

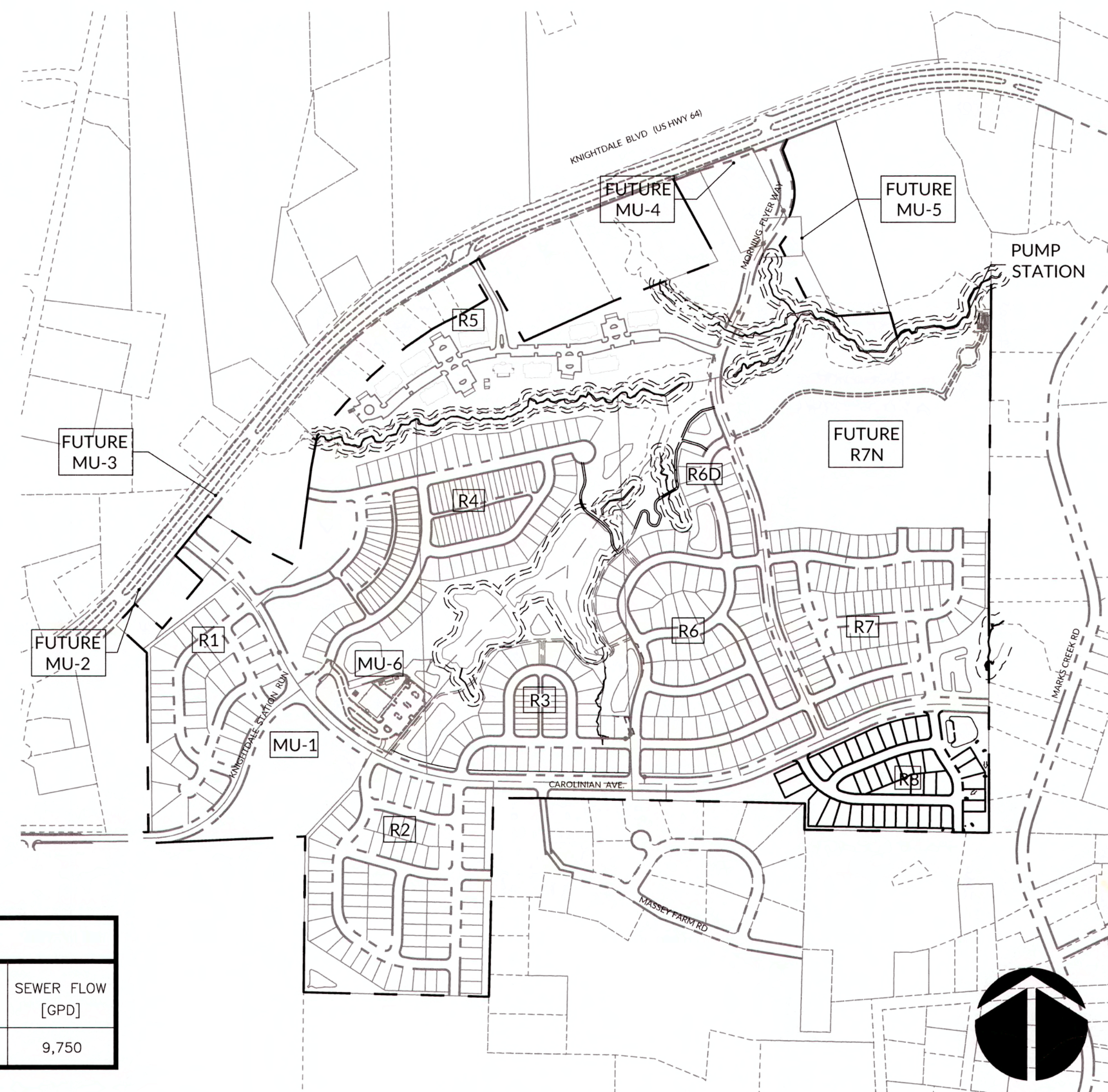
# CONSTRUCTION DRAWINGS FOR KNIGHTDALE STATION R8

KNIGHTDALE, WAKE COUNTY, NORTH CAROLINA  
APRIL 12, 2019

CONSTRUCTION PLANS  
FOR: KNIGHTDALE STATION  
WR PROJECT NO. 2090251.94

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4.1	UTILITY PLAN
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L1.0	LANDSCAPE PLAN
L1.1	LANDSCAPE DETAILS

SITE DATA TABLE - PHASE R8	
KNIGHTDALE PROJECT No.	S-3-13-R8
OWNER	KNIGHTDALE INVESTORS, LLC.
PARCEL PIN No.	1764065984
EXISTING ZONING	GR8
PROPOSED ZONING	GR8
PROPOSED USE	SINGLE FAMILY
TOTAL PHASE AREA	16.37 AC
RECREATIONAL OPEN SPACE (ACTIVE)	0.00 AC
RECREATIONAL OPEN SPACE (PASSIVE)	0.92 AC
TOTAL OPEN SPACE	0.92 AC
MAXIMUM DENSITY ALLOWED (UNITS/ACRE)	12
PROPOSED DENSITY (UNITS/ACRE)	2.38
TOTAL NUMBER OF LOTS ALLOWED	N/A
TOTAL NUMBER OF LOTS PROVIDED	39
TOTAL LINEAR FEET IN STREETS (PUBLIC)	2,217 LF
TOTAL LINEAR FEET OF CURB & GUTTER (30")	4,338 LF
TOTAL LINEAR FEET OF SIDEWALK	4,223 LF
LINEAR FEET IN WATERLINES (6 IN)	107 LF
LINEAR FEET IN WATERLINES (8 IN)	2,295 LF
LINEAR FEET IN WATERLINES (12 IN)	0 LF
TOTAL LINEAR FEET IN STORM DRAINAGE	2,603 LF
TOTAL LINEAR FEET IN SEWER LINES (8 IN)	2,235 LF
PROJECTED WATER USAGE (GPD) (250 GPD/UNIT)	9,750
PROJECTED SEWER USAGE (GPD) (250 GPD/UNIT)	9,750
<b>LOTS 573-611</b>	
MINIMUM LOT WIDTH REQUIRED	60 LF
LOT WIDTH (TYP.)	60 LF
MINIMUM LOT AREA PROVIDED	7,198 SF
MEDIAN LOT AREA PROVIDED	7,892 SF
AVERAGE LOT AREA PROVIDED	8,376 SF
LOT SETBACKS	
FRONT YARD	10 FT
REAR YARD	25 FT
SIDE YARD	20% OF LOT WIDTH (AGGREGATE) - 5 FT MIN. SETBACK PER SIDE (WIDTH 60' OR GREATER) - 3 FT MIN. SETBACK PER SIDE (WIDTH LESS THAN 60')
REAR SETBACK FROM LANE/ALLEY	15 FT FROM CENTERLINE
ACCESSORY STRUCTURE SIDE/REAR SETBACK	5 FT
* PER UDO SECTION 4.6(C)(3), ACCESSORY BUILDINGS SHALL BE A MINIMUM OF 5' FROM ANY PRINCIPAL BUILDING OR OTHER ACCESSORY BUILDING.	
** PER UDO SECTION 4.6(C), ACCESSORY BUILDINGS SHALL NOT EXCEED 800 SF, COLLECTIVELY COVER MORE THAN 20% OF THE TOTAL COMBINED AREA OF THE LOTS' REAR AND SIDE YARDS; INDIVIDUALLY EXCEED THE HEIGHT OF THE PRINCIPAL BUILDING.	
*** DRIVEWAY LENGTH FROM GARAGE TO EDGE OF ASPHALT SHALL BE A MINIMUM OF 20' ALONG ALLEYS.	



**ATTENTION CONTRACTORS**

THE CONSTRUCTION CONTRACTOR RESPONSIBLE FOR THE EXTENSION OF WATER AND SEWER, AS APPROVED IN THESE PLANS, IS RESPONSIBLE FOR CONTACTING THE PUBLIC UTILITIES DEPARTMENT AT (919) 996-4542 AT LEAST 24 HOURS PRIOR TO BEGINNING ANY CONSTRUCTION.

FAILURE TO NOTIFY BOTH CITY DEPARTMENTS IN ADVANCE OF BEGINNING CONSTRUCTION WILL RESULT IN THE ISSUANCE OF MONETARY FINES AND REQUIRE REINSTALLATION OF ANY WATER OR SEWER FACILITIES NOT INSPECTED AS A RESULT OF THIS NOTIFICATION FAILURE.

FAILURE TO CALL FOR INSPECTION, INSTALL A DOWNSTREAM PLUG, HAVE PERMITTED PLANS ON THE JOB SITE, OR ANY OTHER VIOLATION OF CITY OF RALEIGH STANDARDS WILL RESULT IN A FINE AND POSSIBLE EXCLUSION FROM FUTURE WORK IN THE CITY OF RALEIGH.

TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6/13/2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

INFRASTRUCTURE DATA											
SECTIONS	AREA [AC]	UNITS	STREETS [LF]	30" CURB & GUTTER [LF]	SIDEWALK [LF]	6" WATER MAIN [LF]	8" WATER MAIN [LF]	12" WATER MAIN [LF]	STORM DRAINAGE [LF]	8" SEWER MAIN [LF]	SEWER FLOW [GPD]
PHASE R8	16.37	39	2,217	4,338	4,223	107	2,295	-	2,603	2,235	9,750

**DEVELOPER/OWNER**

**KNIGHTDALE INVESTORS, LLC.**  
P.O. BOX 3557  
CARY, NC 27519

ATTN: THAD MOORE  
TELEPHONE: (919) 481-3000  
FAX: (919) 677-8600

**PREPARED BY:**

**WithersRavenel**  
Engineers | Planners | Surveyors

115 MacKenan Drive | Cary, NC 27511 | t: 919.469.3340 | license #: C-0832 | www.withersravenel.com

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # *w-3595*

AUTHORIZATION TO CONSTRUCT *[Signature]*  
DATE *5/3/19*

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

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CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # *S-450020*

AUTHORIZATION TO CONSTRUCT *[Signature]*  
DATE *5/3/19*

TOWN APPROVED STANDARDS SHALL CONTROL, IN THE EVENT OF A CONFLICT OR INCONSISTENCY BETWEEN THESE CONSTRUCTION DRAWINGS AND THE TOWN OF KNIGHTDALE'S APPROVED STANDARDS FOR THIS PROJECT, THE APPROVED STANDARDS SHALL CONTROL. TOWN OF KNIGHTDALE APPROVED STANDARDS SHALL MEAN ALL DEVELOPMENT DOCUMENTS NECESSARY FOR APPROVAL FOR THE PROPERTY INCLUDING, BUT NOT LIMITED TO, ANY SPECIAL USE PERMIT, SUBDIVISION PLAN, SITE PLAN, SUBDIVISION (S), PHASING SCHEDULE, DEVELOPMENT AGREEMENT, UTILITY ALLOCATION AGREEMENT ANNEXATION AGREEMENT, THE TOWN OF KNIGHTDALE STANDARD SPECIFICATION AND DETAILS MANUAL AND APPLICABLE PROVISIONS OF THE NORTH CAROLINA STATE BUILDING CODE.

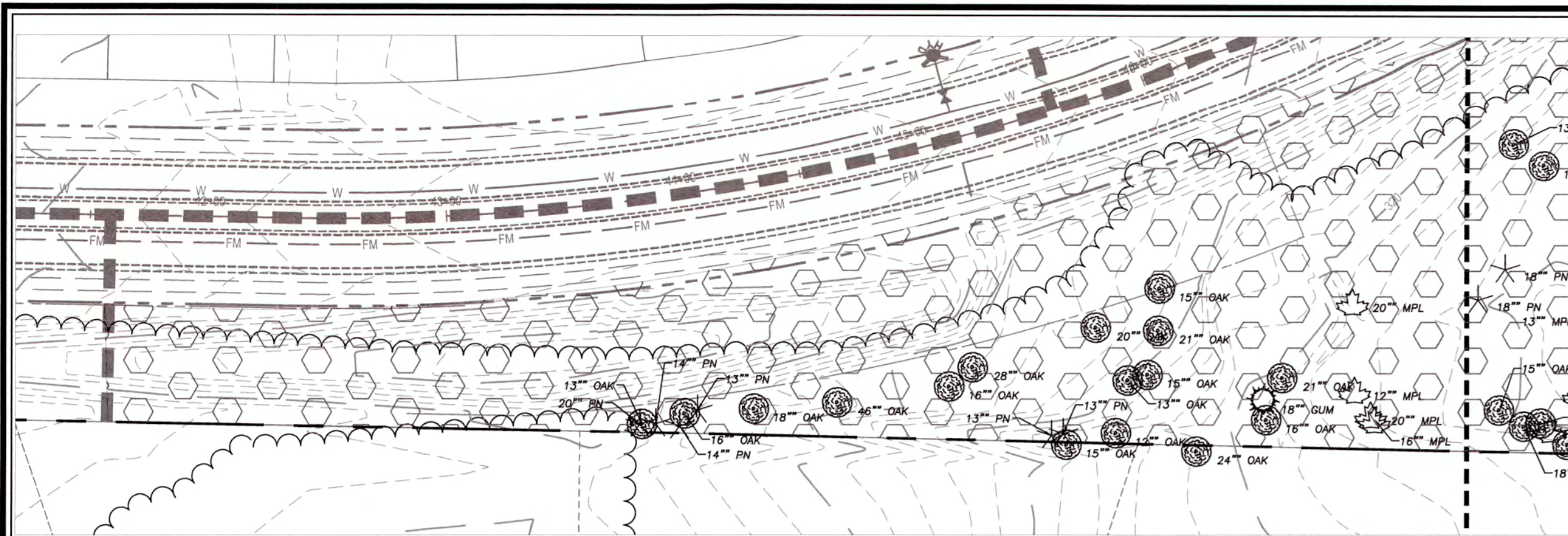
PROFESSIONAL DESIGN ENGINEER CERTIFICATION, THESE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING DRAWINGS AND WITH THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE. I, *Nick J. Anttila*, PE, CERTIFY THAT THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE HAVE BEEN THOROUGHLY CHECKED AND FOUND TO BE APPLICABLE TO THIS PROJECT. ALL EXCEPTIONS TO THE APPLICABLE TOWN STANDARDS HAVE BEEN PREVIOUSLY APPROVED BY THE TOWN OF KNIGHTDALE AND SAID EXCEPTIONS ARE SHOWN ON SHEET(S) *N/A* OF THESE DRAWINGS.

BY: *[Signature]* PE  
DATE: *04/16/19*

**SEAL 38549**  
NORTH CAROLINA PROFESSIONAL ENGINEER  
NICKOLAS J. ANTILLA

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INSET A

TREE LEGEND	
TREE DESCRIPTION	
	90% YOUNG PINE 10% OAK & SWEETGUM
	50% MATURE PINE 40% OAK & GUM 10% YOUNG PINE
	70% OAK, SWEETGUM & POPLAR 20% MATURE PINE 10% YOUNG PINE
	SCATTERED OAK & POPLAR

EXISTING SLOPE LEGEND	
SLOPE DESCRIPTION	
	SLOPES 15% - 25%
	SLOPES > 25%

NOTE:  
SEE SHEET 2.0 KNIGHTDALE STATION SITE PLAN FOR TREE PROTECTION AND REPLACEMENT CALCULATIONS  
SEE SHEET L1.0 - L1.3 FOR LOCATIONS OF REPLACEMENT TREES

TREE LEGEND	
	MAPLE
	HICKORY
	PINE
	OAK
	GUM
	HOLLY
	POPLAR
	CEDAR
	SYCAMORE
	PERSIMMON
	ELM



TOWN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *S.M. All* DATE: 6/13/2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *C.E.G.* DATE: 6/14/19  
ADMINISTRATOR

~~PUBLIC SEWER COLLECTION/EXTENSION SYSTEM~~

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AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

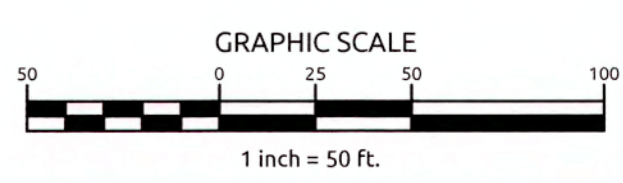
~~PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM~~

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

City of Raleigh  
Public Utilities Department  
DATE: 6/13/19  
BY: *[Signature]*



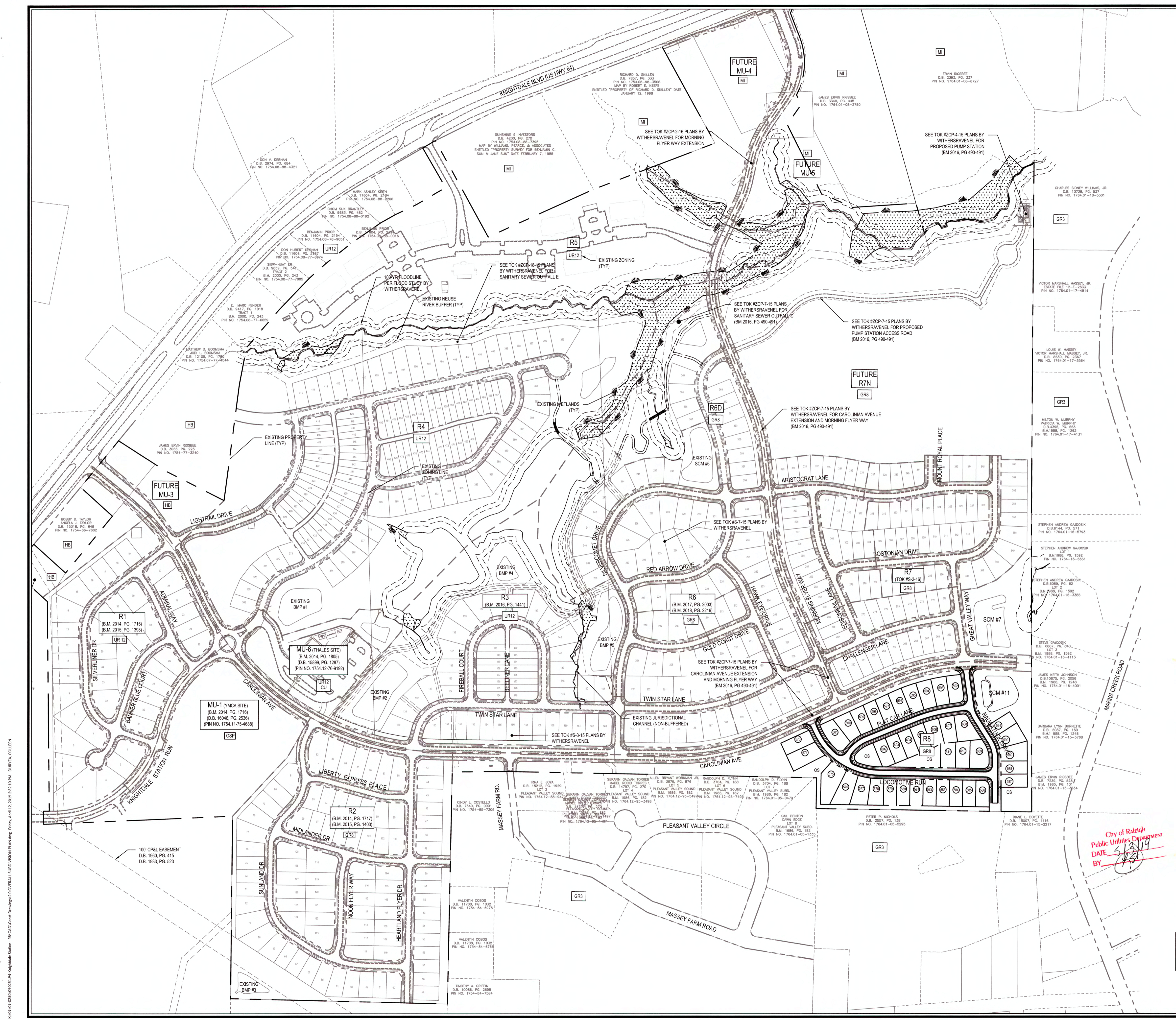
Job No. 02090251.94 Drawn By WGR  
Date 11/21/2018 Designer WGR



Revisions

1 TOK & COR COMMENTS 04/12/19

K:\09\02090251.94\Knightdale Station - R8\_CAD\Cad Drawings\11 EXISTING CONDITIONS.dwg: File: April 12, 2019 2:52:08 PM - DUREKA COLLEN



**SITE DATA**  
TOTAL SITE AREA: 278.61 AC

**PROPOSED ZONING**

TRACT	AREA (AC)	EXISTING/PROPOSED ZONING	PROPOSED USE
R8	16.37 AC	GR8	SF

SF: SINGLE-FAMILY  
TRACT AREAS ARE BASED ON GROSS AREAS INCLUDING OPEN SPACE, RIPARIAN BUFFERS, & PROPOSED RIGHT-OF-WAYS.

**TREE CANOPY SUMMARY**

OVERALL TREE COVER AREA REQUIRED PER UAA	= 8.90 AC
TREE COVER AREA PROVIDED W/ R1 & R2 (BM 2014, PG 1718)	= 2.19 AC
TREE COVER AREA PROVIDED W/ R3 (TO BE DEDICATED)	= 0.79 AC
TREE COVER AREA PROVIDED W/ R4-C (TO BE DEDICATED)	= 1.34 AC
TREE COVER AREA PROVIDED W/ R7-C (TO BE DEDICATED)	= 0.38 AC
TREE COVER AREA PROVIDED W/ R6D (TO BE DEDICATED)	= 2.22 AC
TREE COVER AREA PROVIDED W/ R4 (TO BE DEDICATED)	= 5.33 AC
TREE COVER AREA PROVIDED W/ R8 (TO BE DEDICATED)	= 0.00 AC
TREE COVER AREA PROVIDED W/ R1, R2, R3, R6, R7, R8D, R4, R8	= 12.33 AC
PROJECT AREA - R1 & R2	= 41.89 AC
PROJECT AREA - R3	= 20.01 AC
PROJECT AREA - R4-C	= 30.80 AC
PROJECT AREA - R7A-C	= 25.00 AC
THALES	= 4.56 AC
MU-1	= 0.09 AC
PROJECT AREA - R6D	= 8.82 AC
PROJECT AREA - R4	= 38.94 AC
PROJECT AREA - R8	= 16.37 AC
TOTAL TRACT AREA APPROVED/RECORDED (TO DATE)	= 194.54 AC
TOTAL SITE ACREAGE	= 278.61 AC
TREE CANOPY AREA REQUIRED (TO DATE)	= 118.54 AC x (8.9 AC) (278.61 AC)
	= 6.21 AC

12.33 AC PROVIDED > 6.21 AC REQUIRED (TO DATE)

REMAINING TREE COVER AREA REQUIRED FOR FUTURE PHASES PER UAA = 0 AC

**RECREATIONAL OPEN SPACE SUMMARY**

OVERALL RECREATIONAL OPEN SPACE REQUIRED PER UAA	= 17.00 AC (8.50 AC ACTIVE)
OPEN SPACE AREA PROVIDED W/ R1 & R2	= 7.83 AC (ACTIVE)
OPEN SPACE AREA PROVIDED W/ R3	= 2.87 AC (ACTIVE & PASSIVE)
OPEN SPACE AREA PROVIDED W/ R6	= 1.93 AC (ACTIVE & PASSIVE)
OPEN SPACE AREA PROVIDED W/ R7	= 0.10 AC (PASSIVE)
OPEN SPACE AREA PROVIDED W/ R8D	= 0.86 AC (ACTIVE & PASSIVE)
OPEN SPACE AREA PROVIDED W/ R4	= 3.08 AC (ACTIVE & PASSIVE)
OPEN SPACE AREA PROVIDED W/ R8	= 2.00 AC (PASSIVE)
OPEN SPACE AREA PROVIDED W/ R1, R2, R3, R6, R7, R8D, R4, R8	= 16.67 AC
	10.57 AC (ACTIVE)
	8.01 AC (PASSIVE)
TOTAL TRACT AREA APPROVED/RECORDED (TO DATE)	= 194.54 AC
TOTAL SITE ACREAGE	= 278.61 AC
OPEN SPACE AREA REQUIRED (TO DATE)	= 118.54 AC x (17.0 AC) (278.61 AC)
	= 11.87 AC (5.93 ACTIVE)

16.67 AC PROVIDED > 11.86 AC REQUIRED (TO DATE)

REMAINING RECREATIONAL OPEN SPACE REQUIRED FOR FUTURE PHASES PER UAA = 0.00 AC (0.00 AC ACTIVE)

**TREE PROTECTION**

TOTAL TREES	12"-23.9" DBH	24"-35.9" DBH	36"-47" DBH	48"-59.9" DBH	60"-71.9" DBH	REPLACEMENT TREES NEEDED*
TIER 1	21	21	-	-	-	-
TIER 2	59	57	2	-	-	61
TIER 3	21	-	20	1	-	43

\*PER TOK UDO SECTION 8.5, REPLACEMENT TREES FOR TIER 2 AND TIER 3 SHALL BE PLANTED AT A RATE OF 1 TREE PER 12" DBH.

NOTE: 104 REPLACEMENT TREES WILL BE REQUIRED TO BE PLANTED  
REPLACEMENT TREES WILL BE PLANTED IN PROPOSED BUFFER YARD LOCATIONS  
OR OPEN SPACE. SEE LANDSCAPE PLAN FOR BUFFER YARD PLANTING DETAIL.

**TOWN CERTIFICATION**  
THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER  
THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

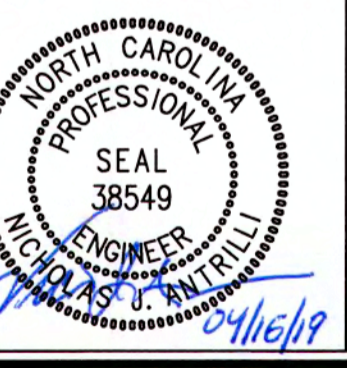
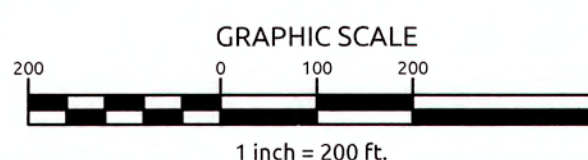
CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT #  
AUTHORIZATION TO CONSTRUCT  
DATE

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

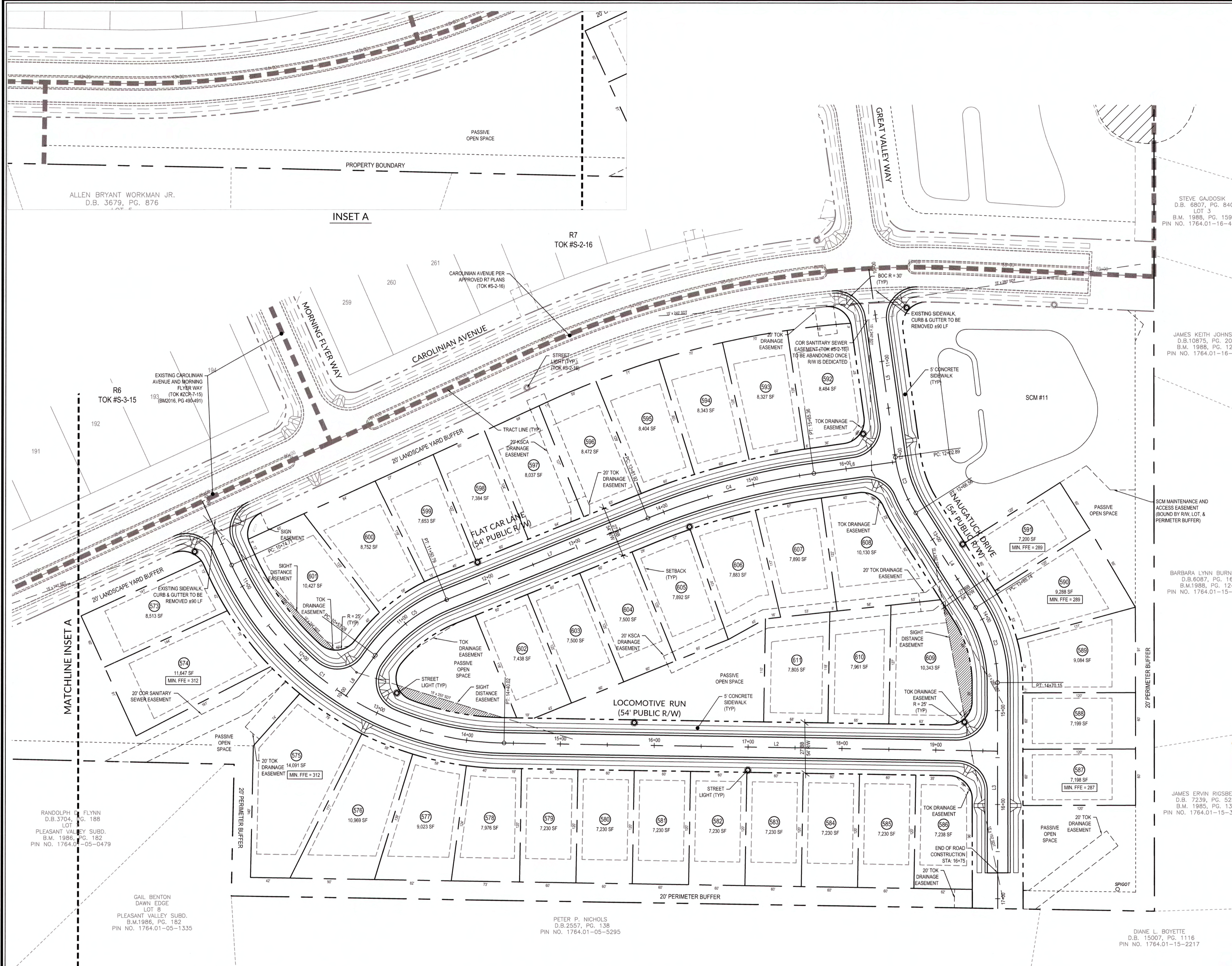
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CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT #  
AUTHORIZATION TO CONSTRUCT  
DATE

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.



Revisions  
1 TOK & COR COMMENTS 04/12/19



ALLEN BRYANT WORKMAN JR.  
D.B. 3679, PG. 876

INSET A

- GENERAL NOTES**
- SEE SHEET 2.0 FOR EXISTING ZONING AND PROPOSED ZONING.
  - BOUNDARY SURVEY PERFORMED BY WITHERSRAVENEL.
  - WETLANDS AND STREAM BUFFERS DELINEATED AND SURVEYED BY WITHERSRAVENEL.
  - PROPERTY ANNEXED INTO TOWN OF KNIGHTDALE SEPT. 3, 2013.
  - WATER ALLOCATION HAS BEEN AWARDED BASED ON THE UTILITY ALLOCATION AND INFRASTRUCTURE AGREEMENT, D.B. 014722, PAGES 01758 - 01813 & SUBSEQUENT AMENDMENTS.
  - STREET LIGHTS SHALL BE PROVIDED FOR R8 PER UDO SECTION 11.5 - STREET LIGHTING POLICY. IF UPGRADES FROM THE TOWN'S STANDARD LIGHT SPECIFICATION ARE REQUESTED, THE DEVELOPER WILL BE REQUIRED TO PAY THE TOWN THE DIFFERENCE IN THE COSTS TO MAINTAIN THE DESIRED FIXTURE AND POLE COVERING A PERIOD OF 10 YEARS.
  - ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES.
  - THIS PROPERTY DOES NOT LIE WITHIN THE FEMA FLOODPLAIN PER MAP NUMBER 37201754001 AND 37201764001, WITH AN EFFECTIVE DATE OF MAY 2, 2006.
  - DIVISION OF WATER QUALITY (DWQ) AND/OR UNITED STATES ARMY CORPS OF ENGINEERS (USACE) APPROVAL SHALL BE REQUIRED PRIOR TO CONSTRUCTION WITHIN WETLANDS OR STREAM BUFFER AREAS.
  - THE TURNOUT RADIUS AT ALL INTERSECTIONS SHALL BE A MINIMUM OF 30 FEET MEASURED AT THE BACK OF CURB UNLESS OTHERWISE NOTED. THE TURNOUT RADIUS AT ALL INTERSECTIONS WITH ALLEYS SHALL BE A MINIMUM OF 17.5 FEET MEASURED AT THE BACK OF CURB.
  - ALL RIGHT-OF-WAY SHOWN HEREIN IS PUBLIC RIGHT-OF-WAY, UNLESS OTHERWISE NOTED.
  - NO SIGHT OBSTRUCTION, OR PARTIALLY OBSTRUCTING WALL, FENCE, FOLIAGE, BERM, SIGN, OR PARKED VEHICLE BETWEEN THE HEIGHTS OF TWO (2) AND EIGHT (8) ABOVE THE CURB LINE ELEVATION OR THE NEAREST TRAVELED WAY IN NO CURB EXISTS SHALL BE PLACED WITHIN A SIGHT TRIANGLE.
  - ALL STRUCTURES SHALL BE CONSISTENT WITH THE APPROVED UTILITY ALLOCATION AND DEVELOPERS AGREEMENT FOR KNIGHTDALE STATION.

ROAD	SPEED LIMIT	CLASSIFICATION
CAROLINIAN DRIVE	25 MPH	AVENUE
NAUGATUCK DRIVE	25 MPH	LOCAL STREET
LOCOMOTIVE RUN	25 MPH	LOCAL STREET
FLAT CAR LANE	25 MPH	LOCAL STREET

**SITE IMPERVIOUS - R8**

TOTAL TRACT AREA	16.37 AC
SUBDIVISION ROADWAYS & SIDEWALKS	1.93 AC
LOT IMPERVIOUS AREA (39 LOTS @ 3,500 SF/LOT)	3.13 AC
PROPOSED PERCENT IMPERVIOUS (5.06 AC/16.37 AC)	30.91%
EXISTING PERCENT IMPERVIOUS (9.2 AC/16.37 AC) (CAROLINIAN DRIVE)	5.62%

**CONNECTIVITY INDEX:**

LINKS	NODES	INDEX
R8	6	1.2

**LINE TABLE**

LINE	BEARING	DISTANCE
L1	S24°41'10"E	74.71'
L2	S89°05'22"E	55.69'
L3	S0°09'14"E	240.45'
L4	S32°23'56"E	119.18'
L5	S8°04'44"E	202.89'
L6	N81°56'16"E	88.46'
L7	N67°54'27"E	231.13'
L8	N35°58'5"E	53.28'

**CURVE TABLE**

CURVE	RADIUS	LENGTH	CHORD	BEARING
C1	325.00'	365.32'	346.39'	S56°53'16"E
C2	150.00'	84.42'	83.31'	S16°16'35"E
C3	150.00'	63.67'	63.19'	S20°14'20"E
C4	750.00'	183.44'	182.98'	N74°54'51"E
C5	175.00'	97.51'	96.26'	N51°56'39"E

STEVE GAJOSIK  
D.B. 6807, PG. 840  
LOT 3  
B.M. 1988, PG. 1592  
PIN NO. 1764.01-16-4113

JAMES KEITH JOHNSON  
D.B. 10875, PG. 2056  
B.M. 1988, PG. 1248  
PIN NO. 1764.01-16-4001

BARBARA LYNN BURNETTE  
D.B. 6087, PG. 160  
B.M. 1986, PG. 1249  
PIN NO. 1764.01-15-3768

JAMES ERVIN RIGSBEE  
D.B. 7239, PG. 528  
B.M. 1985, PG. 131  
PIN NO. 1764.01-15-3534

DIANE L. BOYETTE  
D.B. 15007, PG. 1116  
PIN NO. 1764.01-15-2217

PETER P. NICHOLS  
D.B. 2557, PG. 138  
PIN NO. 1764.01-05-5295

GAIL BENTON DAWN EDGE  
LOT 8  
PLEASANT VALLEY SUBD.  
B.M. 1986, PG. 182  
PIN NO. 1764.01-05-1335

RANDOLPH C. FLYNN  
D.B. 3704, PG. 188  
LOT 8  
PLEASANT VALLEY SUBD.  
B.M. 1986, PG. 182  
PIN NO. 1764.01-05-0479

TOWN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-15-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

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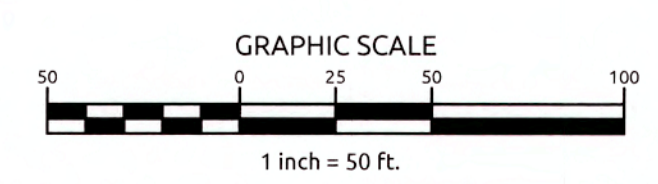
CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

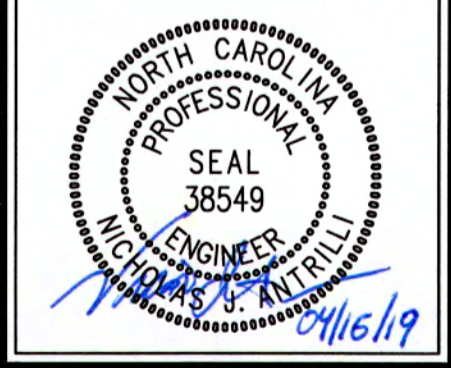
CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

City of Raleigh  
Public Utilities Department  
DATE: 6/14/19  
BY: *[Signature]*



Minor Street Name (Through)	Minor Street Name (Stop)	Design Speed of Minor Street (Through) (mph)	Approach Grade of Minor Street (Stop) (%)	Left Turn Time Gap (sec.)	Right Turn Time Gap (sec.)	Calculated	Calculated	Proposed	Proposed
						Left Turn Sight Distance (ft.)	Right Turn Sight Distance (ft.)	Left Turn Sight Distance (ft.)	Right Turn Sight Distance (ft.)
CAROLINIAN DRIVE	LOCOMOTIVE RUN	25	4.90	8.48	6.99	312	257	315	260
LOCOMOTIVE RUN	FLAT CAR LANE	25	4.20	8.34	6.92	306	254	310	255
NAUGATUCK DRIVE	LOCOMOTIVE RUN	25	-1.00	7.50	6.50	276	239	280	240
NAUGATUCK DRIVE	FLAT CAR LANE	25	-1.00	7.50	6.50	276	239	280	240
CAROLINIAN DRIVE	NAUGATUCK DRIVE	25	1.50	7.50	6.50	276	239	280	240

Job No. 02090251.94 Drawn By WGR  
Date 11/21/2018 Designer WGR

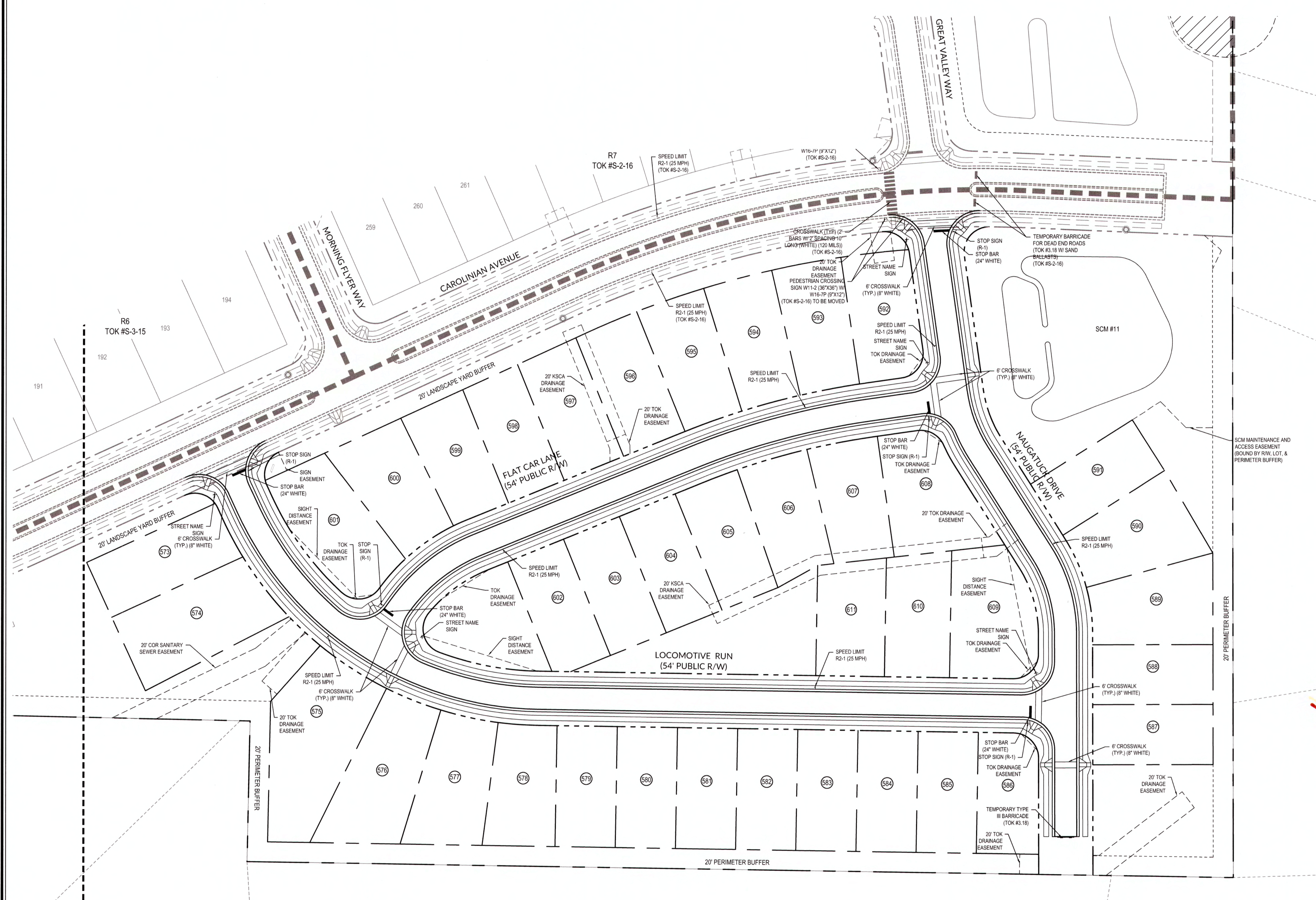


Revisions  
1 TOK & COR COMMENTS 04/12/19

**KNIGHTDALE STATION  
R8**  
TOWN OF KNIGHTDALE, NORTH CAROLINA

**PAVEMENT MARKINGS &  
SIGNAGE PLAN**

- PAVEMENT MARKINGS & SIGNAGE NOTES**
1. ALL PAVEMENT MARKINGS SHALL BE IN ACCORDANCE TO TOWN OF KNIGHTDALE STANDARD AND SPECIFICATIONS, LATEST REVISIONS.
  2. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC IN ACCORDANCE WITH TOWN OF KNIGHTDALE STANDARDS.
  3. ALL SIGNAGE SHALL BE IN ACCORDANCE WITH MUTCD, LATEST REVISION.
  4. STREET SIGNS SHALL FOLLOW THE TOWN OF KNIGHTDALE DETAIL 3.17.



ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

**TOWN CERTIFICATION:** THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6/13/2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

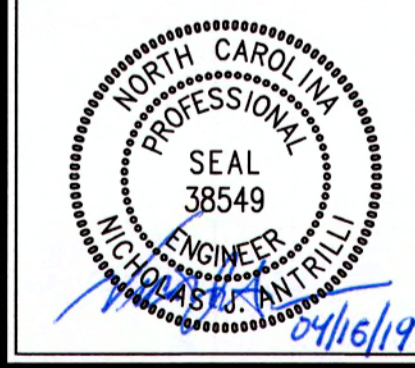
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**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

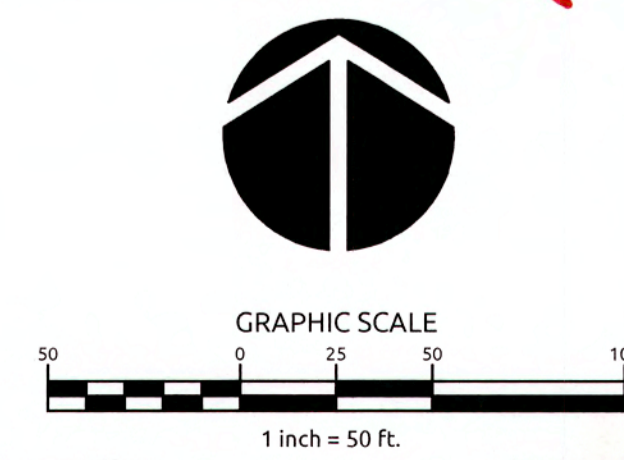
THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

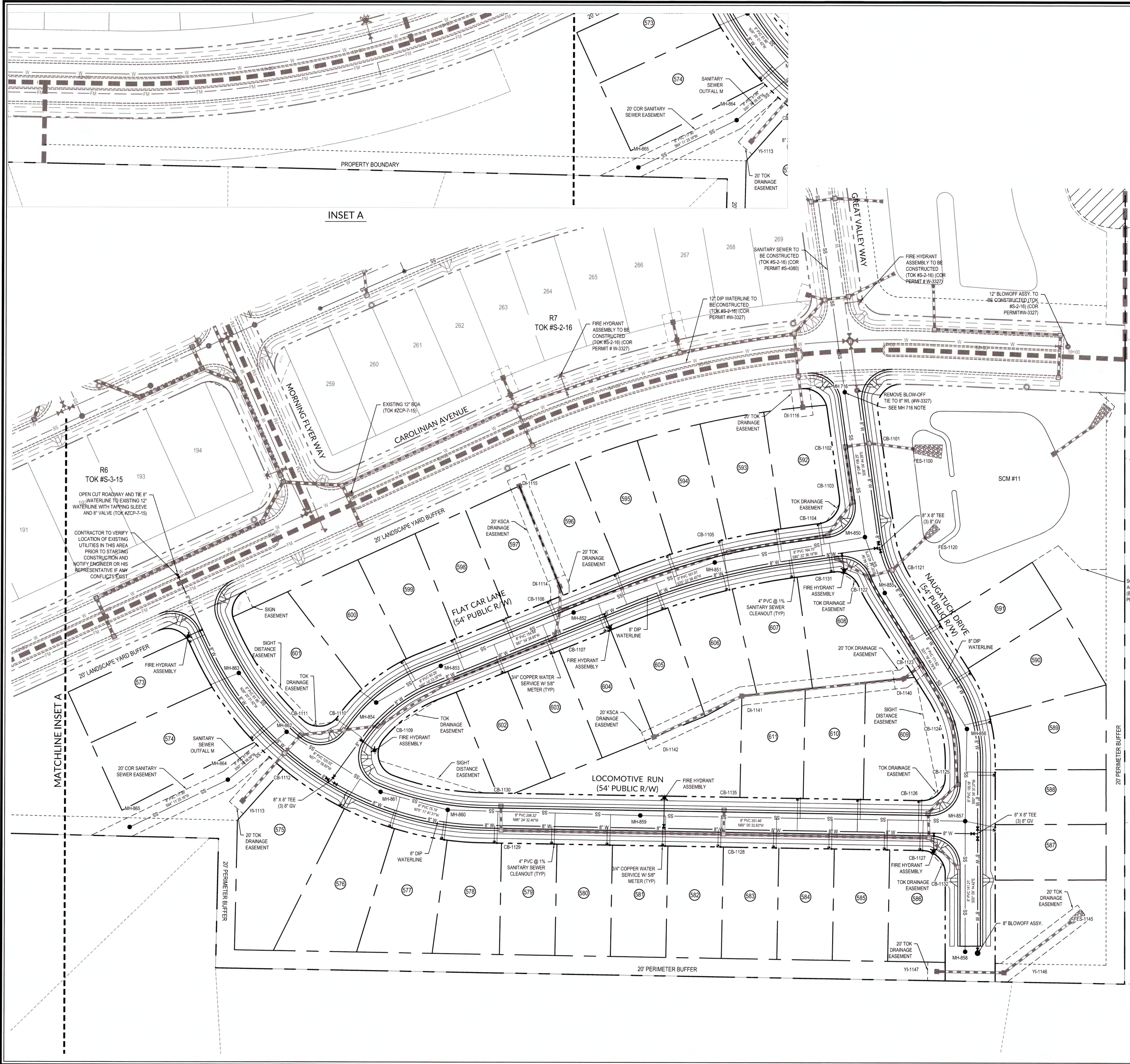
Job No. 02090251.94 Drawn By WGR  
Date 11/21/2018 Designer WGR



Revisions  
1 TOK & COR COMMENTS 04/12/19

K:\09\0250\0251\44-Knightdale Station - R8\CAD\Cover Drawing\12 PAVEMENT MARKINGS & SIGNAGE PLAN.dwg, April 12, 2019 2:33:37 PM, DURYEA, COLLEEN



- UTILITY NOTES**
- ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH CITY OF RALEIGH DESIGN STANDARDS, DETAILS & SPECIFICATIONS (REFERENCE: CORPUD HANDBOOK, CURRENT EDITION)
  - UTILITY SEPARATION REQUIREMENTS:
    - A DISTANCE OF 100' SHALL BE MAINTAINED BETWEEN SANITARY SEWER & ANY PRIVATE OR PUBLIC WATER SUPPLY SOURCE SUCH AS AN IMPOUNDED RESERVOIR USED AS A SOURCE OF DRINKING WATER. IF ADEQUATE LATERAL SEPARATION CANNOT BE ACHIEVED, FERROUS SANITARY SEWER PIPE SHALL BE SPECIFIED & INSTALLED TO WATERLINE SPECIFICATIONS. HOWEVER, THE MINIMUM SEPARATION SHALL NOT BE LESS THAN 25' FROM A PRIVATE WELL OR 50' FROM A PUBLIC WELL.
    - WHEN INSTALLING WATER &/OR SEWER MAINS, THE HORIZONTAL SEPARATION BETWEEN UTILITIES SHALL BE 10'. IF THIS SEPARATION CANNOT BE MAINTAINED DUE TO EXISTING CONDITIONS, THE VARIATION ALLOWED BY THE WATER MAIN IN A SEPARATE TRENCH WITH THE ELEVATION OF THE WATER MAIN AT LEAST 18" ABOVE THE TOP OF THE SEWER & MUST BE APPROVED BY THE PUBLIC UTILITIES DIRECTOR. ALL DISTANCES ARE MEASURED FROM OUTSIDE DIAMETER TO OUTSIDE DIAMETER.
    - WHERE IT IS IMPOSSIBLE TO OBTAIN PROPER SEPARATION, OR ANYTIME A SANITARY SEWER PASSES OVER A WATERMAIN, DIP MATERIALS OR STEEL ENCASEMENT EXTENDED 10' ON EACH SIDE OF CROSSING MUST BE SPECIFIED & INSTALLED TO WATERLINE SPECIFICATIONS.
    - 5.0' MINIMUM HORIZONTAL SEPARATION IS REQUIRED BETWEEN ALL SANITARY SEWER & STORM SEWER FACILITIES, UNLESS DIP MATERIAL IS SPECIFIED FOR SANITARY SEWER.
    - MAINTAIN 18" MIN. VERTICAL SEPARATION AT ALL WATERMAIN & RCP STORM DRAIN CROSSINGS; MAINTAIN 24" MIN. VERTICAL SEPARATION AT ALL SANITARY SEWER & RCP STORM DRAIN CROSSINGS. WHERE ADEQUATE SEPARATIONS CANNOT BE ACHIEVED, SPECIFY DIP MATERIALS & A CONCRETE CRADLE HAVING 6" MIN. CLEARANCE (PER CORPUD DETAILS W-41 & S-49).
    - ALL OTHER UNDERGROUND UTILITIES SHALL CROSS WATER & SEWER FACILITIES WITH 18" MIN. VERTICAL SEPARATION REQUIRED.
  - ANY NECESSARY FIELD REVISIONS ARE SUBJECT TO REVIEW & APPROVAL OF AN AMENDED PLAN &/OR PROFILE BY THE CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PRIOR TO CONSTRUCTION.
  - CONTRACTOR SHALL MAINTAIN CONTINUOUS WATER & SEWER SERVICE TO EXISTING RESIDENCES & BUSINESSES THROUGHOUT CONSTRUCTION OF PROJECT. ANY NECESSARY SERVICE INTERRUPTIONS SHALL BE PRECEDED BY A 24 HOUR ADVANCE NOTICE TO THE CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT.
  - 3.0' MINIMUM COVER IS REQUIRED ON ALL WATER MAINS & SEWER FORCE MAINS. 4.0' MINIMUM COVER IS REQUIRED ON ALL REUSE MAINS.
  - IT IS THE DEVELOPER'S RESPONSIBILITY TO ABANDON OR REMOVE EXISTING WATER & SEWER SERVICES NOT BEING USED IN REDEVELOPMENT OF A SITE UNLESS OTHERWISE DIRECTED BY THE CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT. THIS INCLUDES ABANDONING TAP AT MAIN & REMOVAL OF SERVICE FROM ROW OR EASEMENT PER CORPUD HANDBOOK PROCEDURE.
  - INSTALL 3/4" COPPER WATER SERVICES WITH METERS LOCATED AT ROW OR WITHIN A 2'X2' WATERLINE EASEMENT IMMEDIATELY ADJACENT. NOTE: IT IS THE APPLICANT'S RESPONSIBILITY TO PROPERLY SIZE THE WATER SERVICE FOR EACH CONNECTION TO PROVIDE ADEQUATE FLOW & PRESSURE.
  - INSTALL 4" PVC SEWER SERVICES @ 1.0% MINIMUM GRADE WITH CLEANOUTS LOCATED AT ROW OR EASEMENT LINE & SPACED EVERY 75 LINEAR FEET MAXIMUM.
  - PRESSURE REDUCING VALVES ARE REQUIRED ON ALL WATER SERVICES EXCEEDING 80 PSI; BACKWATER VALVES ARE REQUIRED ON ALL SANITARY SEWER SERVICES HAVING BUILDING DRAINS LOWER THAN 1.0' ABOVE THE NEXT UPSTREAM MANHOLE.
  - ALL ENVIRONMENTAL PERMITS APPLICABLE TO THE PROJECT MUST BE OBTAINED FROM NCDWQ, USACE &/OR FEMA FOR ANY RIPARIAN BUFFER, WETLAND &/OR FLOODPLAIN IMPACTS (RESPECTIVELY) PRIOR TO CONSTRUCTION.
  - NCDOT / RAILROAD ENCRoACHMENT AGREEMENTS ARE REQUIRED FOR ANY UTILITY WORK (INCLUDING MAIN EXTENSIONS & SERVICE TAPS) WITHIN STATE OR RAILROAD ROW PRIOR TO CONSTRUCTION.
  - GREASE INTERCEPTOR / OIL WATER SEPARATOR SIZING CALCULATIONS & INSTALLATION SPECIFICATIONS SHALL BE APPROVED BY THE CORPUD FOG PROGRAM COORDINATOR PRIOR TO ISSUANCE OF A BUILDING PERMIT. CONTACT TIM BEASLEY AT (919) 996-2334 OR TIMOTHY.BEASLEY@RALEIGHNC.GOV FOR MORE INFORMATION.
  - CROSS-CONNECTION CONTROL PROTECTION DEVICES ARE REQUIRED BASED ON DEGREE OF HEALTH HAZARD INVOLVED AS LISTED IN APPENDIX-B OF THE RULES GOVERNING PUBLIC WATER SYSTEMS IN NORTH CAROLINA. THESE GUIDELINES ARE THE MINIMUM REQUIREMENTS. THE DEVICES SHALL MEET AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE) STANDARDS OR BE ON THE UNIVERSITY OF SOUTHERN CALIFORNIA APPROVAL LIST. THE DEVICES SHALL BE INSTALLED AND TESTED (BOTH INITIAL AND PERIODIC TESTING THEREAFTER) IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS OR THE LOCAL CROSS-CONNECTION CONTROL PROGRAM, WHICHEVER IS MORE STRINGENT. CONTACT JOANIE HARTLEY AT (919) 996-5923 OR JOANIE.HARTLEY@RALEIGHNC.GOV FOR MORE INFORMATION.

**MH 716 NOTE:**  
CONTRACTOR SHALL MAKE CONNECTION INTO MH716 PER CITY OF RALEIGH STANDARD SPECIFICATIONS VIA A CONCRETE CORING MACHINE, AND THE PIPE CONNECTION MUST BE MADE WITH A FLEXIBLE RUBBER BOOT. SEE CITY OF RALEIGH SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

**EXISTING UTILITY NOTE:**  
ALL EXISTING WATER MAINS & DOWNSTREAM SEWER FACILITIES TO WHICH THIS PROJECT CONNECTS SHALL BE ACCEPTED BY THE CITY OF RALEIGH FOR MAINTENANCE PRIOR TO RELEASE OF 1ST CO IN KNIGHTDALE STATION, R8 PHASE OF DEVELOPMENT.  
REF: 2014 EDITION OF CORPUD HANDBOOK, PAGES 25-32

**EXISTING WATER & SEWER NOTE:**  
TOK #ZCP-7-15 WATER & SEWER LINES SHOWN CORRESPOND TO COR PERMIT #W-3327 AND #S-4080.

**NOTE:**  
NO VALVES OR MANHOLE COVERS WILL BE LOCATED WITHIN THE SIDEWALKS.

**SCM MAINTENANCE AND ACCESS EASEMENT**  
(BOUND BY ROW, LOT, & PERIMETER BUFFER)

**OWN CERTIFICATION:** THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # 5-4520  
AUTHORIZATION TO CONSTRUCT *[Signature]*  
DATE 5/3/19

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

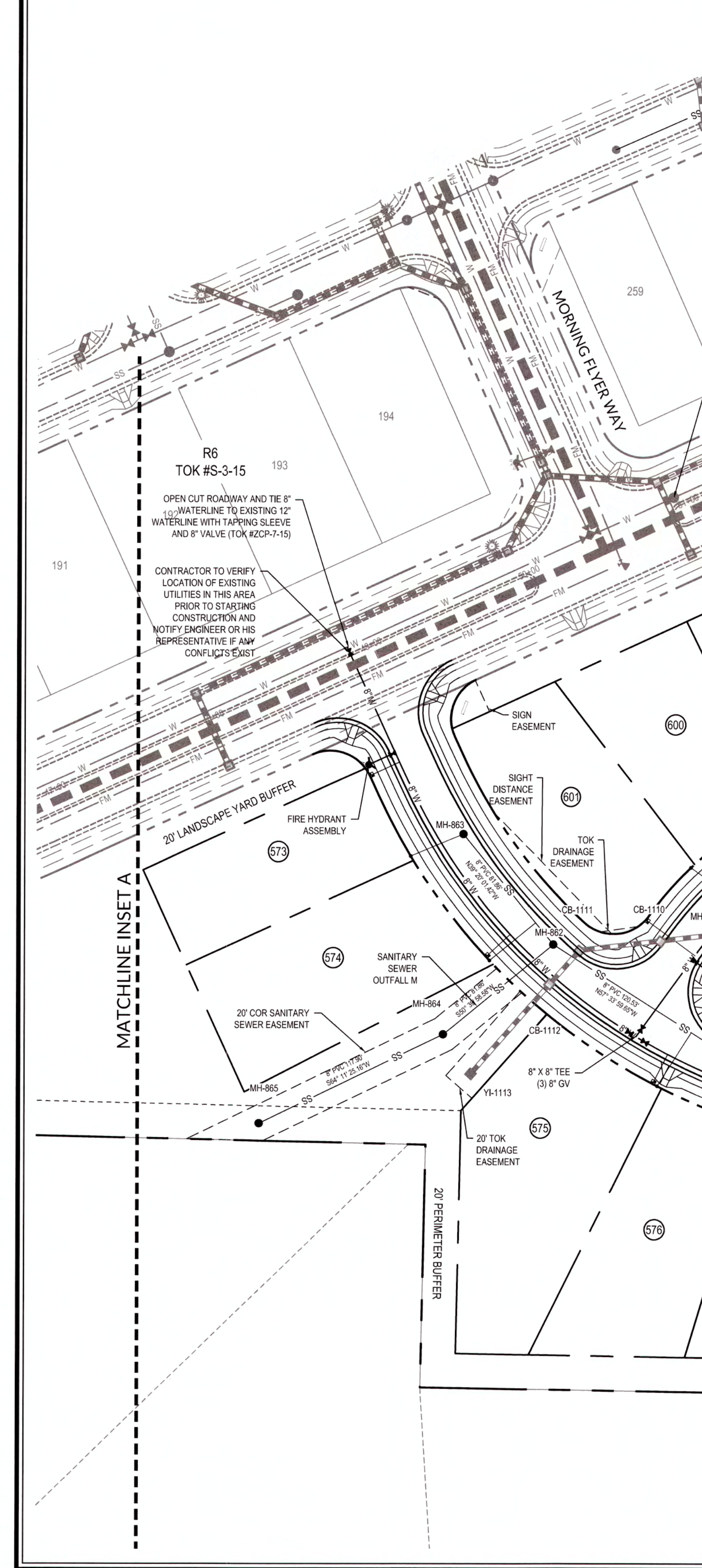
CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # W-3595  
AUTHORIZATION TO CONSTRUCT *[Signature]*  
DATE 5/3/19

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

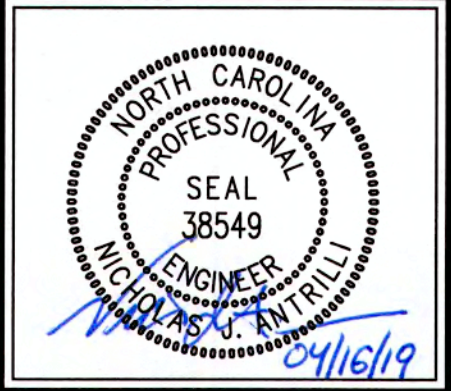
**GRAPHIC SCALE**  
1 inch = 50 ft.

