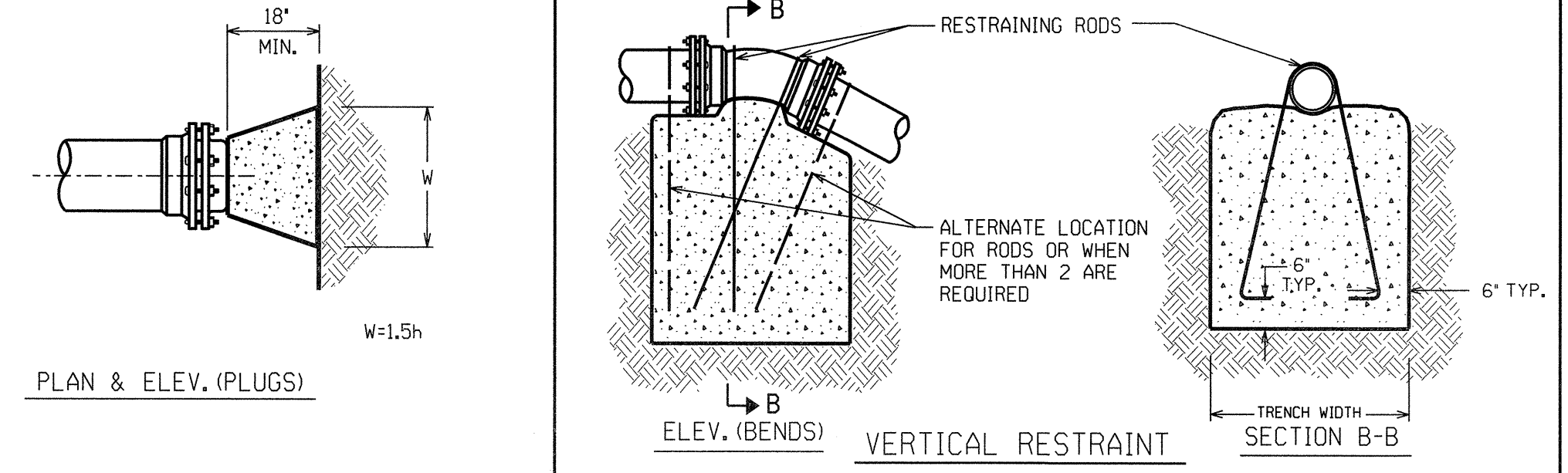
SHEET 2 OF 2

THRUST RESTRAINT FOR WATER MAINS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
RALEIGH, N.C.



