

# CONSTRUCTION DRAWINGS FOR KNIGHTDALE STATION PHASE R3

TOWN OF KNIGHTDALE PROJ. # S-3-15

KNIGHTDALE, WAKE COUNTY, NORTH CAROLINA

AUGUST 31, 2015

### SITE DATA TABLE - PHASE R3

KNIGHTDALE PROJECT No.	S-3-15
OWNER	KNIGHTDALE INVESTORS, LLC.
PARCEL PIN No.	1754867665 & 1754851859
EXISTING ZONING	UR12, GR8
PROPOSED ZONING	UR12, GR8
PROPOSED USE	SINGLE FAMILY
TOTAL TRACT AREA	20.01 AC
RECREATIONAL OPEN SPACE (ACTIVE)	1.03 AC
RECREATIONAL OPEN SPACE (PASSIVE)	1.84 AC
TOTAL OPEN SPACE	7.58 AC
MAXIMUM DENSITY ALLOWED (UNITS/ACRE)	12
PROPOSED DENSITY (UNITS/ACRE)	2.50
TOTAL NUMBER OF LOTS ALLOWED	198 (PER UAA EXHIBIT B)
TOTAL NUMBER OF LOTS PROVIDED	50
TOTAL LINEAR FEET IN STREETS (PUBLIC)	2,219 LF
TOTAL LINEAR FEET OF ALLEY	363 LF
TOTAL LINEAR FEET OF CURB & GUTTER	4,336 LF
TOTAL LINEAR FEET OF SIDEWALK	3,914 LF
TOTAL LINEAR FEET OF GREENWAY TRAIL	1,581 LF
LINEAR FEET IN WATERLINES (6 IN)	122 LF
LINEAR FEET IN WATERLINES (8 IN)	2,300 LF
TOTAL LINEAR FEET IN WATERLINES	2,422 LF
TOTAL LINEAR FEET IN SEWER LINES	2,040 LF
TOTAL LINEAR FEET IN STORM DRAINAGE	2,760 LF
PROJECTED WATER USAGE (GPD)	12,500
(250 GPD/UNIT)	
PROJECTED SEWER USAGE (GPD)	12,500
(250 GPD/UNIT)	

#### LOTS 130-163    LOTS 164-179

MINIMUM LOT WIDTH REQUIRED	60 LF	30 LF
LOT WIDTH (TYP.)	60 LF	30 LF
MINIMUM LOT AREA PROVIDED	6,978 SF	3,898 SF
MEDIAN LOT AREA PROVIDED	7,821 SF	3,900 SF
AVERAGE LOT AREA PROVIDED	8,542 SF	4,073 SF

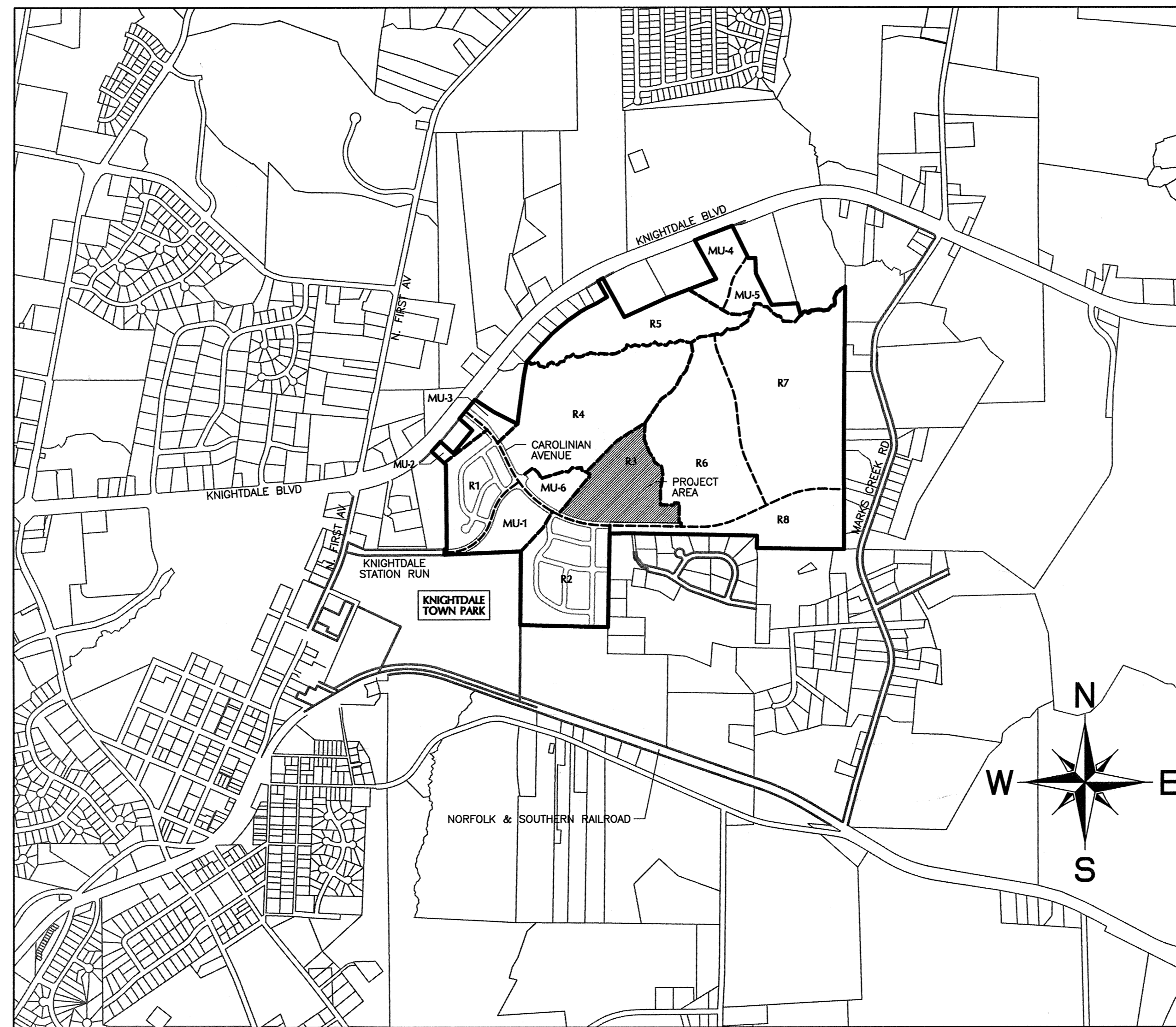
#### LOT SETBACKS

FRONT YARD	10 FT
REAR YARD	25 FT
SIDE YARD	25% 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)(4), 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.

### INDEX OF SHEETS

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1	EXISTING CONDITIONS
2	OVERALL SITE PLAN
3	SITE PLAN
4	UTILITY PLAN
5	EROSION CONTROL AND STORM DRAINAGE PLAN
6	STORM DRAINAGE CHARTS
7	ARUNDEL DRIVE STA 10+00.00 TO 20+64.30 PLAN & PROFILE
8	FIREBALL COURT STA 10+00.00 TO 19+74.38 PLAN & PROFILE
9	SILVERCOMET DRIVE STA 10+00.00 TO 12+55.51 PLAN & PROFILE & BEELINER LANE STA 10+00.00 TO 13+84.57 PLAN & PROFILE
10	SANITARY SEWER OUTFALL D PLAN & PROFILE
11	PAVEMENT MARKINGS AND SIGNAGE PLAN
12	LANDSCAPE PLAN
13	LANDSCAPE DETAILS
14	STORMWATER MANAGEMENT PLAN - BMP #4
15	STORMWATER MANAGEMENT PLAN - BMP #5
16	ROADWAY DETAILS
17	STORM DRAINAGE DETAILS
18	EROSION CONTROL DETAILS
19	WATER UTILITY DETAILS
20	SEWER UTILITY DETAILS
21	GREENWAY DETAILS



VICINITY MAP

1"=1000'

### LEGEND

DESCRIPTION	EXISTING	PROPOSED
1' CONTOUR INTERVAL	---	---
5' CONTOUR INTERVAL	---	---
PROPERTY LINE BY SURVEY	---	---
PROPERTY LINE BY DEED	---	---
EASEMENT LINE	---	---
SANITARY SEWER	○-S	○-S
STORM DRAINAGE	○-S	○-S
WATERLINE	○-W	○-W
FIRE HYDRANT ASSEMBLY	⊕	⊕
CABLE TV	---TV	---TV
FIBER OPTIC	---FO	---FO
OVERHEAD ELECTRICAL	---DHE	---DHE
GAS	---G	---G
TELEPHONE	---T	---T
FENCING STRUCTURE	---X	---X
WATERWAYS	---	---
WETLANDS	---	---
FORCE MAIN	○-FM	○-FM
100 yr FLOOD	---	---
TREELINE	---	---

### OWNER/DEVELOPER

**KNIGHTDALE INVESTORS, LLC.**  
P.O. BOX 3557  
CARY, NC 27519  
Attention: THAD MOORE  
Telephone: (919) 481-3000  
Fax: (919) 677-8600

### PREPARED BY:

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS

115 MacKenan Drive Cary, North Carolina 27511 tel: 919-469-3340 www.wITHERSRAVENEL.com License No. C-0832

REVISION BLOCK		
NO.	DESCRIPTION	DATE
1	TOK 1st COMMENTS	08/31/15 JCI

### 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) 998-4540 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.  
FAILURE TO CALL FOR INSPECTION, INSTALL A DOWNSIDE 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.  
DATE: 9/25/15  
BY: JOHN C. HANSTON, PE  
TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER  
THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
DATE: 9/25/15  
BY: ADMINISTRATOR

### PUBLIC WATER DISTRIBUTION/EXTENSION SYSTEM

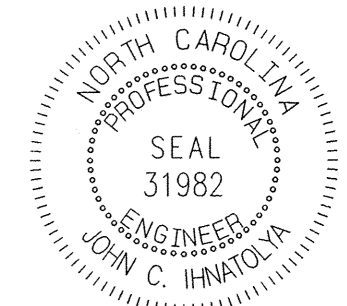
THE CITY OF RALEIGH CONSENTS TO THE CONNECTION AND EXTENSION OF THE CITY'S PUBLIC WATER SYSTEM AS SHOWN ON THIS PLAN. THE MATERIAL AND CONSTRUCTION METHODS USED FOR THIS PROJECT SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY'S PUBLIC UTILITIES HANDBOOK.  
CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT PERMIT # W-3334  
AUTHORIZATION TO CONSTRUCT  
DATE: 9/11/15

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.  
DATE: 9/25/15  
BY: 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 # S-4088  
AUTHORIZATION TO CONSTRUCT  
DATE: 9/11/15

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, JOHN C. HANSTON, 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.  
DATE: 8/31/15  
BY: JOHN C. HANSTON, PE



**TREE SURVEY**

1	15.6' Red Cedar	112	22.8' Loblolly Pine
2	41.4' Triple Trunk Red Cedar	113	23.1' Loblolly Pine
3	32.2' Double Trunk Willow Oak	114	18.8' Loblolly Pine
4	14.2' Red Cedar	115	18.0' Loblolly Pine
5	14.5' Red Cedar	116	15.0' Loblolly Pine
6	13.2' Red Cedar	117	12.3' Loblolly Pine
7	16.2' Loblolly Pine	118	15.7' Loblolly Pine
8	7' Red Cedar	119	12.8' Loblolly Pine
9	21.2' Loblolly Pine	120	15.3' Loblolly Pine
10	25.7' Willow Oak	121	18.4' Loblolly Pine
11	18.8' Red Cedar	122	18.7' Loblolly Pine
12	Loblolly Pine	123	14.1' Loblolly Pine
13	Loblolly Pine	124	15.2' Loblolly Pine
14	15.8' Loblolly Pine	125	15.2' Loblolly Pine
15	24.7' Sweetgum	126	13.2' Loblolly Pine
16	18.9' Red Cedar	127	20.2' Loblolly Pine
17	12.2' Loblolly Pine	128	12.2' Loblolly Pine
18	24.0' Loblolly Pine	129	14.6' Loblolly Pine
19	15.1' Red Cedar	130	16.1' Loblolly Pine
20	21.1' Red Cedar	131	14.3' Loblolly Pine
21	14.2' Loblolly Pine	132	24.5' Loblolly Pine
22	20.4' Loblolly Pine	133	16.4' Loblolly Pine
23	19.2' Loblolly Pine	134	17.4' Loblolly Pine
24	13.5' Loblolly Pine	135	20.8' Loblolly Pine
25	13.0' Loblolly Pine	136	21.7' Loblolly Pine
26	13.0' Loblolly Pine	137	22.6' Loblolly Pine
27	13.0' Loblolly Pine	138	13.8' Loblolly Pine
28	12.9' Loblolly Pine	139	21.5' Loblolly Pine
29	36.9' White Oak	140	14.2' Loblolly Pine
30	35.4' Willow Oak	141	14.2' Loblolly Pine
31	12.9' Loblolly Pine	142	15.7' Loblolly Pine
32	12.9' Loblolly Pine	143	14.4' Loblolly Pine
33	12.8' Persimmon	144	18.6' Loblolly Pine
34	13.4' Loblolly Pine	145	25.3' Loblolly Pine
35	13.4' Loblolly Pine	146	18.0' Loblolly Pine
36	13.4' Loblolly Pine	147	18.0' Loblolly Pine
37	13.4' Loblolly Pine	148	14.8' Loblolly Pine
38	14.8' Loblolly Pine	149	15.4' Loblolly Pine
39	14.8' Loblolly Pine	150	16.1' Loblolly Pine
40	15.7' Loblolly Pine	151	16.0' Loblolly Pine
41	25.2' Yellow Poplar	152	15.3' Loblolly Pine
42	12.1' Red Cedar	153	12.5' Loblolly Pine
43	Loblolly Pine	154	13.5' Loblolly Pine
44	Loblolly Pine	155	13.5' Loblolly Pine
45	Loblolly Pine	156	13.3' Loblolly Pine
46	Loblolly Pine	157	13.3' Loblolly Pine
47	Loblolly Pine	158	12.3' Loblolly Pine
48	Loblolly Pine	159	12.3' Loblolly Pine
49	Loblolly Pine	160	14.6' Loblolly Pine
50	Loblolly Pine	161	13.4' Loblolly Pine
51	Loblolly Pine	162	13.4' Loblolly Pine
52	Loblolly Pine	163	16.7' Loblolly Pine
53	Loblolly Pine	164	16.7' Loblolly Pine
54	Loblolly Pine	165	12.6' Loblolly Pine
55	Loblolly Pine	166	12.6' Loblolly Pine
56	Loblolly Pine	167	12.0' Loblolly Pine
57	Loblolly Pine	168	16.9' Loblolly Pine
58	Loblolly Pine	169	12.7' Loblolly Pine
59	Loblolly Pine	170	13.1' Loblolly Pine
60	Loblolly Pine	171	13.5' Loblolly Pine
61	Loblolly Pine	172	12.4' Loblolly Pine
62	Loblolly Pine	173	13.3' Loblolly Pine
63	Loblolly Pine	174	13.1' Loblolly Pine
64	Loblolly Pine	175	13.1' Loblolly Pine
65	Loblolly Pine	176	13.6' Loblolly Pine
66	Loblolly Pine	177	15.1' Loblolly Pine
67	Loblolly Pine	178	13.8' Loblolly Pine
68	Loblolly Pine	179	15.5' Loblolly Pine
69	Loblolly Pine	180	12.7' Loblolly Pine
70	Loblolly Pine	181	13.0' Loblolly Pine
71	Loblolly Pine	182	13.0' Loblolly Pine
72	Loblolly Pine	183	13.0' Loblolly Pine
73	Loblolly Pine	184	13.0' Loblolly Pine
74	Loblolly Pine	185	13.0' Loblolly Pine
75	Loblolly Pine	186	12.0' Loblolly Pine
76	Loblolly Pine	187	13.7' Loblolly Pine
77	Loblolly Pine	188	15.2' Loblolly Pine
78	Loblolly Pine	189	15.2' Loblolly Pine
79	Loblolly Pine	190	14.4' Loblolly Pine
80	Loblolly Pine	191	15.4' Loblolly Pine
81	Loblolly Pine	192	13.7' Loblolly Pine
82	Loblolly Pine	193	13.0' Loblolly Pine
83	Loblolly Pine	194	15.4' Loblolly Pine
84	Loblolly Pine	195	12.3' Loblolly Pine
85	Loblolly Pine	196	15.5' Loblolly Pine
86	Loblolly Pine	197	13.6' Loblolly Pine
87	Loblolly Pine	198	13.6' Loblolly Pine
88	Loblolly Pine	199	16.3' Loblolly Pine
89	Loblolly Pine	200	13.0' Red Cedar
90	Loblolly Pine	201	14.0' Loblolly Pine
91	Loblolly Pine	202	32.2' Sweetgum
92	Loblolly Pine	203	16.1' Loblolly Pine
93	Loblolly Pine	204	15.1' Loblolly Pine
94	Loblolly Pine	205	15.1' Loblolly Pine
95	Loblolly Pine	206	24.7' Loblolly Pine
96	Loblolly Pine	207	22.1' Sweetgum
97	Loblolly Pine	208	28.4' Yellow Poplar
98	Loblolly Pine	209	20.3' Loblolly Pine
99	Loblolly Pine	210	25.6' Loblolly Pine
100	Loblolly Pine	211	13.6' Loblolly Pine
101	Loblolly Pine	212	13.6' Loblolly Pine
102	Loblolly Pine	213	16.9' Loblolly Pine
103	Loblolly Pine	214	27.5' Loblolly Pine
104	Loblolly Pine	215	38.5' Loblolly Pine
105	Loblolly Pine	216	13.9' Loblolly Pine
106	Loblolly Pine	217	12.1' Loblolly Pine
107	Loblolly Pine	218	13.2' Persimmon
108	Loblolly Pine	219	15.1' Loblolly Pine
109	Loblolly Pine	220	13.8' Loblolly Pine
110	Loblolly Pine	221	14.1' Loblolly Pine
111	Loblolly Pine	222	19.6' Loblolly Pine

\*TREE SURVEY BASED ON REPORT PREPARED BY ELLEN & ASSOCIATES CONSULTING FORESTRY, INC. DATED APRIL 10, 2015.

**TREE LEGEND**

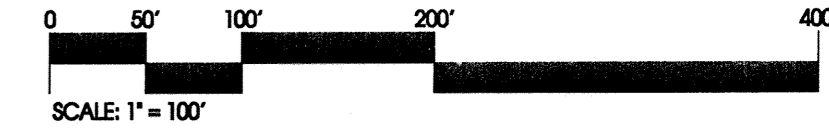
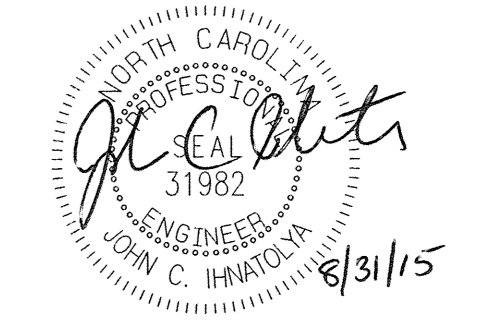
TREE DESCRIPTION	
	90% SMALL PINE (2"-10" DBH) 10% RED CEDAR, WILLOW OAK & SWEETGUM
	100% LARGE PINE, POPLAR & SWEETGUM (18"-36" DBH)
	80% SMALL PINE (2"-12" DBH) 10% LARGE PINE (12"-16" DBH) 10% LARGE PINE (14"-28" DBH)
	SCATTERED PINE & CEDAR

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: 1/23/15  
TOWN ENGINEER DEVELOPMENT SERVICES, EASTINGHAM

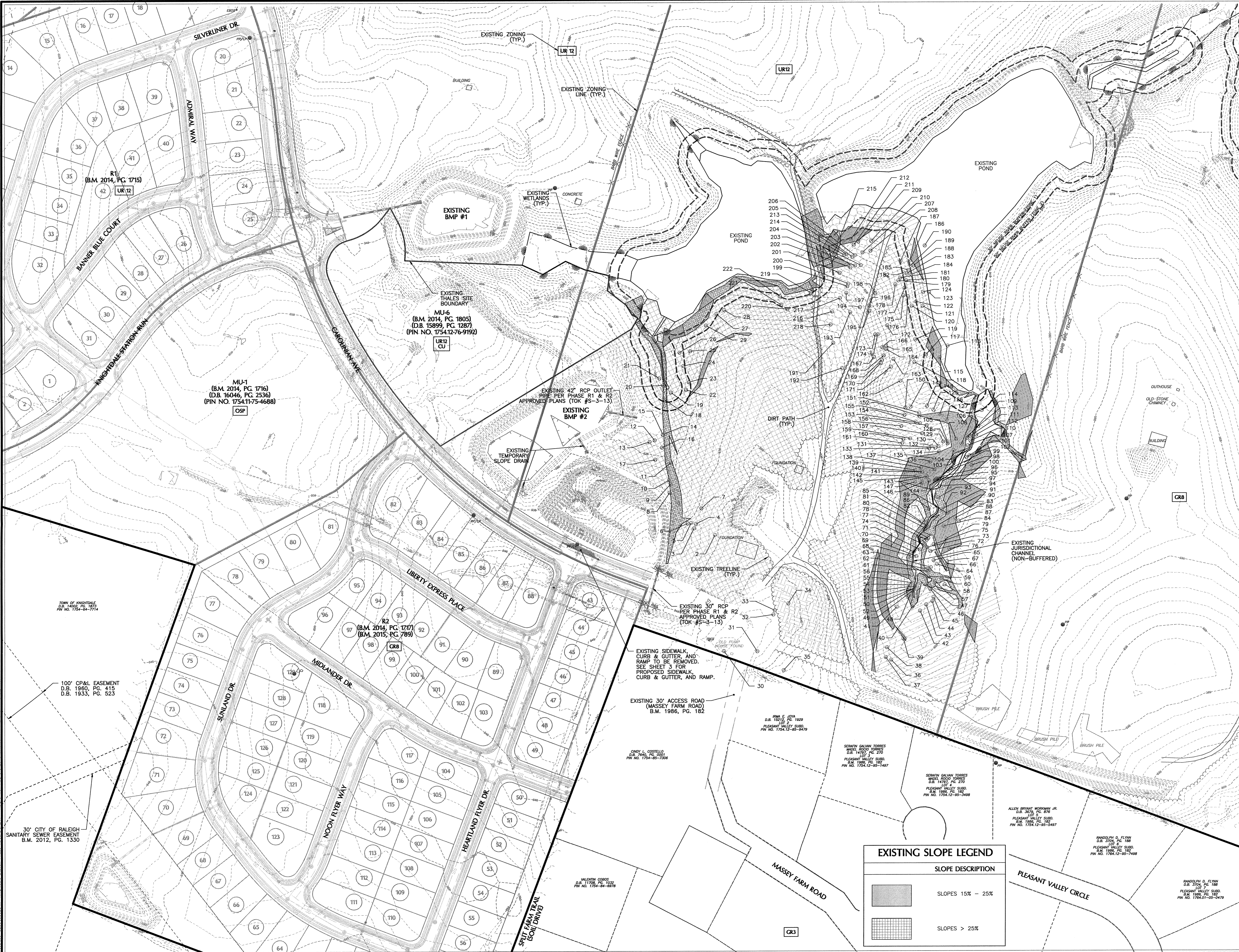
THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVED AS CONSTRUCTION PLANS FOR THIS PROJECT.

BY: *[Signature]* DATE: 1/23/15  
ADMINISTRATOR



**EXISTING SLOPE LEGEND**

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



No.	Revision	Date	By
1	TOK 1st COMMENTS	08/31/15	JCI

Designer: W&R Scale: SEE SHEET  
 Drawn By: JCI Date: 06/23/15  
 Checked By: JCI Job No: 020902517

**KNIGHTDALE STATION  
PHASE R3**

TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

**EXISTING CONDITIONS**

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS

115 MacKenon Drive Cary, North Carolina 27511 tel: 919-469-3340 www.wITHERSRAVENEL.COM License No. C-0832

Sheet No. **1** of **21**

**SITE DATA**  
TOTAL SITE AREA: 278.81 ACRES

TRACT	AREA* (AC)	EXISTING/PROPOSED ZONING	PROPOSED USE
R3	20.01	UR12,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 = 2.19 AC  
REMAINING TREE COVER AREA REQUIRED PER UAA = 6.71 AC  
REQUIRED TREE COVER AREA W/ R3 (20' x 0 LF PERIMETER) = 0.00 AC\*  
REMAINING TREE COVER AREA REQUIRED FOR FUTURE PHASES PER UAA = 6.71 AC

\* NO TREE COVER AREA SHALL BE REQUIRED FOR R3 SINCE R3 DOES NOT BORDER THE PROPERTY LINE.

**RECREATIONAL OPEN SPACE SUMMARY**  
OVERALL RECREATIONAL OPEN SPACE REQUIRED PER UAA = 17.00 AC (8.50 AC ACTIVE)  
RECREATIONAL OPEN SPACE PROVIDED W/ R1 & R2 = 7.83 AC\* (ACTIVE)  
RECREATIONAL OPEN SPACE PROVIDED W/ R3 = 9.17 AC (0.67 AC ACTIVE)  
REMAINING RECREATIONAL OPEN SPACE REQUIRED PER UAA = 1.04 AC\*\*

REQUIRED RECREATIONAL OPEN SPACE W/ R3 = 1.04 AC\*\*  
RECREATIONAL OPEN SPACE PROVIDED W/IN 30' GREENWAY EASEMENT = 1.03 AC (ACTIVE)  
RECREATIONAL OPEN SPACE PROVIDED W/IN R3 DIRECTLY NORTH OF LOTS 171 & 172 = 0.31 AC (PASSIVE)  
RECREATIONAL OPEN SPACE PROVIDED W/IN EXISTING PONDS = 1.53 AC (PASSIVE)  
REMAINING RECREATIONAL OPEN SPACE REQUIRED FOR FUTURE PHASES PER UAA = 6.30 AC (0.00 ACTIVE)

\* SEE B.M. 2015 PG. 536  
\*\* TOTAL BEDROOMS (50 SINGLE-FAMILY x 3.5 BEDROOM) = 175  
MULTIPLIER = 260 SF/BEDROOM BASED ON 2-6 DU/AC AND ADJACENT TO PARK  
REQUIRED REC. OPEN SPACE W/ R3 = 175 x 260 = 45,500 SF = 1.04 AC

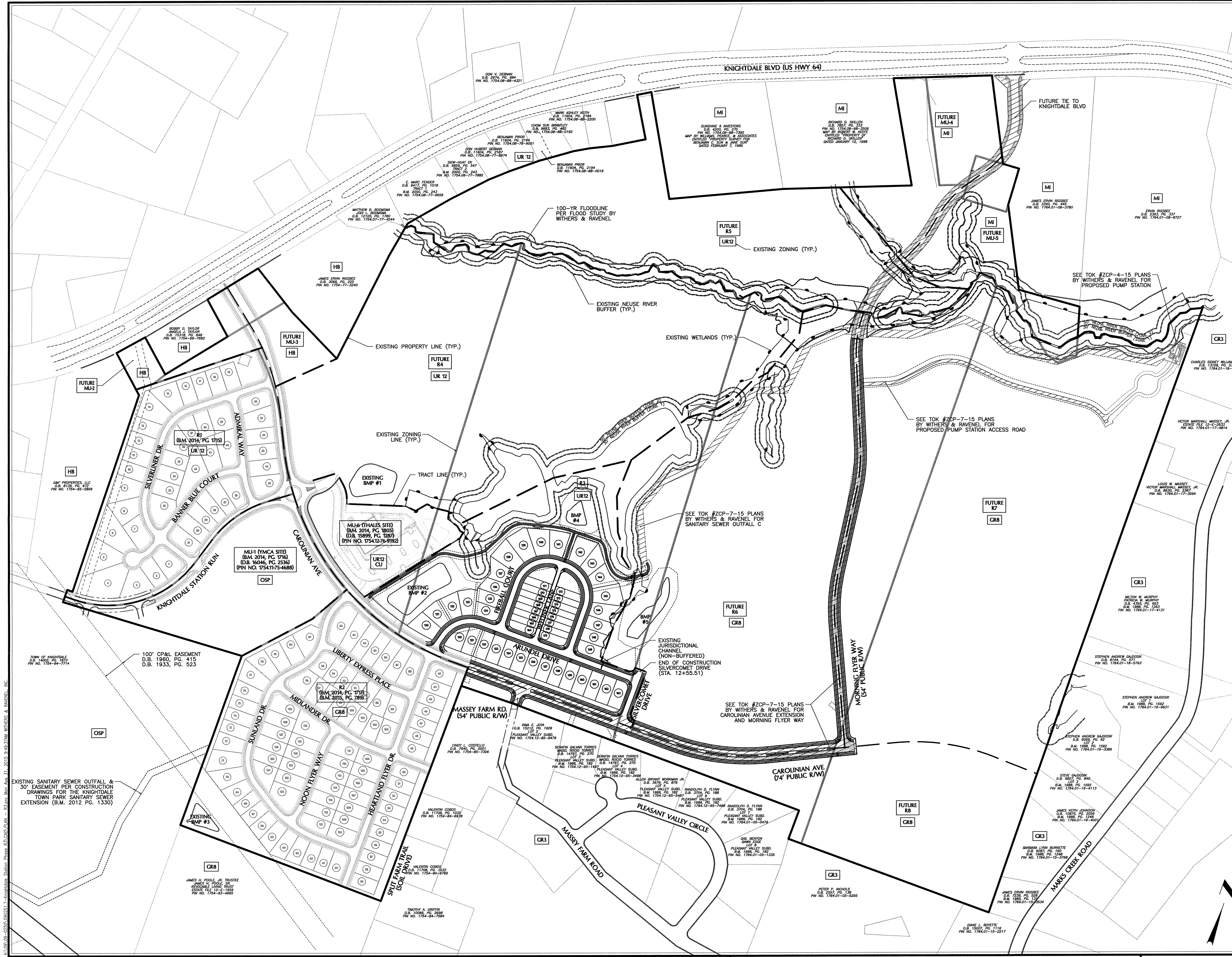
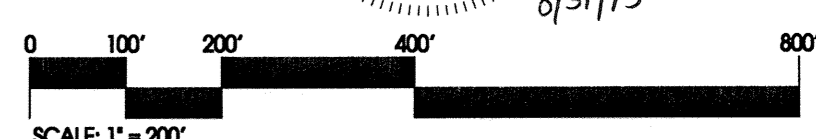
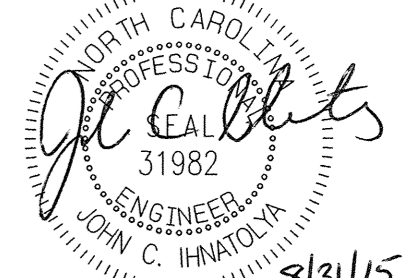
**TREE PROTECTION**

TIER	TOTAL TREES	12"-23" DBH	24"-35" DBH	36"-47" DBH	REPLACEMENT TREES NEEDED*
TIER 1	4	0	4	0	-
TIER 2	9	4	5	0	14
TIER 3	20	0	19	1	41

\*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: 55 - 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.

GENERAL NOTES:  
1. BOUNDARY BASED ON SURVEY BY WITHERS AND RAVENEL, INC.  
2. WETLANDS, STREAMS, AND PONDS SHOWN BASED ON SURVEY BY WITHERS AND RAVENEL, INC.

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: 7/25/15  
TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER  
THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
BY: [Signature] DATE: 7/25/15  
ADMINISTRATOR



No.	Revision	Date	By	Designer	W&R	Scale
1	TOK 1st COMMENTS	08/31/15	JCI	JCI	JCI	SEE SHEET

**KNIGHTDALE STATION  
PHASE R3**  
TOWN OF KNIGHTDALE  
WAKE COUNTY  
NORTH CAROLINA

**OVERALL SITE PLAN**

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS  
115 MacKenan Drive Cary, North Carolina 27511 | tel: 919-469-3340 | www.wITHERSRAVENEL.com | License No. C-0832

Sheet No. **2 of 21**

- GENERAL NOTES**
- SEE SHEET 2 FOR EXISTING ZONING AND PROPOSED ZONING.
  - BOUNDARY SURVEY PERFORMED BY WITHERS & RAVENEL, INC.
  - WETLANDS AND STREAM BUFFERS DELINEATED AND SURVEYED BY WITHERS & RAVENEL, INC.
  - 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.
  - TREE CANOPY REQUIREMENTS ARE BASED ON THE UTILITY ALLOCATION AND INFRASTRUCTURE AGREEMENT, D.B. 014722, PAGES 01758 - 01813. SEE OVERALL SITE PLAN, SHEET 2, FOR TREE CANOPY REQUIREMENTS FOR PHASE R3.
  - OPEN SPACE SHALL BE DEDICATED PER THE UUA. SEE OVERALL SITE PLAN, SHEET 2, FOR OPEN SPACE TO BE DEDICATED WITH R3.
  - STREET LIGHTS SHALL BE PROVIDED FOR TRACTS R3 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.
  - ARCHITECTURAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE RECORDED UUA.
  - ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES.
  - THIS PROPERTY DOES NOT LIE WITHIN THE FEMA FLOODPLAIN PER MAP NUMBER 3720175400J AND 3720176400J, 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.
  - ALL RIGHT-OF-WAY SHOWN HEREIN IS PUBLIC RIGHT-OF-WAY, UNLESS OTHERWISE NOTED.
  - NO SIGHT OBSTRUCTION, OR PARTIALLY OBSTRUCTING WALL, FENCE, 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.