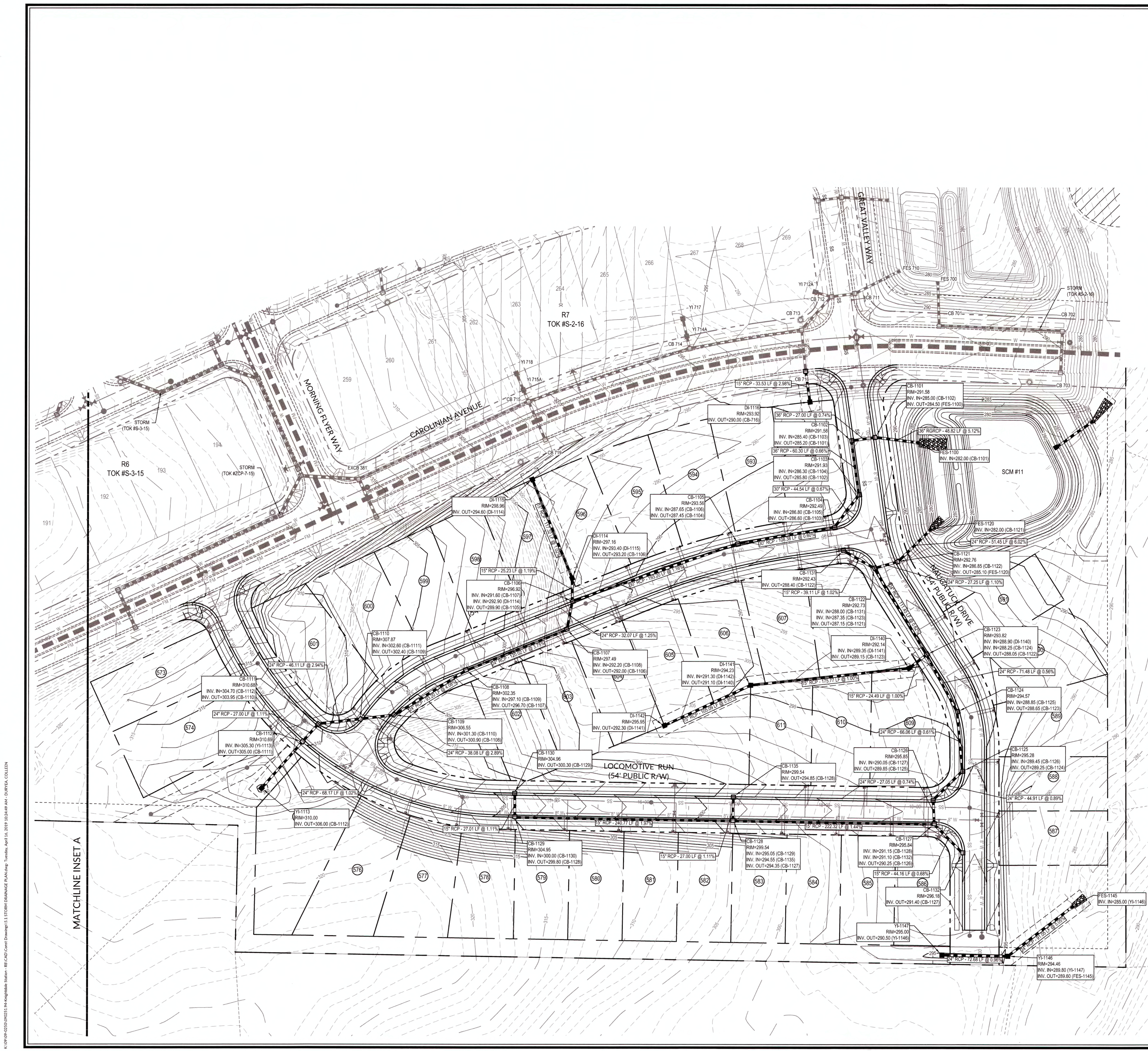
1 TOK & COR COMMENTS 04/12/19

**INSET A**



K:\09\09-0220\090221-14 Knightdale Station - BSCAD\Corr\Drawings\4.1 UTILITY PLAN.dwg Friday, April 12, 2019 3:50:00 PM - DURIEA, COLLEEN





- GRADING AND DRAINAGE NOTES:**
- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS & DETAILS.
  - BOUNDARY SURVEY AND TOPOGRAPHIC SURVEY PERFORMED BY WITHERSRAVENEL, INC. OFFSITE TOPOGRAPHIC INFORMATION PROVIDED BY NC LIDAR.
  - WETLANDS AND STREAM BUFFERS DELINEATED AND SURVEYED BY WITHERSRAVENEL, INC.
  - THIS PROPERTY DOES NOT LIE WITHIN THE FEMA FLOODPLAIN PER MAP NUMBER 3720175400J AND 3720175400J, WITH AN EFFECTIVE DATE OF MAY 2, 2006.
  - RECEIVING WATERCOURSE: UNNAMED TRIBUTARY OF MARKS CREEK IN THE NEUSE RIVER BASIN.
  - THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING CONSTRUCTION. THE LOCATION OF EXISTING UTILITIES SHOWN ON THE PLANS IS BASED ON THE BEST AVAILABLE INFORMATION, BUT CAN BE CONSIDERED ONLY AS APPROXIMATE.
  - ALL STORM DRAINAGE PIPE SHALL HAVE A MINIMUM COVER OF 2 FEET TO THE PIPE CROWN IN TRAFFIC, UNLESS APPROVED BY THE TOWN OF KNIGHTDALE.
  - ALL STORM DRAINAGE PIPE SHALL HAVE A MINIMUM COVER OF 1 FOOT TO THE PIPE CROWN IN NON-TRAFFIC AREAS.
  - STORM SEWER PIPE ENDS SHALL BE FURNISHED WITH REINFORCED CONCRETE PIPE FLARED END SECTION UNLESS OTHERWISE SPECIFIED ON PLANS.
  - EACH DRAINAGE STRUCTURE SHALL HAVE A SHAPED INVERT CONSTRUCTED FROM CONCRETE PER TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS.
  - ENERGY DISSIPATORS SHALL BE INSTALLED AT ALL STORM SEWER DISCHARGE POINTS. A FABRIC OR WASHED STONE BARRIER SHALL BE INSTALLED BETWEEN THE DISSIPATION PAD AND THE NATURAL GROUND.
  - STORM PIPE TRENCH EXCAVATION AND BACKFILLING SHALL BE PERFORMED IN ACCORDANCE WITH TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS AND DETAILS. PLEASE CONTACT THE TOWN OF KNIGHTDALE DEVELOPMENT SERVICES ENGINEER PRIOR TO THE INSTALLATION OF ALL STORM DRAIN PIPE. STORMWATER CALCULATIONS ARE BASED ON A MAXIMUM 3,500 SF OF IMPERVIOUS AREA PER LOT.
  - ALL STORM DRAINAGE PIPE SHALL BE CLASS III REINFORCED CONCRETE PIPE (RCP) UNLESS NOTED OTHERWISE.
  - DISCHARGE BASED ON 10-YR STORM EVENT UNLESS NOTED OTHERWISE.
  - CB=CATCH BASIN; FES=FLARED END SECTION; JB=JUNCTION BOX; YI=YARD INLET (TOK #5.03); DI=DROP INLET (TOK #5.04)
  - RIM ELEVATION GIVEN FOR CB IS TOP OF CURB, YI OPENING INVERT FOR SLAB TOP, DI IS TOP OF GRATE FOR GRATED INLET, JB IS TOP OF RIM.
  - "TOK DRAINAGE EASEMENT" = PUBLIC EASEMENT. "KSCA DRAINAGE EASEMENT" = KNIGHTDALE STATION COMMUNITY ASSOCIATION, INC.
  - ALL PUBLIC STORM DRAINAGE FRAMES, GRATES, & HOODS SHALL BE STAMPED W/ "DRAINS TO RIVER" IN ACCORDANCE WITH TOWN OF KNIGHTDALE STANDARDS.
  - THE USE OF WAFFLE BOXES IS NOT PERMITTED WITHIN PUBLIC RIGHTS OF WAY AND PUBLIC DRAINAGE EASEMENTS.
  - THE CONTRACTOR WILL BE RESPONSIBLE FOR INSTALLING STEPS IN STORM DRAINAGE BOXES GREATER THAN OR EQUAL TO 5.0 FEET DEPTH. THE STEPS SHALL BE INSTALLED ON 16 INCH CENTERS AND SECURED PER TOWN OF KNIGHTDALE SPECIFICATIONS.

TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-15-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

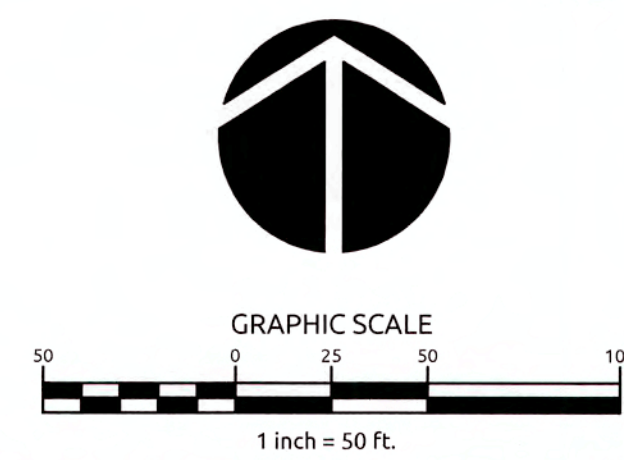
CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.



Job No. 02090251.94 Drawn By WGR  
Date 11/21/2018 Designer WGR



Revisions  
1 TOK & COR COMMENTS 04/12/19

K:\09\0250\070251\H-Knightdale Station - BE CAD\Coord Drawings\11 STORM DRAINAGE PLAN.dwg, Tuesday, April 16, 2019 10:26:49 AM - DURETA, COLLEEN



PIPE SCHEDULE

FES-1100

STORM SYSTEM DATA							
UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SIZE	LENGTH	SLOPE	MATERIAL	UPSTREAM INVERT	DOWNSTREAM INVERT
CB-1101	FES-1100	36	48.82	5.12%	RGRCP	284.50	282.00
CB-1102	CB-1101	36	27.00	0.74%	# RCP	285.20	285.00
CB-1103	CB-1102	36	60.30	0.66%	# RCP	285.80	285.40
CB-1104	CB-1103	30	44.54	0.67%	# RCP	286.60	286.30
CB-1105	CB-1104	30	108.38	0.60%	RCP	287.45	286.80
CB-1106	CB-1105	30	193.20	1.16%	RCP	289.90	287.65
CB-1107	CB-1106	24	32.07	1.25%	RCP	292.00	291.60
CB-1108	CB-1107	24	120.02	3.75%	RCP	296.70	292.20
CB-1109	CB-1108	24	93.20	4.08%	RCP	300.90	297.10
CB-1110	CB-1109	24	38.08	2.89%	RCP	302.40	301.30
CB-1111	CB-1110	24	46.11	2.94%	RCP	303.95	302.60
CB-1112	CB-1111	24	27.00	1.11%	RCP	305.00	304.70
DI-1114	CB-1106	15	25.23	1.19%	RCP	293.20	292.90
DI-1115	DI-1114	15	117.32	1.02%	RCP	294.60	293.40
YI-1113	CB-1112	24	68.17	1.02%	RCP	306.00	305.30

STRUCTURE SCHEDULE

FES-1100

STORM STRUCTURE TABLE				
STRUCTURE	RIM EL	STRUCTURE IN	INVERT IN	INVERT OUT
CB-1101	291.58	CB-1102	285.00	284.50
CB-1102	291.58	CB-1103	285.40	285.20
CB-1103	291.93	CB-1104	286.30	285.80
CB-1104	292.49	CB-1105	286.60	286.60
CB-1105	293.56	CB-1106	287.65	287.45
CB-1106	296.92	CB-1107 DI-1114	291.60 292.90	289.90
CB-1107	297.49	CB-1108	292.20	292.00
CB-1108	302.35	CB-1109	297.10	296.70
CB-1109	306.55	CB-1110	301.30	300.90
CB-1110	307.87	CB-1111	302.60	302.40
CB-1111	310.68	CB-1112	304.70	303.95
CB-1112	310.69	YI-1113	305.30	305.00
DI-1114	297.16	DI-1115	293.40	293.20
DI-1115	298.96			294.60
FES-1100	285.42	CB-1101	282.00	
YI-1113	310.00			306.00

FES-1120

STORM SYSTEM DATA							
UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SIZE	LENGTH	SLOPE	MATERIAL	UPSTREAM INVERT	DOWNSTREAM INVERT
CB-1121	FES-1120	24	51.45	6.02%	RCP	285.10	282.00
CB-1122	CB-1121	24	27.25	1.10%	RCP	287.15	286.85
CB-1123	CB-1122	24	111.45	0.62%	RCP	288.05	287.35
CB-1124	CB-1123	24	71.48	0.56%	RCP	288.65	288.25
CB-1125	CB-1124	24	66.06	0.61%	RCP	289.25	288.85
CB-1126	CB-1125	24	44.91	0.89%	RCP	289.85	289.45
CB-1127	CB-1126	24	27.05	0.74%	RCP	290.25	290.05
CB-1128	CB-1127	15	222.32	1.44%	RCP	294.35	291.15
CB-1129	CB-1128	15	240.77	1.97%	RCP	299.80	295.05
CB-1130	CB-1129	15	27.01	1.11%	RCP	300.30	300.00
CB-1131	CB-1122	15	39.11	1.02%	RCP	288.40	288.00
CB-1132	CB-1127	15	44.16	0.68%	RCP	291.40	291.10
CB-1135	CB-1128	15	27.00	1.11%	RCP	294.85	294.55

FES-1120

STORM STRUCTURE TABLE				
STRUCTURE	RIM EL	STRUCTURE IN	INVERT IN	INVERT OUT
CB-1121	292.76	CB-1122	286.85	285.10
CB-1122	292.73	CB-1131 CB-1123	288.00 287.35	287.15
CB-1123	293.82	DI-1140 CB-1124	288.90 288.25	288.05
CB-1124	294.57	CB-1125	288.85	288.65
CB-1125	295.28	CB-1126	289.45	289.25
CB-1126	295.85	CB-1127	290.05	289.85
CB-1127	295.84	CB-1128 CB-1132	291.15 291.10	290.25
CB-1128	299.54	CB-1129 CB-1135	295.05 294.55	294.35
CB-1129	304.95	CB-1130	300.00	299.80
CB-1130	304.96			300.30
CB-1131	292.43			288.40
CB-1132	296.18			291.40
CB-1135	299.54			294.85
DI-1140	292.14	DI-1141	289.35	289.15
DI-1141	294.23	DI-1142	291.30	291.10
DI-1142	295.95			292.30
FES-1120	284.79	CB-1121	282.00	

FES-1145

STORM SYSTEM DATA							
UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SIZE	LENGTH	SLOPE	MATERIAL	UPSTREAM INVERT	DOWNSTREAM INVERT
FES-1145	YI-1146	24	91.05	5.05%	RCP	285.00	289.60
YI-1146	YI-1147	24	72.68	0.96%	RCP	289.80	290.50

FES-1145

STORM STRUCTURE TABLE				
STRUCTURE	RIM EL	STRUCTURE IN	INVERT IN	INVERT OUT
FES-1145	286.52	YI-1146	285.00	
YI-1146	294.46	YI-1147	289.80	289.60
YI-1147	295.00			290.50

TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: S. M. Hall DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: [Signature] DATE: 6/14/19  
ADMINISTRATOR

PUBLIC SEWER COLLECTION/EXTENSION SYSTEM

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM

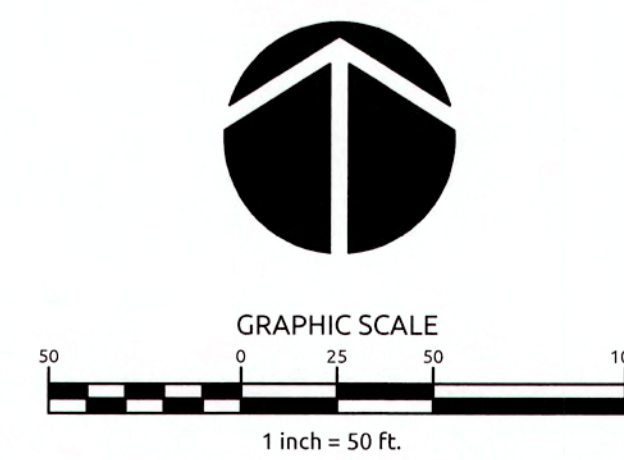
THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

NOTES:

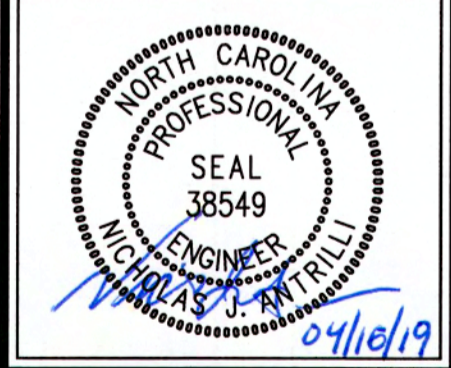
- RGRCP: DENOTES O-RING GASKET RCP
- # : DENOTES CLASS IV RCP
- 1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS AND DETAILS.
- 2. RIM ELEVATION GIVEN FOR CB IS TOP OF CURB, YI & DI IS TOP OF GRATE FOR GRATED INLET, JB IS TOP OF RIM.
- 3. ALL PIPING SHALL BE CLASS III REINFORCED CONCRETE PIPE (RCP) UNLESS NOTED OTHERWISE.
- 4. ALL PUBLIC STORM DRAINAGE FRAMES, GRATES, & HOODS SHALL BE STAMPED W/ 'DRAINS TO RIVER' IN ACCORDANCE WITH TOWN OF KNIGHTDALE STANDARDS.

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.



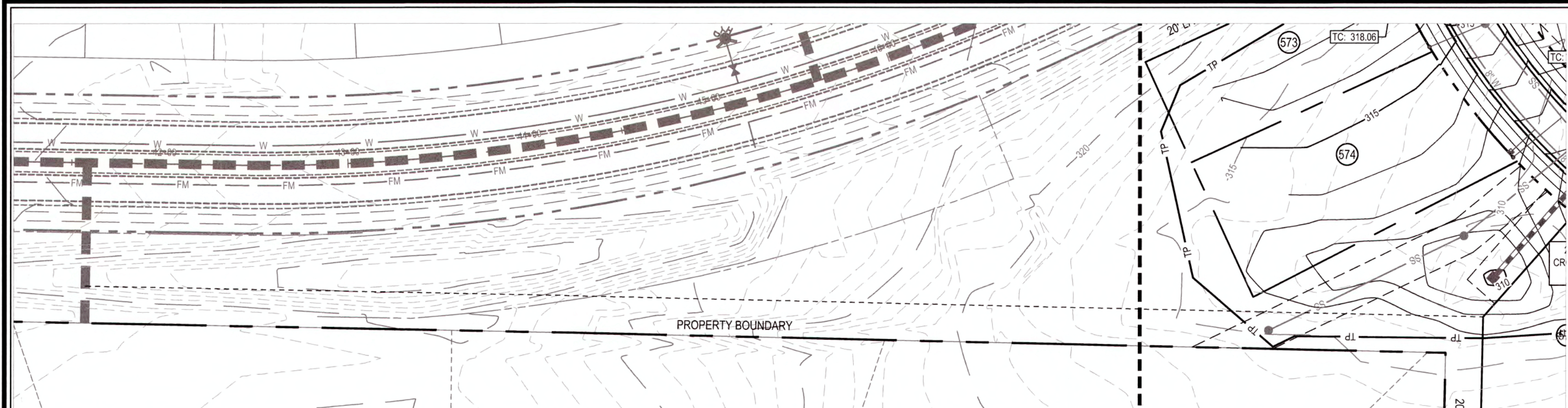
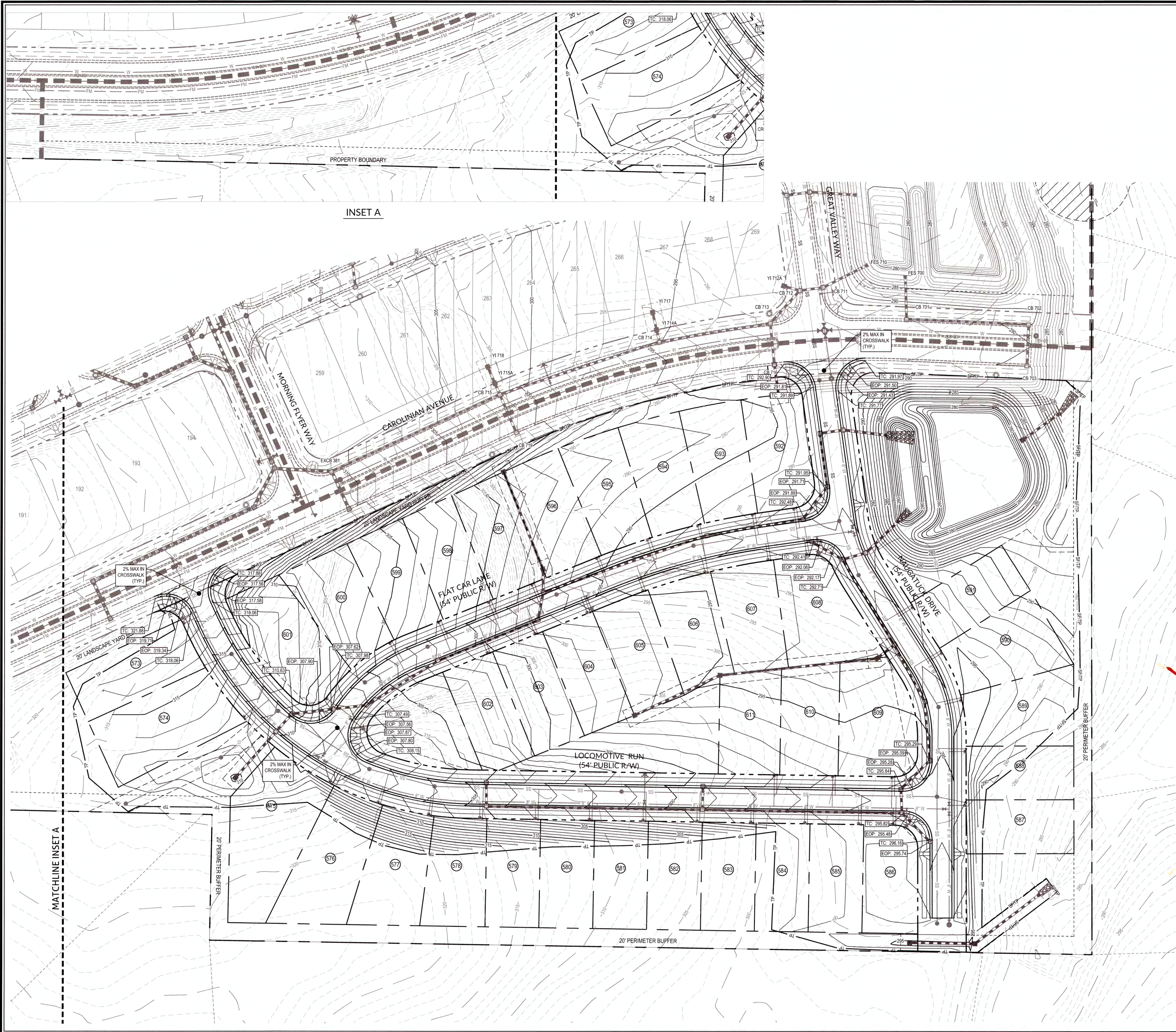
STORM DRAINAGE NOTES:  
FES: FLARED END SECTIONS, CB: CATCH BASIN, JB: JUNCTION BOX, DI: DROP INLET (TOK #5.04), YI: YARD INLET (TOK #5.04)

Job No: 02090251.94 Drawn By: W&R  
Date: 11/21/2018 Designer: W&R



Revisions  
1 TOK & COR COMMENTS 04/12/19

K:\09\04\0250\020251.94\Knightdale Station - BE\CAD\Coord Drawings\11 STORM DRAINAGE PLAN.dwg, Friday, April 12, 2019 2:33:31 PM - DUREVA, COLLEEN



INSET A

TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

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BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

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CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

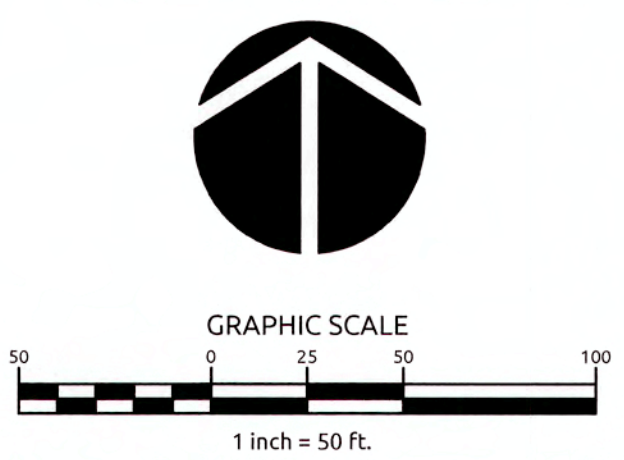
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**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

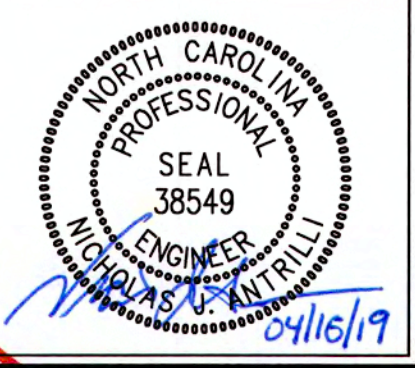
THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

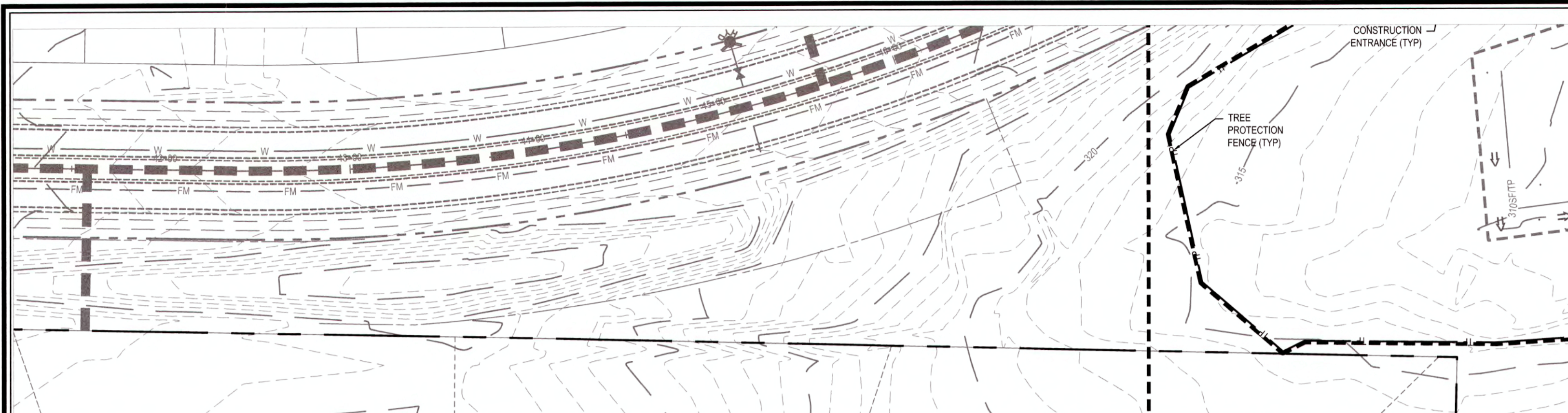


Job No. 02090251.94 Drawn By W&R  
Date 11/21/2018 Designer W&R



1 TOK & COR COMMENTS 04/12/19

K:\09\02090251-14-Knightdale Station - R8\CADD\Cont Drawings\5.3 GRADING PLAN.dwg, Tuesday, April 16, 2019 10:31:13 AM - BURRVA, COLLEEN

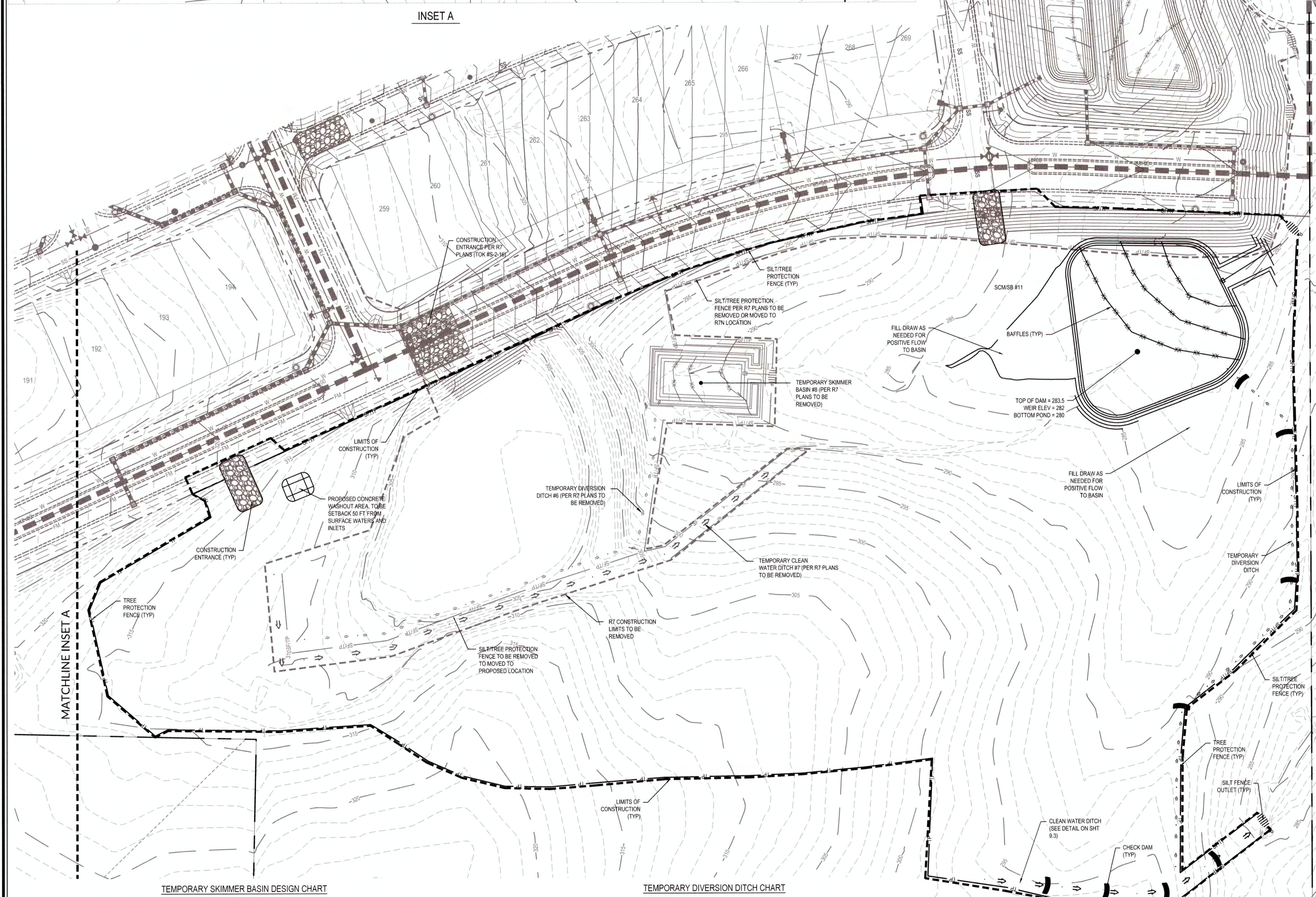


**VELOCITY DISSIPATOR DESIGN CHART**

NAME	PIPE SIZE (IN)	DISCHARGE 10-YR (CFS)	VELOCITY (FT/S)	LENGTH (FT)	WIDTH AT BEGINNING (FT)	WIDTH AT END (FT)	AVG DIA (IN)	THICKNESS (IN)	STONE CLASS
FES-1100	36	32.98	20.2	30	9	15	23	22	1
FES-1120	24	19.11	17.75	16	6	8.5	13	18	1
FES-1145	24	17.6	14.37	16	6	8.5	13	18	1

ALL DISSIPATORS SHALL HAVE FILTER FABRIC UNDERLINERS.

- CONSTRUCTION SEQUENCE**
- SCHEDULE A PRECONSTRUCTION CONFERENCE WITH THE WATERSHED MANAGER, KARYN PAGEAU, 919-796-8769. OBTAIN A LAND-DISTURBING PERMIT.
  - INSTALL GRAVEL CONSTRUCTION PAD, TEMPORARY DIVERSIONS, SILT FENCE, SEDIMENT BASINS OR OTHER MEASURES AS SHOWN ON THE APPROVED PLAN. CLEAR ONLY AS NECESSARY TO INSTALL THESE DEVICES. SEED TEMPORARY DIVERSIONS, BERMS AND BASINS IMMEDIATELY AFTER CONSTRUCTION. INSTALL INLET PROTECTION TO EXISTING CATCH BASINS.
  - DUE TO FILL REQUIRED FOR FINAL GRADE OF BMP, THE RISER STRUCTURE INSTALLED SHALL BE DELAYED UNTIL THE SITE IS BROUGHT UP TO GRADE.
  - CALL 919-796-8769 FOR AN ONSITE INSPECTION BY THE WATERSHED MANAGER TO OBTAIN A CERTIFICATE OF COMPLIANCE.
  - BEGIN CLEARING AND GRUBBING. MAINTAIN DEVICES AS NEEDED. ROUGH GRADE SITE.
  - INSTALL STORM SEWER, IF SHOWN, AND PROTECT INLETS WITH BLOCK AND GRAVEL, INLET CONTROLS, SEDIMENT TRAPS OR OTHER APPROVED MEASURES AS SHOWN ON THE PLAN. BEGIN CONSTRUCTION, BUILDING, ETC.
  - STABILIZE SITE AS AREAS ARE BROUGHT UP TO FINISH GRADE WITH VEGETATION, PAVING, DITCH LININGS, ETC. SEED AND MULCH DENUDED AREAS PER GROUND STABILIZATION TIME FRAMES.
  - WHEN CONSTRUCTION IS COMPLETE AND ALL AREAS ARE STABILIZED COMPLETELY, CALL 919-842-7142 FOR AN INSPECTION BY THE WATERSHED MANAGER.
  - IF SITE IS APPROVED, REMOVE TEMPORARY DIVERSIONS, SILT FENCE, SEDIMENT BASINS, ETC. AND SEED OUT OR STABILIZE ANY RESULTING BARE AREAS. ALL REMAINING PERMANENT EROSION CONTROL DEVICES, SUCH AS VELOCITY DISSIPATORS, SHOULD NOW BE INSTALLED.
  - WHEN VEGETATION HAS BECOME ESTABLISHED, CALL FOR A FINAL SITE INSPECTION BY THE WATERSHED MANAGER, 919-796-8769. OBTAIN A CERTIFICATE OF COMPLETION.



- BASIN REMOVAL SEQUENCE**
- SCHEDULE A SITE MEETING WITH THE ENVIRONMENTAL ENGINEER/CONSULTANT TO DETERMINE IF A BASIN CAN BE REMOVED. INSTALL SILT FENCING OR OTHER TEMPORARY EROSION CONTROL MEASURES AS NEEDED PRIOR TO REMOVAL OF THE BASIN.
  - REMOVE BASIN(S) AND ASSOCIATED TEMPORARY DIVERSION OPERATES. IF CULVERT PIPES NEED TO BE EXTENDED, PERFORM THIS OPERATION AT THIS TIME. FINE GRADE AREA IN PREPARATION FOR SEEDING.
  - PERFORM SEEDING PREPARATION, SEED, MULCH, AND ASPHALT TACK ANY RESULTING BARE AREAS IMMEDIATELY.
  - INSTALL VELOCITY DISSIPATORS AND/OR LEVEL SPREADERS AS REQUIRED ON THE EROSION CONTROL PLAN.
  - WHEN SITE IS FULLY STABILIZED, CALL ENVIRONMENTAL ENGINEER/CONSULTANT FOR APPROVAL OF REMOVING REMAINING TEMPORARY EROSION CONTROL MEASURES AND ADVICE ON WHEN SITE CAN BE ISSUED A CERTIFICATE OF COMPLETION.

**EROSION CONTROL NOTE:**  
FOREBAY WILL NOT BE REQUIRED WHILE SCM IS ACTING AS AN EROSION CONTROL DEVICE.

**EROSION CONTROL LEGEND**

- LIMITS OF CONSTRUCTION
- - - EX. LIMITS OF CONSTRUCTION (SEC-014164-2019)
- - - SILT FENCE
- - - EX. SILT FENCE (SEC-014164-2019)
- - - TREE PROTECTION FENCE
- - - SILTTREE PROTECTION FENCE
- - - EX. SILTTREE PROTECTION FENCE (SEC-014164-2019)
- - - TEMPORARY DIVERSION DITCH
- - - TEMPORARY CLEAN WATER DITCH
- - - INLET PROTECTION
- - - SILT FENCE OUTLET
- - - ROCK CHECK DAM
- - - SKIMMER BASIN
- - - TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- - - CONCRETE WASHOUT AREA

TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

**TEMPORARY SKIMMER BASIN DESIGN CHART**

BASIN	TYPE	DRAINAGE AREA (AC)	DESIGNED AREA (AC)	COMPOSITE RATIONAL C	PEAK FLOW Q10 (CFS)	BASIN DIMENSIONS	WEIR LENGTH (FT)	VOLUME REQUIRED (CFS)	VOLUME PROVIDED (CFS)	SURFACE AREA (SQ FT)	SURFACE PROVIDED (SQ FT)	SKIMMER SIZE (IN)	ORIFICE SIZE (IN)
SCM #1	SKIMMER	18.0	11.1	0.30	88.1	SEE B.C. PLAN	20	33.49	43.24	21,74	21,86	4.5	2.0

NOTES:  
SCM #1 WILL BE USED AS A SEDIMENT OR SHEDDING SITE CONSTRUCTION ADD 6" TO DEPTH TO OBTAIN OVERALL DEPTH OF BASIN.  
REQUIRED VOLUME FOR A SKIMMER SEDIMENT BASIN DETERMINED PER NC DENR EROSION CONTROL MANUAL, (1800 CF PER DRAINAGE AREA).  
REQUIRED SURFACE AREA FOR A SKIMMER SEDIMENT BASIN DETERMINED PER NC DENR EROSION CONTROL MANUAL, (435 SQ FT PER 10 TR STORM).  
CALCULATED SURFACE AREA IS BASED ON RECEIVING ELEVATION.  
CALCULATED WEIR LENGTH BASED ON Q10 FLOWING THROUGH SPILLWAY WITH 0.6 FT MAXIMUM DEPTH.  
TOP OF FREEBOARD IS SHOWN PROVIDED FOR THE BASINS. VOLUME CALCULATION DOES NOT INCLUDE FREEBOARD.  
10 YRS RAINFALL INTENSITY = 7.08 IN/HR.

**TEMPORARY DIVERSION DITCH CHART**

Name	Rational C	Drainage Area (ac)	Q10 (cfs)	Slope (ft)	Calculated Depth (ft)	Calculated Shear Stress (lb/ft <sup>2</sup> )	Calculated Velocity (ft/s)	Type of Liner
Temporary Diversion Ditch #1	0.50	0.87	3.08	2.0	0.37	0.46	3.00	\$75
Temporary Clean Water Ditch	0.22	6.22	9.69	4.0	0.58	1.45	5.35	\$150

Notes:  
1 Rainfall Intensity based on the 10 year storm (in/hr) = 7.08  
2 Calculated depth and calculated velocity based on FlowMaster output.  
3 NAG S75: North American Green S75 or equal  
NAG S150: North American Green S150 or equal  
NAG SC150: North American Green SC150 or equal

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

**GRAPHIC SCALE**  
1 inch = 50 ft.

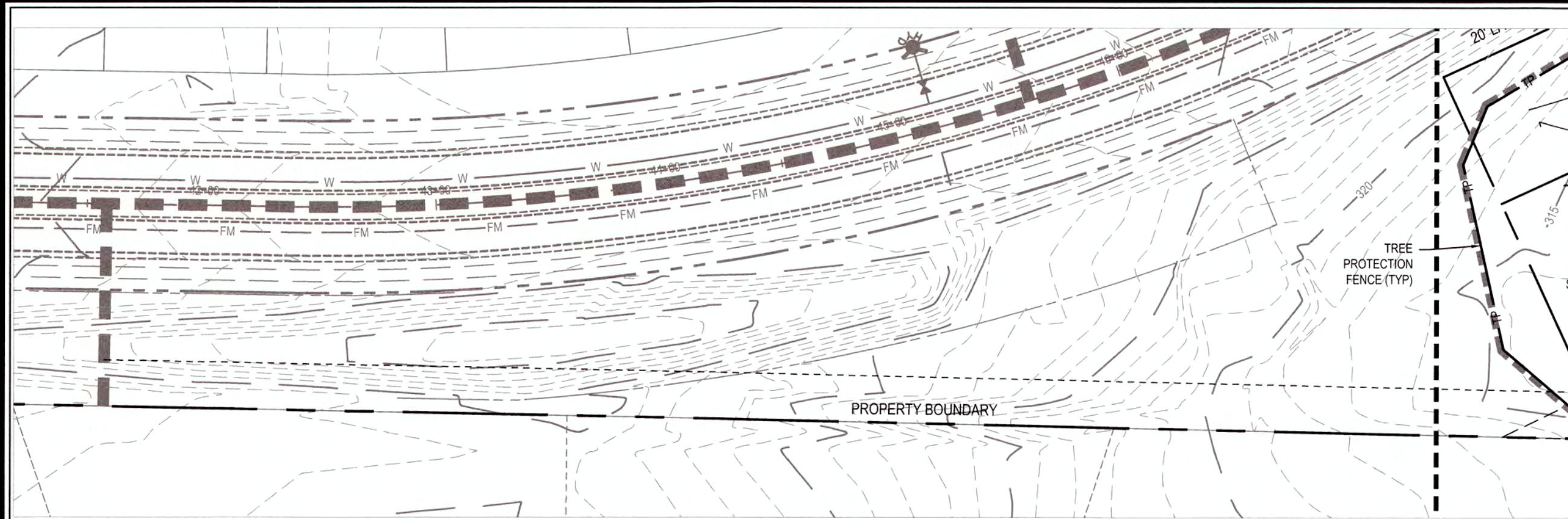


Revisions

No.	Description	Date
1	TOK & COR COMMENTS	04/12/19

Sheet No. **6.1**

K:\07-0250\025015-14-Knightdale Station - PRE-EROSION CONTROL PLAN.dwg, Monday, April 15, 2019, 1:35:40 PM - DAVID A. COLLEEN



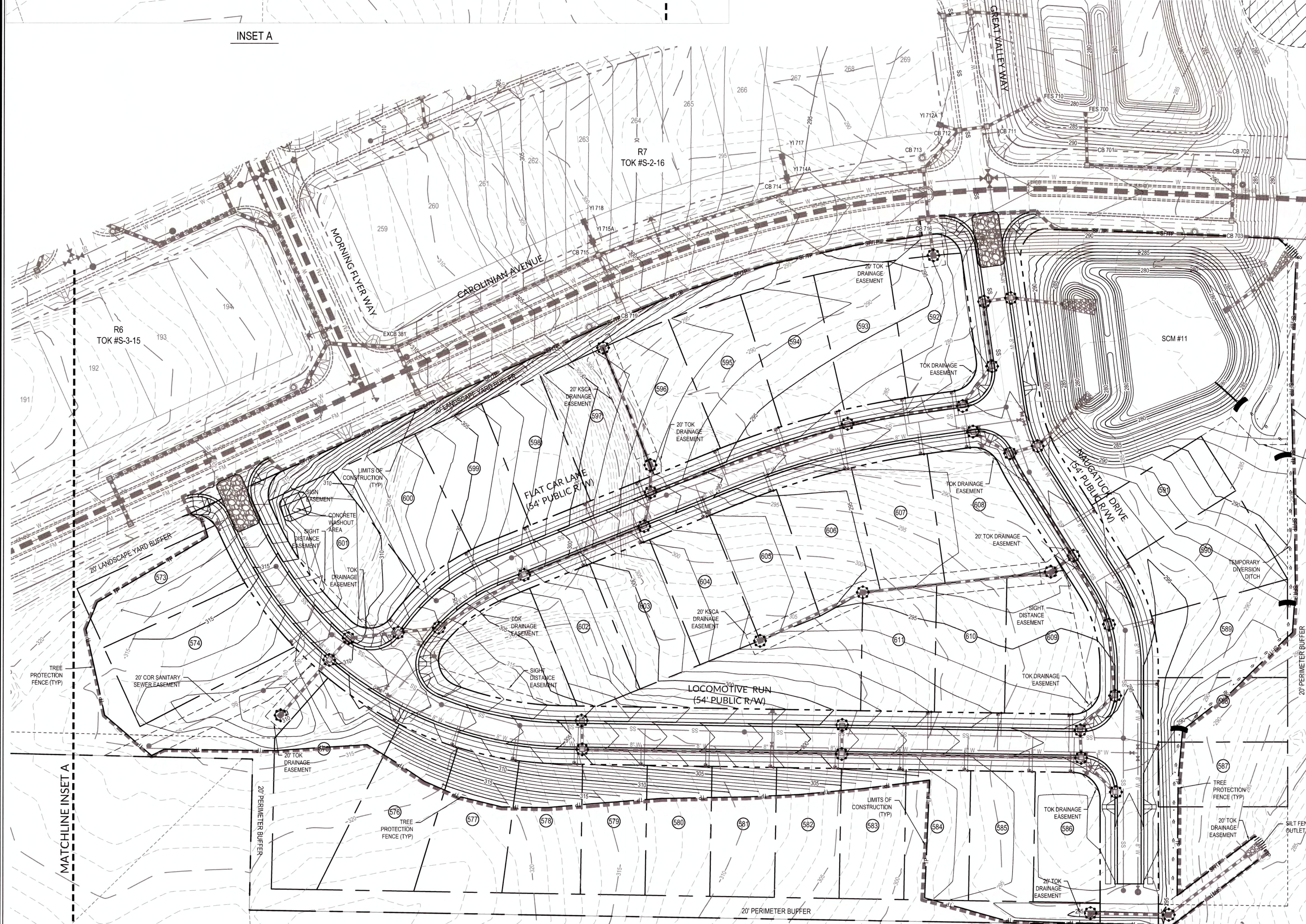
INSET A

PORTION OF R8 DENUDED AREA WITHIN R7 LIMITS  
(TOK #S-2-16): 2.5 AC  
ADDITIONAL R8 DENUDED AREA: 9 AC

EROSION CONTROL NOTE:  
FORESBY WILL NOT BE REQUIRED WHILE SCM IS ACTING AS AN EROSION CONTROL DEVICE.

CONSTRUCTION SEQUENCE NOTE:  
SEE SHEET 6.1 FOR BASIN REMOVAL SEQUENCE.

EROSION CONTROL LEGEND	
	LIMITS OF CONSTRUCTION
	EX. LIMITS OF CONSTRUCTION (SEC-014164-2019)
	SILT FENCE
	EX. SILT FENCE (SEC-014164-2019)
	TREE PROTECTION FENCE
	SILT/TREE PROTECTION FENCE
	EX. SILT/TREE PROTECTION FENCE (SEC-014164-2019)
	TEMPORARY DIVERSION DITCH
	TEMPORARY CLEAN WATER DITCH
	INLET PROTECTION
	SILT FENCE OUTLET
	ROCK CHECK DAM
	SKIMMER BASIN
	TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
	CONCRETE WASHOUT AREA



TOWN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6/13/2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**

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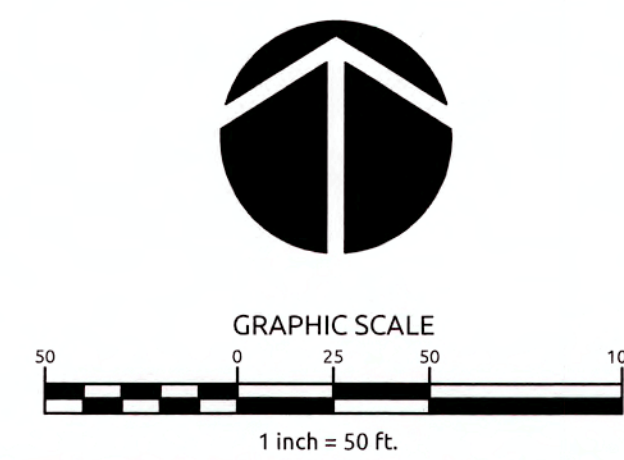
CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

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CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
DATE \_\_\_\_\_

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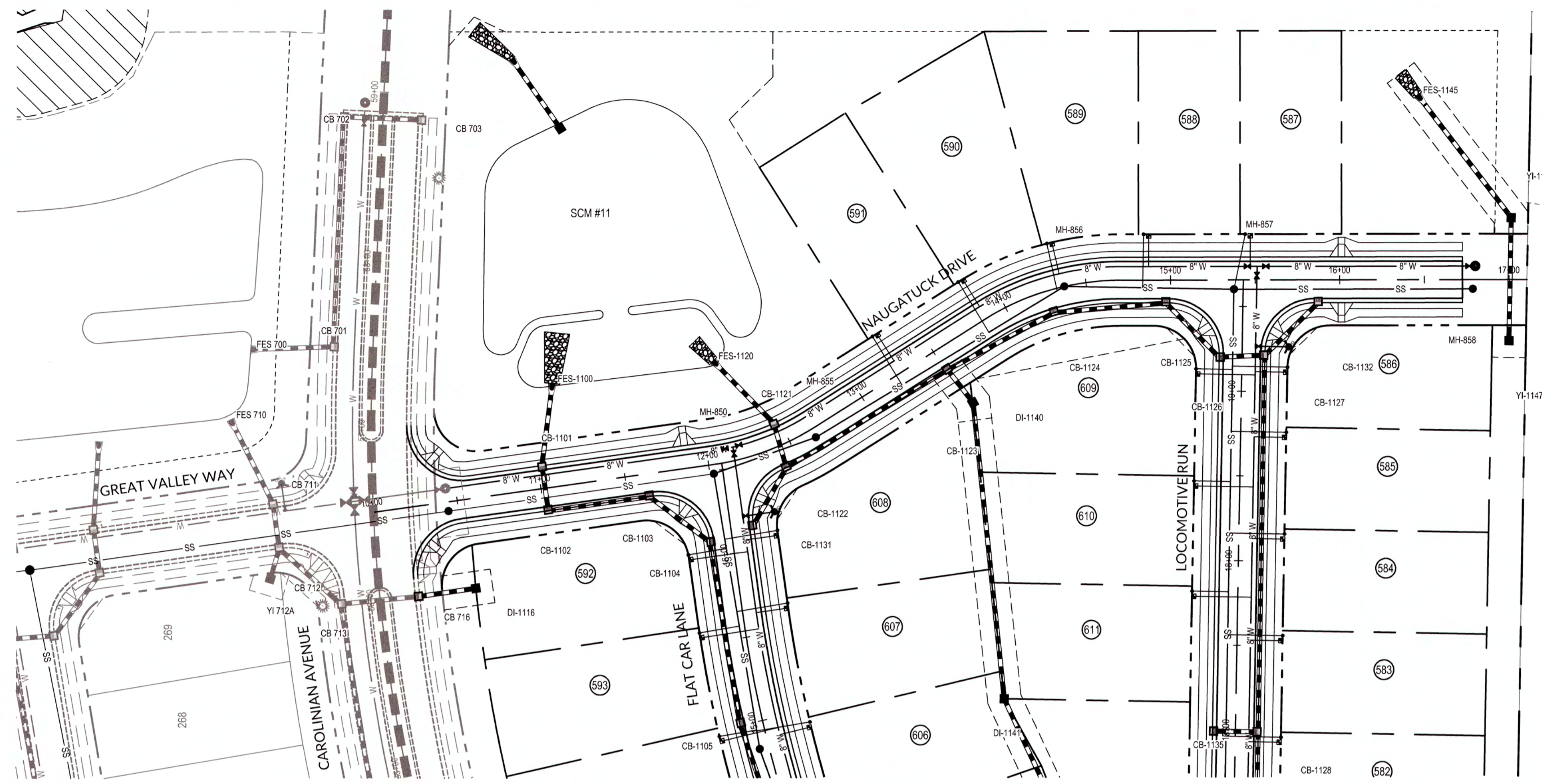


Job No. 02090251.94 Drawn By W&R  
Date 11/21/2018 Designer W&R



Revisions  
1 TOK & COR COMMENTS 04/12/19

K:\09\0250\090251\04-Knightdale Station - R8 CAD\Corr Drawings\2 POST EROSION CONTROL PLAN.dwg Tuesday, April 15, 2019 12:28:44 AM GURRYA COLLEN



**PUBLIC  
SEWER COLLECTION/EXTENSION SYSTEM**

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CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # 5-4620  
AUTHORIZATION TO CONSTRUCT Rose M. Sample  
DATE 5/3/19

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**PUBLIC  
WATER DISTRIBUTION/EXTENSION SYSTEM**

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CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # W-3595  
AUTHORIZATION TO CONSTRUCT Rose M. Sample  
DATE 5/3/19

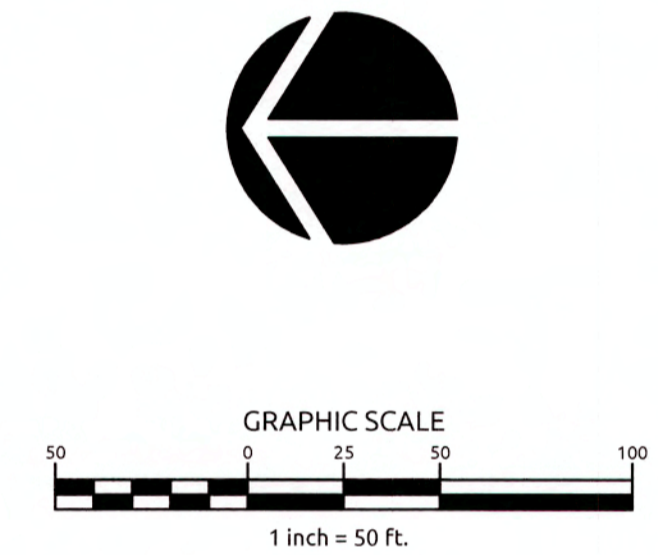
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JOHN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: [Signature] DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: [Signature] DATE: 6/14/19  
ADMINISTRATOR

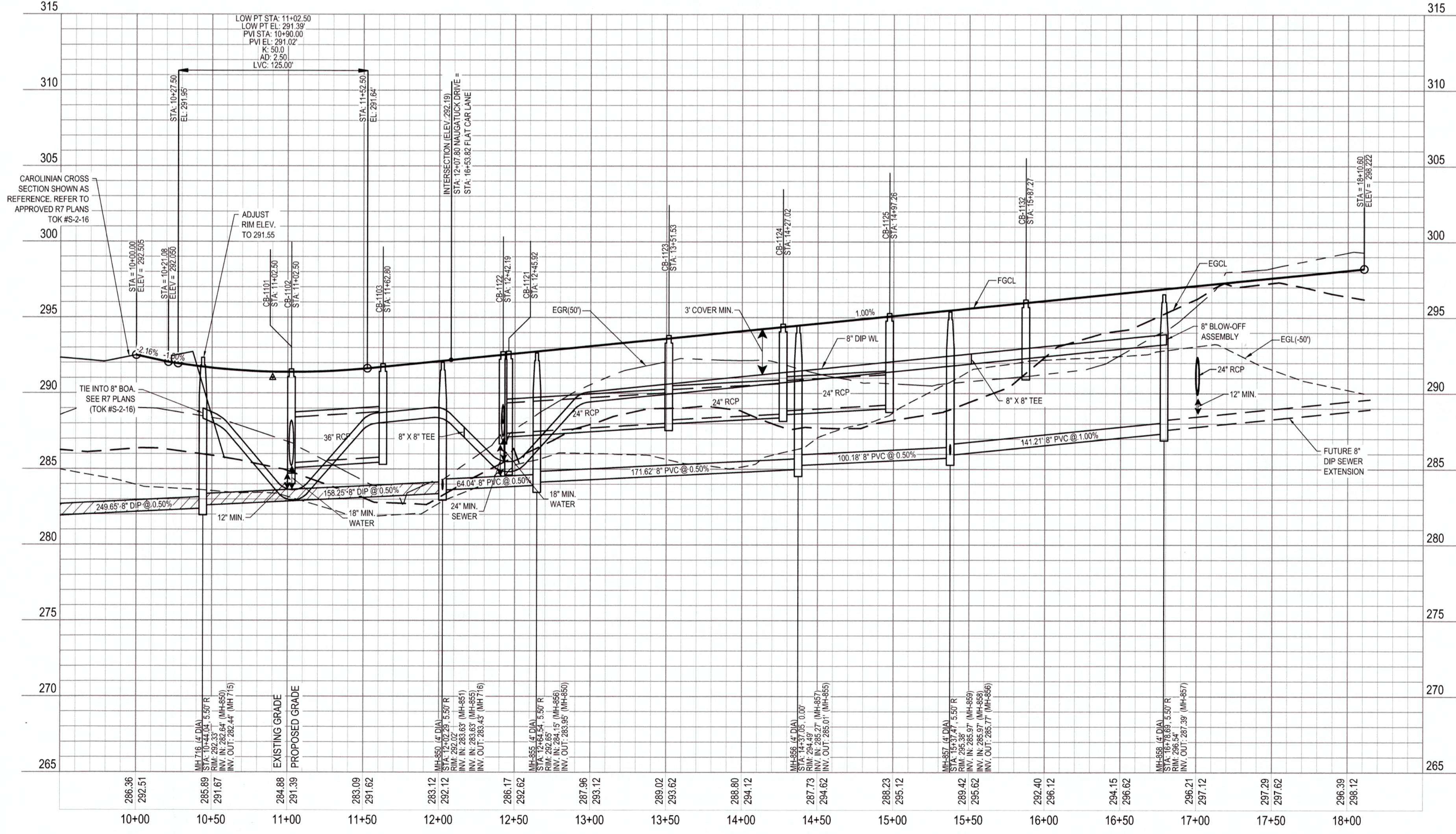


**WithersRavenel**  
Engineers | Planners | Surveyors

**KNIGHTDALE STATION  
R8**

TOWN OF KNIGHTDALE, NORTH CAROLINA

**NAUGATUCK DRIVE**



**SCALE:**  
1" = 50' HORIZ.  
1" = 5' VERT.

ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

**WATERLINE NOTE:**  
IF MINIMUM CLEARANCE CANNOT BE ACHIEVED WITHOUT EXCEEDING MAXIMUM PIPE DEFLECTION FOR THE WATERLINE, THEN CONTRACTOR TO INSTALL 45° VERTICAL BENDS PER COR DETAIL W-12.

**CLASS 1 STRUCTURAL MATERIAL NOTE:**  
CLASS 1 STRUCTURAL MATERIAL REQUIRED FROM EXISTING GROUND TO SPRING LINE OF PROPOSED STORM PIPE IN FILL CONDITIONS. SEE LATEST TOK STANDARD SPECIFICATIONS.

**CITY OF RALEIGH**

ALL CONSTRUCTION MUST BE IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL RULES AND REGULATIONS.

TRANSPORTATION SERVICES: N/A

PUBLIC UTILITIES: [Signature] 5/3/19

STORMWATER: N/A

PLANNING: N/A

FIRE: N/A

URBAN FORESTRY: N/A

**ATTENTION CONTRACTORS**

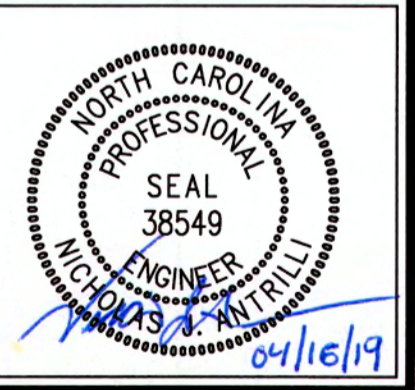
THE CONSTRUCTION CONTRACTOR RESPONSIBLE FOR THE EXTENSION OF WATER AND SEWER AS APPROVED IN THESE PLANS, IS RESPONSIBLE FOR CONTACTING THE PUBLIC UTILITIES DEPARTMENT AT (919) 596-4562 AT LEAST 24 HOURS PRIOR TO BEGINNING ANY CONSTRUCTION.

FAILURE TO NOTIFY BOTH CITY DEPARTMENTS IN ADVANCE OF BEGINNING CONSTRUCTION WILL RESULT IN THE ISSUANCE OF MONETARY FINES AND REQUIRE REINSTALLATION OF ANY WATER OR SEWER FACILITIES NOT INSPECTED AS A RESULT OF THIS NOTIFICATION FAILURE.

FAILURE TO CALL FOR INSPECTION, INSTALL A DOWNSTREAM PLUG, HAVE PERMITTED PLANS ON THE JOB SITE, OR ANY OTHER VIOLATION OF CITY OF RALEIGH STANDARDS WILL RESULT IN A FINE AND POSSIBLE EXCLUSION FROM FUTURE WORK IN THE CITY OF RALEIGH.