HORIZONTAL RESTRAINT



THRUST RESTRAINT FOR PIPE LINES

RESTRAINED JOINT DESIGN TABLE FOR DUCTILE IRON PIPE

FITTING	REQUIRED RESTRAINED LENGTH (FT) OF BARE D.I. PIPE BY DEPTH OF COVER							
	3 FT	4 FT	5 FT	6 FT	7 FT	8 FT	9 FT	10 FT
HORIZONTAL BENDS								
8 INCH DIA - 11.25 DEG	3	3	2	2	2	2	2	2
8 INCH DIA - 22.5 DEG	7	6	5	5	4	4	3	3
8 INCH DIA - 45 DEG	14	12	10	9	8	8	7	7
12 INCH DIA - 11.25 DEG	5	4	4	3	3	3	2	2
12 INCH DIA - 22.5 DEG	9	8	7	6	6	5	5	5
12 INCH DIA - 45 DEG	20	17	15	13	12	11	10	10
16 INCH DIA - 11.25 DEG	6	5	5	4	4	3	3	3
16 INCH DIA - 22.5 DEG	12	11	9	8	8	7	6	6
16 INCH DIA - 45 DEG	25	22	19	17	16	14	13	12
18 INCH DIA - 11.25 DEG	7	6	5	5	4	4	4	3
18 INCH DIA - 22.5 DEG	13	12	10	9	8	8	7	7
18 INCH DIA - 45 DEG	28	24	22	19	18	16	15	14
VERTICAL BENDS - DOWN								
8 INCH DIA - 11.25 DEG	10	8	7	6	6	5	5	5
8 INCH DIA - 22.5 DEG	19	17	15	13	12	11	10	9
8 INCH DIA - 45 DEG	40	35	30	27	25	22	21	19
12 INCH DIA - 11.25 DEG	14	12	10	9	8	8	7	7
12 INCH DIA - 22.5 DEG	28	24	21	19	17	16	14	13
12 INCH DIA - 45 DEG	57	50	44	39	35	32	30	28
16 INCH DIA - 11.25 DEG	18	15	14	12	11	10	9	9
16 INCH DIA - 22.5 DEG	36	31	27	25	22	20	19	17
16 INCH DIA - 45 DEG	74	65	57	51	46	42	39	36
18 INCH DIA - 11.25 DEG	20	17	15	14	12	11	10	10
18 INCH DIA - 22.5 DEG	40	34	30	27	25	23	21	19
18 INCH DIA - 45 DEG	83	72	63	57	52	47	43	40
VERTICAL BENDS - UP								
8 INCH DIA - 11.25 DEG	3	3	2	2	2	2	2	2
8 INCH DIA - 22.5 DEG	7	6	5	5	4	4	3	3
8 INCH DIA - 45 DEG	14	12	10	9	8	8	7	7
12 INCH DIA - 11.25 DEG	5	4	4	3	3	3	2	2
12 INCH DIA - 22.5 DEG	9	8	7	6	6	5	5	5
12 INCH DIA - 45 DEG	20	17	15	13	12	11	10	10
16 INCH DIA - 11.25 DEG	6	5	5	4	4	3	3	3
16 INCH DIA - 22.5 DEG	12	11	9	8	8	7	6	6
16 INCH DIA - 45 DEG	25	22	19	17	16	14	13	12
18 INCH DIA - 11.25 DEG	7	6	5	5	4	4	4	3
18 INCH DIA - 22.5 DEG	13	12	10	9	8	8	7	7
18 INCH DIA - 45 DEG	28	24	22	19	18	16	15	14

- ASSUMPTIONS**
 LAYING CONDITION = TYPE 4
 SOIL DESIGNATION = COHESIVE-GRANULAR
 DESIGN PRESSURE = 200 PSI (TEST PRESSURE)
 SAFETY FACTOR = 1.5

- NOTES**
 1. 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.
 2. 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.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4716B	UO-1	4