**ROADWAY LINE TABLE**

LINE	BEARING	DISTANCE
L1	N15°32'18"E	101.30'
L2	S88°46'59"E	764.88'
L3	N00°00'00"E	231.02'
L4	N90°00'00"E	34.00'
L5	S00°00'00"W	238.12'
L6	N00°57'45"E	312.89'
L7	N00°00'00"E	384.57'

**ROADWAY CURVE TABLE**

LINE	RADIUS	ARC	CHORD	CHORD BEARING
C1	150.00'	198.13'	184.04'	N53°22'39"E
C2	150.00'	235.62'	212.13'	N45°00'00"E
C3	150.00'	235.62'	212.13'	S45°00'00"E

**SITE IMPERVIOUS - R3**

TOTAL TRACT AREA	20.01 AC
SUBDIVISION ROADWAYS & SIDEWALKS	2.50 AC
LOT IMPERVIOUS AREA (34 LOTS @ 3,500 SF/LOT) (16 LOTS @ 2,500 SF/LOT)	3.65 AC
PERCENT IMPERVIOUS (6.15 AC/20.01 AC)	30.73 %

**OPEN SPACE NOTE:**  
SEE SHEET 13 FOR PROPOSED OPEN SPACE LAYOUT AND LANDSCAPING.

**CONNECTIVITY INDEX:**

	LINKS	NODES	INDEX
R3	9	7	1.3

**AASHTO INTERSECTION SIGHT DISTANCE SUMMARY**

STREET NAME (THROUGH TRAFFIC)	STREET NAME (STOP) (DIRECTION OF TRAVEL)	DESIGN SPEED OF STREET (THROUGH) (MPH)	APPROACH GRADE OF STREET (STOP) (%)	LEFT TURN TIME GAP (SEC.)	RIGHT TURN TIME GAP (SEC.)	CALCULATED LEFT TURN SIGHT DISTANCE (FT)	CALCULATED RIGHT TURN SIGHT DISTANCE (FT)	PROPOSED LEFT TURN SIGHT DISTANCE (FT)	PROPOSED RIGHT TURN SIGHT DISTANCE (FT)
ARUNDEL DR.	FIREBALL CT. (STA. 10+00.00)	25	1.80	7.50	6.50	276	239	280	240
ARUNDEL DR.	BELINER LANE	25	1.95	7.50	6.50	276	239	280	240
ARUNDEL DR.	FIREBALL CT. (STA. 19+74.38)	25	1.70	7.50	6.50	276	239	280	240
SILVERCOMET DR.	ARUNDEL DR.	25	2.00	7.50	6.50	276	239	280	240

**PROPOSED STREET CLASSIFICATION**

ROAD	CLASSIFICATION
ARUNDEL DRIVE	LOCAL STREET
FIREBALL COURT	LOCAL STREET
SILVERCOMET DRIVE	LOCAL STREET
BELINER LANE	ALLEY

**PROPOSED POSTED SPEED LIMIT**

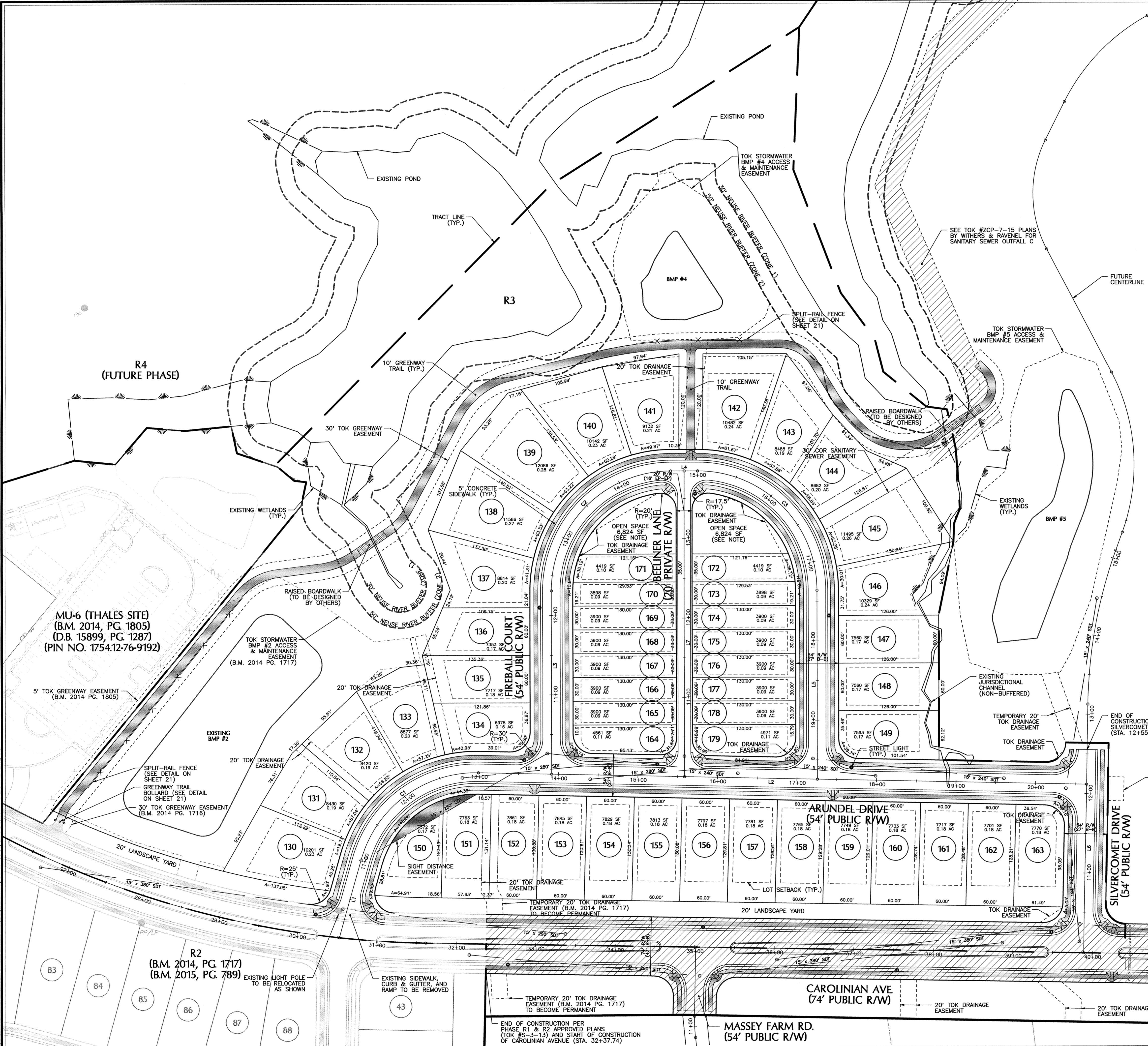
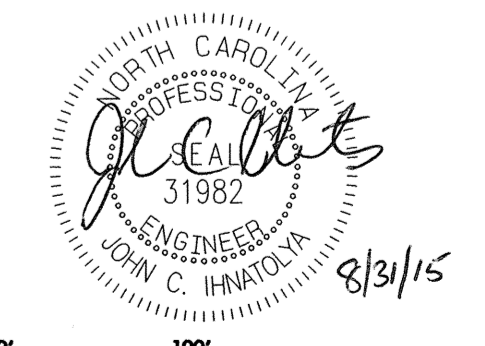
ROAD	SPEED LIMIT
ARUNDEL DRIVE	25 MPH
FIREBALL COURT	25 MPH
SILVERCOMET DRIVE	25 MPH
BELINER LANE	10 MPH

**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: 9/23/15  
 TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
 ADMINISTRATOR



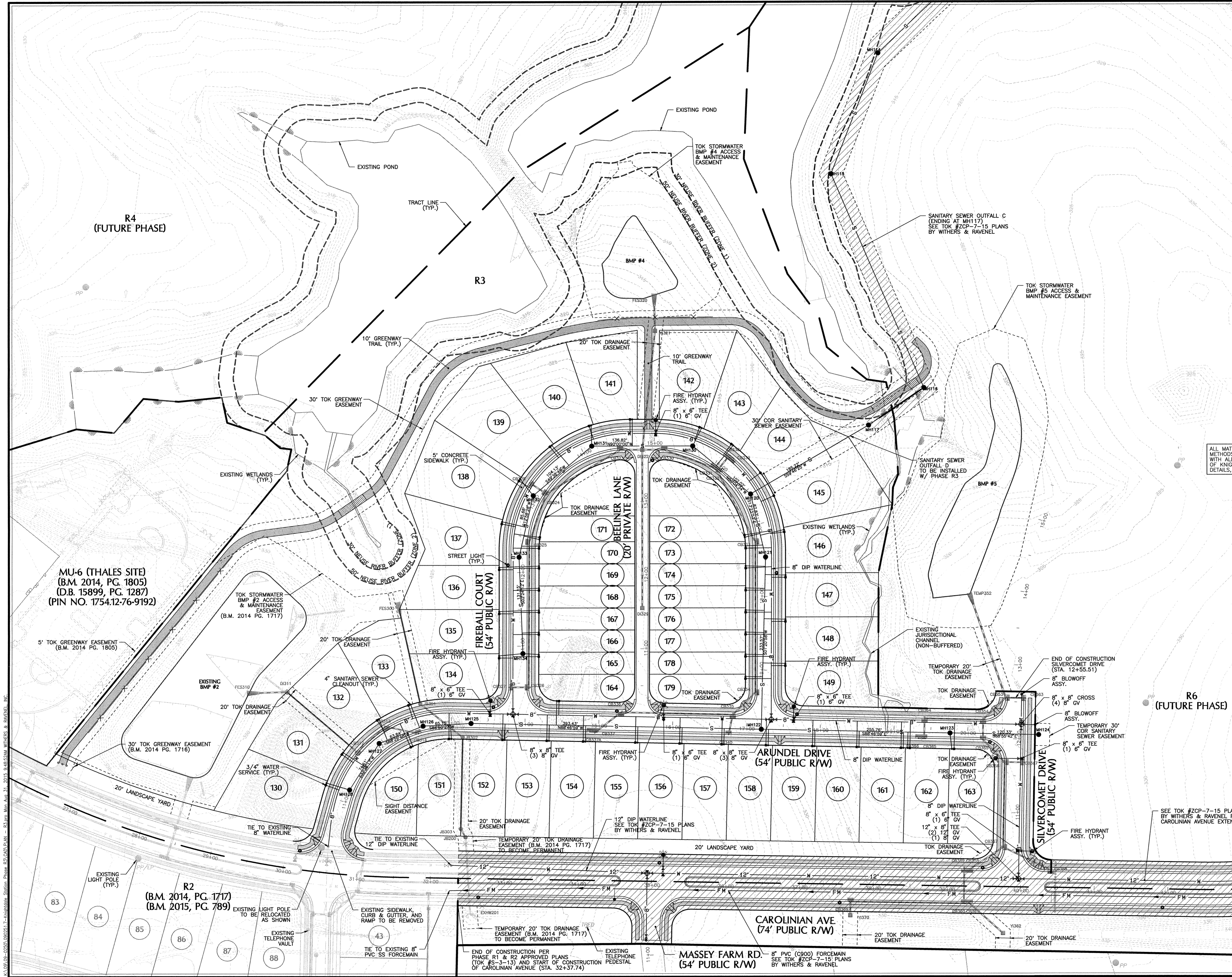
No.	Revision	Date	By	Checked By
1	TOK 1st COMMENTS	08/31/15	JCI	JCI

**KNIGHTDALE STATION  
PHASE R3**  
WAKE COUNTY  
NORTH CAROLINA

**SITE PLAN**

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS  
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Sheet No. **3 of 21**



- ### 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 10' 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 IS 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 ENCASUREMENT 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 OVER 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 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; BACKFLOW 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 NCDEQ &/OR FEMA FROM ANY RIPARIAN BUFFER, WETLAND &/OR FLOODPLAIN IMPACTS (RESPECTIVELY) PRIOR TO CONSTRUCTION.
  - NOOT RAILROAD 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.

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

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) 996-4340 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.

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-3334**

AUTHORIZATION TO CONSTRUCT *[Signature]*

DATE **9/11/15**

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 **S-4088**

AUTHORIZATION TO CONSTRUCT *[Signature]*

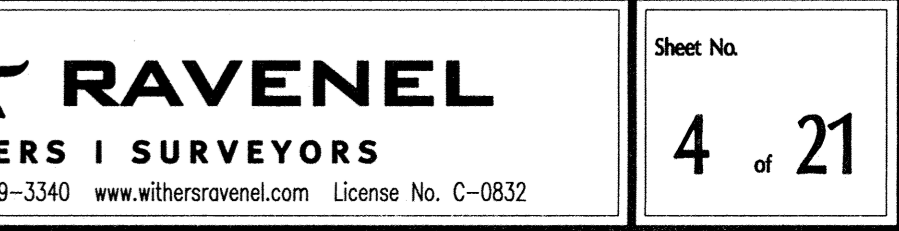
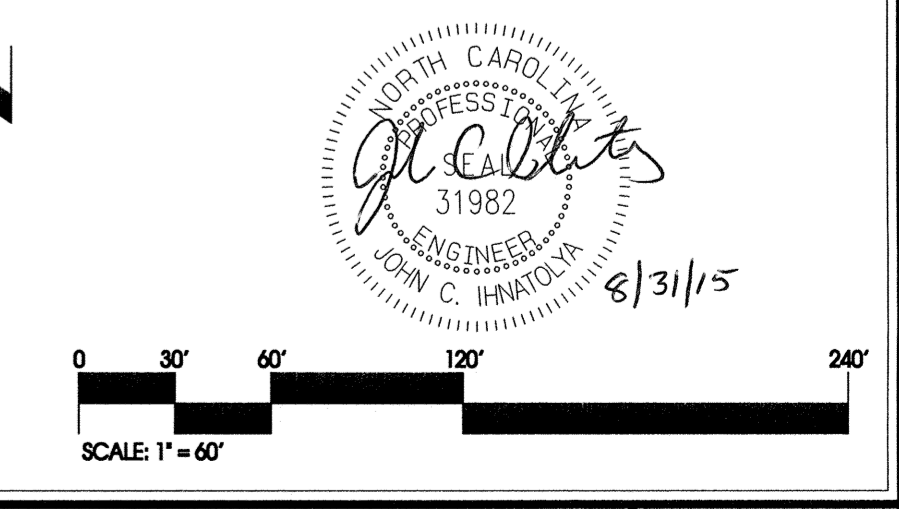
DATE **9/11/15**

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: **9/23/15**  
TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: **9-25-15**  
ADMINISTRATOR



No.	Revision	Date	By	Designer	W&R	Scale	SEE SHEET
1	TOK 1st COMMENTS	08/31/15	JCI	JCI	JCI	06/23/15	
				JCI	JCI	02/09/2017	

**KNIGHTDALE STATION  
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**CONSTRUCTION SEQUENCE (WAKE COUNTY):**

- SCHEDULE A PRECONSTRUCTION CONFERENCE WITH THE WATERSHED MANAGER, DEBRA RYALS (919-842-7142). OBTAIN A LAND-DISTURBING PERMIT.
- INSTALL GRAVEL CONSTRUCTION PAD, TEMPORARY DIVERSION DITCHES #1, #2 & #3A, SILT FENCE, SEDIMENT BASINS, OR OTHER MEASURES AS SHOWN ON THE APPROVED PLAN. CLEAR ONLY AS NECESSARY TO INSTALL THESE DEVICES. SEED TEMPORARY DIVERSION DITCHES, BERMS, AND BASINS IMMEDIATELY AFTER CONSTRUCTION.
- BERM AS NEEDED TO CREATE TEMPORARY DIVERSION DITCH #2 & 3A IN ORDER TO DIRECT RUNOFF TO BMP #4 & BMP #5, RESPECTIVELY.
- CALL 919-842-7142 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.
- BEGIN CONSTRUCTION, UTILITIES, BUILDING, ETC. STORM SEWER INLETS, IF SHOWN, SHALL BE PROTECTED WITH BLOCK AND GRAVEL INLET CONTROLS, SEDIMENT TRAPS, OR OTHER APPROVED MEASURES AS SHOWN ON THE PLAN.
- TEMPORARY DIVERSION DITCH #2 SHALL BE RELOCATED AS ROAD GRADES ALLOW TO DIRECT RUNOFF TO BMP #4.
- ONCE ROAD GRADES ARE ESTABLISHED AND STORM DRAINAGE INSTALLED, TEMPORARY DIVERSION DITCHES #1, #2, #3A, #3B, #4 & #5 SHALL BE REMOVED AND AREAS STABILIZED.
- STABILIZE SITE AS AREAS ARE BROUGHT UP TO FINISH GRADE WITH VEGETATION, PAVING, DITCH LININGS, ETC.
- 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, DEBRA RYALS (919-842-7142). OBTAIN A CERTIFICATE OF COMPLETION.
- CALL TOWN OF KNIGHTDALE DEVELOPMENT SERVICES ENGINEER AT 919-217-2247 FOR AN INSPECTION PRIOR TO CONVERTING AND CLEANING OUT BMPs #4 & #5. CONVERT TO WET PONDS.

**VELOCITY DISSIPATOR DESIGN**

OUTLET #	PIPE DIA. (INCHES)	DISCHARGE LENGTH (FT)	OUTLET WIDTH (FT)	D. STREAM WIDTH (FT)	RIP RAP THICKNESS (INCHES)	RIP RAP CLASS (NGDOT)
FES300	30	21.85	20	7.5	22.5	22
FES310	18	2.49	6	4.5	3.9	18
FES320	30	23.83	20	7.5	10.5	22
TEMP352	36	61.85	20	9.0	11.0	22

ALL DISSIPATORS SHALL HAVE FILTER FABRIC UNDERLINGS.

**TEMPORARY SKIMMER BASIN DESIGN**

BASIN #	DENUED AREA (AC)	DRAINAGE AREA (AC)	COMP. COEFF. C	Q10 FLOW (CFS)	SURFACE VOLUME (CF)	REQUIRED VOLUME (CF)	SKIMMER DEPTH (FT)	BASIN LENGTH (FT)	BASIN WIDTH (FT)	WEIR LENGTH (FT)	SURFACE PROVIDED (SF)	VOLUME PROVIDED (CF)	SKIMMER SIZE (IN)	SKIMMER ORIFICE SIZE (IN)
BMP #2	12.00	24.65	0.36	62.18	27,050	44,370	-	-	-	-	38,854	176,777	4.0	3.25
BMP #4	6.20	7.20	0.46	23.51	10,225	12,960	-	-	-	-	10,535	32,767	2.5	2.0
BMP #5	6.85	21.40	0.31	46.52	20,234	38,520	-	-	-	-	23,277	92,500	4.0	3.0

- NOTES:
- EXISTING BMP #2, BMP #4 & BMP #5 WILL BE USED AS SEDIMENT BASINS DURING SITE CONSTRUCTION.
  - ADD 1.5' TO DEPTH TO OBTAIN OVERALL DEPTH OF BASIN.
  - REQUIRED VOLUME BASED ON 1800 CF/AC X DRAINAGE AREA.
  - REQUIRED SURFACE AREA BASED ON 4.5 SF/CFS X Q10 FOR BMPs.
  - CALCULATED SURFACE AREAS BASED ON RISER/WEIR ELEVATIONS.
  - CALCULATED WEIR LENGTH BASED ON Q10 FLOWING THROUGH SPILLWAY WITH 0.5 FT MAXIMUM DEPTH.
  - RAINFALL INTENSITY BASED ON 7.08 IN/HR FOR Q10 PER NCDEM EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.

- EROSION CONTROL LEGEND**
- LIMITS OF CONSTRUCTION (TOK #S-3-13) (WC #S3592 & #S3592A)
  - LIMITS OF CONSTRUCTION (TOK #ZCP-7-15)
  - LIMITS OF CONSTRUCTION (TOK #S-3-15)
  - EXISTING SILT FENCE
  - SILT FENCE
  - SILT/TREE PROTECTION FENCE
  - TP TREE PROTECTION FENCE
  - SKIMMER BASIN
  - INLET PROTECTION
  - SILT FENCE OUTLET
  - TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
  - FLARED END SECTION W/ RIP RAP OUTLET PROTECTION

**EROSION CONTROL AND STORM DRAINAGE NOTES:**

- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS & DETAILS.
- BOUNDARY SURVEY PERFORMED BY WITHERS & RAVENEL, INC.
- WETLANDS AND STREAM BUFFERS DELINEATED AND SURVEYED BY WITHERS & RAVENEL, INC.
- THIS PROPERTY DOES NOT LIE WITHIN THE FEMA FLOODPLAIN PER MAP NUMBER 3720175400J AND 3720176400J, WITH AN EFFECTIVE DATE OF MAY 2, 2006.
- RECEIVING WATERCOURSE: UNNAMED TRIBUTARY OF MARKS CREEK IN THE NEUSE RIVER BASIN.
- ALL STORM DRAINAGE PIPE 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 CONSTRUCTION FROM CONCRETE AND A BENCH WITH A MAXIMUM 5:1 SLOPE. THE BENCH SHALL BEGIN AT A HEIGHT OF ONE-HALF THE PIPE DIAMETER FOR 12 TO 24 INCH PIPE, ONE-THIRD THE PIPE DIAMETER FOR 30 TO 48 INCH PIPE, AND ONE-FOURTH THE DIAMETER FOR PIPE GREATER THAN 48 INCHES.
- 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.
- A PRECONSTRUCTION MEETING SHALL BE REQUIRED FOR THIS CONSTRUCTION.
- GRAVEL CONSTRUCTION ENTRANCE PADS SHALL BE CONSTRUCTED AT EACH POINT OF CONSTRUCTION ACCESS TO EACH PROPERTY. NOTE: IT SHALL BE THE DEVELOPER'S RESPONSIBILITY TO SEE THAT THE CONSTRUCTION ENTRANCE PADS ARE PROPERLY MAINTAINED SO THAT THE MUD IS NOT TRACKED ONTO ADJACENT STREETS. IN THE EVENT THAT THE GRAVEL CONSTRUCTION ENTRANCE PADS ARE NOT PROPERLY MAINTAINED, OR ARE OTHERWISE INEFFECTIVE, THE TOWN REPRESENTATIVE MAY ISSUE A STOP WORK ORDER OR ANY OTHER ACTION THAT MAY BE REQUIRED BY THE TOWN OF KNIGHTDALE UDO OR NC GENERAL STATUTES. THE STOP WORK ORDER SHALL REMAIN IN EFFECT UNTIL SUCH TIME AS THE PADS ARE RESTORED AND REPLENISHED AND UNTIL ANY RESULTING MUD AND DEBRIS HAS BEEN REMOVED FROM THE ADJACENT STREETS BY THE CONTRACTOR.
- TO MINIMIZE DAMAGE TO EXISTING TREES NEAR THE INTERIOR EDGE OF BUFFERS AND STREETSCAPES, THE CONTRACTOR SHALL CUT MINIMUM 2' TRENCHES ALONG LIMITS OF DISTURBANCE, SO AS TO CUT, RATHER THAN YEAR, ROOTS.
- THE TREE PROTECTION FENCE SHALL BE MAINTAINED ON THE SITE UNTIL ALL SITE WORK IS COMPLETED AND THE FINAL SITE INSPECTION PRIOR TO THE CERTIFICATE OF OCCUPANCY (CO) IS SCHEDULED. THE FENCING SHALL BE REMOVED PRIOR TO FINAL SITE INSPECTION.
- THE PROJECT WILL MEET ALL THE REQUIREMENTS RELATIVE TO THE BEST MANAGEMENT PRACTICES AND ENGINEERED STORMWATER CONTROL STRUCTURES AS OUTLINED IN THE TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS AND DETAILS MANUAL (CHAPTER 6 SECTION 6.3).
- GRADING OF INDIVIDUAL LOTS WITHIN THE MAJOR SUBDIVISION SHALL NOT BEGIN WITHOUT FIRST OBTAINING A BUILDING PERMIT FROM THE ADMINISTRATOR AND SHALL BE LIMITED TO THOSE AREAS COMPRISING THE BUILDING FOOTPRINT, DRIVEWAY AND A MINIMAL AREA SURROUNDING THEIR BUILDING FOOTPRINT TO ACCOMMODATE CONSTRUCTION EQUIPMENT PER UDO SECTION 6.6.D.3.a.
- CONTRACTOR SHALL INSTALL PROPER EROSION CONTROL MEASURES TO ENSURE THAT SEDIMENTATION DURING LOT CLEARING WILL BE MINIMIZED.
- GRADING PERMIT WILL NOT BE ISSUED UNTIL A RECEIPT SHOWING PROOF OF PAYMENT TO ECOSYSTEM ENHANCEMENT PROGRAM OR AN APPROVED NUTRIENT OFFSET BANK IS PROVIDED TO THE TOWN OF KNIGHTDALE.
- CONTRACTOR SHALL MAINTAIN ALL EROSION CONTROL STRUCTURES DURING THE LIFE OF THE PROJECT.
- CONTRACTOR SHALL CONSTRUCT DIVERSION DITCHES AS NECESSARY TO ENSURE ALL SEDIMENT IS DIRECTED INTO EROSION CONTROL MEASURES.
- CONTRACTOR SHALL INSTALL TEMPORARY SLOPE DRAINS PER DETAIL (SHEET 18) AT LOCATIONS WHERE TEMPORARY DIVERSION DITCHES DISCHARGE INTO A SKIMMER BASIN AS TO AVOID SLOPE EROSION.
- TOPSOIL SHALL BE WASTED OFFSITE OR AT APPROVED STOCKPILE AREA ON SITE.
- ALL STORM DRAINAGE PIPE SHALL BE PROTECTED DURING CONSTRUCTION IN ACCORDANCE WITH TOWN OF KNIGHTDALE DETAILS AND SPECIFICATIONS.
- CONTRACTOR SHALL PROVIDE RIP RAP DISSIPATOR PADS AT STORM DRAINAGE PIPE DISCHARGE POINTS AS REQUIRED TO ENSURE POSITIVE DRAINAGE.
- ALL CLEARING LIMITS SHALL BE CLEARLY IDENTIFIED AND STAKED PRIOR TO ANY CONSTRUCTION. THE TOWN SHALL BE GIVEN 24-HOUR NOTICE PRIOR TO BEGINNING CLEARING OPERATIONS.
- ALL EARTHWORK SHALL BE COMPLETED IN ACCORDANCE WITH THE TOWN OF KNIGHTDALE STANDARD SPECIFICATIONS AND CONSTRUCTION DETAILS MANUAL (SECTION 2.05)
- STABILIZATION SHALL BE IN ACCORDANCE WITH NPDES STORMWATER DISCHARGE PERMIT (SEE TABLE ON SHEET 18).

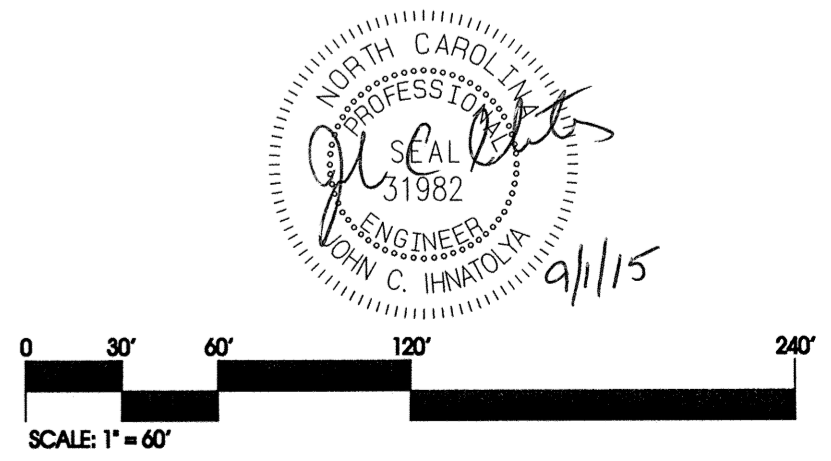
**EROSION CONTROL NARRATIVE**

THIS PROJECT CONSISTS OF GRADING, UTILITY INFRASTRUCTURE, PAVEMENT WITH CURB AND GUTTER, AND SIDEWALK TO SERVE FUTURE SINGLE FAMILY HOMES. THE CONTRACTOR SHALL FAITHFULLY FOLLOW THE CONSTRUCTION SEQUENCE AND MINIMIZE EROSION WITH INSTALLATION AND MAINTENANCE OF MEASURES AS SHOWN ON THESE PLANS. ONCE SITE IS STABILIZED, WET PONDS SHALL BE CLEANED OUT AND FINE GRADED.

**DENUED AREA**  
9.10 AC

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.

DATE: 9/25/15  
ADMINISTRATOR



**R4 (FUTURE PHASE)**

**MU-6 (THALES SITE)**  
(B.M. 2014, PG. 805)  
(D.B. 15899, PG. 1287)  
(PIN NO. 1754.12.76-9192)

**R2**  
(B.M. 2014, PG. 1717)  
(B.M. 2015, PG. 789)

**KNIGHTDALE STATION  
PHASE R3**

**EROSION CONTROL AND STORM  
DRAINAGE PLAN**

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS

No.	Revision	Date	By	Designer	W&R	Scale	SEE SHEET
1	TOK 1st COMMENTS	08/31/15	JCI	JCI	JCI	06/23/15	00902517

TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

STORM DRAINAGE PIPE SCHEDULE

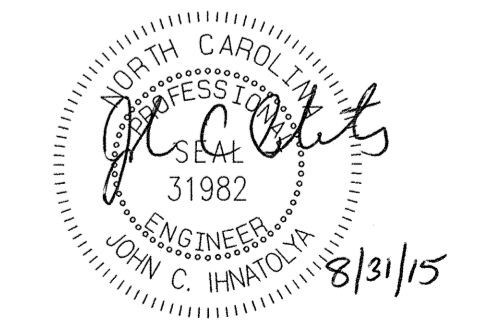
DS Inlet	US Inlet	DS Invert	US Invert	Pipe Size	Pipe Material	Pipe Length (ft)	Pipe Slope (%)
FES300	JB301	321.08	325.53	30"	Dia. CLASS III	130.95	3.40
JB301	JB302	327.73	328.46	30"	Dia. CLASS III	73.13	1.00
JB302	JB303	328.66	331.42	30"	Dia. CLASS III	123.64	2.23
JB303	HW200	331.62	331.75	30"	Dia. CLASS III	13.09	0.99
FES310	DI311	325.50	326.38	18"	Dia. CLASS III	44.01	2.00
DI311	CB312	326.58	328.69	18"	Dia. CLASS III	124.04	1.70
CB312	CB313	328.94	329.46	15"	Dia. CLASS III	51.98	1.00
CB313	CB314	329.66	330.11	15"	Dia. CLASS III	45.30	0.99
FES320	YI321	311.50	313.75	30"	Dia. CLASS III	40.04	5.62
YI321	DI322	313.95	315.53	30"	Dia. CLASS III	161.30	0.98
DI322	CB323	319.35	320.27	18"	Dia. CLASS III	29.62	3.11
CB323	CB324	320.47	322.39	18"	Dia. CLASS III	116.93	1.64
CB324	CB325	322.54	324.30	15"	Dia. CLASS III	69.37	2.54
CB325	CB326	324.50	327.40	15"	Dia. CLASS III	197.38	1.47
CB326	CB327	327.60	327.87	15"	Dia. CLASS III	27.00	1.00
CB324	CB328	322.64	322.91	15"	Dia. CLASS III	27.00	1.00
DI322	DI329	319.60	323.80	15"	Dia. CLASS III	215.12	1.95
DI322	CB330	315.73	316.03	30"	Dia. CLASS III	29.62	1.01
CB330	CB331	316.53	317.29	24"	Dia. CLASS III	69.71	1.00
CB331	CB332	317.43	317.51	24"	Dia. CLASS III	8.00	1.00
CB332	CB333	318.01	319.60	18"	Dia. CLASS III	109.33	1.45
CB333	CB334	319.80	323.28	18"	Dia. CLASS III	204.48	1.70
CB334	CB335	323.48	325.24	18"	Dia. CLASS III	42.67	4.10
CB335	CB336	325.44	326.96	18"	Dia. CLASS III	151.27	1.00
CB336	CB337	327.21	327.65	15"	Dia. CLASS III	43.36	1.01
CB337	CB337A	327.85	327.93	15"	Dia. CLASS III	8.00	1.00
CB332	CB338	318.26	318.53	15"	Dia. CLASS III	27.00	1.00
CB338	CB339	318.73	318.81	15"	Dia. CLASS III	8.00	1.00
CB335	CB340	325.25	325.53	15"	Dia. CLASS III	27.49	1.02
TEMP352	CB353	312.00	314.36	36"	Dia. HDPE	140.57	1.68
CB353	CB354	314.86	315.49	36"	Dia. CLASS III	42.52	1.48
CB354	CB355	316.80	317.07	36"	Dia. CLASS III	27.00	1.00
CB355	CB356	317.27	317.69	36"	Dia. CLASS III	42.33	0.99
CB356	CB357	317.89	319.04	36"	Dia. CLASS III	115.01	1.00
CB353	CB363	318.99	319.26	24"	Dia. CLASS III	27.00	1.00
CB354	CB364	316.49	317.29	24"	Dia. CLASS III	79.47	1.01
CB364	CB365	317.79	318.06	18"	Dia. CLASS III	27.00	1.00
CB365	CB366	318.26	318.34	18"	Dia. CLASS III	8.00	1.00
CB356	CB367	320.66	320.93	15"	Dia. CLASS III	27.00	1.00

STORM DRAINAGE INLET SCHEDULE

Inlet Name	Runoff Coeff	System Int (in/hr)	Drainage Area (ac)	Inlet Sys Q (cfs)	Rim Elev	Floor Elev	Box Depth (ft)
JB301	0.00	6.89	0.00	0.00	334.99	325.53	9.46
JB302	0.00	6.91	0.00	0.00	334.46	328.46	6.00
JB303	0.00	6.99	0.00	0.00	336.23	331.42	4.81
HW200	0.00	7.00	0.00	0.00	339.30	331.75	7.55
DI311	0.60	6.71	0.09	0.36	332.67	326.38	6.29
CB312	0.60	6.92	0.18	0.75	335.60	328.69	6.91
CB313	0.60	7.00	0.07	0.29	335.13	329.46	5.67
CB314	0.60	7.08	0.26	1.10	334.76	330.11	4.65
YI321	0.60	6.31	0.10	0.38	317.25	313.75	3.50
DI322	0.70	6.42	0.59	2.65	324.25	315.53	8.72
CB323	0.60	6.56	0.13	0.51	325.17	320.27	4.90
CB324	0.70	6.66	0.11	0.51	327.56	322.39	5.17
CB325	0.70	6.72	0.42	1.98	328.95	324.30	4.65
CB326	0.90	7.03	0.02	0.13	332.52	327.40	5.12
CB327	0.60	7.08	0.23	0.98	332.52	327.87	4.65
CB328	0.60	7.08	0.34	1.44	327.56	322.91	4.65
DI329	0.70	7.08	0.41	2.03	328.45	323.80	4.65
CB330	0.90	6.46	0.02	0.12	324.07	316.03	8.04
CB331	0.50	6.51	0.16	0.52	323.21	317.23	5.98
CB332	0.50	6.51	0.17	0.55	323.20	317.51	5.69
CB333	0.70	6.60	0.42	1.94	324.68	319.60	5.08
CB334	0.70	6.77	0.06	0.28	328.18	323.28	4.90
CB335	0.70	6.80	0.11	0.52	330.08	325.24	4.84
CB336	0.70	7.01	0.12	0.59	331.97	326.96	5.01
CB337	0.50	7.07	0.52	1.94	332.30	327.65	4.65
CB337A	0.50	7.08	0.53	1.98	332.38	327.93	4.45
CB338	0.60	7.06	0.42	1.78	323.21	318.53	4.68
CB339	0.60	7.08	0.42	1.78	323.21	318.81	4.40
CB340	0.50	7.08	0.61	2.16	330.18	325.53	4.65
CB353	0.90	6.48	0.02	0.12	324.71	314.36	10.35
CB354	0.90	6.50	0.02	0.12	324.26	315.49	8.77
CB355	0.70	6.51	0.05	0.23	324.27	317.07	7.20
CB356	0.60	6.54	0.13	0.51	325.58	317.69	7.89
CB357	0.90	6.61	0.02	0.12	326.73	319.04	7.69
CB363	0.60	7.08	1.24	5.27	324.71	319.26	5.45
CB364	0.80	7.01	0.18	1.01	323.22	317.29	5.93
CB365	0.50	7.08	0.69	2.44	323.22	318.06	5.16
CB366	0.50	7.08	0.69	2.44	323.24	318.34	4.90
CB367	0.60	7.08	0.76	3.23	325.58	320.93	4.65

STORM DRAINAGE NOTES:  
 F: FLARED END SECTION, CB: CATCH BASIN, JB: JUNCTION BOX, DI: DROP INLET (TOK #5.04), YI: YARD INLET (TOK #5.03)  
 DISCHARGE BASED ON 10-YR STORM EVENT UNLESS NOTED OTHERWISE.  
 & DENOTES O-RING PIPE REQUIRED  
 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, 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.