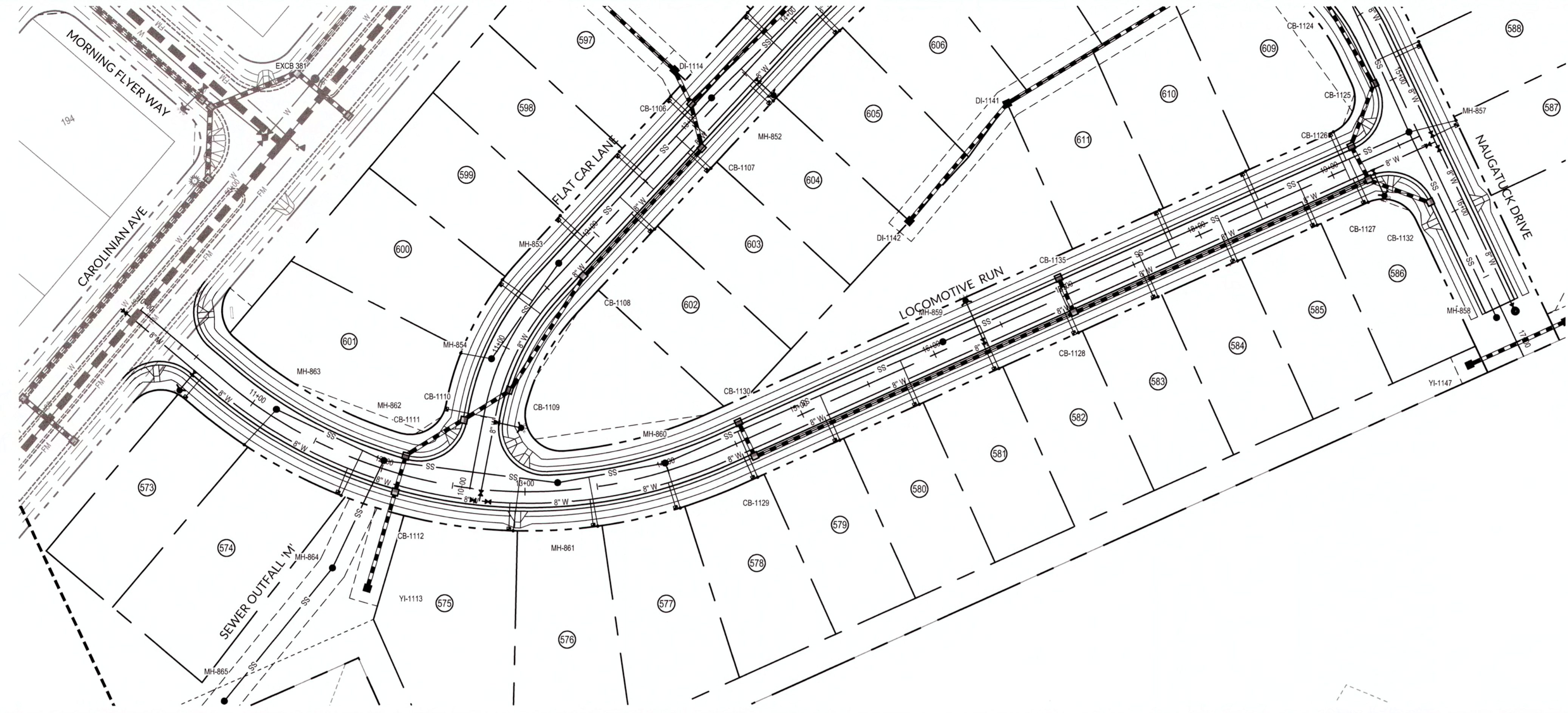
**NAUGATUCK DRIVE PLAN  
AND PROFILE**

Job No. 02090251.94  
Date 11/21/2018  
Drawn By WGR  
Designer WGR



Revisions	
1	TOK & COR COMMENTS 04/12/19

K:\09\0250\0251\84 Knightdale Station - R8\CAD\Gen\Drawings\2.1 - TX PLAN AND PROFILE.dwg, Tuesday, April 16, 2019 10:27:38 AM, DURITA COLLEEN



PUBLIC  
SEWER COLLECTION/EXTENSION SYSTEM

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC SEWER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # 5-4520  
AUTHORIZATION TO CONSTRUCT Raven M. Sample  
DATE 5/3/19

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PUBLIC  
WATER DISTRIBUTION/EXTENSION SYSTEM

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CITY OF RALEIGH  
PUBLIC UTILITIES DEPARTMENT PERMIT # W-3595  
AUTHORIZATION TO CONSTRUCT Raven M. Sample  
DATE 5/3/19

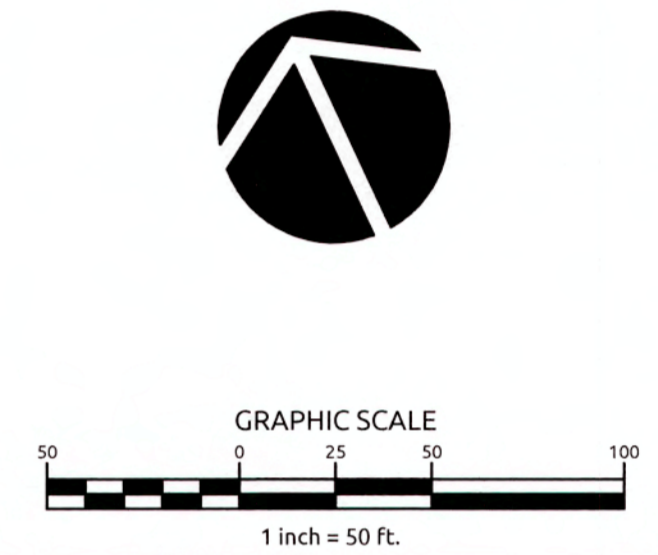
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TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

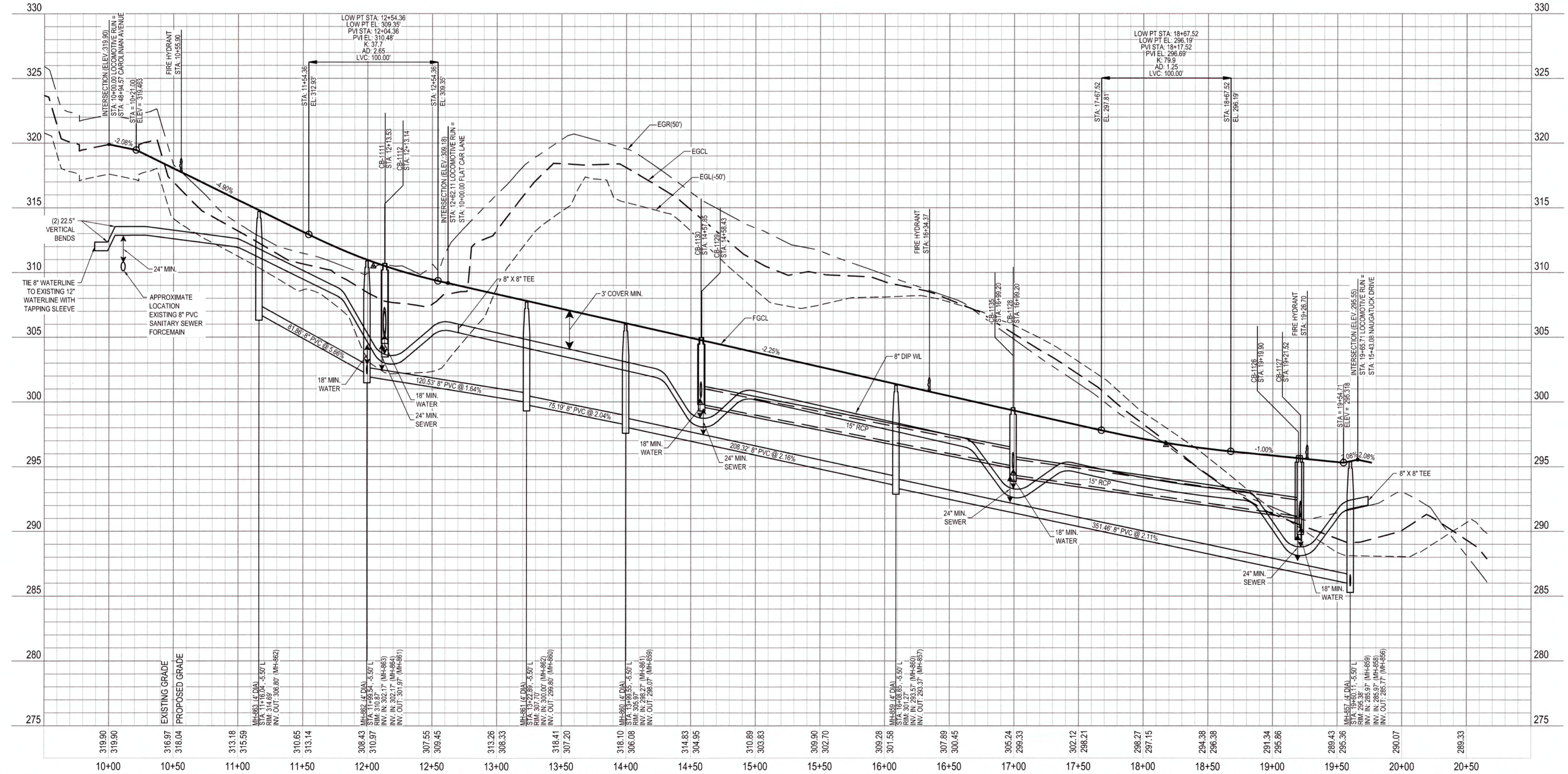
BY: [Signature] DATE: 6-15-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: [Signature] DATE: 6/14/19  
ADMINISTRATOR



### LOCOMOTIVE RUN



**SCALE:**  
1" = 50' HORIZ.  
1" = 5' VERT.

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**WATERLINE NOTE:**  
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**CLASS 1 STRUCTURAL MATERIAL NOTE:**  
CLASS 1 STRUCTURAL MATERIAL REQUIRED FROM EXISTING GROUND TO SPRING LINE OF PROPOSED STORM PIPE IN FILL CONDITIONS. SEE LATEST TOK STANDARD SPECIFICATIONS.

CITY OF RALEIGH

ALL CONSTRUCTION MUST BE IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL RULES AND REGULATIONS.

TRANSPORTATION SERVICES	N/A
PUBLIC UTILITIES	<u>RS</u> 5/3/19
STORMWATER	N/A
PLANNING	N/A
FIRE	N/A
URBAN FORESTRY	N/A

**ATTENTION CONTRACTORS**

THE CONSTRUCTION CONTRACTOR RESPONSIBLE FOR THE EXTENSION OF WATER AND SEWER AS APPROVED IN THESE PLANS IS RESPONSIBLE FOR CONTACTING THE PUBLIC UTILITIES DEPARTMENT AT (919) 996-4540 AT LEAST 24 HOURS PRIOR TO BEGINNING ANY CONSTRUCTION.

FAILURE TO NOTIFY BOTH CITY DEPARTMENTS IN ADVANCE OF BEGINNING CONSTRUCTION WILL RESULT IN THE ISSUANCE OF MONETARY FINES AND REQUIRE REINSTALLATION OF ANY WATER OR SEWER FACILITIES NOT INSPECTED AS A RESULT OF THIS NOTIFICATION FAILURE.

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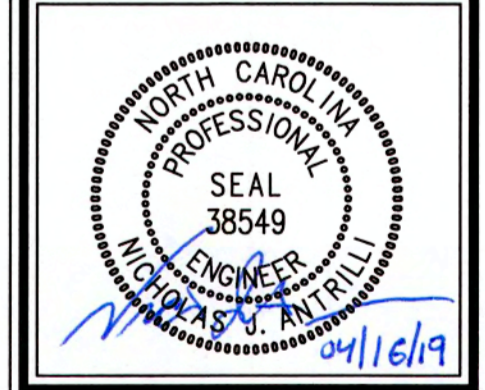
**WithersRavenel**  
Engineers | Planners | Surveyors

**KNIGHTDALE STATION  
R8**

TOWN OF KNIGHTDALE, NORTH CAROLINA

**LOCOMOTIVE RUN PLAN  
AND PROFILE**

Job No. 02090251.94 Drawn By W&R  
Date 11/21/2018 Designer W&R

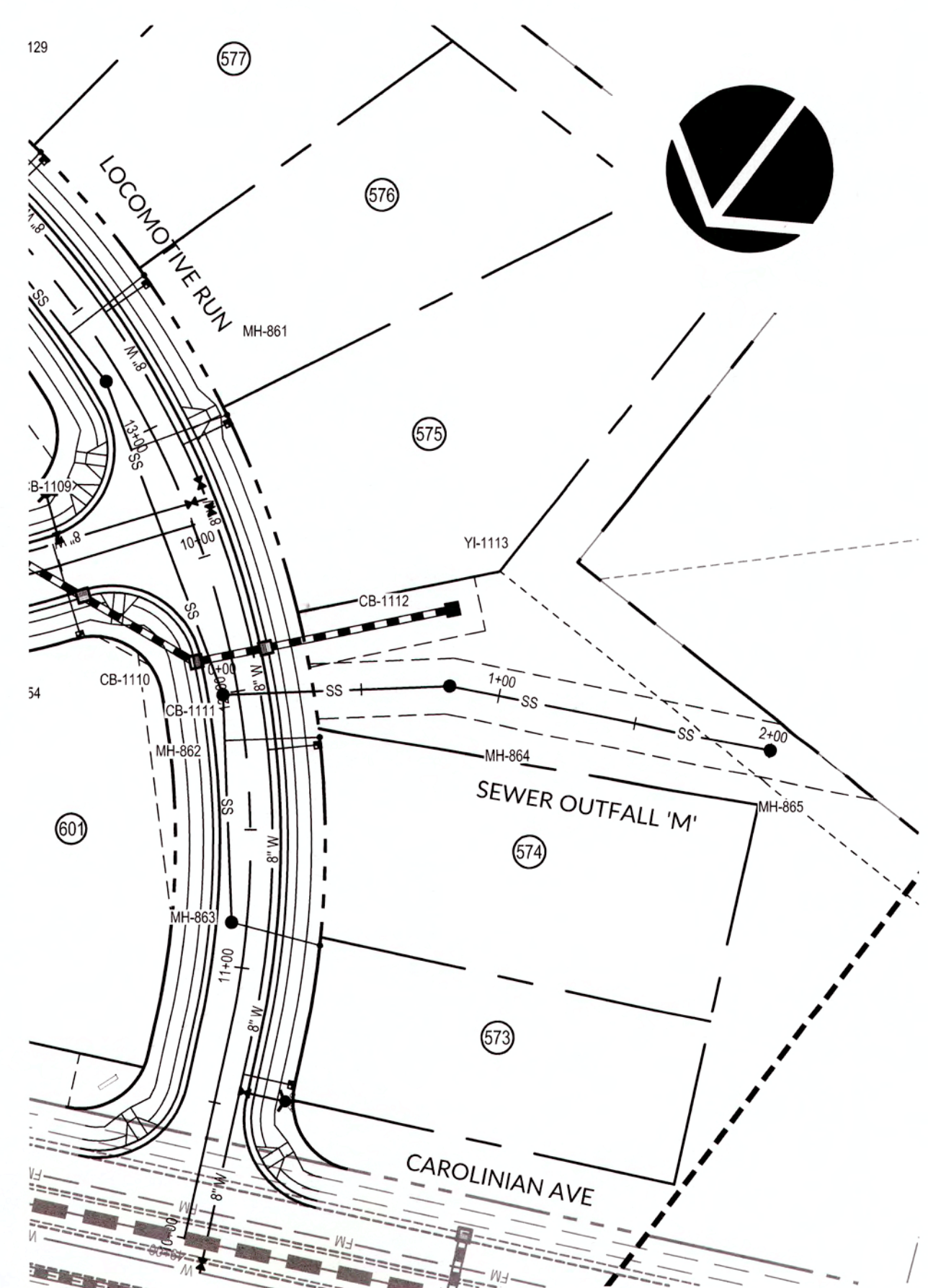
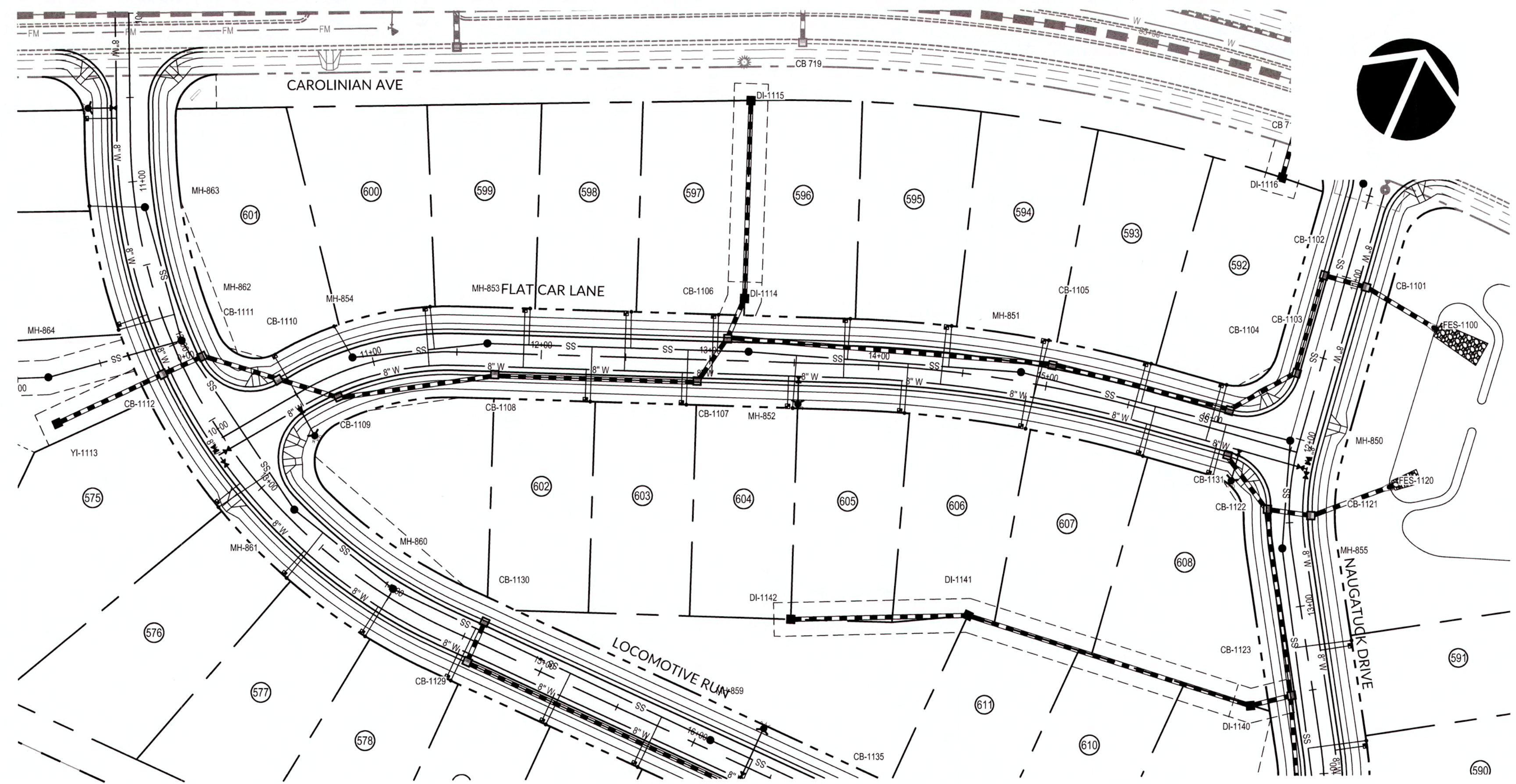


Revisions

1	TOK & COR COMMENTS	04/12/19
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**7.2**

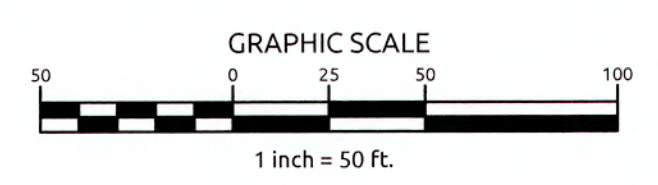
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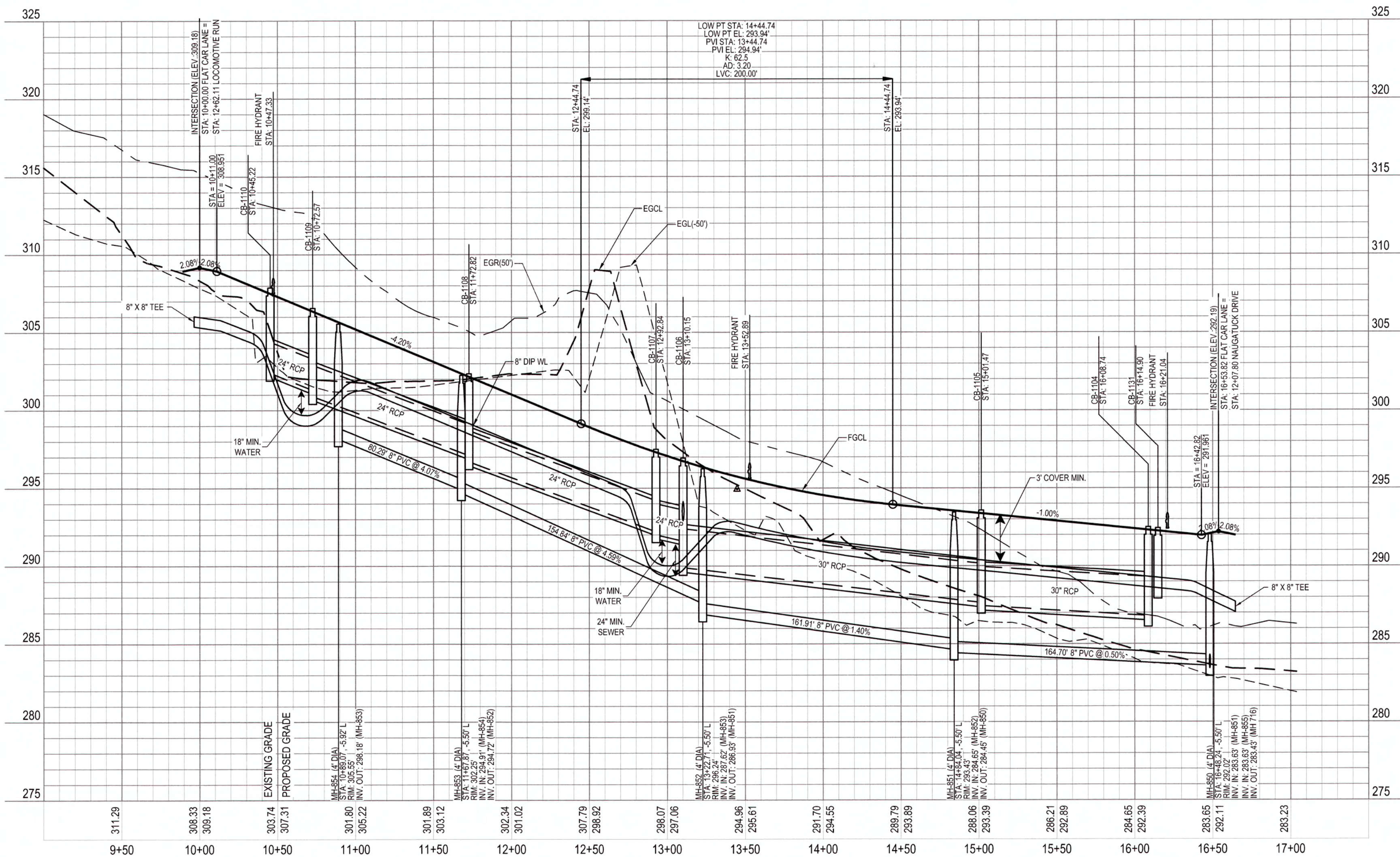
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 CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # 5-4520  
 AUTHORIZATION TO CONSTRUCT Renee M. Samps  
 DATE 6/3/19

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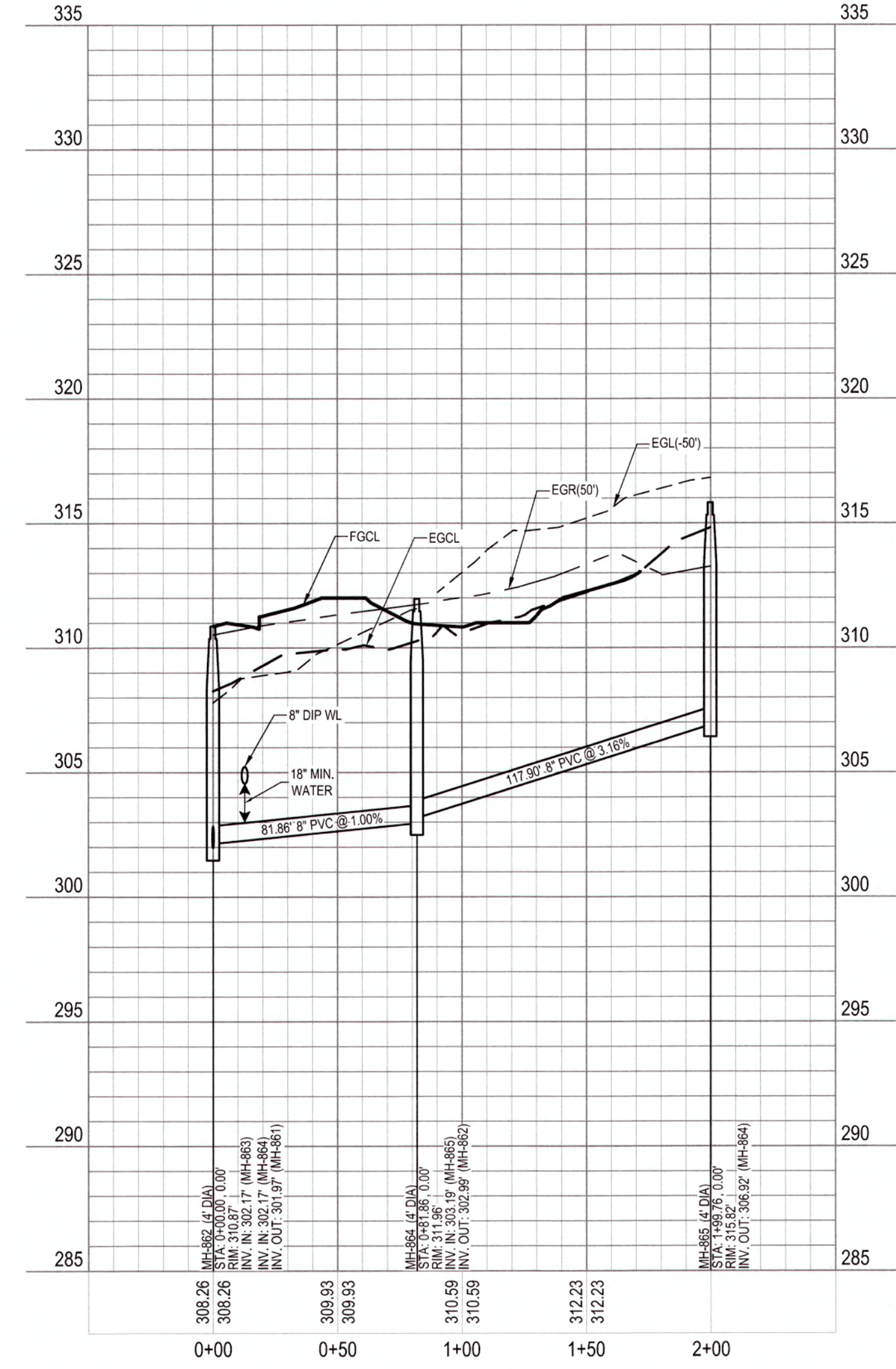
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 BY: [Signature] DATE: 6/13/2019  
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 BY: [Signature] DATE: 6/14/19  
 ADMINISTRATOR



**FLAT CAR LANE**



**SEWER OUTFALL M**



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TRANSPORTATION SERVICES	N/A
PUBLIC UTILITIES	<u>[Signature]</u> 6/3/19
STORMWATER	N/A
PLANNING	N/A
FIRE	N/A
URBAN FORESTRY	N/A

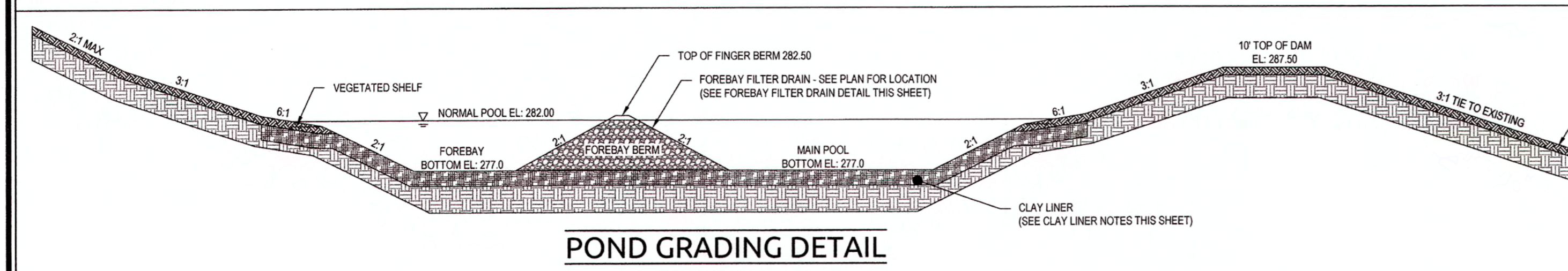
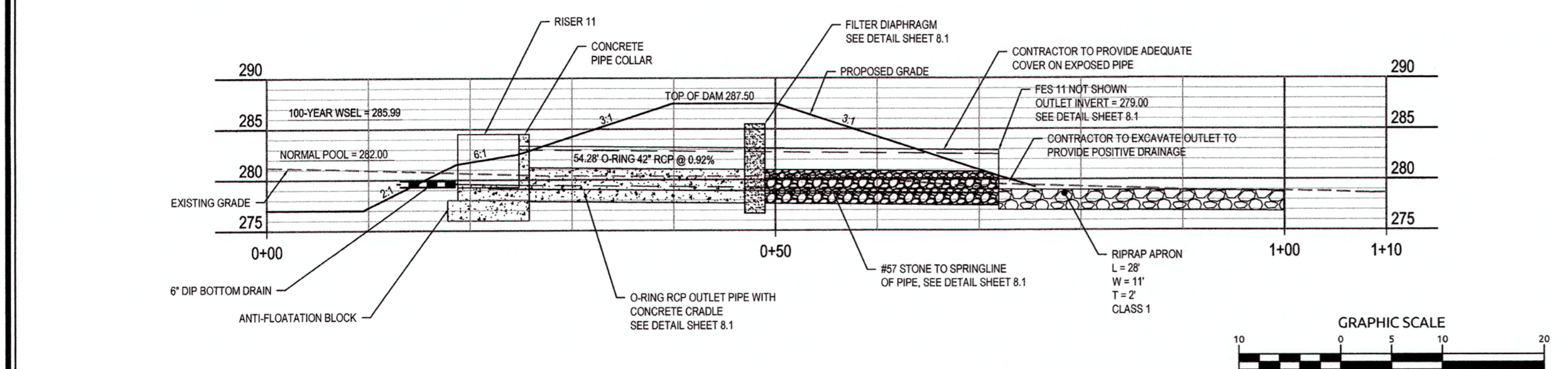
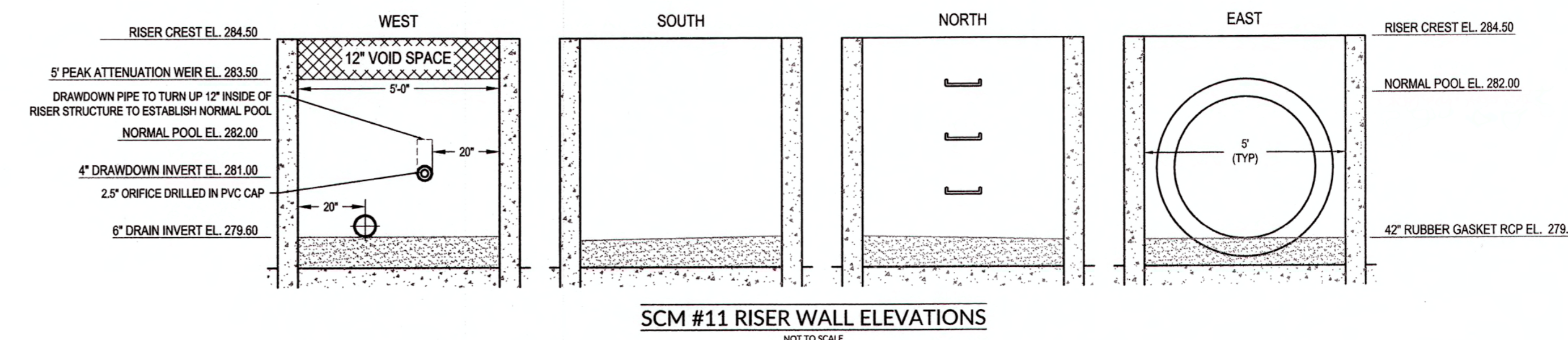
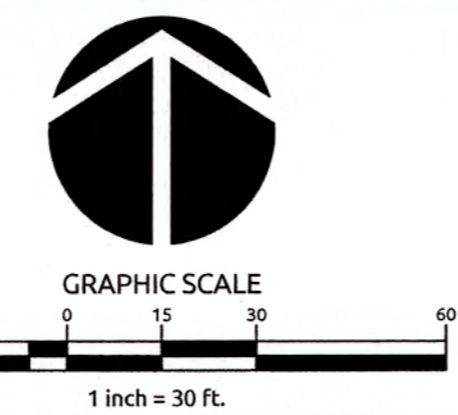
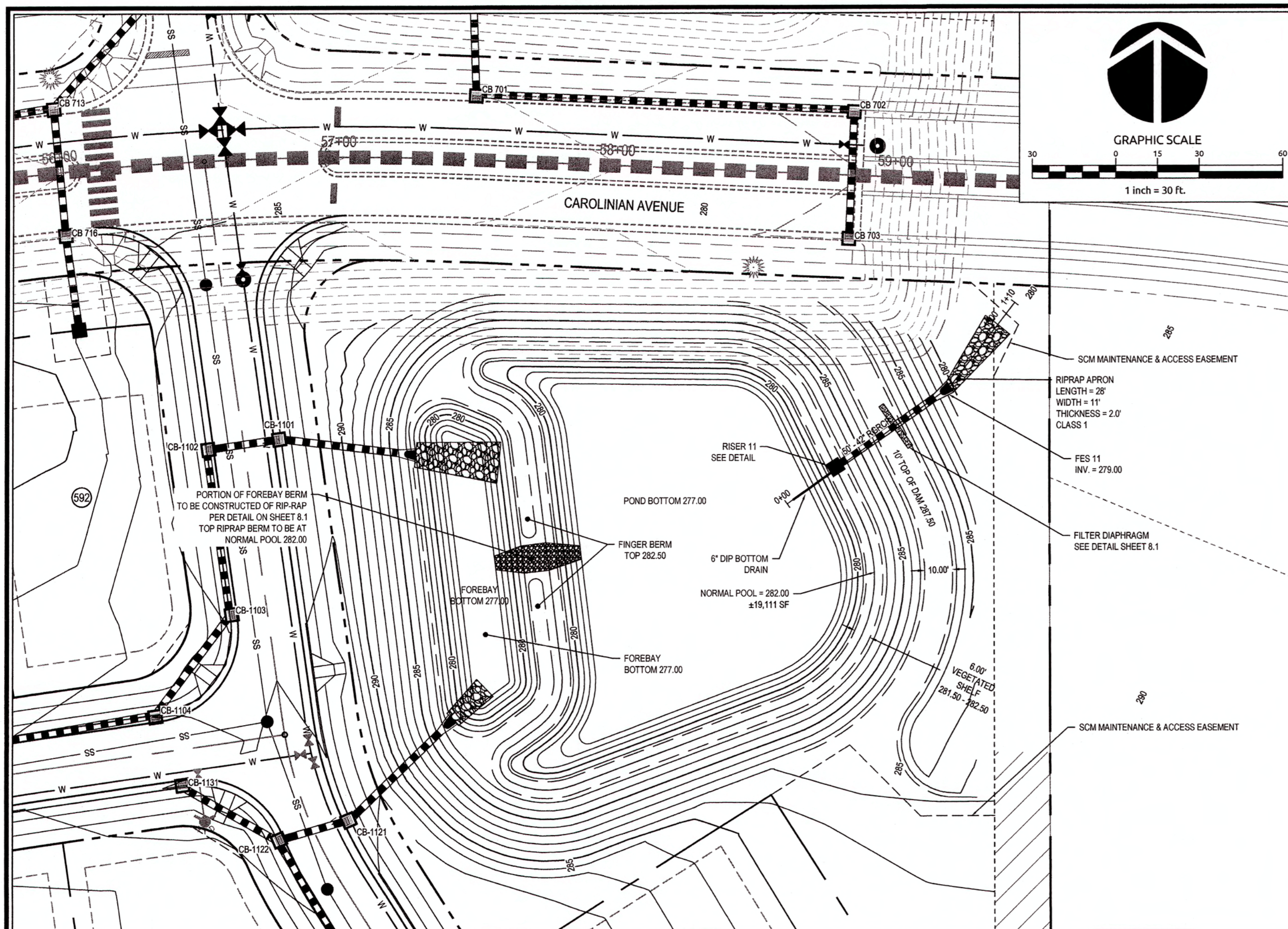
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Job No. 02090251.94 Drawn By W&R  
 Date 11/21/2018 Designer W&R



Revisions  
 1 TOK & COR COMMENTS 04/12/19

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**STORMWATER CONTROL MEASURE (SCM) NOTES:**

- PRIOR TO BEGINNING CONSTRUCTION, ANY DISCREPANCIES IN THE PLANS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DESIGN ENGINEER FOR RESOLUTION. ALL CONSTRUCTION TO BE IN ACCORDANCE WITH ALL CURRENT TOWN OF KNIGHTDALE STANDARDS AND SPECIFICATIONS.
- THE GEOTECHNICAL ENGINEER SHALL COMPLETE A GEOTECHNICAL EXPLORATION OF THE EXISTING EMBANKMENT AND PROVIDE A REPORT EVALUATING THE SUITABILITY OF EXISTING SOILS PRIOR TO CONTRACTOR COMPLETING IMPROVEMENTS.
- THE GEOTECHNICAL ENGINEER SHALL EVALUATE EXISTING AND BORROW SOILS FOR SUITABILITY OF DAM CONSTRUCTION AND SLOPE STABILITY. PROFESSIONAL CERTIFICATION OF EMBANKMENT CONSTRUCTION IS REQUIRED FOR AS-BUILT CERTIFICATION.
- EMBANKMENT TO BE CONSTRUCTED PER THE FOLLOWING SPECIFICATIONS UNLESS SUPERSEDED BY GEOTECHNICAL ENGINEER'S RECOMMENDATIONS:
  - BORROW MATERIALS FOR USE AS EMBANKMENT FILL SHALL BE FREE OF ORGANICS, ROOTS AND OTHER WOODY VEGETATION OR ORGANIC DEBRIS. MATERIALS SHALL CONSIST OF SOILS WHICH CLASSIFY AS SC, SM, CL, CI, CH AND ML IN ACCORDANCE WITH THE UNIFIED CLASSIFICATION SYSTEM OR AS APPROVED BY THE GEOTECHNICAL ENGINEER WITH A MAXIMUM PARTICLE SIZE OF 3" OR LESS IN MEAN DIAMETER.
  - SOIL MATERIALS USED FOR EARTH FILL WHICH ARE CONSIDERED PERMEABLE OR WHICH EXHIBIT SIGNIFICANT SHRINK/SWELL SHALL NOT BE USED IN THE EMBANKMENT UNLESS SPECIFICALLY APPROVED BY ONSITE GEOTECHNICAL ENGINEER.
  - FILL SHALL BE PLACED IN 8" (MAXIMUM) LOOSE LIFTS UNDER THE SUPERVISION OF THE GEOTECHNICAL ENGINEER. FILL SHALL BE BROUGHT UP BY BENCHING INTO THE EXISTING SLOPE. THE MAXIMUM HEIGHT OF 2 FEET SHALL BE USED FOR EACH BENCH LIFT TAKING CARE TO REMOVE ROOT STRUCTURES AS THE FILL PROCEEDS. THE SURFACE OF EACH LIFT SHALL BE SCARIFIED PRIOR TO PLACEMENT OF THE NEXT LIFT IN ORDER TO EFFECTIVELY TIE THE FILL LIFTS TOGETHER.
  - ALL COMPACTION SHALL BE TESTED BY THE SAND CONE METHOD (ASTM D-1586) OR
- NUCLEAR METHOD (ASTM D-698) AT A RATE OF AT LEAST ONE TEST PER 5,000 SF PER ONE FOOT OF COMPACTED FILL THICKNESS IN GENERAL AREA FILLS AND ONE TEST PER 50 LINEAL FEET PER LIFT ALONG THE BARREL. THE MINIMUM COMPACTION SHOULD BE 95% OF THE MAXIMUM STANDARD PROCTOR DENSITY (ASTM D-698) AT MOISTURE CONTENTS VARYING FROM 2 PERCENT BELOW TO 3 PERCENT ABOVE OPTIMUM MOISTURE CONTENT TO WITHIN 1/4" OF THE FINAL GRADE.
- EMBANKMENT AND SIDE SLOPES OF THE BASIN SHALL BE STABILIZED PER SEEDING SCHEDULE ON EROSION CONTROL DETAILS SHEET OR SOILED. SEE LANDSCAPE PLAN SHEET L.1.1.
- DURING CONSTRUCTION, THE SCM IS TO BE USED AS AN EROSION CONTROL DEVICE. THE FOREBAY WILL NOT BE REQUIRED WHILE SCM IS ACTING AS AN EROSION CONTROL DEVICE.
- ALL PERMANENT STRUCTURES (I.E. RISER BOX, OUTLET PIPES, CONCRETE CRADLES, SPILLWAY FILTER, ETC.) ARE TO BE INSTALLED WITH THE INITIAL DAM CONSTRUCTION. CONTRACTOR TO PROVIDE SHOP DRAWINGS TO THE DESIGN ENGINEER FOR REVIEW AND APPROVAL PRIOR TO ORDERING STRUCTURES.
- ONCE THE SITE HAS BEEN STABILIZED, CONTRACTOR SHALL OBTAIN APPROVAL BY EROSION CONTROL INSPECTOR IN ORDER TO REMOVE EROSION CONTROL DEVICES.
- ONCE ALL SEDIMENT AND EROSION CONTROL DEVICES HAVE BEEN REMOVED, THE SCM SHALL BE CONVERTED TO A PERMANENT SCM.
  - ALL SEDIMENT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
  - INTERIOR SCM GRADING SHALL BE CONSTRUCTED PER THIS PLAN.
  - SCM SHALL BE PLANTED PER PLANT SCHEDULE ON LANDSCAPE PLAN SHEET.
  - TOWN OF KNIGHTDALE REQUIRES FINAL CERTIFICATION OF SCM BY PROFESSIONAL ENGINEER.

**CLAY LINER SPECIFICATIONS:**  
THE CLAY LINER FOR THE WET POND SHALL BE AT LEAST 6" THICK AND MEET THE FOLLOWING SPECIFICATIONS:

- UNIFIED SOIL CLASSIFICATION SYSTEM DESIGNATION OF CL, CH, ML, SC
- MINIMUM OF 40% PASSING #200 SIEVE
- MINIMUM PLASTICITY INDEX OF 12
- MAXIMUM INFILTRATION RATE OF 0.01 INHR.
- A MINIMUM OF 2 TESTS OF EACH ABOVE PARAMETER SHALL BE PROVIDED FROM AN APPROVED TESTING LABORATORY ON THE LINER MATERIAL AND PRESENTED TO THE ENGINEER FOR APPROVAL.
- COMPACTION TO A MINIMUM OF 95% PER ASTM D698, AND WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT (1 COMPACTION DENSITY TEST PER 2500 SQ. FT.) OTHERWISE NOTED.

THE CLAY LINER SHALL BE PLACED UNDER THE BOTTOM OF THE SCM PERMANENT POOL TO A THICKNESS OF 8 INCHES. A MINIMUM OF 4 INCHES OF TOPSOIL IN LANDSCAPE AREAS ONLY SHALL BE THE FINISHED GRADE AS SHOWN ON THE DRAWINGS AND/OR DETAILS. CARE SHALL BE TAKEN WHEN TRACKING IN THE TOPSOIL TO NOT PUNCTURE OR DAMAGE THE CLAY. A CLAY/SOIL MIXTURE, NO ORGANICS, MAY BE USED IF THE ABOVE SPECIFICATIONS ARE SATISFIED AND WITH WRITTEN APPROVAL BY THE ENGINEER.

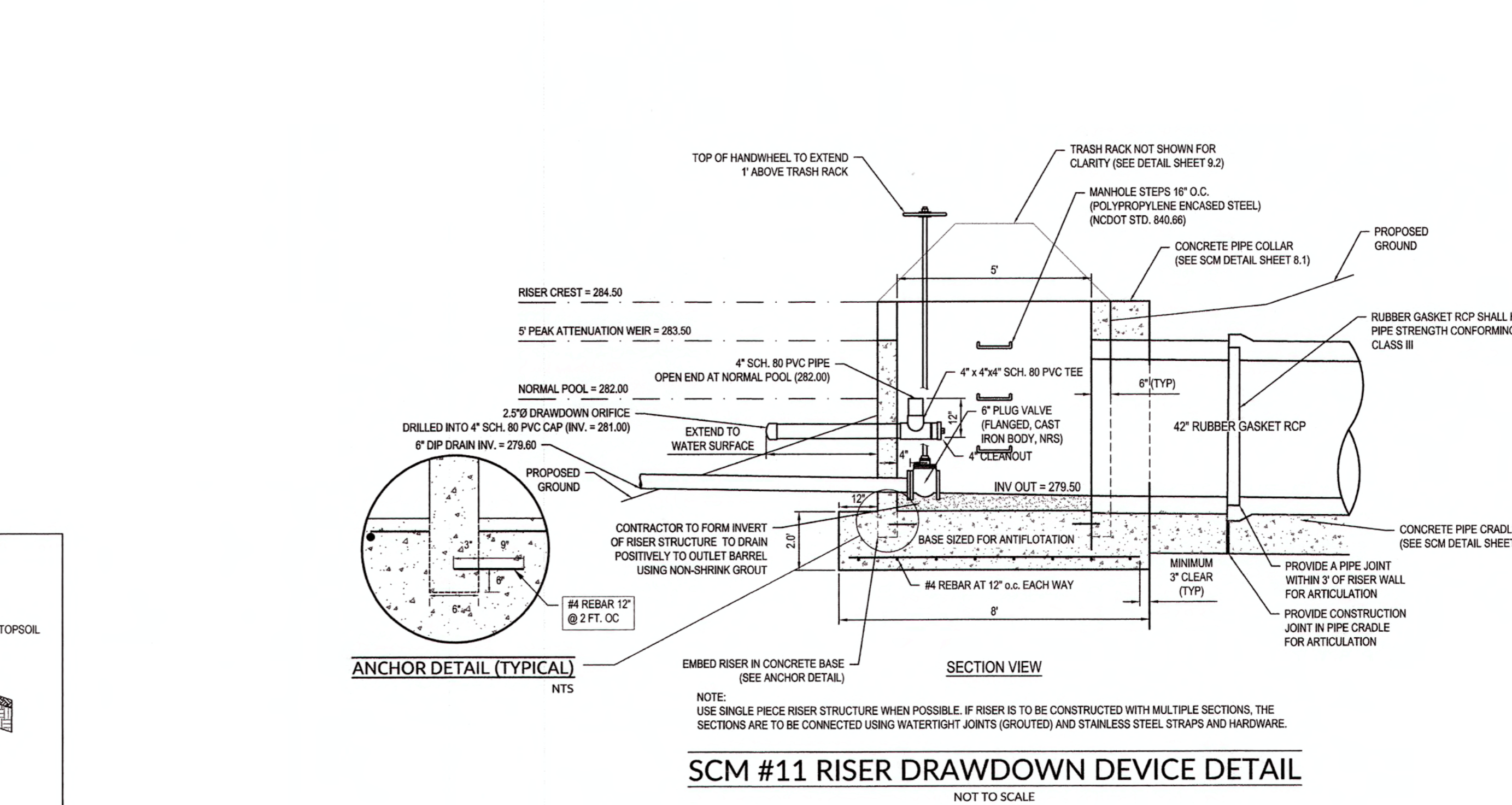
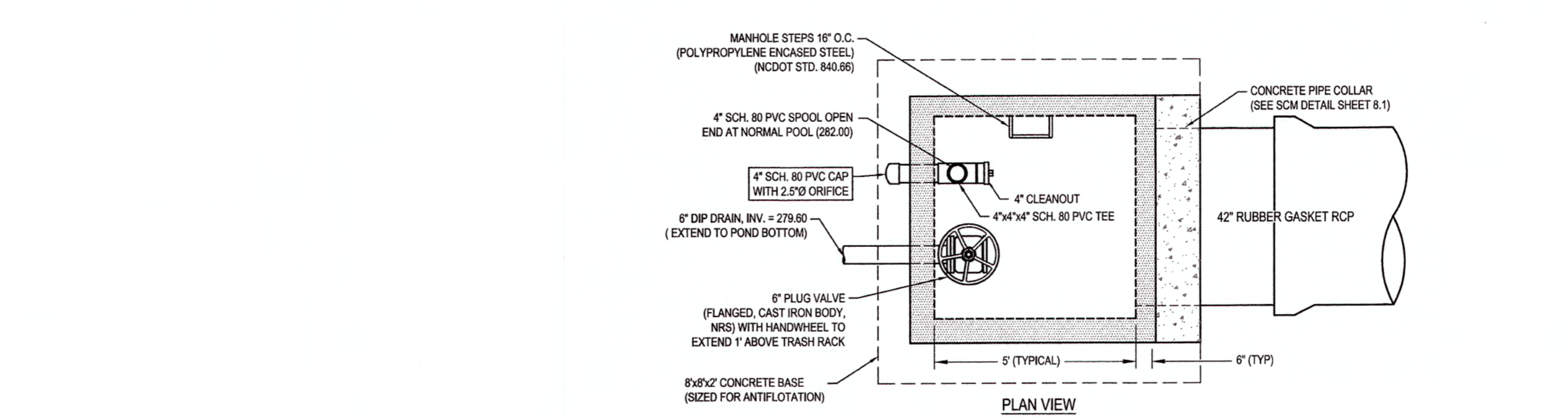
**PRECAST CONCRETE MATERIALS**

- ALL PRECAST CONCRETE STRUCTURES SHALL CONFORM TO ASTM C913 (RECTANGULAR) OR C478 (ROUND).
- ALL REINFORCED CONCRETE PIPE SHALL CONFORM TO ASTM C76, CLASS III (UNLESS OTHERWISE NOTED).
- RUBBER GASKETED JOINTS (O-RING) SHALL CONFORM TO ASTM C443 & ASTM C381.
- NON O-RING JOINTS SHALL CONFORM TO ASTM C290.

**LANDSCAPING NOTES**

- REFER TO SHEET L1.0 FOR LANDSCAPE SCREENING & SHEET L.1.1 FOR PLANTING REQUIREMENTS.

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BY: *[Signature]* DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

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CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
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**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**

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Revisions

1	TOK & COR COMMENTS	04/12/19
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Sheet No. 8.0

**WithersRavenel**  
Engineers | Planners | Surveyors

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**KNIGHTDALE STATION R8**

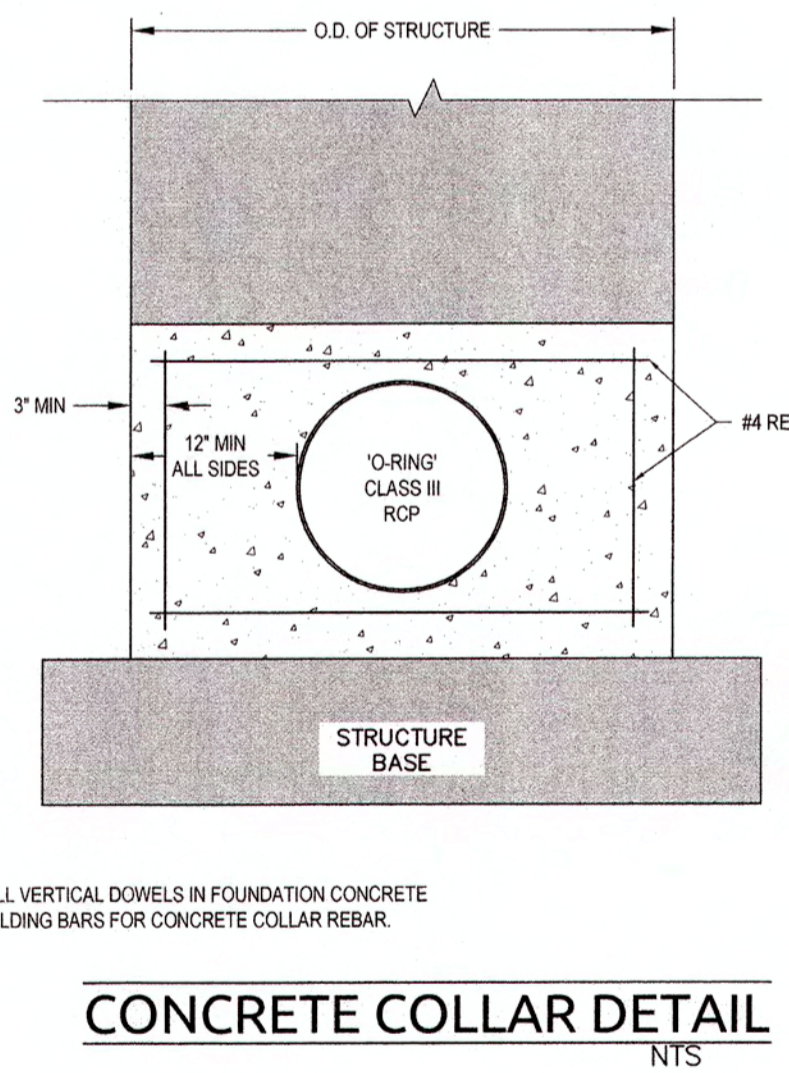
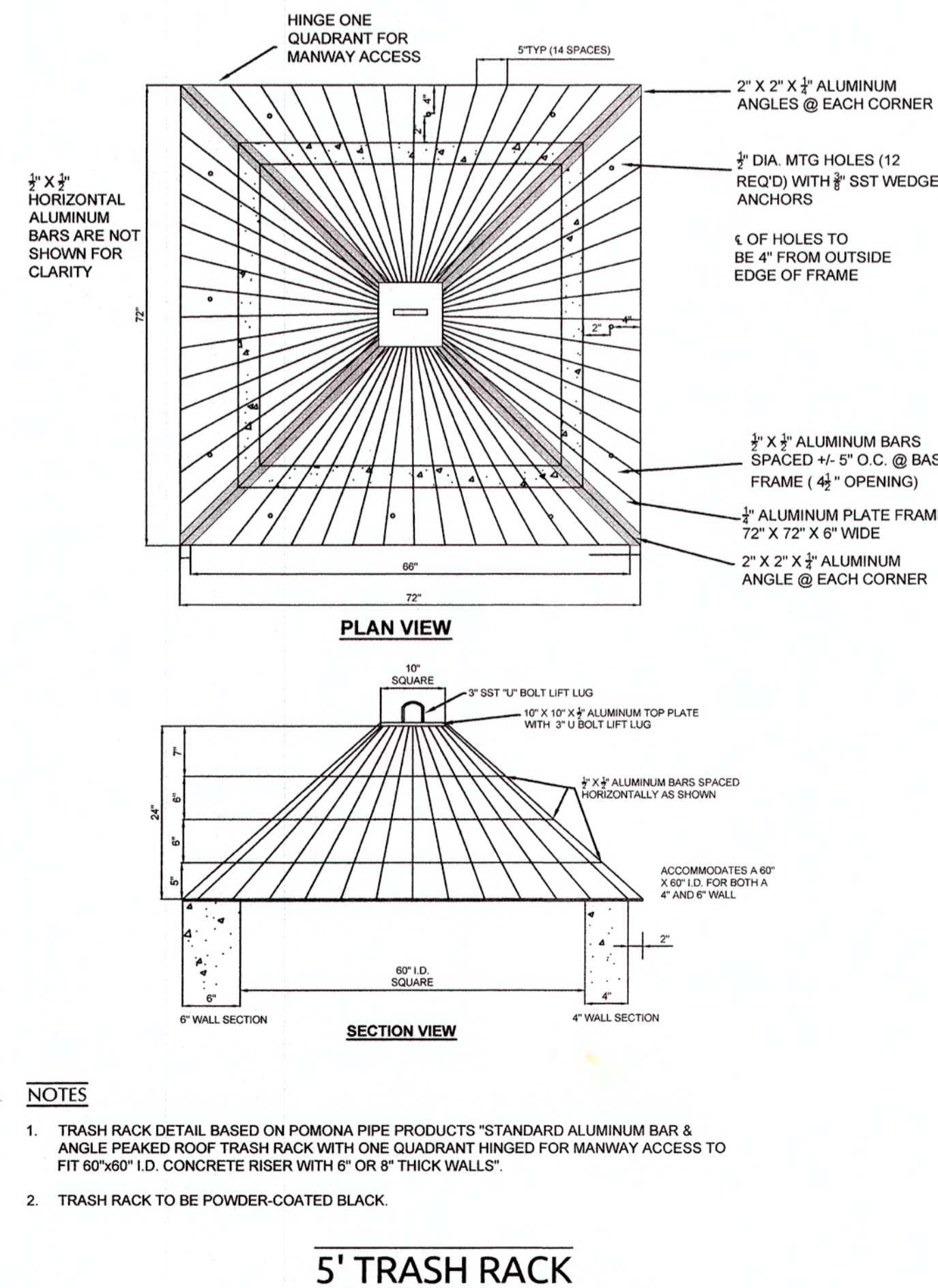
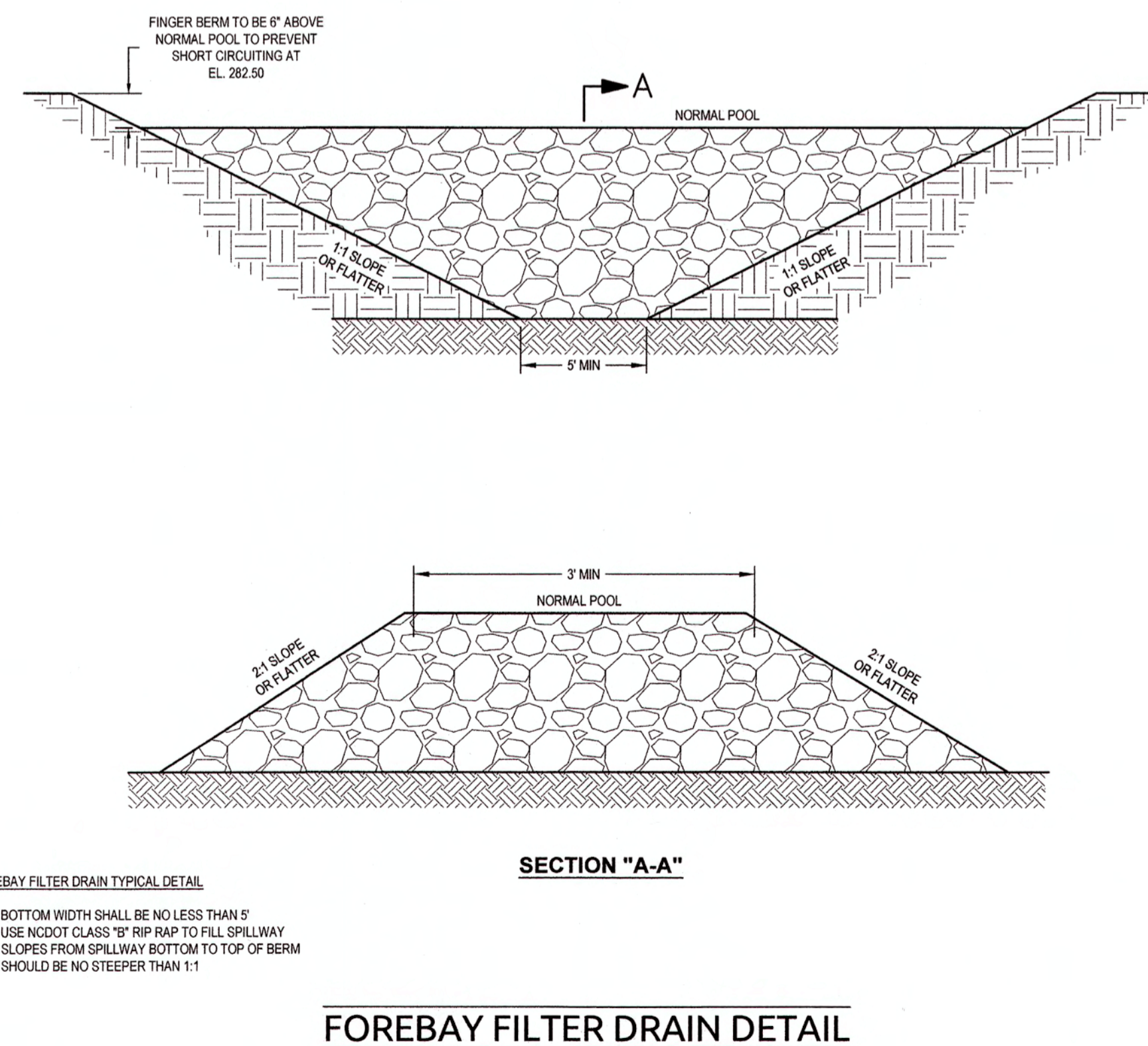
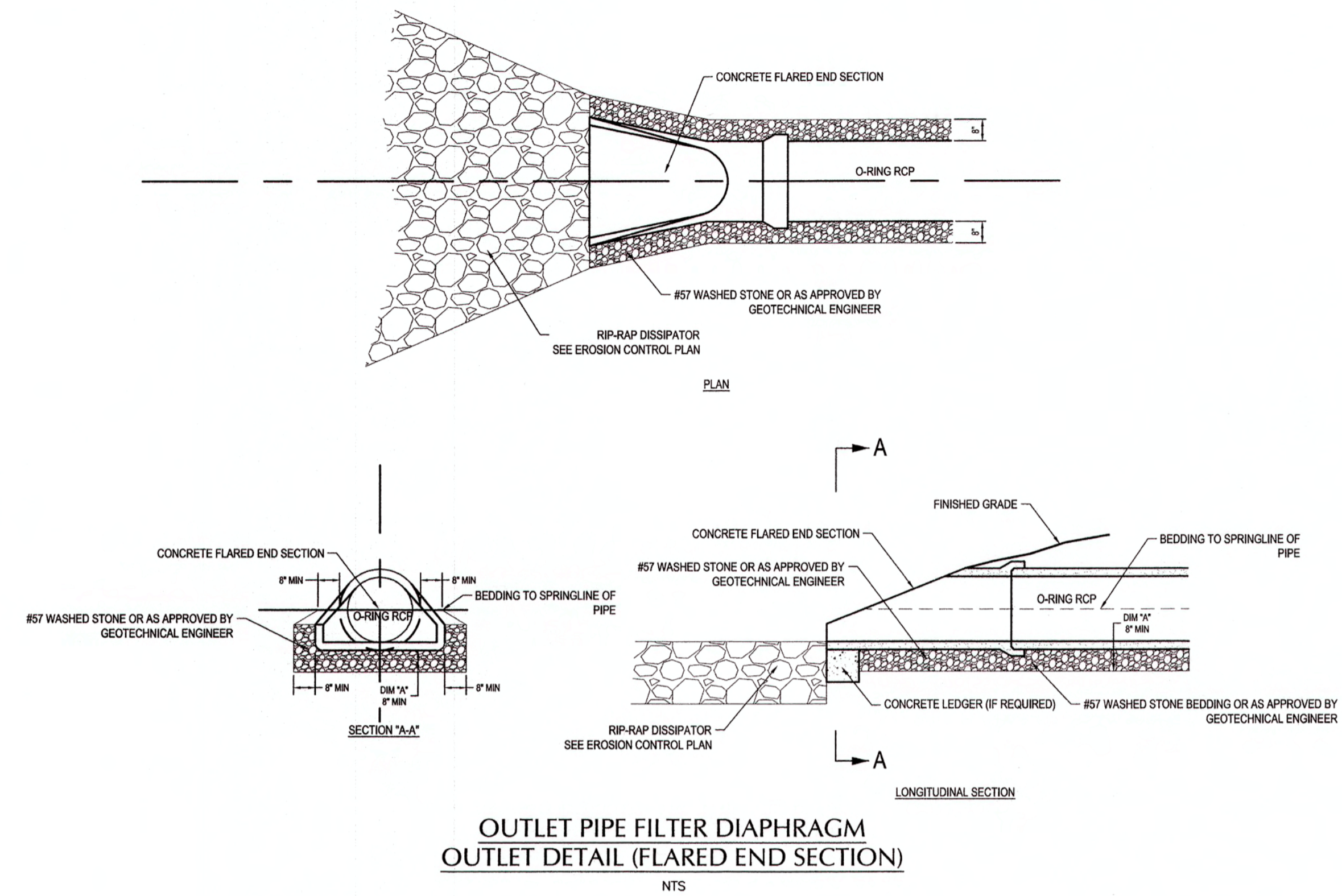
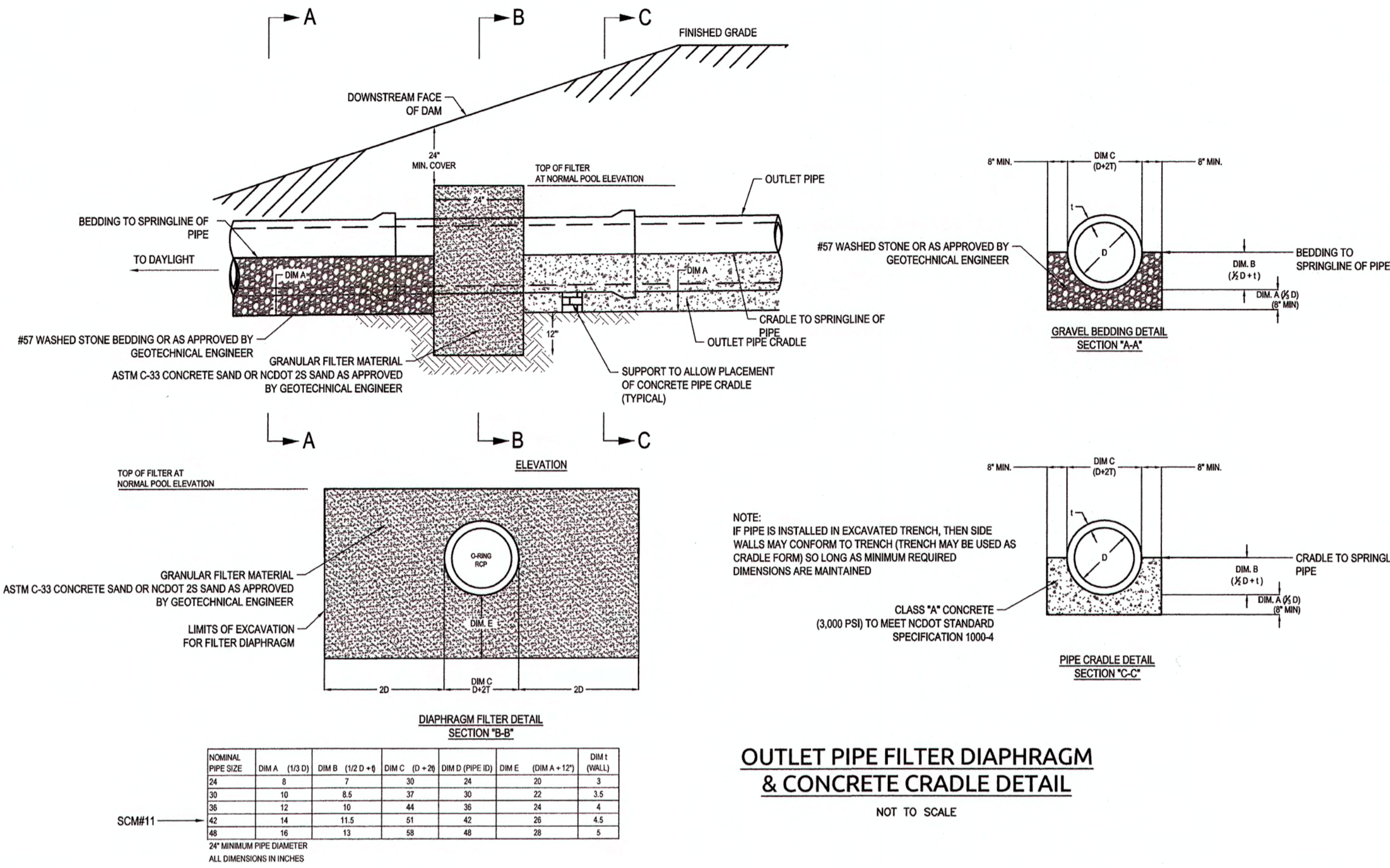
TOWN OF KNIGHTDALE, NORTH CAROLINA