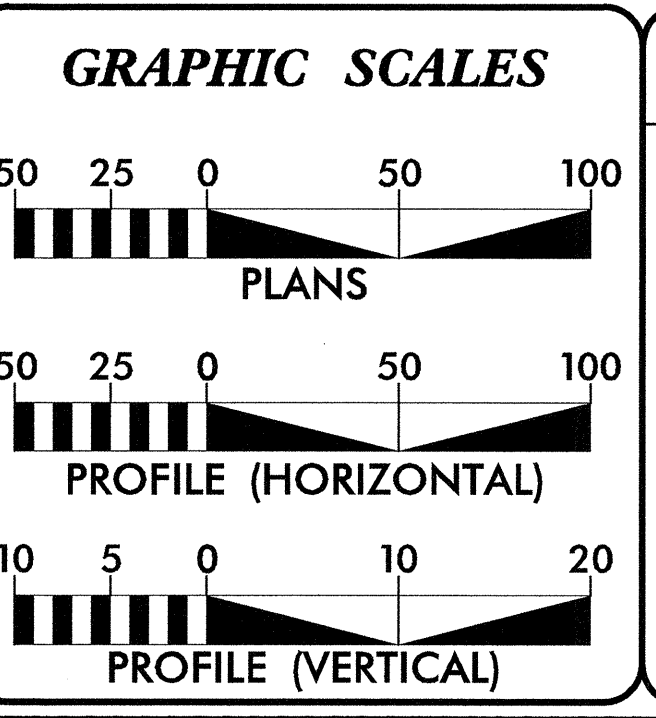
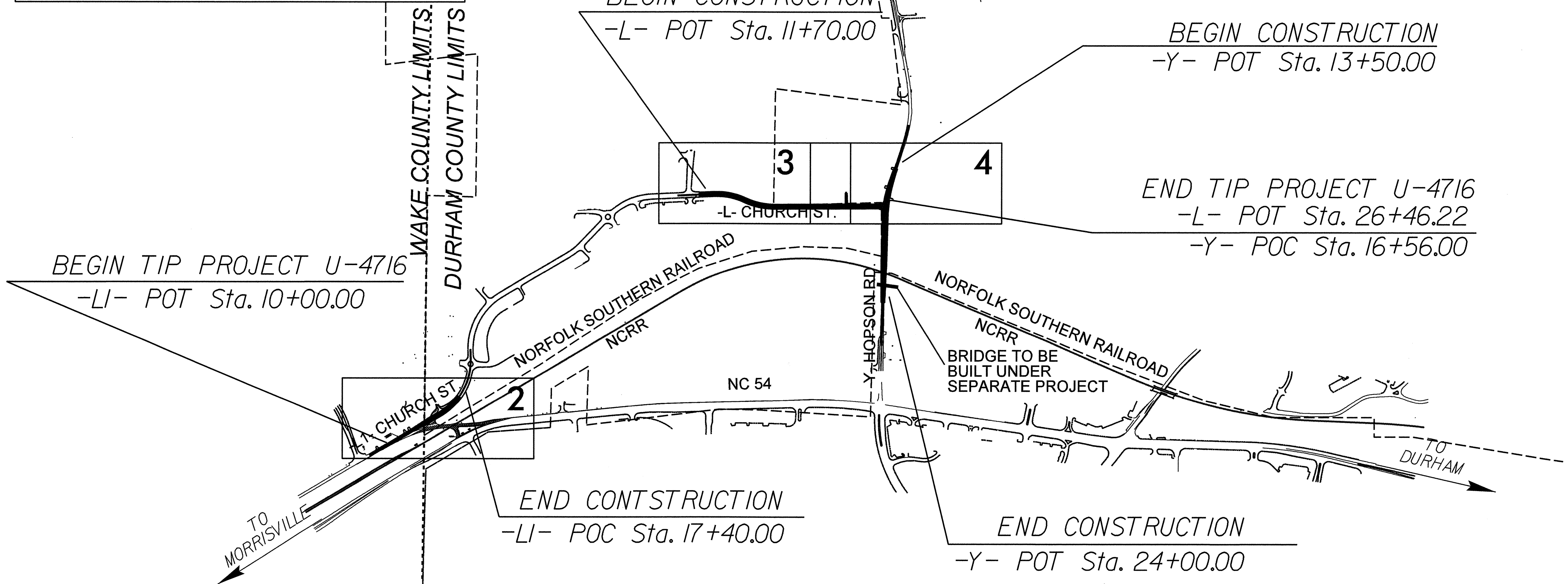