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: 9/23/15  
 TOWN ENGINEER/DEVELOPMENT SERVICES ENGINEER  
 THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
 BY: *[Signature]* DATE: 9.25.15  
 ADMINISTRATOR



No.	Revision	Date	By
1	TOK 1st COMMENTS	08/31/15	JCI

Designer	W&R	Scale	SEE SHEET
Drawn By	JCI	Date	06/23/15
Checked By	JCI	Job No.	000902517

**KNIGHTDALE STATION  
 PHASE R3**  
 WAKE COUNTY  
 NORTH CAROLINA

**STORM DRAINAGE CHARTS**

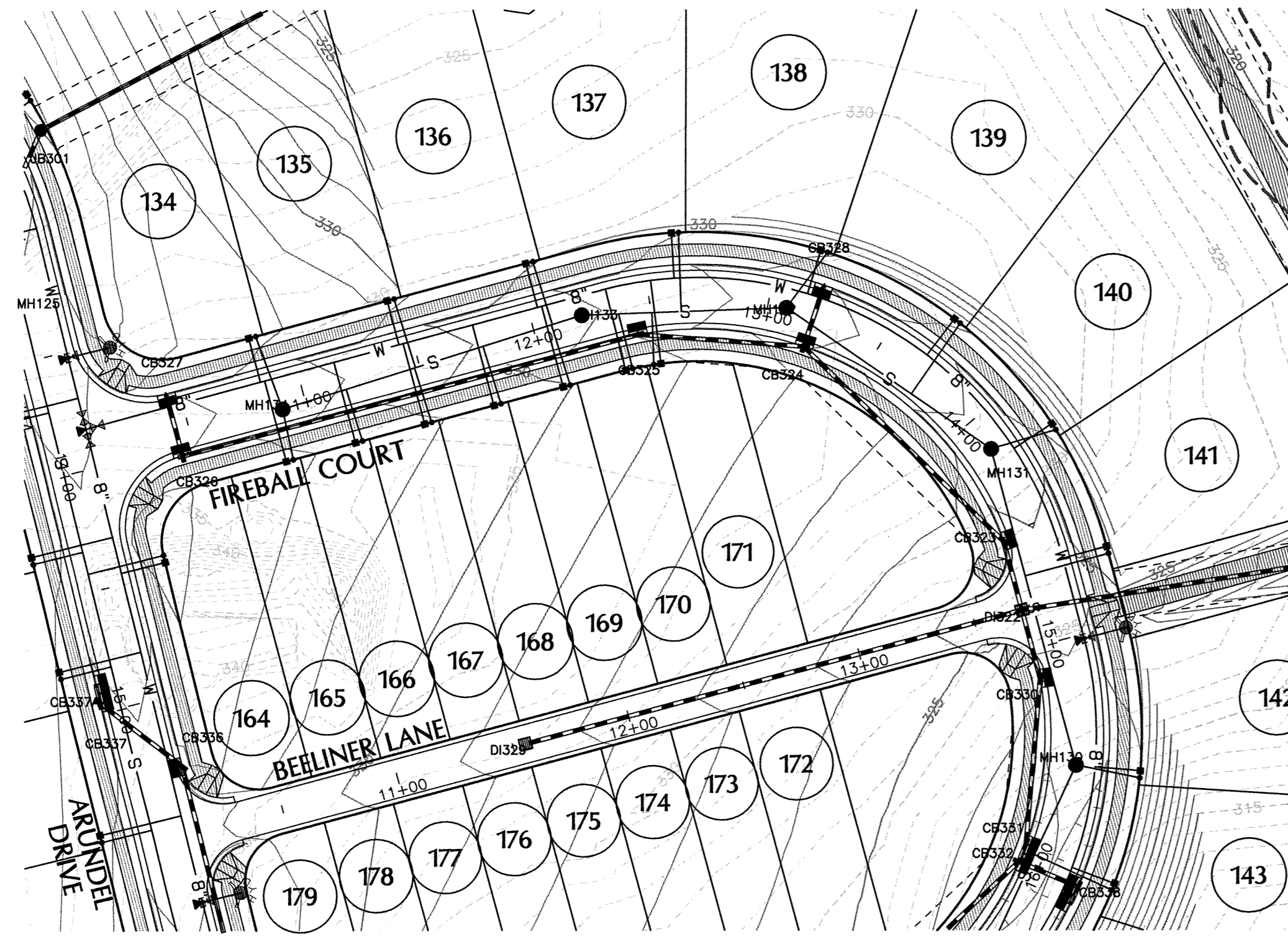
**WITHERS & RAVENEL**  
 ENGINEERS | PLANNERS | SURVEYORS  
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Sheet No.  
**6 of 21**

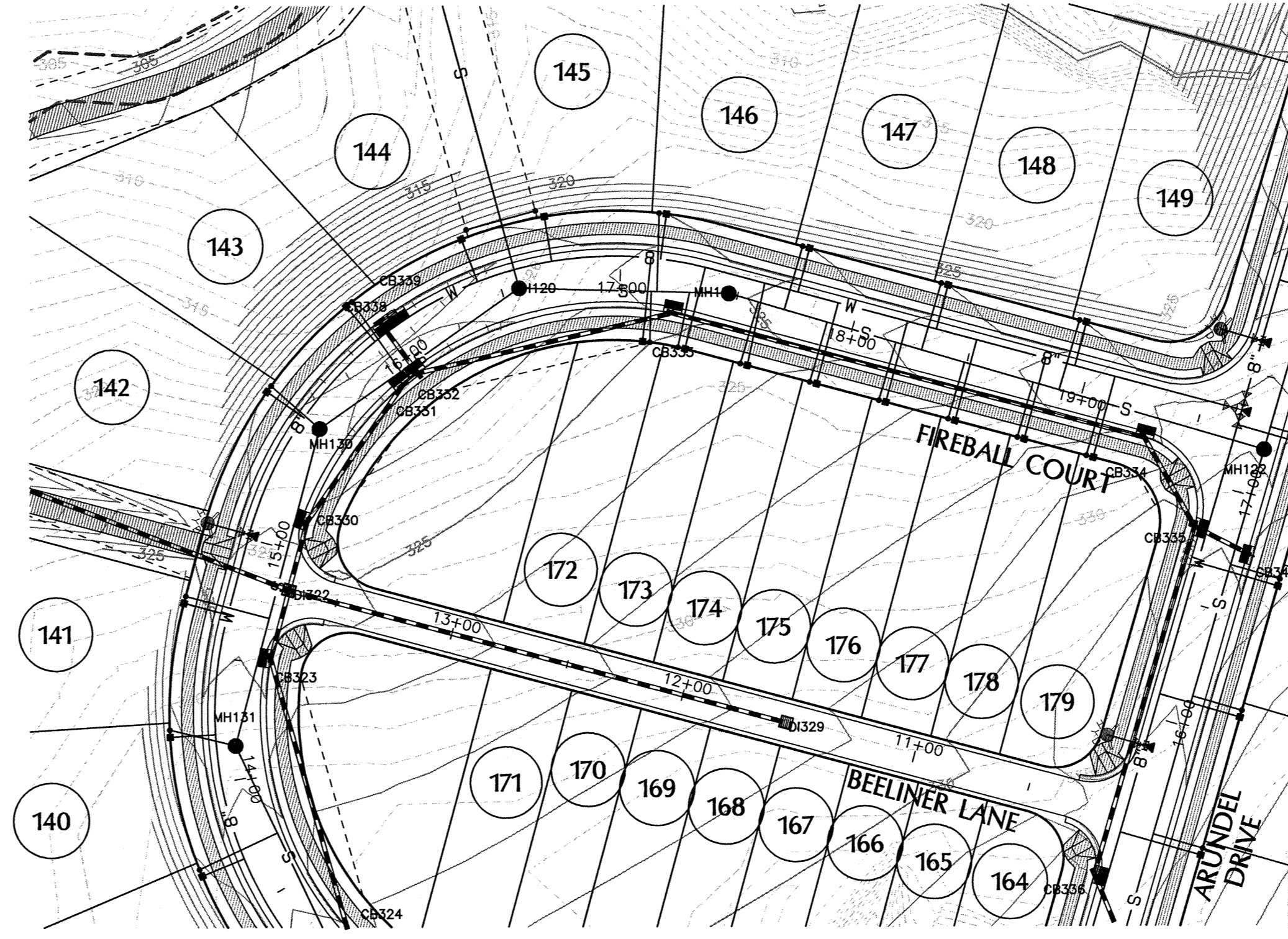
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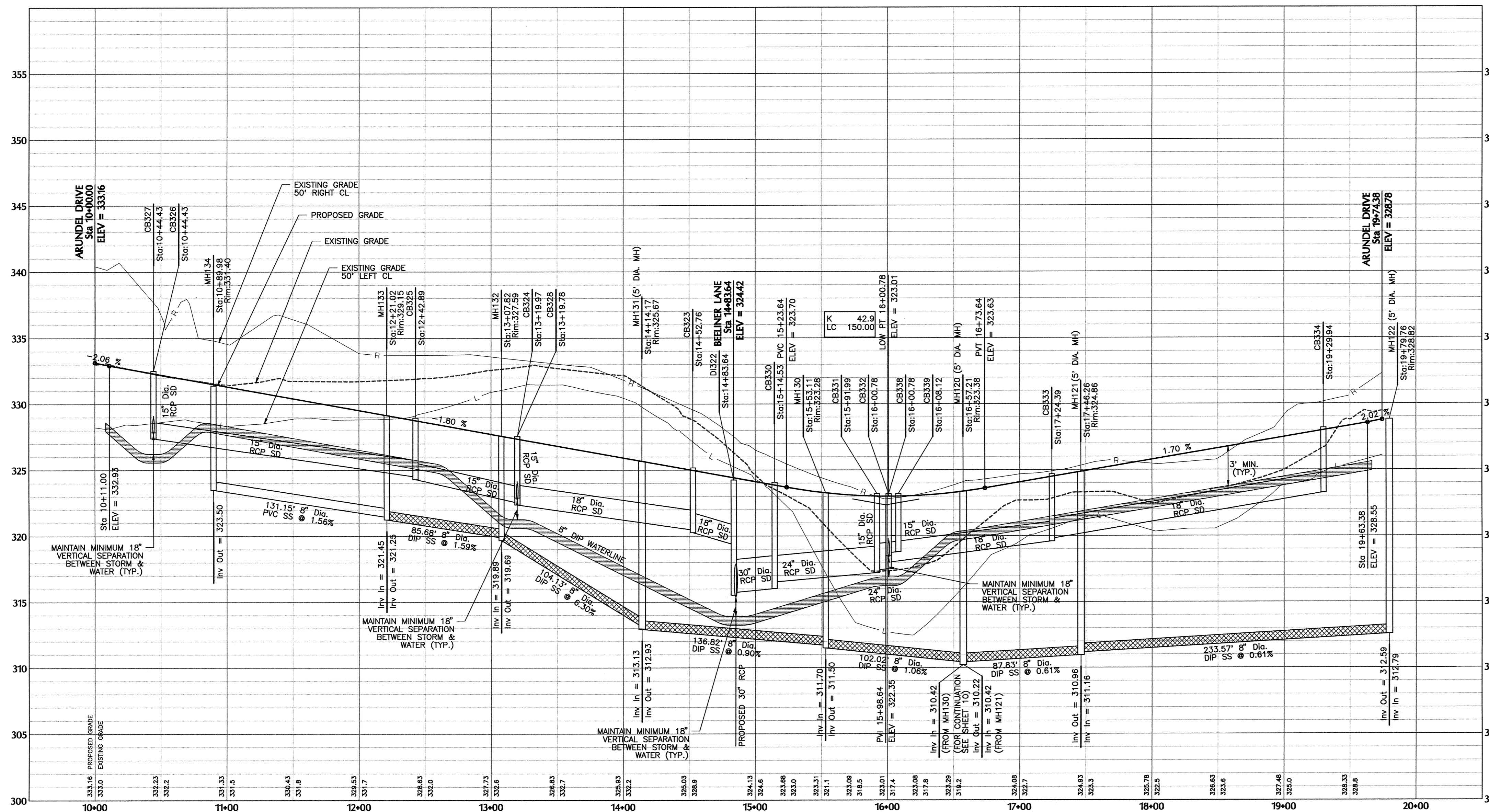




FIREBALL COURT



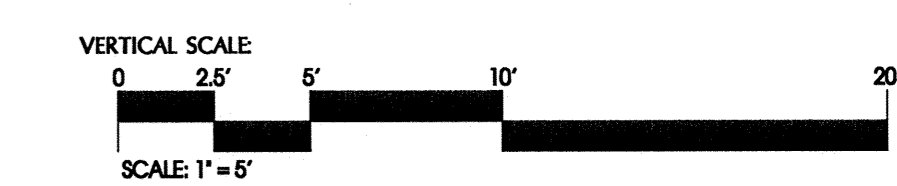
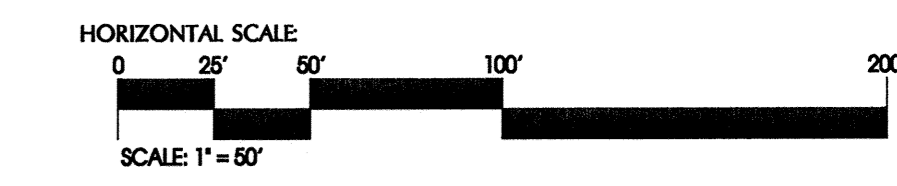
FIREBALL COURT



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-3334  
 AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
 DATE 9/11/15

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 # S-14088  
 AUTHORIZATION TO CONSTRUCT \_\_\_\_\_  
 DATE 9/11/15

SANITARY SEWER MANHOLE NOTE:  
 ALL MANHOLES SHALL BE 4' IN DIAMETER UNLESS OTHERWISE NOTED.



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: 9/23/15  
 TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER  
 THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
 BY: [Signature] DATE: 9.25.15  
 ADMINISTRATOR



No.	Revision	Date	By	JCI
1	TOK 1st COMMENTS	08/31/15	JCI	

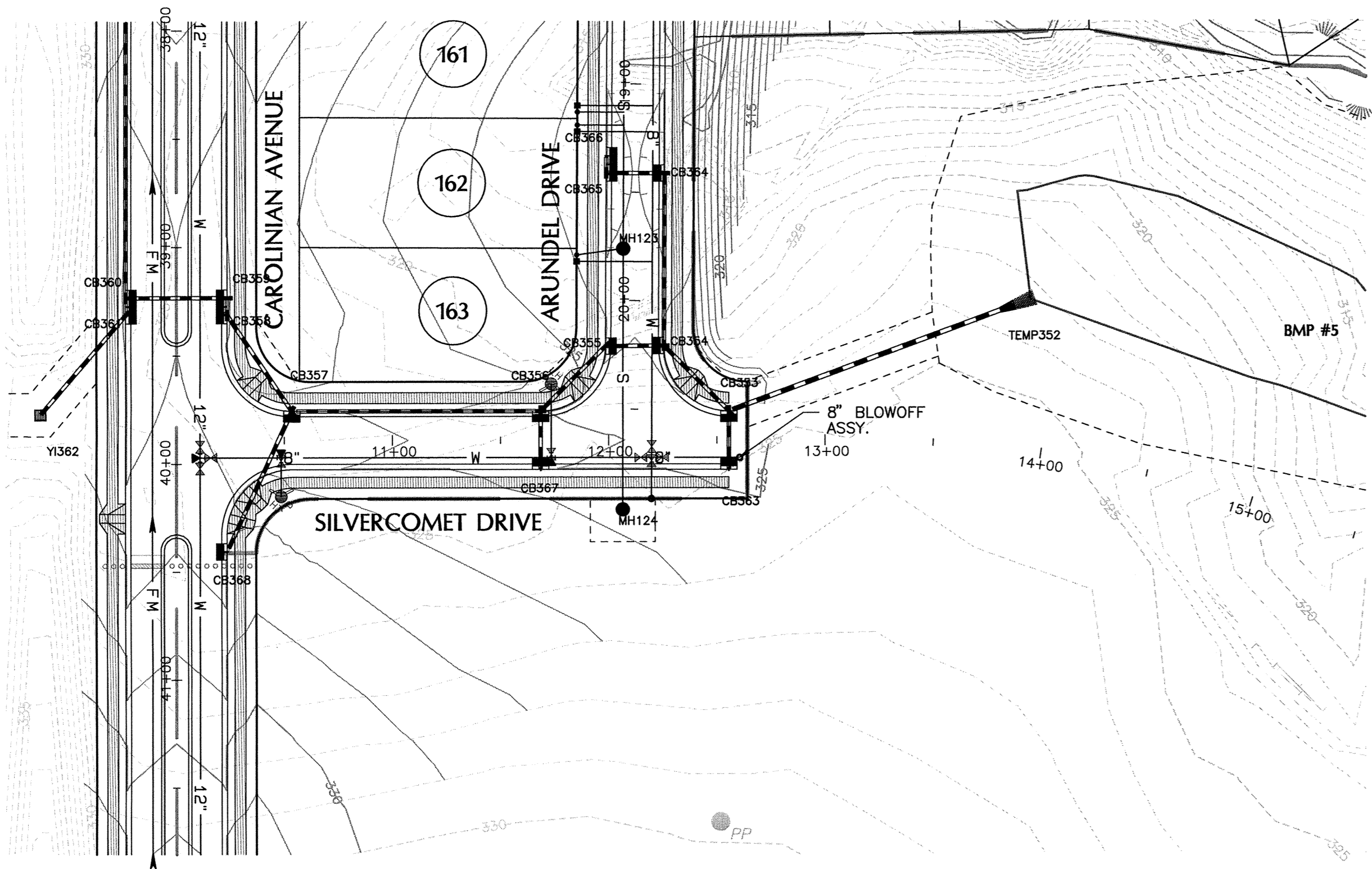
Designer	W&R	Scale	SEE SHEET
Drawn By	JCI	Date	06/23/15
Checked By	JCI	Job No.	020902517

**KNIGHTDALE STATION**  
**PHASE R3**  
 TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

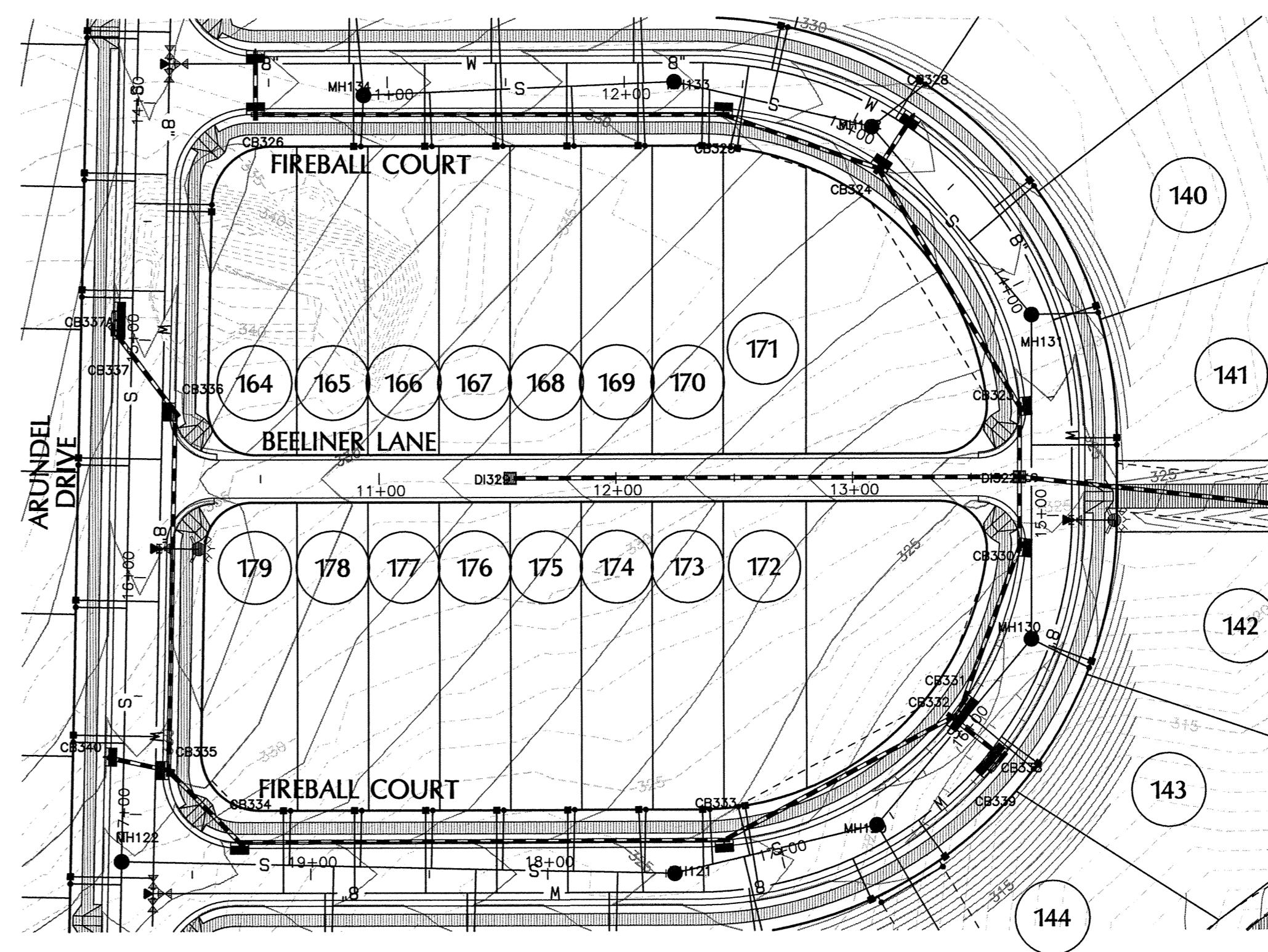
**FIREBALL COURT STA.**  
**10+00.00 TO 19+74.38 PLAN & PROFILE**

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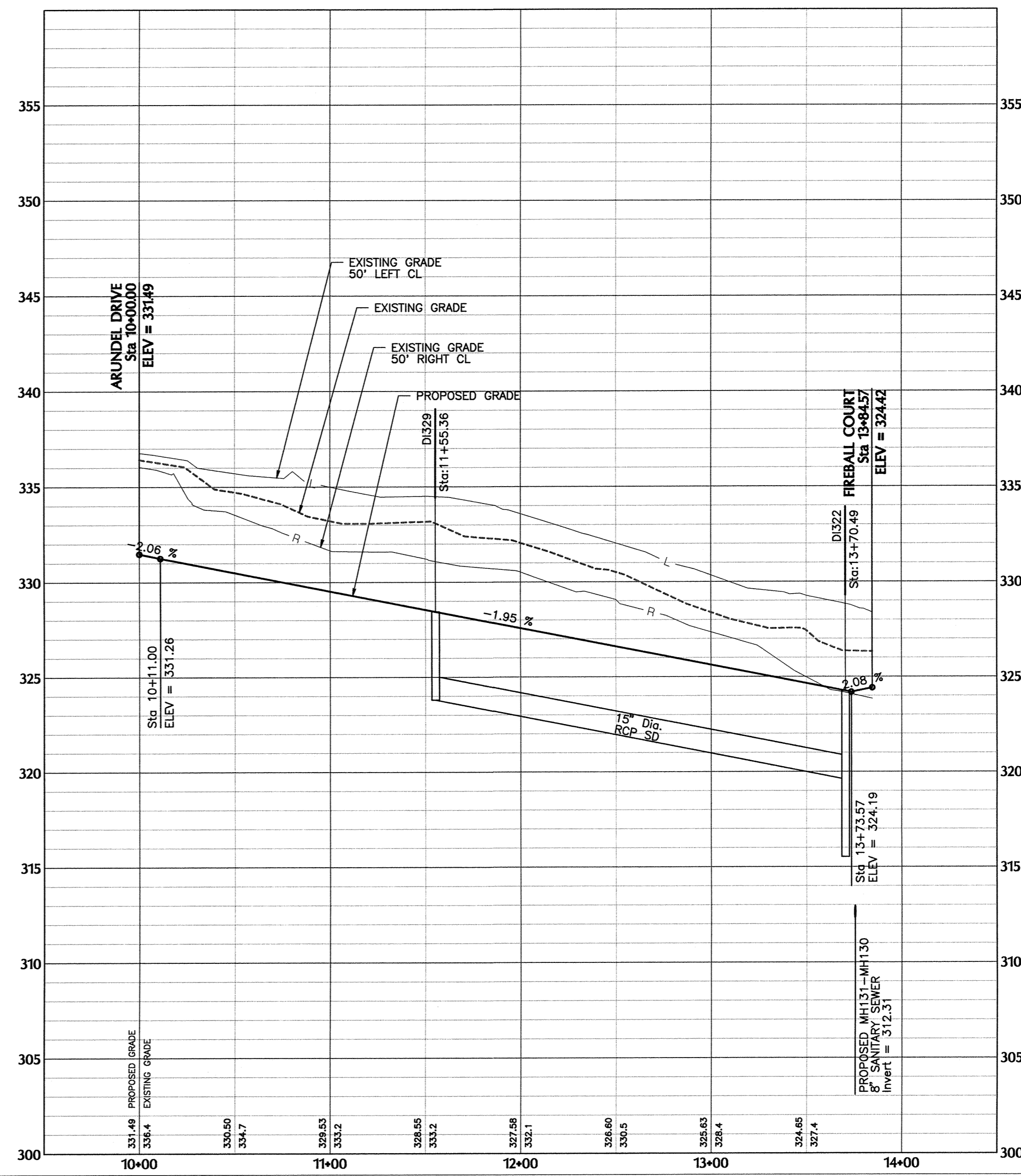
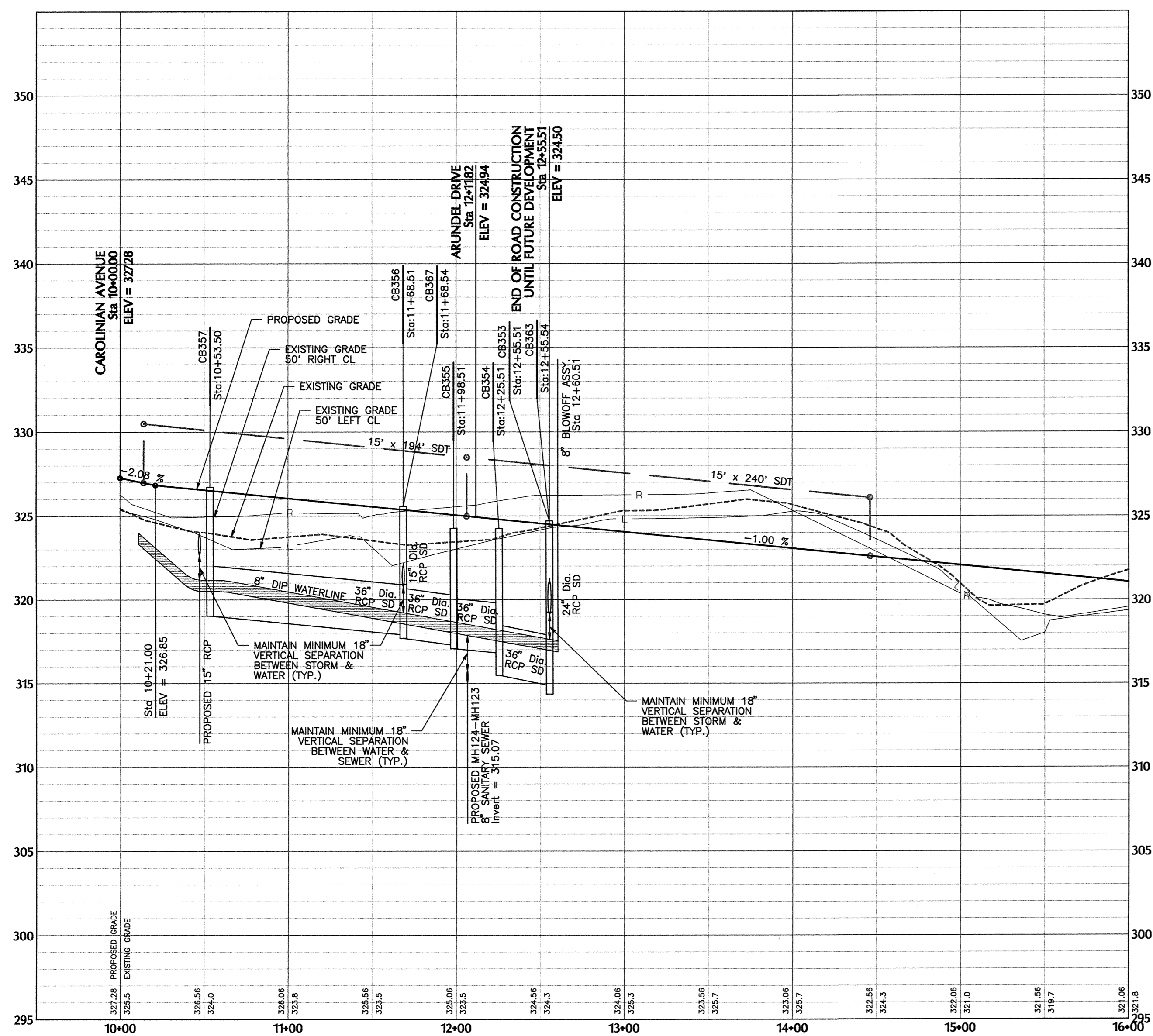
Sheet No. **8** of **21**



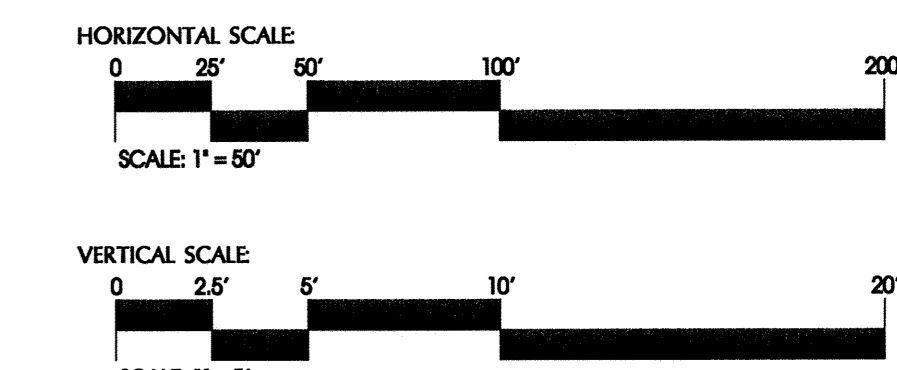
SILVERCOMET DRIVE



BEELINER LANE



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-3334  
 AUTHORIZATION TO CONSTRUCT  
 DATE: 9/11/15



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: 9/23/15  
 TOWN ENGINEER DEVELOPMENT SERVICES, ENGINEER  
 THESE PLANS ARE APPROVED BY THE TOWN OF KNIGHTDALE AND SERVE AS CONSTRUCTION PLANS FOR THIS PROJECT.  
 BY: [Signature] DATE: 9.25.15  
 ADMINISTRATOR

PROFESSOR OF ENGINEERING  
 JOHN C. IHWAKOLA  
 31982  
 9/31/15

No.	Revision	Date	By
1	TOK 1st COMMENTS	08/25/15	JCI

Designer	W&R	Scale	SEE SHEET
Drawn By	JCI	Date	06/23/15
Checked By	JCI	Job No.	020902517

**KNIGHTDALE STATION**  
**PHASE R3**  
 TOWN OF KNIGHTDALE  
 WAKE COUNTY  
 NORTH CAROLINA

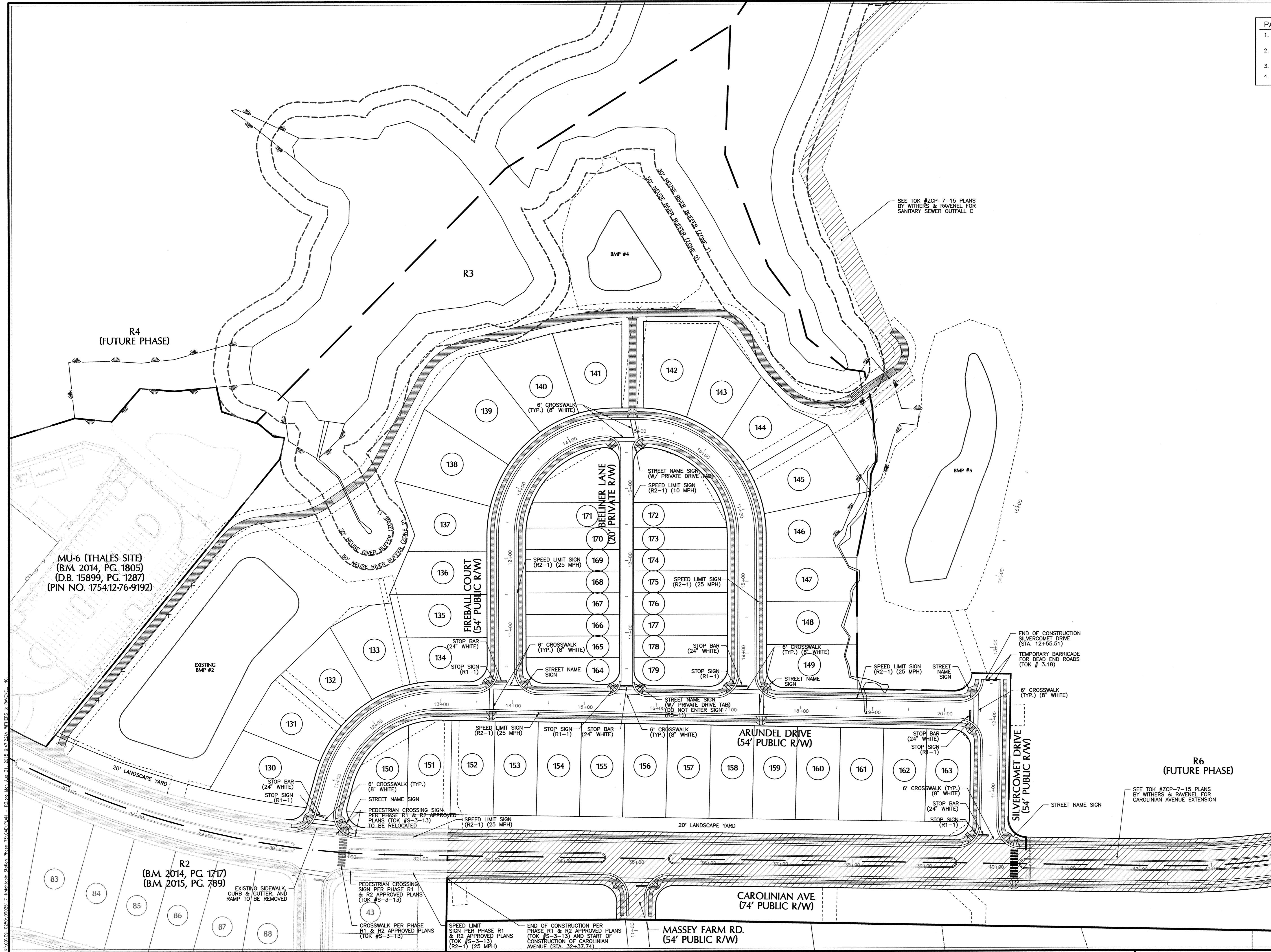
**SILVERCOMET DRIVE STA. 10+00.00 TO 12+55.51 PLAN & PROFILE**  
**& BEELINER LANE STA. 10+00.00 TO 13+84.57 PLAN & PROFILE**

**WITHERS & RAVENEL**  
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Sheet No. **9 of 21**



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



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: 9/23/15  
 TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
 ADMINISTRATOR

Professional Engineer Seal for John C. Hanaoka, License No. 31982, State of North Carolina. The seal is dated 8/31/15.

Scale: 1" = 60'

No.	Revision	Date	By	Designer	Scale
1	TOK 1st COMMENTS	08/31/15	JCI	W&R	SEE SHEET
				Drawn By	Date
				Checked By	Job No.
					020902517

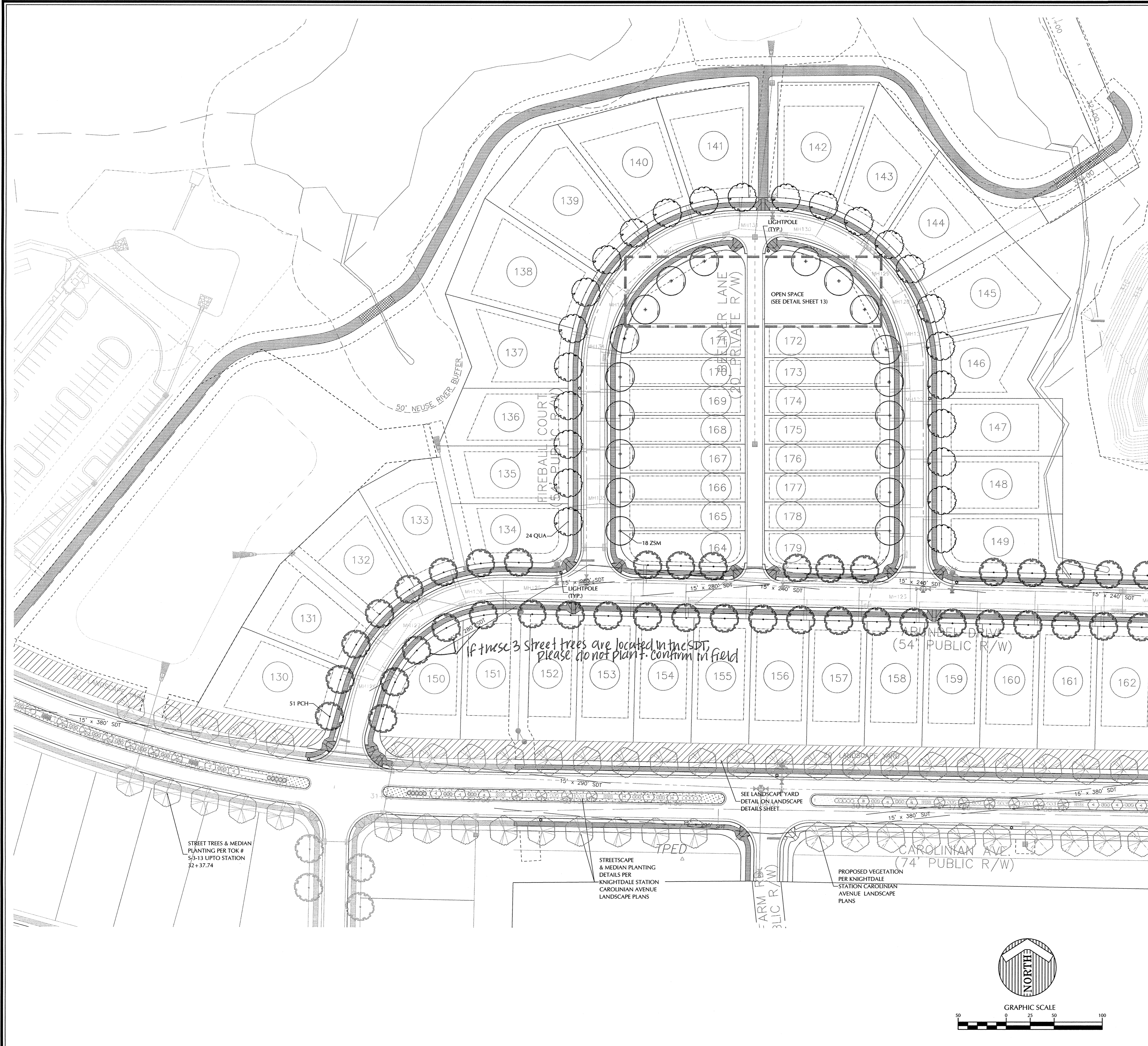
**KNIGHTDALE STATION  
 PHASE R3**  
 TOWN OF KNIGHTDALE  
 WAKE COUNTY  
 NORTH CAROLINA

**PAVEMENT MARKINGS AND  
 SIGNAGE PLAN**

**WITHERS & RAVENEL**  
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Sheet No. **11** of **21**

K:\09\09-0250\090251.7-09\Knightdale Station Phase R3\LANDSCAPE\PLAN\ENG- Monday, August 31, 2015 11:28:03 AM - WNC\KAP



KNIGHTDALE STATION PHASE R3 SCHEDULE							08.31.15	
PLANT TYPE	QTY	KEY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	HEIGHT	NOTES
CANOPY	51	PCH	Pistacia chinensis	Chinese Pistache	B&B	2"	8' min.	MATCHED; 40' O.C.
STREET TREES	24	QUA	Quercus aculeifolia	Sawtooth Oak	B&B	2"	8' min.	MATCHED; 40' O.C.
	18	ZSM	Zelkova serrata "ZSPKF"	Myrtanar Zelkova	B&B	2"	8' min.	MATCHED; 40' O.C.