**SCM #11 PLAN & DETAILS**

Job No. 02090251.94 Drawn By W&R  
Date 11/21/2018 Designer W&R

**NORTH CAROLINA PROFESSIONAL ENGINEER**  
WESLEY R. HERRERT  
4-12-19





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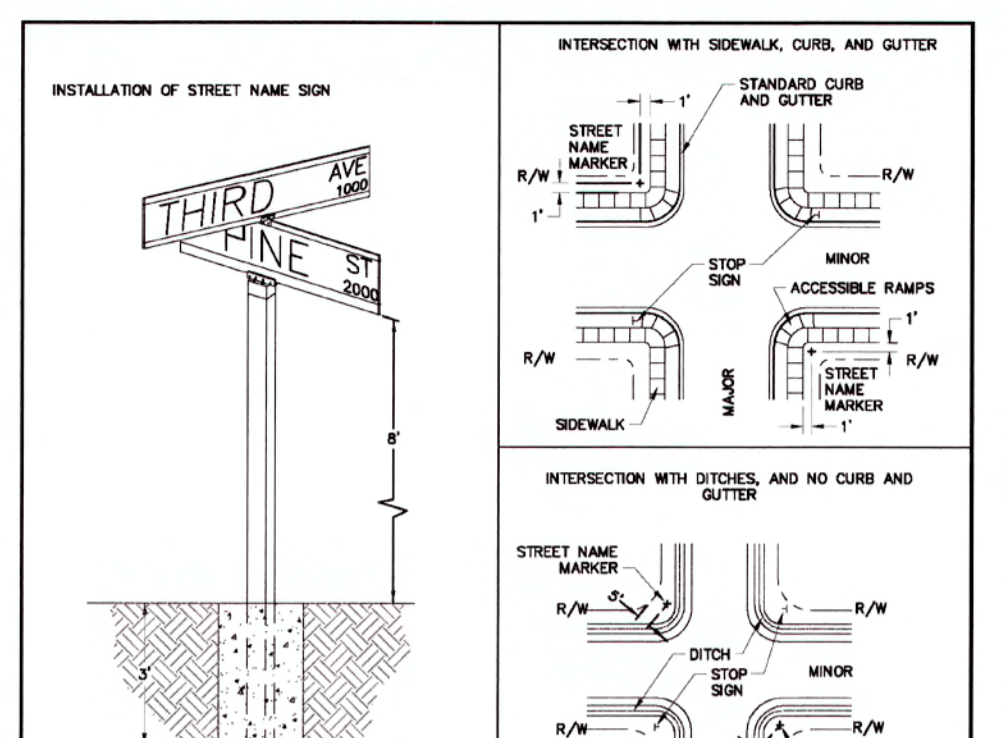
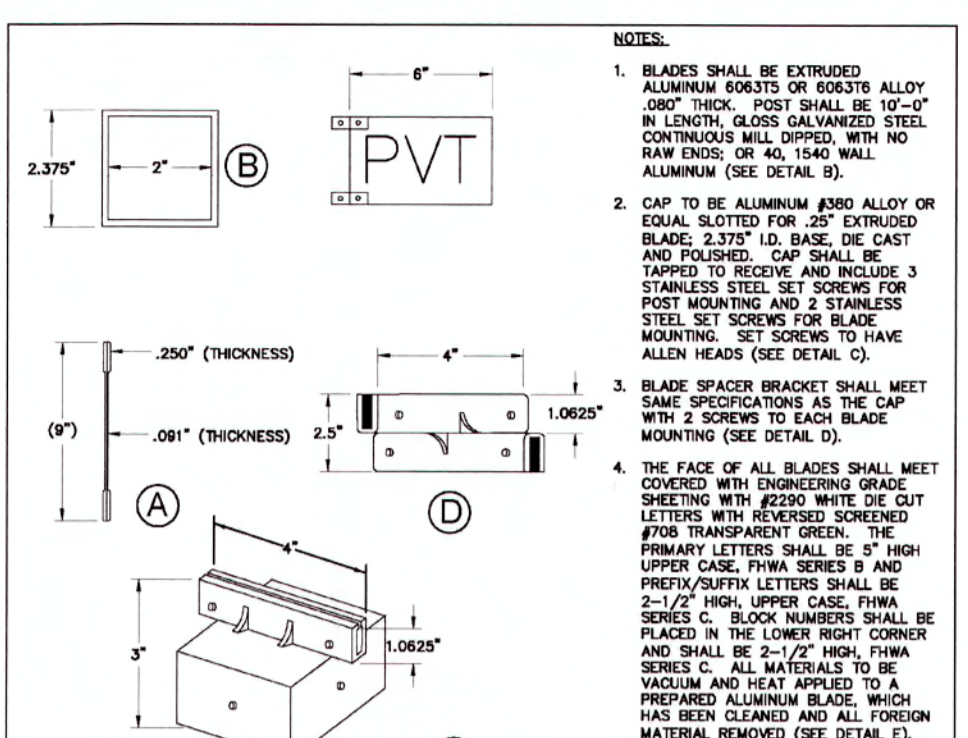
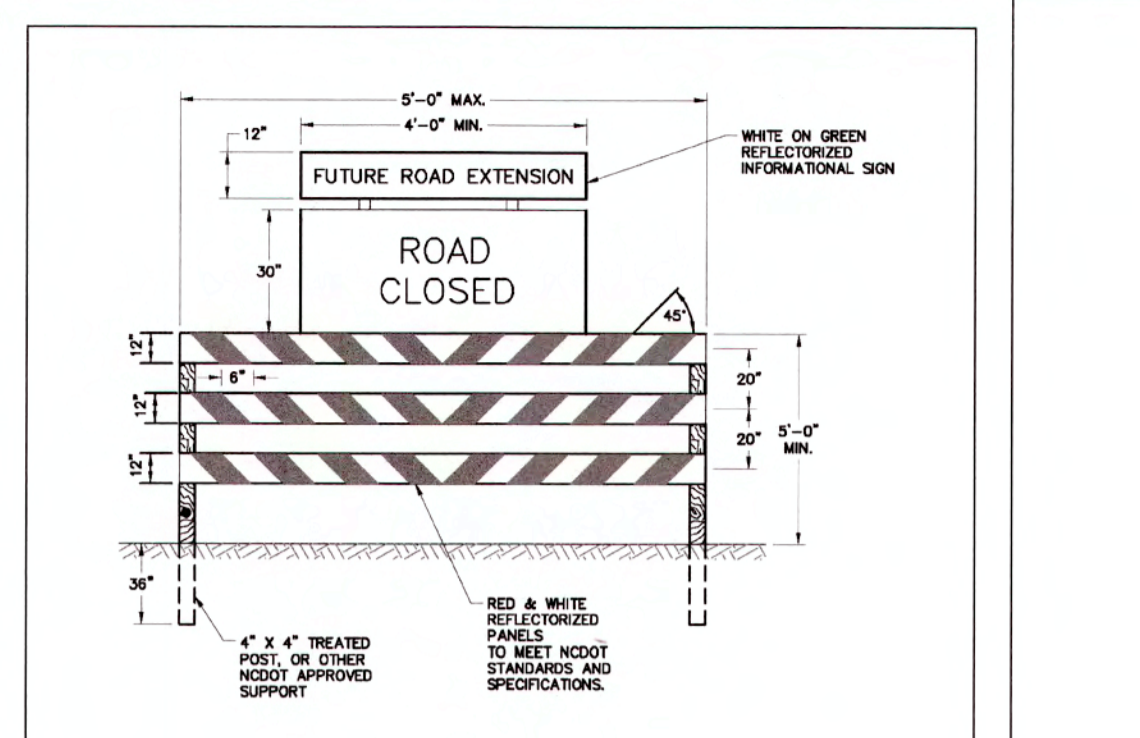
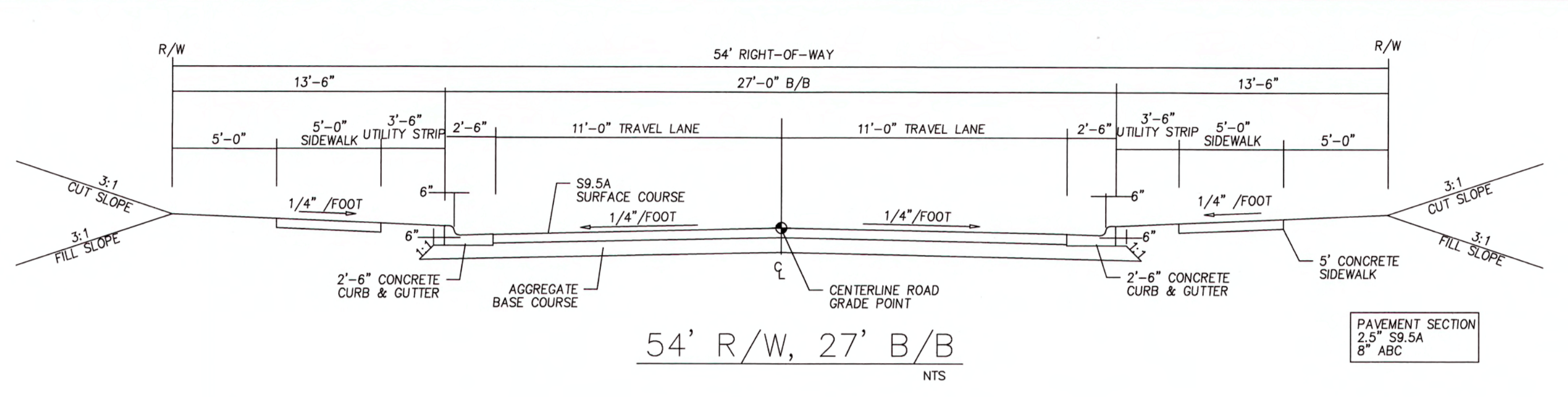
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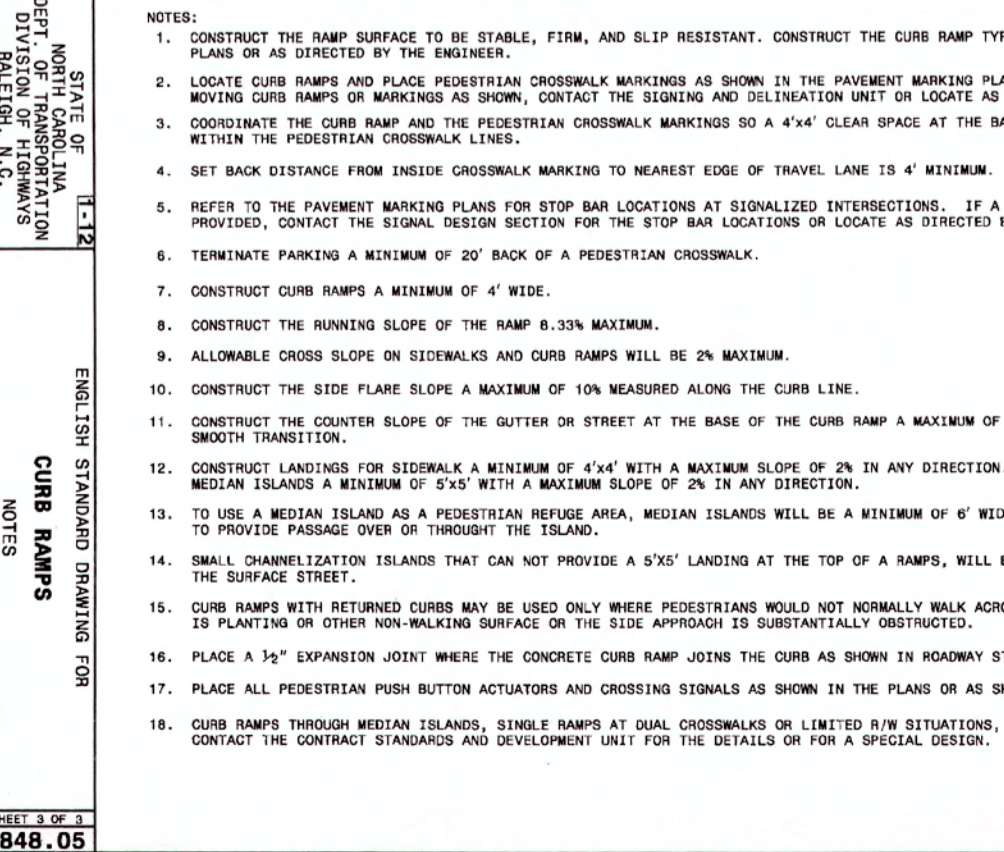
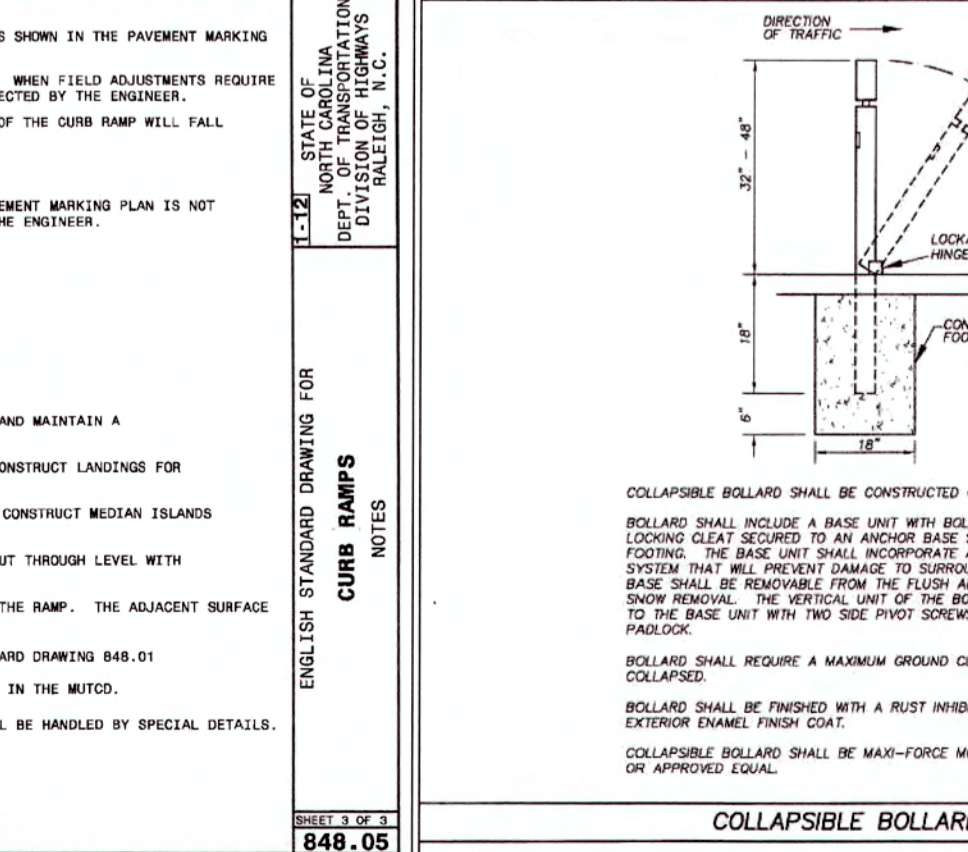
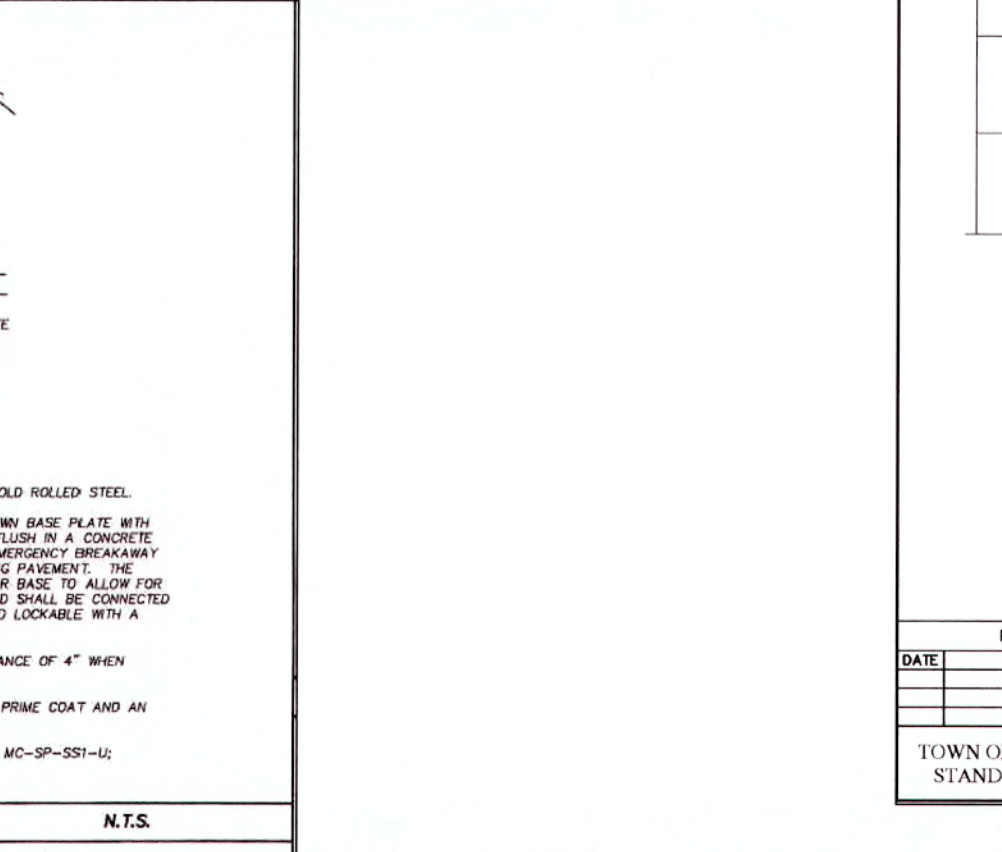
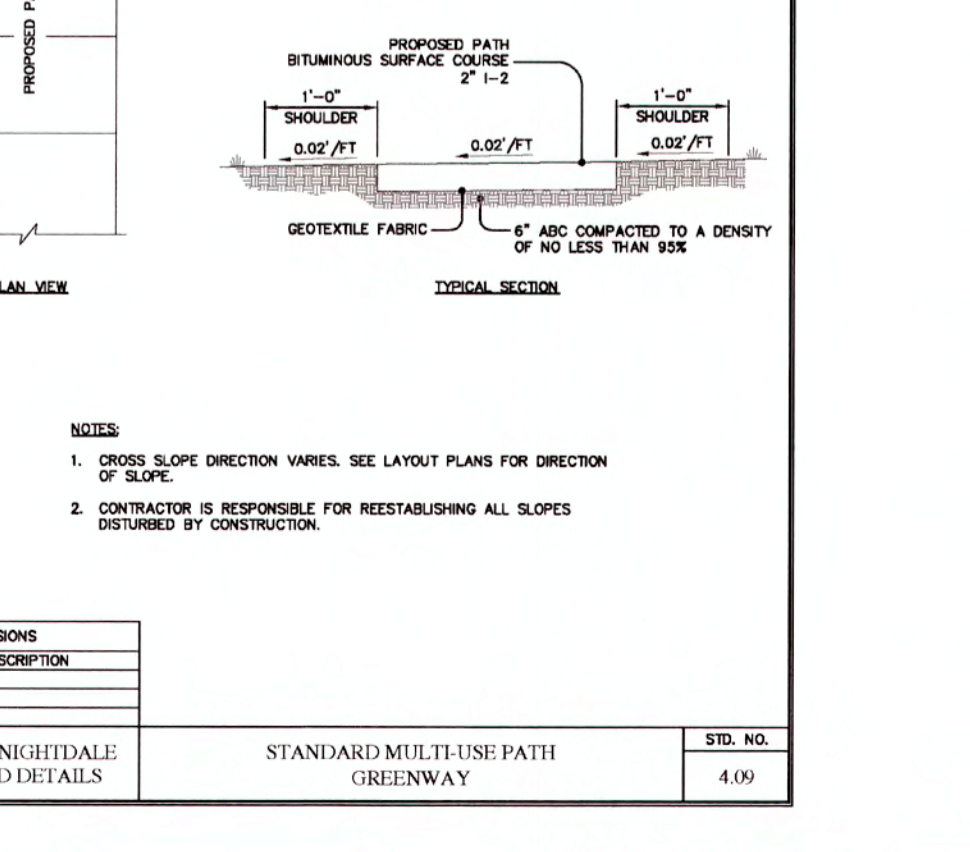
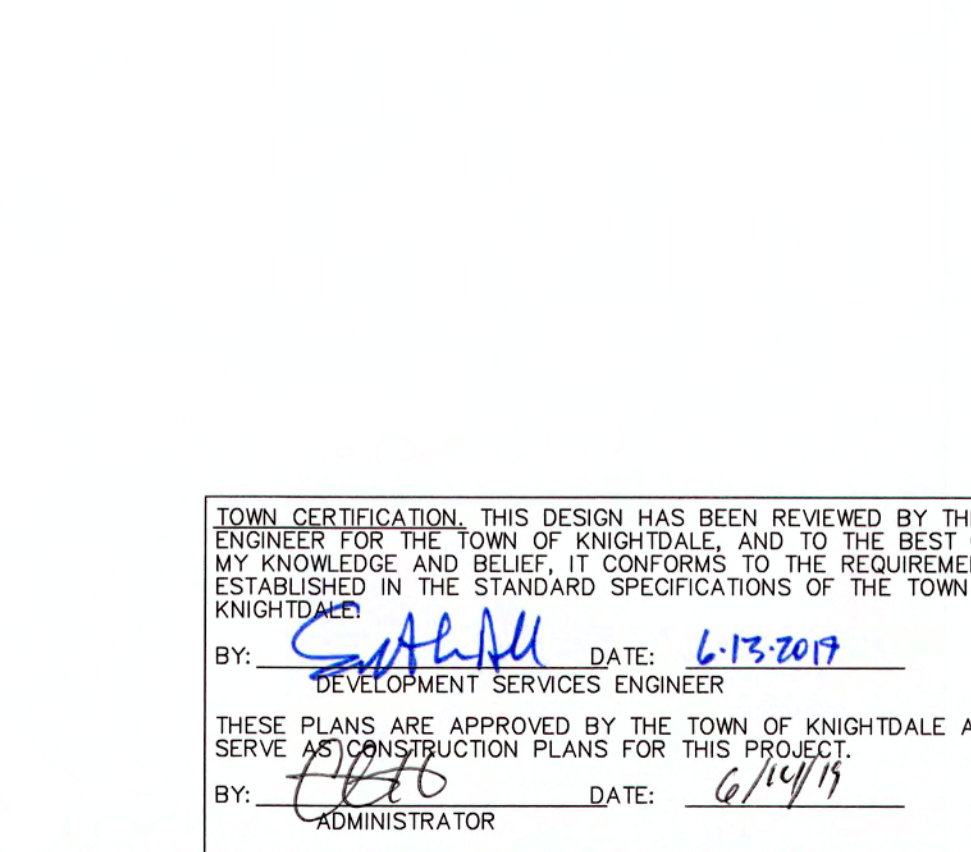
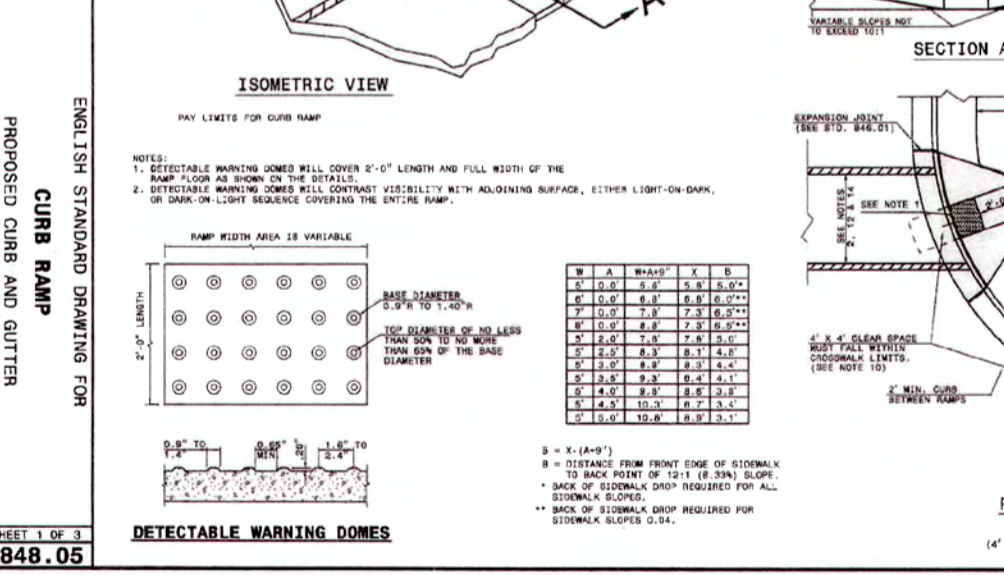
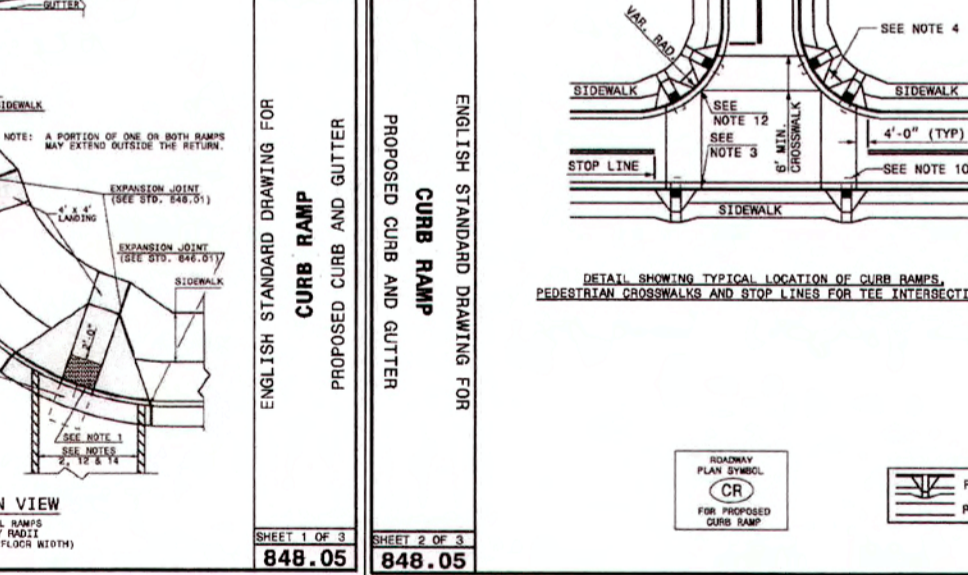
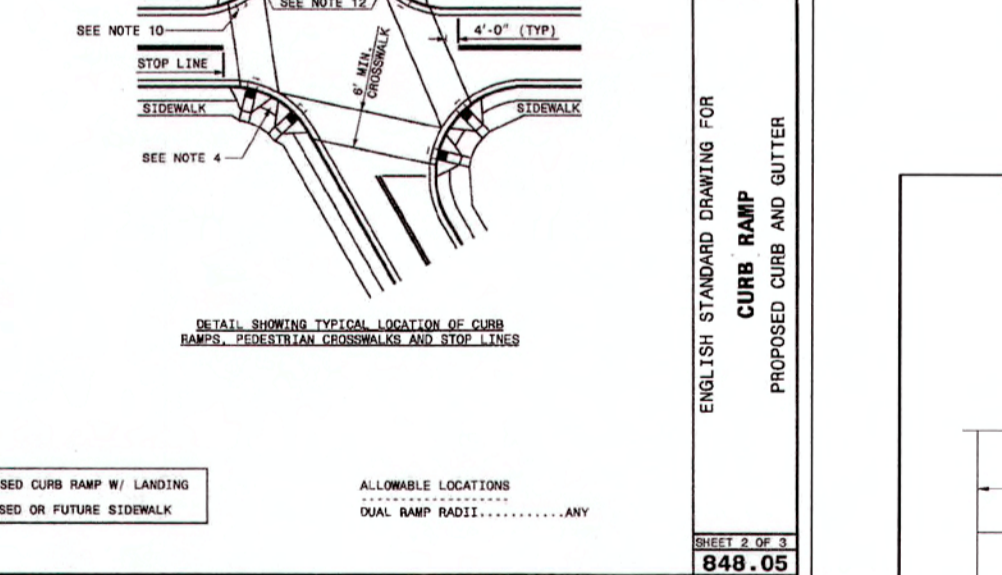
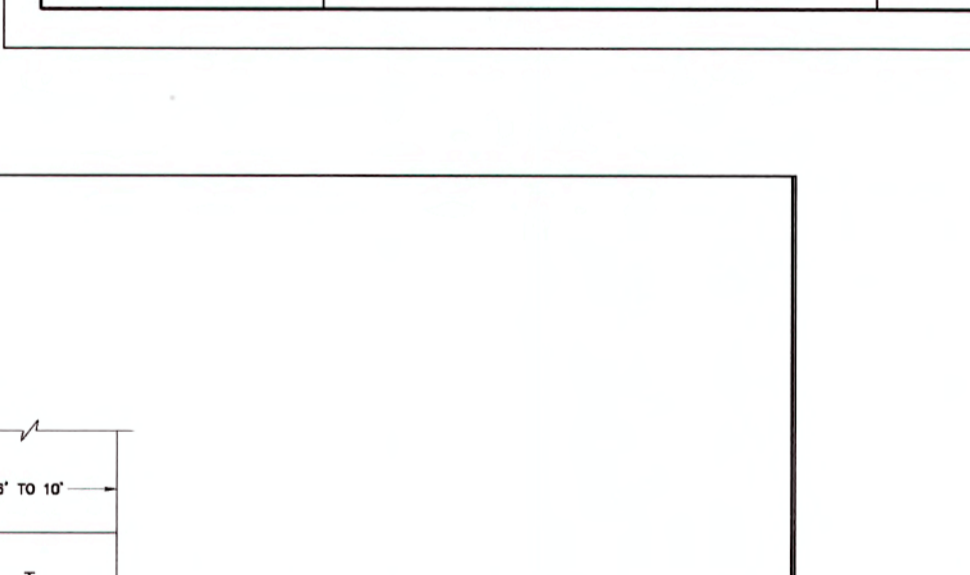
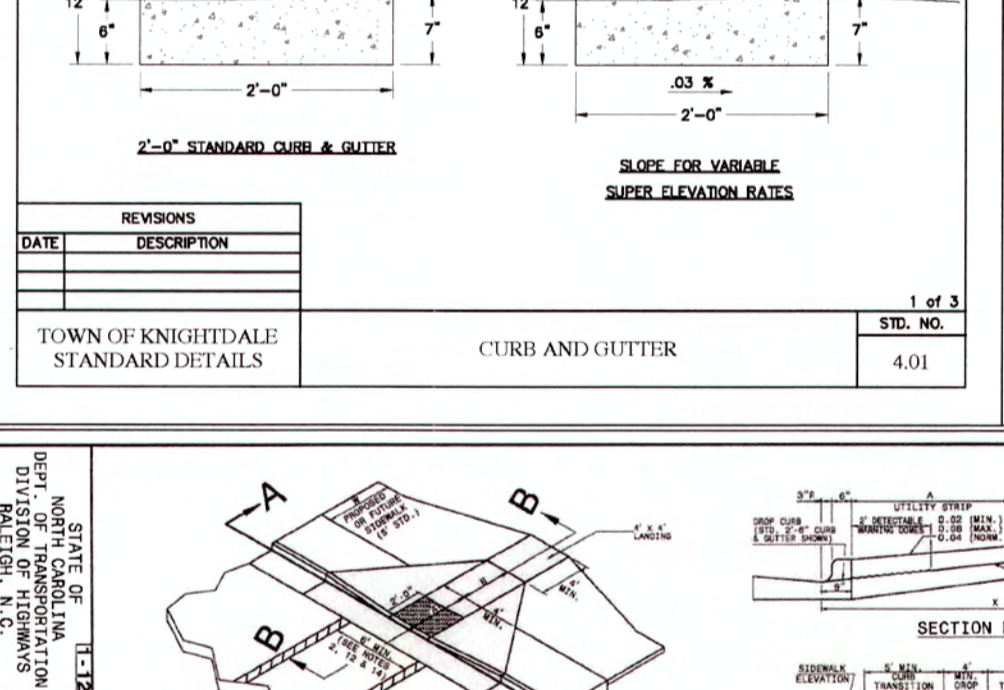
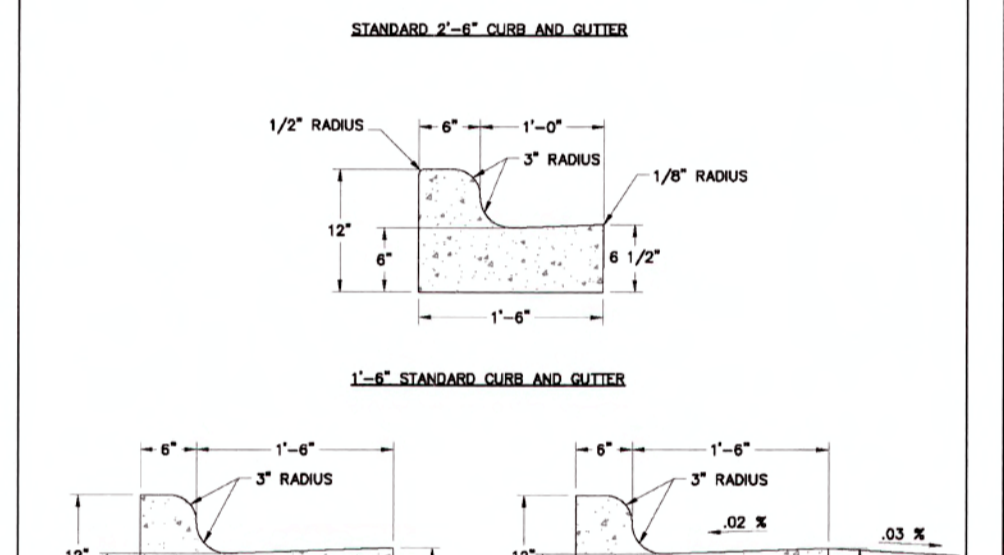
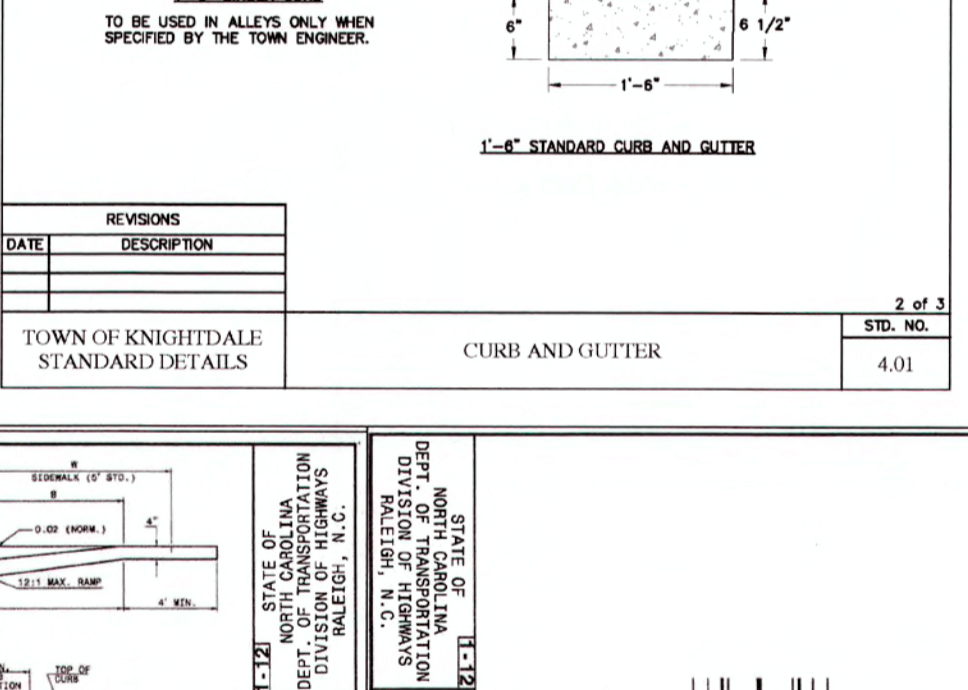
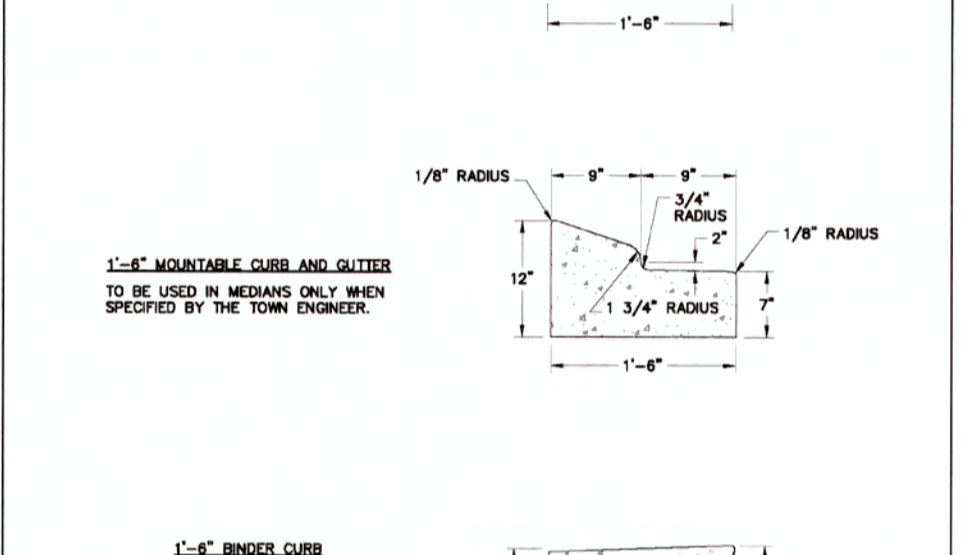
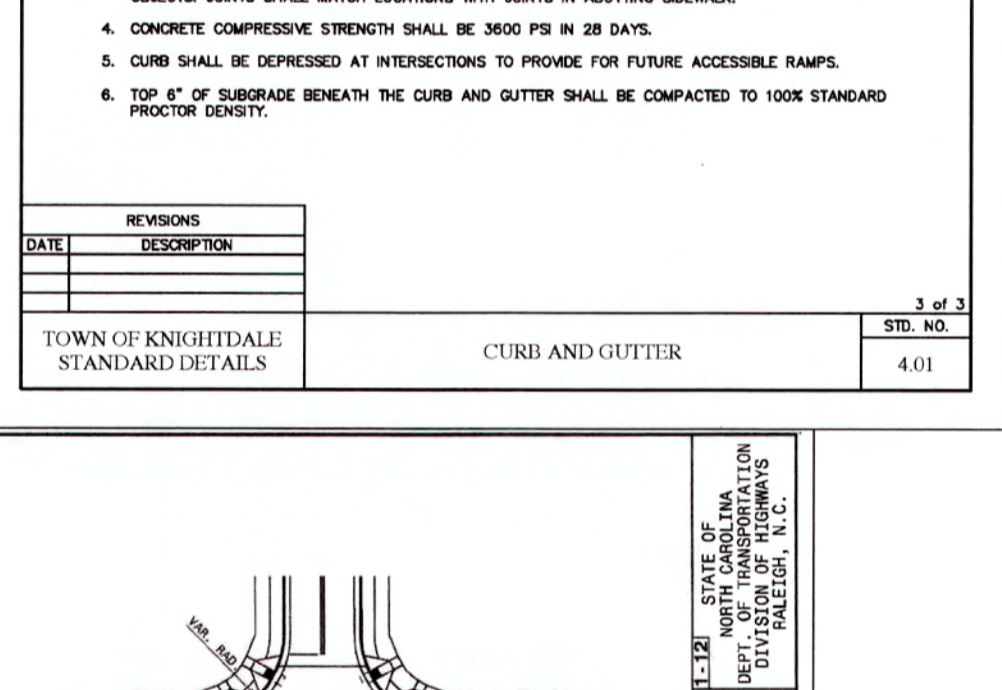
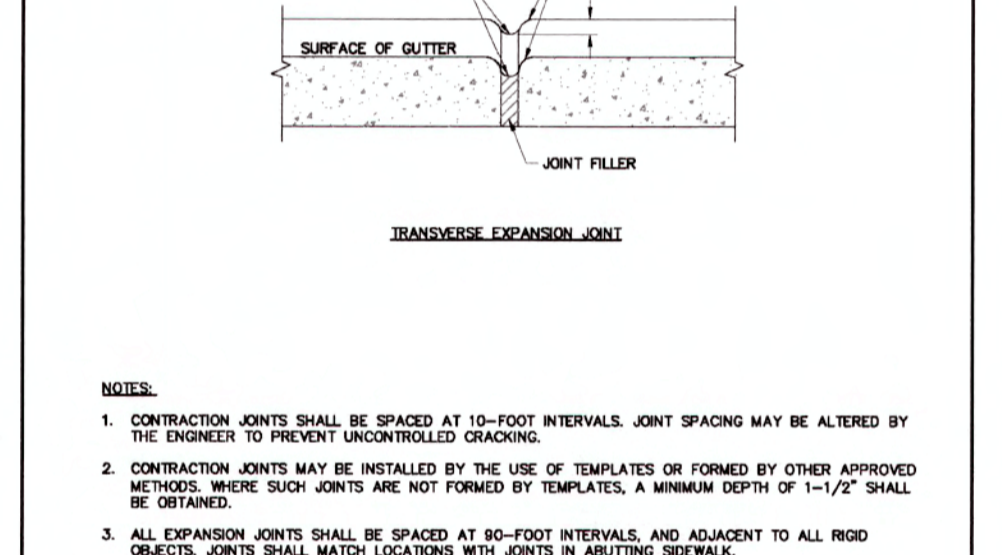
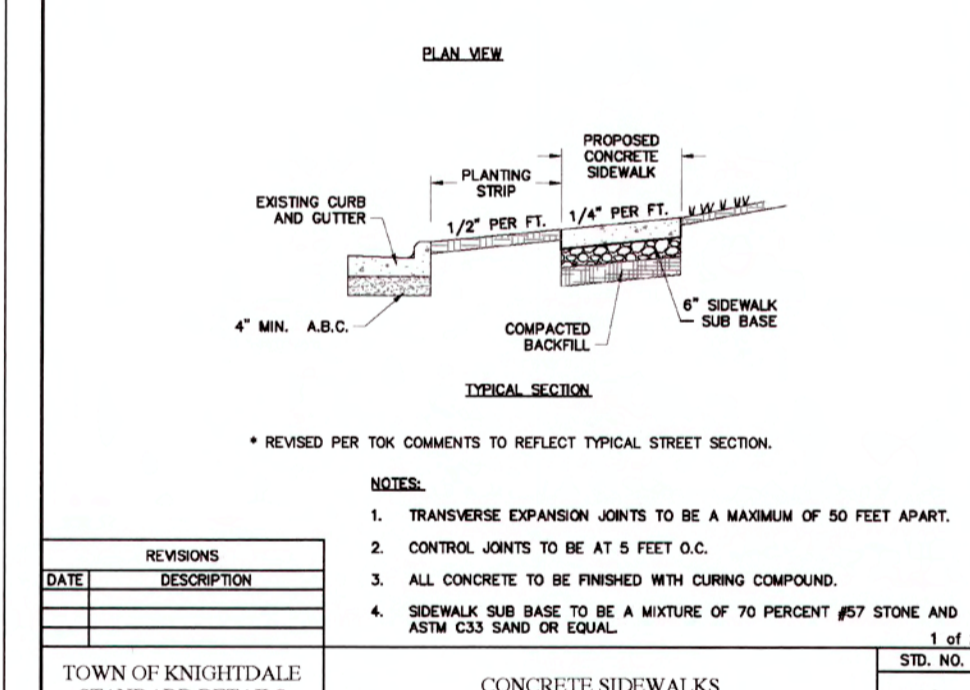
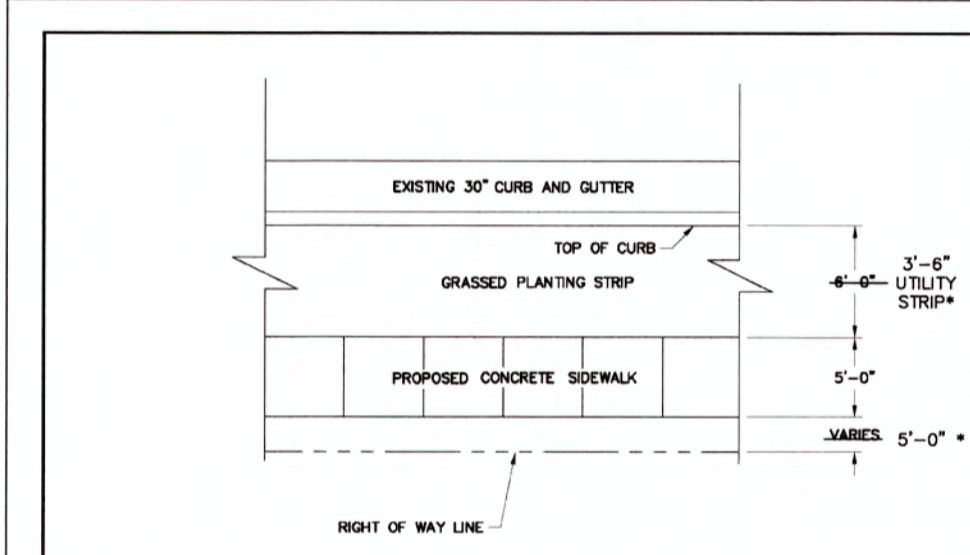
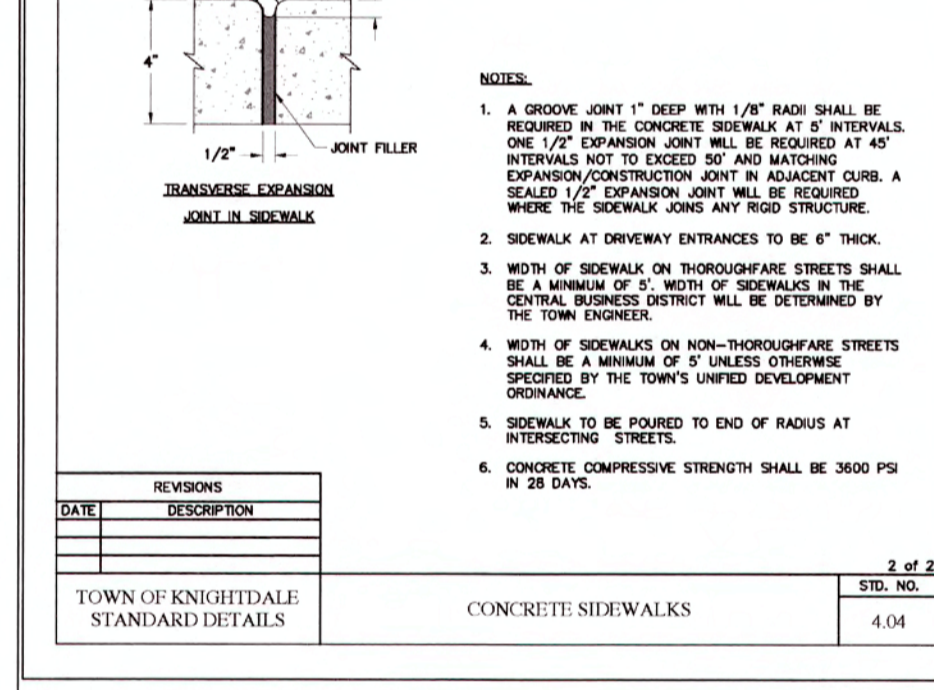
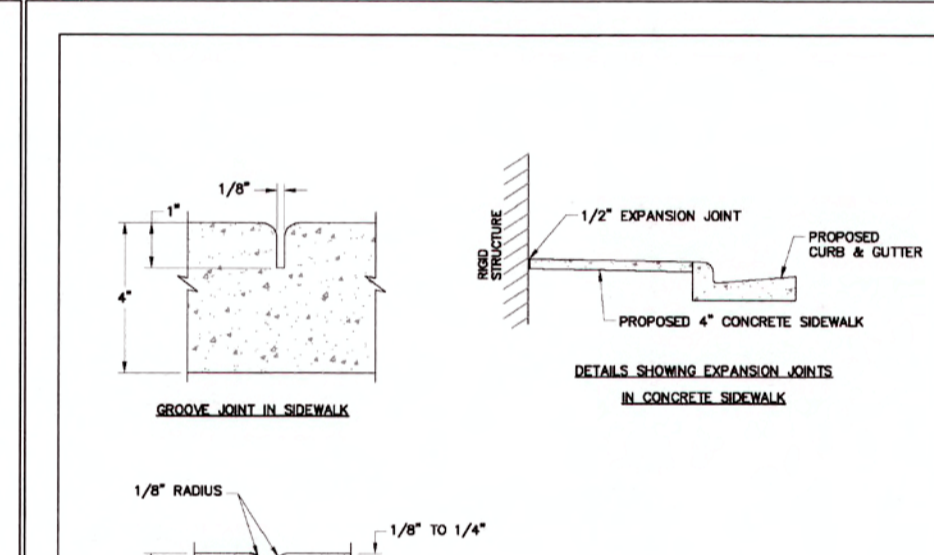
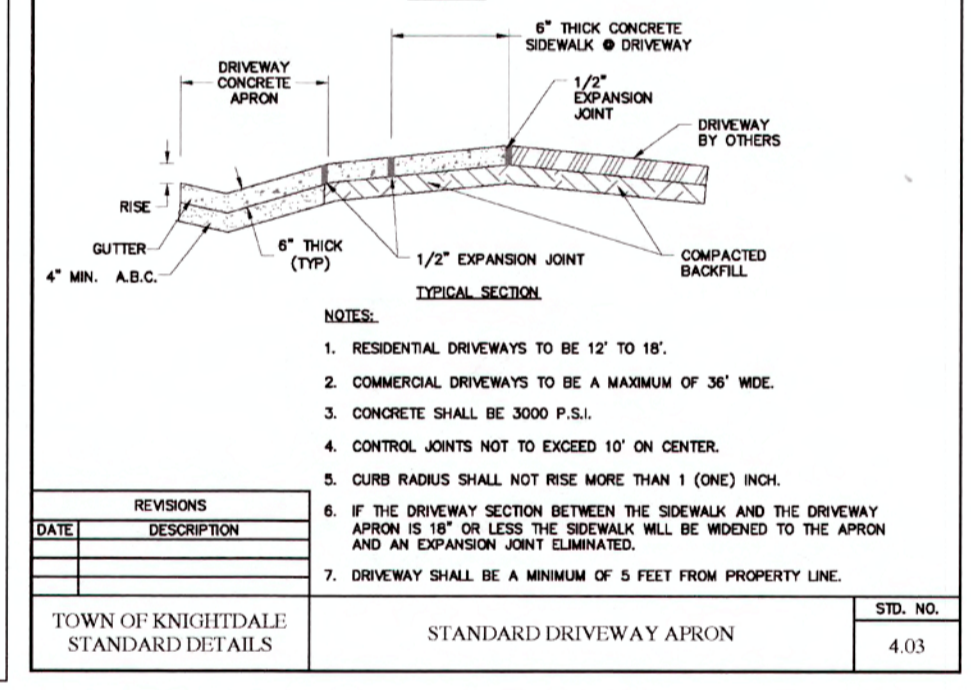
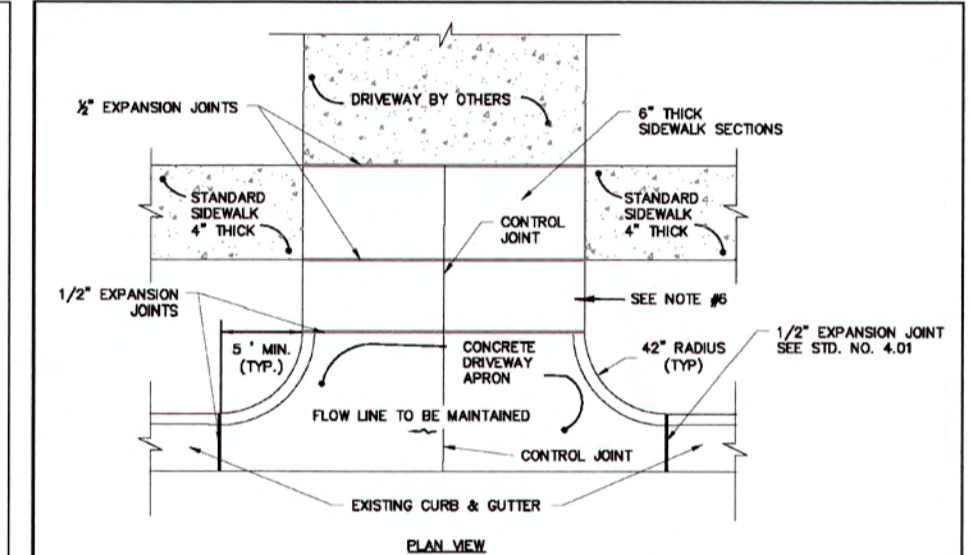
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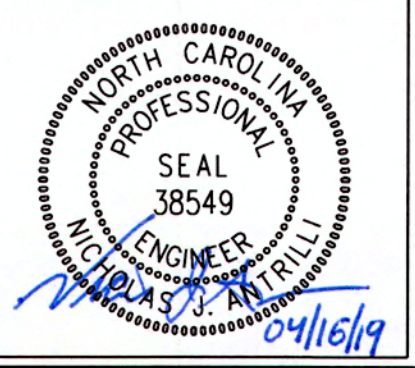
Revisions	Date	Description
1	TOK & COR COMMENTS	04/12/19