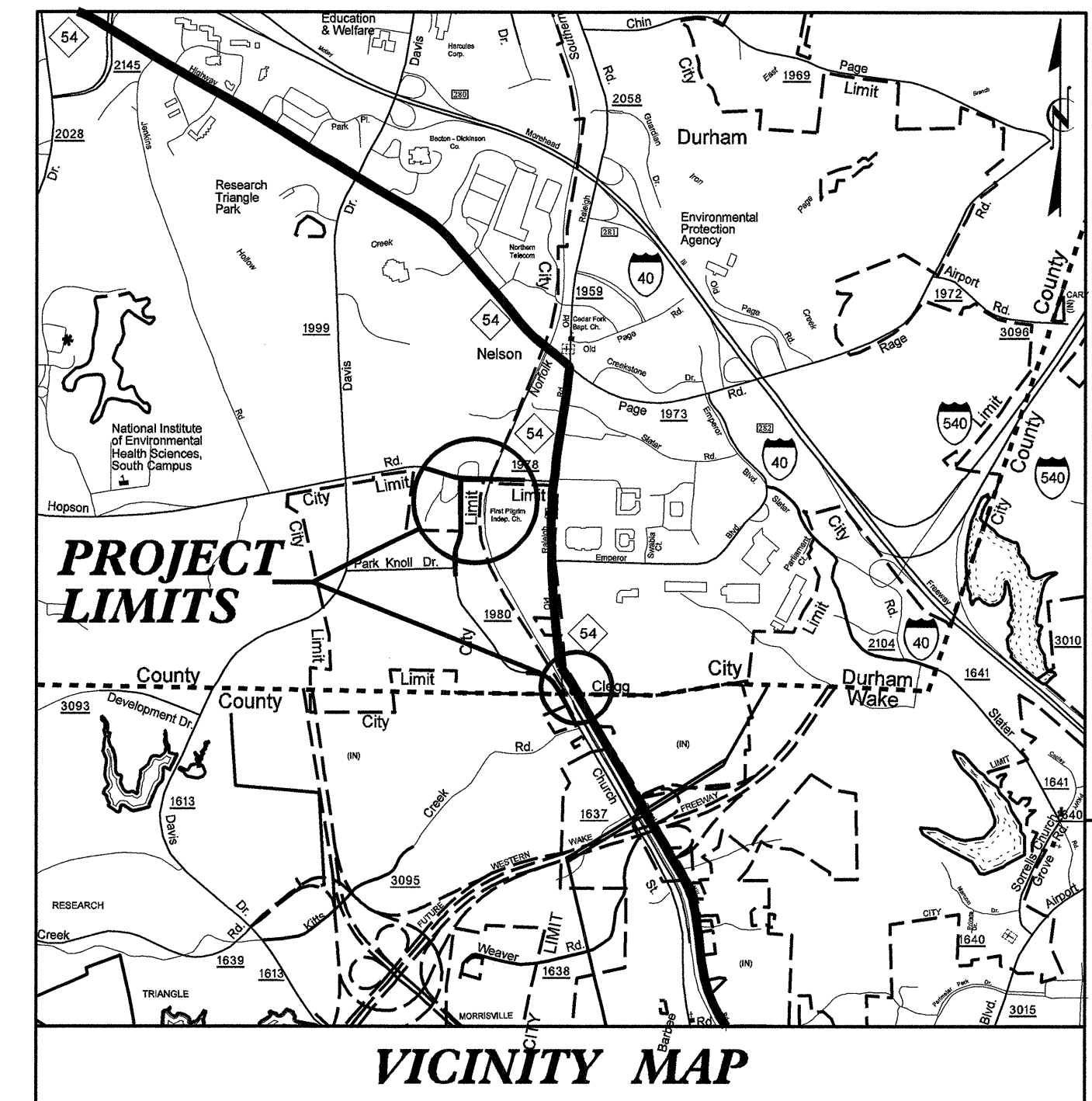
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE & DURHAM COUNTIES