- GENERAL LANDSCAPE NOTES**
- TREE PROTECTION FENCE SHALL SURROUND ALL EXISTING PLANTINGS AND EXISTING BUFFER AREAS WHERE APPLICABLE AND SHALL BE MAINTAINED UNTIL ALL SITE WORK IS COMPLETE. THE FENCE SHALL BE REMOVED PRIOR TO THE FINAL SITE INSPECTION FOR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY.
  - WHERE EXISTING OR PROPOSED VEGETATION FAILS TO FUNCTION ADEQUATELY AS REQUIRED, THE TOWN OF KNIGHTDALE SITE INSPECTOR RESERVES THE RIGHT TO REQUIRE SUPPLEMENTAL PLANTINGS IN ADDITION TO THOSE SHOWN ON THE LANDSCAPE PLAN BASED ON ACTUAL FIELD CONDITIONS.
  - NO CHANGES TO ANY ASPECT OF THIS SITE PLAN, INCLUDING BUT NOT LIMITED TO LANDSCAPING, GRADING, BUILDING ELEVATIONS (ESPECIALLY COLOR), LIGHTING, OR UTILITIES WILL BE MADE WITHOUT THE APPROVAL OF THE TECHNICAL REVIEW COMMITTEE OF THE TOWN OF KNIGHTDALE.
  - ALL EXTERIOR SITE LIGHTING WILL BE DESIGNED TO PREVENT OFF-SITE GLARE.
  - THE SITE SHALL BE STABILIZED AND SEEDED PRIOR TO THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY (CO).
  - ALL ABOVE GROUND UTILITY EQUIPMENT (AND FACILITIES ASSOCIATED WITH ON-SITE ELECTRIC, TELEPHONE, GAS, CABLE, OR OTHER SIMILAR UTILITY) AND ENCLOSED TRASH CONTAINMENT SHALL BE SCREENED BY THE ELEMENTS OF A TYPE B (SEMI-OPAQUE) BUFFER YARD TO A SIX (6) FEET IN HEIGHT OR THE HEIGHT OF THE UTILITY OR ENCLOSURE, WHICHEVER IS LESS.
  - ALL RIP RAP PADS, DETENTION PONDS, AND OTHER STORMWATER RELATED DEVICES SHALL BE SCREENED WITH EVERGREEN PLANTINGS TO REDUCE VISUAL IMPACT FROM OFF-SITE.
  - NO TREE SHALL BE LOCATED WITHIN TEN FEET OF A LIGHT POLE OR 12 FEET FROM ELECTRICAL TRANSFORMERS.
  - THIS PLAN IS FOR PLANTING PURPOSES ONLY. FOR INFORMATION REGARDING ROAD WORK GEOMETRY, GRADING, WALLS, UTILITIES, ETC., REFER TO THE CIVIL DRAWINGS.
  - ALL PLANTS AND PLANTING PROCEDURES SHALL MEET OR EXCEED A.N.I.A. STANDARDS AS SET FORTH IN "AMERICAN STANDARD FOR NURSERY STOCK", 2004 OR LATER EDITION.
  - ALL TREES AND SHRUBS SHALL BE FULL, WELL-BRANCHED PLANTS WHICH ARE CHARACTERISTIC TO THE SPECIES.
  - ALL CANOPY TREES TO BE A MINIMUM OF 2" CALIPER AND 8' HEIGHT, ALL UNDERSTORY TREES 1 1/2" CALIPER, 6' HEIGHT AND SHRUBS 18", 3 GAL. CONTAINER AT TIME OF INSTALLATION.
  - NO FENCING SHALL BE PLACED WITHIN BUFFER AREAS UNLESS INSTALLED AT ONE TIME FOR THE ENTIRE LENGTH OF THE BUFFER OR STREETScape. NEITHER INDIVIDUAL LOT OWNERS NOR THE H.O.A. SHALL INSTALL FENCES IN A PIECEMEAL FASHION. PRIOR TO PLACING A FENCE IN A BUFFER OR STREETScape, THE FENCE SHALL BE SUBMITTED TO AND APPROVED BY THE TOWN OF KNIGHTDALE.
  - PLANT MATERIAL LOCATED WITHIN A REQUIRED SIGHT DISTANCE MAINTENANCE EASEMENT SHALL BE MAINTAINED AT A HEIGHT LESS THAN 24 INCHES OR LIMBED UP TO A MINIMUM HEIGHT OF SIX FEET.
  - ALL PLANT BEDS TO BE MULCHED WITH A MINIMUM OF 3" OF CLEAN PINE STRAW OR SHREDDED HARDWOOD BARK AT THE DISCRETION OF THE DEVELOPER. ALL PLANT GROUPINGS SHALL BE MULCHED AS ONE BED.
  - RESIDENTIAL LANDSCAPING.
    - EACH SINGLE-FAMILY OR DUPLEX LOT SHALL CONTAIN A MINIMUM OF ONE (1) CANOPY TREE FOR EACH TWO THOUSAND (2,000) SQUARE FEET OF LOT AREA OR FRACTION THEREOF UP TO 20,000 SQUARE FEET IN LOT AREA. ANY PORTION OF THE RESIDENTIAL LOT OCCUPIED BY A RECORDED UTILITY EASEMENT SHALL NOT BE INCLUDED AS PART OF THE TOTAL LOT AREA. THE LOCATION OF PLANTING TO ACCOUNT FOR PHYSICAL CONDITIONS MAY BE ADJUSTED BY THE ADMINISTRATOR.
    - THE USE OF EXISTING TREES MEETING THE FOLLOWING STANDARDS TO SATISFY THIS REQUIREMENT IS ENCOURAGED. EXISTING LARGE SHADE TREES OVER SIX (6) INCHES IN CALIPER AS MEASURED AT DBH (DIAMETER BREAST HEIGHT) MAY BE COUNTED TOWARDS FULFILLING THIS REQUIREMENT.
    - REQUIRED STREET TREES MAY NOT BE COUNTED TOWARDS THE FULFILLMENT OF THIS RESIDENTIAL LANDSCAPING REQUIREMENT. APART FROM REQUIRED STREET TREES, ALL OTHER TREES REQUIRED UNDER THIS CHAPTER SHALL BE PLANTED WITHIN THE PRIVATE LOT.
  - A LIGHTING PLAN SHALL BE SUBMITTED BY THE UTILITY PROVIDER TO THE KNIGHTDALE PLANNING DEPARTMENT FOR APPROVAL PRIOR TO THE INSTALLATION OF ALL REQUIRED LIGHTING. THE LIGHTING PLAN SHALL DESIGNATE THE PROPOSED LOCATION OF ALL LIGHT POLES AND SHALL BE IN COMPLIANCE WITH SECTIONS 8.10 AND 16.88 AS WELL AS CHAPTER 11 OF THE TOWN OF KNIGHTDALE UDO. IF A PROPOSED LIGHT POLE LOCATION SHOULD PRESENT A CONFLICT WITH EXISTING OR PROPOSED VEGETATION ACCORDING TO THE APPROVED CONSTRUCTION DRAWINGS, THE LANDSCAPING PLAN SHALL BE REVISED TO COMPLY WITH THE TOWN OF KNIGHTDALE UDO REQUIREMENTS. ALL REVISIONS ARE SUBJECT TO TOWN OF KNIGHTDALE APPROVAL.

- KNIGHTDALE UDO REQUIREMENTS**
- STREET TREE PLANTINGS**
- CANOPY TREES SHALL BE INSTALLED AT A MINIMUM AVERAGE DISTANCE OF 40 FEET ON CENTER IN A PLANTING STRIP MINIMUM OF FIVE FEET IN WIDTH, WHERE OVERHEAD UTILITIES EXIST PRIOR TO DEVELOPMENT, UNDERSTORY TREES MAY BE SUBSTITUTED.
  - IF UNDERSTORY TREES SUBSTITUTED, THEY HAVE TO BE PLANTED 20 FEET ON CENTER AND SPECIES SHALL BE APPROVED BY THE TOWN OF KNIGHTDALE PRIOR TO INSTALLATION.
  - STREET TREES SHALL BE PLACED AT LEAST 10 FEET FROM LIGHT POLES AND 12 FEET FROM ELECTRICAL TRANSFORMERS.
  - STREET TREES SHALL BE DECIDUOUS HARDWOODS.

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: 9/23/15  
TOWN ENGINEER Development Services Engineer

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

BY: *[Signature]* DATE: 9.25.15  
ADMINISTRATOR

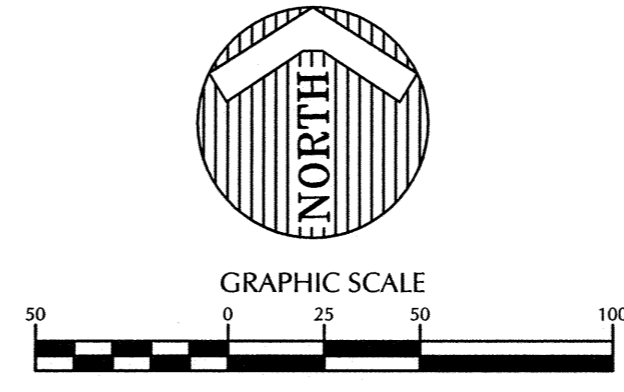
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DATE \_\_\_\_\_ APPLICANT \_\_\_\_\_

I (OFFICER AUTHORIZED TO TAKE ACKNOWLEDGEMENTS) DO HEREBY CERTIFY THAT PERSONALLY APPEARED BEFORE ME THIS DAY AND ACKNOWLEDGED THE DUE EXECUTION OF THIS CERTIFICATE. WITNESS MY HAND AND (WHERE AN OFFICIAL SEAL IS REQUIRED BY LAW) OFFICIAL SEAL THIS \_\_\_\_ DAY OF \_\_\_\_\_, A.D., \_\_\_\_\_ (YEAR).

NOTARY \_\_\_\_\_

COMMISSION EXPIRES \_\_\_\_\_



No.	Revision	Date	By	Designer	Scale
1	TOK 1st Comments	08/31/15	SN	SN	1" = 50'
				SN	Date: 04/29/15
				Job No.:	
				KAP	02090251.7

**KNIGHTDALE STATION  
PHASE R3**

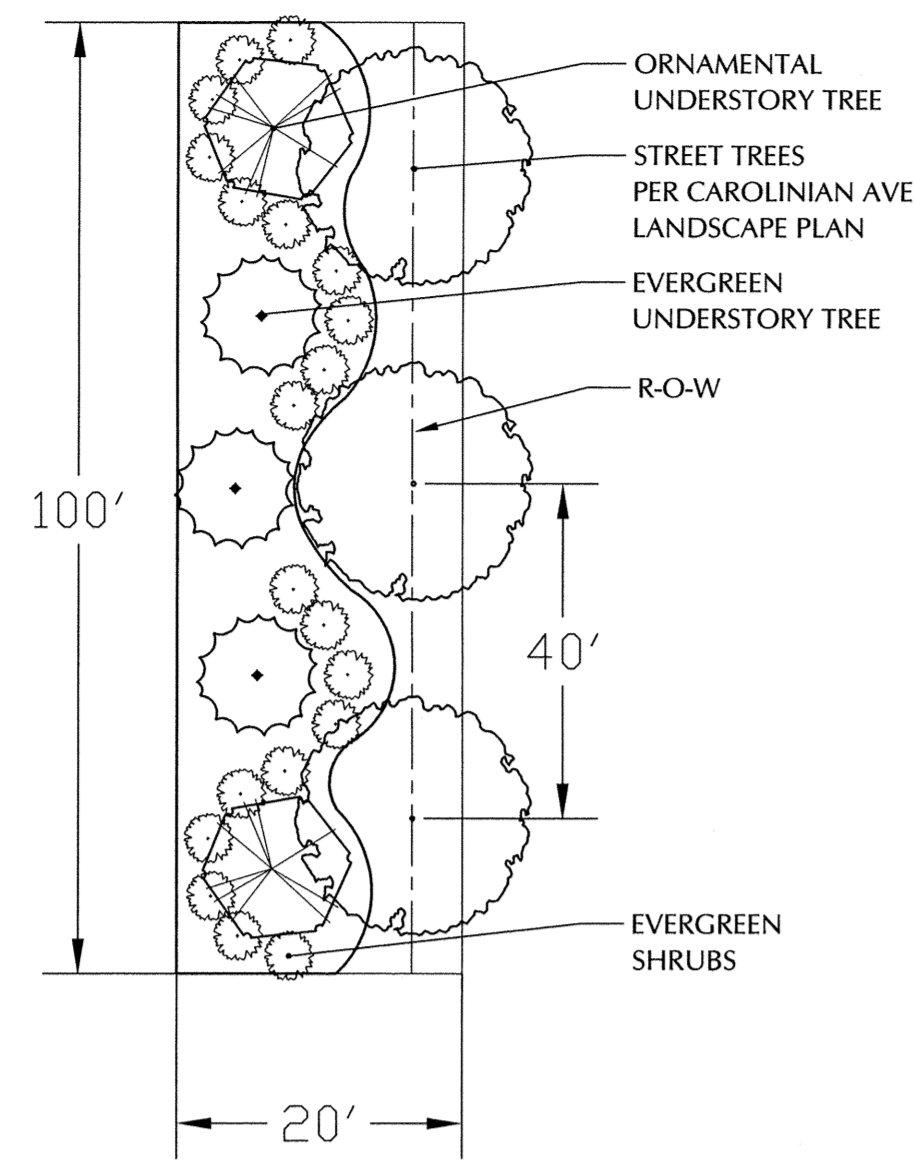
TOWN OF KNIGHTDALE      WAKE COUNTY      NORTH CAROLINA

**LANDSCAPE PLAN**

**WITHERS & RAVENEL**  
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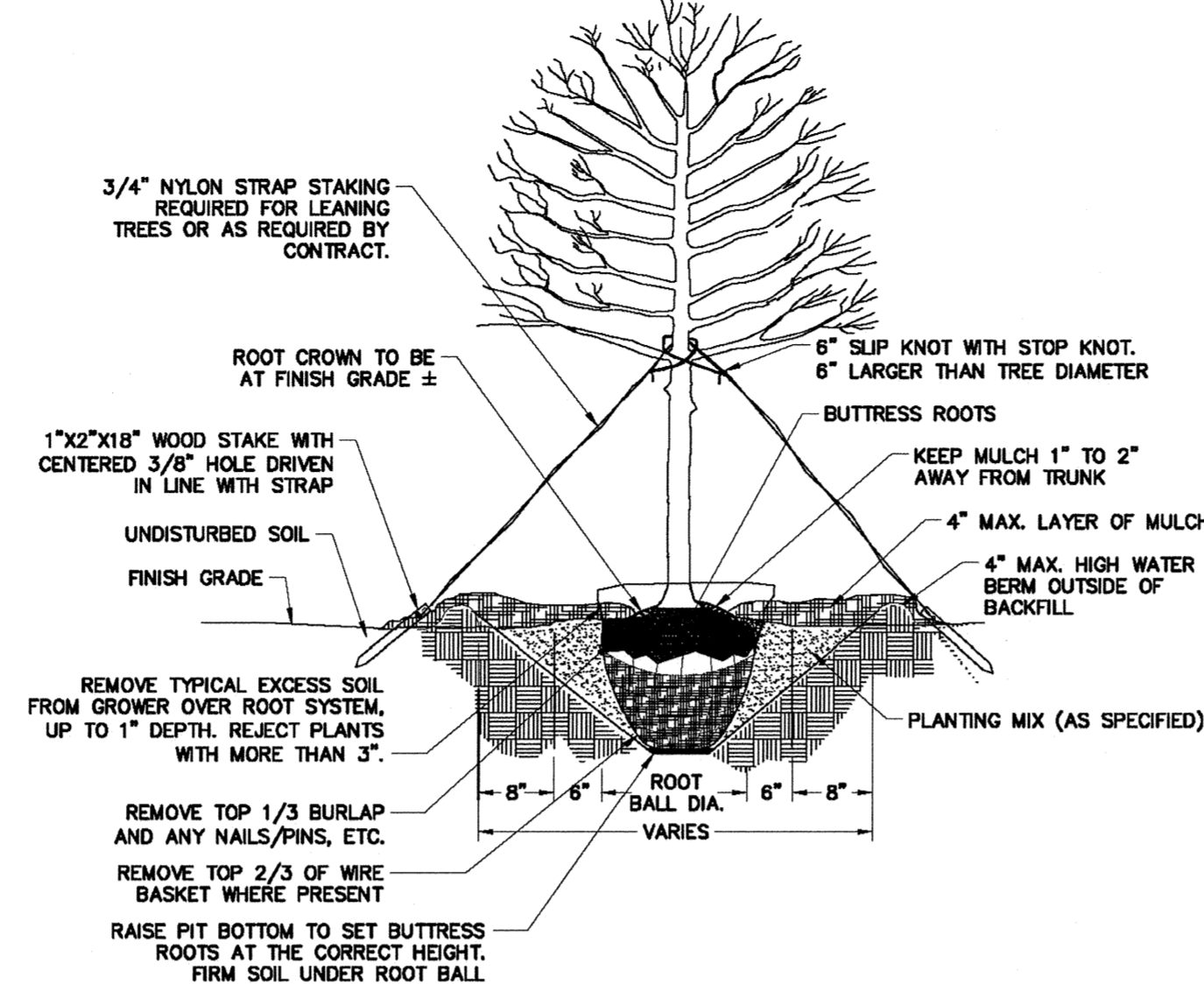
Sheet No.  
**12 OF 21**



20' LANDSCAPE YARD BUFFER DETAIL  
NOT TO SCALE

**NOTES:**

1. REMOVE WIRE OR NYLON TWINE FROM BALL.
2. SOAK ROOT BALL AND PLANT PIT IMMEDIATELY AFTER INSTALLATION.



ALL TREES SHALL MEET AMERICAN STANDARD FOR NURSERY STOCK (AMSI, 1990, PART 1, "SHADE AND FLOWERING TREES")

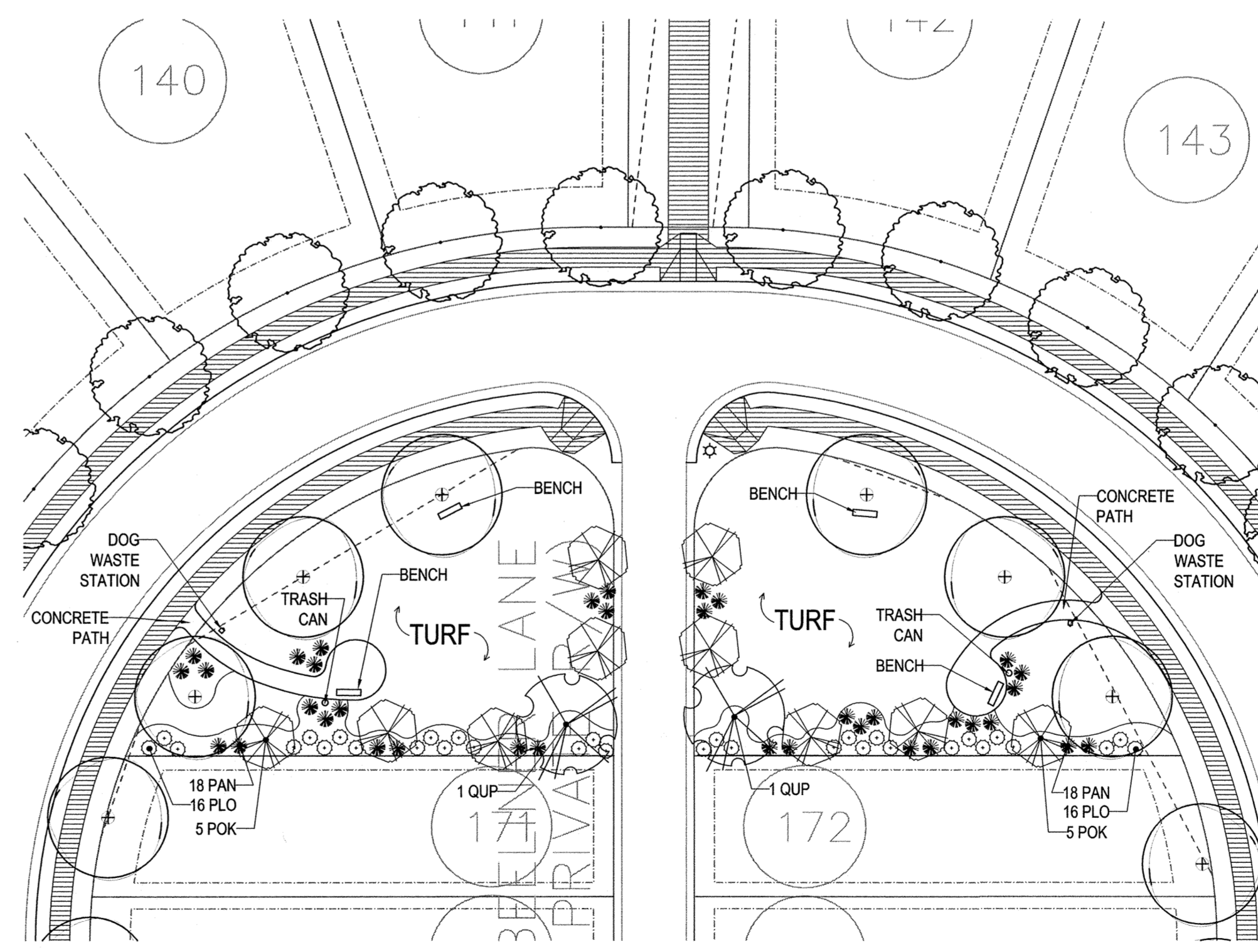
FOR EXAMPLE:

CALIPER	HEIGHT (RANGE)	MAX. HEIGHT	MIN. ROOT BALL DIA.	MIN. ROOT BALL DEPTH
2"	12-14'	16'	24"	16"
3"	14-16'	18'	32"	21"

REVISIONS		STD. NO.
DATE	DESCRIPTION	
TOWN OF KNIGHTDALE	TREE PLANTING	3.25
STANDARD DETAILS	(FOR SINGLE AND MULTI-STEM TREES)	

**NOTE:**  
A ROOT COLLAR EXCAVATION FOR ALL TREES SPECIFIED WILL BE DONE BY THE TOWN TO ENSURE THAT TREES WERE NOT PLANTED/GROWN TOO DEEPLY AT SOURCE (NURSERY). LANDSCAPE CONTRACTOR SHALL HAVE SUPPLIER MARK GROUND LEVEL LINE ABOVE ROOT BALL. IF TOWN DETERMINES THAT THERE IS EXCESSIVE SOIL OVER THE ROOT CROWN, THESE TREES WILL BE REJECTED.

REVISIONS		STD. NO.
DATE	DESCRIPTION	
TOWN OF KNIGHTDALE	ROOT CROWN DEPTHS	3.21
STANDARD DETAILS		



OPEN SPACE DETAIL PLAN  
SCALE: 1" = 30'

KNIGHTDALE STATION PHASE R3 SCHEDULE								08.31.15
PLANT TYPE	QTY	KEY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	HEIGHT	NOTES
	2	QPH	Quercus phellos	Willow Oak	B&B	2 1/2"	12-14'	MATCHED
	10	POK	Prunus serrulata 'Okame'	Okame Cherry	B&B	2"	8-10'	MATCHED
	32	PLO	Prunus laurocerasus 'Otto Luken'	Otto Luken laurel	CONT.	3 Gal.	18"-24"	MATCHED; 3' O.C.
	36	PAN	Pennisetum alopecuroides 'Hameln'	Hameln Fountain Grass	CONT.	3 Gal.	18"-24"	MATCHED; 3' O.C.

**LANDSCAPE MAINTENANCE**

THE OWNERS OF THE PROPERTY AND THEIR AGENTS, HEIRS OR ASSIGNS SHALL BE RESPONSIBLE FOR THE INSTALLATION, PRESERVATION AND MAINTENANCE OF ALL PLANTINGS AND PHYSICAL FEATURES SHOWN ON THIS PLAN. THE OWNERS SHALL BE RESPONSIBLE FOR ANNUAL MAINTENANCE OF THE VEGETATION TO INCLUDE BUT NOT BE LIMITED TO:

**LAWN AREA**

1. THE LAWN AREA WILL BE MOWED AS NEEDED TO PROVIDE A NEAT AND UNIFORMLY FINISHED LAWN.
2. FOR AREAS INACCESSIBLE TO MOWERS, A STRING TRIMMER WILL BE USED TO CUT GRASS TO SAME HEIGHT AS MOWER.
3. CURB, SIDEWALK, AND BED EDGES WILL BE MECHANICALLY EDGED AS NEEDED TO PROVIDE A NEAT AND UNIFORM APPEARANCE.
4. ALL DEBRIS WILL BE REMOVED FROM TURF PRIOR TO MOWING AND FROM TURF AND PAVEMENT AREAS FOLLOWING EDGING.
5. THE ENTIRE LAWN WILL BE CORE AERIFIED IN THE FALL.
6. SEEDING AND FERTILIZATION WILL BE PERFORMED IN CONJUNCTION WITH AERIFICATION.
7. THE LAWN AREA WILL BE OVERSEEDDED WITH A HYBRID FESCUE BLEND (IF DEVELOPER CHOOSES A FESCUE VARIETY TURF DURING INITIAL INSTALLATION) AT A RATE OF 75 POUNDS PER ACRE.
8. THE TURF WILL BE FERTILIZED THREE TIMES DURING THE YEAR (MARCH, SEPTEMBER, AND NOVEMBER). A SLOW RELEASE NITROGEN PRODUCT WILL BE USED AT A RATE OF 1-2 POUNDS OF NITROGEN PER 100 SQUARE FEET.
9. A PRE-EMERGENT CRABGRASS CONTROL WILL BE APPLIED TO THE LAWN WHEN SOIL TEMPERATURES REACH 48 DEGREES.

**PLANT BEDS AND SMALL ORNAMENTAL TREES**

1. ALL PLANT BEDS WILL BE SPRAYED AND WEEDED BY HAND TO MAINTAIN THEM FREE OF WEEDS AT ALL TIMES.
2. TREE AND SHRUB FERTILIZERS SHALL ONLY BE APPLIED AS RECOMMENDED BY A SOIL SAMPLE ANALYSIS.
3. PRUNE ONLY DEAD, DAMAGED AND/OR BROKEN BRANCHES AT INSTALLATION. PRUNING AFTER THE FIRST YEAR SHALL FOLLOW ANSI A-300 STANDARDS.
4. MULCH SHALL BE APPLIED TO A DEPTH OF 2"-3" AND SHALL NOT BE PLACED WITHIN 3" FROM ANY TREE OR SHRUB ROOT CROWN. MULCH TYPES TO BE SELECTED BY OWNER, HOWEVER SHREDDED BARK OR HARDWOOD MULCH SHALL BE USED AGAINST ALL BUILDING FOUNDATIONS. ALL PLANT BEDS AND TREE SAUCERS SHALL BE REFRESHED WITH NEW MULCH ANNUALLY.
5. FORMAL HEDGES WILL BE TRIMMED TO AN INVERT 'V' SHAPE TO ENCOURAGE LOW LIMB STRUCTURE AND DENSE GROWTH.
6. PRE-EMERGENT WEED CONTROL SHALL BE APPLIED (IF NECESSARY) IN FEBRUARY. CHEMICALS FOR INSECT & DISEASE MAY BE APPLIED FOR SPECIFIC PROBLEMS ONLY.

**LEAVES AND NATURAL AREAS**

1. ALL LEAVES WILL BE REMOVED FROM THE LAWN AREAS WEEKLY AND FOUR TIMES A YEAR FROM THE PLANT BEDS.
2. NATURAL AREAS WILL BE MAINTAINED FREE OF BRUSH AND WEEDS WITHIN THE FIRST 10 FEET OF ANY NATURAL 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: 9/23/15  
TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
ADMINISTRATOR

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NOTARY \_\_\_\_\_

COMMISSION EXPIRES \_\_\_\_\_



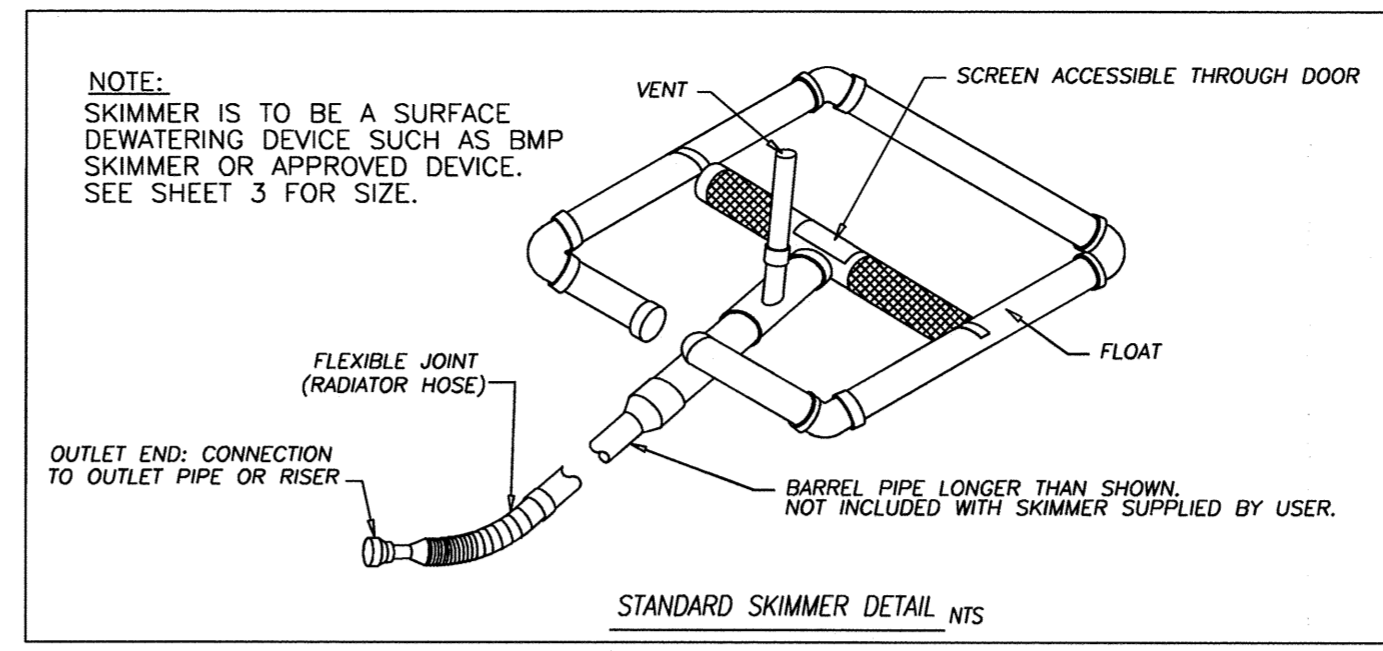
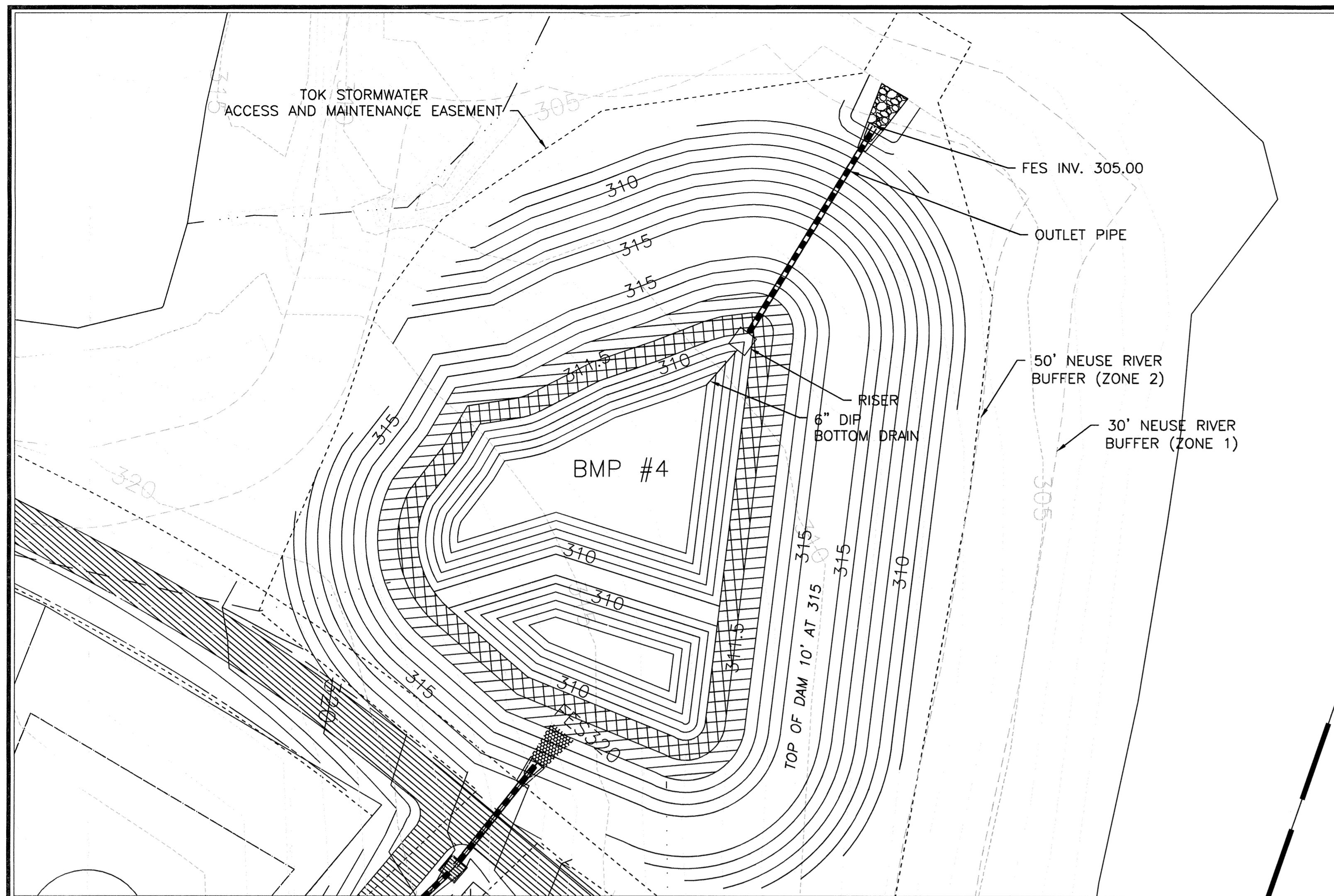
No.	Revision	Date	By
1	TOK 1st Comments	08/31/15	SN

Designer	SN	Scale	1" = 50'
Drawn By	SN	Date	04/29/15
Checked By	KAP	Job No.	02090251.7