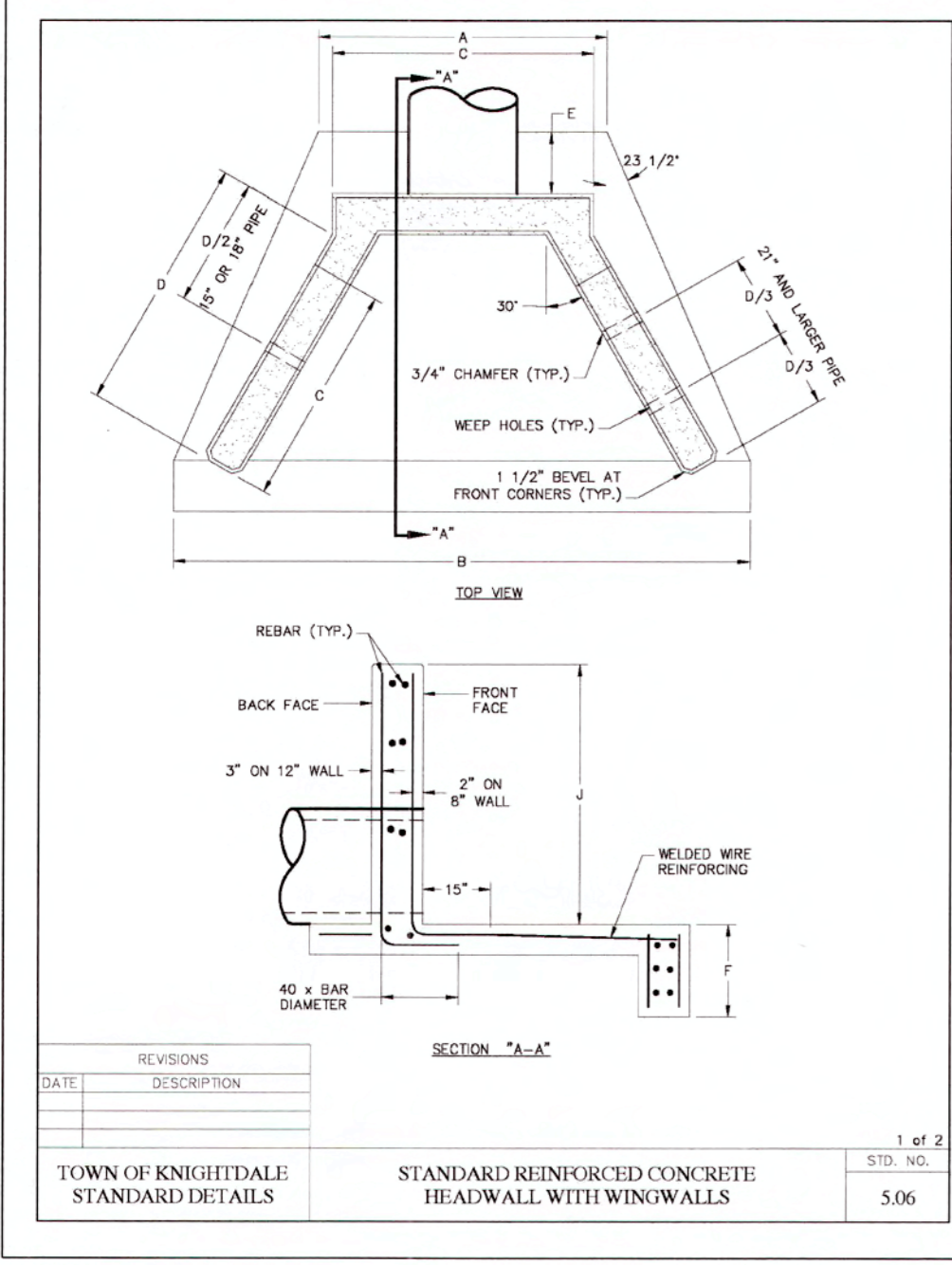
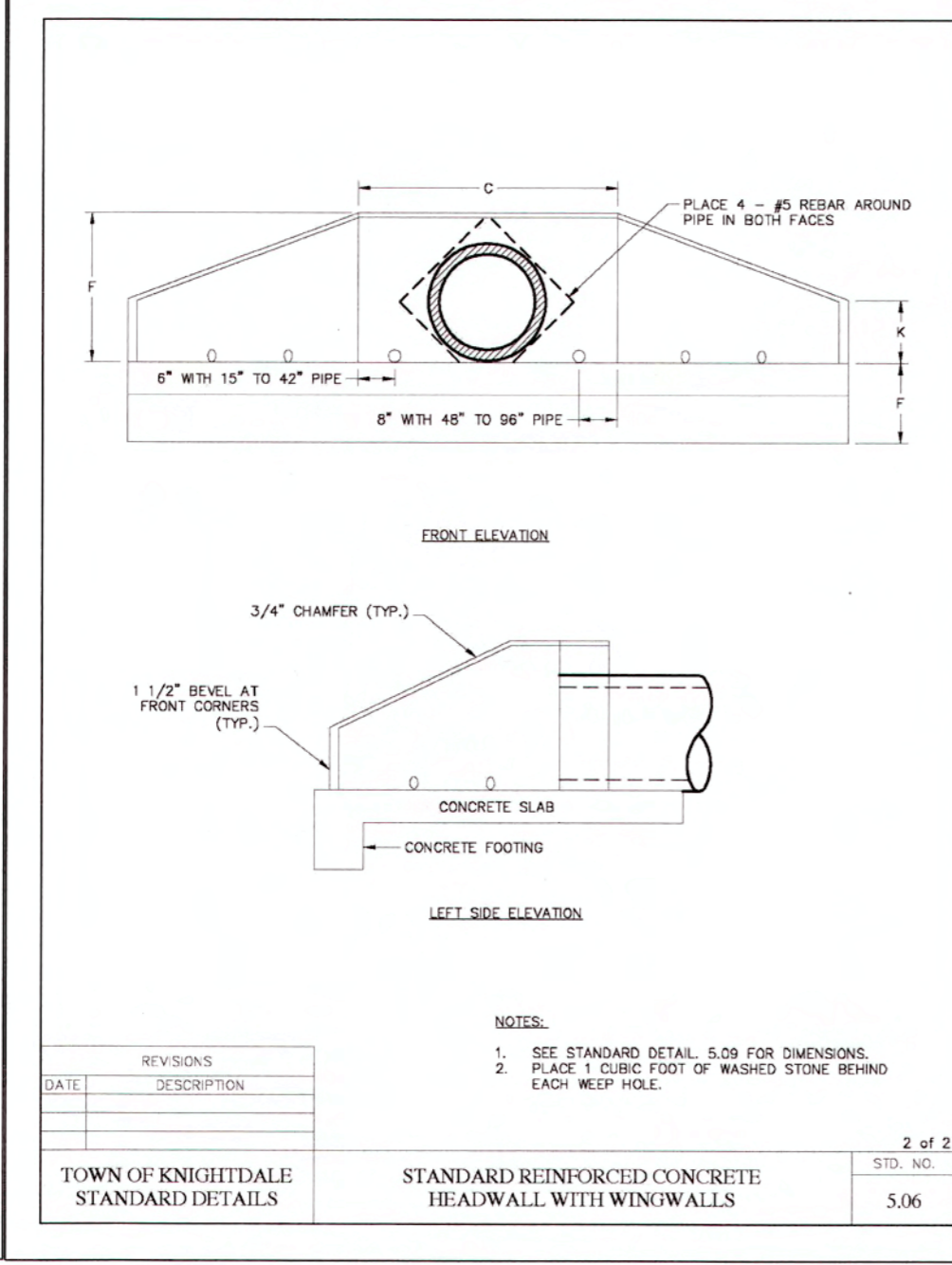
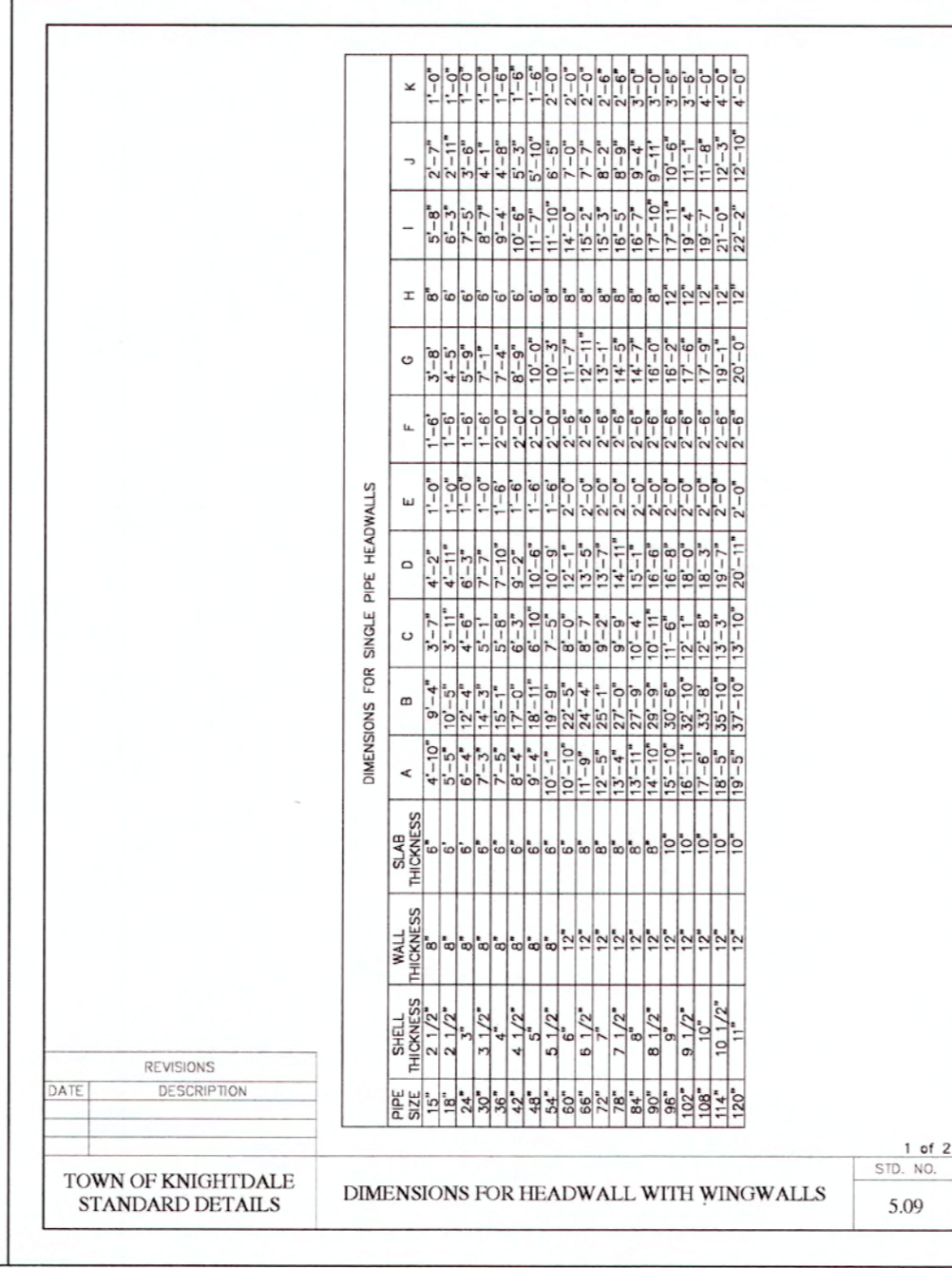
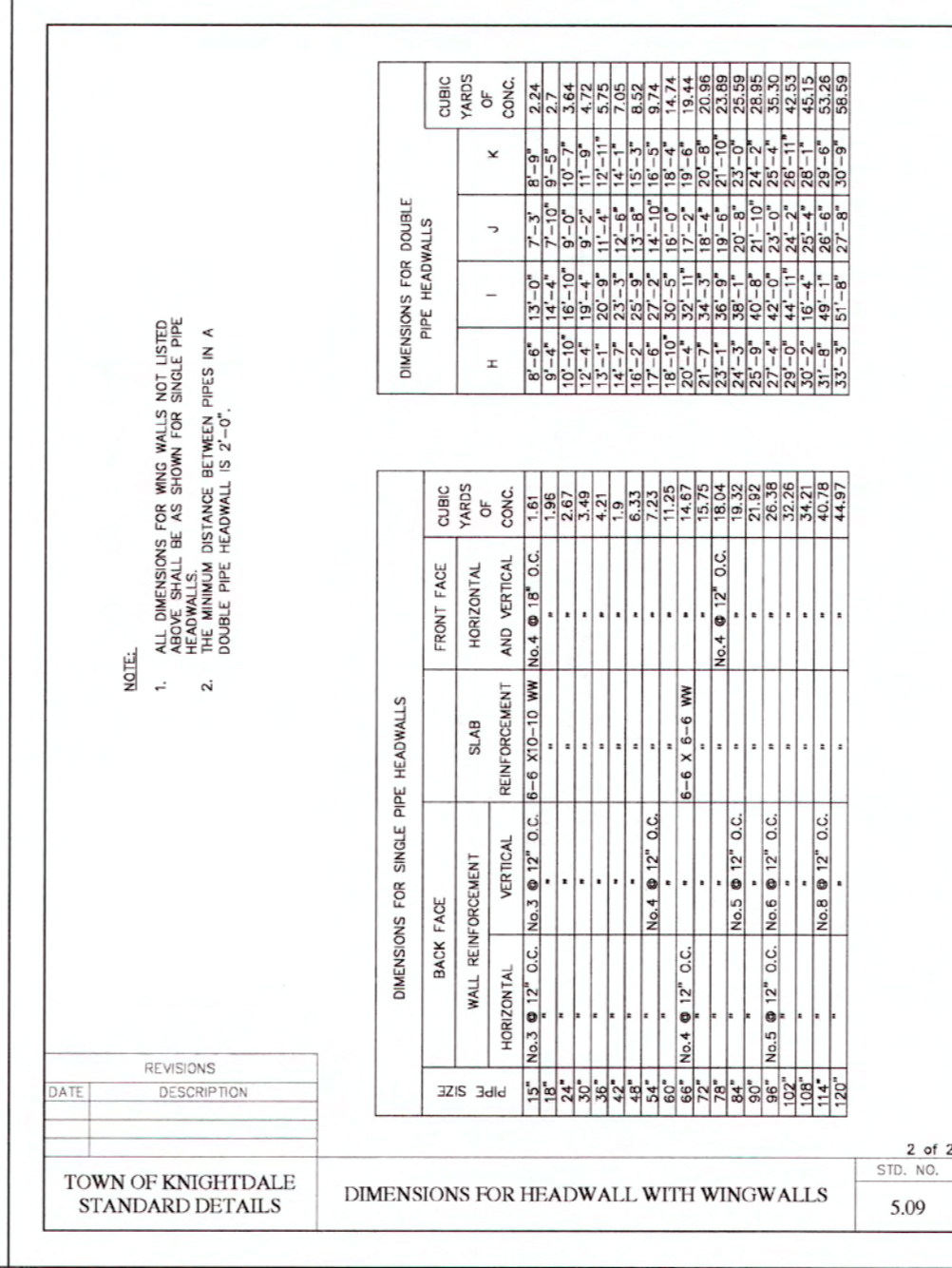
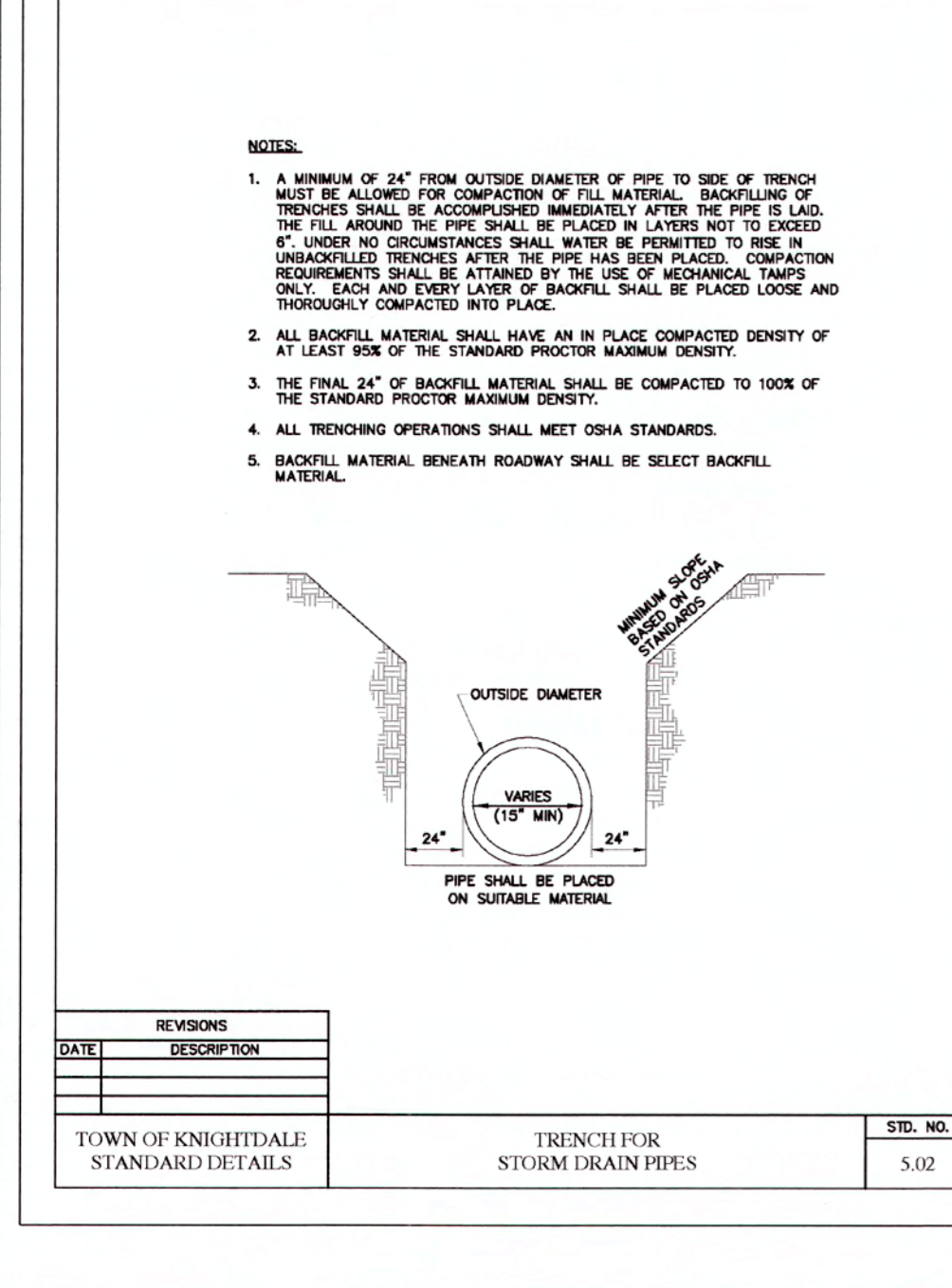
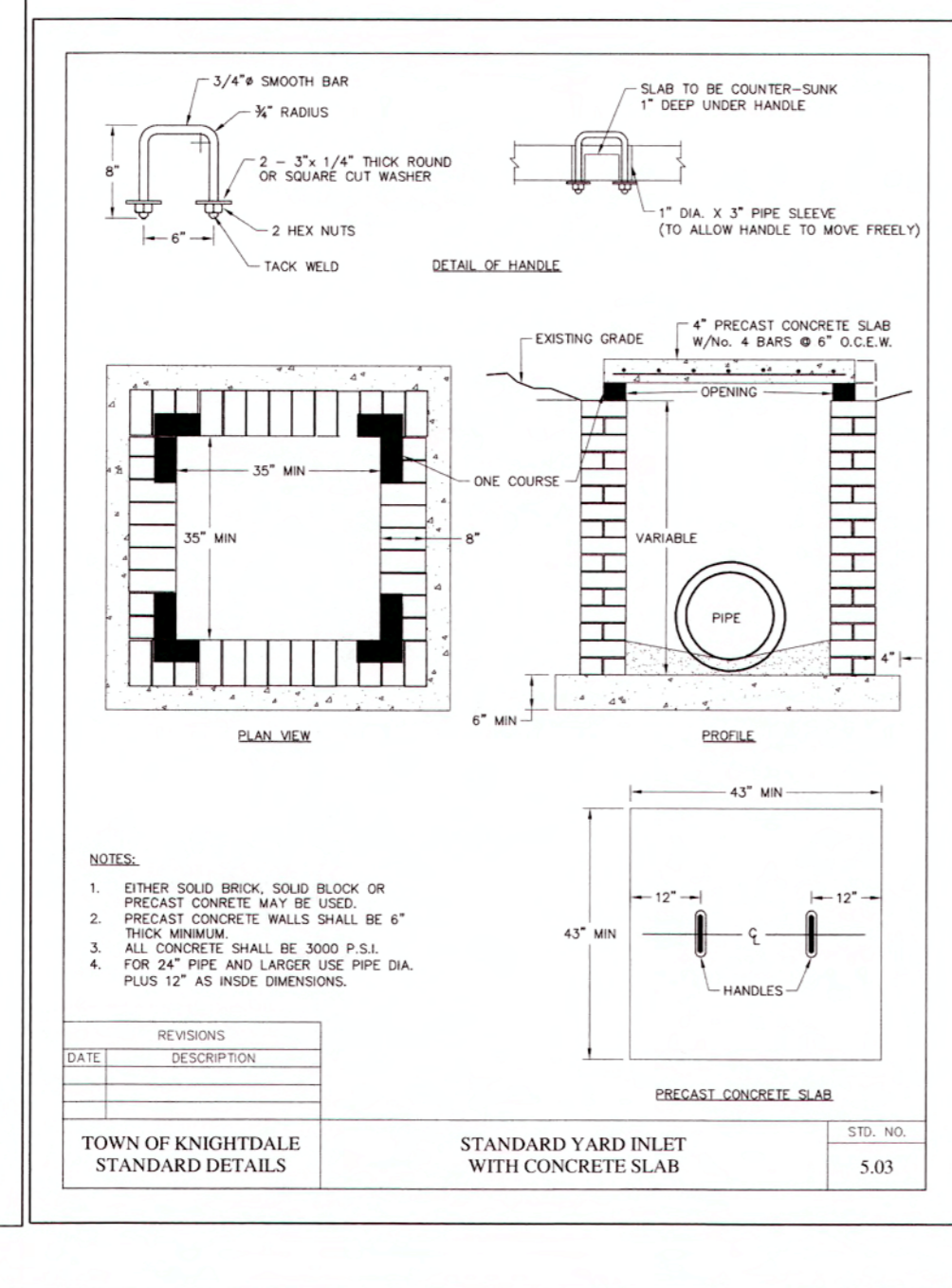
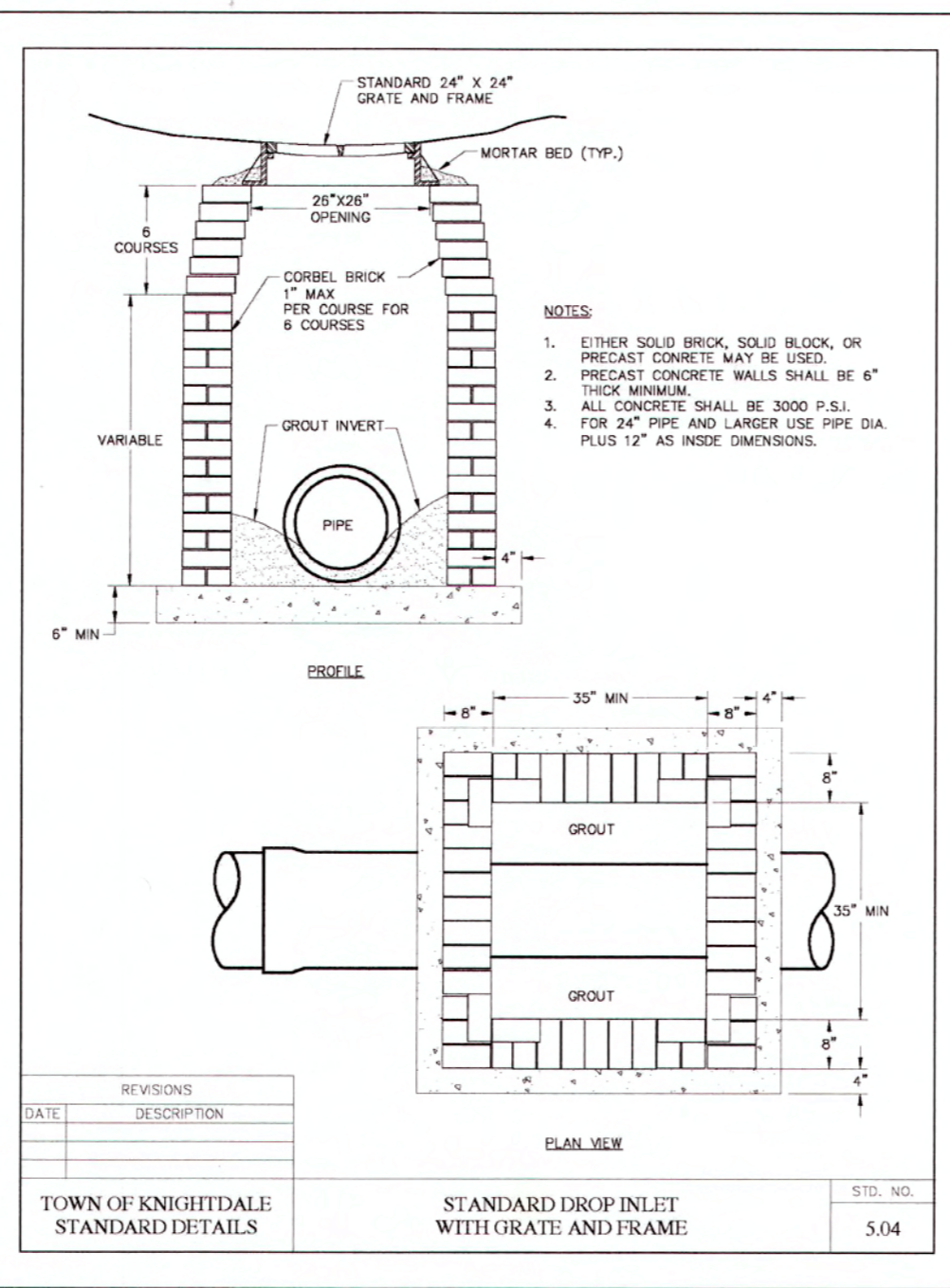
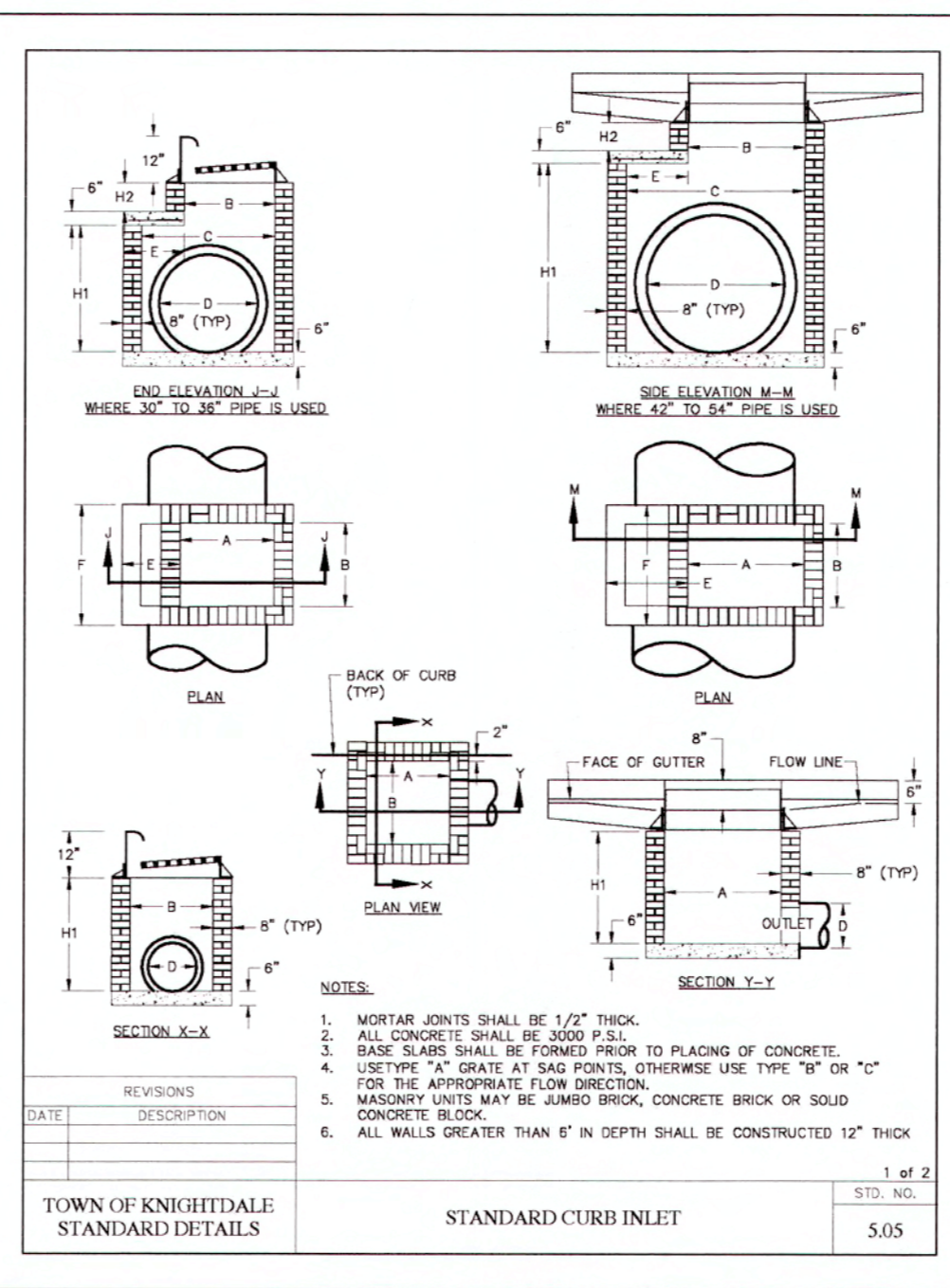
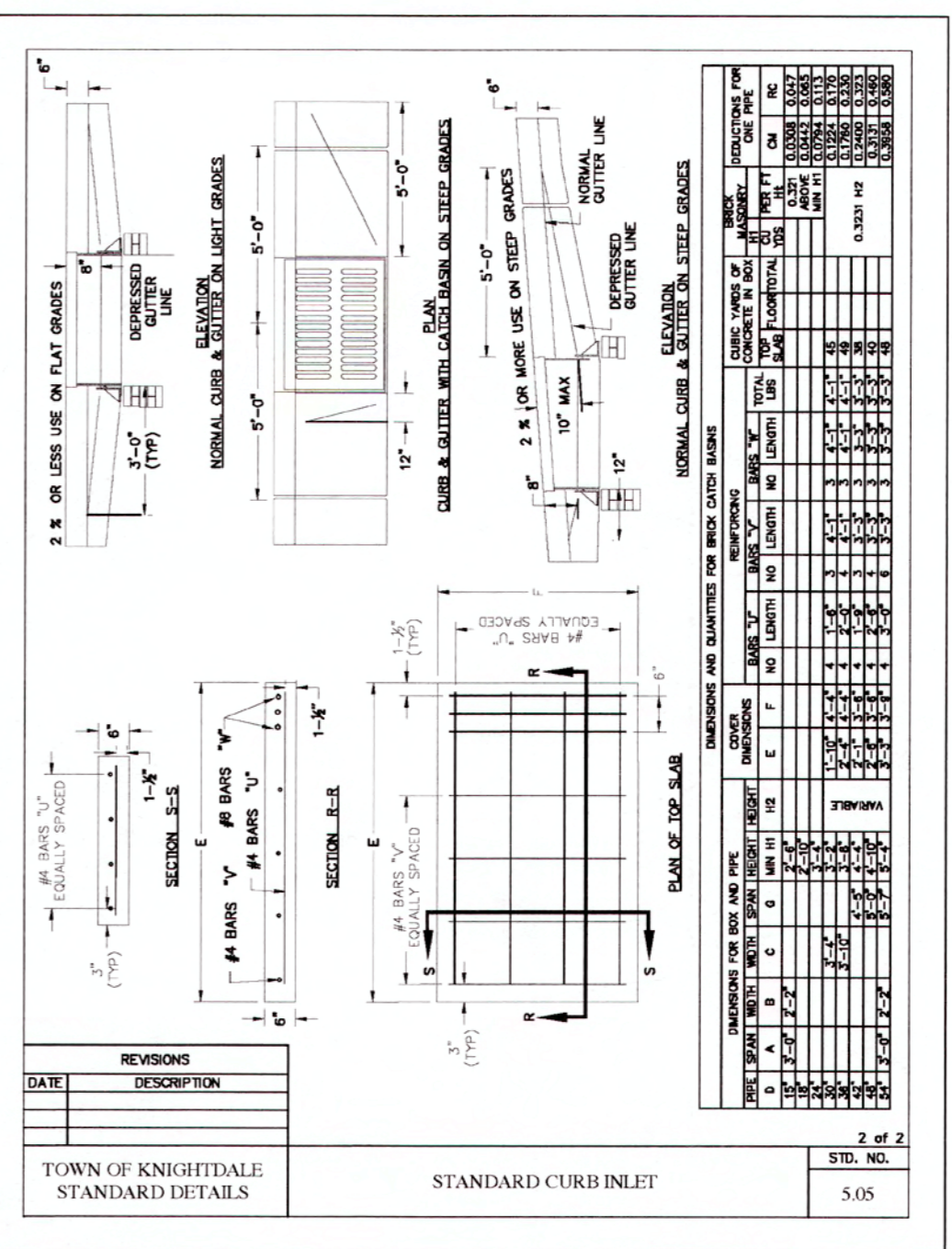
DATE	DESCRIPTION	STD. NO.
	TOWN OF KNIGHTDALE STANDARD DETAILS	3.16
	TOWN OF KNIGHTDALE STANDARD DETAILS	3.17
	TOWN OF KNIGHTDALE STANDARD DETAILS	3.18



Job No. 02090251.94 Drawn By W&R  
Date 11/21/2018 Designer W&R



Revisions  
1 TOK & COR COMMENTS 04/12/19

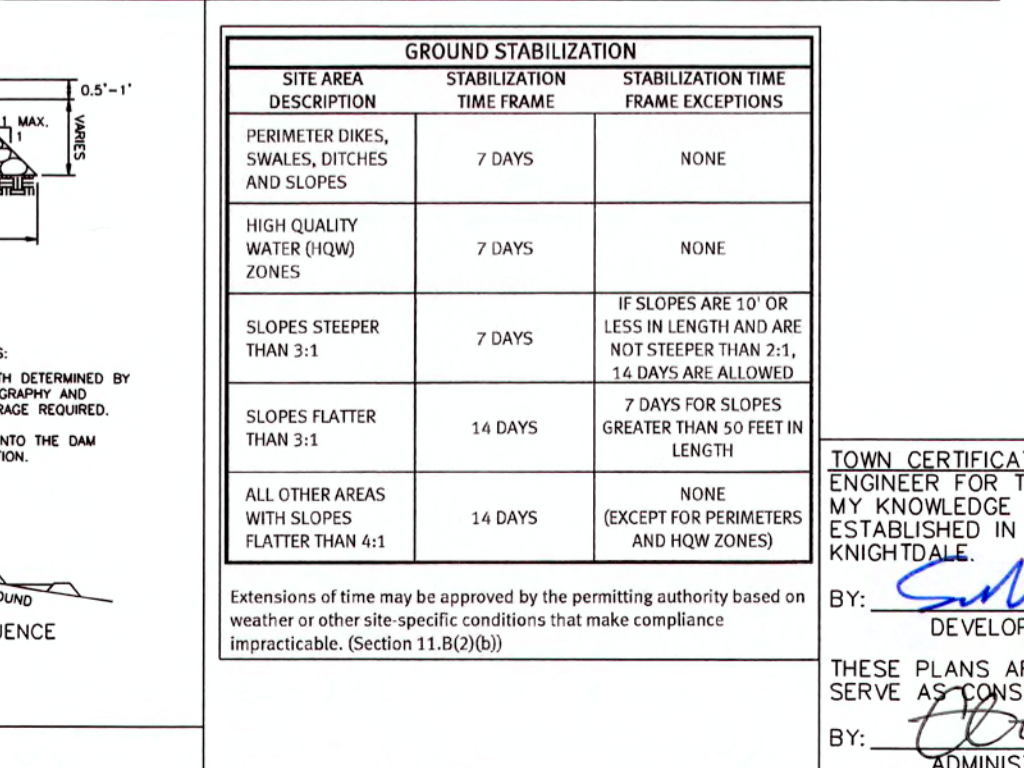
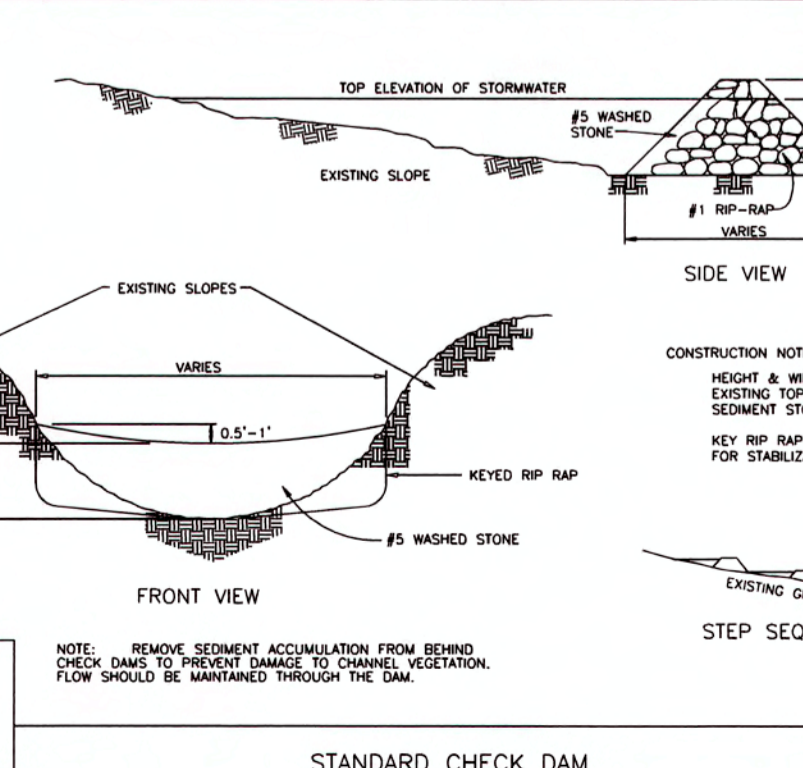
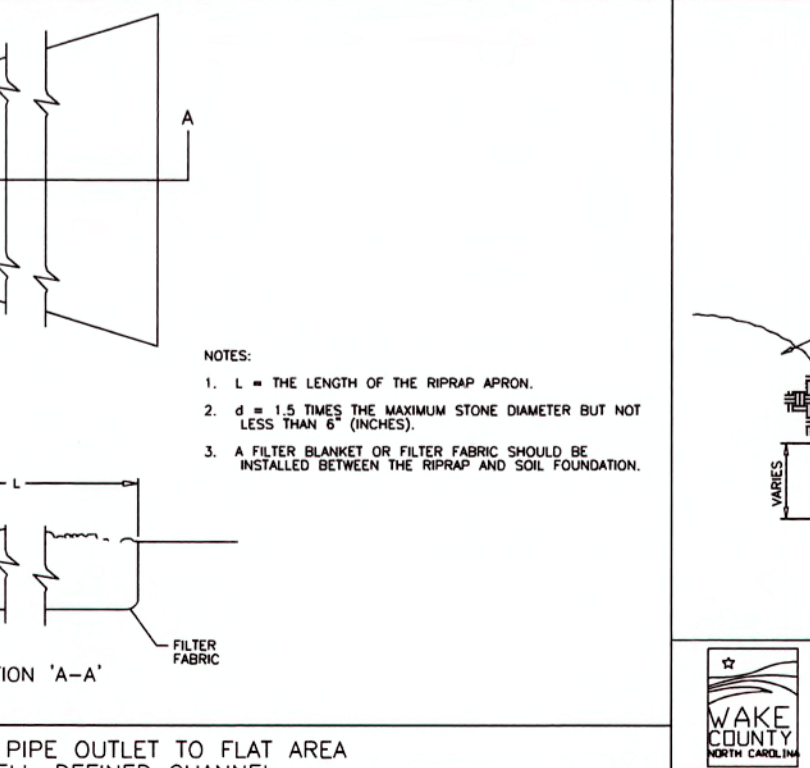
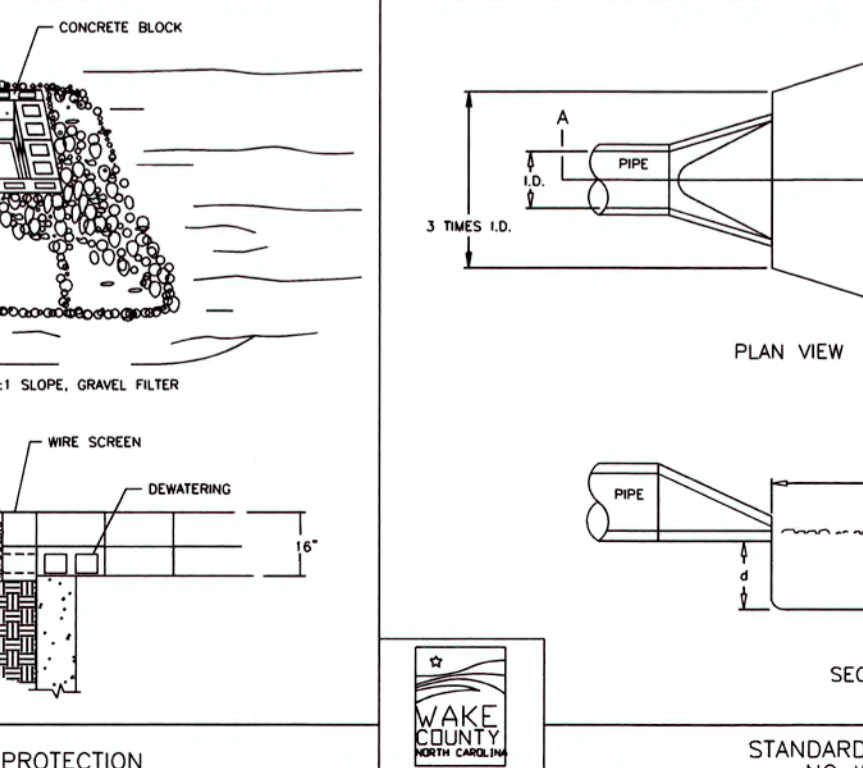
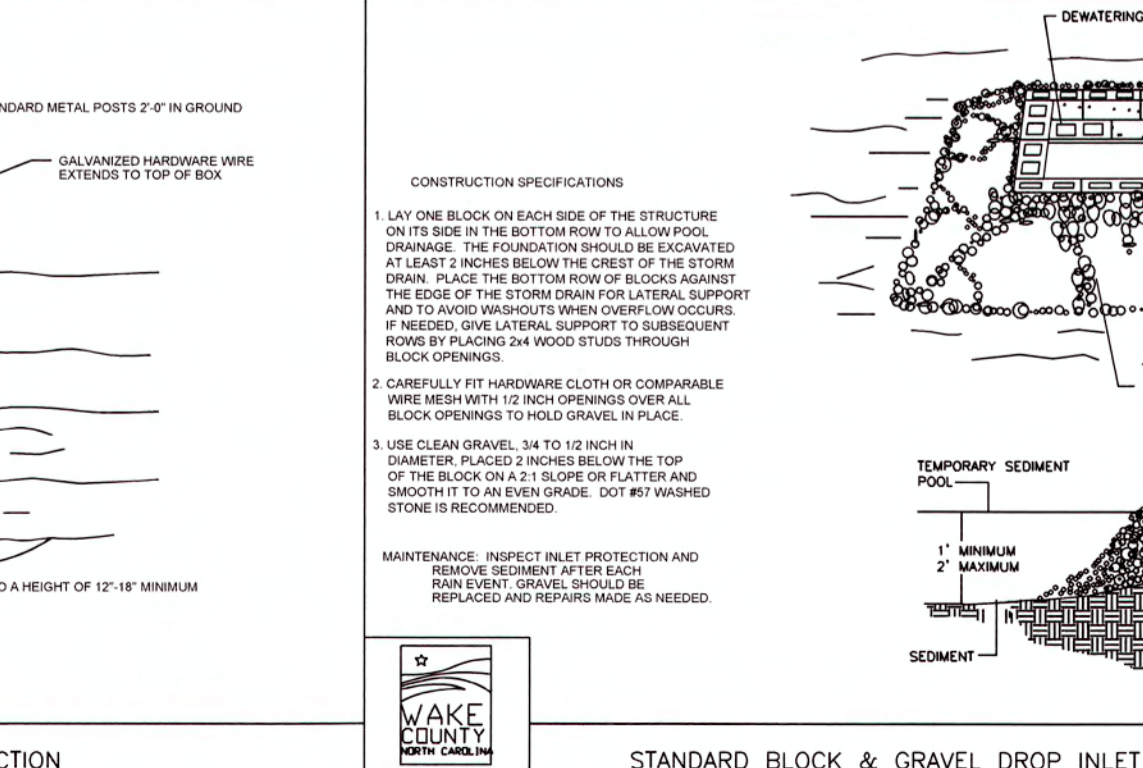
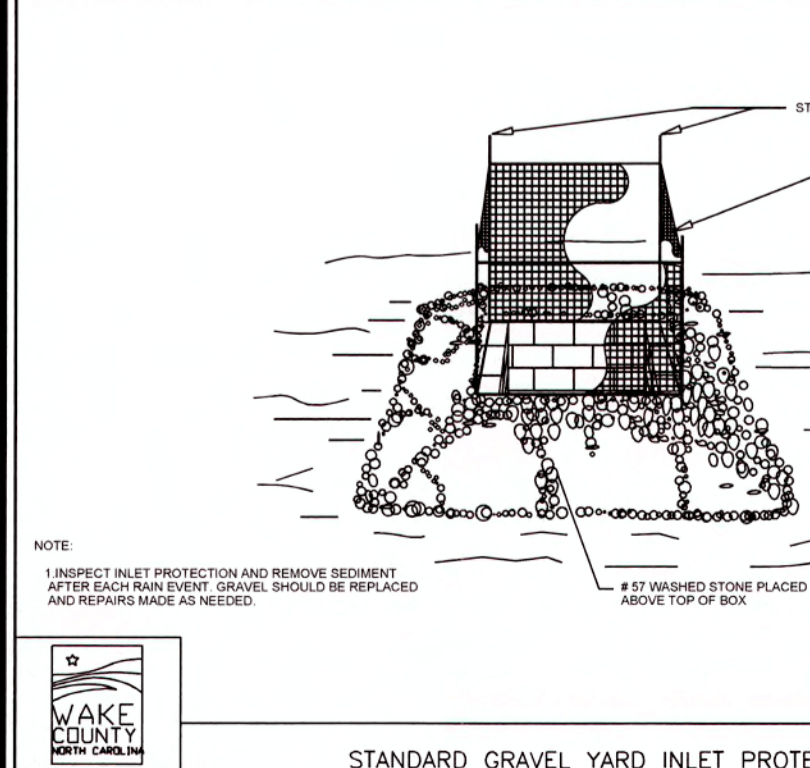
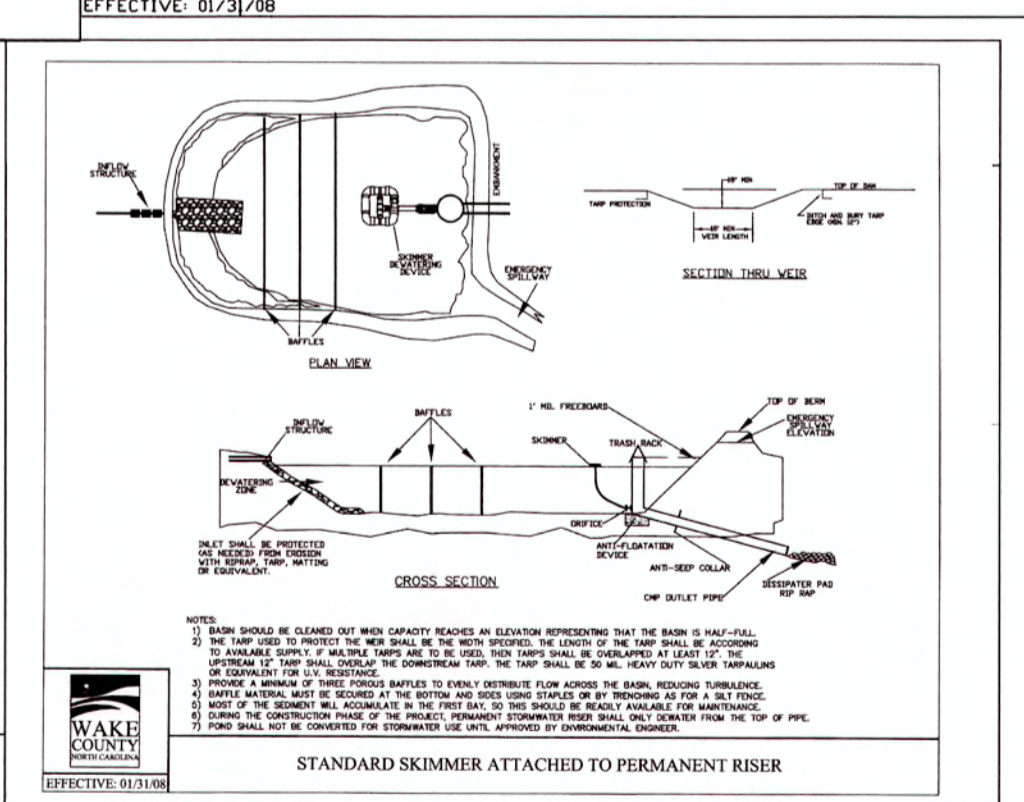
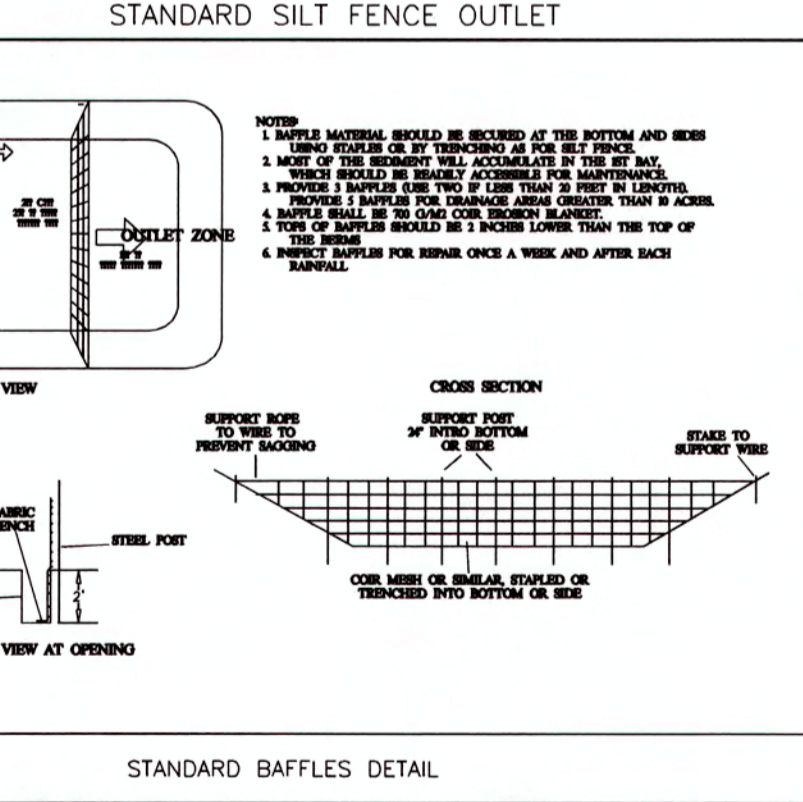
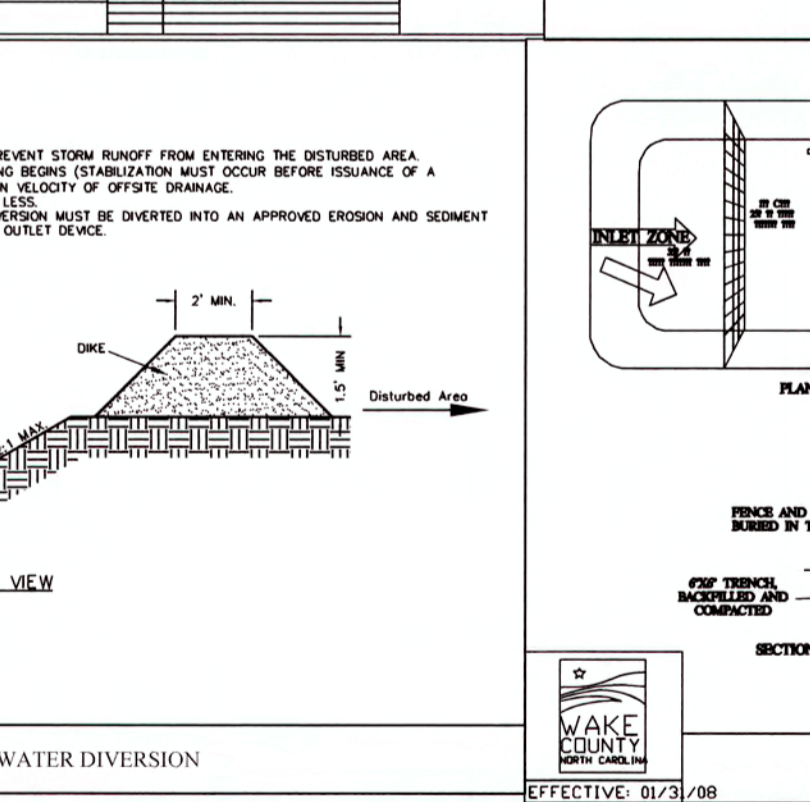
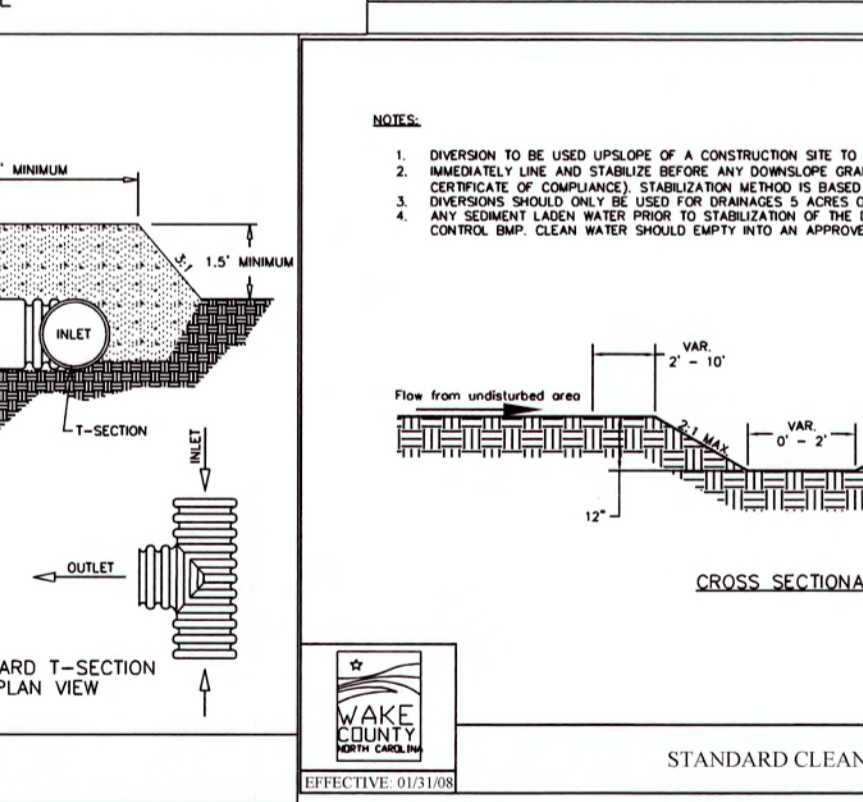
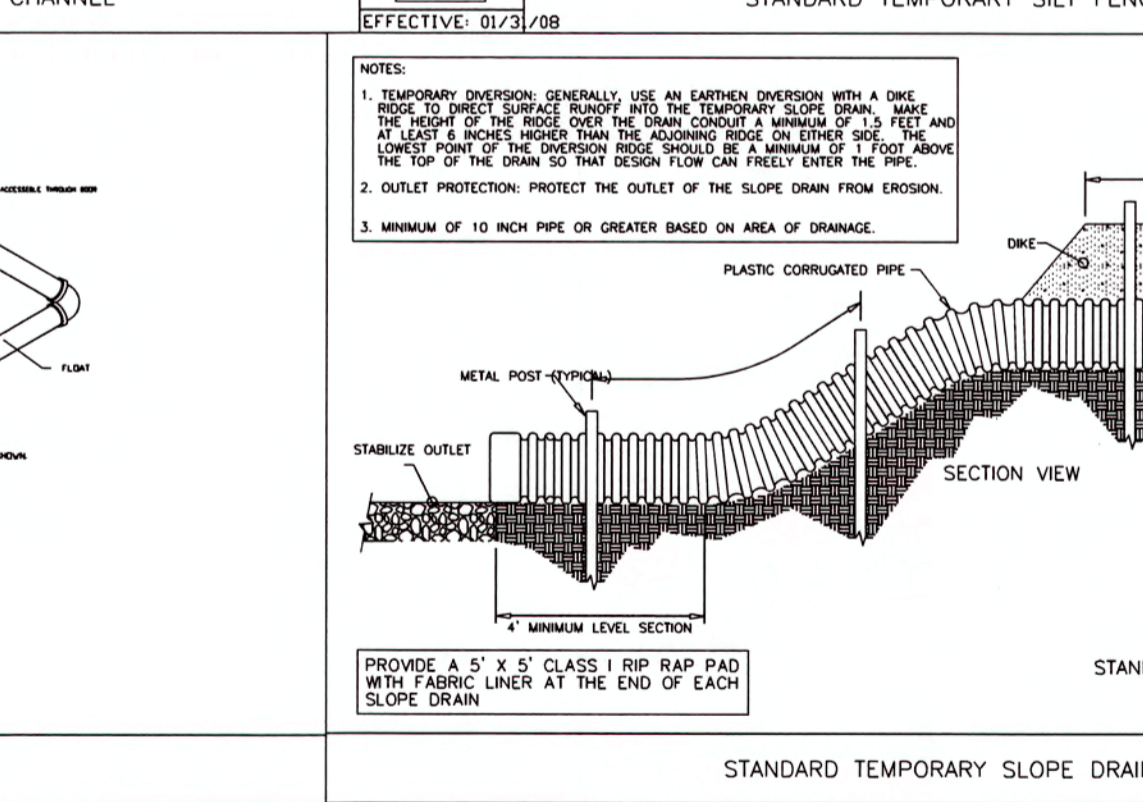
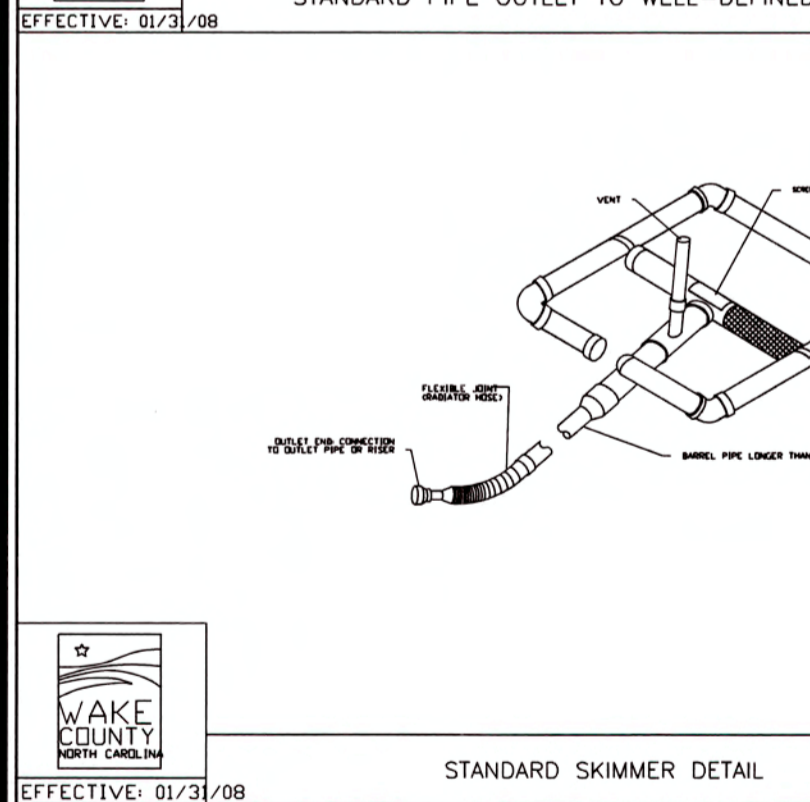
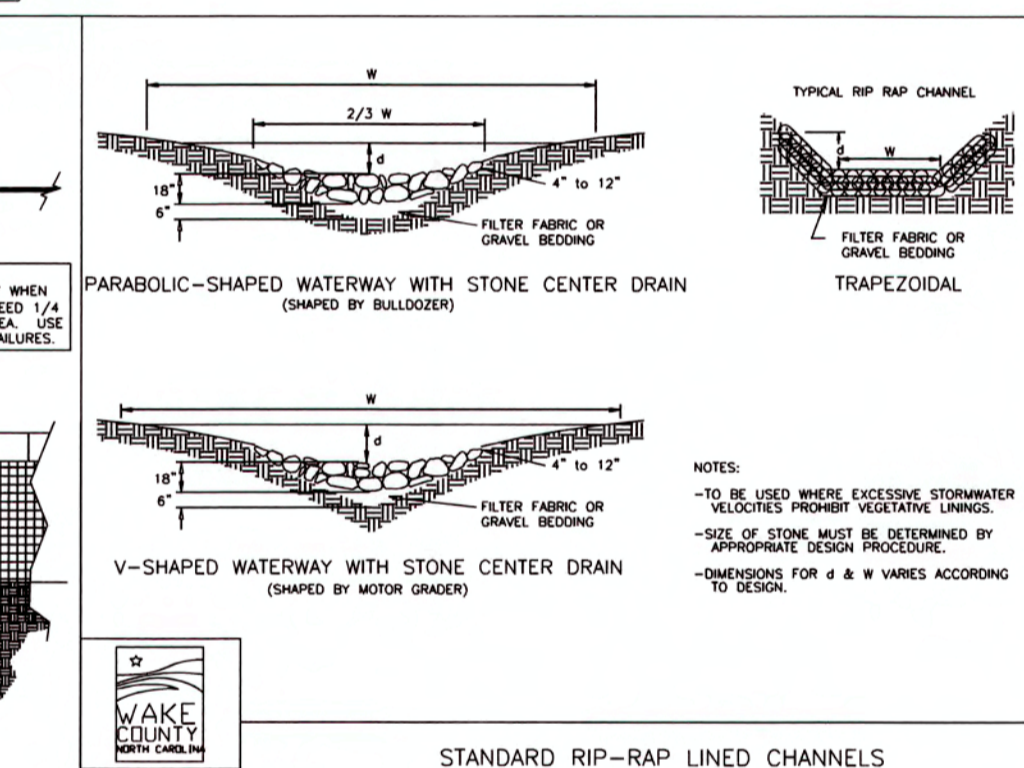
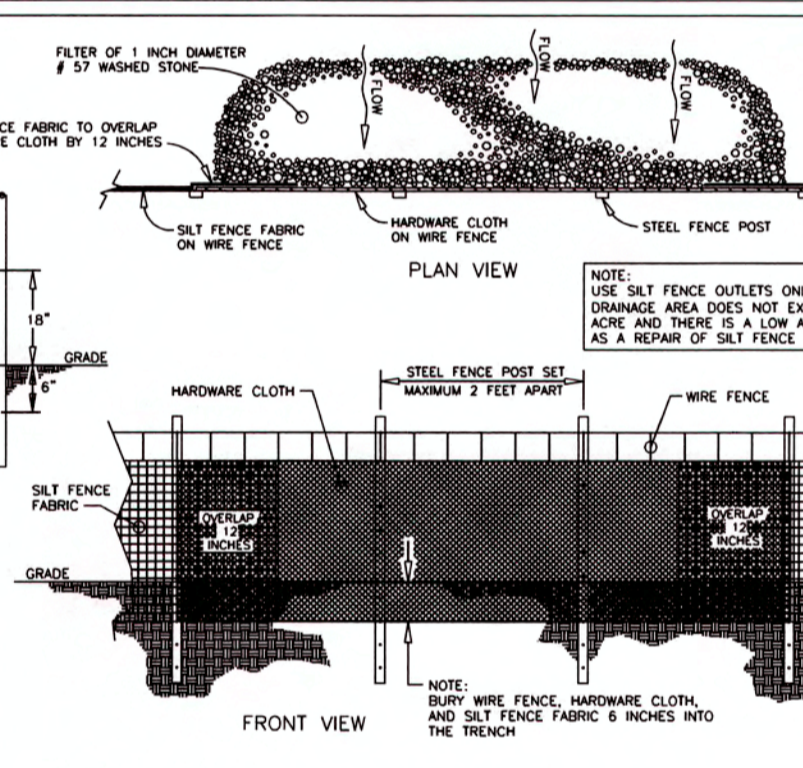
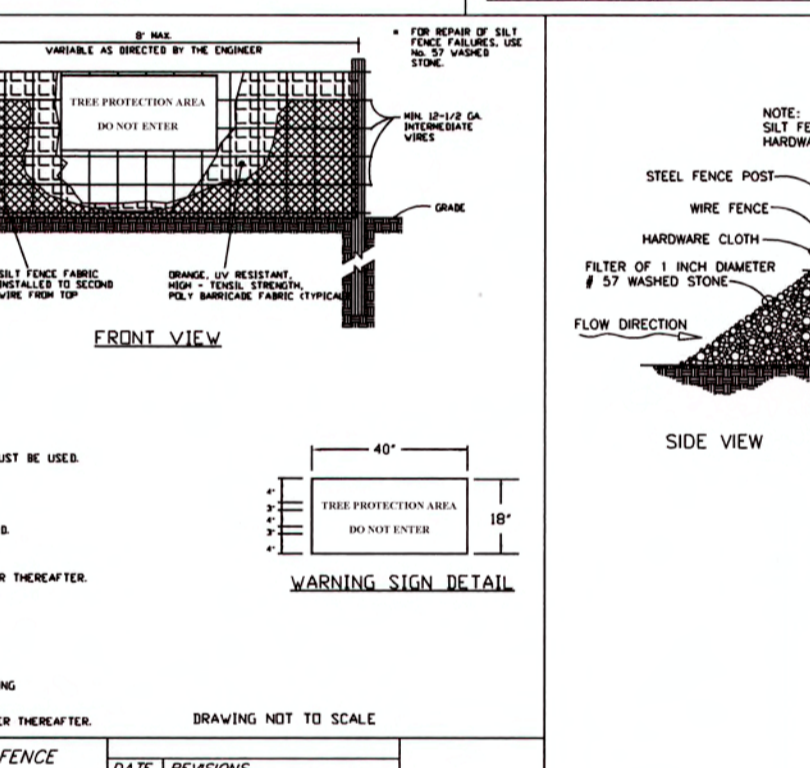
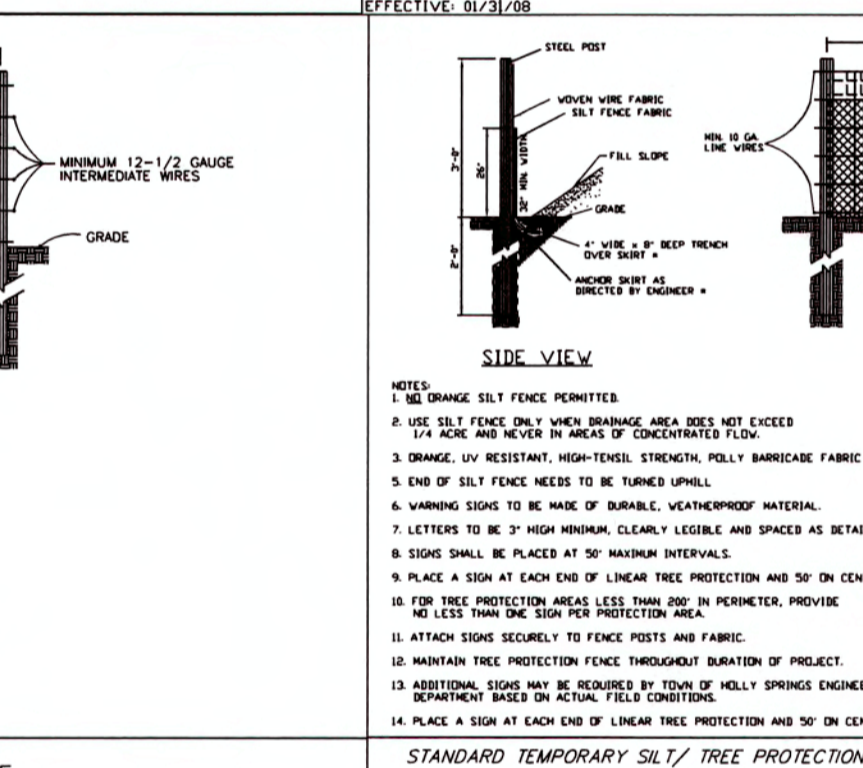
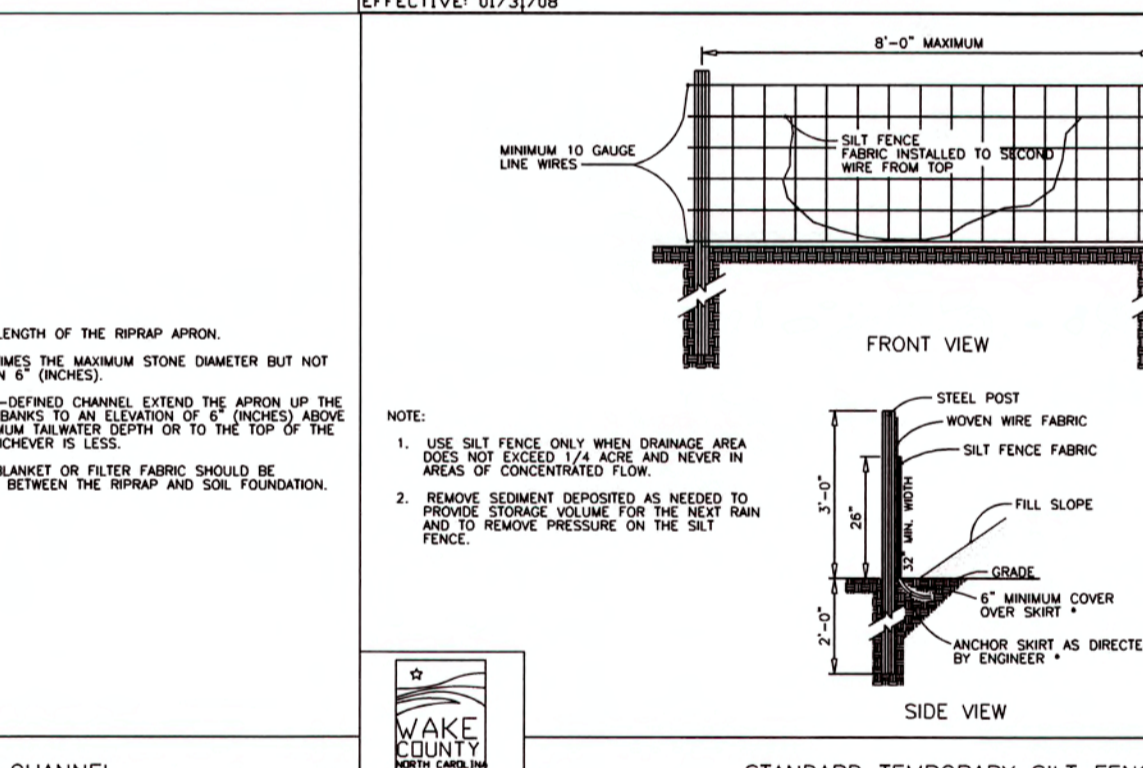
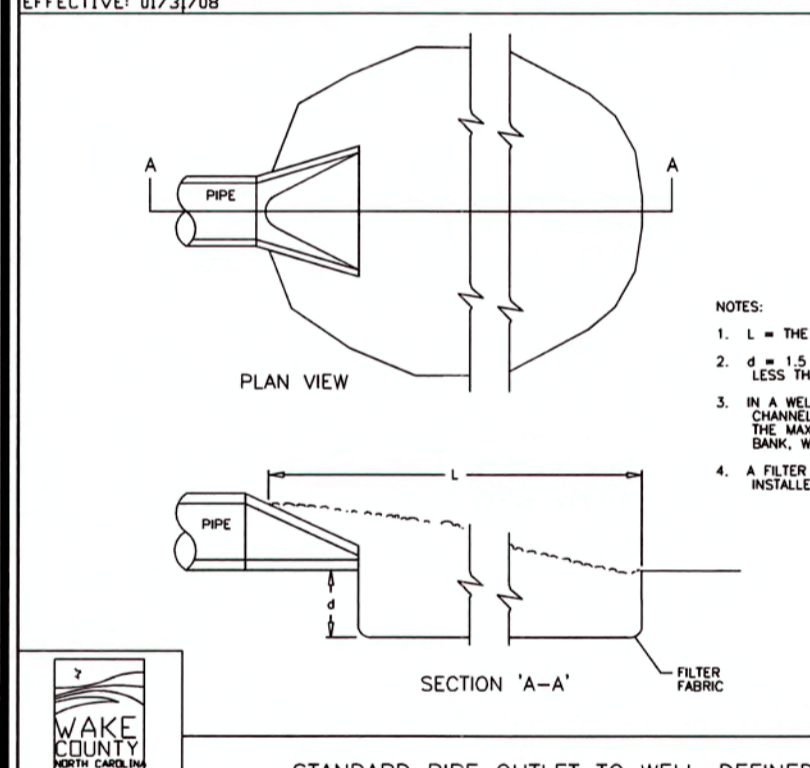
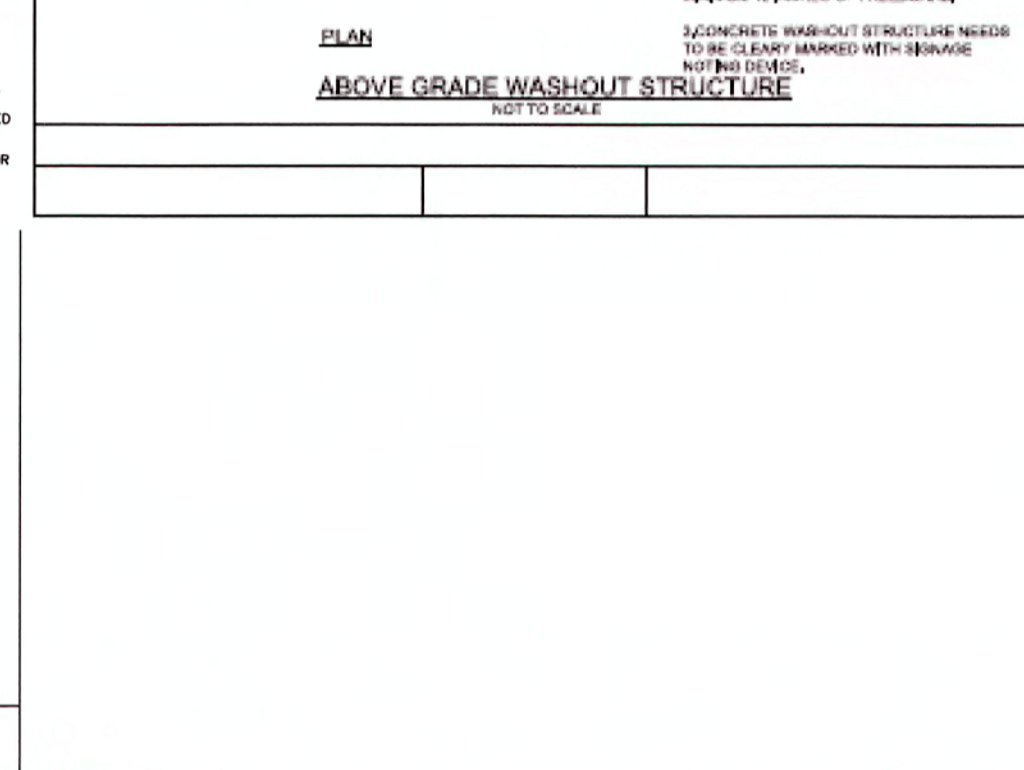
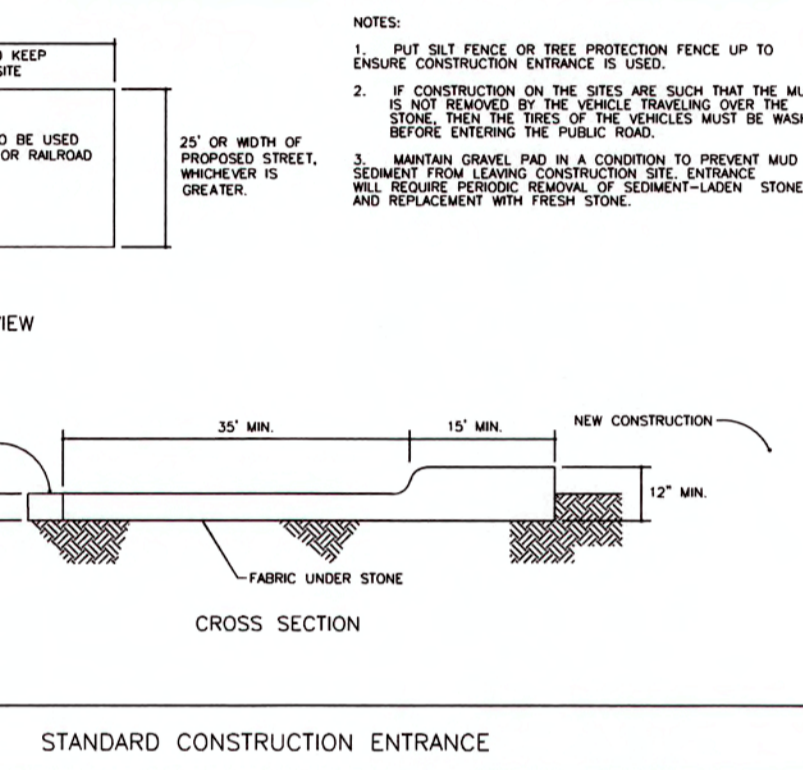
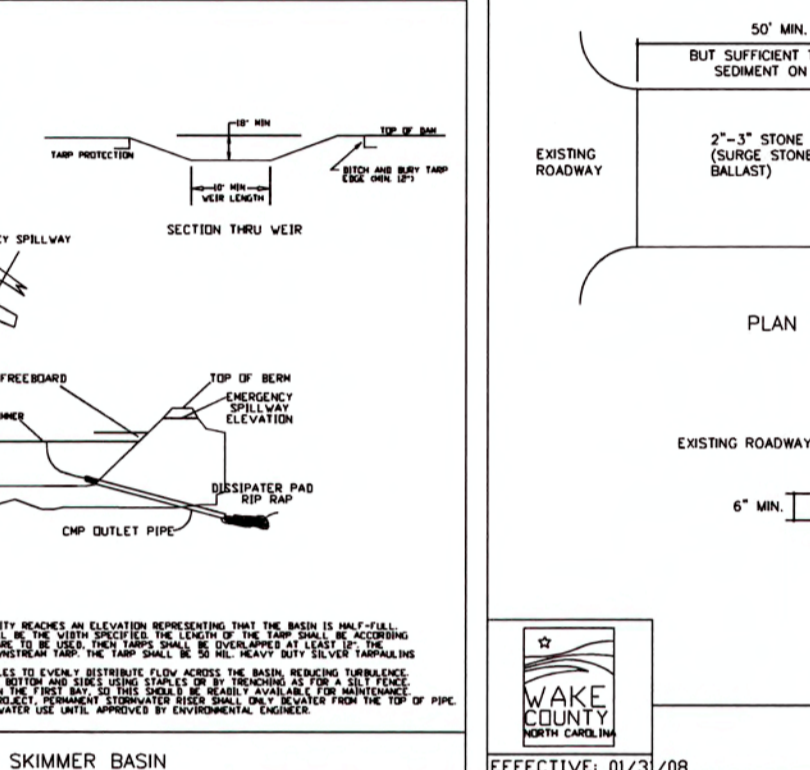
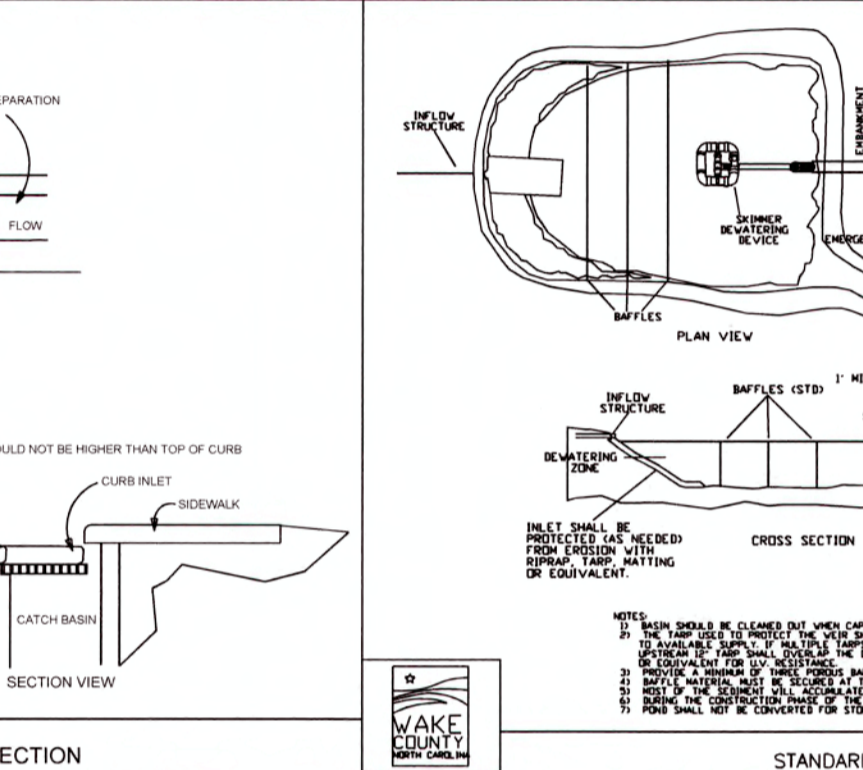
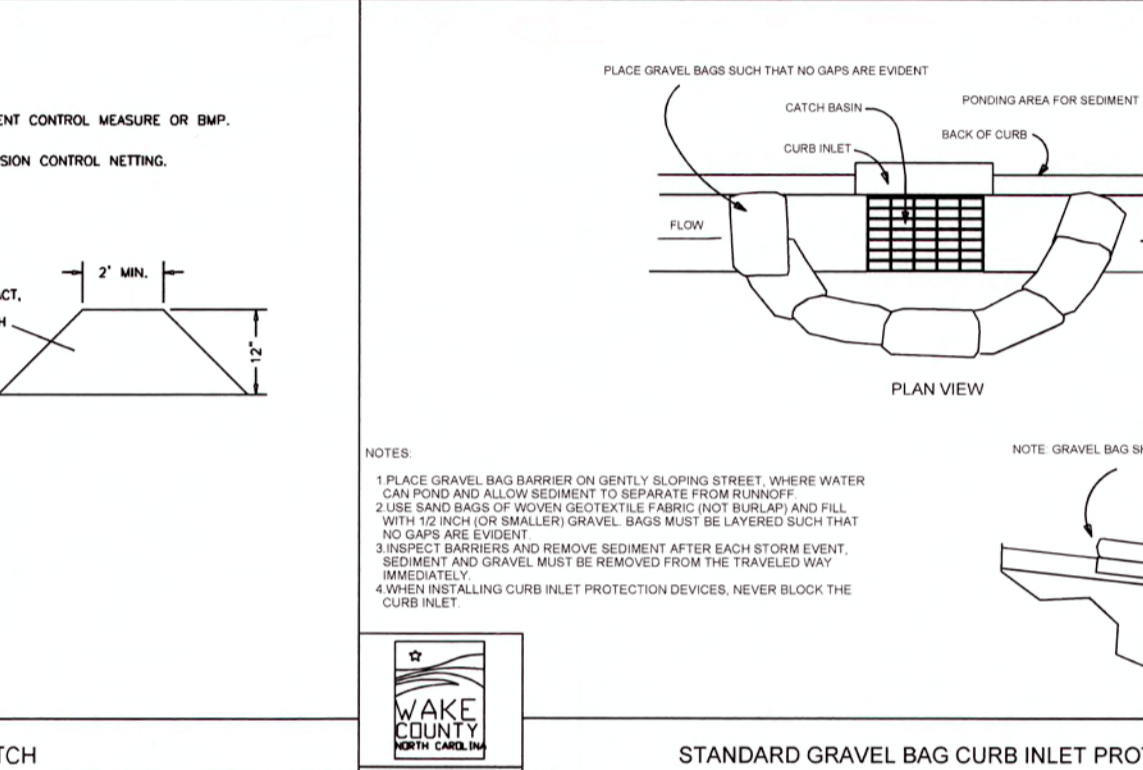
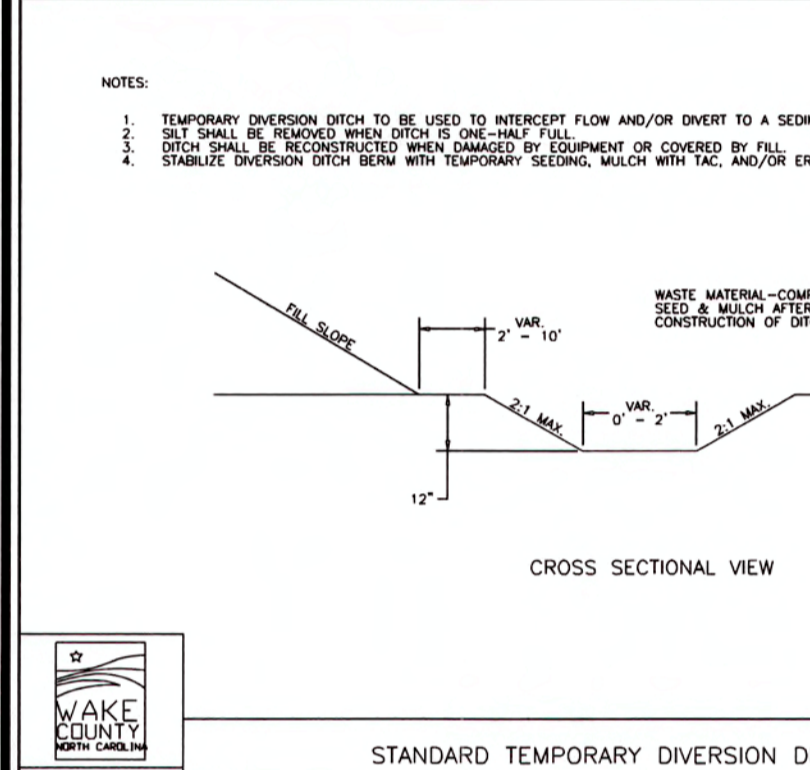
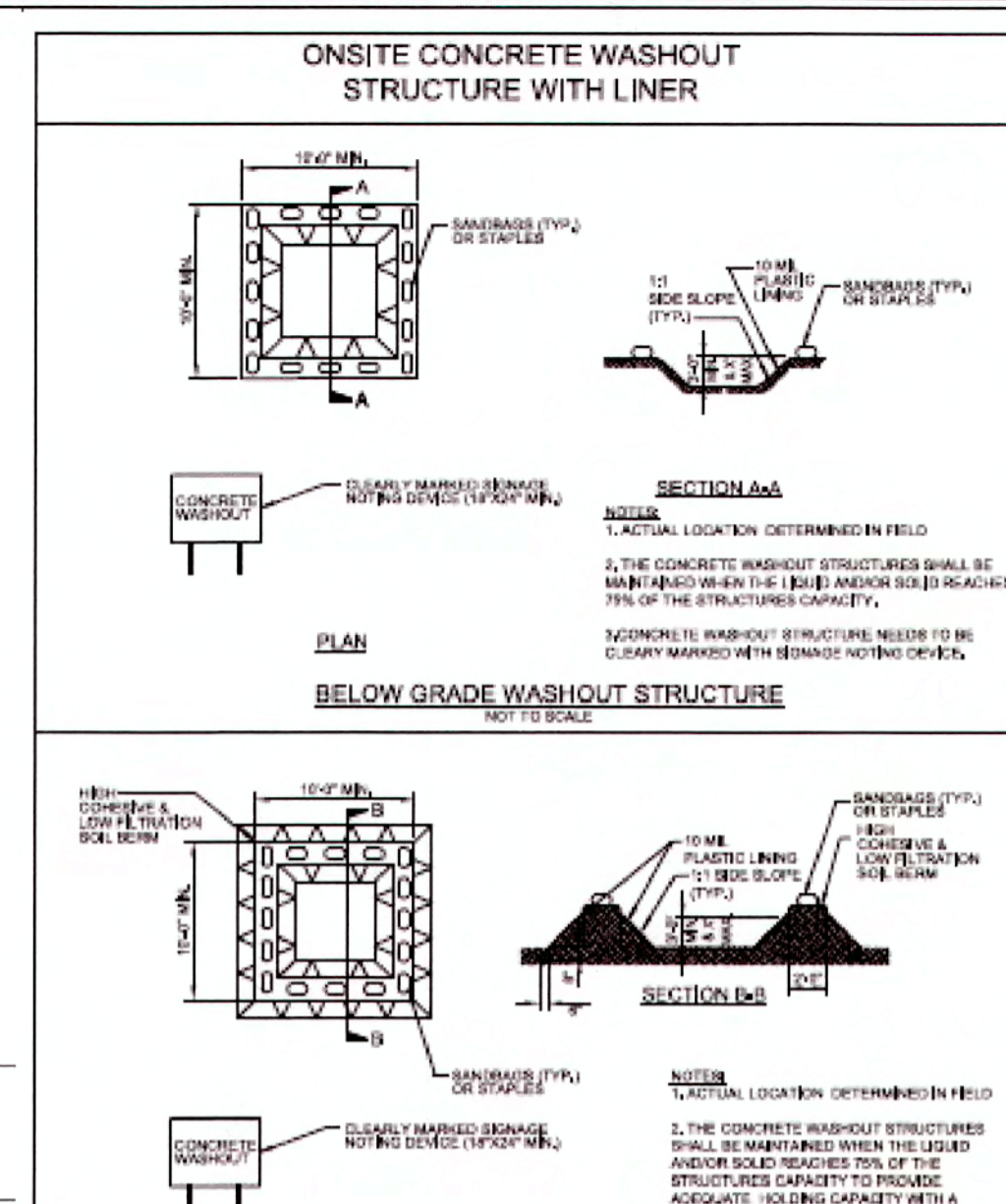
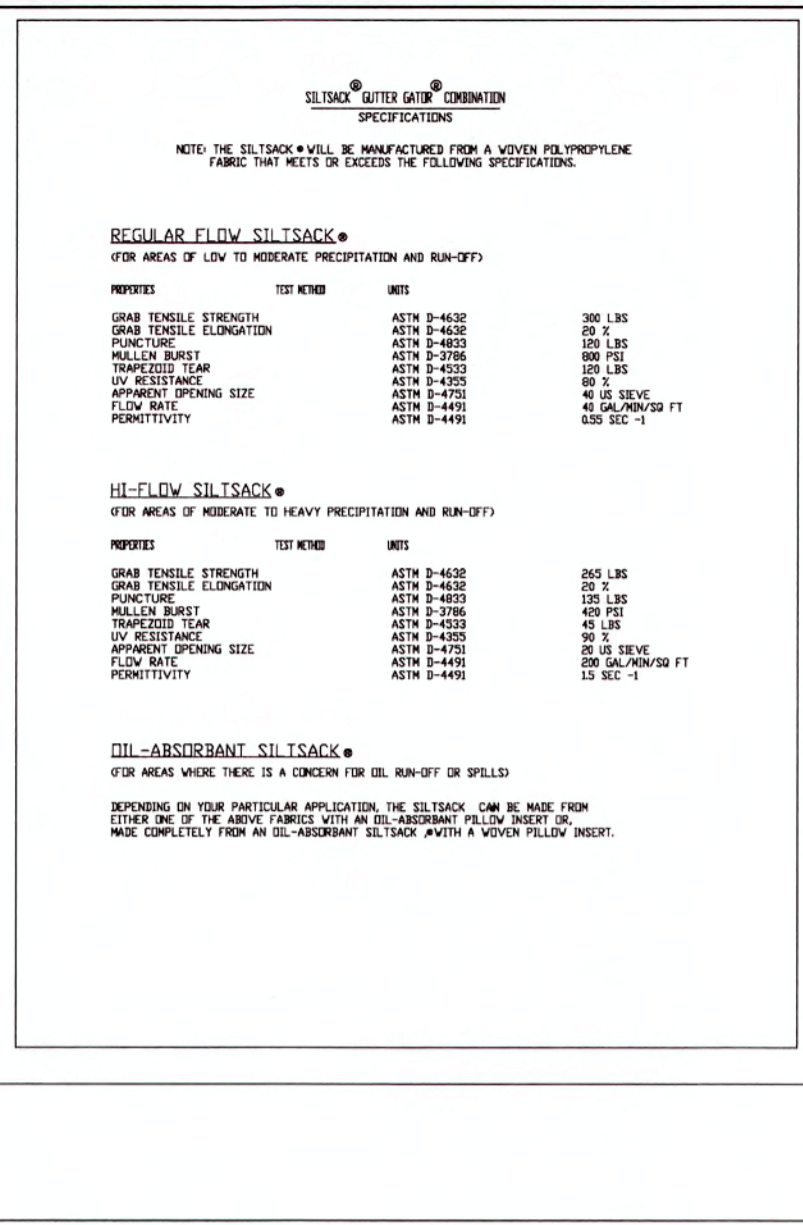
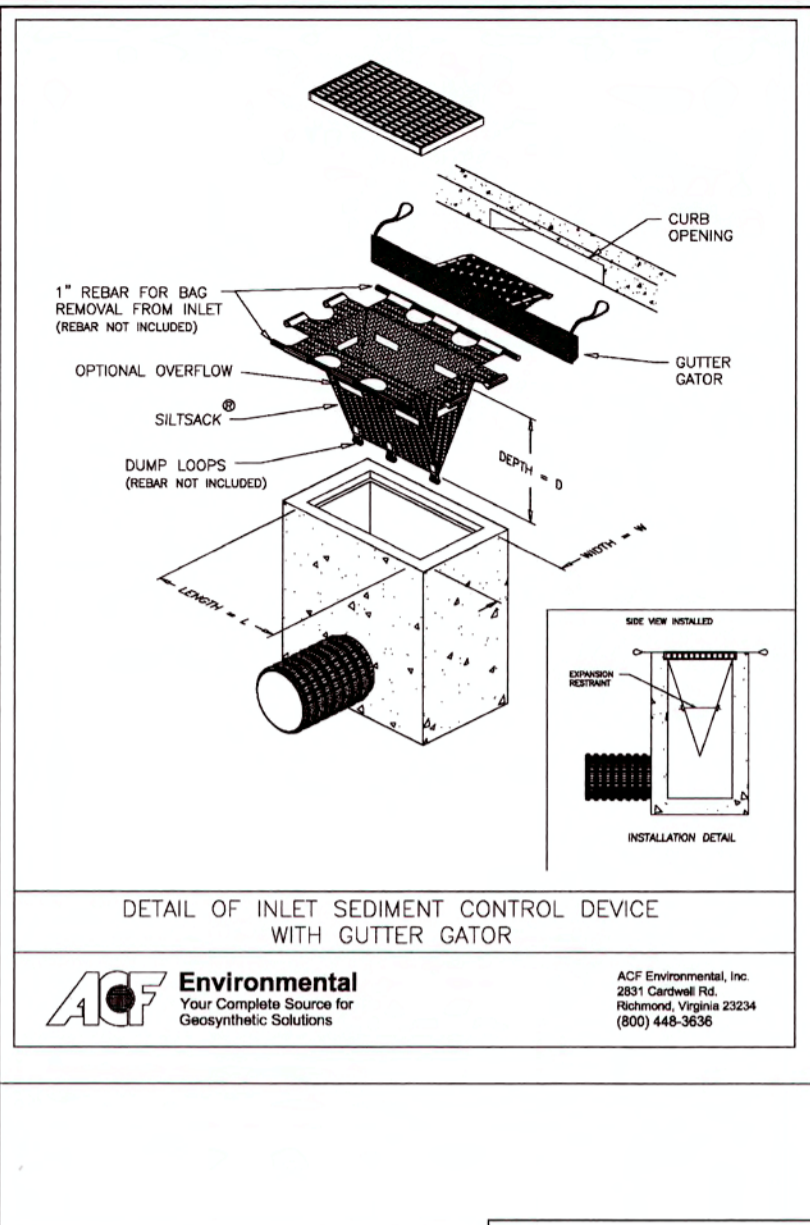
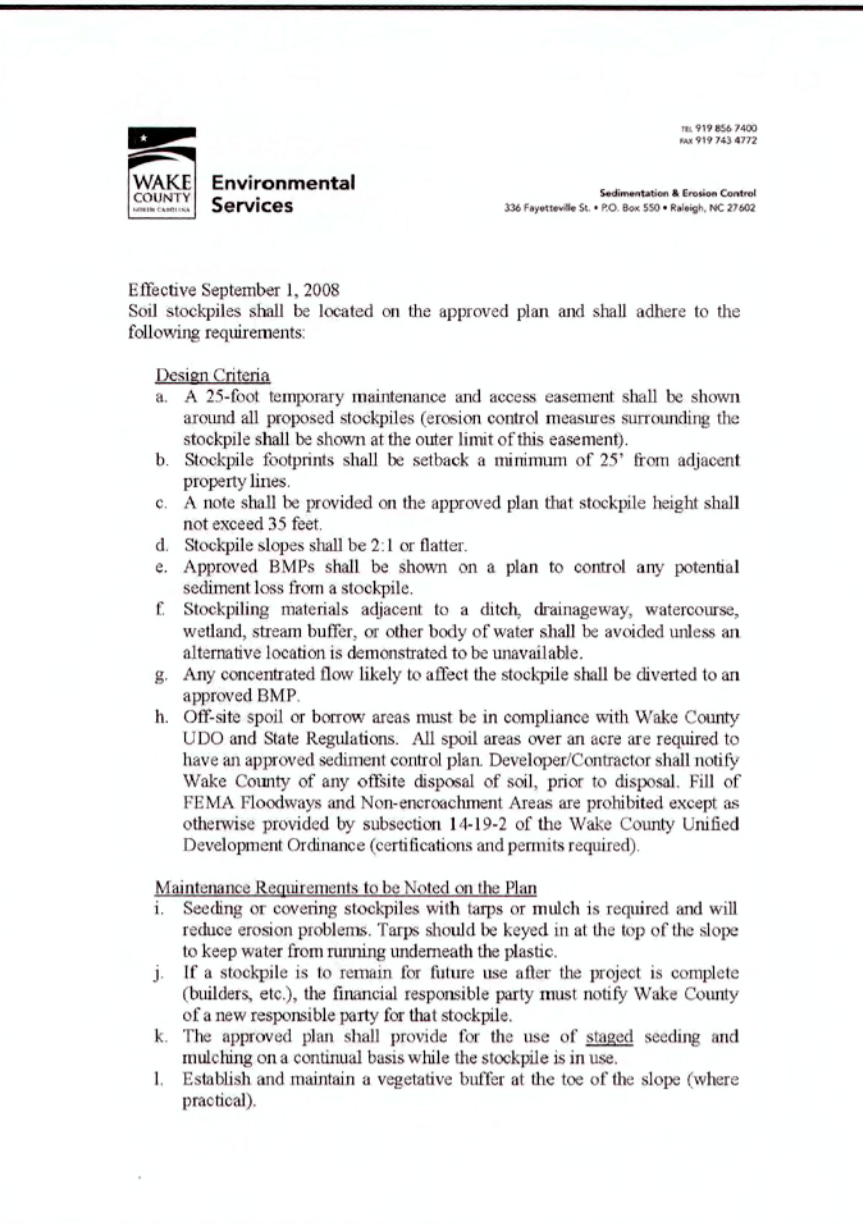
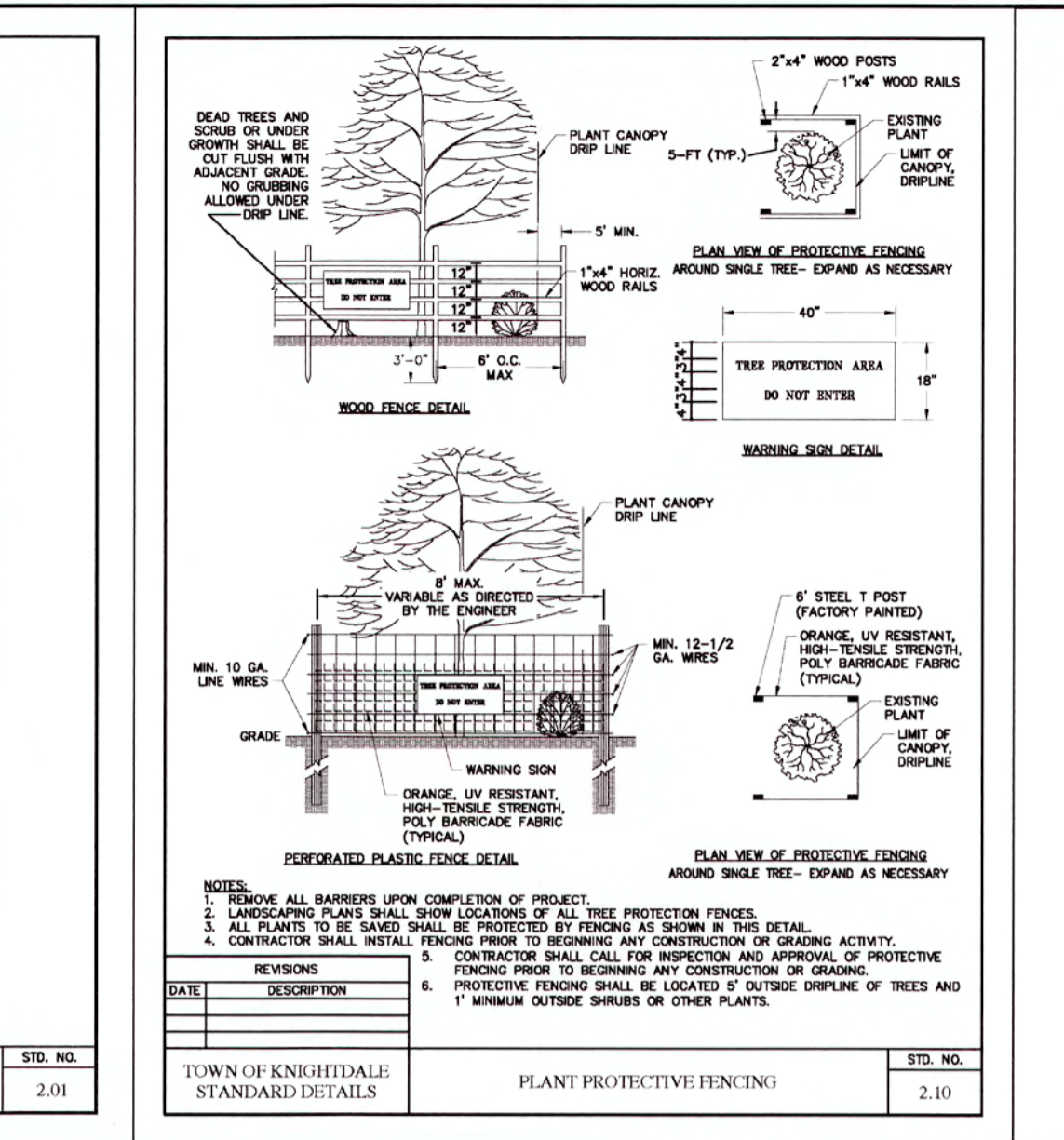