UTILITIES BY OTHERS PLANS

LOCATION: HOPSON RD. AND CHURCH ST. EXTENSION IN DURHAM
TYPE OF WORK: RELOCATION OF POWER, TELEPHONE, CATV & GAS

CONTRACT: WBS-40325.1.3 TIP PROJECT: U-4716B



INDEX OF SHEETS

SHEET NO.	DESCRIPTION
UO-1	TITLE SHEET
UO-2 TO UO-4	UO PLAN SHEETS

UTILITY OWNERS ON PROJECT

TELEPHONE: FIBERTECH NETWORKS - ROBERT ENRIGHT
LEVEL 3 COMMUNICATIONS - DANIEL MILLER
VERIZON BUSINESS - ERIC CRANE
FRONTIER - MARCUS DICKINSON

CABLE: TIME WARNER CABLE - JOSEPH FAHEY

POWER: DUKE ENERGY - GARY VONCANNON

GAS: PSNC ENERGY - REID CRANE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

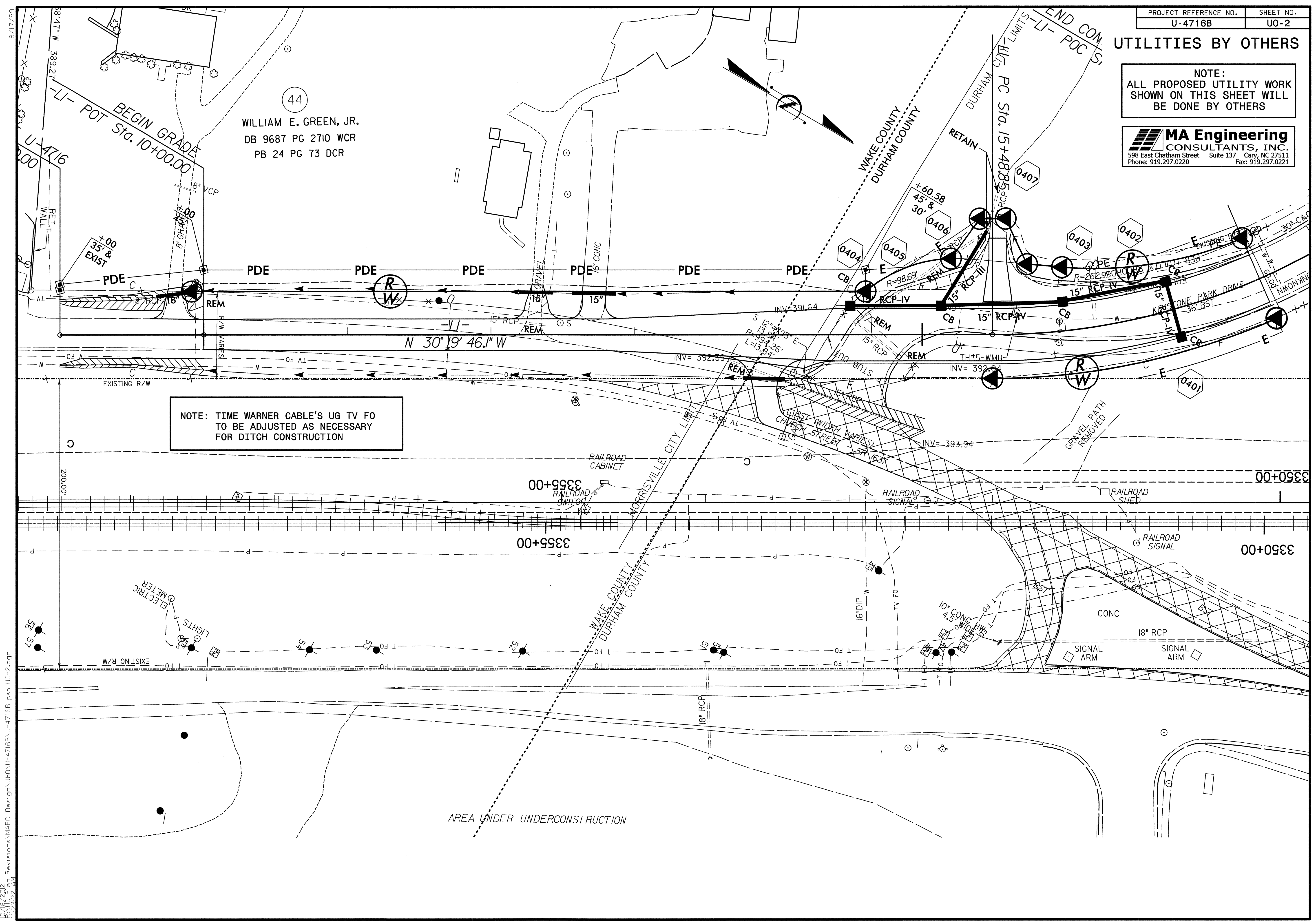
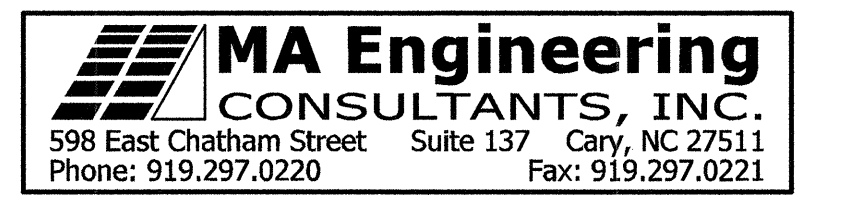
RAIL DIVISION