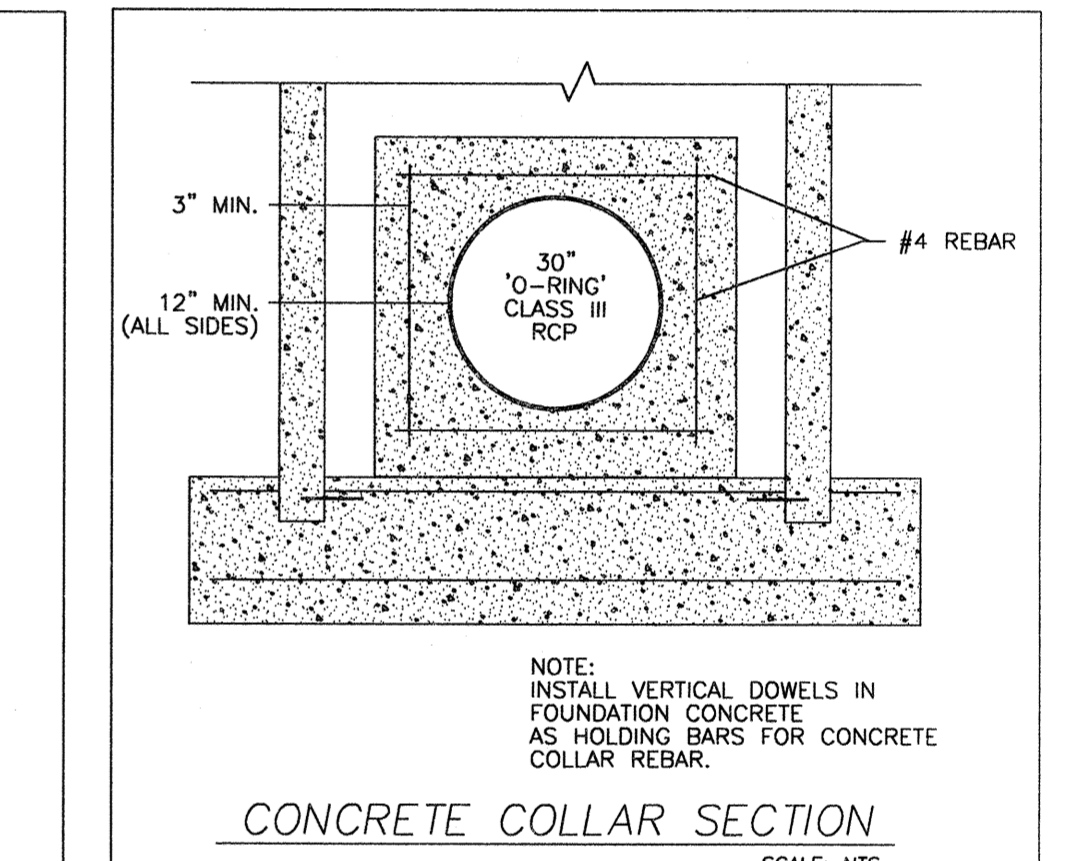
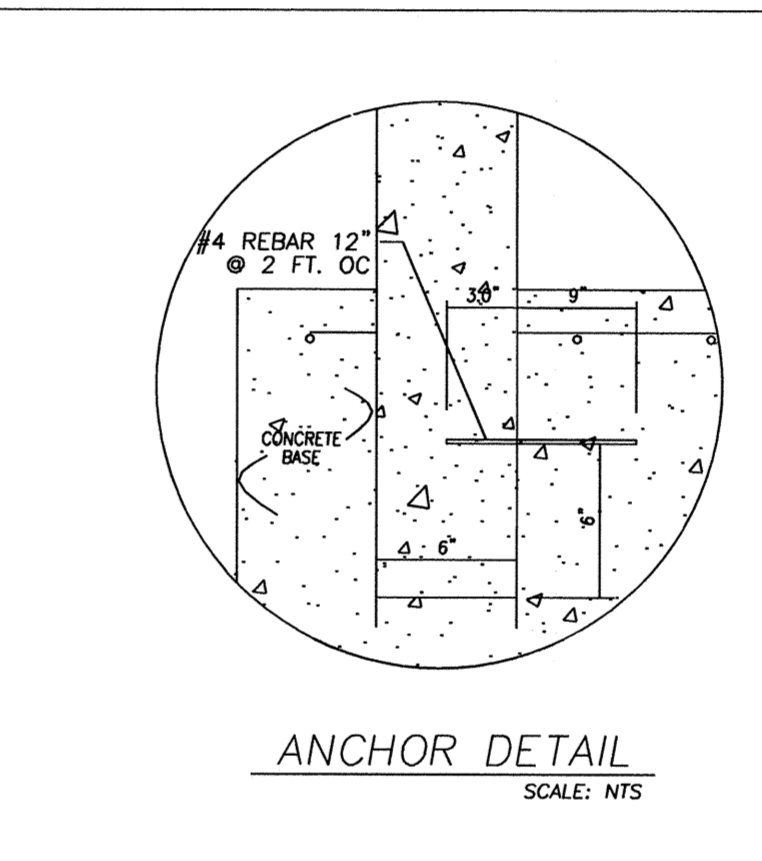
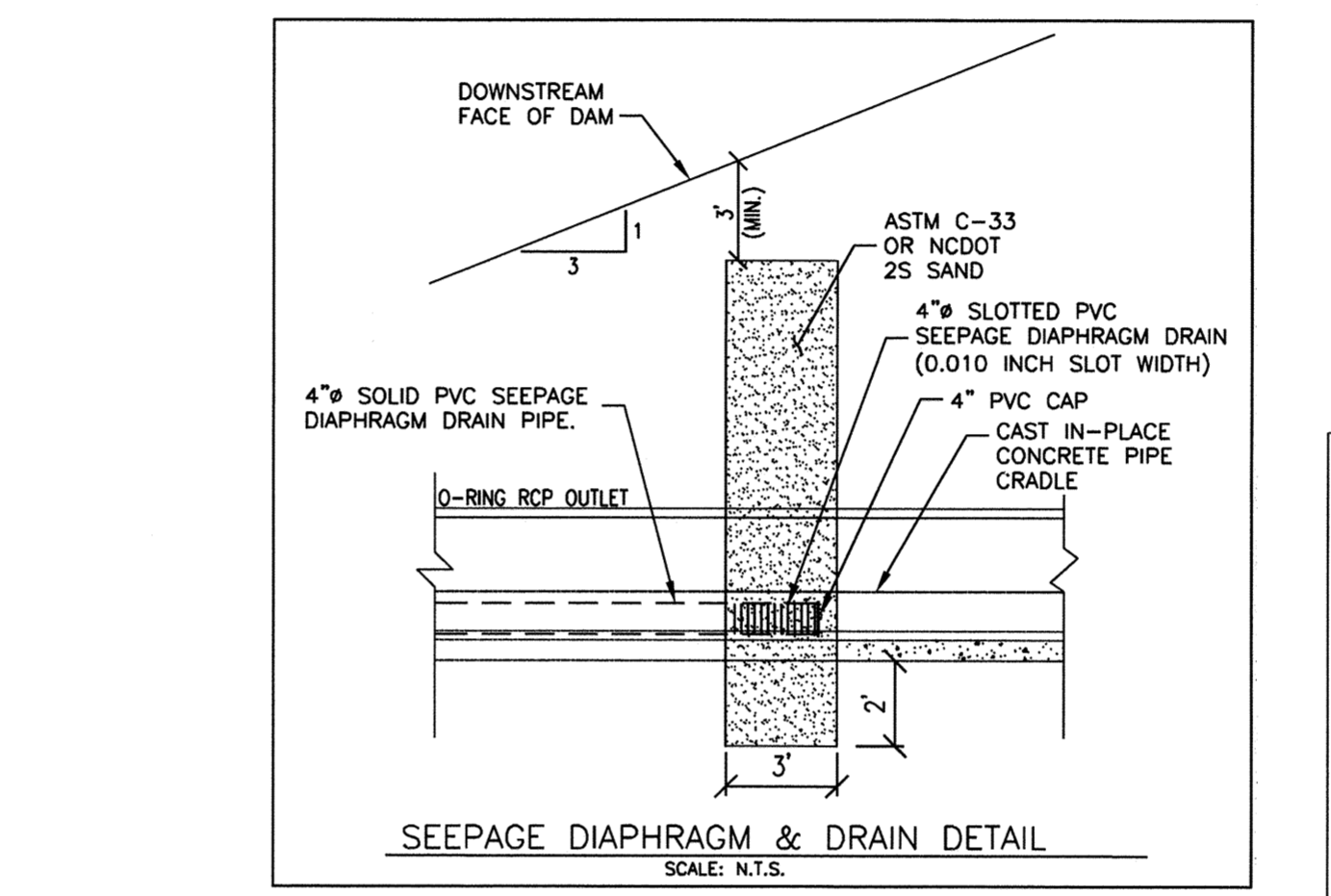
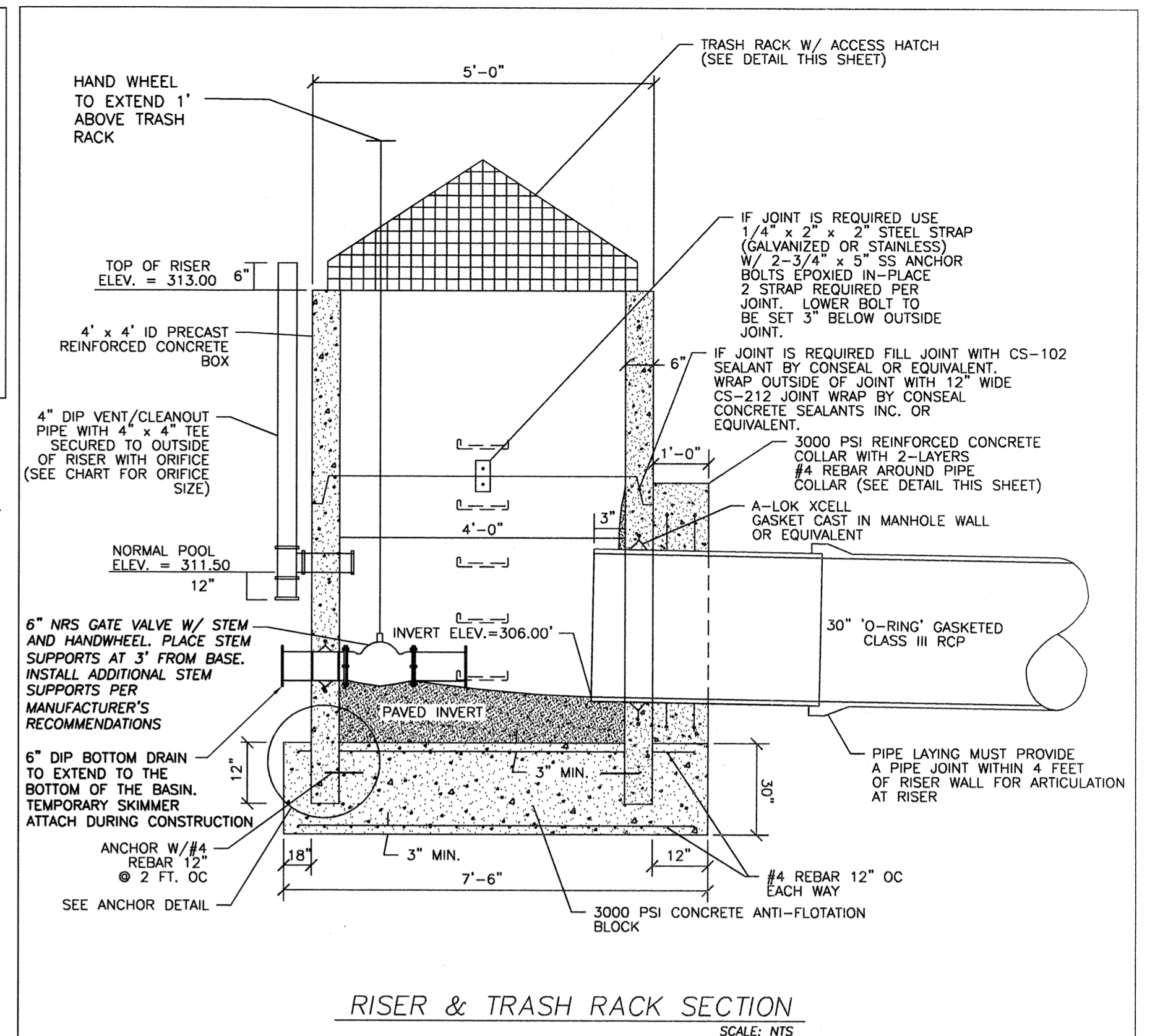
**KNIGHTDALE STATION PHASE R3**  
TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

**LANDSCAPE DETAILS**

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS  
115 MacKenzie Drive Cary, North Carolina 27511 tel: 919-469-3340 www.wITHERSRAVENEL.com License No. C-0832



- 1STORMWATER BMP NOTES:
- PRIOR TO CONSTRUCTION, ANY DISCREPANCIES IN THE PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER FOR RESOLUTION.
  - GEOTECHNICAL ENGINEER SHALL EVALUATE SOILS ONSITE FOR SUITABILITY OF DAM CONSTRUCTION AND CLAY LINER.
  - DURING CONSTRUCTION, THE BMP IS TO BE USED AS AN EROSION CONTROL DEVICE. THE FOREBAY WILL NOT BE REQUIRED WHILE BMP IS ACTING AS AN EROSION CONTROL DEVICE.
  - ALL PERMANENT STRUCTURES (I.E. RISER BOX, OUTLET PIPES, SEEPAGE DIAPHRAGM, 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 BMP SHALL BE CONVERTED TO A PERMANENT BMP.
    - ALL SEDIMENT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
    - FOREBAY AND VEGETATED SHELF SHALL BE CONSTRUCTED PER THIS PLAN.
    - VEGETATED SHELF SHALL BE PLANTED PER PLANT SCHEDULE ON THIS SHEET.
    - TOWN OF KNIGHTDALE REQUIRES FINAL CERTIFICATION OF BMP BY PROFESSIONAL ENGINEER.

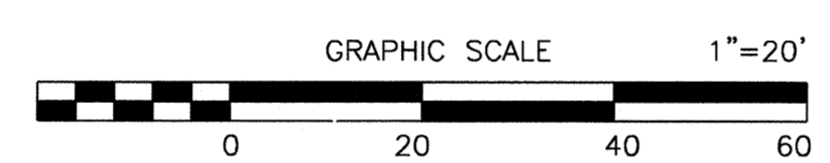


PLANT LIST - BMP #4

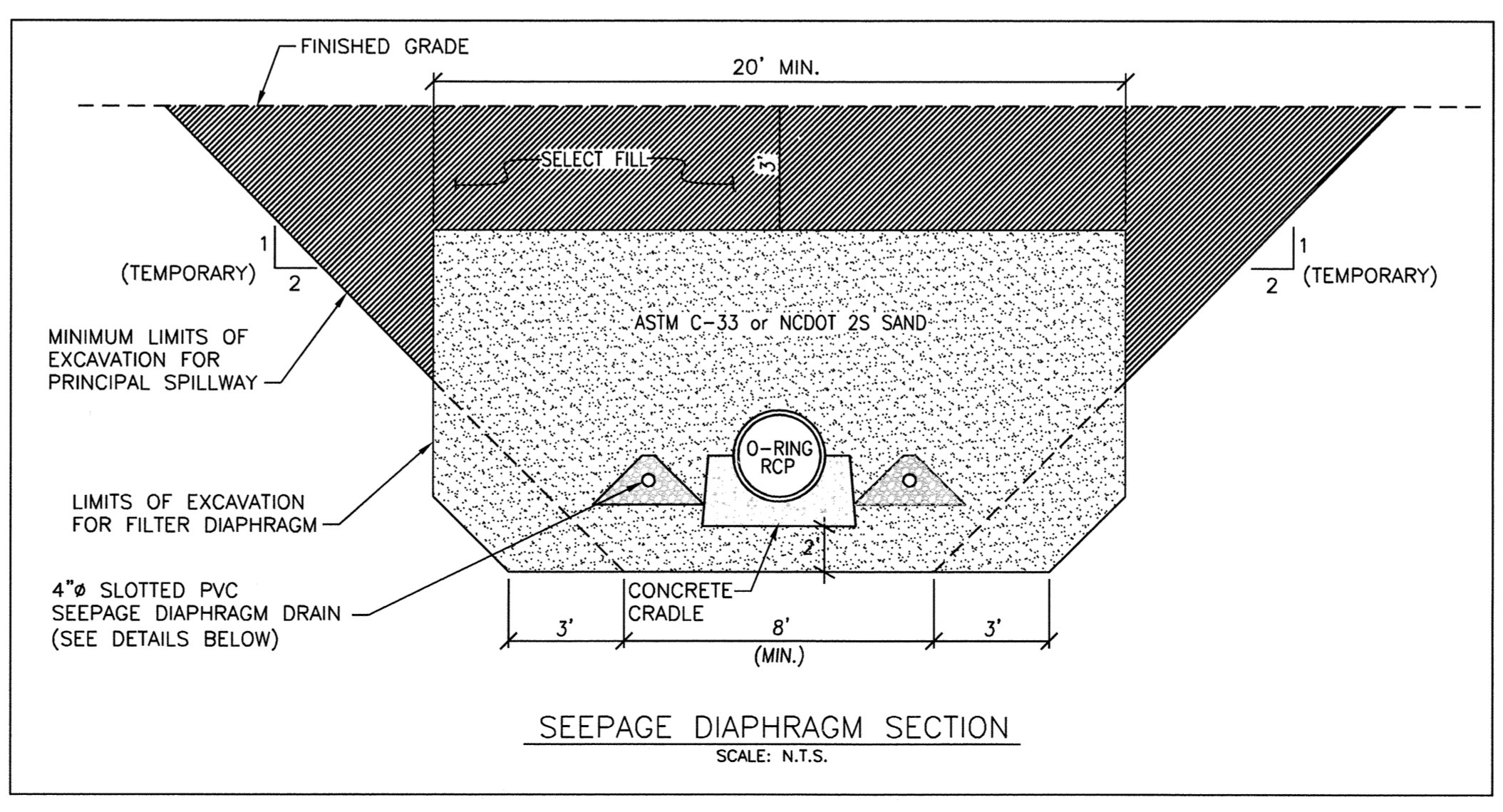
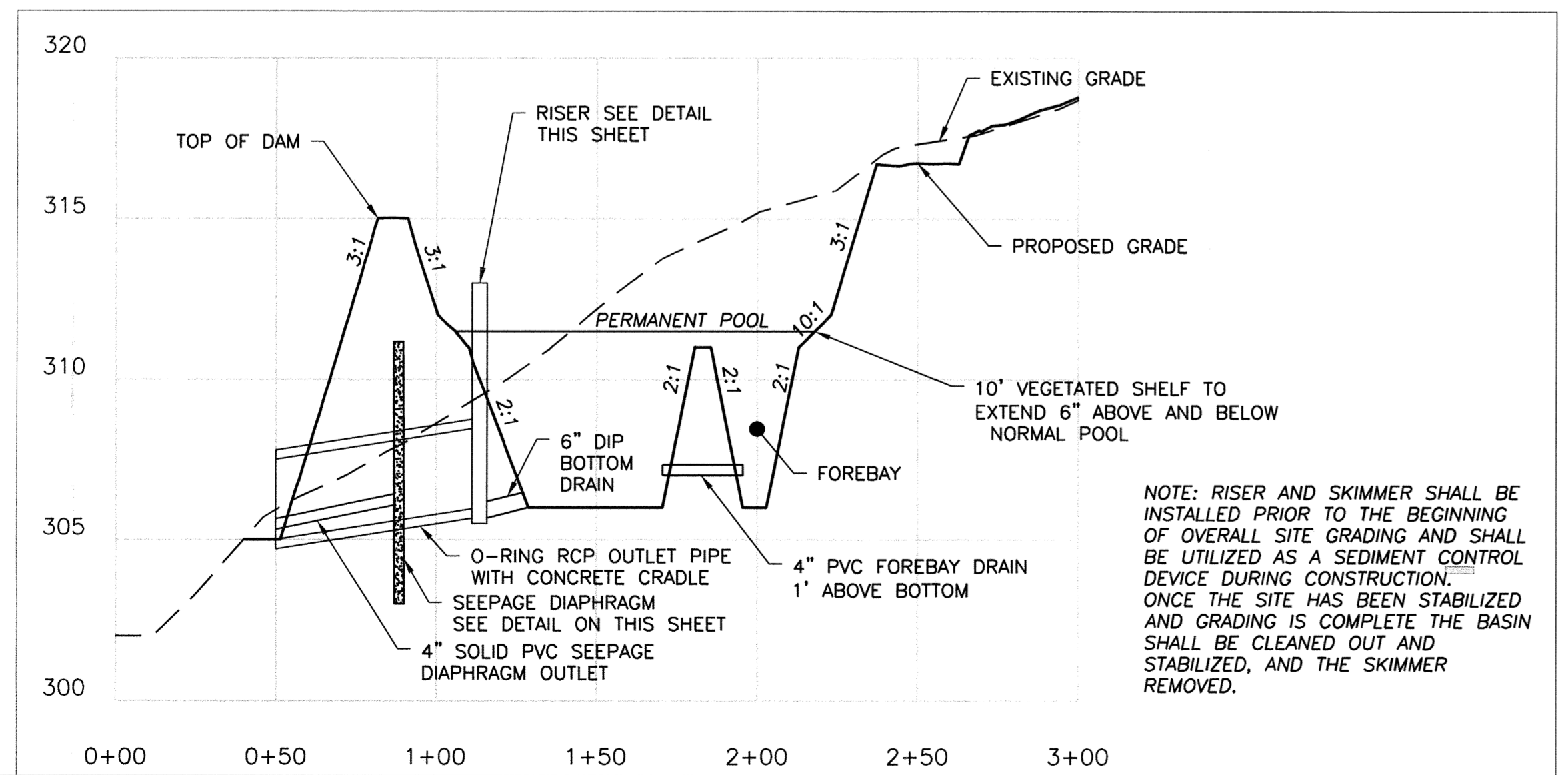
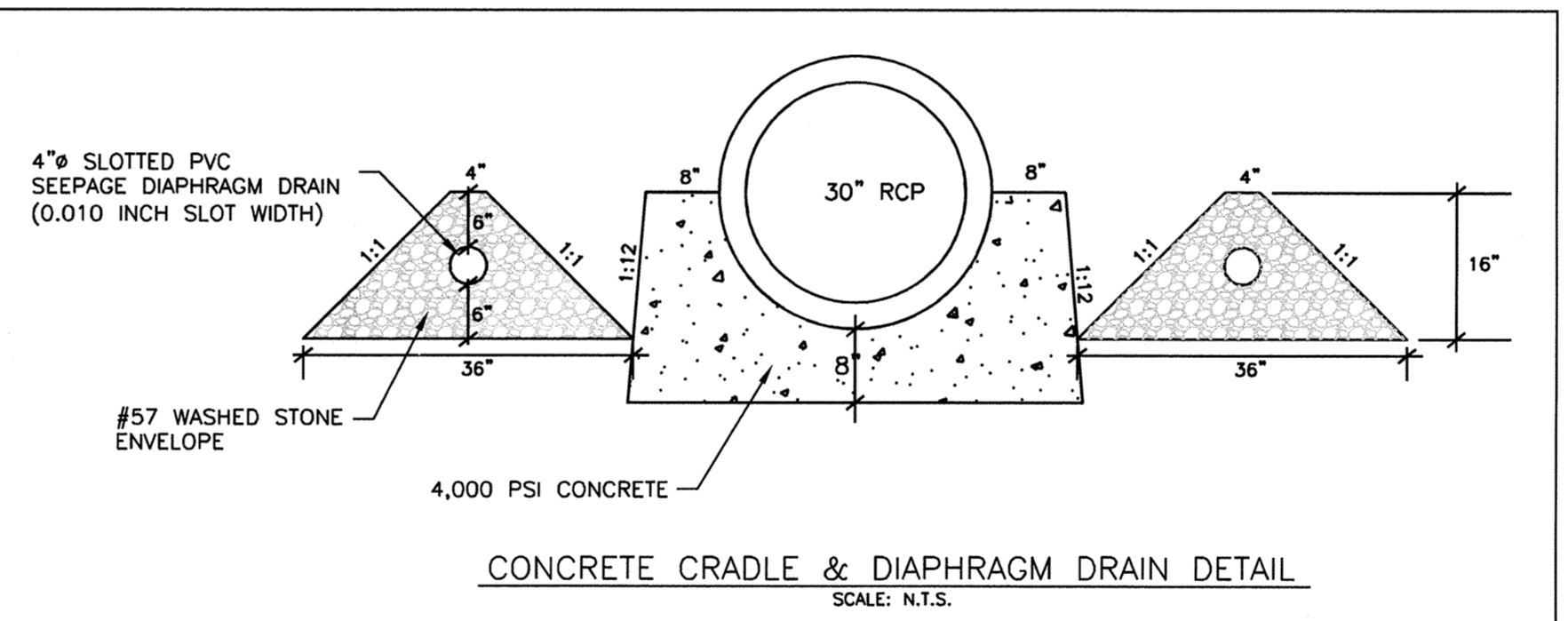
BMP SHALLOW LAND (NORMAL POOL TO 6" ABOVE) = 1,737 SF		50 HERB. PLANTS / 200 SF (1,737 SF) = 434				
PLANT TYPE	QTY	BOTANICAL NAME	COMMON NAME	ROOT	CALIPER	NOTES
HERBACEOUS	86	Asclepias incarnata	Swamp Milkweed	CONT.	4" POT	24" O.C.
	86	Chelone glabra	White Turtlehead	CONT.	4" POT	24" O.C.
	86	Eupatoriadelphus fistulosus	Joe-Pye weed	CONT.	4" POT	24" O.C.
HERBACEOUS	86	Kosteletzkya virginica	Seashore Mallow	CONT.	4" POT	24" O.C.
	90	Lobelia cardinalis	Cardinal Flower	CONT.	4" POT	24" O.C.
BMP SHALLOW WATER (NORMAL POOL TO 6" BELOW) = 1,578 SF		50 HERB. PLANTS / 200 SF (1,578 SF) = 395				
PLANT TYPE	QTY	BOTANICAL NAME	COMMON NAME	ROOT	CALIPER	NOTES
HERBACEOUS	79	Iris virginica	Blue Flag Iris	CONT.	4" POT	24" O.C.
	79	Juncus effusus	Soft Rush	CONT.	4" POT	24" O.C.
	79	Pontederia cordata	Pickerweed	CONT.	4" POT	24" O.C.
	79	Saururus cernuus	Lizard's tail	CONT.	4" POT	24" O.C.
	79	Schoenoplectus tabernaemontani	Soft Stem Bulrush	CONT.	4" POT	24" O.C.

-A MINIMUM OF THREE (3) DIVERSE SPECIES MUST BE USED FOR EACH PLANTING ZONE.  
-TOPSOIL SHALL BE USED OVER THE CLAY LINER AS NECESSARY TO PROMOTE AND MAINTAIN VEGETATION ESPECIALLY ALONG THE VEGETATED SHELF FOR THE ABOVE PLANTINGS.

BMP #4 - WET POND



BMP #4	DIMENSIONS	ELEV.
TOP OF DAM WIDTH	10'	315.00
TOP OF RISER	4'x4' ID	313.00
NORMAL POOL	7,098 SF	311.50
NORMAL POOL ORIFICE	1.5" ORIFICE	310.50
BOTTOM DRAIN	6"	306.00
ANTI-FLOTATION DEVICE	7.5'x7.5'x2.5'	N/A
ANTI-SEEP COLLAR	96"x96"	N/A
OUTLET PIPE INVERT IN	6" LF OF 30" O-RING CLASS III RCP @ 1.6%	306.00
OUTLET PIPE INVERT OUT		305.00



CLAY LINER SPECIFICATIONS

THE CLAY LINER FOR THE WET POND SHALL BE AT LEAST 12" 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 IN/HR
- A MINIMUM OF 2 TESTS OF EACH ABOVE PARAMETER SHALL BE COMPLETED BY THE CONTRACTOR ON THE LINER MATERIAL AND PRESENTED TO THE ENGINEER FOR APPROVAL.
- COMPACTION TO A MINIMUM OF 93% PER ASTM D698, AND WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT (1% COMPACTION DENSITY TEST PER 2500 SQ. FT.)

THE CLAY LINER SHALL BE PLACED UNDER THE BOTTOM OF THE BMP PERMANENT POOL TO A THICKNESS OF 12 INCHES. A MINIMUM OF 8 INCHES OF TOPSOIL 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 MAY BE USED IF THE ABOVE SPECIFICATIONS ARE SATISFIED AND WITH WRITTEN APPROVAL BY THE ENGINEER.

BMP #4 OUTFLOW SUMMARY

STORM EVENT	FLOW (CFS)	ELEV. (FT)
1-YEAR	0.36	313.02
10-YEAR	20.69	313.55
100-YEAR	45.08	313.94

VELOCITY DISSIPATOR DESIGN						
OUTLET PIPE (INCHES)	DISCHARGE (CFS)	LENGTH (FT)	OUTLET WIDTH (INCHES)	D/STREAM WIDTH (FT)	RIP RAP THICKNESS (INCHES)	RIP RAP CLASS
#4	30	20.69	15	7.50	18.00	9

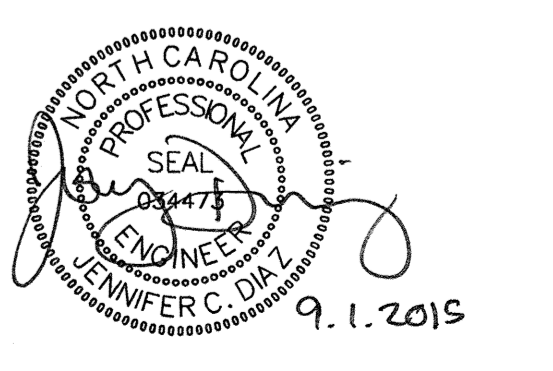
NOTE: ALL DISSIPATORS SHALL HAVE FILTER FABRIC UNDERLINERS. INSTALL RIP RAP PADS AT LEVEL GRADE.

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: 9/23/15  
TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
ADMINISTRATOR



No.	Revision	Date	By
1	TOK 1ST COMMENTS	8/31/15	JCI

Designer	BJM	Scale	SEE SHEET
Drawn By	BJM	Date	6/23/2015
Checked By	JCD	Job No.	02090251.7

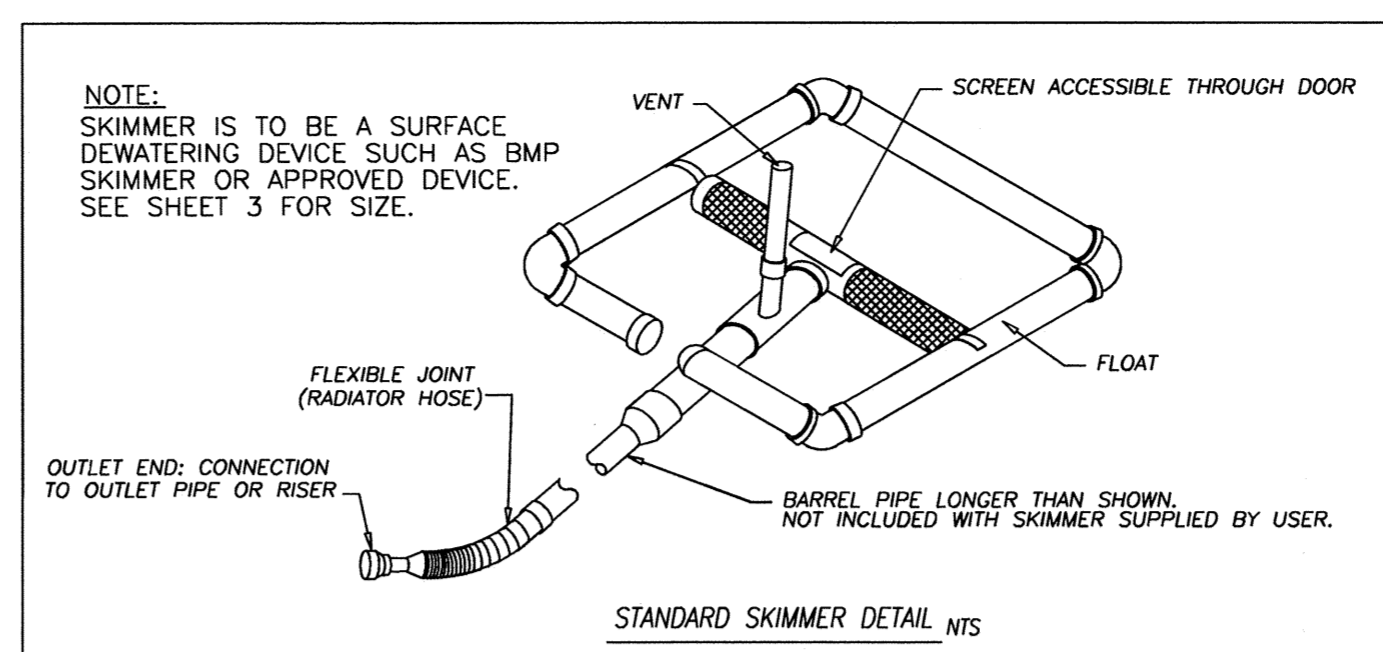
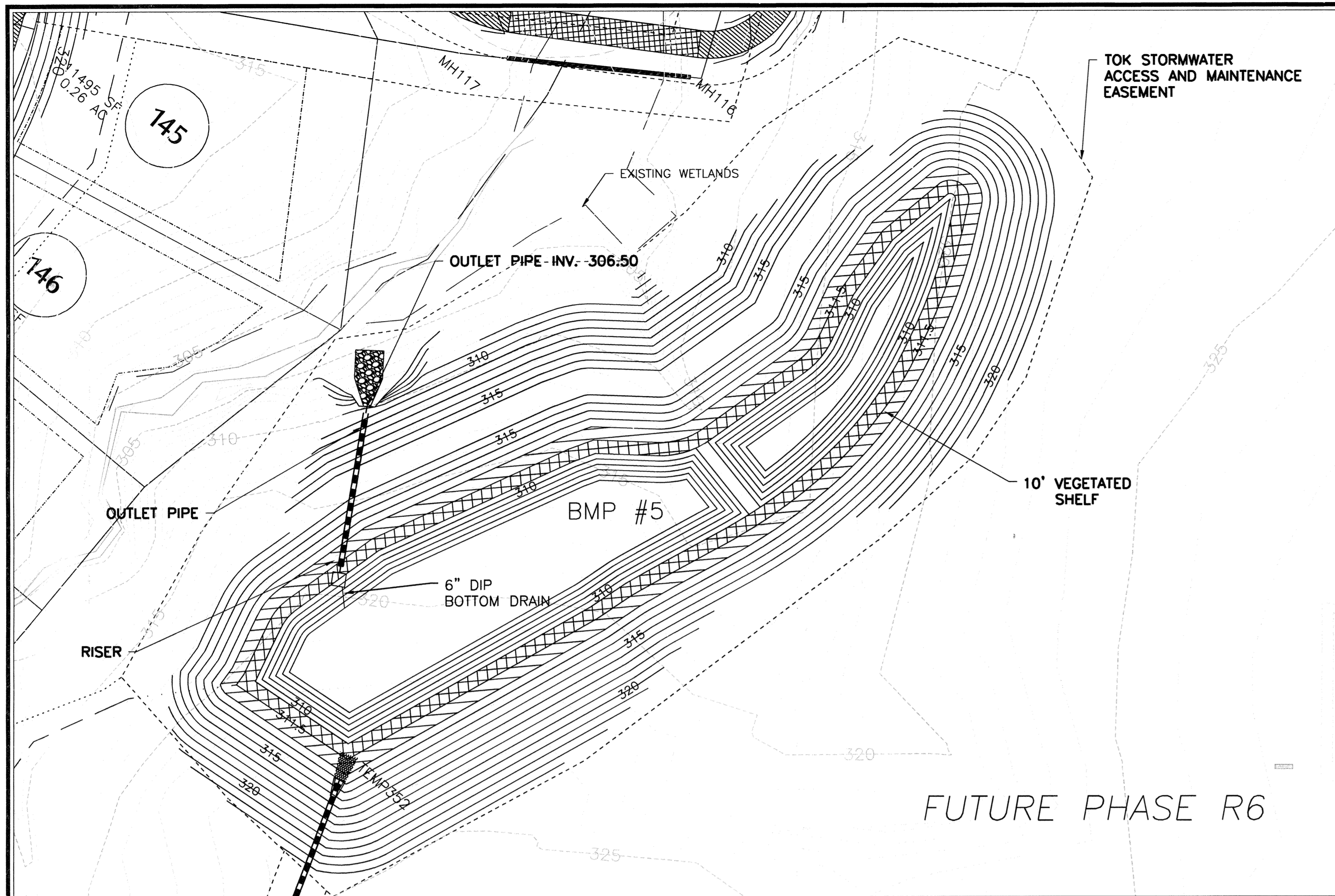
KNIGHTDALE STATION PHASE R3  
TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