TOWN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.  
BY: S. McAll DATE: 6/13/2019  
DEVELOPMENT SERVICES ENGINEER  
THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
BY: [Signature] DATE: 6/14/19  
ADMINISTRATOR

SEEDING SCHEDULE		
SEEDING PERIOD	SEEDING TYPE	APPLICATION RATE (LB/ACRE)
AUGUST 15 - NOVEMBER 01	TALL FESCUE	300
NOVEMBER 01 - MARCH 01	ARBUZZ RYE	25
MARCH 01 - APRIL 15	TALL FESCUE	300
APRIL 15 - JUNE 30	HALLED COMMON BERMAUDGRASS	25
JULY 01 - AUGUST 15	HOPNOTOP MILLET OR MORNING-GLOAM HYDRUS	30
MARCH 01 - JUNE 01	BERMUDA LEOPOLDA (UNGRAZED) AND	80
MARCH 01 - APRIL 15	TALL FESCUE OR	120
MARCH 01 - JUNE 30	HALLED COMMON BERMAUDGRASS	10
JUNE 01 - SEPTEMBER 01	*TALL FESCUE AND HOPNOTOP MILLET OR MORNING-GLOAM HYDRUS	30
SEPTEMBER 01 - MARCH 01	TALL FESCUE OR	120
NOVEMBER 01 - MARCH 01	ARBUZZ RYE	25

REVISIONS

DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE	SEEDING SCHEDULE	2.01
STANDARD DETAILS		



**WithersRavenel**  
Engineers | Planners | Surveyors

**KNIGHTDALE STATION R8**  
TOWN OF KNIGHTDALE, NORTH CAROLINA

**EROSION CONTROL DETAILS**

Job No. 02090251.94 Drawn By WBR  
Date 11/21/2018 Designer WBR

**PROFESSIONAL ENGINEER**  
SEAL 38549

Revisions

1	TOK & COR COMMENTS	04/12/19
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Sheet No. 9.3

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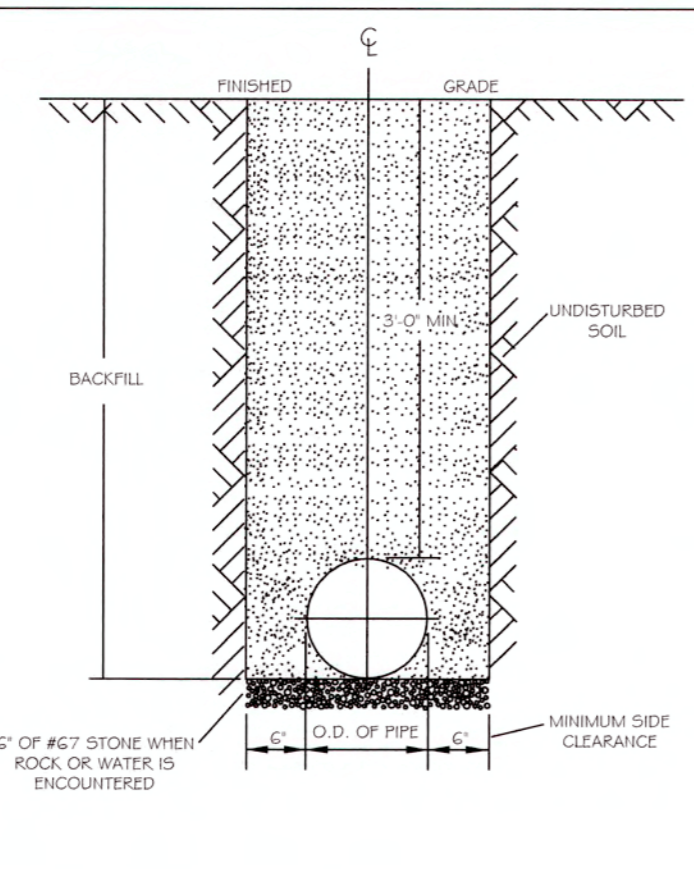
**REACTION BEARING AREAS FOR HORIZONTAL WATER PIPE BENDS BASED ON TEST PRESSURE OF 200 P.S.I.**

PIPE SIZE	1" MIN. BACKFILL	2" MIN. BACKFILL	3" MIN. BACKFILL	4" MIN. BACKFILL	6" MIN. BACKFILL	8" MIN. BACKFILL	10" MIN. BACKFILL	12" MIN. BACKFILL
6"	1,108	1	1	1	1	1	2	1
8 1/4"	2,807	1	2	2	1	1	1	3
10"	4,388	2	3	3	1	1	2	5
12"	7,956	2	4	5	1	1	2	8
14"	5,653	2	3	4	1	1	2	6
16"	1,978	1	1	2	1	1	1	2
18 1/4"	3,922	1	2	3	1	1	1	4
20"	7,694	2	4	5	1	1	2	8
24"	14,215	4	8	9	2	2	4	15
30"	10,653	3	5	6	2	2	3	10
36"	4,433	2	3	3	1	1	2	5
42 1/2"	8,826	3	5	6	2	2	3	9
48"	17,312	5	9	11	3	3	5	18
54"	31,983	8	16	19	4	4	8	32
60"	22,619	6	10	14	3	3	6	23
66"	7,881	2	4	5	1	1	2	8
72 1/2"	15,691	4	8	10	2	2	4	16
78"	30,779	8	16	19	4	4	8	31
84"	36,861	10	20	25	5	5	10	37
90"	40,213	10	21	25	5	5	10	41

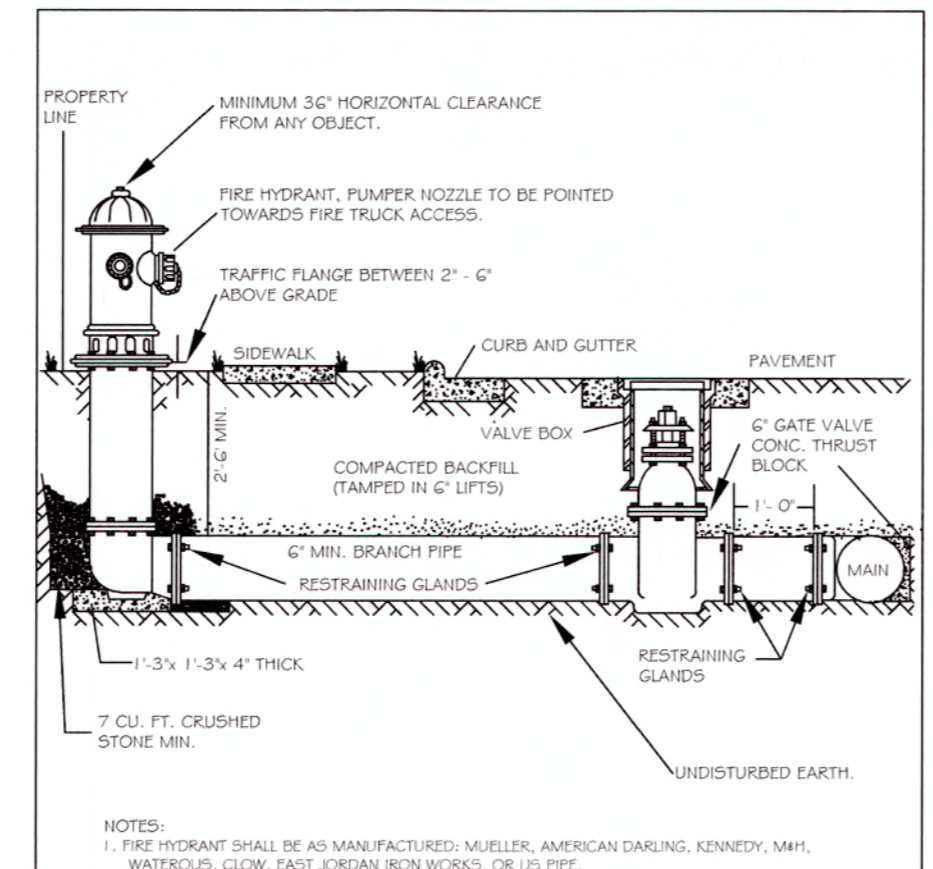
**REACTION BEARING AREAS ARE IN SQUARE FEET MEASURED IN A VERTICAL PLANE IN THE TRENCH SIDE AT AN ANGLE OF 90° TO THE THRUST LINE.**

USE 1.5 TO 2.0 BEAD VALUE FOR HYDRANTS FOR ADDITIONAL SAFETY FACTOR.

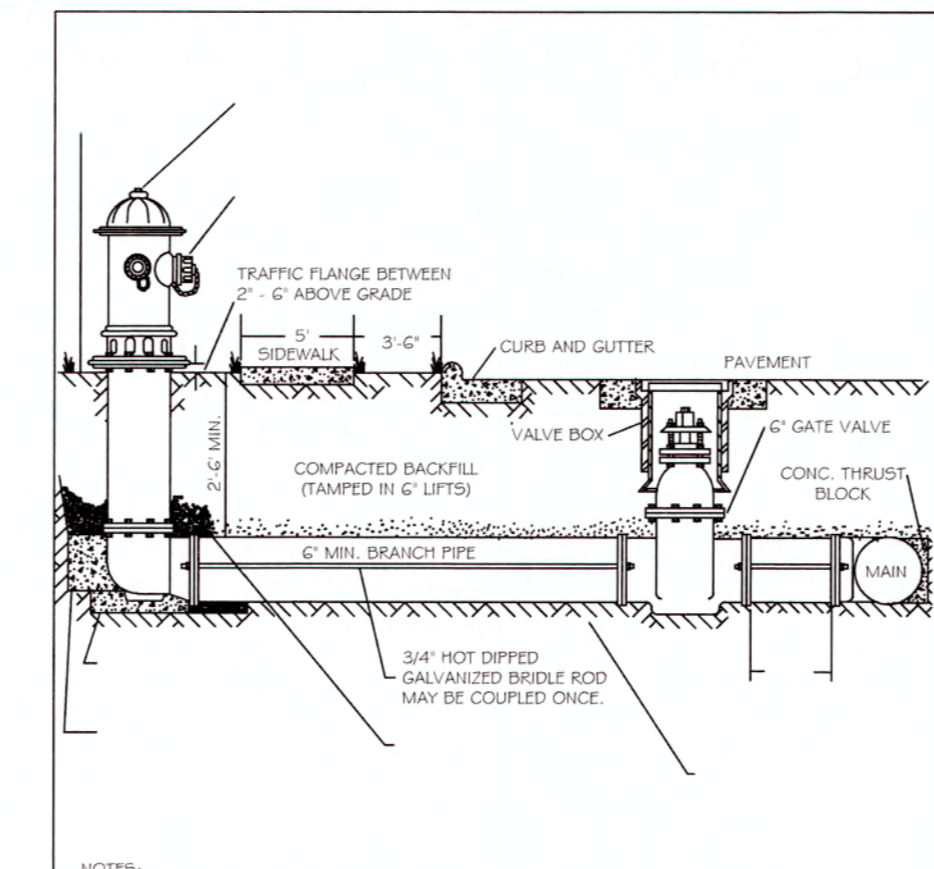
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-10	1	12-23-18	1	12-23-18



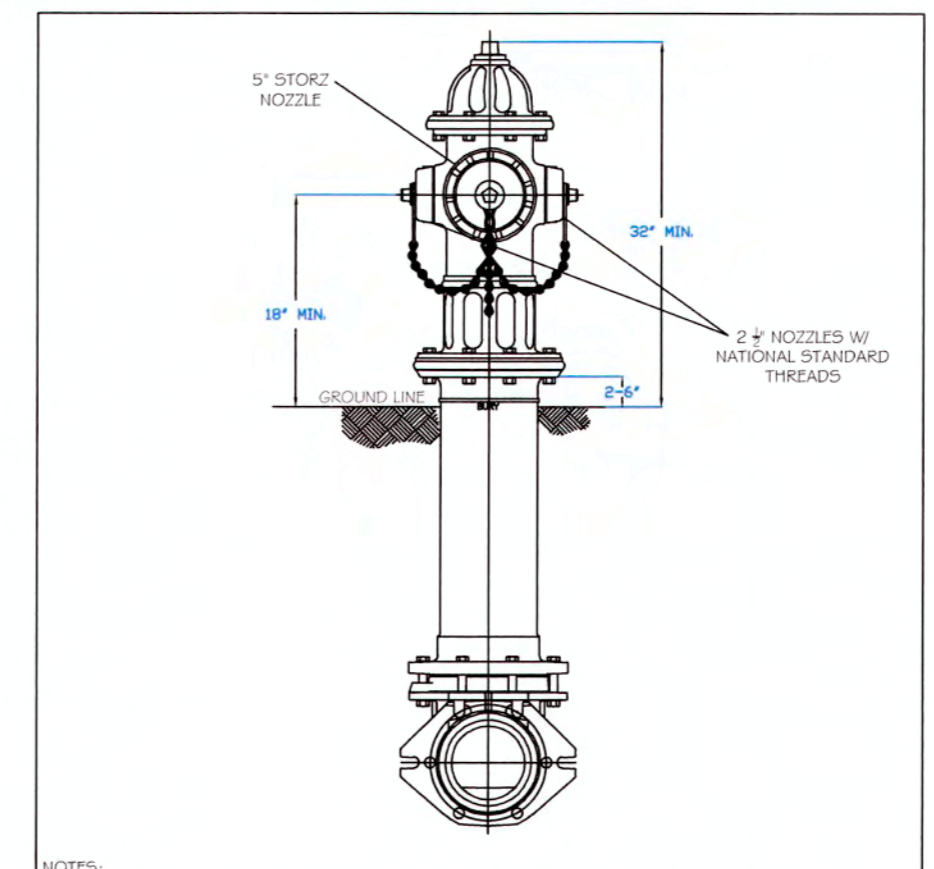
- NOTES:**
- TRENCHES REQUIRING SHORING AND BRACING, DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING AND BRACING.
  - NO ROCKS OR BOLLERS 4" OR LARGER TO BE USED IN BACKFILL.
  - ALL BACKFILL MATERIAL SHALL BE SUITABLE NATIVE MATERIAL.
  - BACKFILL SHALL BE TAMPED IN 6" LIFTS.
  - ACHIEVE 95% COMPACTION IN BACKFILL.



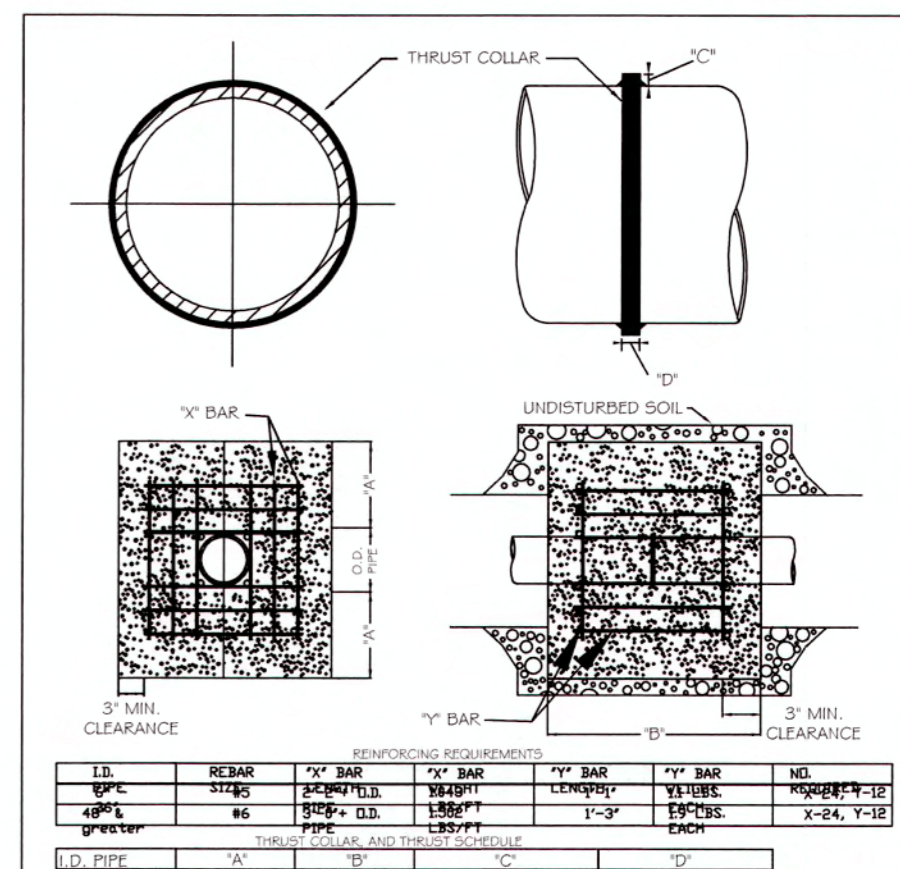
- NOTES:**
- FIRE HYDRANT SHALL BE AS MANUFACTURED: MULLER, AMERICAN DARING, KENNEDY, MHI, WATERLOO, CLOW, EAST JORDAN NEW WORKS, OR US PIPE.
  - BRANCH PIPE SHALL BE DUCTILE IRON AWWA C900-15 OR 20\"/>



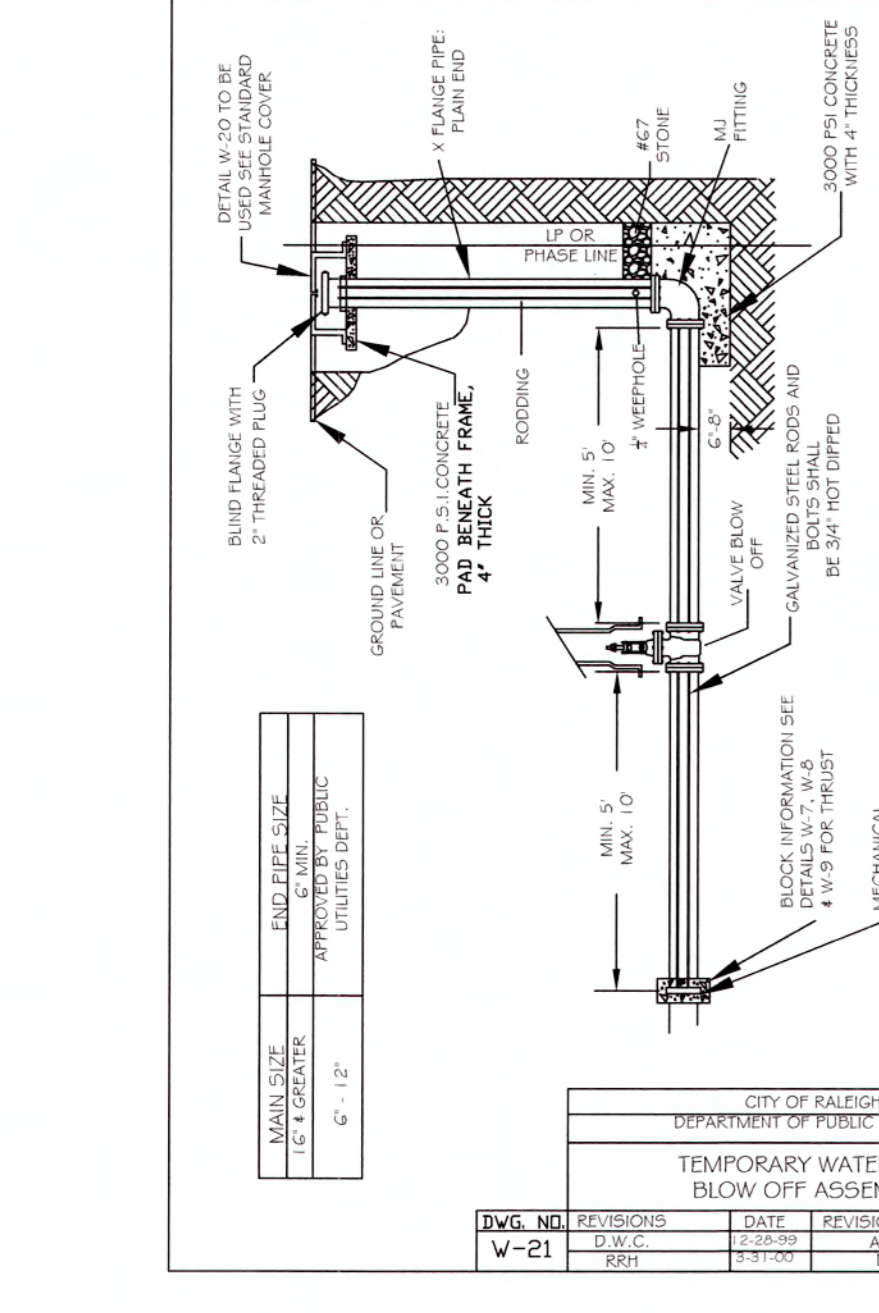
- NOTES:**
- FIRE HYDRANT SHALL BE AS MANUFACTURED: MULLER, AMERICAN DARING, KENNEDY, MHI, WATERLOO, CLOW, EAST JORDAN NEW WORKS, OR US PIPE.
  - BRANCH PIPE SHALL BE DUCTILE IRON AWWA C900-15 OR 20\"/>



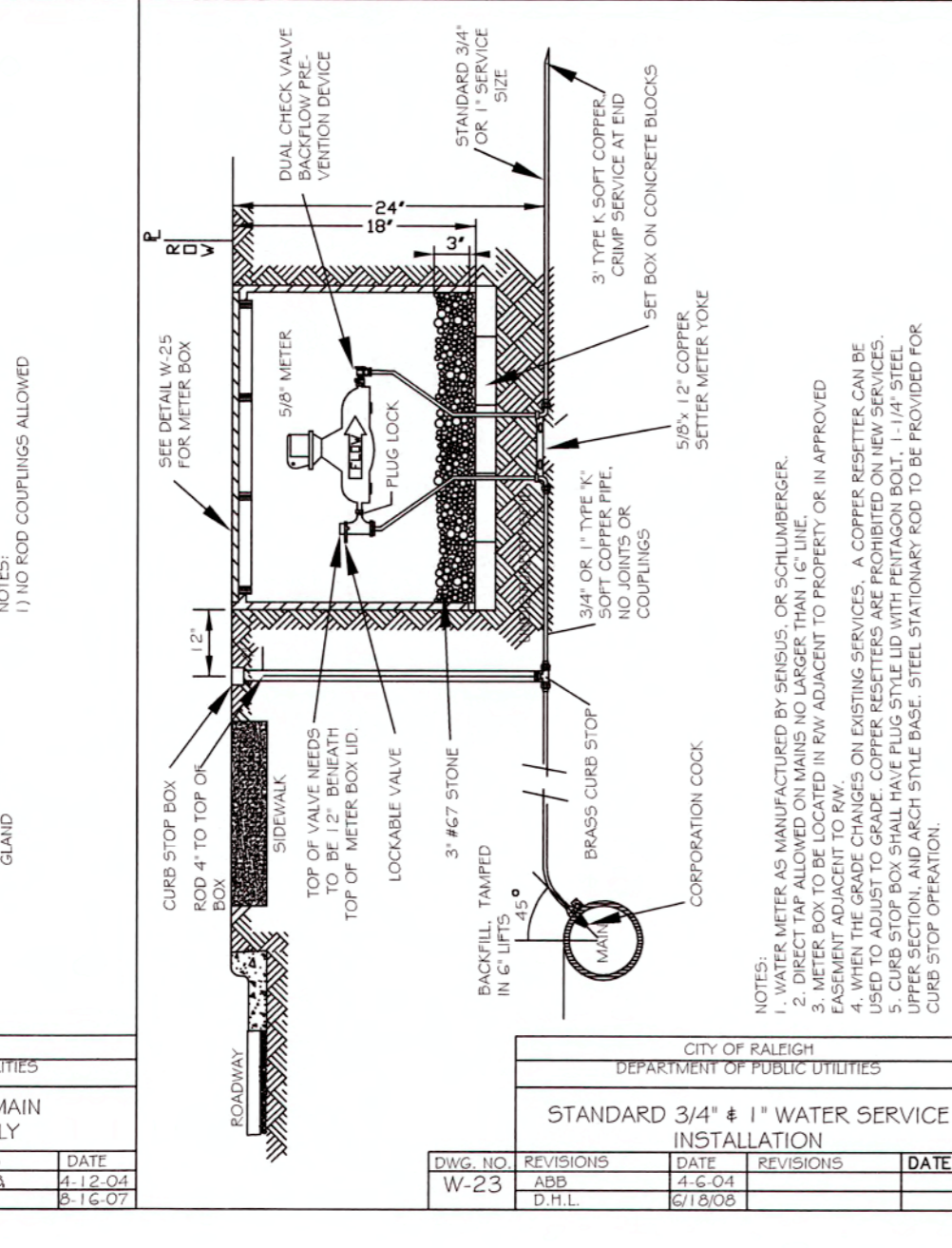
- NOTES:**
- ALL PUBLIC FIRE HYDRANTS IN THE CITY OF RALEIGH AND THE MERGER TOWNS OF GARNER, ROLESVILLE, WAKE FOREST, KNIGHTDALE, WENDILL & ZEBULON SHALL BE PAINTED CHROME YELLOW WITH HIGH REFLECTIVE ALUMINUM SILVER CAPS, BONNETS AND OPERATING NUTS.
  - ALL PRIVATE FIRE HYDRANTS SHALL BE RED.



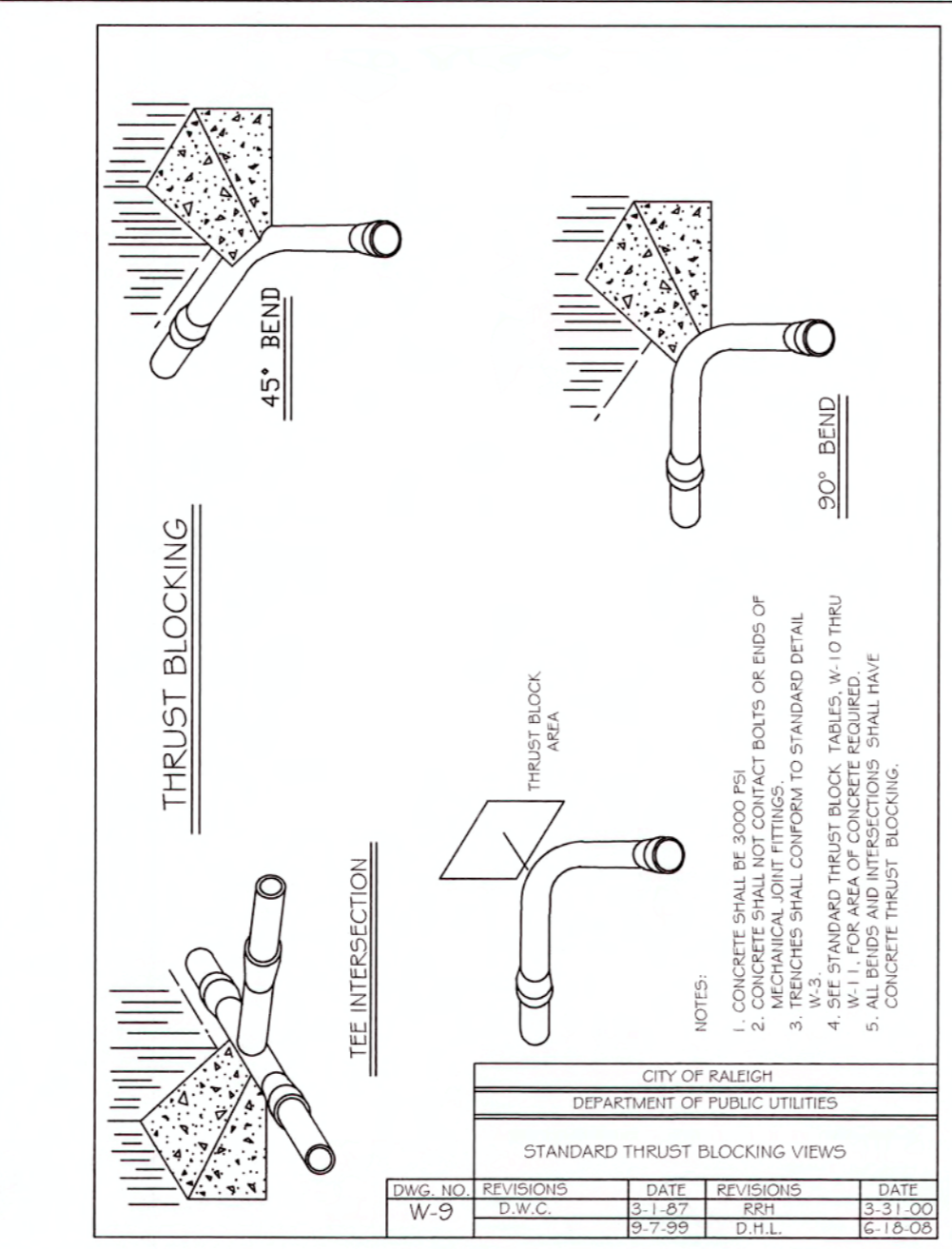
- NOTES:**
- SEE STANDARD DETAIL W-9 FOR THRUST BLOCK LOCATIONS.
  - CONCRETE SHALL BE 3000 PSI AND TRANSLATED.
  - REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
  - TRENCH BOTTOM WITHIN VICINITY OF THRUST BLOCK INSTALLATION SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD DETAIL W-3.
  - STANDARD DETAIL W-3 LIFTS PER
  - THRUST COLLAR MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH SIDES OF COLLAR AROUND CIRCUMFERENCE.