PREPARED BY: **MA Engineering CONSULTANTS, INC.**
598 East Chatham Street Suite 137 Cary, NC 27511
Phone: 919.297.0220 Fax: 919.297.0221

Prepared for: **ENGINEERING & SAFETY BRANCH**
MAIL: 1536 MAIL SERVICE CENTER RALEIGH, NC 27603
DELIVERY: 360 CAPITAL BOULEVARD RALEIGH, NC 27603
PHONE: (919) 715-8803
FAX: (919) 715-8804

UTILITIES BY OTHERS

NOTE:
ALL PROPOSED UTILITY WORK
SHOWN ON THIS SHEET WILL
BE DONE BY OTHERS



NOTE: TIME WARNER CABLE'S UG TV FO
TO BE ADJUSTED AS NECESSARY
FOR DITCH CONSTRUCTION

44
WILLIAM E. GREEN, JR.
DB 9687 PG 2710 WCR
PB 24 PG 73 DCR

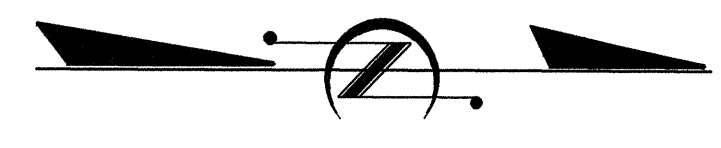
AREA UNDER UNDERCONSTRUCTION

10/16/2012
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UTILITIES BY OTHERS

NOTE:
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CONSULTANTS, INC.
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Phone: 919.297.0220 Fax: 919.297.0221