STORMWATER MANAGEMENT PLAN - BMP #4

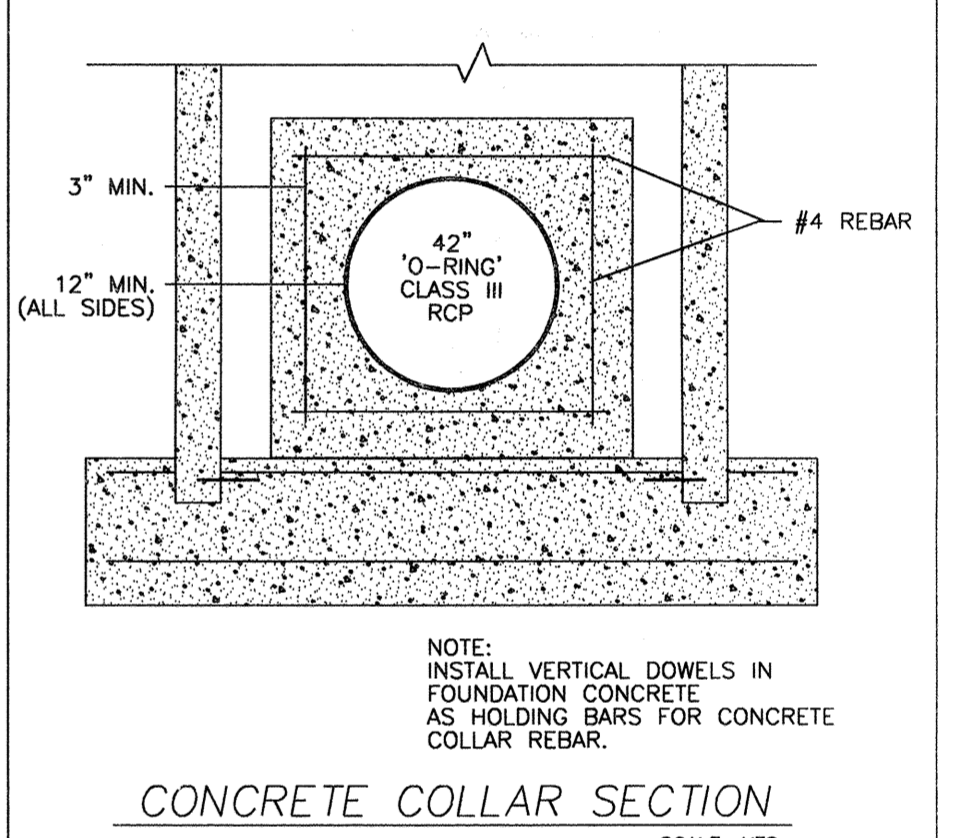
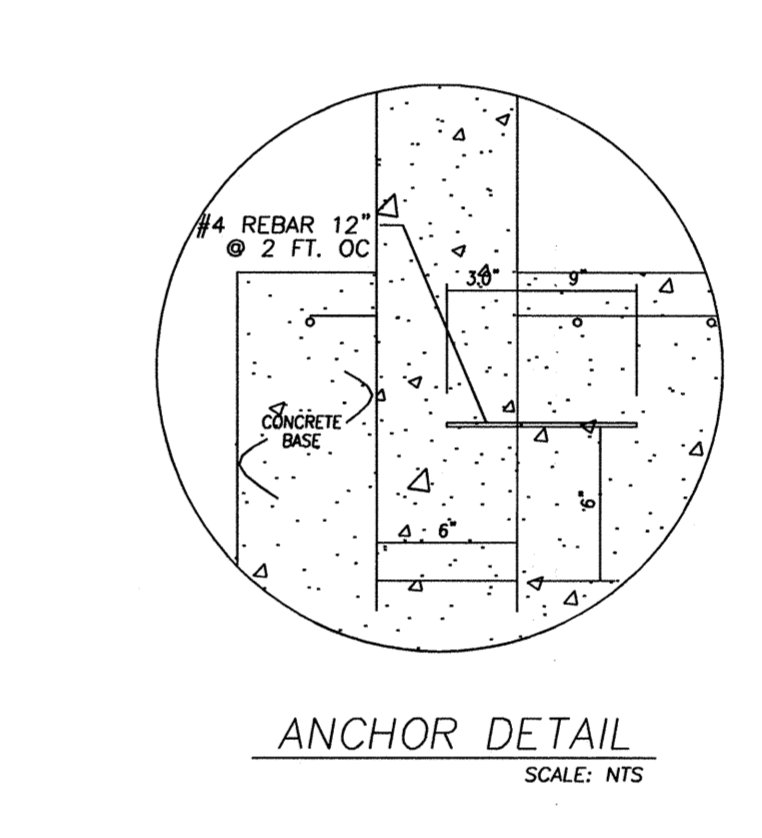
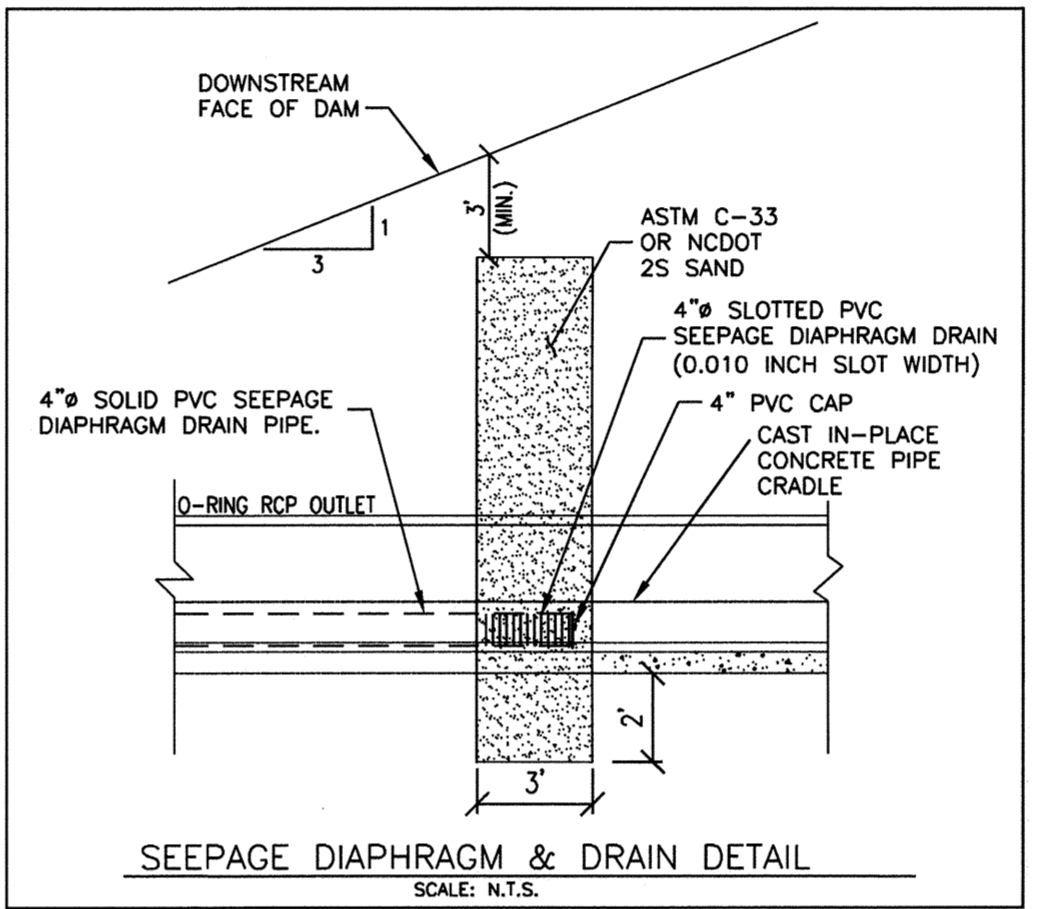
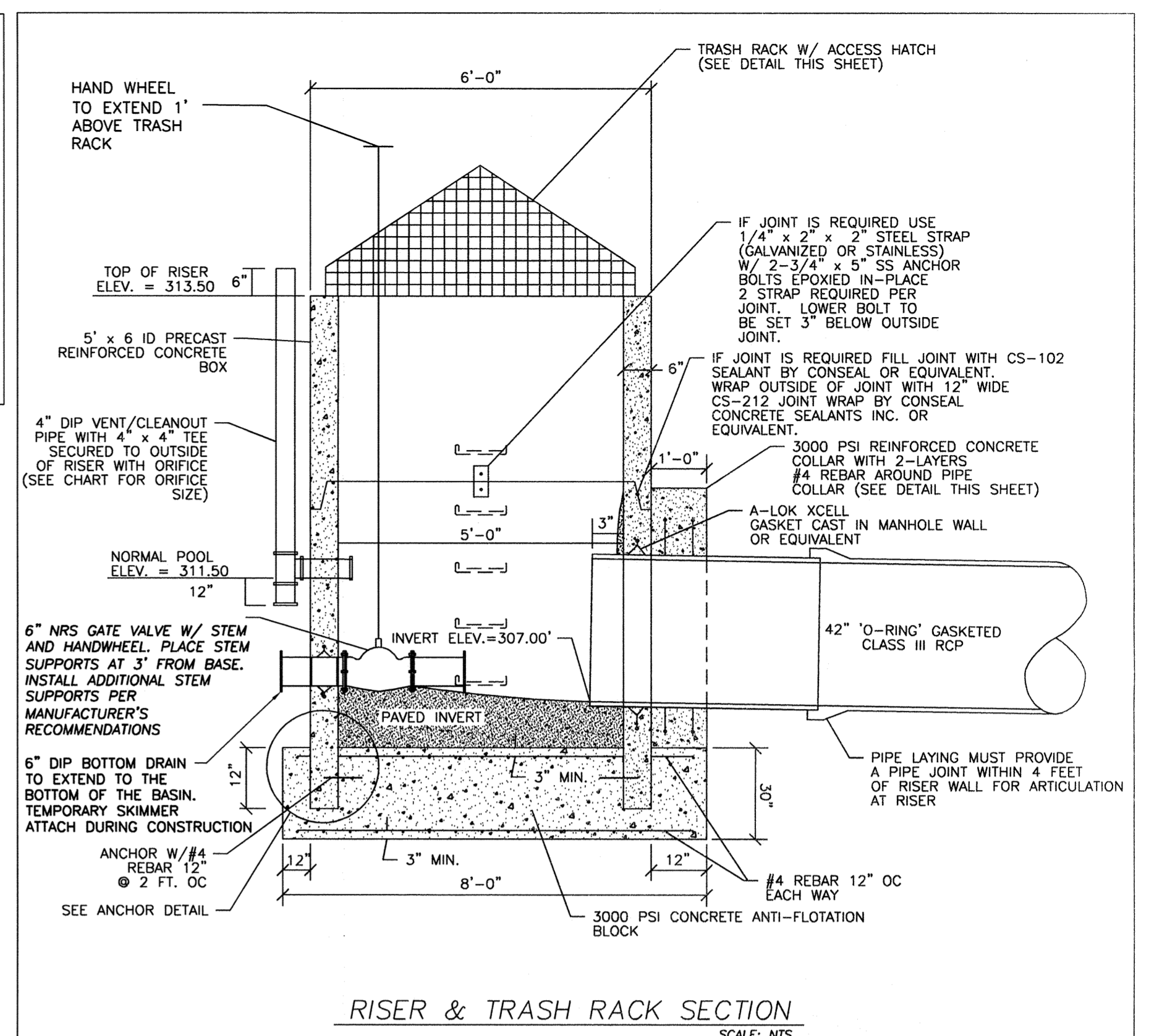
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Sheet No. 14 of 21

K:\WORK\02090251.7-Knightdale Station Phase R3\10-Map MASTER BME SITE.dwg - Tuesday, September 01, 2015 2:39:52 PM - MILLER, BRANDON



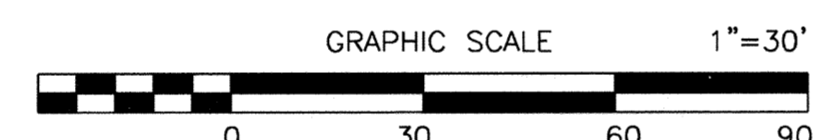
- 1STORMWATER BMP NOTES:**
- PRIOR TO CONSTRUCTION, ANY DISCREPANCIES IN THE PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER FOR RESOLUTION.
  - GEOTECHNICAL ENGINEER SHALL EVALUATE SOILS ONSITE FOR SUITABILITY OF DAM CONSTRUCTION AND CLAY LINER.
  - DURING CONSTRUCTION, THE BMP IS TO BE USED AS AN EROSION CONTROL DEVICE. THE FOREBAY WILL NOT BE REQUIRED WHILE BMP IS ACTING AS AN EROSION CONTROL DEVICE.
  - ALL PERMANENT STRUCTURES (I.E. RISER BOX, OUTLET PIPES, SEEPAGE DIAPHRAGM, 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 BMP SHALL BE CONVERTED TO A PERMANENT BMP.
  - ALL SEDIMENT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
  - FOREBAY AND VEGETATED SHELF SHALL BE CONSTRUCTED PER THIS PLAN.
  - VEGETATED SHELF SHALL BE PLANTED PER PLANT SCHEDULE ON THIS SHEET.
  - TOWN OF KNIGHTDALE REQUIRES FINAL CERTIFICATION OF BMP BY PROFESSIONAL ENGINEER.



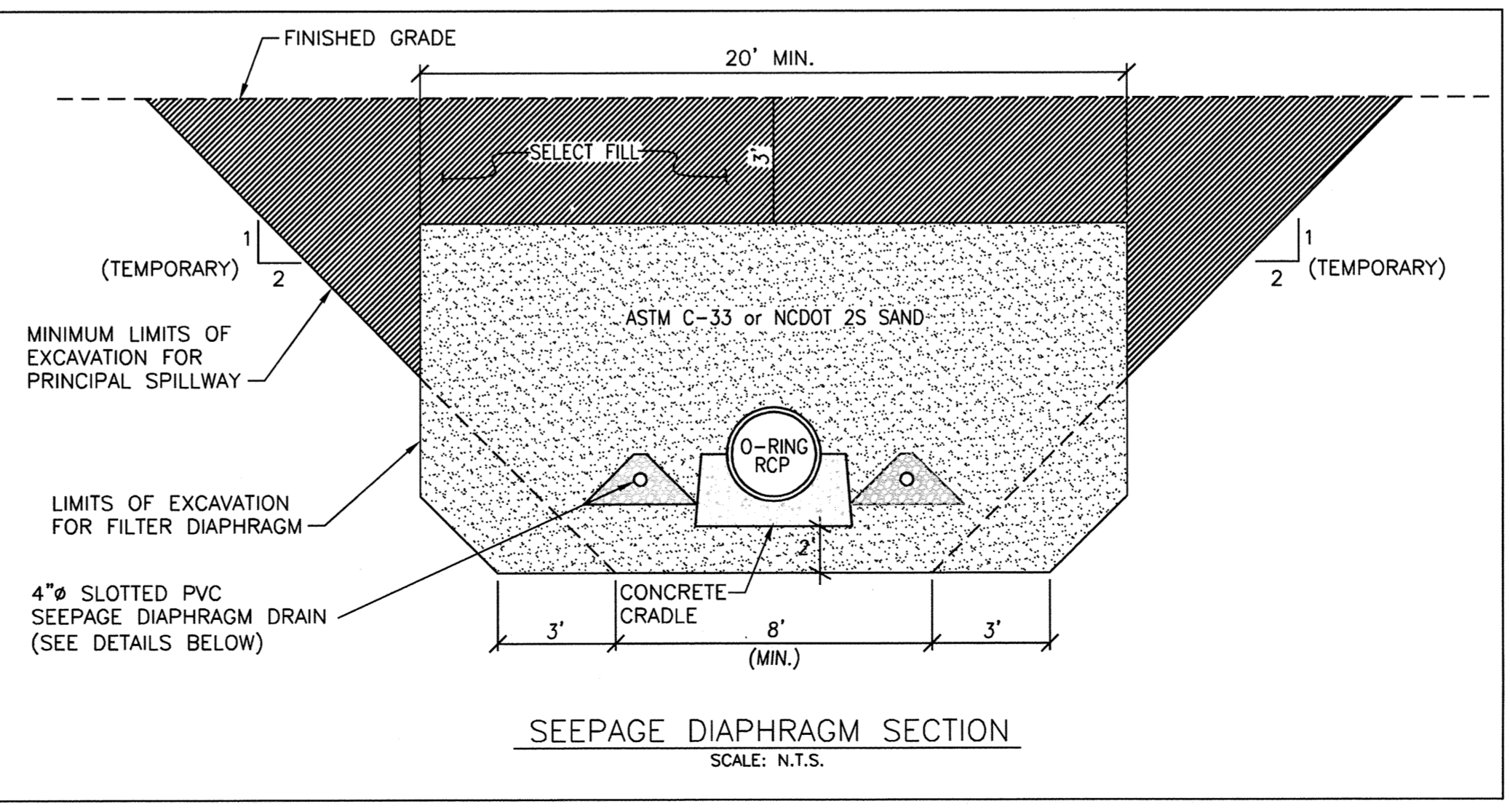
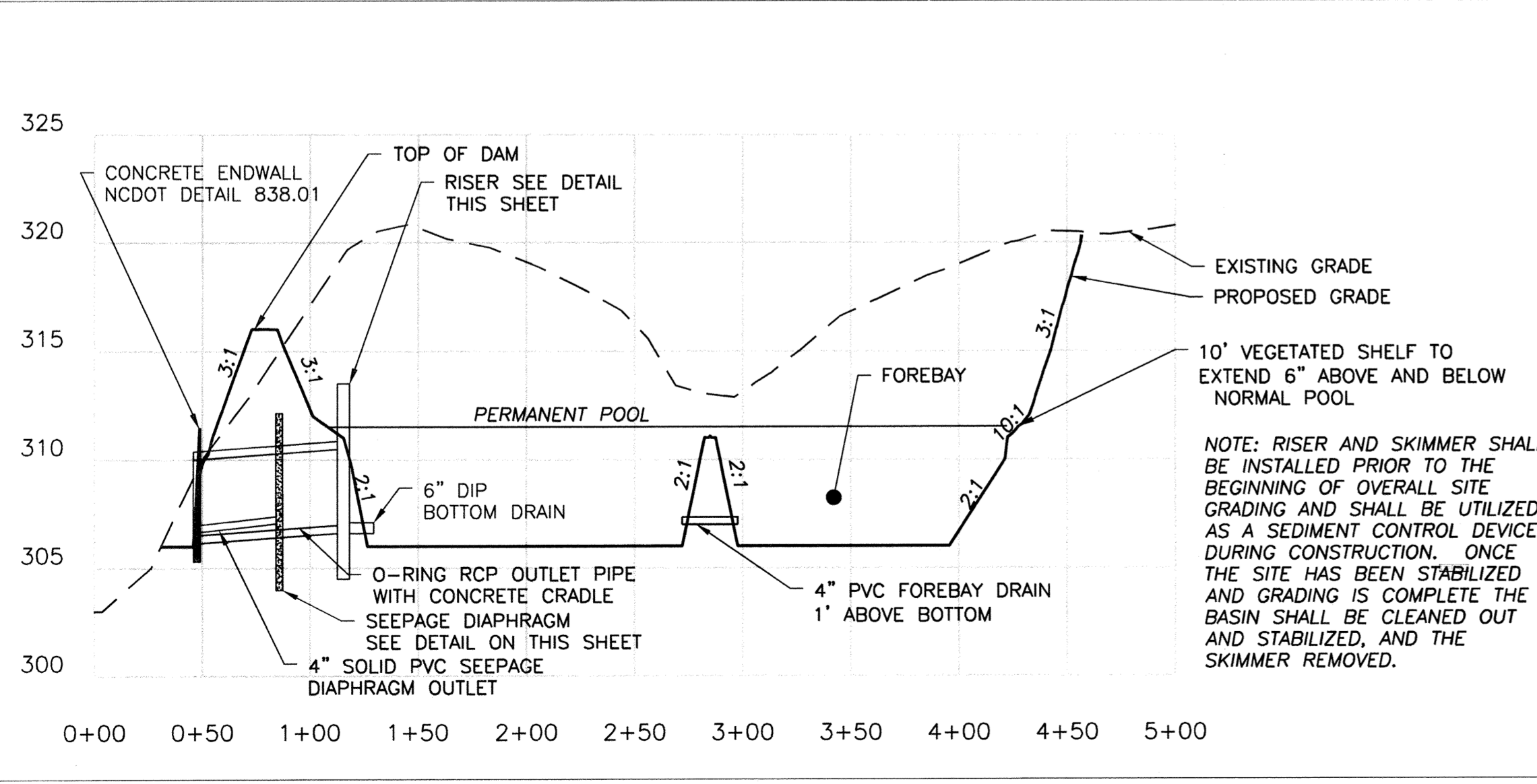
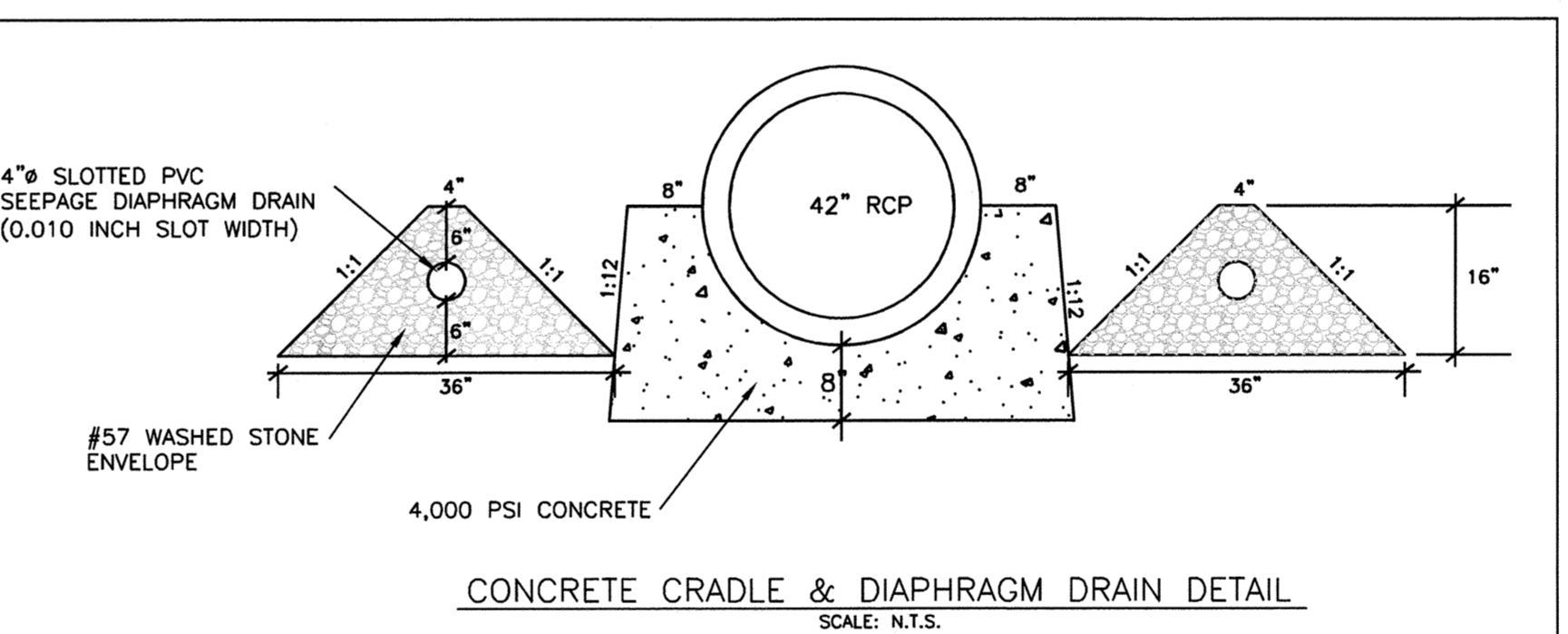
**PLANT LIST - BMP #5**

BMP SHALLOW LAND (NORMAL POOL TO 6" ABOVE) = 3,988 SF		50 HERB. PLANTS / 200 SF (3,739 SF) = 935					
PLANT TYPE	QTY	BOTANICAL NAME	COMMON NAME	ROOT	CALIPER	NOTES	
HERBACEOUS	183	Asclepias incarnata	Swamp Milkweed	CONT.	4" POT	24" O.C.	
	193	Chelone glabra	White Turtlehead	CONT.	4" POT	24" O.C.	
	183	Eupatoriadelphus fistulosus	Joe-Pye weed	CONT.	4" POT	24" O.C.	
	188	Kosteletzkya virginica	Seashore Mallow	CONT.	4" POT	24" O.C.	
BMP SHALLOW WATER (NORMAL POOL TO 6" BELOW) = 3,194 SF	50 HERB. PLANTS / 200 SF (3,569 SF) = 892						
	PLANT TYPE	QTY	BOTANICAL NAME	COMMON NAME	ROOT	CALIPER	NOTES
	HERBACEOUS	178	Iris virginica	Blue Flag Iris	CONT.	4" POT	24" O.C.
		178	Juncus effusus	Soft Rush	CONT.	4" POT	24" O.C.
178		Pontederia cordata	Pickersweed	CONT.	4" POT	24" O.C.	
178		Saururus cernuus	Lizard's tail	CONT.	4" POT	24" O.C.	
	180	Schoenoplectus tabernaemontani	Soft Stem Bulrush	CONT.	4" POT	24" O.C.	

**BMP #5 - WET POND**



BMP #5	DIMENSIONS	ELEV.
TOP OF DAM WIDTH	10'	316.00
TOP OF RISER	5'X5' ID	313.50
NORMAL POOL	16,036 SF	311.50
NORMAL POOL ORIFICE	2.5" ORIFICE	310.50
BOTTOM DRAIN	6"	306.00
ANTI-FLOATATION DEVICE	8'x8'x2.5"	N/A
ANTI-SEEP COLLAR	96'x96"	N/A
OUTLET PIPE INVERT IN	63' LF OF 42" O-RING CLASS III RCP @ 0.79%	307.00
OUTLET PIPE INVERT OUT		306.50



**CLAY LINER SPECIFICATIONS**

- THE CLAY LINER FOR THE WET POND SHALL BE AT LEAST 12" 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 IN/HR.
  - A MINIMUM OF 2 TESTS OF EACH ABOVE PARAMETER SHALL BE COMPLETED BY THE CONTRACTOR ON THE LINER MATERIAL AND PRESENTED TO THE ENGINEER FOR APPROVAL.
  - COMPACTION TO A MINIMUM OF 93% PER ASTM D698, AND WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT (1) COMPACTION DENSITY TEST PER 2500 SQ. FT.)
- THE CLAY LINER SHALL BE PLACED UNDER THE BOTTOM OF THE BMP PERMANENT POOL TO A THICKNESS OF 12 INCHES. A MINIMUM OF 8 INCHES OF TOPSOIL 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 MAY BE USED IF THE ABOVE SPECIFICATIONS ARE SATISFIED AND WITH WRITTEN APPROVAL BY THE ENGINEER.

**BMP #5 OUTFLOW SUMMARY**

STORM EVENT	FLOW (CFS)	ELEV. (FT)
1-YEAR	0.22	313.46
10-YEAR	36.22	314.19
100-YEAR	113.29	315.06

**VELOCITY DISSIPATOR DESIGN**

OUTLET PIPE (INCHES)	DISCHARGE (CFS)	LENGTH (FT)	OUTLET WIDTH (FT)	D. STREAM WIDTH (INCHES)	RIP RAP THICKNESS (INCHES)	RIP RAP CLASS (NGDOT)
42	36.22	21	10.50	25.00	18.00	B

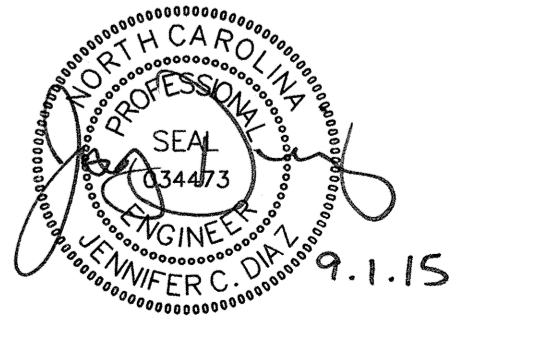
NOTE: ALL DISSIPATORS SHALL HAVE FILTER FABRIC UNDERLINERS. INSTALL RIP RAP PADS AT LEVEL GRADE.

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: 9/23/15  
 TOWN ENGINEER/DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9/23/15  
 ADMINISTRATOR



No.	Revision	Date	By
1	TOK 1ST COMMENTS	8/31/15	JCI

Designer	BJM	Scale	SEE SHEET
Drawn By	BJM	Date	6/23/2015
Checked By	JCD	Job No.	02090251.7