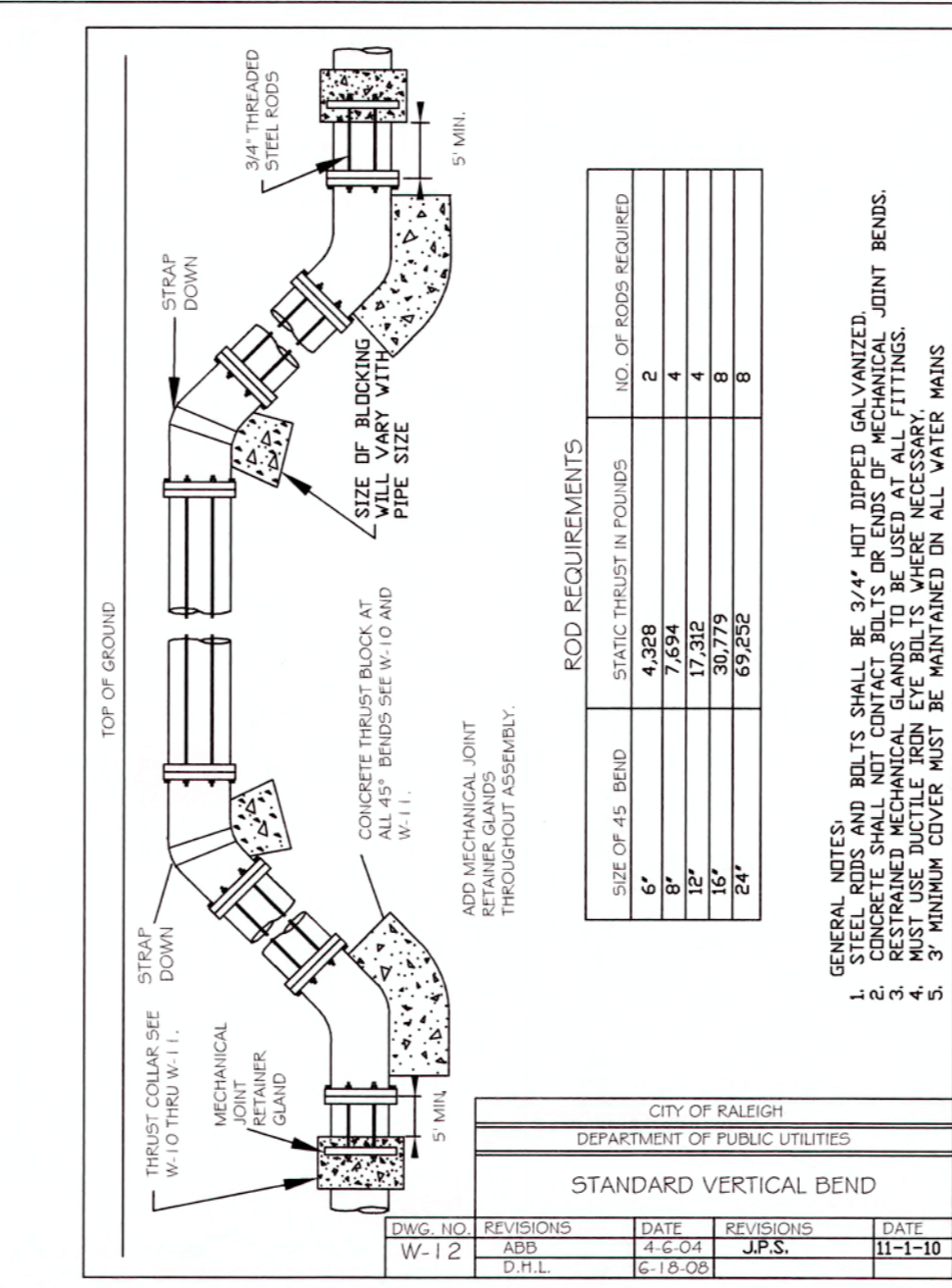
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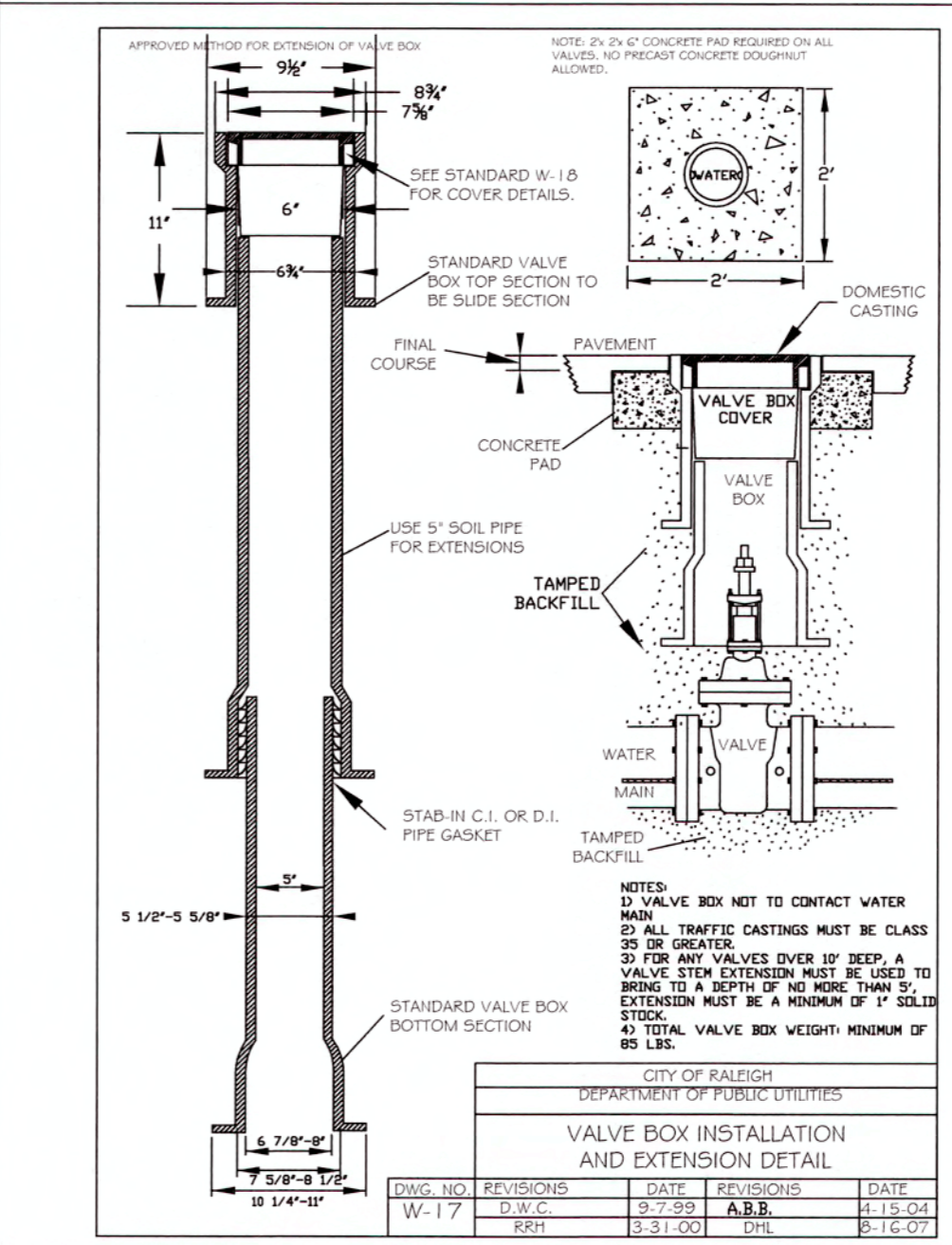
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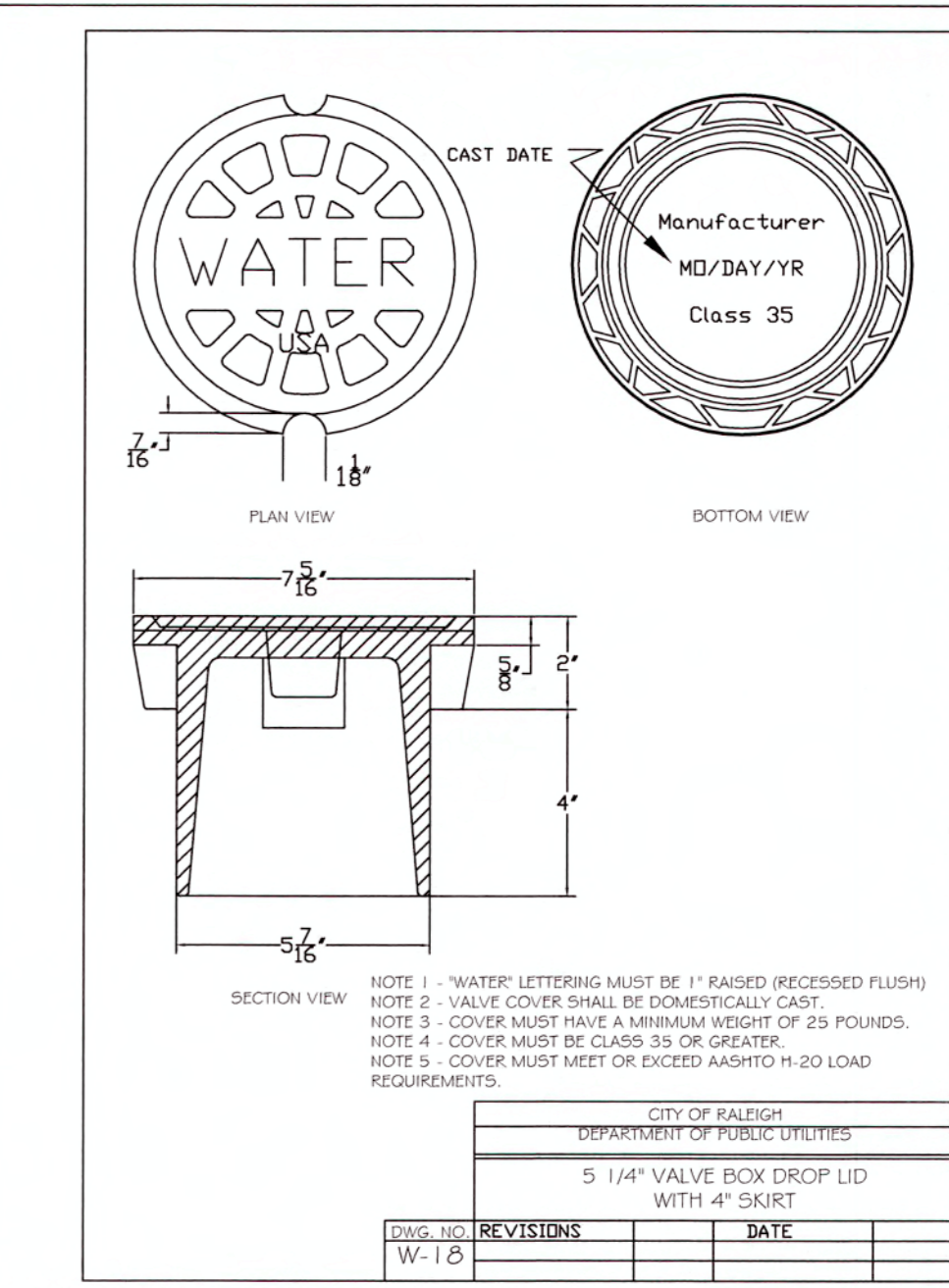
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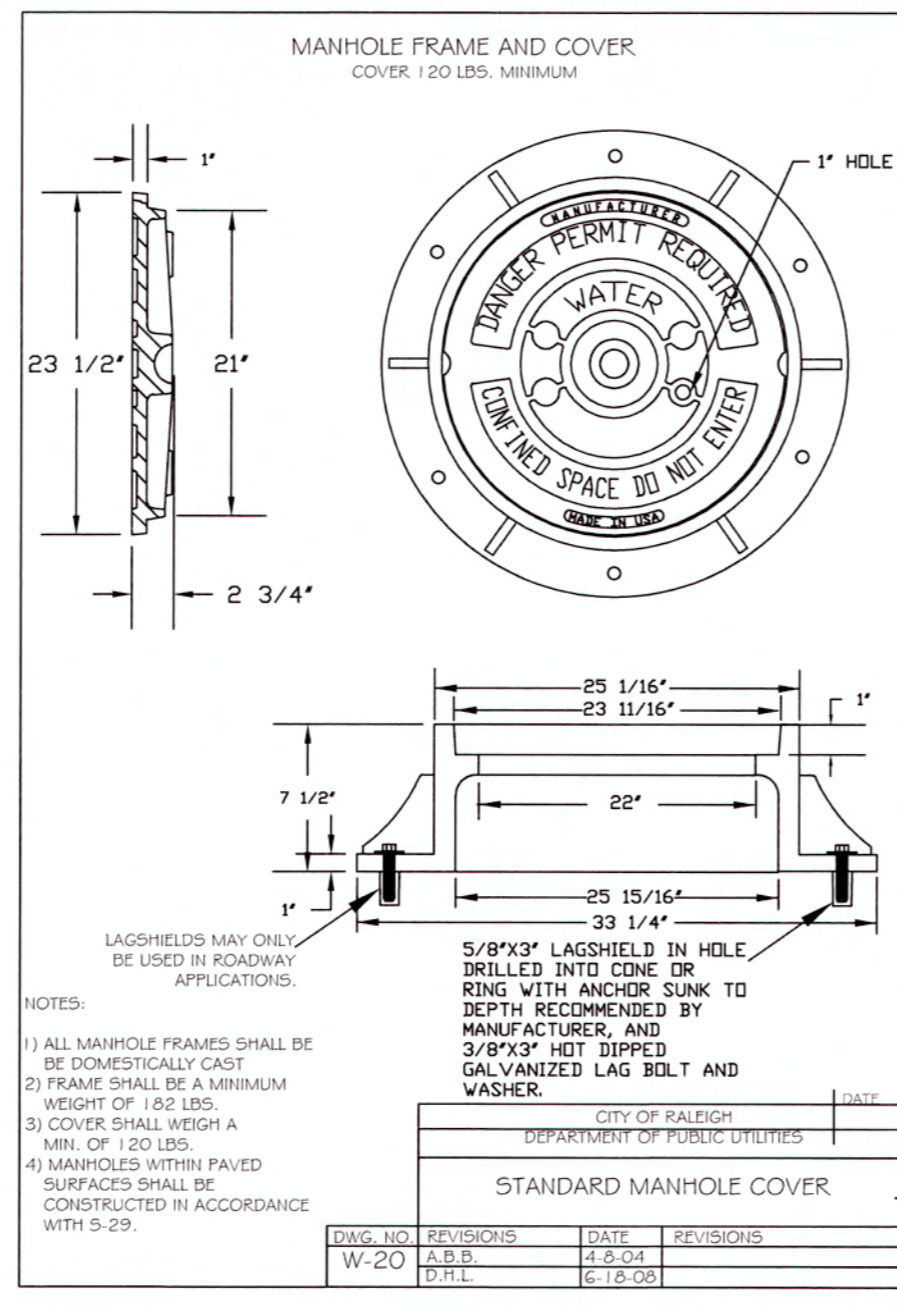
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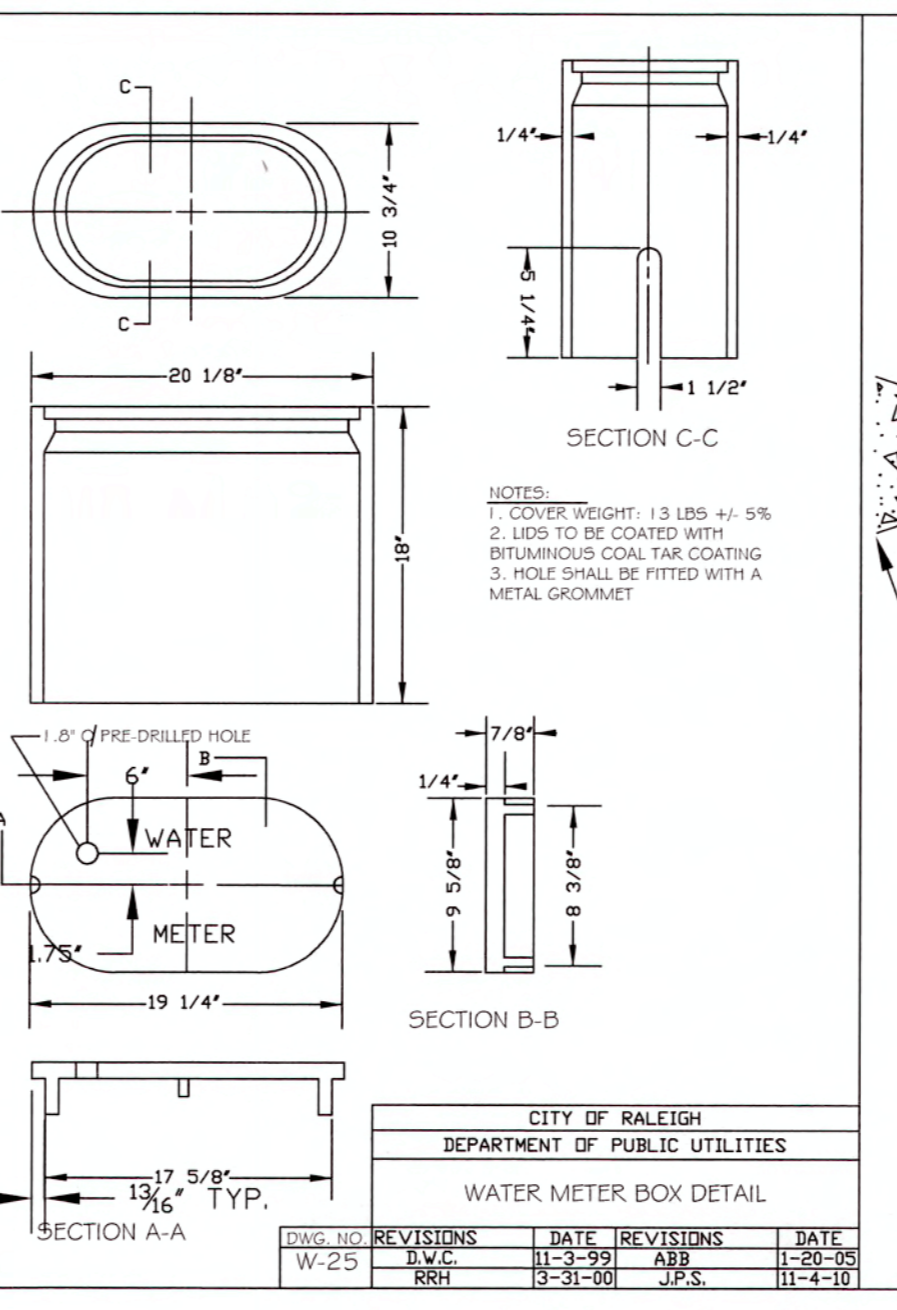
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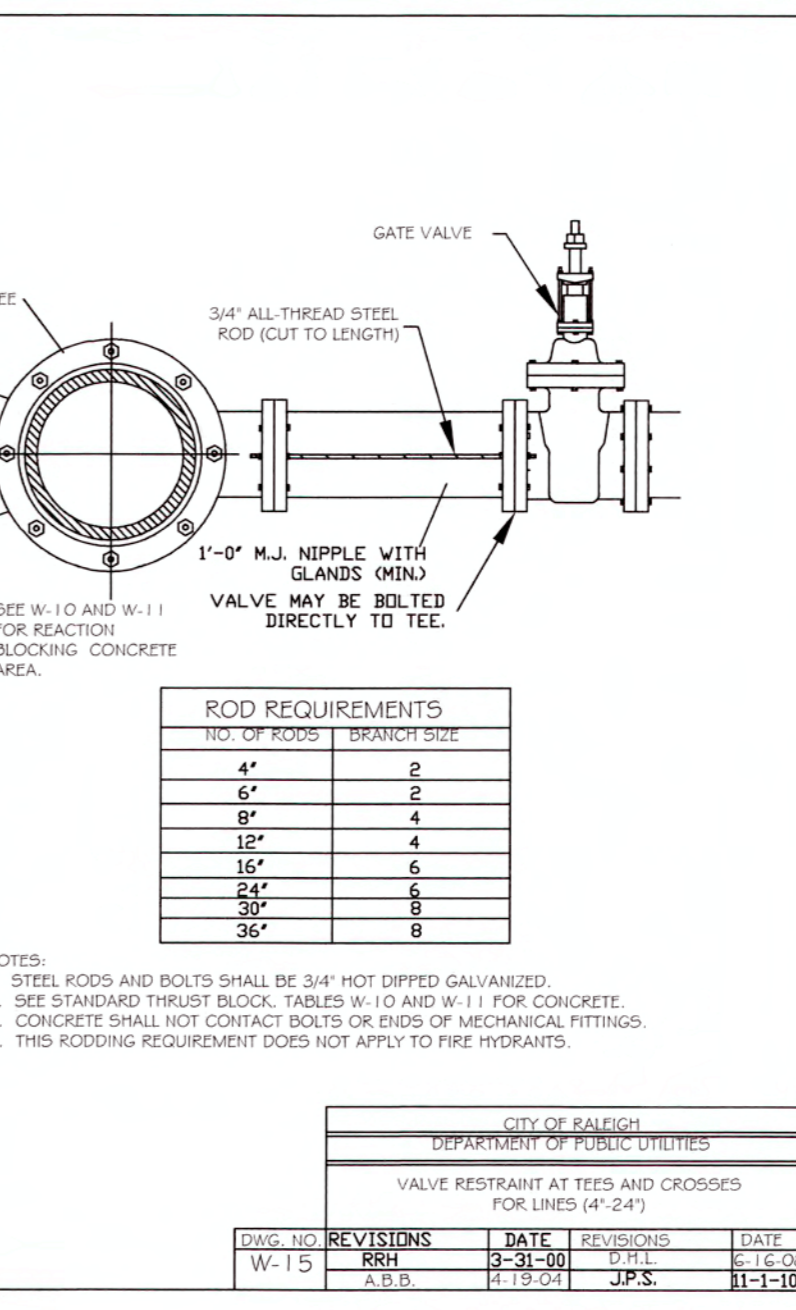
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W-18	1	6-25-18	1	6-12-2018



DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-20	1	6-12-18	1	6-12-2018



DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
W-25	1	3-31-18	1	6-12-2018



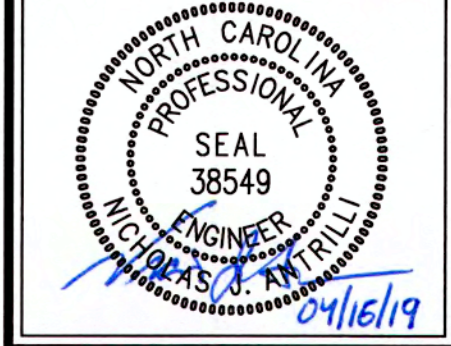
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**WithersRavenel**  
Engineers | Planners | Surveyors

**KNIGHTDALE STATION R8**  
TOWN OF KNIGHTDALE, NORTH CAROLINA

**WATER UTILITY DETAILS**

Job No. 02090251.94 Drawn By W&R  
Date 11/21/2018 Designer W&R



Revisions

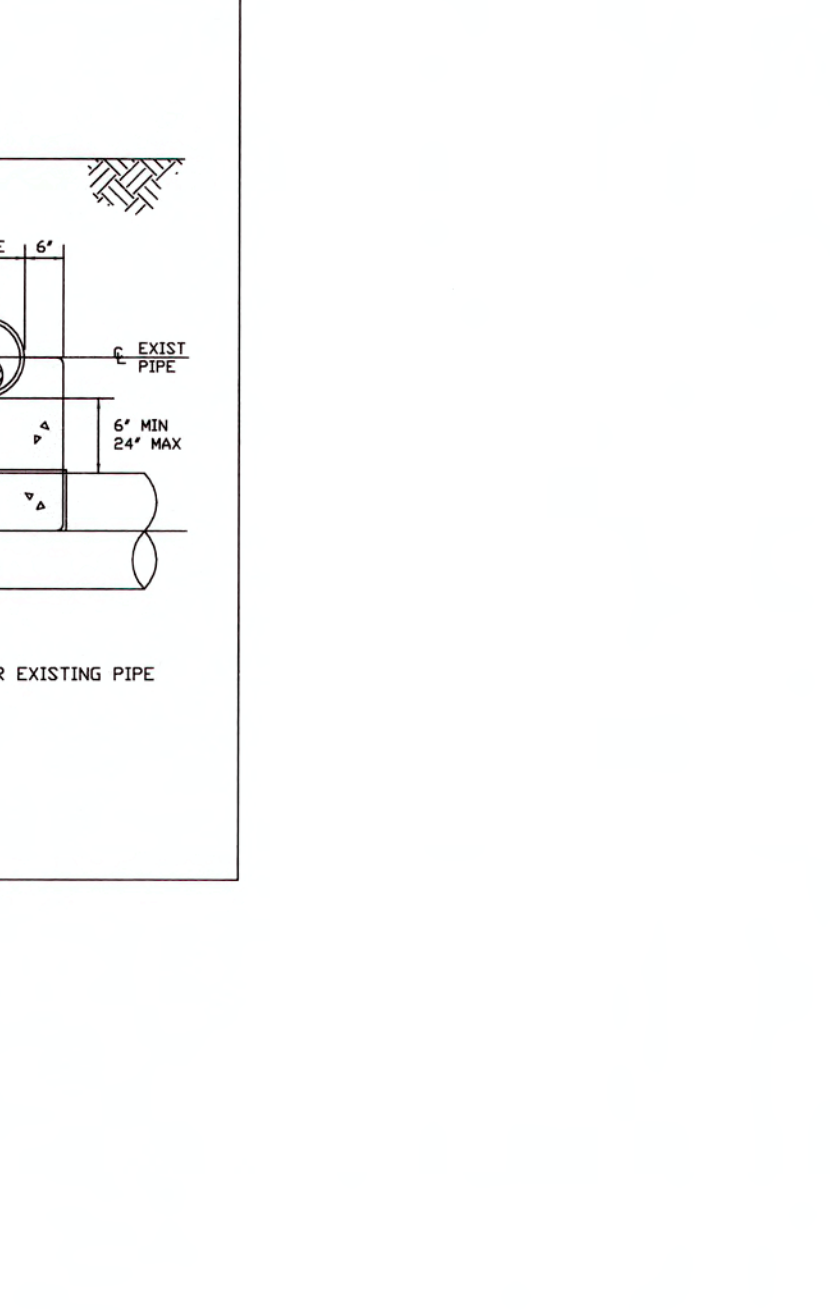
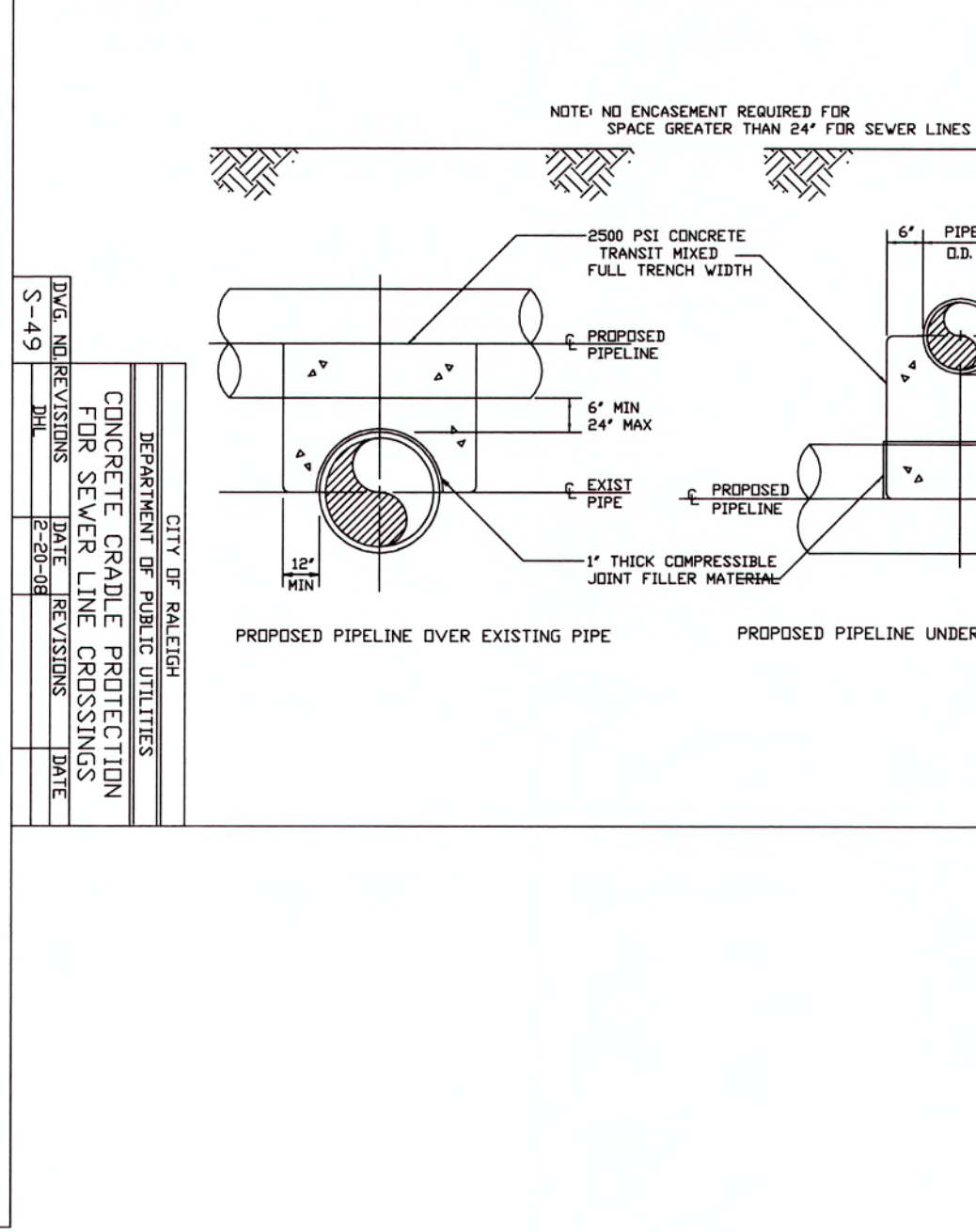
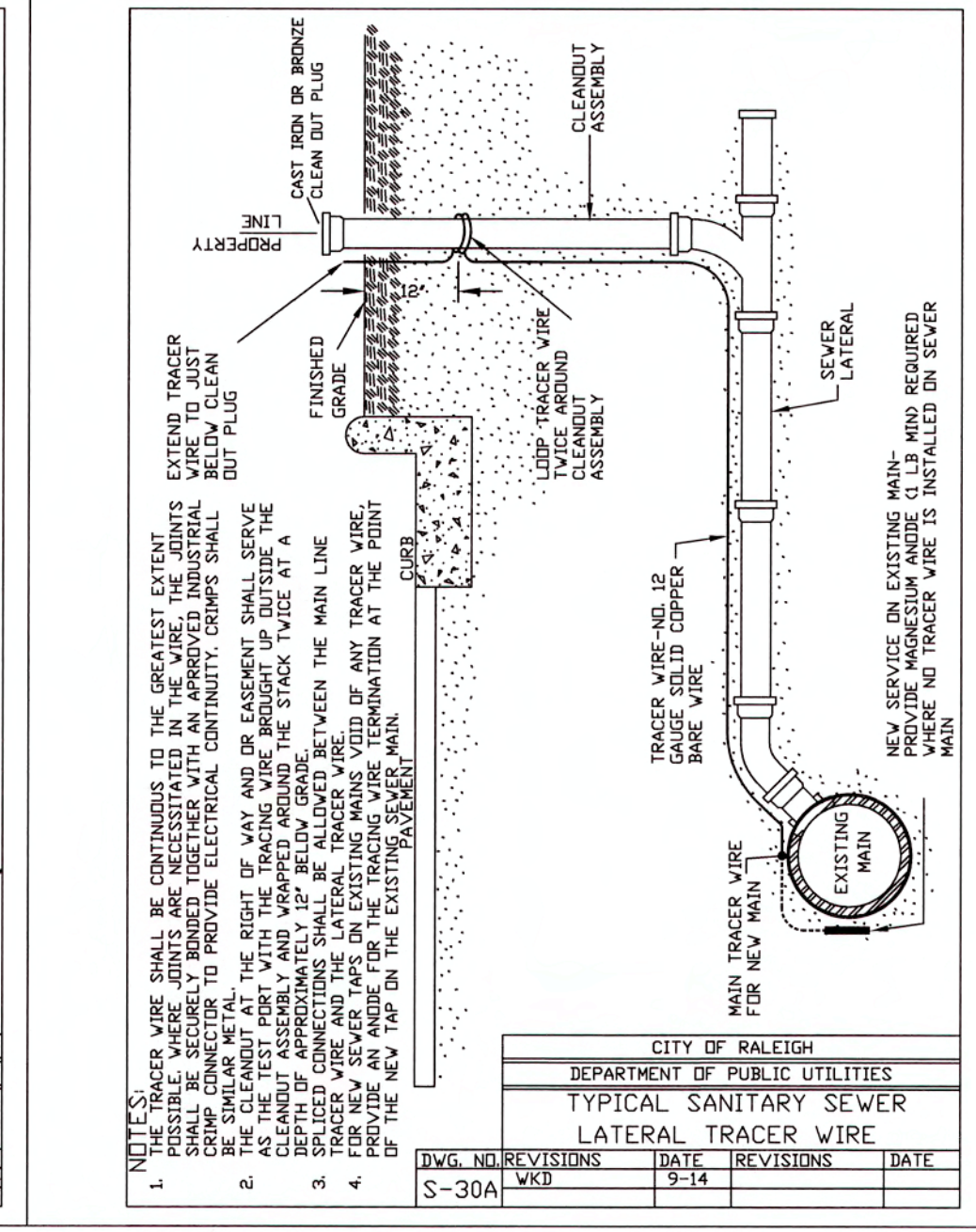
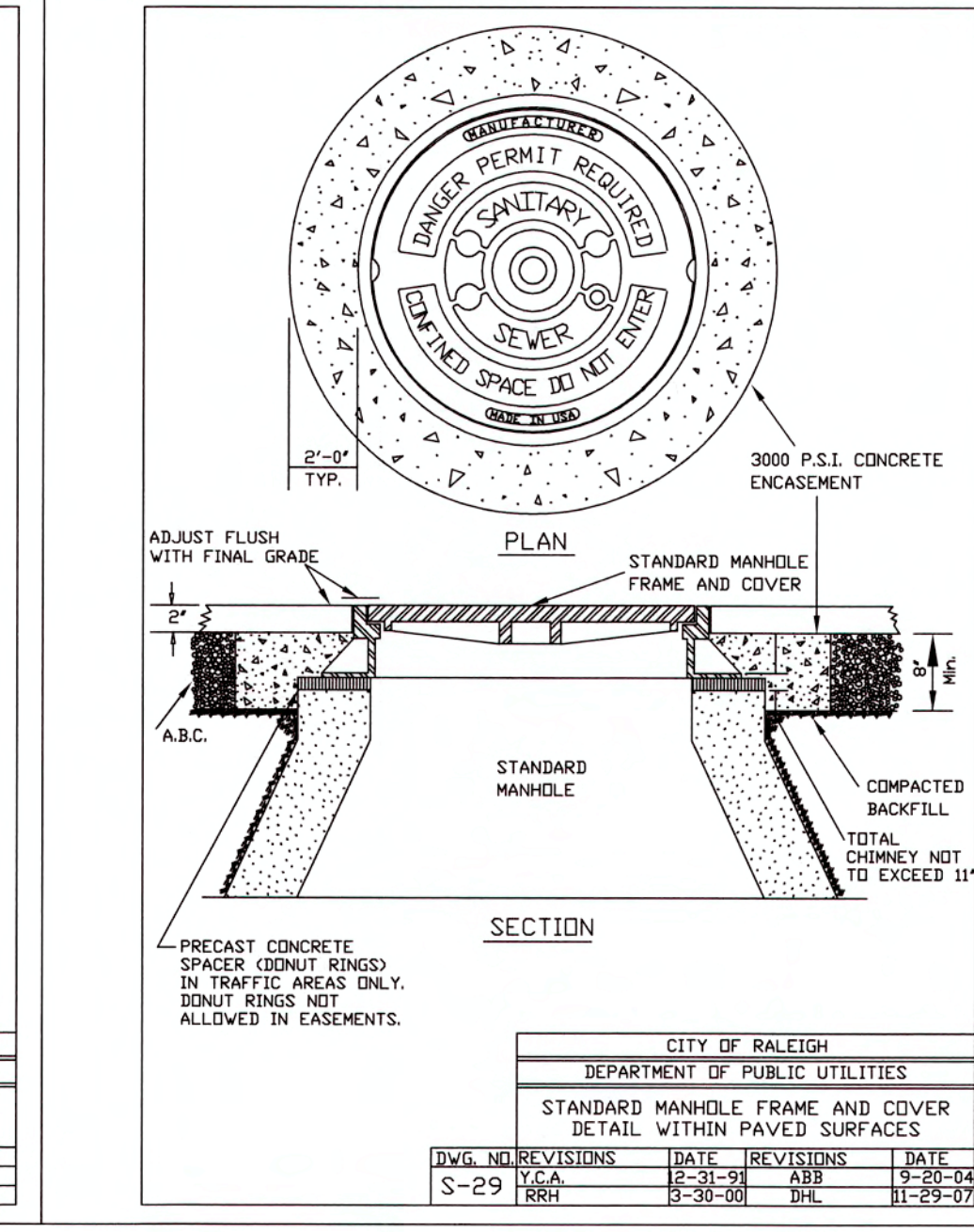
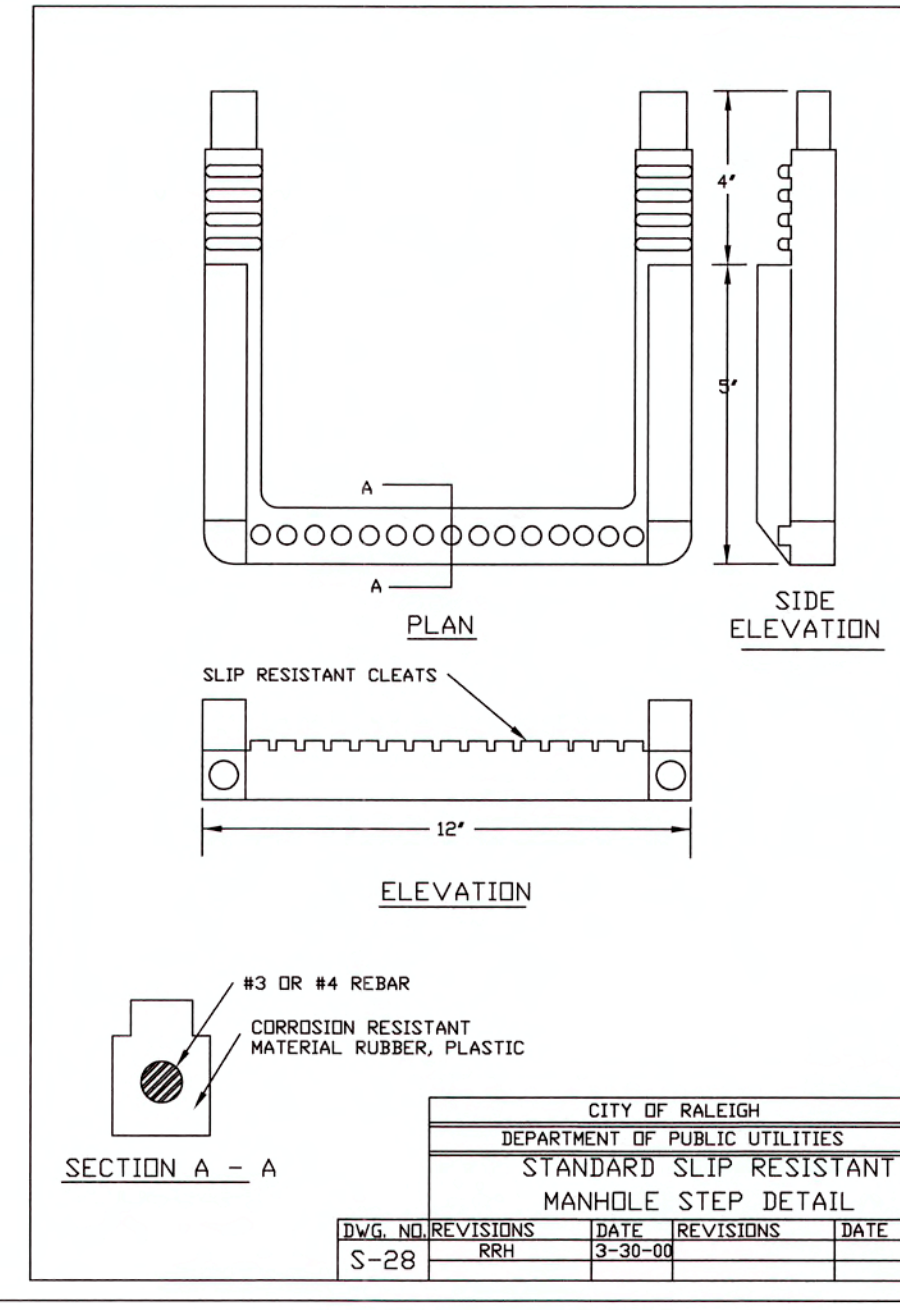
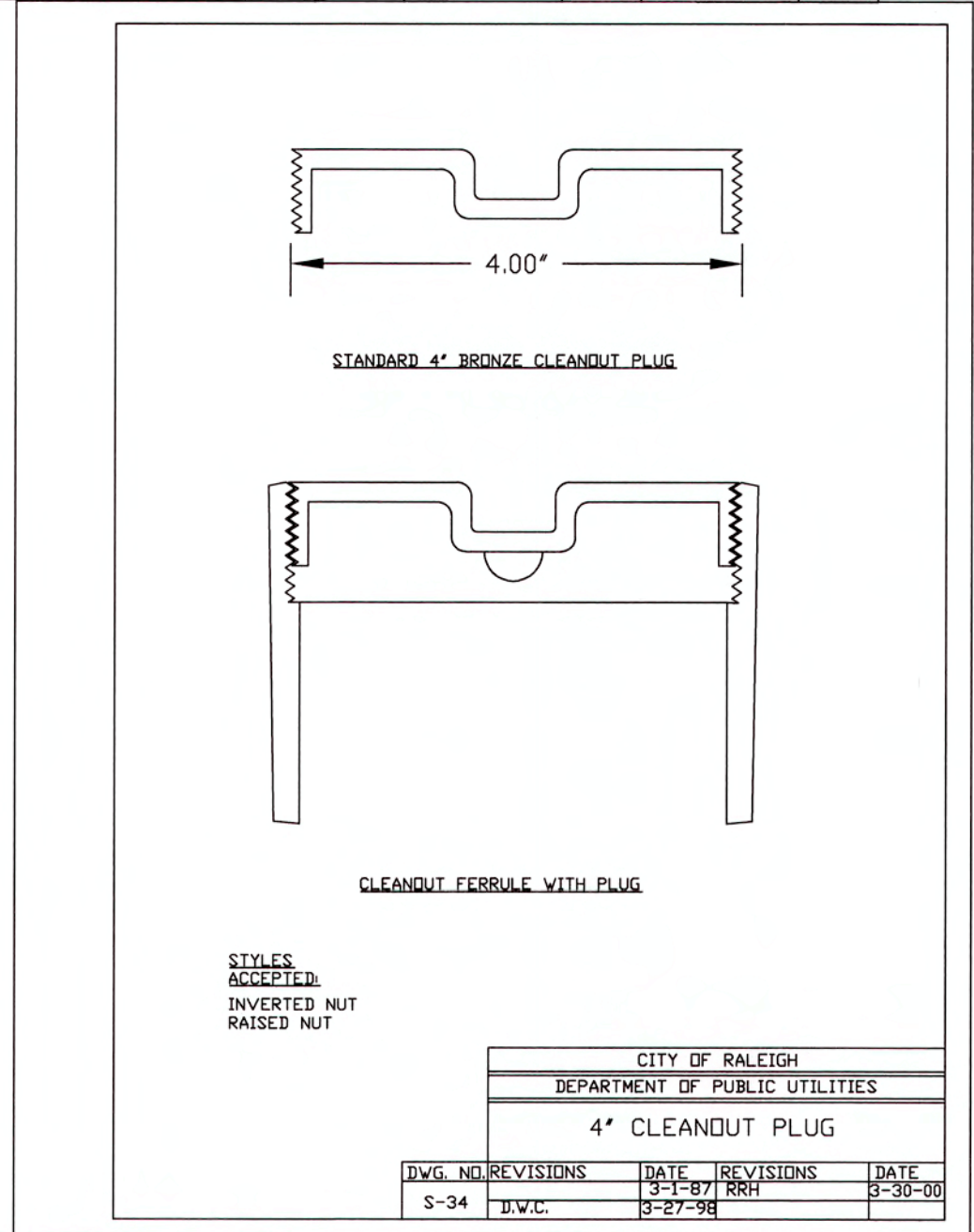
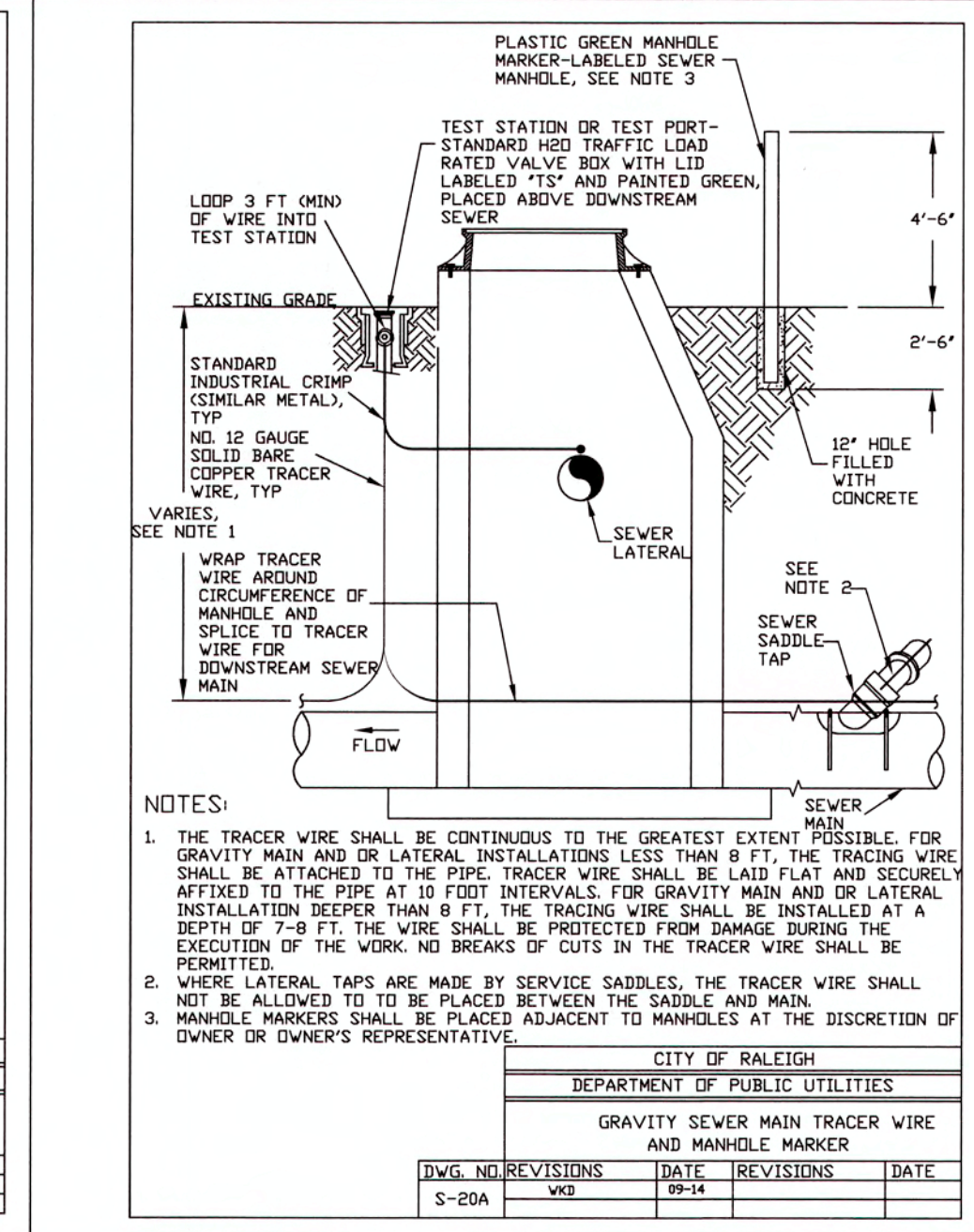
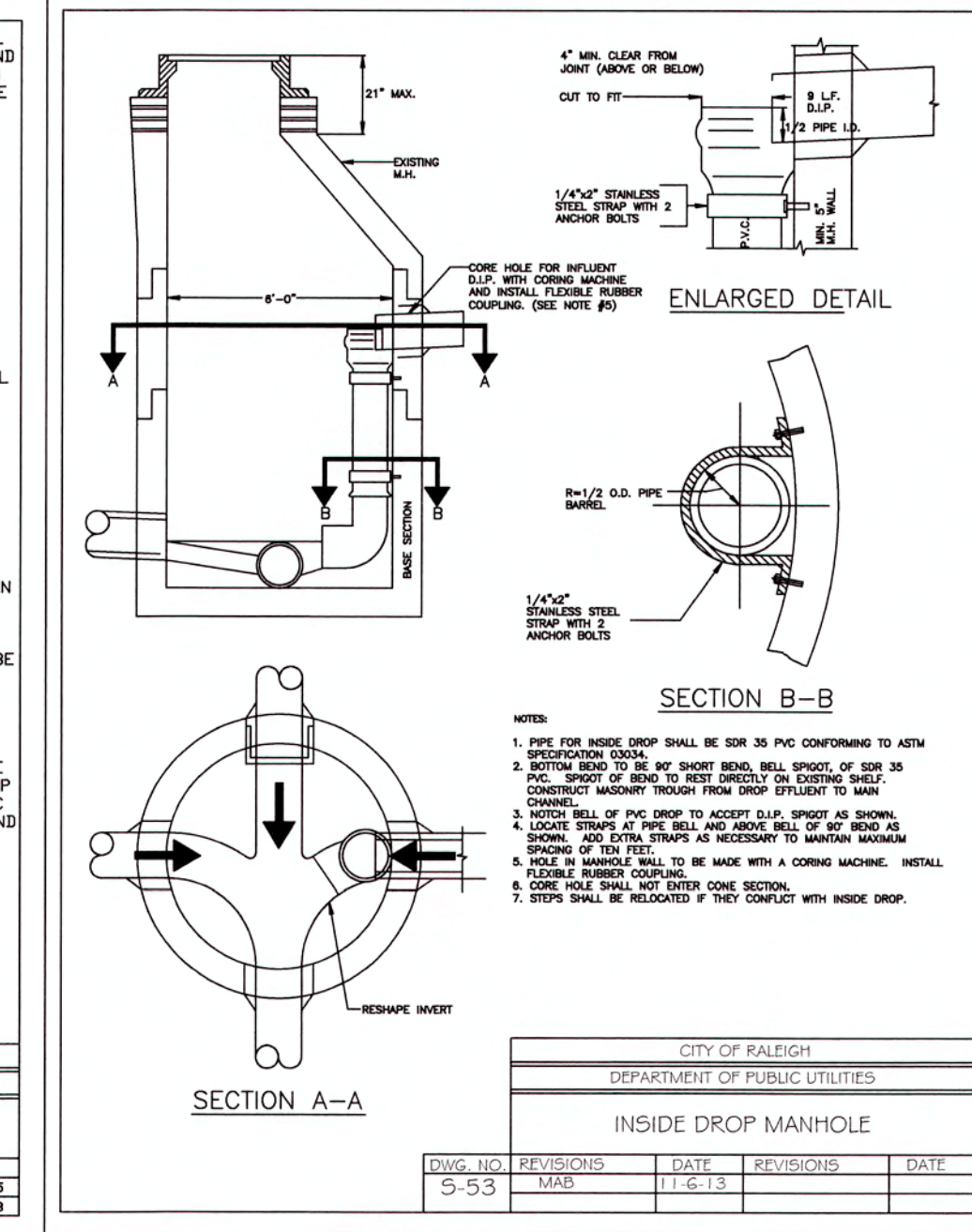
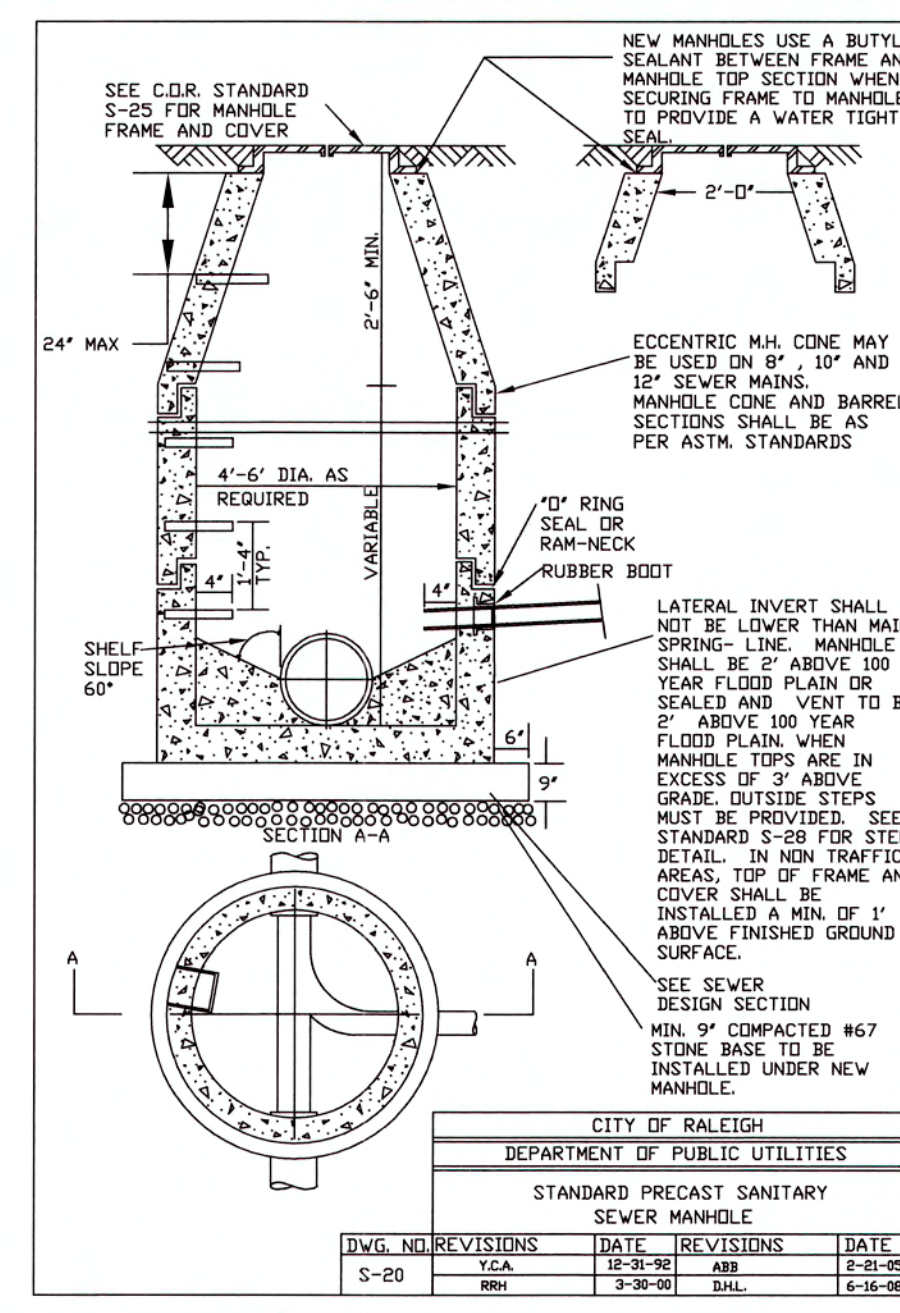
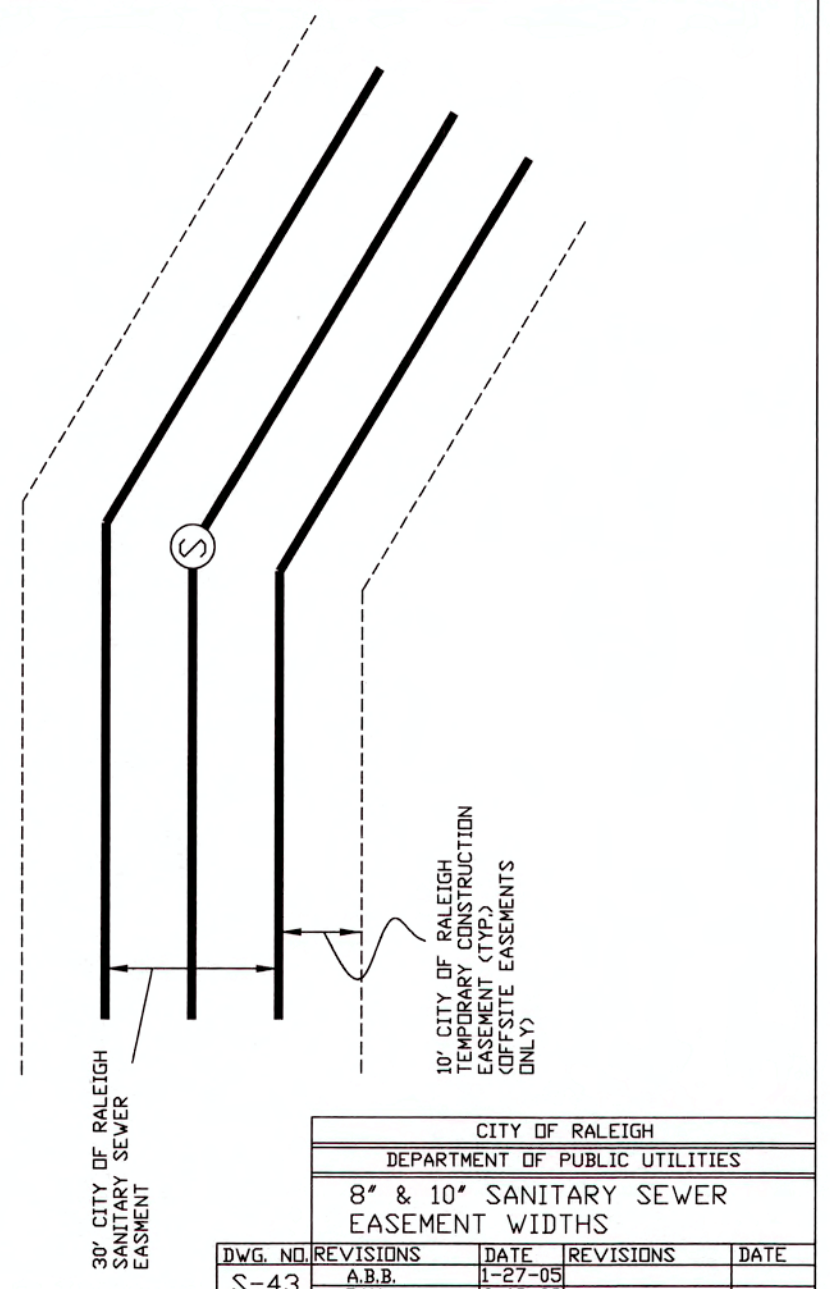
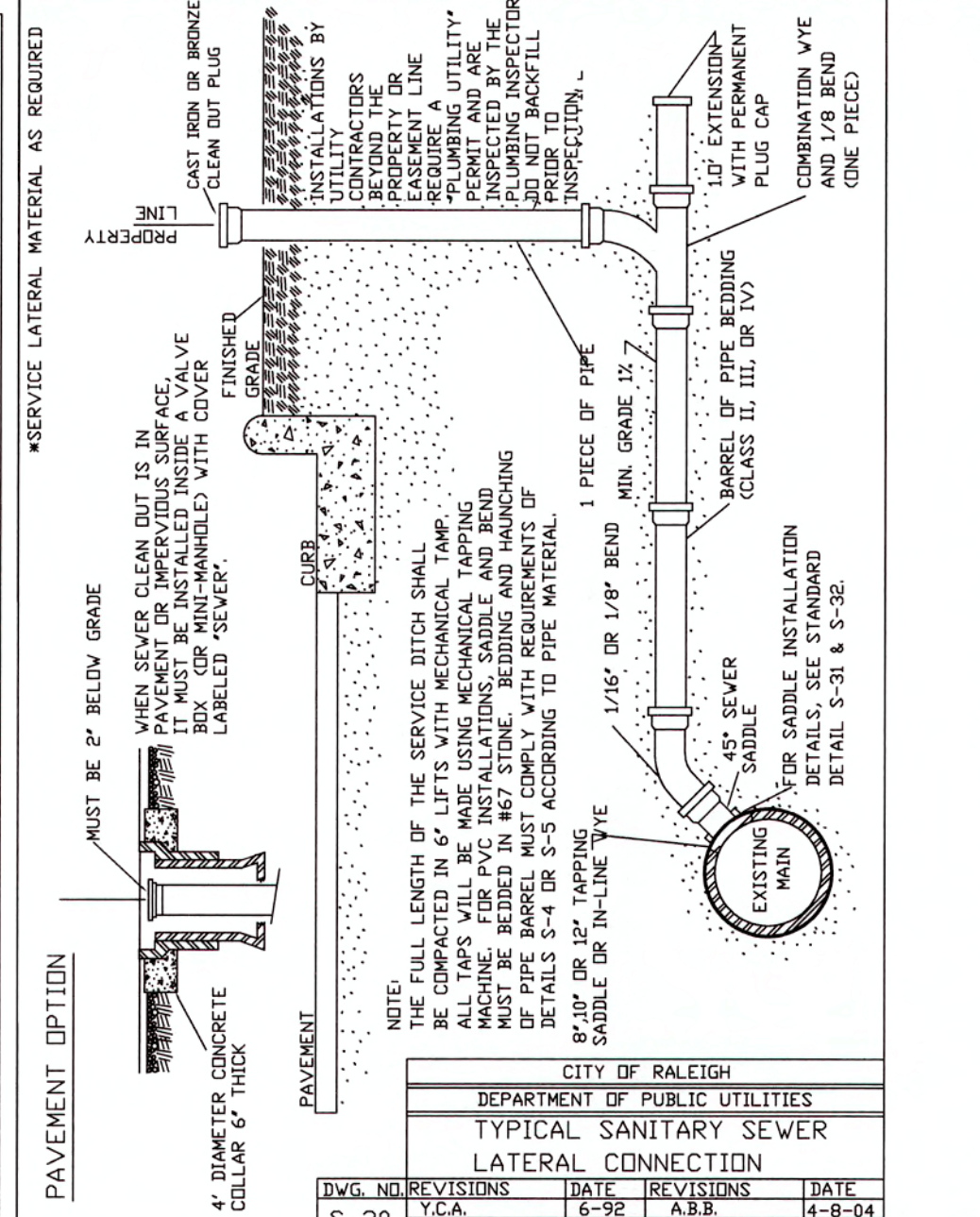
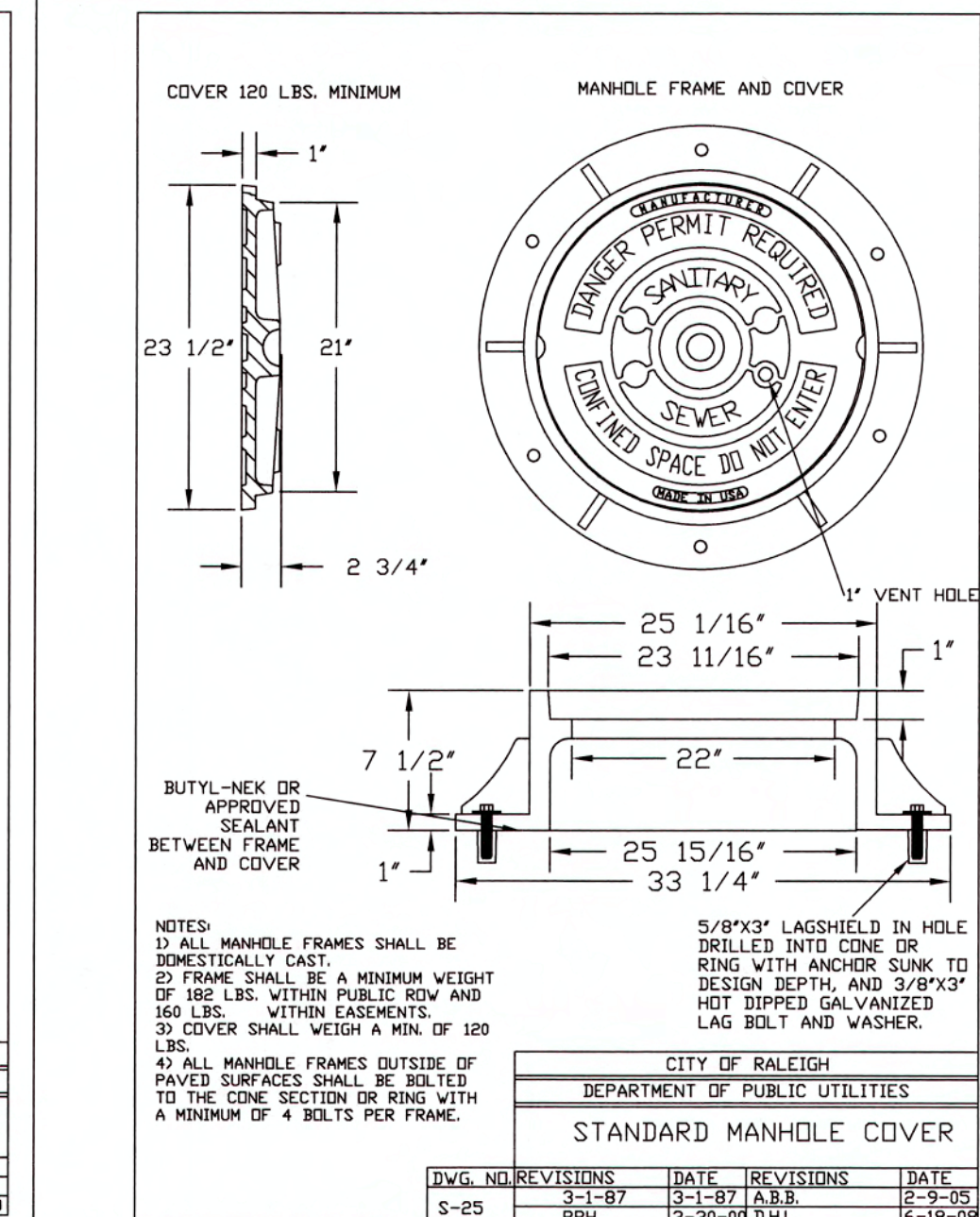
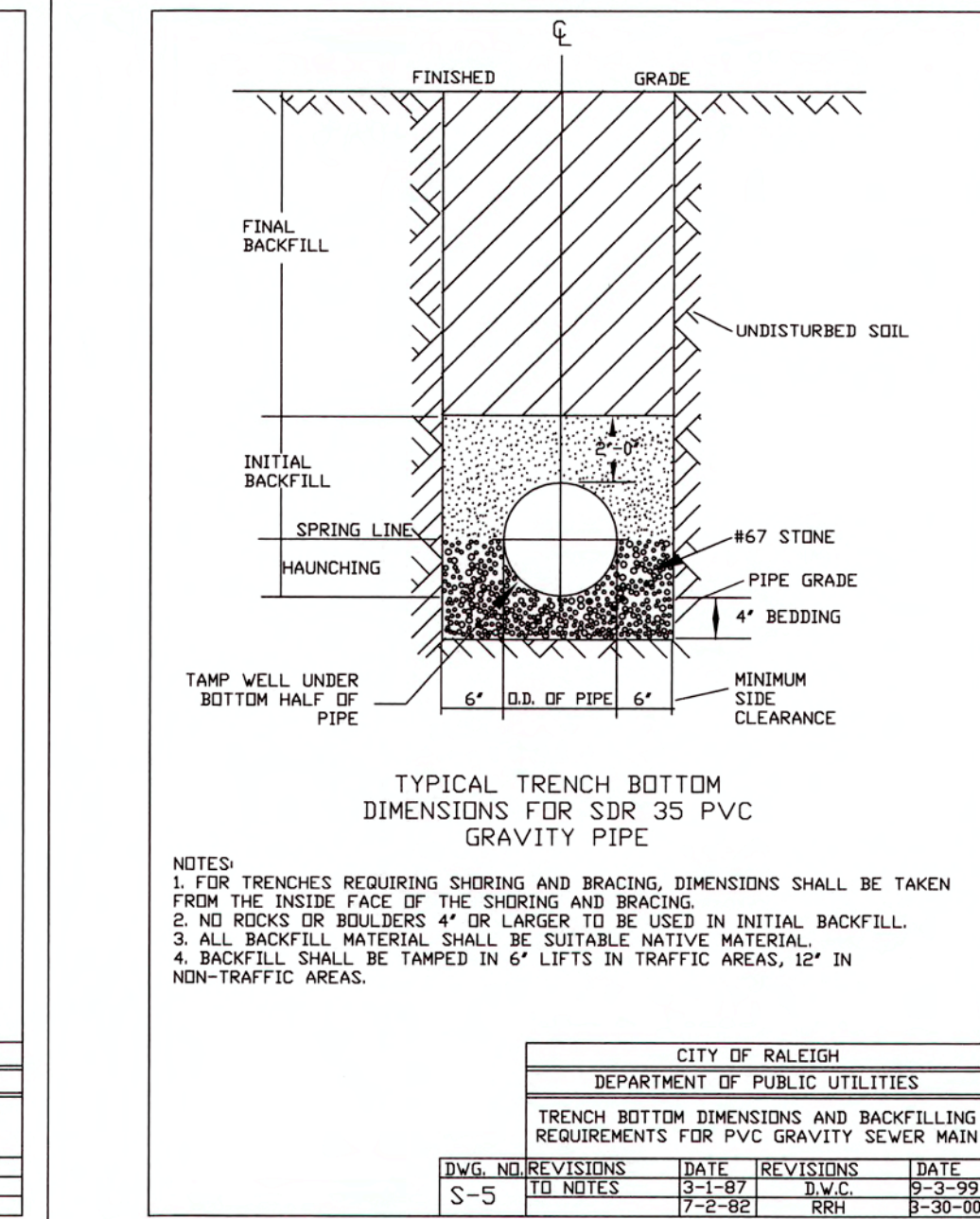
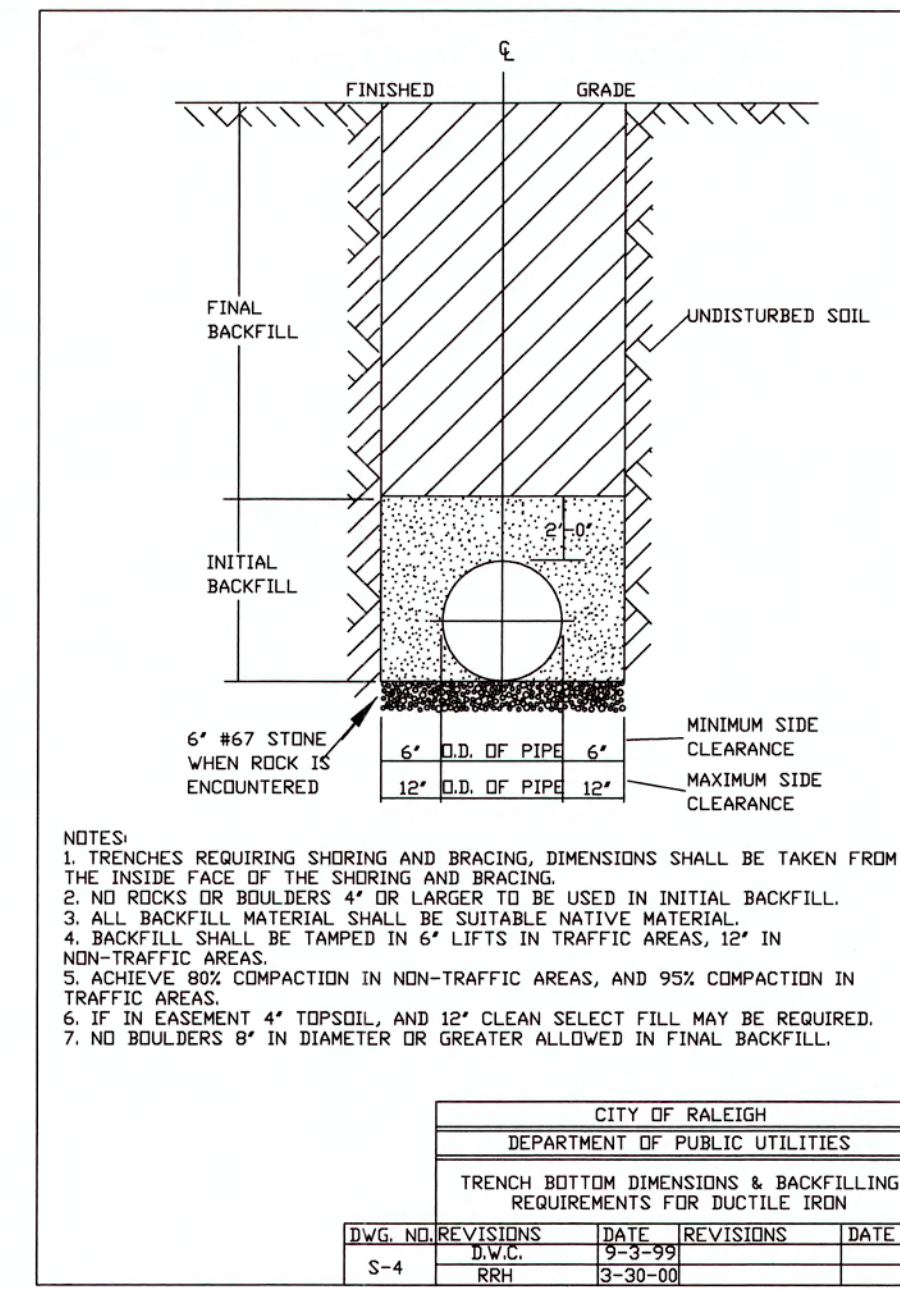
1	TOK & COR COMMENTS	04/12/19
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TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-13-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR



**CITY OF RALEIGH**  
 DEPARTMENT OF PUBLIC UTILITIES

ALL CONSTRUCTION MUST BE IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL RULES AND REGULATIONS.