42

KEYSTONE PARK ASSOC. LLC
DB 5505 PG 513
PB 133 PG 112

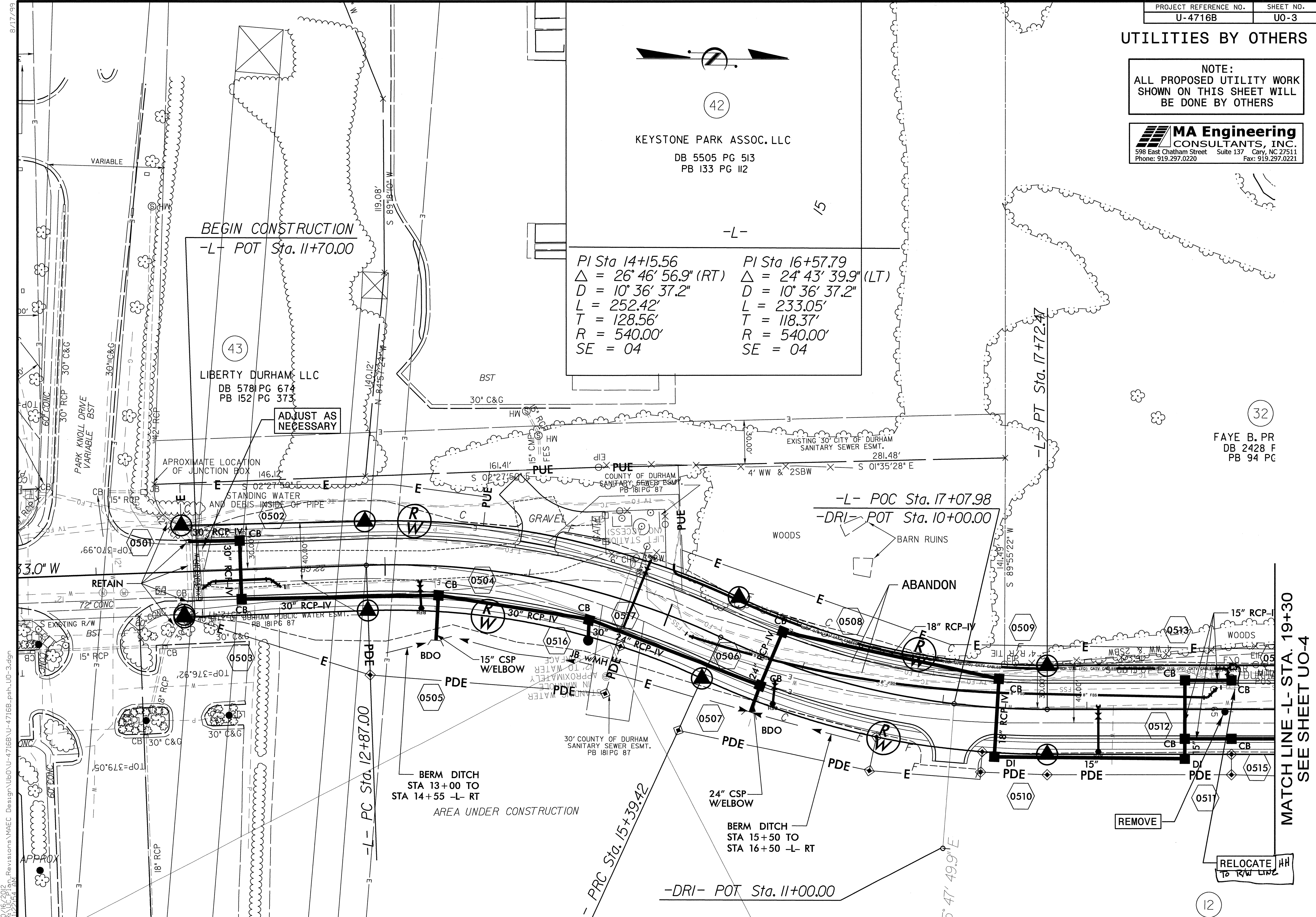
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$D = 10^\circ 36' 37.2"$	$D = 10^\circ 36' 37.2"$
$L = 252.42'$	$L = 233.05'$
$T = 128.56'$	$T = 118.37'$
$R = 540.00'$	$R = 540.00'$
$SE = 04$	$SE = 04$