**KNIGHTDALE STATION PHASE R3**

TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

**STORMWATER MANAGEMENT PLAN - BMP #5**

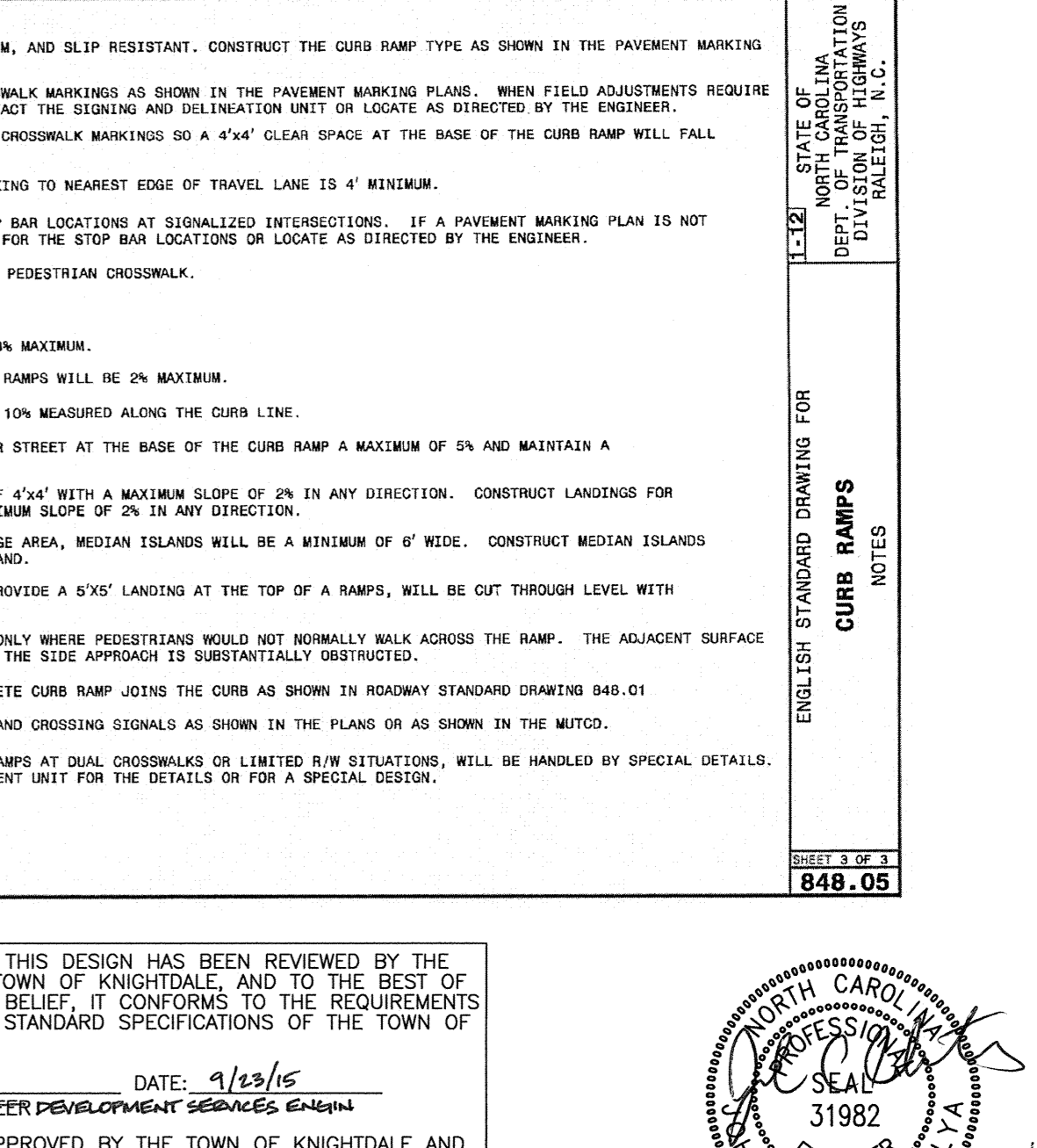
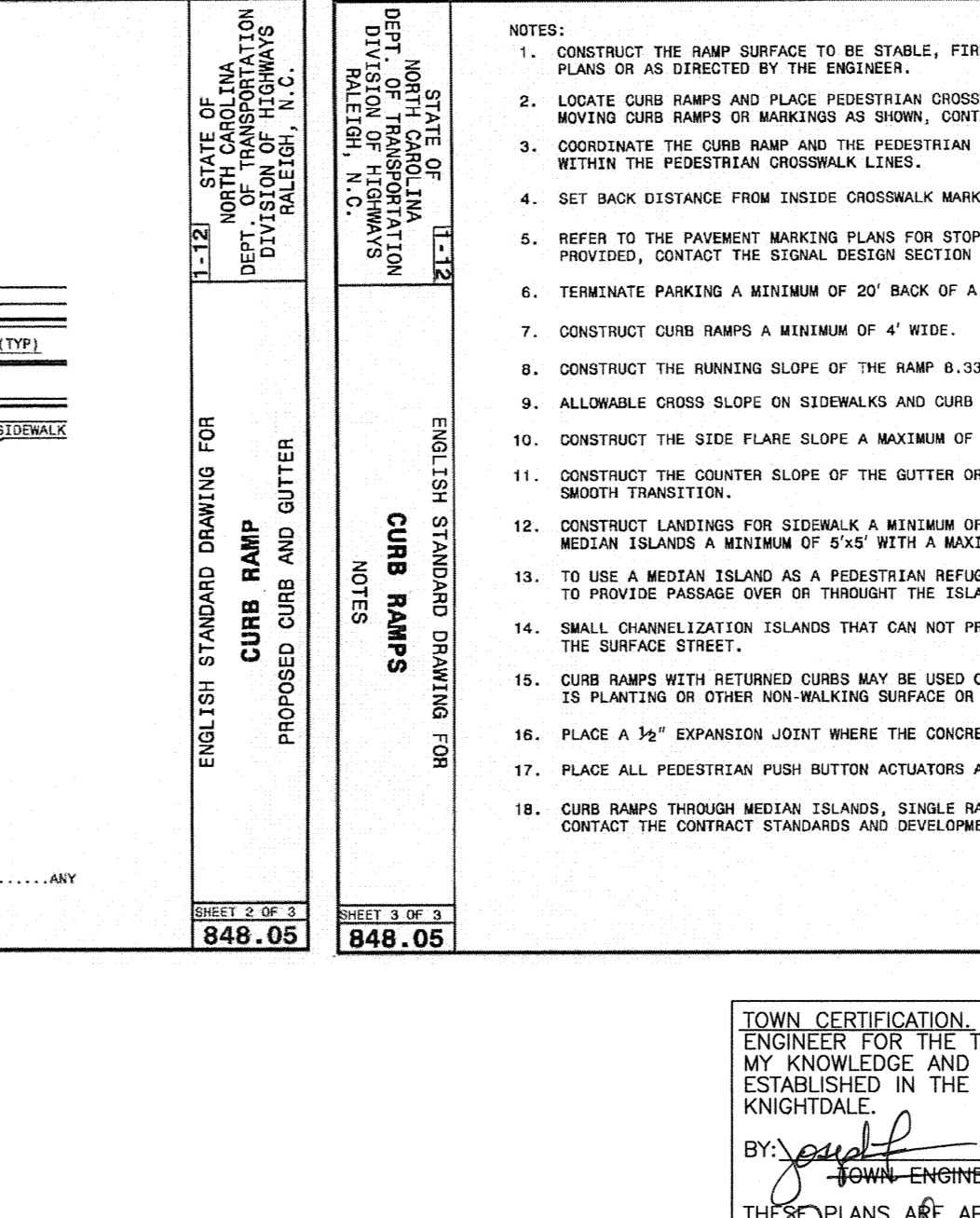
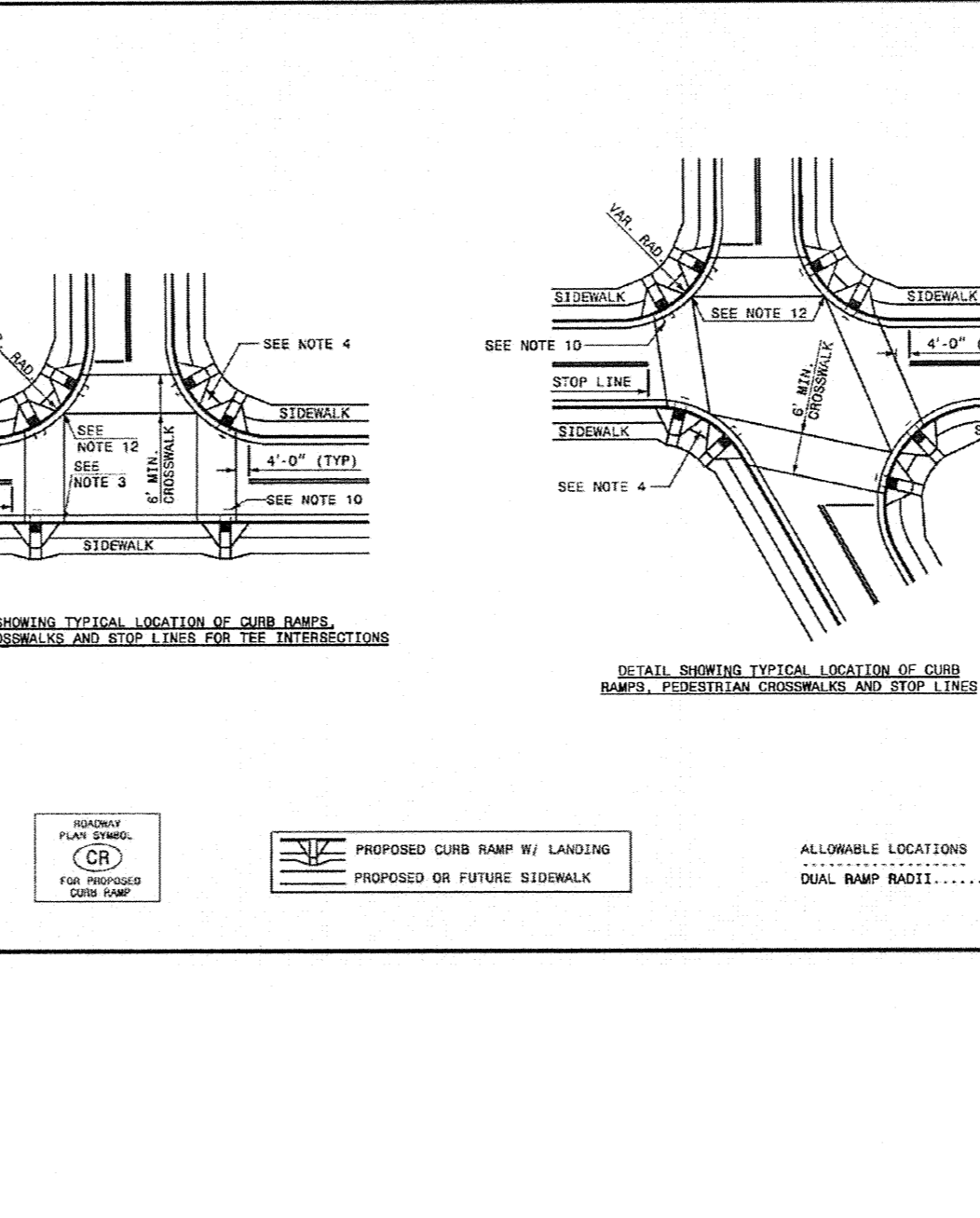
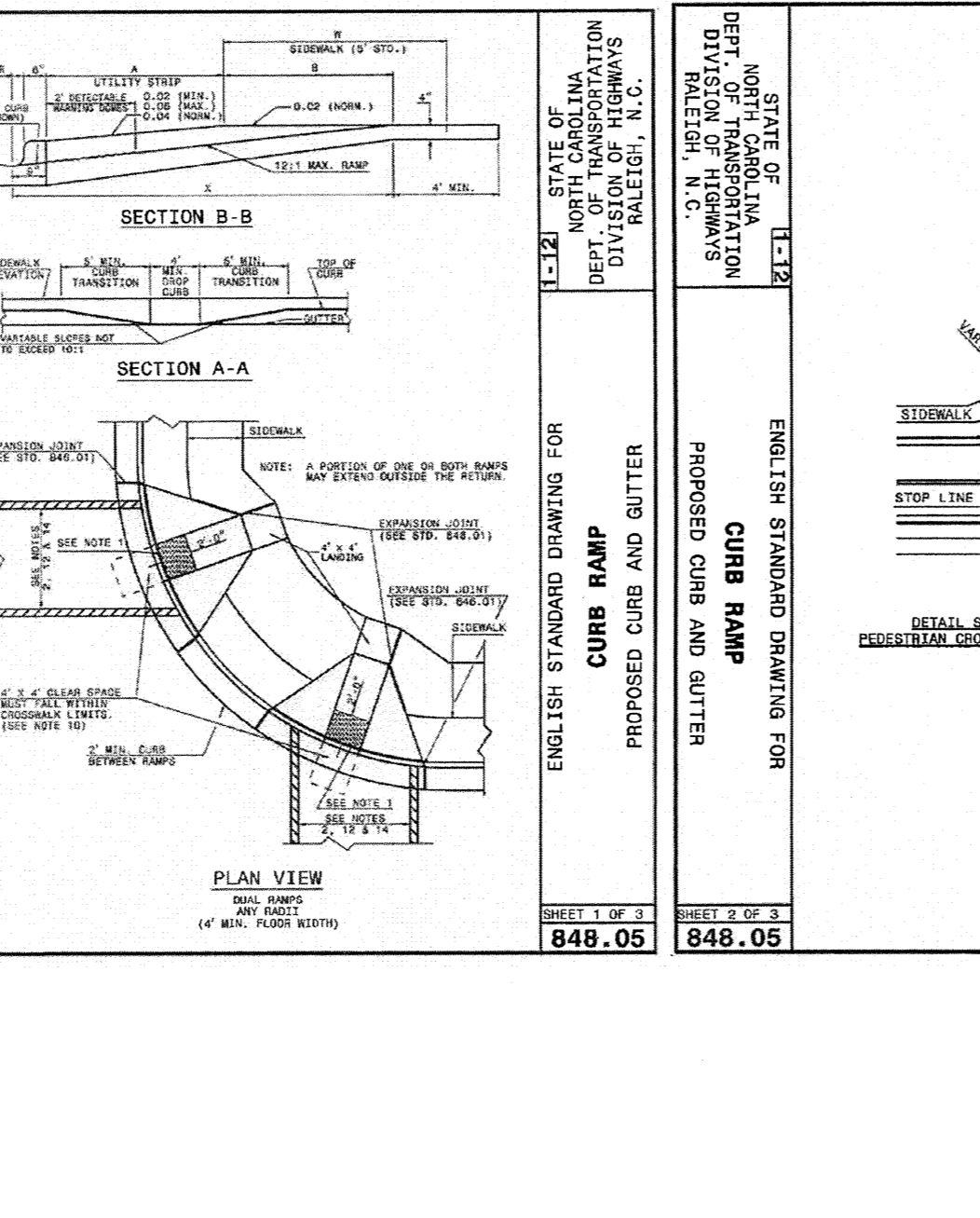
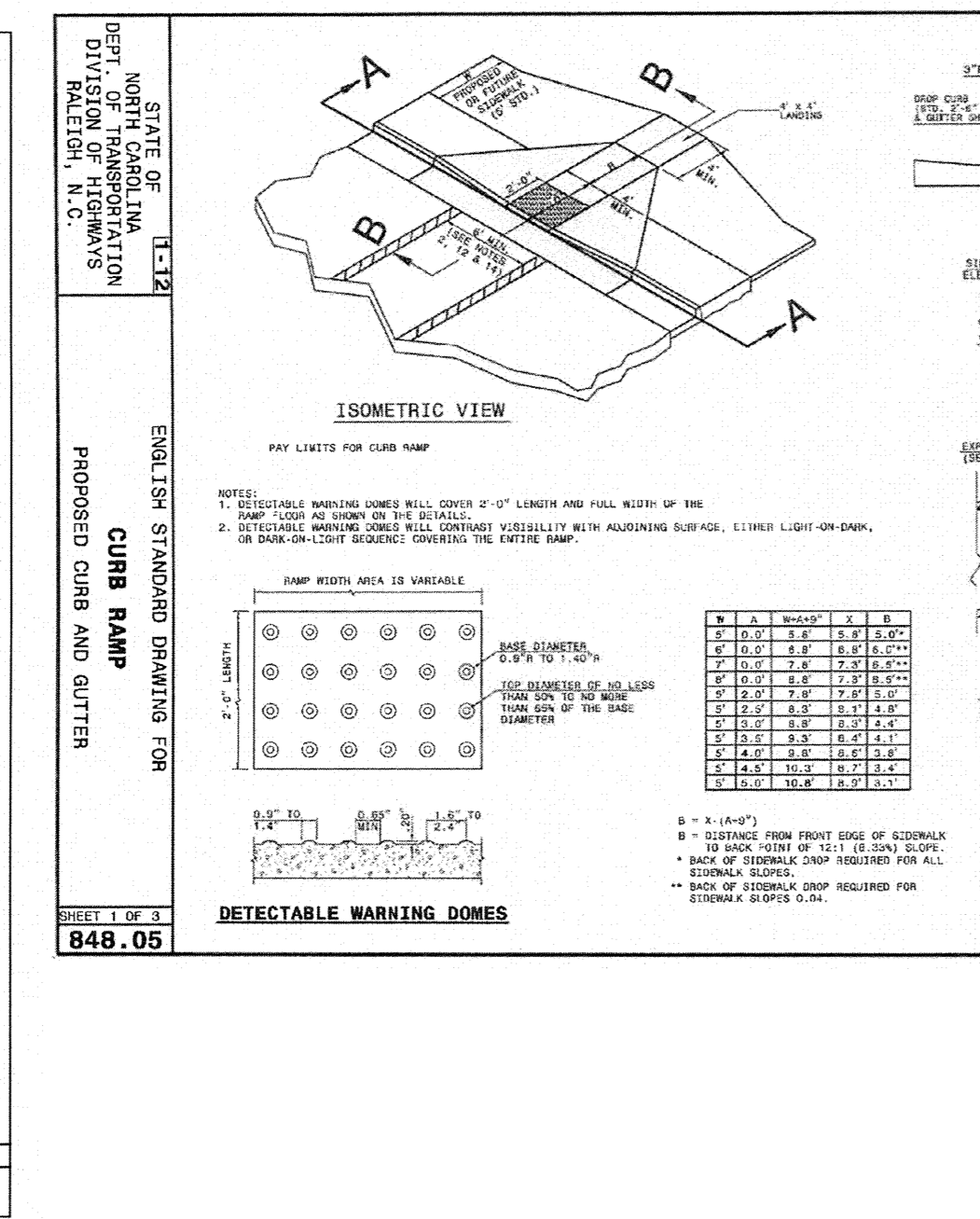
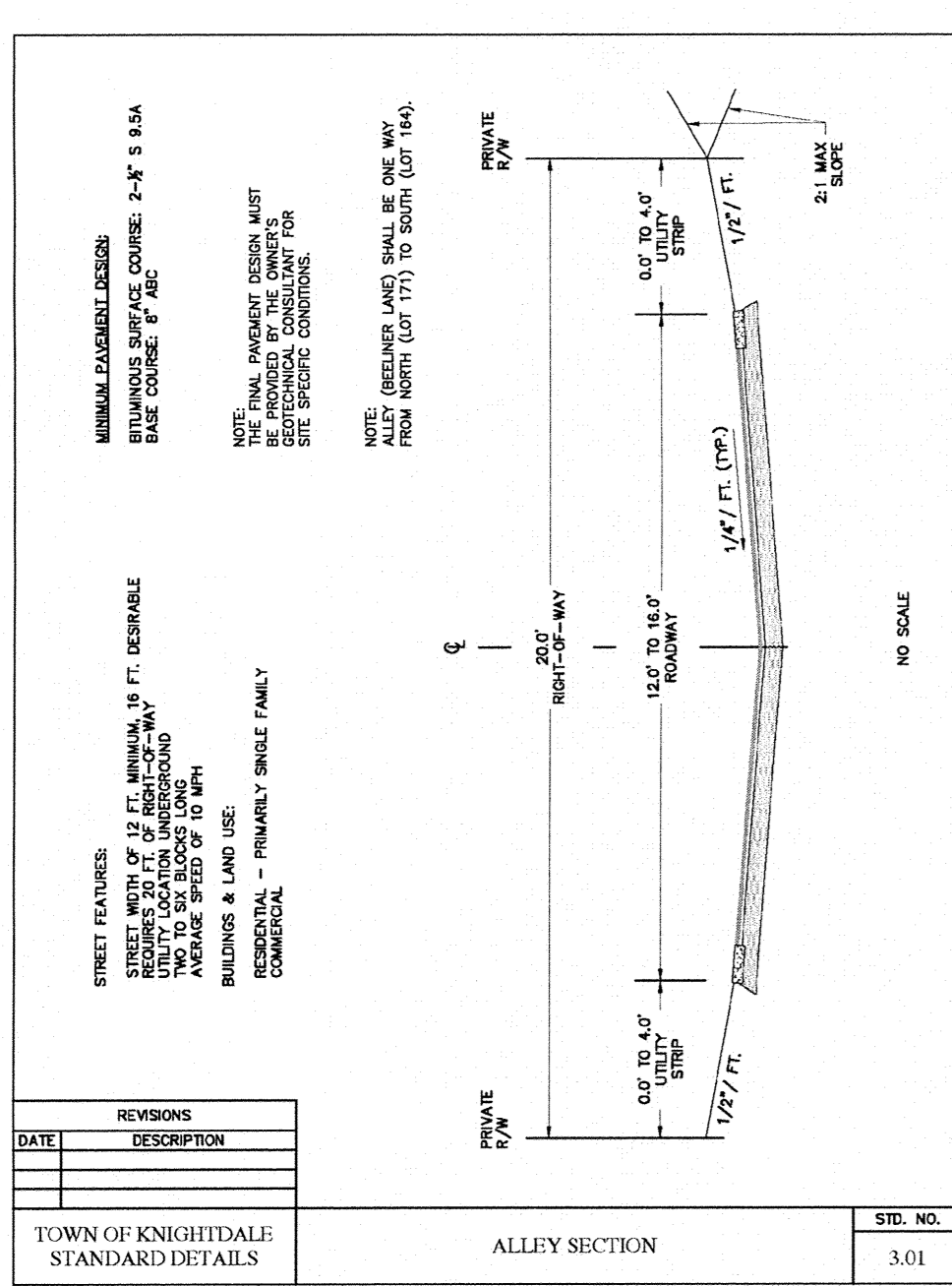
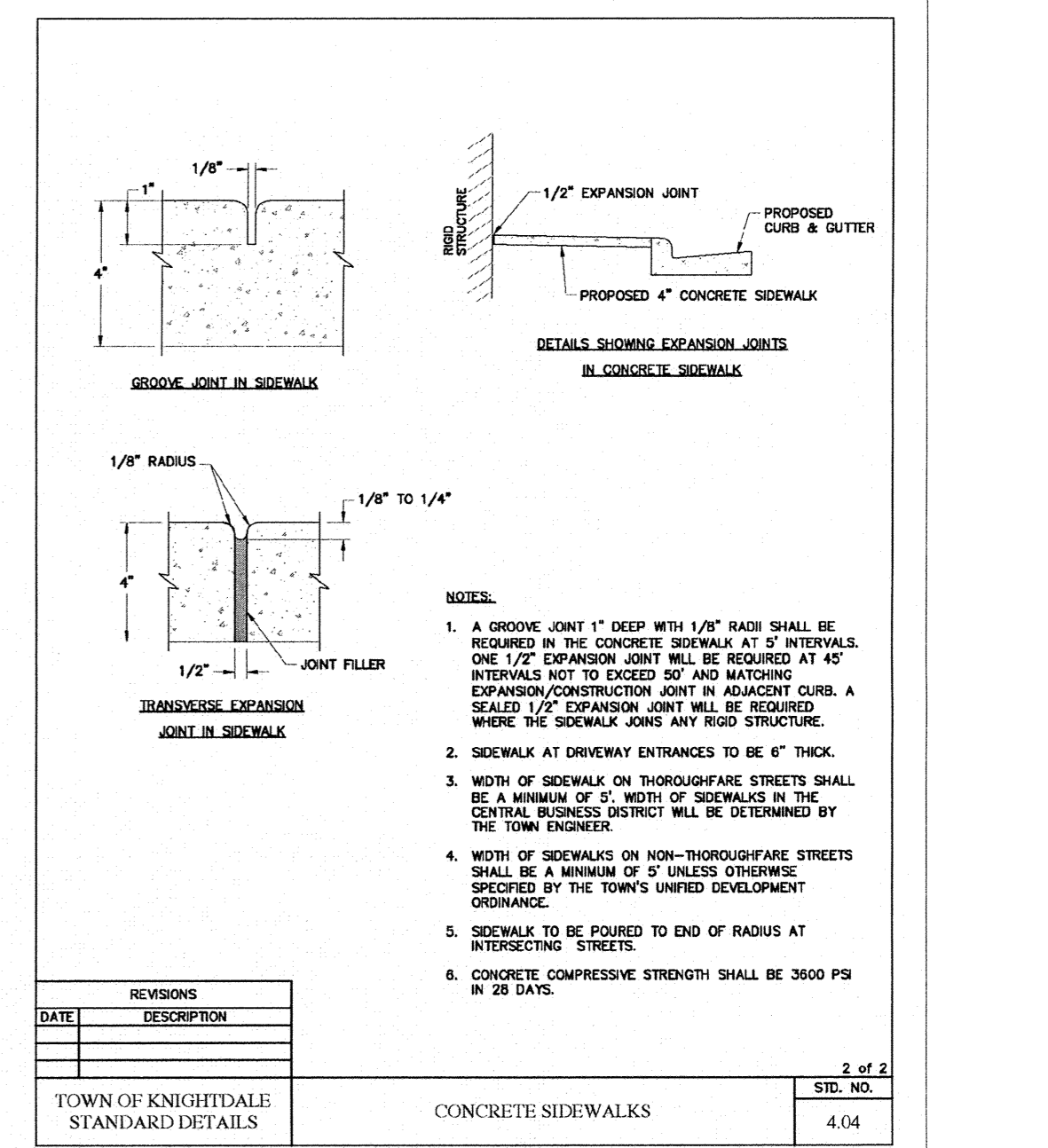
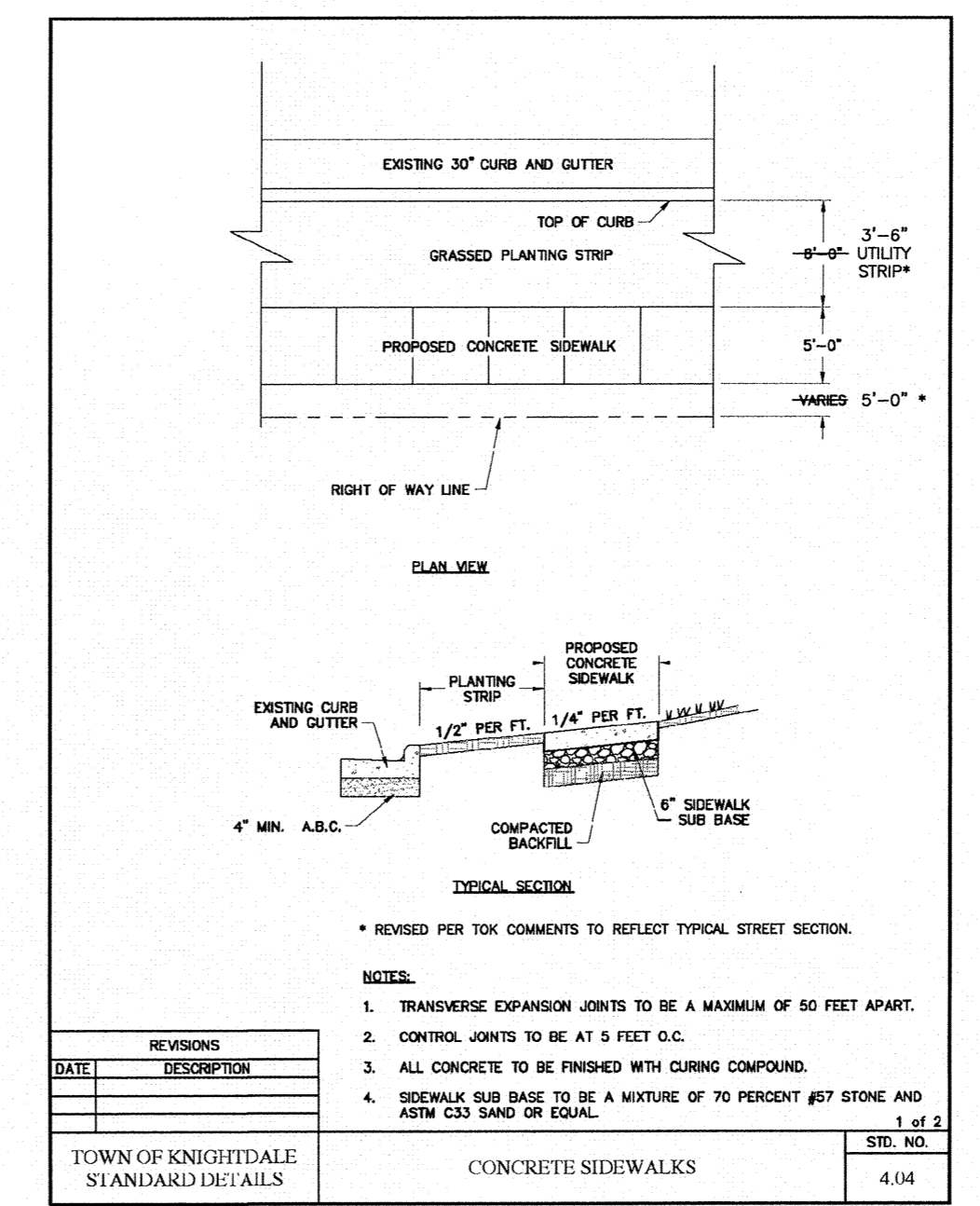
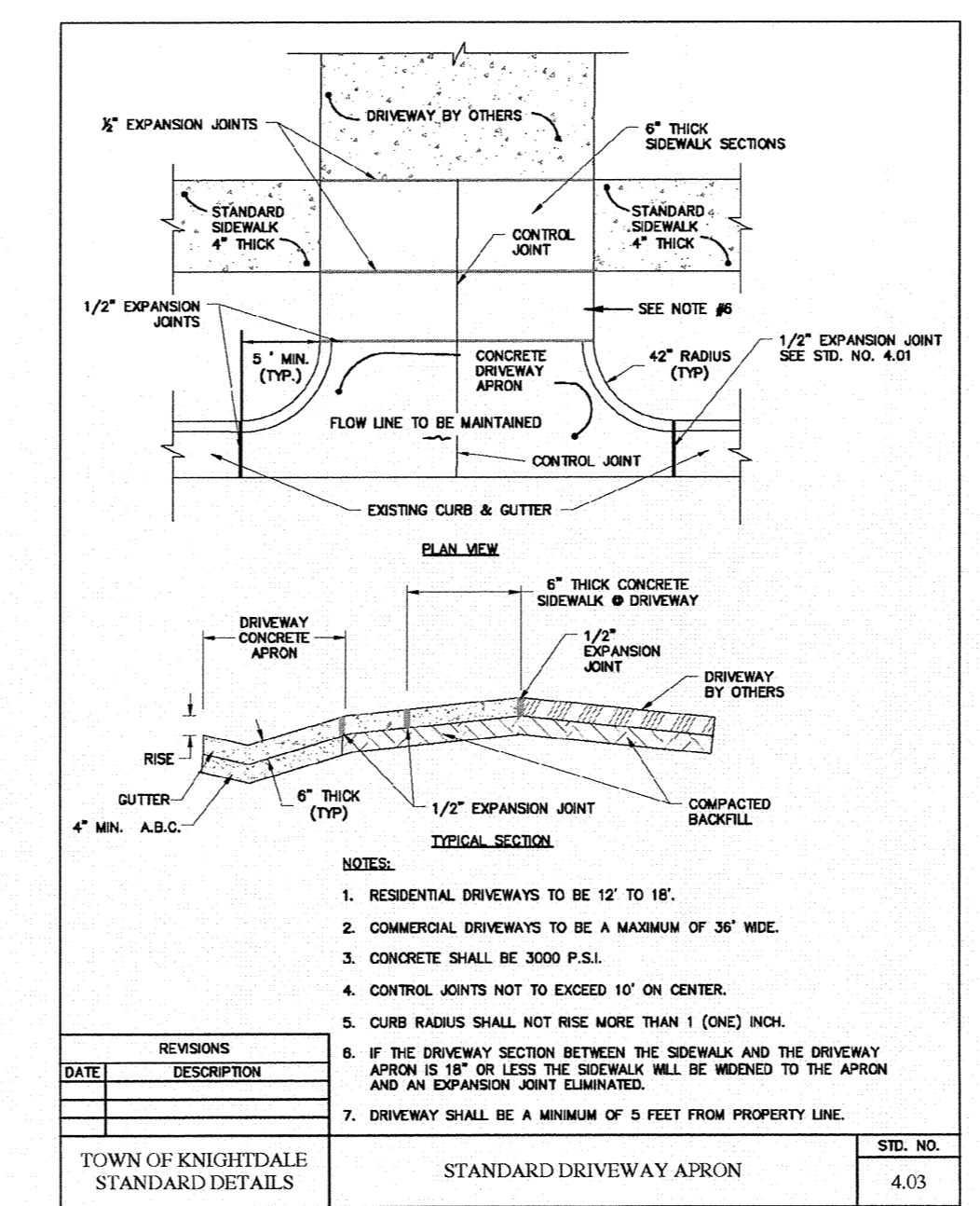
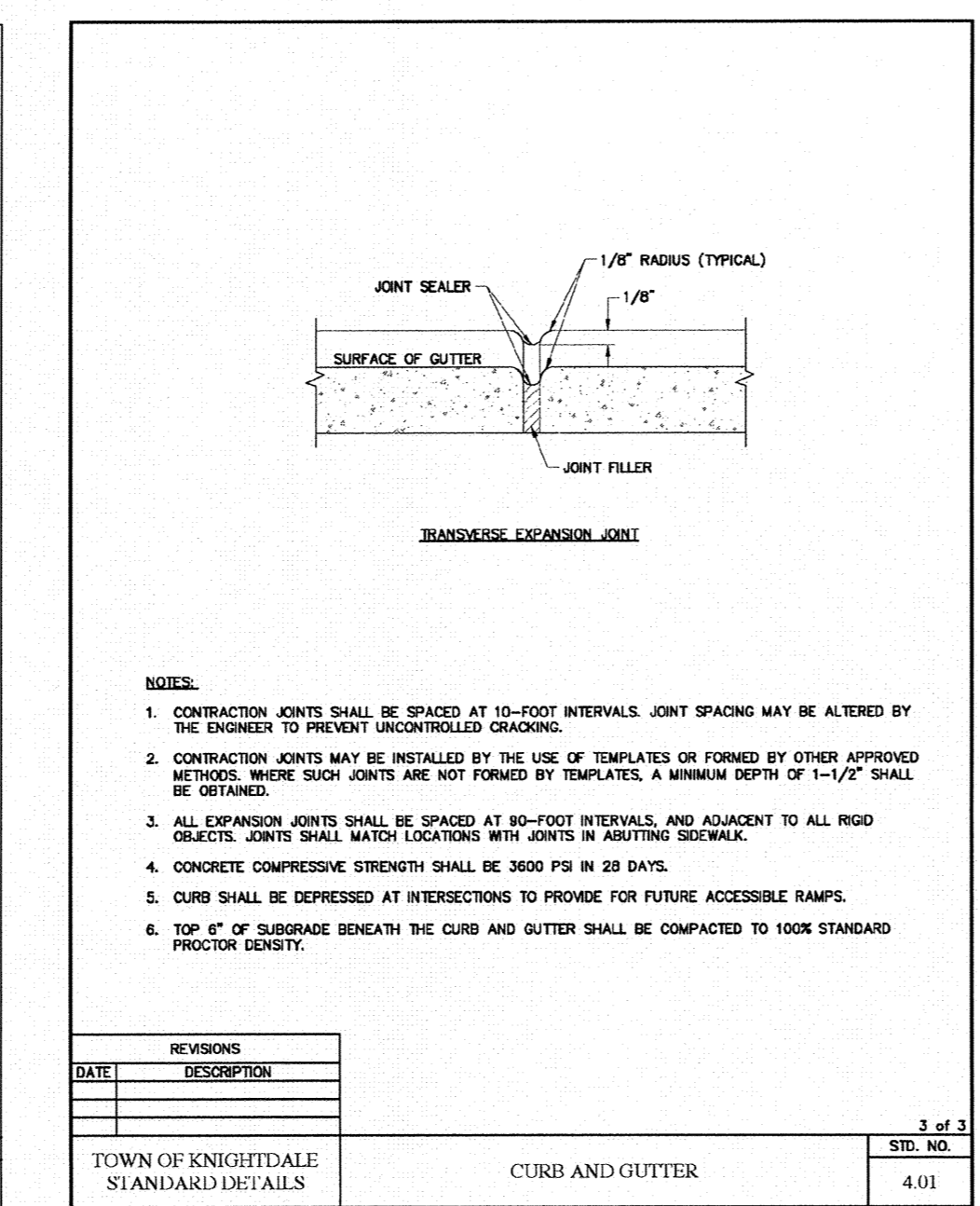
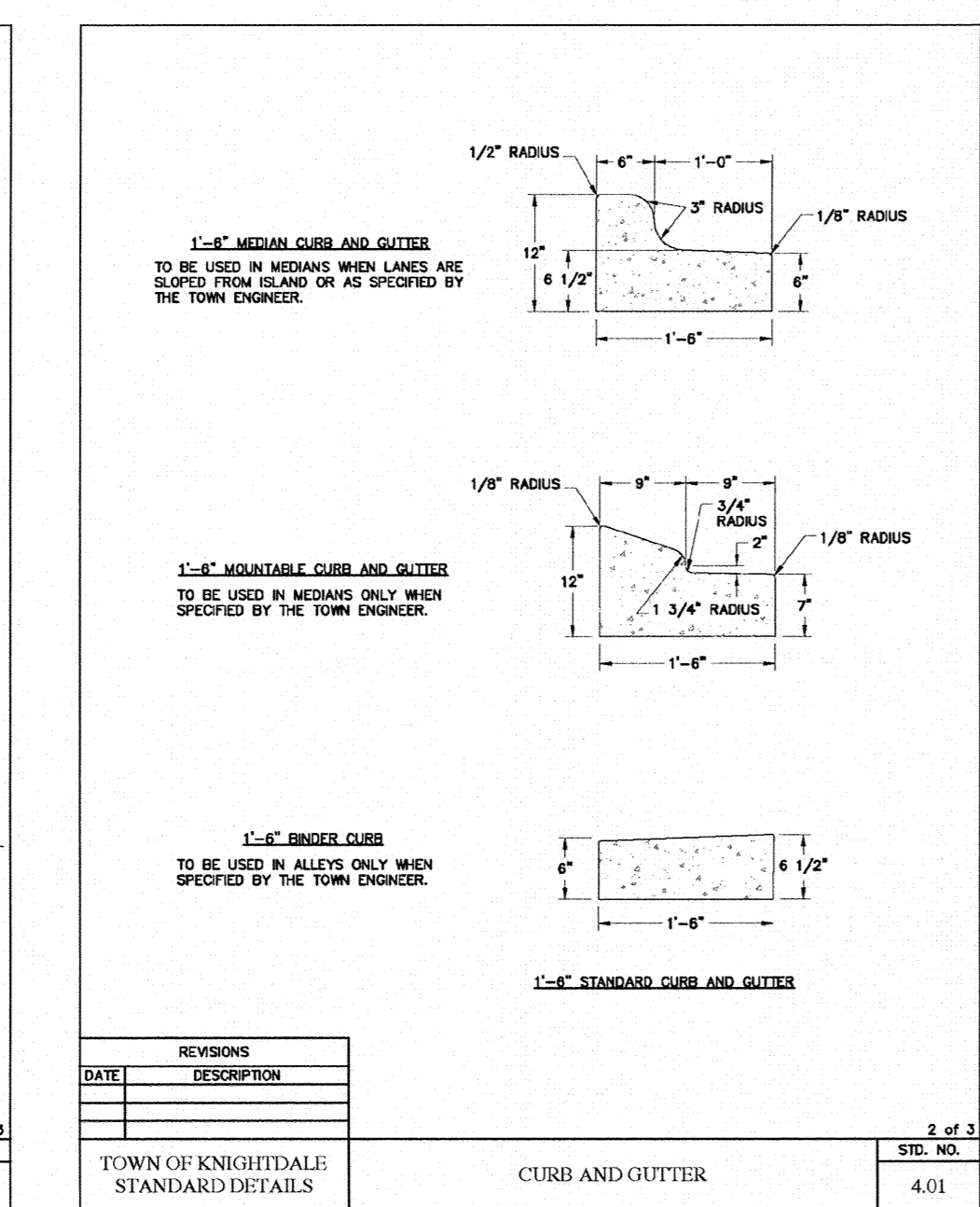
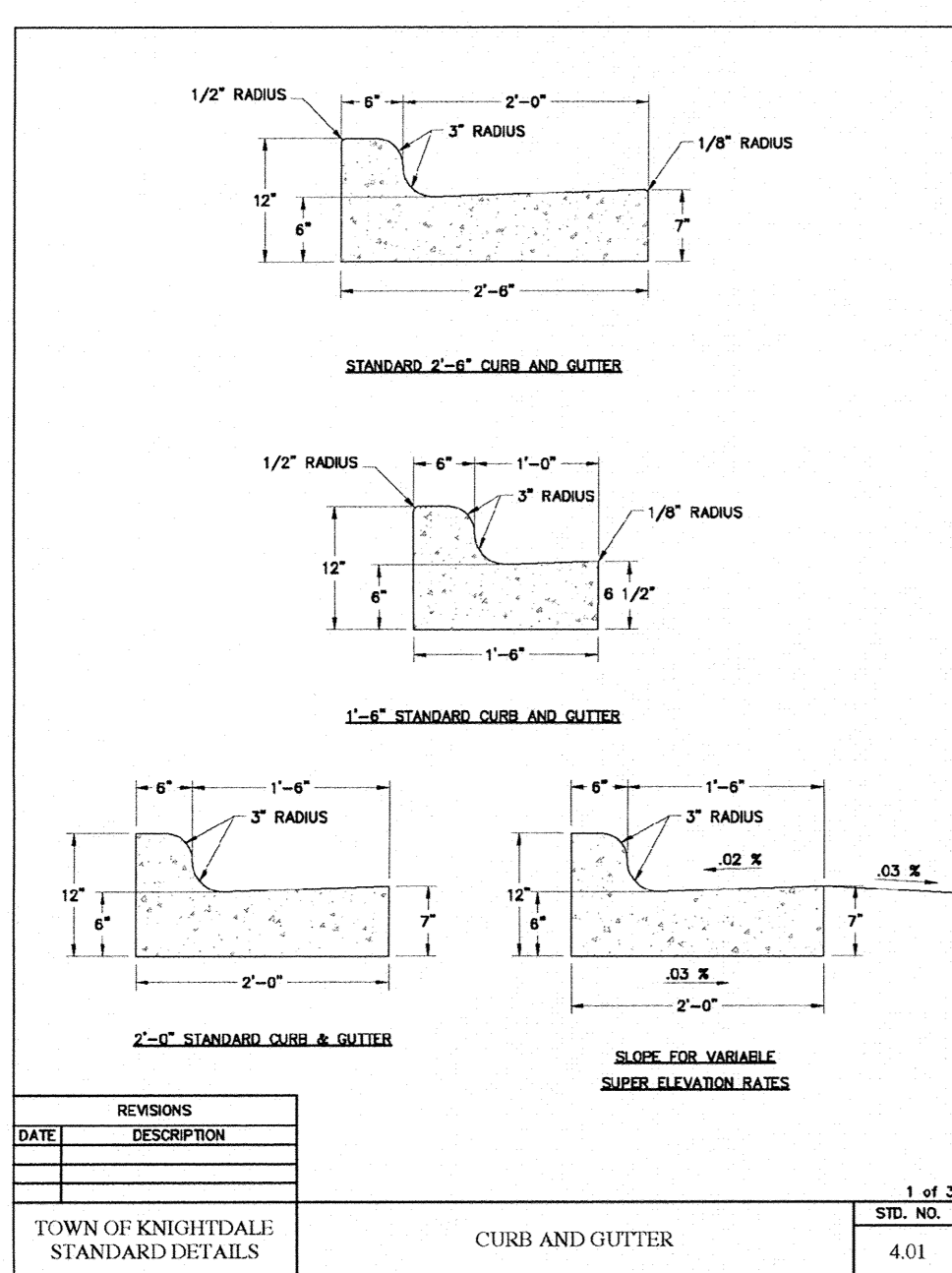
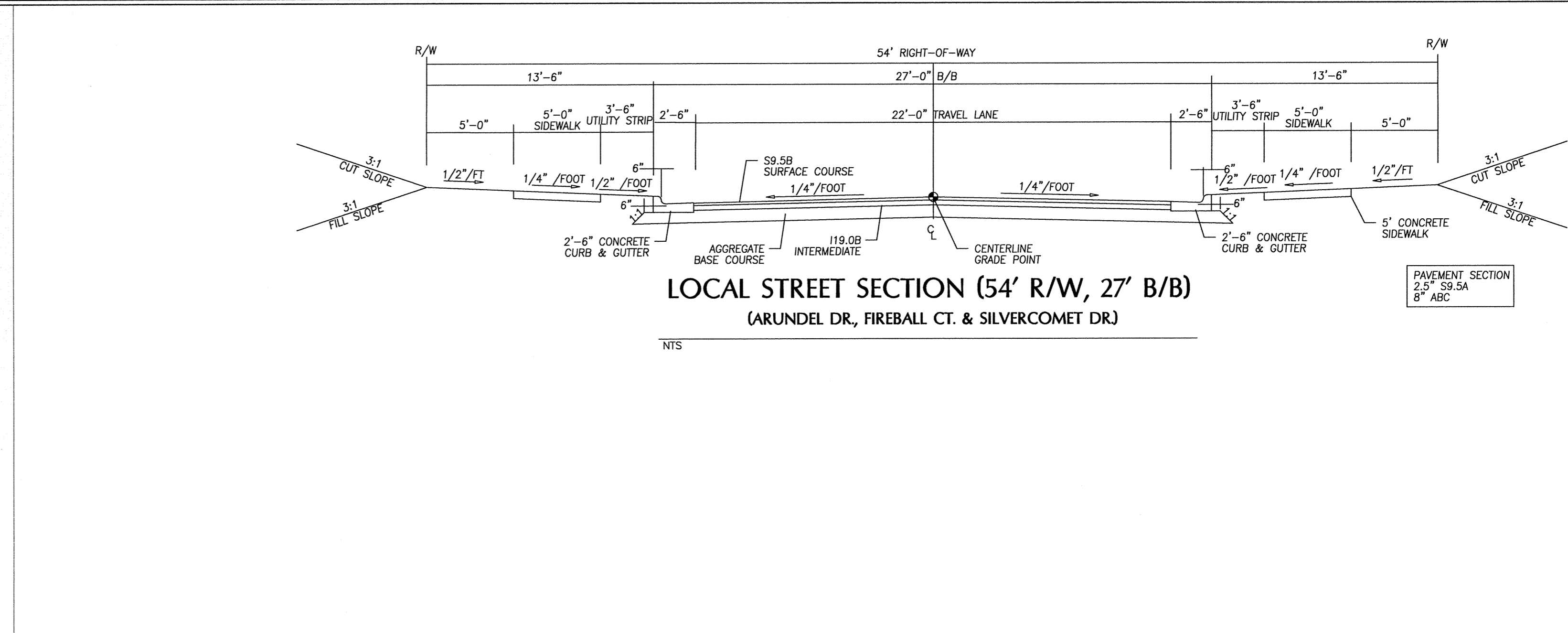
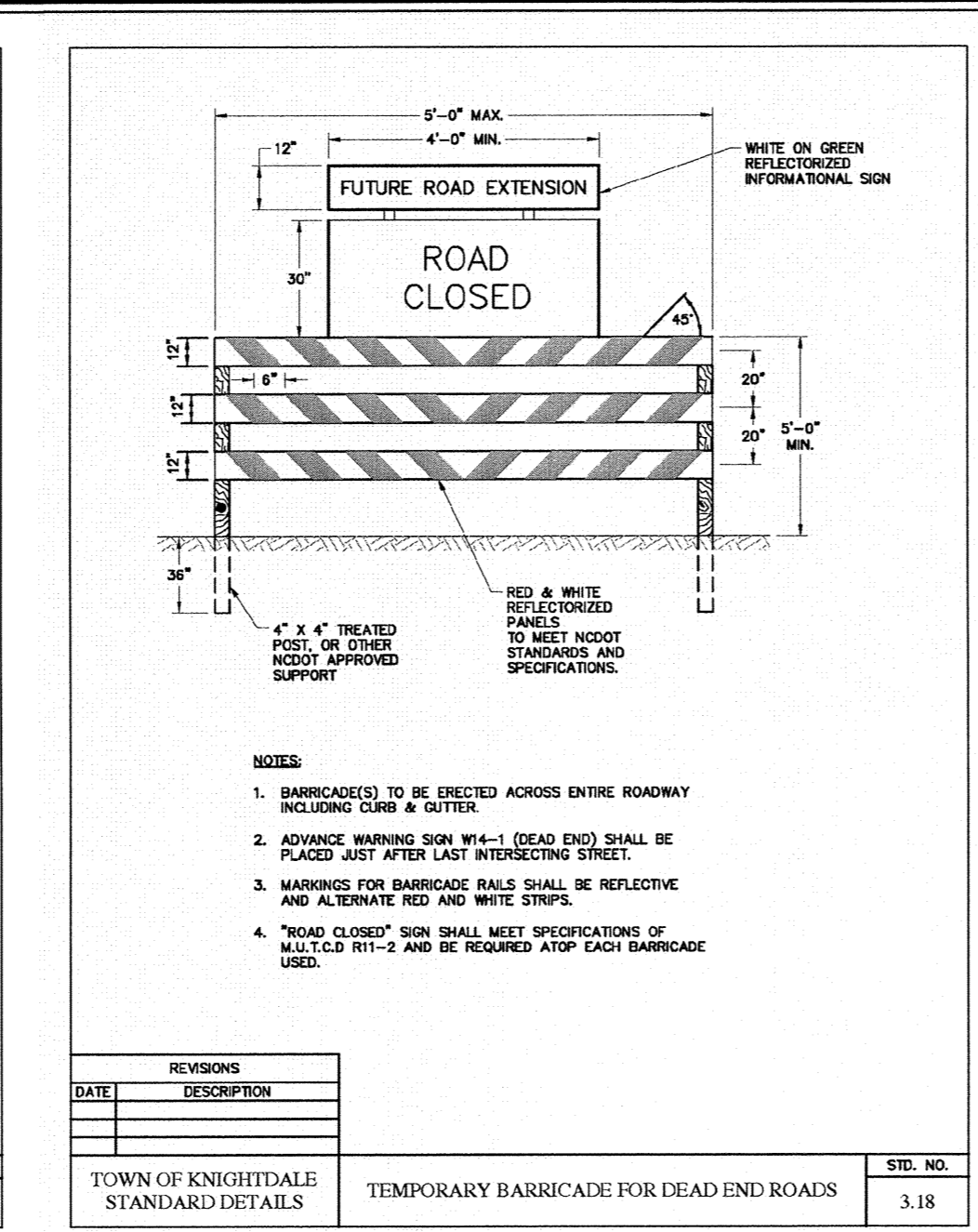
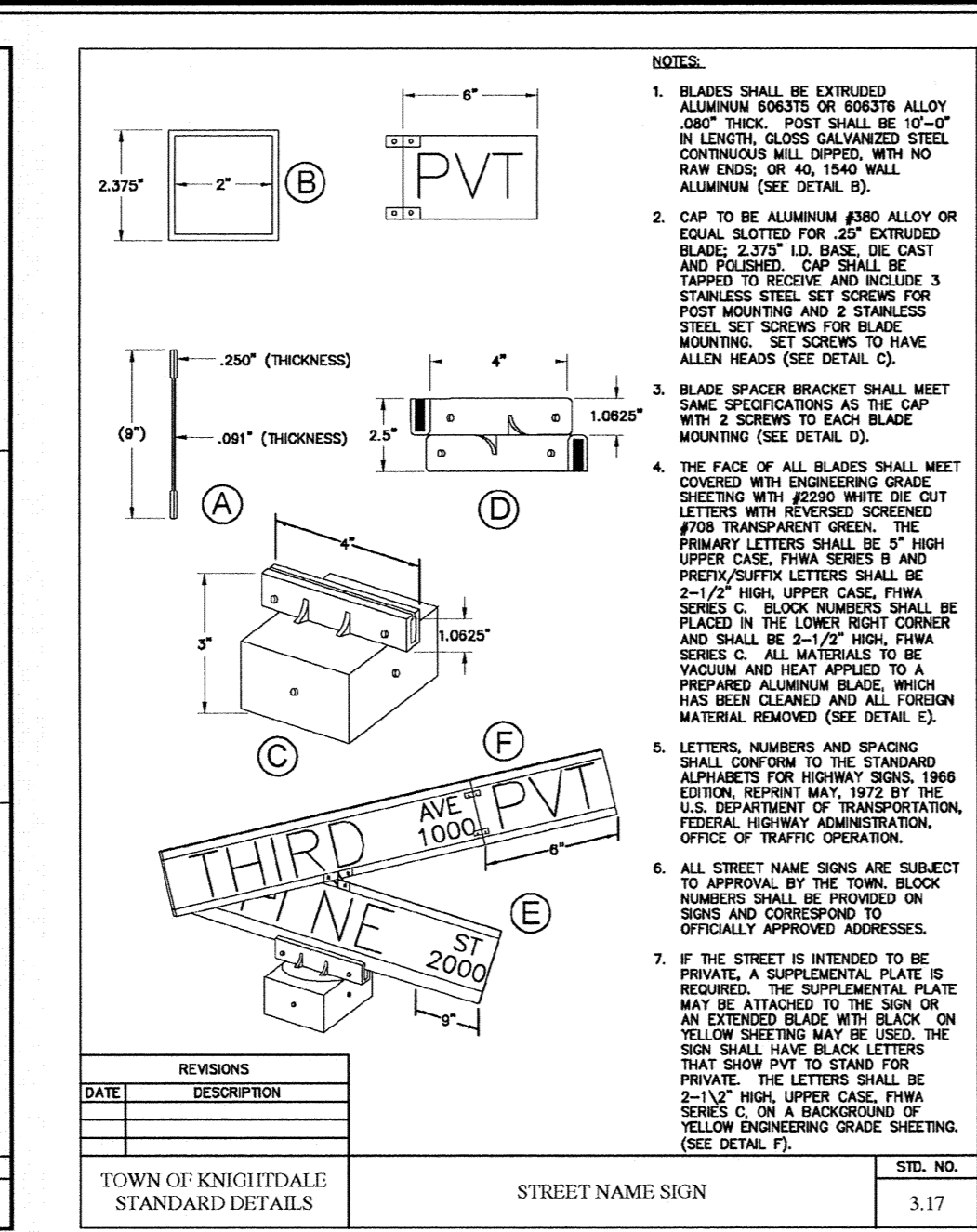
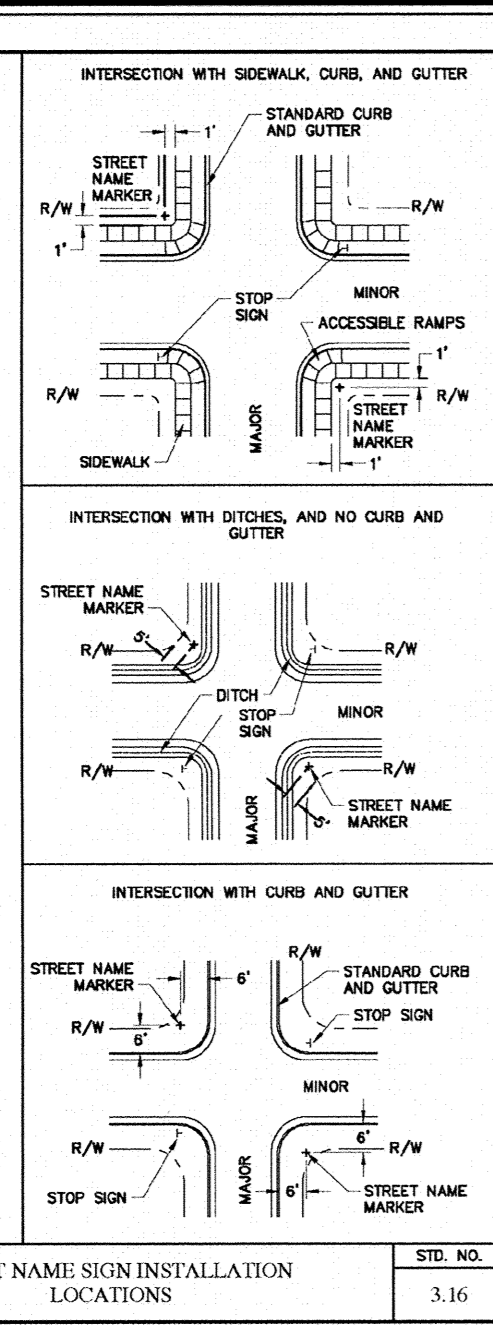
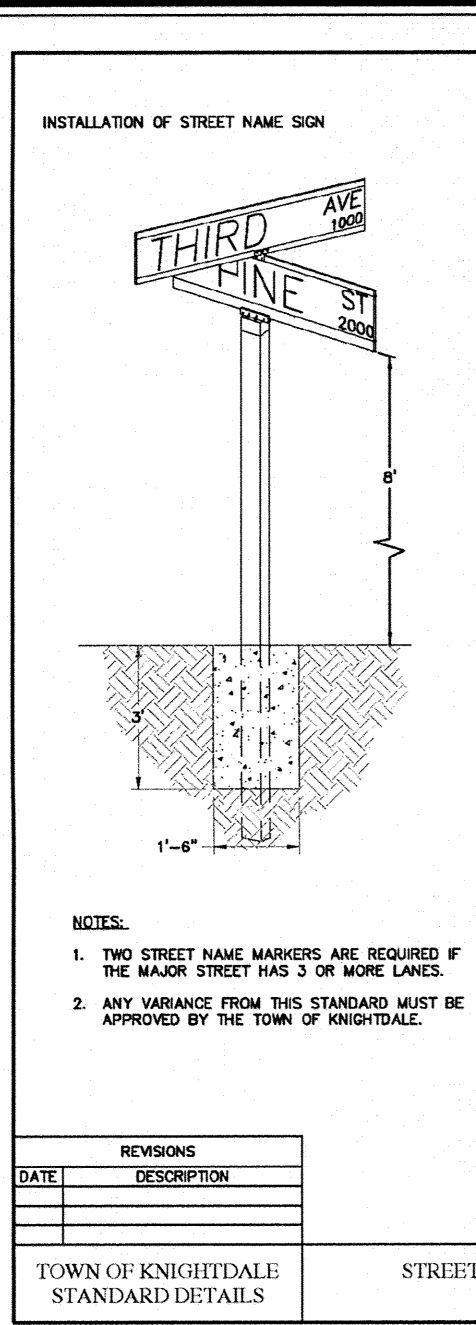
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Sheet No. 15 of 21