TRANSPORTATION-SERVICES N/A  
 PUBLIC UTILITIES **89** 5/3/19  
 STORMWATER N/A  
 PLANNING N/A  
 FIRE N/A  
 URBAN-FORESTRY N/A

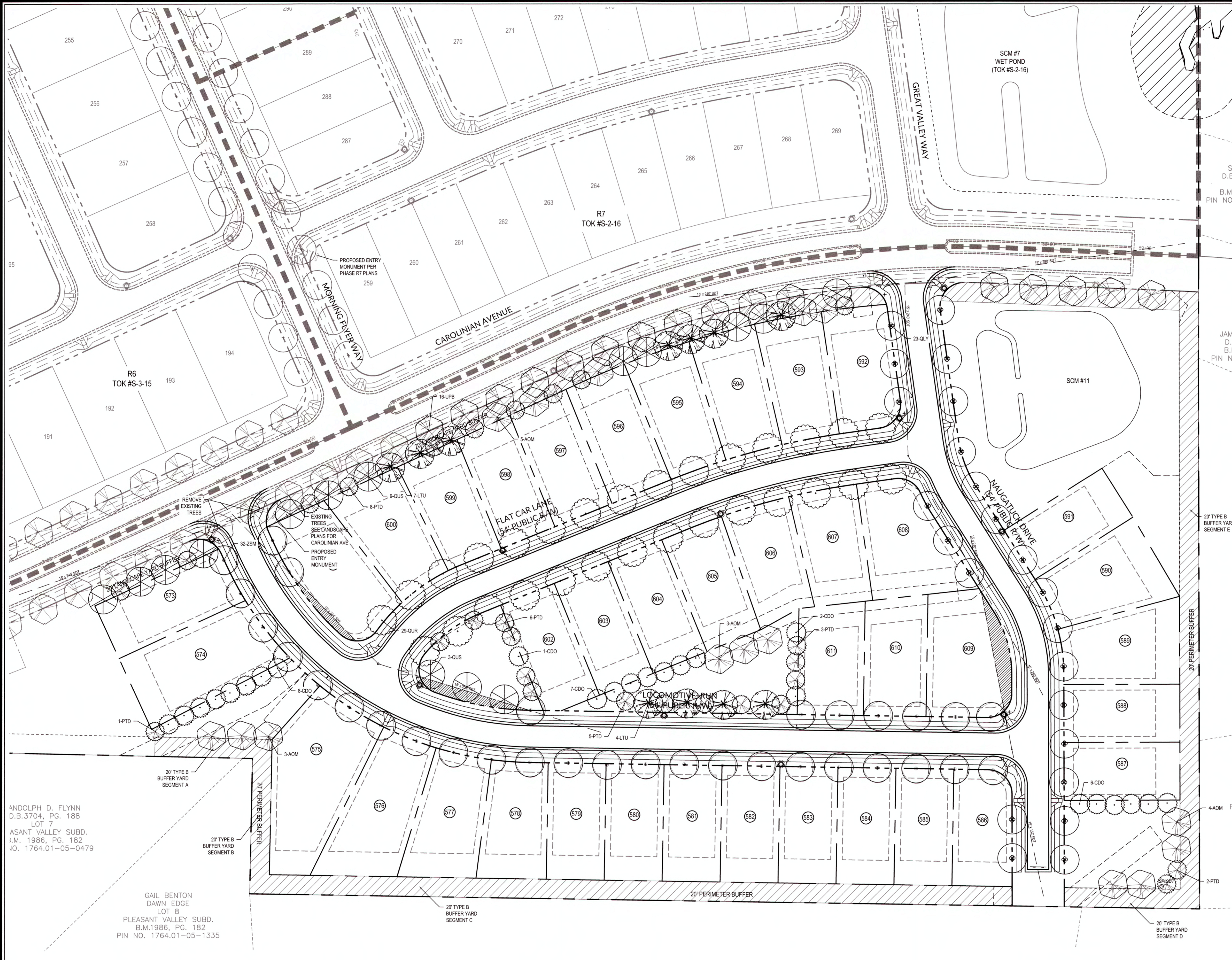
Revisions:  
 1 TOK & COR COMMENTS 04/12/19

TOWN CERTIFICATION, THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

By: **S. J. Hill** DATE: **6-13-2019**  
 DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

By: **G. J. Hill** DATE: **6/14/19**  
 ADMINISTRATOR



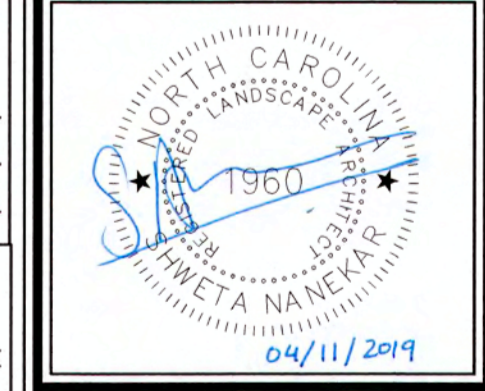
ALL MATERIALS & CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH ALL CITY OF RALEIGH & TOWN OF KNIGHTDALE DESIGN STANDARDS, DETAILS, AND SPECIFICATIONS.

TOWN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.  
 BY: S. H. HALL DATE: 6/13/2019  
 DEVELOPMENT SERVICES ENGINEER  
 THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
 BY: CHS DATE: 6/14/19  
 ADMINISTRATOR

**PUBLIC SEWER COLLECTION/EXTENSION SYSTEM**  
 THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.  
 CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
 AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
 DATE \_\_\_\_\_

**PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM**  
 THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.  
 CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_  
 AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
 DATE \_\_\_\_\_

Job No. 02090251.94 Drawn By WGR  
 Date 11/21/2018 Designer WGR

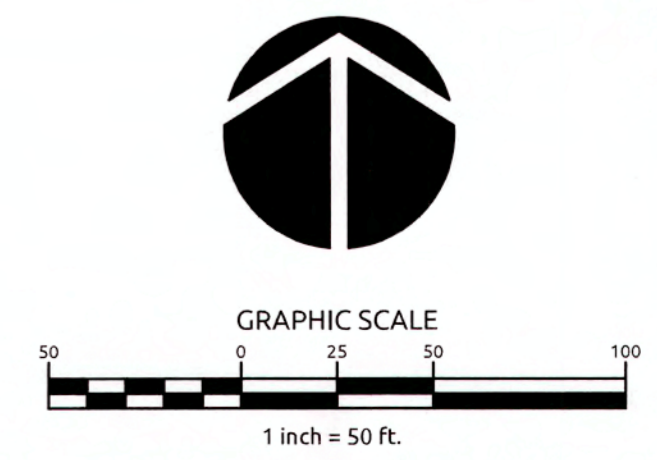


Revisions  
 1 TOK & COR COMMENTS 04/12/19

Sheet No.  
**L1.0**

PLANT TYPE	QTY	KEY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	HEIGHT	NOTES
CANOPY	29	QUR	Quercus rubra	Red Oak	B&B	2"	8'	MATCHED; 40' O.C.
STREET TREES	18	UPB	Ulmus Parvifolia 'PMPF'	Bosque Elm	B&B	2"	8'	MATCHED; 40' O.C.
	23	QLY	Quercus lyrata	Overcup Oak	B&B	2"	8'	MATCHED; 40' O.C.
	32	ZSM	Zelkova serrata ZSPKF	Myriam Japanese Zelkova	B&B	2"	8'	MATCHED; 40' O.C.

PLANT TYPE	QTY	KEY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	HEIGHT	NOTES
CANOPY	24	CDO	Cedrus deodara	Deodar Cedar	B&B	2"	8-10'	MATCHED
STREET TREES	27	PTD	Pinus taeda	Loblolly Pine	B&B	2 1/2"	12-14'	MATCHED
	15	ACM	Acer rubrum 'October Glory'	October Glory Maple	B&B	2 1/2"	12-14'	MATCHED
	15	LSR	Liquidambar styraciflua 'Rotundiloba'	Fruitless Sweetgum	B&B	2 1/2"	12-14'	MATCHED
	15	QUS	Quercus shumardii	Shumard Oak	B&B	2 1/2"	12-14'	MATCHED
	16	LTU	Liriodendron tulipifera	Tulip Poplar	B&B	2 1/2"	12-14'	MATCHED



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**GENERAL LANDSCAPE NOTES**

- LANDSCAPED AREAS SHALL NOT CONTAIN ANY DEVELOPMENT, IMPERVIOUS SURFACES OR SITE FEATURES THAT DO NOT FUNCTION TO MEET THE APPLICABLE STANDARDS FOR THAT AREA OR THAT REQUIRE REMOVAL OF EXISTING SIGNIFICANT VEGETATION.
- NO GRADING, DEVELOPMENT OR LAND-DISTURBING ACTIVITIES SHALL OCCUR WITHIN A BUFFER YARD IF FOREST CANOPY, SPECIMEN TREES OR SIGNIFICANT VEGETATION EXISTS WITHIN THESE AREAS, UNLESS APPROVED BY THE ADMINISTRATOR. IF GRADING WITHIN A BUFFER YARD IS PROPOSED, SLOPES 1:3 OR LESS ARE ENCOURAGED TO ENSURE PROPER TRANSITION OF GRASSES TO THE ADJACENT PROPERTY AND TO FACILITATE LANDSCAPING AND MAINTENANCE.
- PERMANENT OFF-SITE LANDSCAPE EASEMENTS MAY BE USED TO MEET REQUIRED BUFFER YARDS PROVIDED THAT THE SIZE OR SHAPE OF THE PARCEL SIGNIFICANTLY RESTRICTS THE ABILITY TO REASONABLY USE THE PROPERTY AND MEET THE BUFFER YARD REQUIREMENTS. THESE EASEMENTS MUST BE RECORDED PRIOR TO OR IN CONJUNCTION WITH THE APPROVAL OF THE SITE OR SUBDIVISION PLAN.
- NEW PLANT MATERIAL SHOULD COMPLY WITH EXISTING VEGETATION NATIVE TO THE SITE. THE USE OF DROUGHT TOLERANT, INDIGENOUS, NATIVE AND/OR REGIONALLY GROWN SPECIES OF TREES, SHRUBS AND GROUND COVERS IS ENCOURAGED IN ORDER TO MAINTAIN PLANTED AREAS COMPATIBLE WITH EXISTING NATIVE HABITATS AND TO REDUCE DEPENDENCY ON IRRIGATION.
- ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS & DETAIL MANUAL.
- LANDSCAPING SHOULD BE OF SUFFICIENT SIZE SO THAT NATURAL APPEARANCE WILL BE ACHIEVED WITHIN (3) YEARS OF INSTALLATION FOR SHRUBS AND WITHIN (5) YEARS OF INSTALLATION FOR TREES. WHERE THE MINIMUM SIZE REQUIREMENTS OVERLAP, THE HIGHER STANDARD SHALL PREVAIL.
- EACH CANOPY TREE SHALL BE PROVIDED WITH A MINIMUM PERVIOUS GROUND AREA OF 33 SF FOR ROOT GROWTH (EXCEPTION: STREET TREES) AND SHOULD BE PLANTED ON SLOPES NOT TO EXCEED 1:4 VERTICAL TO HORIZONTAL DISTANCE.
- GROUND COVER MUST BE PLANTED WITH ON-CENTER SPACING EQUIVALENT TO THE AVERAGE MATURE SPREAD FOR EACH PARTICULAR SPECIES.
- ALL NEW PLANT MATERIAL SHALL BE OF GOOD QUALITY, FREE FROM DISEASE, INSTALLED IN SOUND MANNER, MULCHED (2" LAYER) AND MEET STANDARDS SET FORTH IN THE AMERICAN STANDARD FOR NURSERY STOCK BY AMERICAN NURSERY & LANDSCAPE ASSOCIATION (ANLA). THE SELECTION OF PLANTS, PLANTING METHODS, MINIMUM HEIGHT, ROOT BALL AND CONTAINER SIZE, NUMBER OF BRANCHES AND WIDTH, SHALL CONFORM TO THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE ANLA FOR THAT TYPE OF TREE OR SHRUB AT THE TIME OF INSTALLATION.
- ALL NEW TREES SHALL ALSO BE PROPERLY GUYED AND STAKED AT THE TIME OF PLANTING.
- ADEQUATE DRAINAGE AND MULCHING SHALL BE PROVIDED IN ALL CASES, PARTICULARLY FOR MEDIANS AND ISLANDS.
- INSTALLATION PRACTICES SHALL BE UTILIZED WHICH PRESERVE AND REPLACE EXISTING TOPSOIL, OR AMEND THE SOIL TO REPLACE COMPACTED SOIL.
- ALL PORTIONS OF A LANDSCAPED AREA NOT PLANTED WITH SHRUBS AND TREES OR COVERED BY A WALL OR OTHER SCREENING DEVICE SHALL BE PLANTED WITH GROUND COVER AND/OR GRASS, OR COVERED WITH NATURAL MULCH WITH A MINIMUM DEPTH OF 2" OVER THE ENTIRE SURFACE.
- WHERE A CANOPY TREE IS REQUIRED AND OVERHEAD UTILITY LINES EXIST, (2) UNDERSTORY TREES SHALL BE SUBSTITUTED WITH THE APPROVAL OF THE ADMINISTRATOR.
- NOTHING SHALL BE PLANTED OR INSTALLED WITHIN AN UNDERGROUND OR OVERHEAD UTILITY EASEMENT OR DRAINAGE EASEMENT WITHOUT THE CONSENT OF THE TOWN AND THE EASEMENT HOLDER AT THE TIME OF MASTER PLAN APPROVAL.
- CONTRACTOR SHALL WARRANT ALL NEW PLANT MATERIAL FOR (1) YEAR FROM TIME OF INSTALLATION.
- ALL LANDSCAPING, MULCHING AND SEEDING SHALL BE INSTALLED IN ACCORDANCE WITH THE APPROVED SITE PLAN AND THE STANDARDS OF THIS CHAPTER PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY. REQUESTS FOR A DELAY IN COMPLYING WITH THIS REQUIREMENT WILL BE CONSIDERED FOLLOWING A WRITTEN REQUEST DIRECTED TO THE ADMINISTRATOR. SUCH REQUEST FOR A DELAY SHALL NOTE THE TIMEFRAME DURING WHICH THE PLANTING SHALL BE COMPLETED. CERTIFICATES OF OCCUPANCY WILL BE ISSUED WITH THE APPROVAL OF A REQUEST FOR PLANTING DELAY, IF DEEMED REASONABLE.
- THE TOWN MAY ISSUE A TEMPORARY CERTIFICATE OF OCCUPANCY FOR A PERIOD OF 30-180 DAYS, RELATIVE TO THE NEXT PLANTING SEASON, WHILE THE TOWN OF KNIGHTDALE MAY ALSO ISSUE A TEMPORARY CERTIFICATE OF OCCUPANCY FOR A PERIOD NOT TO EXCEED 30 DAYS.
- WHERE RIGHT TRIANGLES FOR DRIVES OR STREETS OVERLAP SCREENING, GROUND COVER VEGETATION SHALL BE USED EXCLUSIVELY (EXCEPTION: SINGLE-FAMILY DWELLINGS & DUPLEXES).
- ALL SIDES OF PARKING LOTS SHALL BE SCREENED WITH A TYPE 'A' BUFFER YARD. SIDES ADJACENT TO AN ARTERIAL SHALL BE SCREENED WITH A TYPE 'B' BUFFER YARD. OTHER VEHICLE ACCOMMODATION AREAS SHALL BE SCREENED FROM OFF-SITE VIEW WITH A TYPE 'B' BUFFER YARD.
- ABOVE GROUND UTILITIES AND ENCLOSED CONTAINMENT AREAS FOR TRASH AND RECYCLABLES SHALL BE SCREENED BY ELEMENTS OF A TYPE 'B' BUFFER YARD THAT PERTAIN TO SEMI-OPAQUE SCREENS UP TO 6' IN HEIGHT OR THE HEIGHT OF THE UTILITY OR ENCLOSURE, WHICHEVER IS LESS.

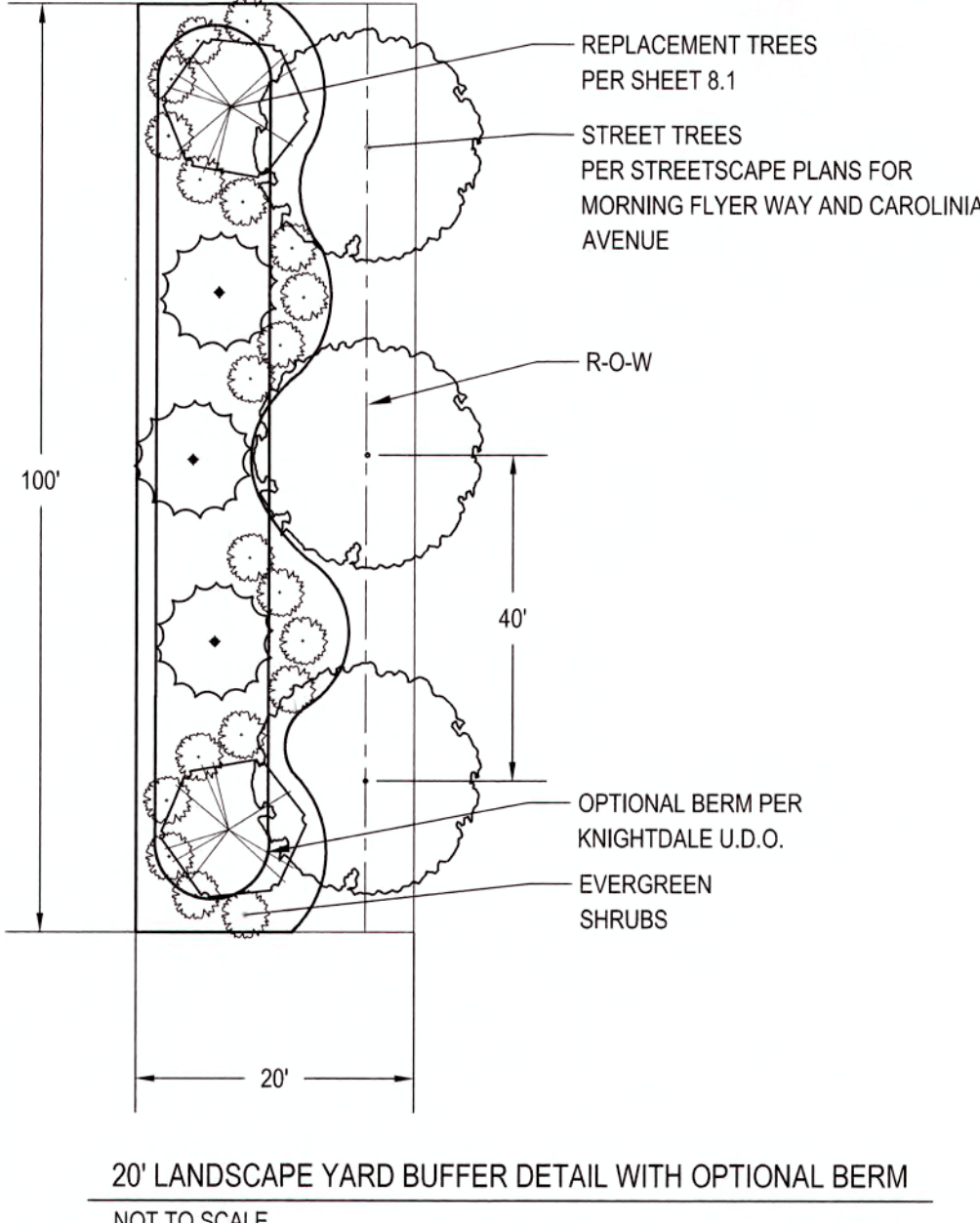
**BERMS WITH A FENCE OR WALL:**

- ALL BERMS SHALL NOT EXCEED A SLOPE WITH MAXIMUM RISE OF 1" TO A RUN OF 2", A MAXIMUM HEIGHT OF 4' AND A MAXIMUM WIDTH OF 40% OF THE REQUIRED BUFFER WIDTH.
- BERMS SHALL BE STABILIZED WITH A GROUND COVER OR OTHER SUITABLE VEGETATION OR PERMANENT SLOPE RETENTION DEVICE. BERMS TALLER THAN 4' SHALL BE APPROVED BY THE ADMINISTRATOR ON A CASE BY CASE BASIS, BUT SHALL CONFORM TO THE SLOPE AND WIDTH RESTRICTIONS AS PREVIOUSLY DETAILED.

**MAINTENANCE:**

- THE OWNER(S) OR THE PROPERTY SHALL BE RESPONSIBLE FOR ALL NATURAL AND PHYSICAL FEATURES REQUIRED BY THE LANDSCAPE SECTION OF THE UDO AND SHALL PRESERVE AND MAINTAIN THESE FEATURES IN HEALTHY GROWING CONDITIONS. REPLACE THEM WHEN NECESSARY, AND KEEP THE AREAS AROUND THEM FREE OF REFUSE AND DEBRIS IN A MANNER THAT PREVENTS REFUSE AND DEBRIS FROM WASHING ONTO PUBLIC RIGHTS-OF-WAY.
- THE USE OF IRRIGATION IS PERMITTED IN ALL REQUIRED LANDSCAPING AREAS AS REQUIRED BY THE LANDSCAPING SECTION OF THE UDO AND MAY CONNECT TO THE PUBLIC WATER SYSTEM SUBJECT TO THE REQUIREMENTS OF THE TOWNS STANDARDS SPECIFICATIONS AND DETAILS MANUAL AND OTHER APPLICABLE TOWN ORDINANCES OR POLICIES. THE USE OF MOISTURE METERING DEVICES AND AUTOMATIC TRENDS WITH AN IRRIGATION SYSTEM IS ENCOURAGED. THE USE OF XERISCAPE PRACTICES AND DRIP IRRIGATION IS ALSO ENCOURAGED, UNLESS OTHERWISE REQUIRED.
- ALL VEGETATION SHOULD BE ALLOWED TO REACH AND BE MAINTAINED AT ITS MATURE SIZE.
- TREE TOPPING (THE REMOVAL OF MORE THAN 25% OF A TREE'S CANOPY) IS CONSIDERED TO BE DAMAGE AND MIS-CONFIGURATION AND SHALL BE PROHIBITED ON ALL TREES ON PUBLIC PROPERTY, PUBLIC RIGHT-OF-WAY, REQUIRED TREE SAVE AREAS AND PARKING LOT LANDSCAPING AREAS UNLESS OTHERWISE APPROVED BY THE LAND USE REVIEW BOARD (LURB). TREE LOCATIONS WHERE PROPER PRUNING PRACTICES ARE IMPRACTICAL MAY BE EXEMPTED FROM THIS ARTICLE AT THE DETERMINATION OF THE ADMINISTRATOR.
- THE OWNER OF ANY TREE OR SHRUB ON PRIVATE PROPERTY THAT OVERHANGS ANY PUBLIC RIGHT-OF-WAY WITHIN THE TOWN SHALL PRUNE THE BRANCHES SO THAT SUCH BRANCHES SHALL NOT OBSTRUCT THE LIGHT FROM ANY STREET LAMP OR OBSTRUCT THE VIEW OF ANY STREET INTERSECTION AND SO THAT THERE SHALL BE A CLEAR SPACE OF 8' ABOVE THE SURFACE OF THE STREET OR SIDEWALK.
- THE TOWN OF KNIGHTDALE PUBLIC WORKS DIRECTOR IS AUTHORIZED TO PRUNE TREES AND SHRUBS FROM PUBLIC PROPERTIES AND PUBLIC RIGHTS-OF-WAY.
- THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT) IS AUTHORIZED TO PRUNE TREES AND SHRUBS IN THE PUBLIC RIGHTS-OF-WAY OWNED BY THE STATE OF NORTH CAROLINA.
- THE REMOVAL BY ANY ENTITY OF A TREE OR SHRUB THAT IS DEAD, INFECTED BY DISEASE, OR DETERMINED TO BE A HAZARD TO PUBLIC SAFETY AND WELFARE AND SUBSEQUENT REPLACEMENT MAY BE APPROVED BY THE ADMINISTRATOR. TREES REMOVED MUST BE REPLACED IN ACCORDANCE WITH THE REPLACEMENT PROVISIONS OF THE UDO.
- OWNERS SHALL REMOVE ALL DEAD, DISEASED OR HAZARDOUS TREES AND SHRUBS AS WELL AS ANY BROKEN OR DECAYED LIMBS WHICH CONSTITUTE A MENACE TO THE SAFETY OF THE PUBLIC. THE TOWN SHALL HAVE THE RIGHT TO CAUSE THE REMOVAL OF ANY DEAD OR DISEASED TREES AND SHRUBS ON PRIVATE PROPERTY WHEN SUCH TREE OR SHRUB CONSTITUTES A HAZARD TO LIFE AND PROPERTY, HARBOR INSECTS OR DISEASE WHICH CONSTITUTES A POTENTIAL THREAT TO OTHER VEGETATION IN THE TOWN. THE ADMINISTRATOR WILL NOTIFY PROPERTY OWNER(S) OF THE REQUIREMENT TO REMOVE SUCH TREES, SHRUBS OR LIMBS. REMOVAL SHALL BE DONE AT THE OWNER'S EXPENSE WITHIN 90 DAYS AFTER THE DATE OF SERVICE OF THE WRITTEN NOTICE. FAILURE TO COMPLY WITH SUCH PROVISIONS SHALL CONSTITUTE A VIOLATION OF THE TOWN OF KNIGHTDALE ORDINANCE AND SHALL BE SUBJECT TO THE APPLICABLE PROCEDURES AND PENALTIES.
- WHEN REMOVING TREES AND SHRUBS, STUMPS SHALL BE REMOVED OR GROUND MINIMUM DEPTH OF 4".
- IN THE EVENT THAT ANY REQUIRED VEGETATION IS SEVERELY DAMAGED DUE TO AN UNUSUAL WEATHER OCCURRENCE OR NATURAL DISASTER, THE OWNER SHALL HAVE (1) GROWING SEASON TO REPLACE OR REPLANT FOLLOWING THE EVENT OR FOLLOWING THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY FOR ANY EVENT-RELATED SITE RECONSTRUCTION, WHICHEVER IS LATER.
- VEGETATION WITHIN A REQUIRED TREE PROTECTION OR LANDSCAPED AREA THAT DIES WITHIN (1) YEAR OF CONSTRUCTION COMPLETION SHALL BE REMOVED AND REPLACED WITH NEW VEGETATION OF EQUAL OR GREATER SIZE BY THE CONTRACTOR PROVIDING THE WARRANT. SHOULD ANY VEGETATION REQUIRED IN A TREE PROTECTION OR LANDSCAPED AREA DIE AFTER THE EXPIRATION OF THE WARRANTY, THE PROPERTY OWNER SHALL REPLACE IT WITHIN 180 DAYS WITH VEGETATION OF EQUAL OR GREATER SIZE.
- A PLAN DENOTING THE PROPOSED LOCATION AND SPECIES OF REPLACEMENTS SHALL BE SUBMITTED TO THE TOWN OF KNIGHTDALE FOR APPROVAL. THE ADMINISTRATOR MAY ELECT TO PRESENT THE PLAN TO THE LURB FOR FINAL APPROVAL.
- ALL VEGETATION SHALL BE REPLACED IN A MANNER THAT SATISFIES THE APPLICABLE TYPE, AMOUNT AND PERFORMANCE CRITERIA REQUIRED BY THE TOWN OF KNIGHTDALE UDO.
- THE ADMINISTRATOR MAY INSPECT THE SITE ONCE A YEAR AFTER THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY IN ORDER TO ENSURE COMPLIANCE WITH THE APPROVED SITE PLAN AND TO ENSURE THAT THE VEGETATION AND LANDSCAPING IS PROPERLY MAINTAINED. THE ADMINISTRATOR MAY ISSUE A NOTICE OF VIOLATION TO COMPLY WITH THE PROVISIONS OF THE KNIGHTDALE ORDINANCE IF WARRANTED UPON AN INSPECTION.

- ALL BERMS SHALL NOT EXCEED:
- A SLOPE WITH MAXIMUM RISE OF ONE (1) FOOT TO A RUN OF THREE (3) FEET,
  - A MAXIMUM HEIGHT OF FOUR (4) FEET AND
  - A MINIMUM TOP OF BERM WIDTH OF TWO (2) FEET.
- BERMS SHALL BE STABILIZED WITH A GROUND COVER OR OTHER SUITABLE VEGETATION OR PERMANENT SLOPE RETENTION DEVICE.
- BERMS TALLER THAN FOUR (4) FEET SHALL BE APPROVED BY THE ADMINISTRATOR ON A CASE BY CASE BASIS, BUT SHALL CONFORM TO THE SLOPE AND WIDTH RESTRICTIONS AS PREVIOUSLY DETAILED.
- MINIMUM PLANTING REQUIREMENTS**
- TOTAL LENGTH OF BUFFER ALONG MORNING FLYER WAY & CAROLINIAN AVE** = 932 L.F.
- SHRUBS (20 PER 100 L.F.) = 187  
TOTAL SHRUBS PROVIDED = 187  
CANOPY TREES (3 PER 100 L.F.) = 28  
TOTAL TREES PROVIDED = 28  
UNDERSTORY TREES (5 PER 100 L.F.) = 47  
TOTAL UNDERSTORY TREES PROVIDED = 47
- MINIMUM PLANTING REQUIREMENTS**
- BUFFER SEGMENT A** = 110 L.F.
- SHRUBS (20 PER 100 L.F.) = 22  
TOTAL SHRUBS PROVIDED = 22  
CANOPY TREES (3 PER 100 L.F.) = 4  
TOTAL TREES PROVIDED = 4  
UNDERSTORY TREES (5 PER 100 L.F.) = 6  
TOTAL UNDERSTORY TREES PROVIDED = 6
- BUFFER SEGMENT B** = 135 L.F.
- SHRUBS (20 PER 100 L.F.) = 27  
TOTAL SHRUBS PROVIDED = 27  
CANOPY TREES (3 PER 100 L.F.) = 4  
TOTAL TREES PROVIDED = 4  
UNDERSTORY TREES (5 PER 100 L.F.) = 7  
TOTAL UNDERSTORY TREES PROVIDED = 7
- BUFFER SEGMENT C** = 774 L.F.
- SHRUBS (20 PER 100 L.F.) = 155  
TOTAL SHRUBS PROVIDED = 155  
CANOPY TREES (3 PER 100 L.F.) = 23  
TOTAL TREES PROVIDED = 23  
UNDERSTORY TREES (5 PER 100 L.F.) = 39  
TOTAL UNDERSTORY TREES PROVIDED = 39
- BUFFER SEGMENT D** = 127 L.F.
- SHRUBS (20 PER 100 L.F.) = 25  
TOTAL SHRUBS PROVIDED = 25  
CANOPY TREES (3 PER 100 L.F.) = 4  
TOTAL TREES PROVIDED = 4  
UNDERSTORY TREES (5 PER 100 L.F.) = 6  
TOTAL UNDERSTORY TREES PROVIDED = 6
- BUFFER SEGMENT E** = 469 L.F.
- SHRUBS (20 PER 100 L.F.) = 94  
TOTAL SHRUBS PROVIDED = 94  
CANOPY TREES (3 PER 100 L.F.) = 12  
TOTAL TREES PROVIDED = 12  
UNDERSTORY TREES (5 PER 100 L.F.) = 23  
TOTAL UNDERSTORY TREES PROVIDED = 23
- TREE REPLACEMENT QUANTITY CALCULATIONS**
- REFER TO SHEET 2.1 SITE PLAN FOR TREE REPLACEMENT CALCULATIONS
- TOTAL TREE REPLACEMENT REQUIRED = 104  
40% EVERGREEN PROVIDED = 42  
60% DECIDUOUS PROVIDED = 62



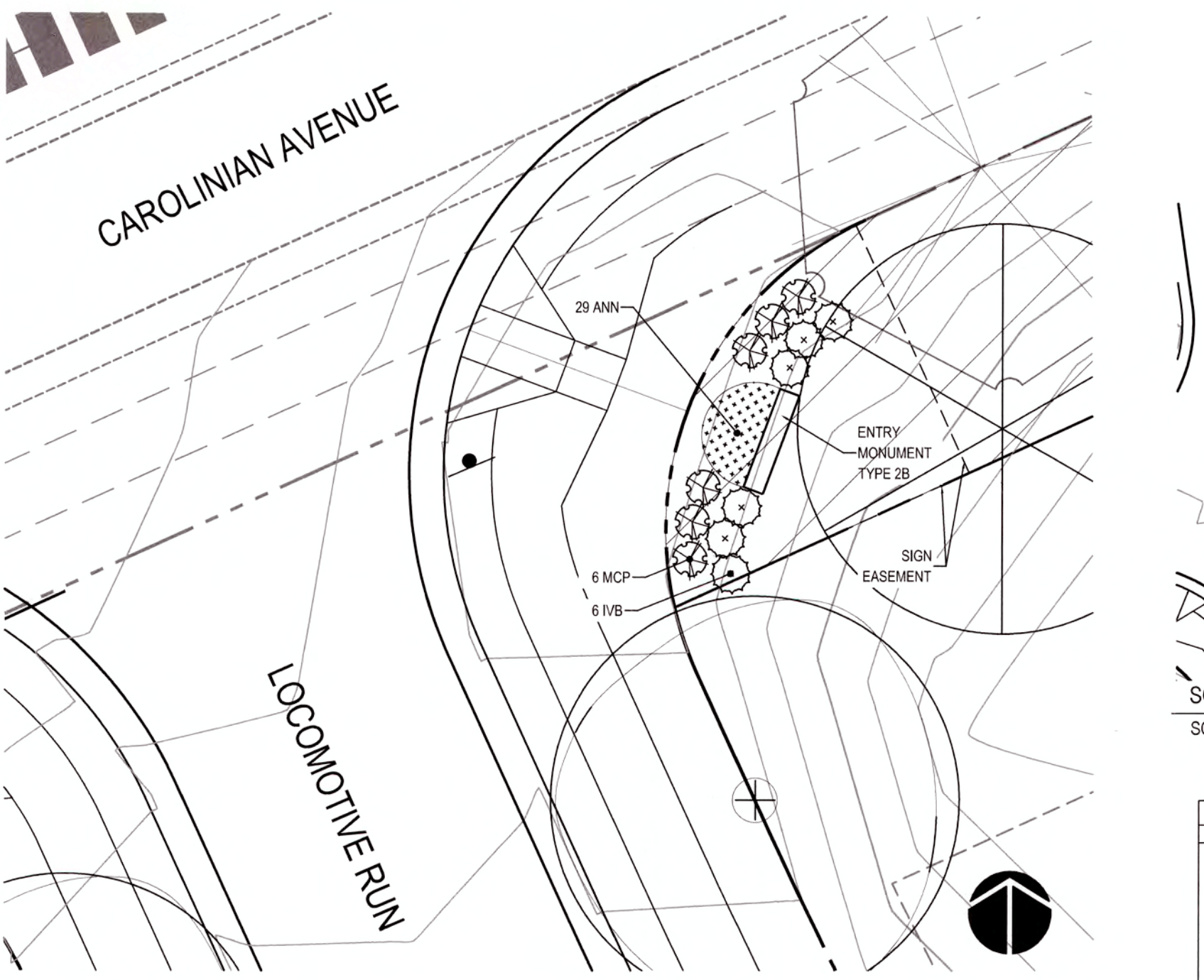
**LANDSCAPE CALCULATIONS:**

**RESIDENTIAL LANDSCAPING**

- 1 CANOPY TREE / 2,000 SF OF LOT AREA (OR A FRACTION THEREOF UP TO 20,000 SF)
- UTILITY EASEMENTS SHALL NOT BE INCLUDED IN LOT AREA.
- EXISTING LARGE TREES MEASURING MORE THAN 6" DBH MAY BE COUNTED TOWARDS REQUIREMENT.
- FOUNDATION PLANTINGS CONSISTING OF EVERGREEN SHRUBS SHALL BE INSTALLED ALONG THE ENTIRE EXTERIOR WALL OF THE BUILDING. (MIN. 2' HEIGHT AND 4" O.C.)

**STREET TREE PLANTINGS**

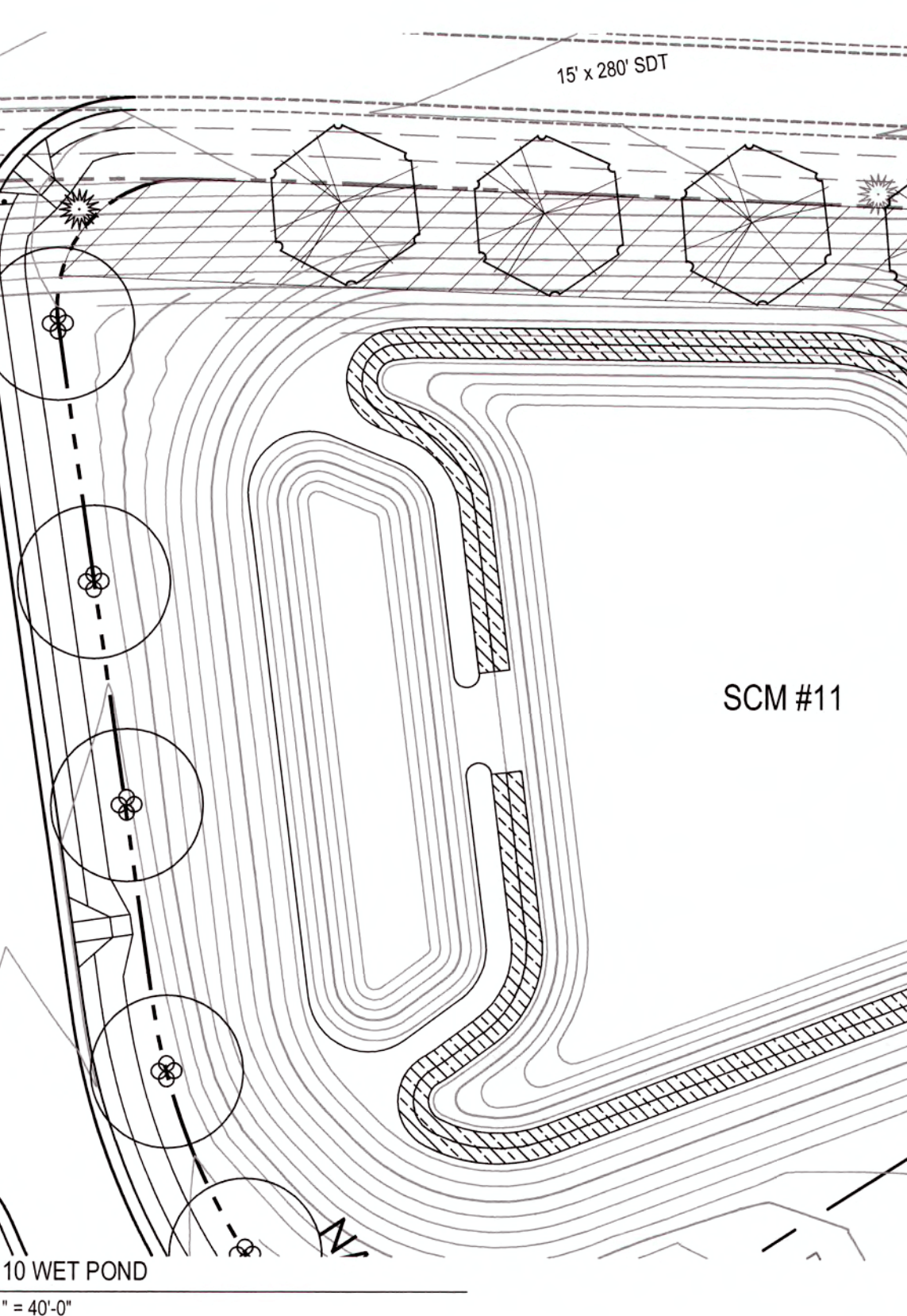
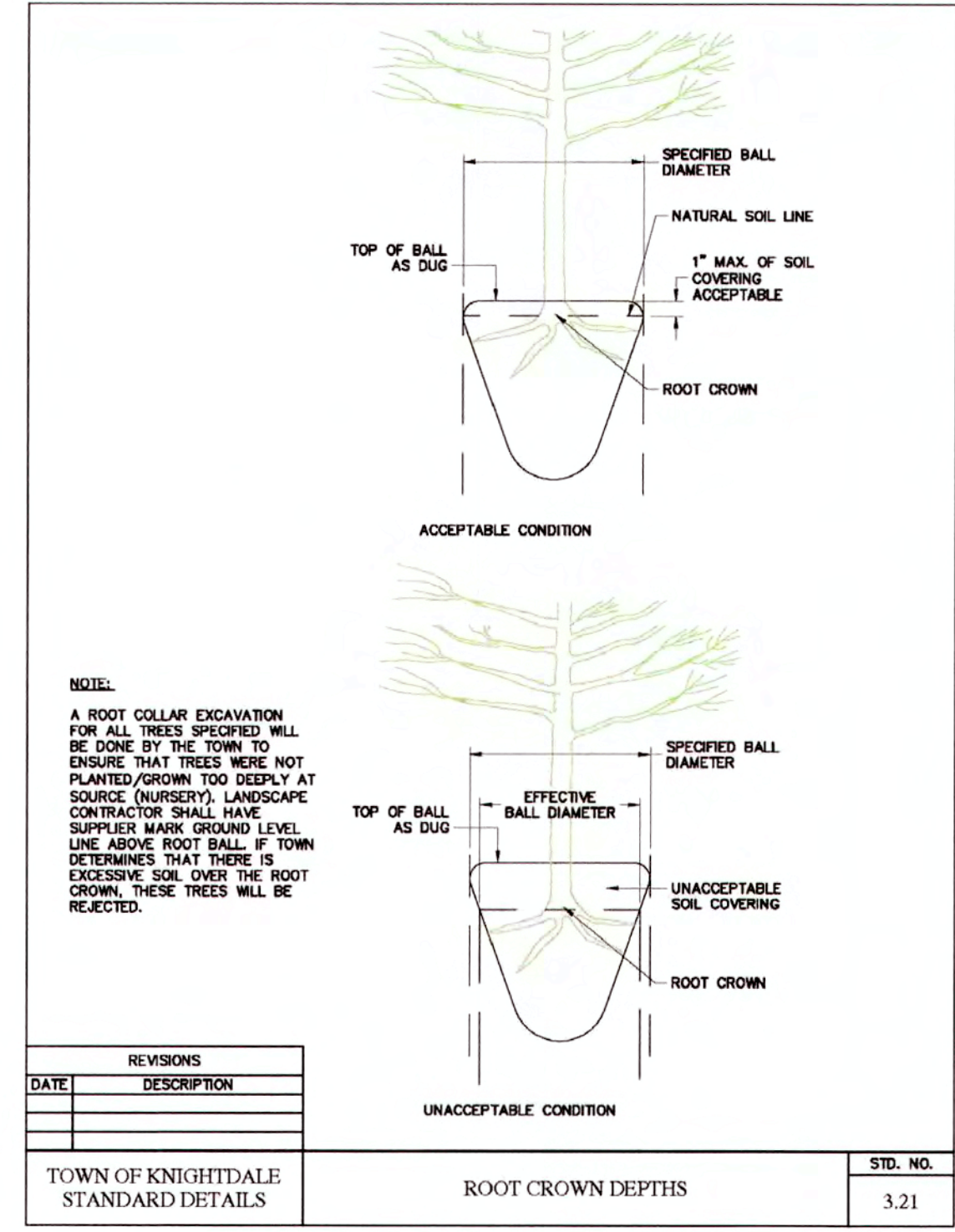
- CANOPY TREES TO BE INSTALLED AT A MINIMUM AVERAGE DISTANCE OF 40' O.C. IN A PLANTING STRIP (MIN. WIDTH OF 9').
- WHERE OVERHEAD UTILITIES EXIST PRIOR TO DEVELOPMENT, UNDERSTORY TREES MAY BE SUBSTITUTED.
- STREET TREES SHALL BE PLACED AT LEAST 10' FROM LIGHT POLES AND 12' FROM ELECTRICAL TRANSFORMERS IN ORDER TO ALLOW THESE UTILITIES TO BE SAFELY SERVICES (UNDERSTORY TREES MAY BE PLACED WITHIN 5' OF SUCH DEVICES).
- STREET TREES SHALL BE DECIDUOUS HARDWOODS AND SHALL MEET THE CRITERIA SET FORTH IN PREVIOUS NOTES/DETAILS.



TOTAL NUMBER OF MONUMENTS - 1  
NOTE: SIGNAGE IS NOT BEING REVIEWED AS PART OF THIS APPROVAL REQUEST. A SEPARATE TOWN OF KNIGHTDALE SIGN PERMIT IS REQUIRED.

**KNIGHTDALE STATION PLANT SCHEDULE - ENTRY MONUMENTS**

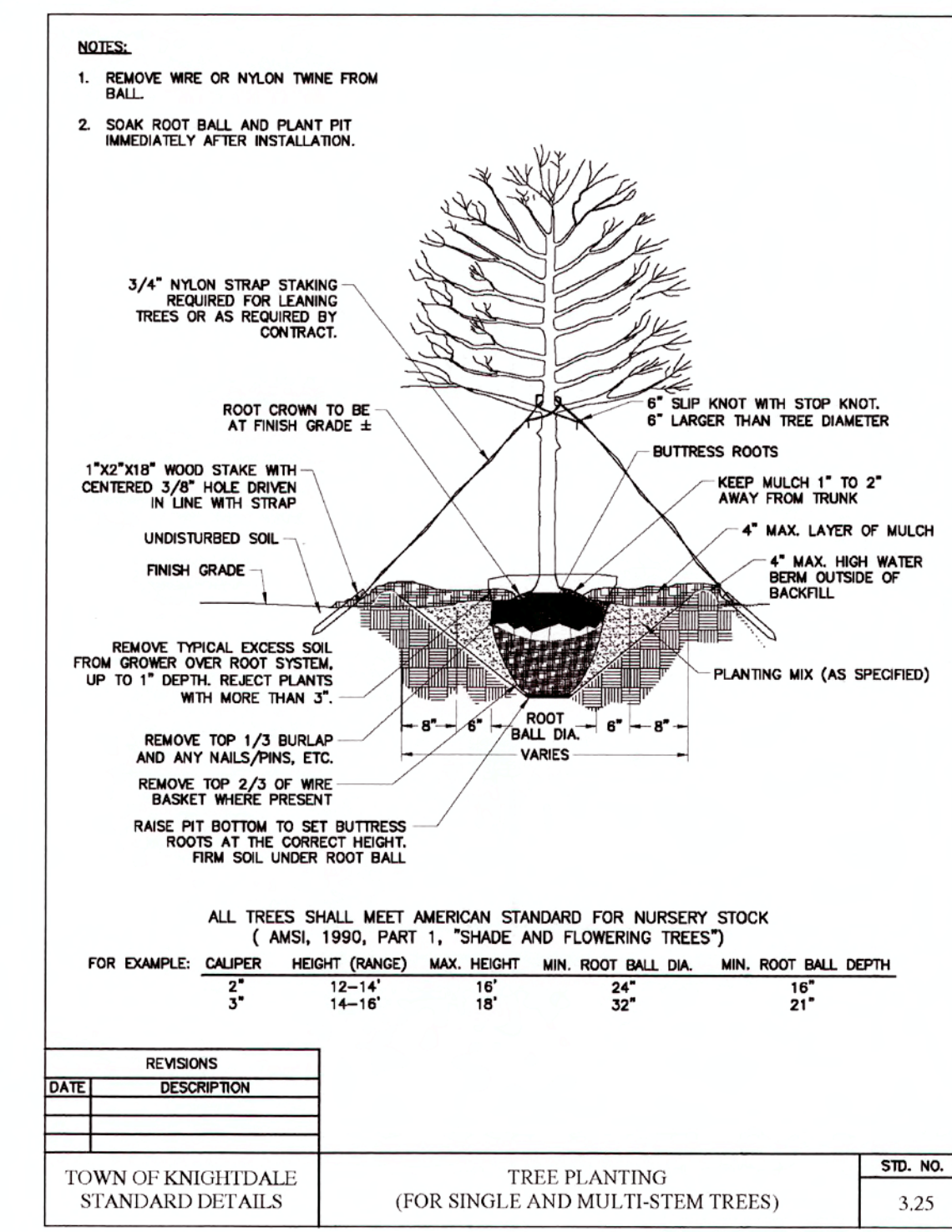
PLANT TYPE	QTY	KEY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	HEIGHT	NOTES
SHRUBS & GROUND COVER	6	IVB	Ilex vomitoria 'Bordeaux'	Bordeaux Dwarf Yaupon Holly	CONT.	3 Gal.	18"-24"	36" O.C.
	87	ANN	Seasonal Color	Annual Plantings	CONT.	Flat		12" O.C. (11,15)
GRASSES	6	MCP	Muhlenbergia capillaris	Pink Muly Grass	CONT.	3 Gal.	18"-24"	MATCHED; 3" O.C.



VEGETATED SHELVE = 2,287 SF w/ 50 HERB. PLANTS / 200 SF = 567 PLANTS

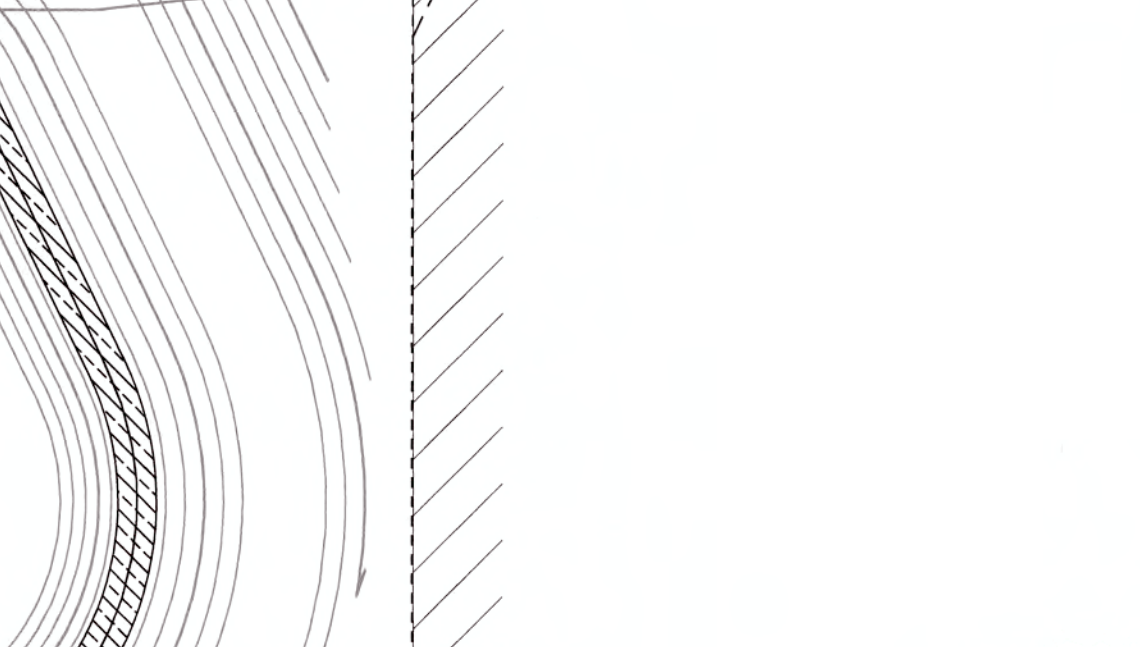
PLANT TYPE	QTY	BOTANICAL NAME	COMMON NAME	ROOT	NOTES
HERBACEOUS	95	Asclepias incarnata	Swamp Milkweed	CONT.	MIN. 24" - 36" O.C.
	95	Carex tenax	Quill Sedge	CONT.	MIN. 24" - 36" O.C.
	95	Eupatorium altissimum	Joe Pye Weed	CONT.	MIN. 24" - 36" O.C.
	95	Lobelia cardinalis	Cardinal Flower	CONT.	MIN. 24" - 36" O.C.
	95	Rhynchospora colorata	Starrush Whitepot	CONT.	MIN. 24" - 36" O.C.
	95	Saccharum baldwinii	Narrow Plumegrass	CONT.	MIN. 24" - 36" O.C.

- NOTES:**
- ON THE DAM AND DAM EMBANKMENT SLOPES, TURF GRASS PROVIDES STABILITY AND ENHANCES ACCESS TO THE FACILITY FOR MAINTENANCE. DCO RECOMMENDS PERENNIAL GRASSES SUCH AS HYBRID BERMUDA OR CENTPEDE IN THE COASTAL PLAIN AND PIEDMONT, AND COOL SEASON TURF GRASSES SUCH AS FESCUE AND BLUEGRASS IN THE MOUNTAINS. WEEPING LOVE GRASS IS NOT ALLOWED BECAUSE IT DOES NOT PROVIDE LONG-TERM SLOPE STABILIZATION.
  - THE DAM STRUCTURE, INCLUDING FRONT AND BACK EMBANKMENT SLOPES, OF THE POND SHALL BE VEGETATED WITH NON-CLUMPING TURF GRASS. TREES AND SHRUBS SHALL NOT BE ALLOWED.
  - THE VEGETATED SHELVE SHALL BE PLANTED WITH A MINIMUM OF (3) DIVERSE SPECIES OF HERBACEOUS, NATIVE VEGETATION AT A MINIMUM DENSITY OF 50 PLANTS PER 200 SQUARE FEET OF SHELVE AREA.



**TREE PLANTING STANDARD DETAILS**

DATE	REVISIONS	DESCRIPTION	STD. NO.
			3.25



TOWN CERTIFICATION: THIS DESIGN HAS BEEN REVIEWED BY THE ENGINEER FOR THE TOWN OF KNIGHTDALE, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT CONFORMS TO THE REQUIREMENTS ESTABLISHED IN THE STANDARD SPECIFICATIONS OF THE TOWN OF KNIGHTDALE.

BY: *[Signature]* DATE: 6-15-2019  
DEVELOPMENT SERVICES ENGINEER

THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 6/14/19  
ADMINISTRATOR

PUBLIC SEWER COLLECTION/EXTENSION SYSTEM

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_

AUTHORIZATION TO CONSTRUCT \_\_\_\_\_

DATE \_\_\_\_\_

PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM

THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.

CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # \_\_\_\_\_

AUTHORIZATION TO CONSTRUCT \_\_\_\_\_

DATE \_\_\_\_\_

Revisions

1	TOK & COR COMMENTS	04/12/19
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**KNIGHTDALE STATION R8**

TOWN OF KNIGHTDALE, NORTH CAROLINA

**LANDSCAPE DETAILS**

Job No. 0209025194  
Date 11/21/2018  
Drawn By W&R  
Designer W&R

Sheet No.  
L1.1