BEGIN CONSTRUCTION
-L- POT Sta. 11+70.00

43
LIBERTY DURHAM LLC
DB 5781 PG 674
PB 152 PG 373

ADJUST AS NECESSARY

32
FAYE B. PR
DB 2428 F
PB 94 PG



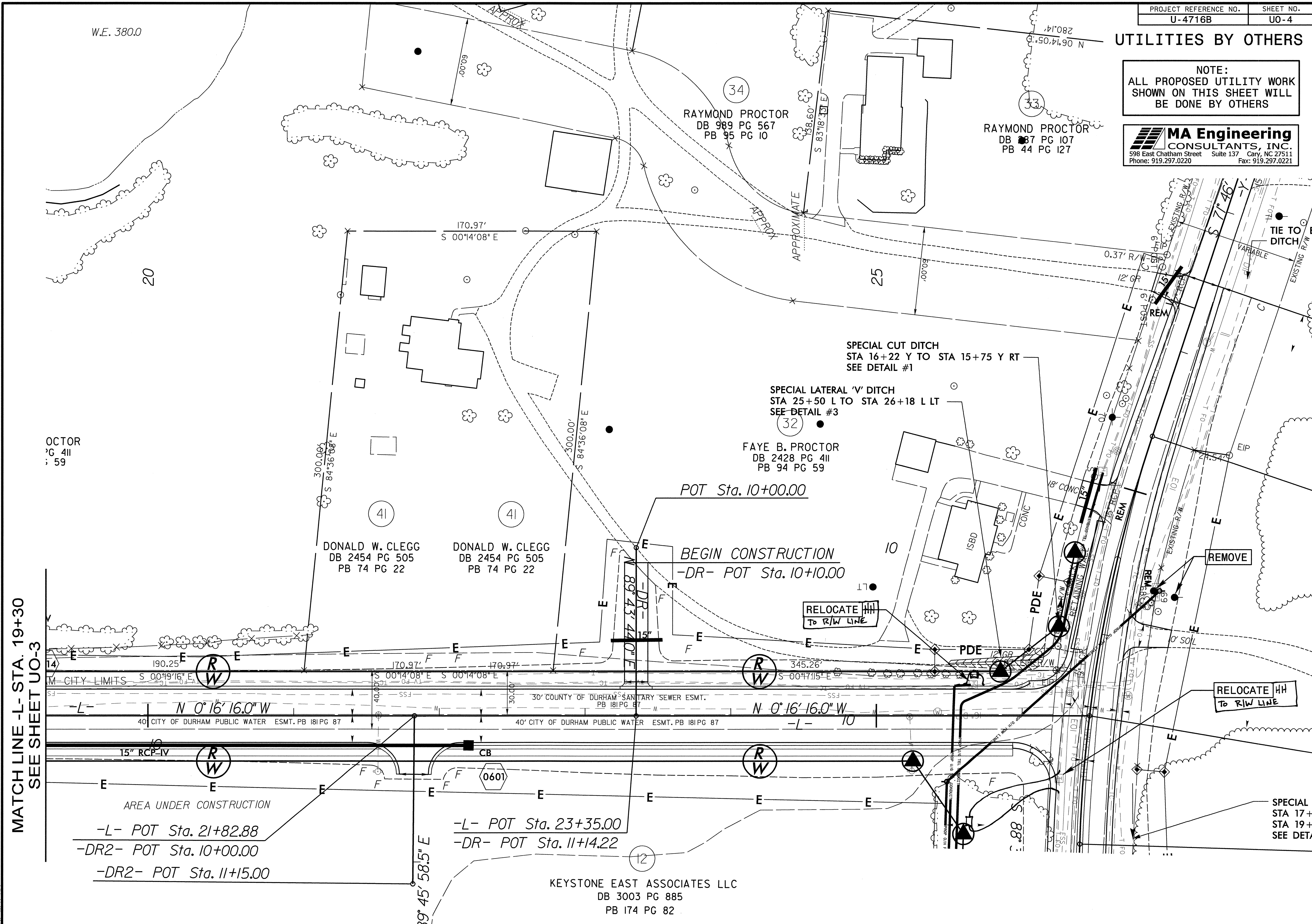
MATCH LINE -L- STA. 19+30
SEE SHEET UO-4

8/17/09
 10/16/2012
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UTILITIES BY OTHERS

NOTE:
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Phone: 919.297.0220 Fax: 919.297.0221



MATCH LINE - L- STA. 19+30
SEE SHEET UO-3

OCTOR
PG 411
59

RAYMOND PROCTOR
DB 989 PG 567
PB 95 PG 10

RAYMOND PROCTOR
DB 87 PG 107
PB 44 PG 127

DONALD W. CLEGG
DB 2454 PG 505
PB 74 PG 22

DONALD W. CLEGG
DB 2454 PG 505
PB 74 PG 22

FAYE B. PROCTOR
DB 2428 PG 411
PB 94 PG 59

KEYSTONE EAST ASSOCIATES LLC
DB 3003 PG 885
PB 174 PG 82

AREA UNDER CONSTRUCTION
-L- POT Sta. 21+82.88
-DR2- POT Sta. 10+00.00
-DR2- POT Sta. 11+15.00

-L- POT Sta. 23+35.00
-DR- POT Sta. 11+14.22

SPECIAL CUT DITCH
STA 16+22 Y TO STA 15+75 Y RT
SEE DETAIL #1

SPECIAL LATERAL 'V' DITCH
STA 25+50 L TO STA 26+18 L LT
SEE DETAIL #3

BEGIN CONSTRUCTION
-DR- POT Sta. 10+10.00

RELOCATE HH
TO R/W LINE

RELOCATE HH
TO R/W LINE

SPECIAL
STA 17+
STA 19+
SEE DET

10/16/2012
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Revisions\MAEC Design\UO-4716B\UO-4716B-psd-UO-4.dgn