K:\09\09-0250\090251.7 - Knightdale Station Phase R3\1-11\10a - Map MASTER BACE STD\_receiver.dwg - Tuesday, September 01, 2015 4:30:23 PM - MILLER, BRANDON





No.	Revision	Date	By	Designer	Scale	SEE SHEET
1	TOK 1st COMMENTS	06/31/15	JCI	W&R		

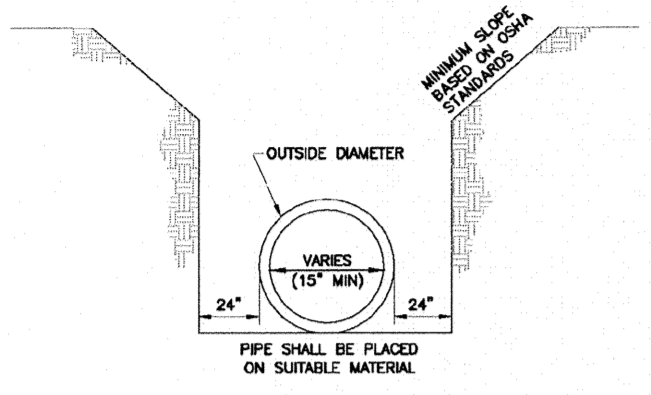
KNIGHTDALE STATION  
PHASE R3  
WAKE COUNTY  
NORTH CAROLINA

ROADWAY DETAILS

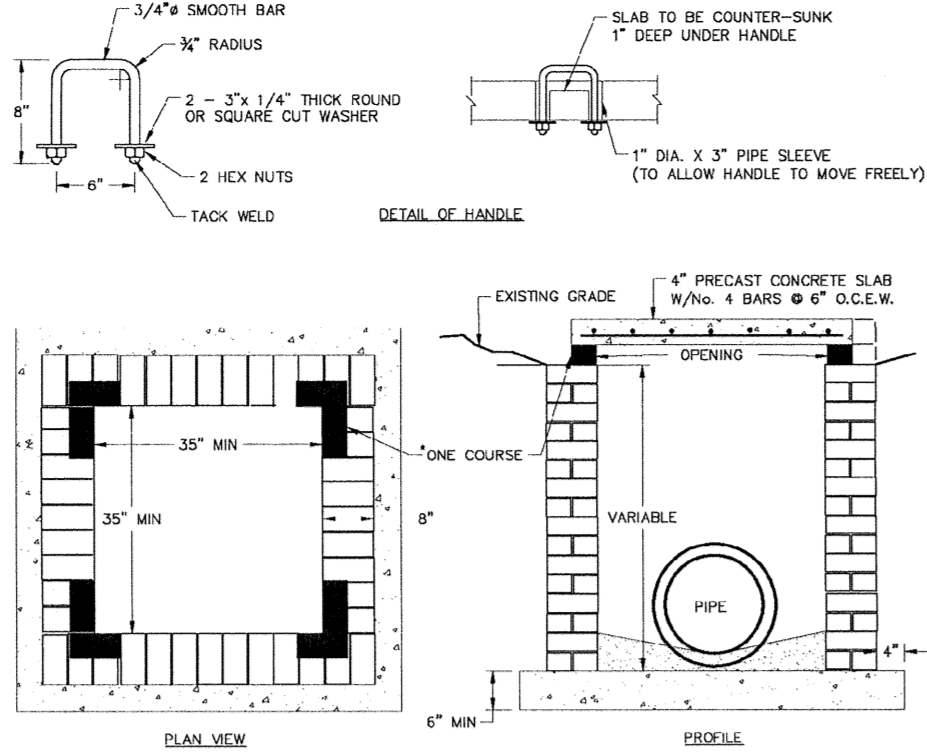
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Sheet No. 16 of 21

- NOTES:
1. A MINIMUM OF 24" FROM OUTSIDE DIAMETER OF PIPE TO SIDE OF TRENCH MUST BE ALLOWED FOR COMPACTION OF FILL MATERIAL. BACKFILLING OF TRENCHES SHALL BE ACCOMPLISHED IMMEDIATELY AFTER THE PIPE IS Laid. THE FILL AROUND THE PIPE SHALL BE PLACED IN LAYERS NOT TO EXCEED 4" UNLESS NO CIRCUMSTANCES SHALL BE PERMITTED TO RISE IN UNGRAVELLED TRENCHES AFTER THE PIPE HAS BEEN PLACED. COMPACTION REQUIREMENTS SHALL BE ATTAINED BY THE USE OF MECHANICAL TAMPS ONLY. EACH AND EVERY LAYER OF BACKFILL SHALL BE PLACED LOOSE AND THOROUGHLY COMPACTIONED INTO PLACE.
  2. ALL BACKFILL MATERIAL SHALL HAVE AN IN PLACE COMPACTIONED DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DENSITY.
  3. THE FINAL 24" OF BACKFILL MATERIAL SHALL BE COMPACTIONED TO 100% OF THE STANDARD PROCTOR MAXIMUM DENSITY.
  4. ALL TRENCHING OPERATIONS SHALL MEET OSHA STANDARDS.
  5. ALL TRENCHING OPERATIONS SHALL MEET OSHA STANDARDS.

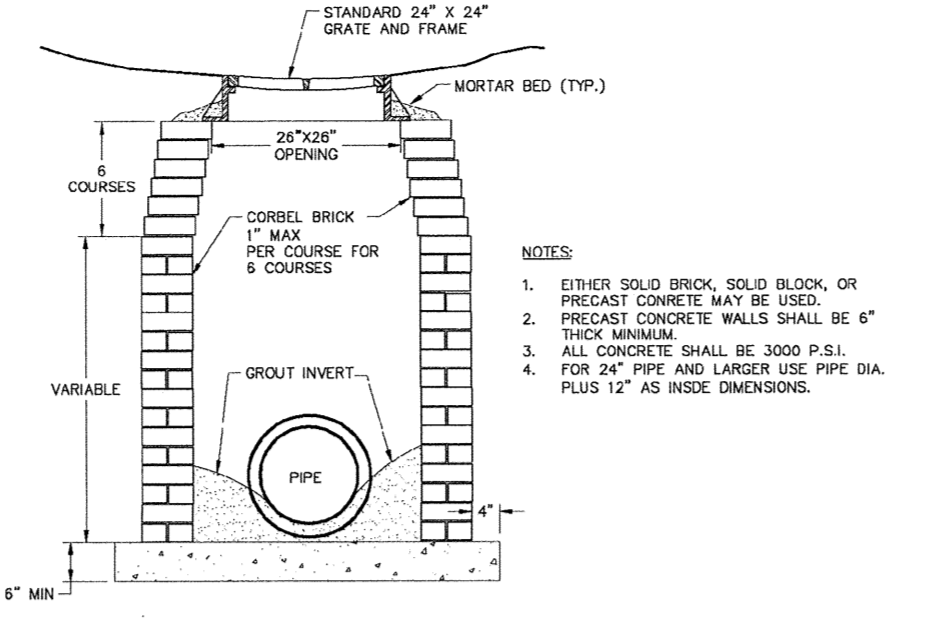


REVISIONS	DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		TRENCH FOR STORM DRAIN PIPES	5.02



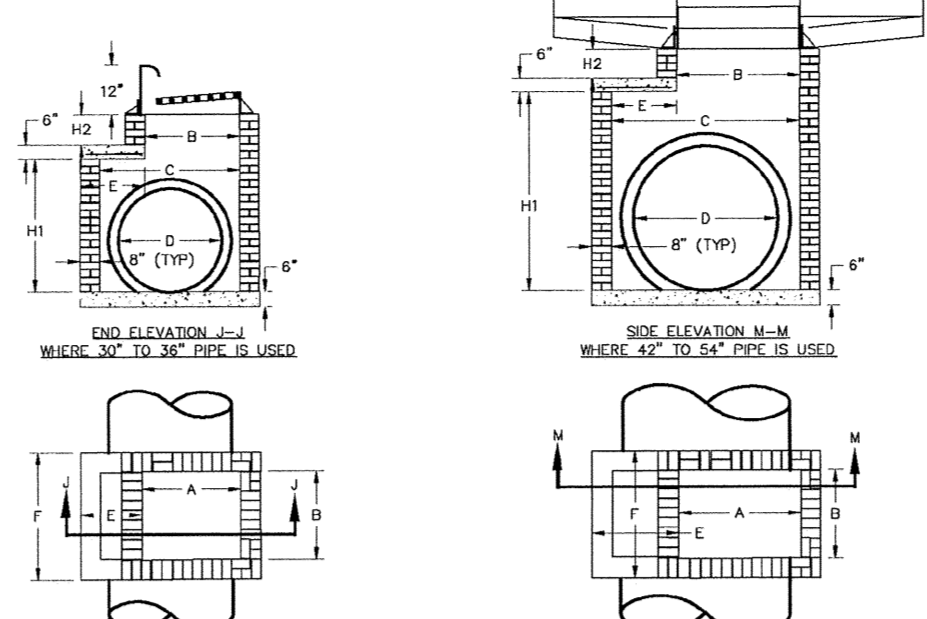
- NOTES:
1. EITHER SOLID BRICK, SOLID BLOCK OR PRECAST CONCRETE MAY BE USED.
  2. PRECAST CONCRETE WALLS SHALL BE 4" THICK MINIMUM.
  3. ALL CONCRETE SHALL BE 3000 P.S.I. FOR 24" PIPE AND LARGER USE PIPE DIA. PLUS 12" AS INSIDE DIMENSIONS.
  4. FOR 24" PIPE AND LARGER USE PIPE DIA. PLUS 12" AS INSIDE DIMENSIONS.

REVISIONS	DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		STANDARD YARD INLET WITH CONCRETE SLAB	5.03



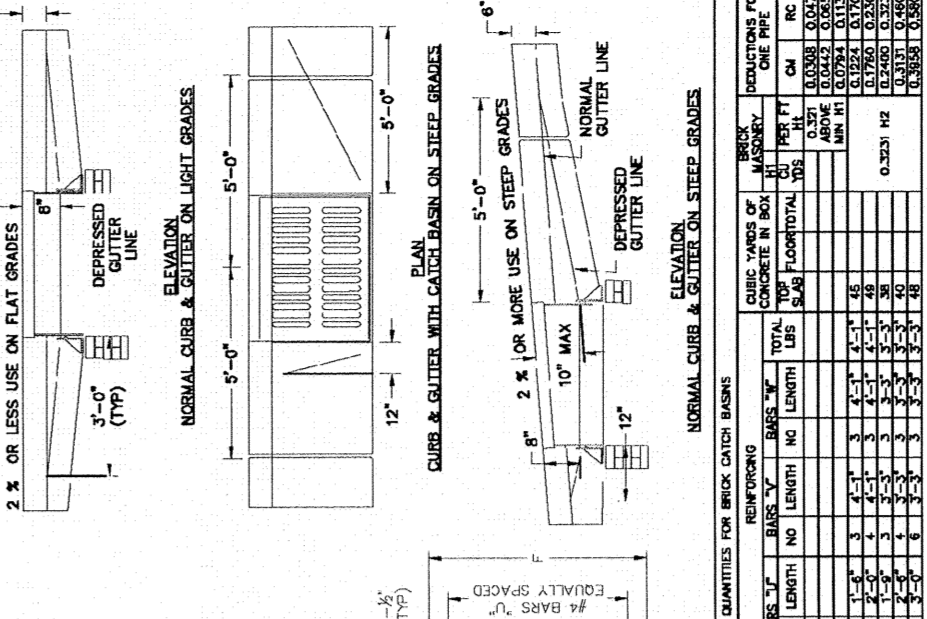
- NOTES:
1. EITHER SOLID BRICK, SOLID BLOCK OR PRECAST CONCRETE MAY BE USED.
  2. PRECAST CONCRETE WALLS SHALL BE 4" THICK MINIMUM.
  3. ALL CONCRETE SHALL BE 3000 P.S.I. FOR 24" PIPE AND LARGER USE PIPE DIA. PLUS 12" AS INSIDE DIMENSIONS.
  4. FOR 24" PIPE AND LARGER USE PIPE DIA. PLUS 12" AS INSIDE DIMENSIONS.

REVISIONS	DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		STANDARD DROP INLET WITH GRATE AND FRAME	5.04



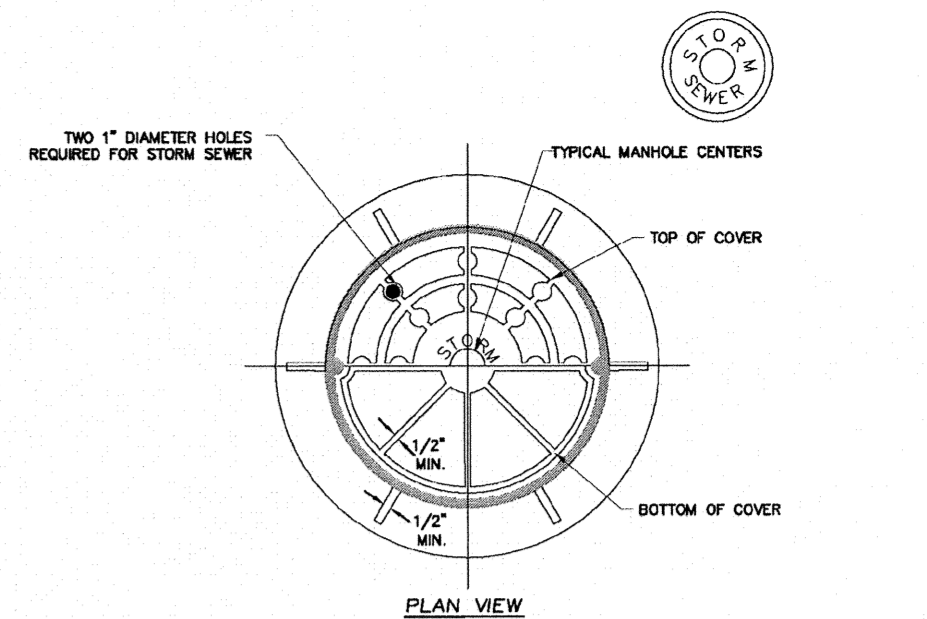
- NOTES:
1. MORTAR JOINTS SHALL BE 1/2" THICK.
  2. ALL CONCRETE SHALL BE 3000 P.S.I.
  3. BASE SLABS SHALL BE FORMED PRIOR TO PLACING OF CONCRETE.
  4. USE TYPE "A" GRATE AT SAG POINTS. OTHERWISE USE TYPE "B" OR "C" FOR THE APPROPRIATE FLOW DIRECTION.
  5. MASONRY JOINTS MAY BE BRICK, CONCRETE BRICK OR SOLID CONCRETE BLOCK.
  6. ALL WALLS GREATER THAN 6" IN DEPTH SHALL BE CONSTRUCTED 12" THICK.

REVISIONS	DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		STANDARD CURB INLET	5.05



- NOTES:
1. MORTAR JOINTS SHALL BE 1/2" THICK.
  2. ALL CONCRETE SHALL BE 3000 P.S.I.
  3. BASE SLABS SHALL BE FORMED PRIOR TO PLACING OF CONCRETE.
  4. USE TYPE "A" GRATE AT SAG POINTS. OTHERWISE USE TYPE "B" OR "C" FOR THE APPROPRIATE FLOW DIRECTION.
  5. MASONRY JOINTS MAY BE BRICK, CONCRETE BRICK OR SOLID CONCRETE BLOCK.
  6. ALL WALLS GREATER THAN 6" IN DEPTH SHALL BE CONSTRUCTED 12" THICK.

REVISIONS	DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		STANDARD CURB INLET	5.05



- NOTES:
1. MORTAR JOINTS SHALL BE 1/2" THICK.
  2. ALL CONCRETE SHALL BE 3000 P.S.I.
  3. BASE SLABS SHALL BE FORMED PRIOR TO PLACING OF CONCRETE.
  4. USE TYPE "A" GRATE AT SAG POINTS. OTHERWISE USE TYPE "B" OR "C" FOR THE APPROPRIATE FLOW DIRECTION.
  5. MASONRY JOINTS MAY BE BRICK, CONCRETE BRICK OR SOLID CONCRETE BLOCK.
  6. ALL WALLS GREATER THAN 6" IN DEPTH SHALL BE CONSTRUCTED 12" THICK.

REVISIONS	DATE	DESCRIPTION	STD. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		STANDARD MANHOLE RING & COVER	5.10

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: 9/23/15  
TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
ADMINISTRATOR



No.	Revision	Date	By
1	TOK 1st COMMENTS	08/31/15	JCI

Designer	W&R	Scale	SEE SHEET
Drawn By	JCI	Date	06/23/15
Checked By	JCI	Job No.	02090251.7

KNIGHTDALE STATION  
PHASE R3  
TOWN OF KNIGHTDALE  
WAKE COUNTY  
NORTH CAROLINA

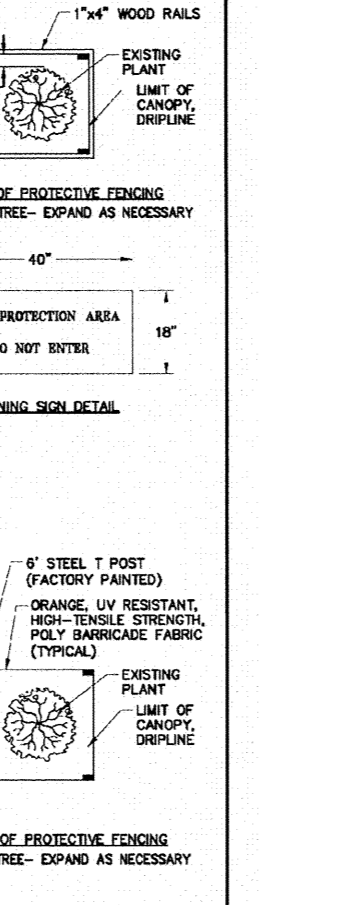
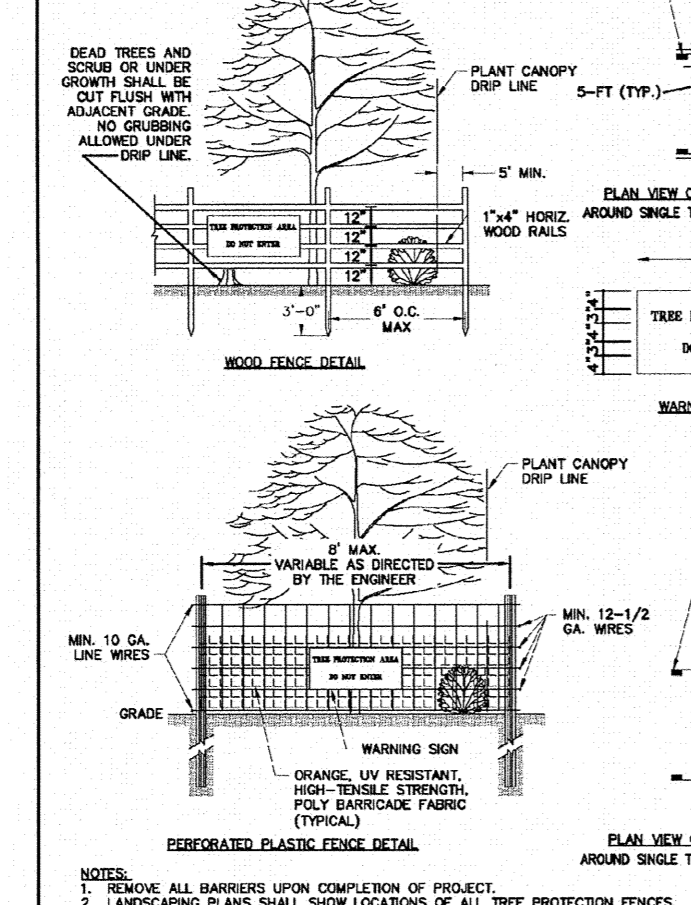
STORM DRAINAGE DETAILS

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Sheet No.  
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SEEDING PERIOD	SEEDING TYPE	APPLICATION RATE (LBS/ACRE)
AUGUST 15 - NOVEMBER 01	TALL FESCUE	300
NOVEMBER 01 - MARCH 01	TALL FESCUE AND AMBUZZA RYE	300
MARCH 01 - APRIL 15	TALL FESCUE	300
APRIL 15 - JUNE 30	HULLED COMMON BERMUDAGRASS	25
JULY 01 - AUGUST 15	TALL FESCUE AND AMBUZZA RYE	100
	MIKODIUM-SULIAN HYBRIDS	30
	SLOPES 2:1 TO 3:1	50
MARCH 01 - APRIL 01	BERNOLA LUPINECKIA (SCARIFIED) AND	100
MARCH 01 - APRIL 15	TALL FESCUE OR	100
MARCH 01 - APRIL 30	METTING LOWGRASS OR	10
	HULLED COMMON BERMUDAGRASS	25
	TALL FESCUE AND	100
JUNE 01 - SEPTEMBER 01	MIKODIUM-SULIAN HYBRIDS	30
	BERNOLA LUPINECKIA (UNRAILED, UNSCARIFIED) AND	100
SEPTEMBER 01 - MARCH 01	TALL FESCUE OR	100
NOVEMBER 01 - MARCH 01	AMBUZZA RYE	25

SEEDING PERIOD	SEEDING TYPE	APPLICATION RATE (LBS/ACRE)
AUGUST 15 - NOVEMBER 01	TALL FESCUE	300
NOVEMBER 01 - MARCH 01	TALL FESCUE AND AMBUZZA RYE	300
MARCH 01 - APRIL 15	TALL FESCUE	300
APRIL 15 - JUNE 30	HULLED COMMON BERMUDAGRASS	25
JULY 01 - AUGUST 15	TALL FESCUE AND AMBUZZA RYE	100
	MIKODIUM-SULIAN HYBRIDS	30
	SLOPES 2:1 TO 3:1	50
MARCH 01 - APRIL 01	BERNOLA LUPINECKIA (SCARIFIED) AND	100
MARCH 01 - APRIL 15	TALL FESCUE OR	100
MARCH 01 - APRIL 30	METTING LOWGRASS OR	10
	HULLED COMMON BERMUDAGRASS	25
	TALL FESCUE AND	100
JUNE 01 - SEPTEMBER 01	MIKODIUM-SULIAN HYBRIDS	30
	BERNOLA LUPINECKIA (UNRAILED, UNSCARIFIED) AND	100
SEPTEMBER 01 - MARCH 01	TALL FESCUE OR	100
NOVEMBER 01 - MARCH 01	AMBUZZA RYE	25



**Environmental Services**

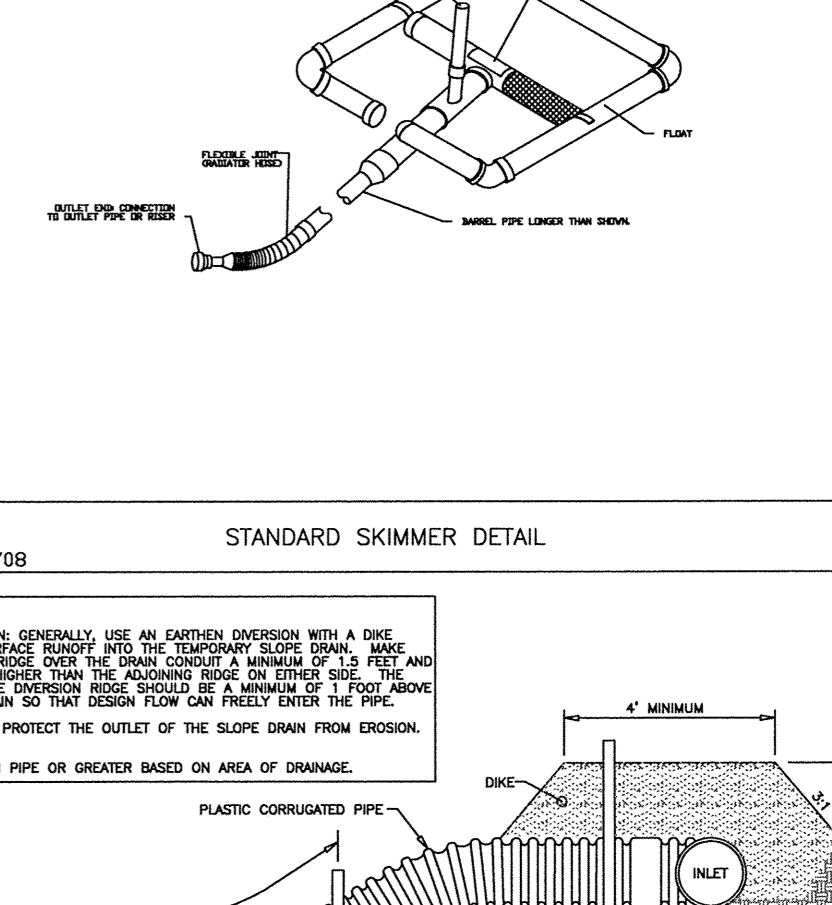
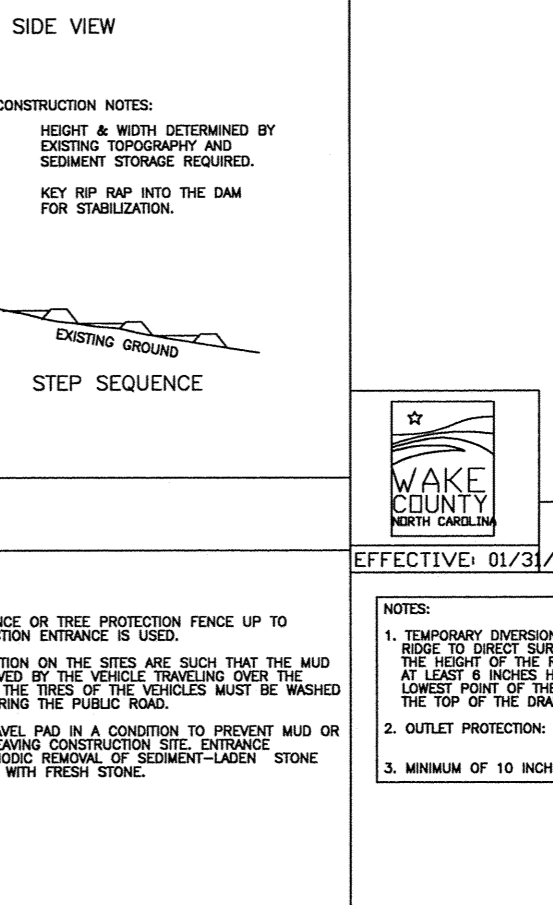
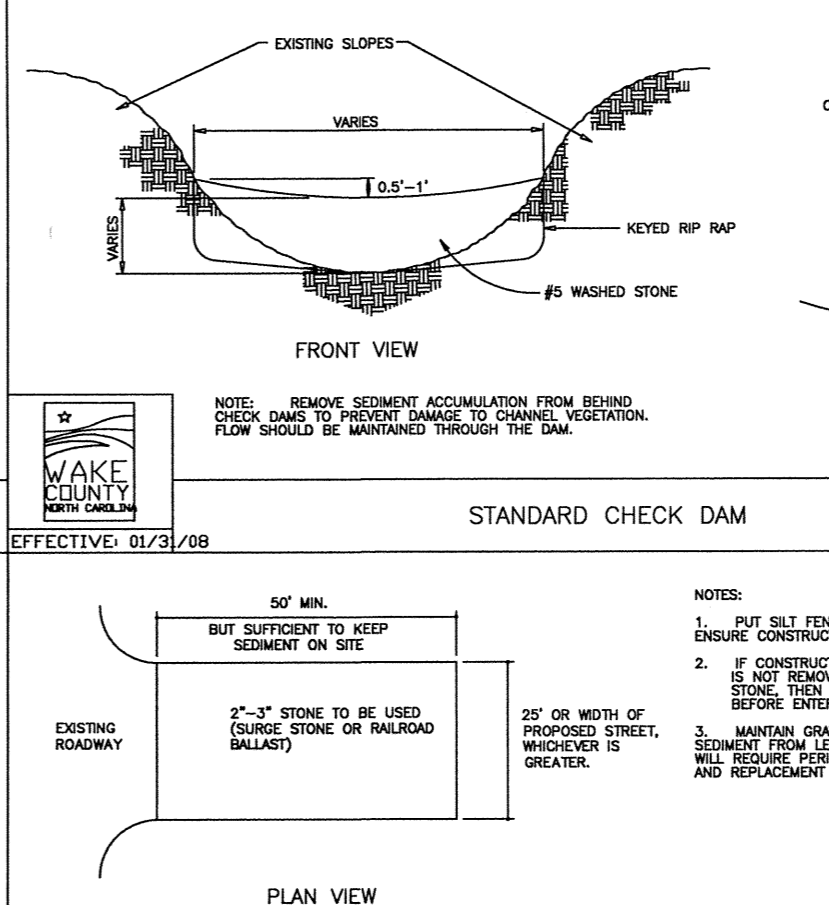
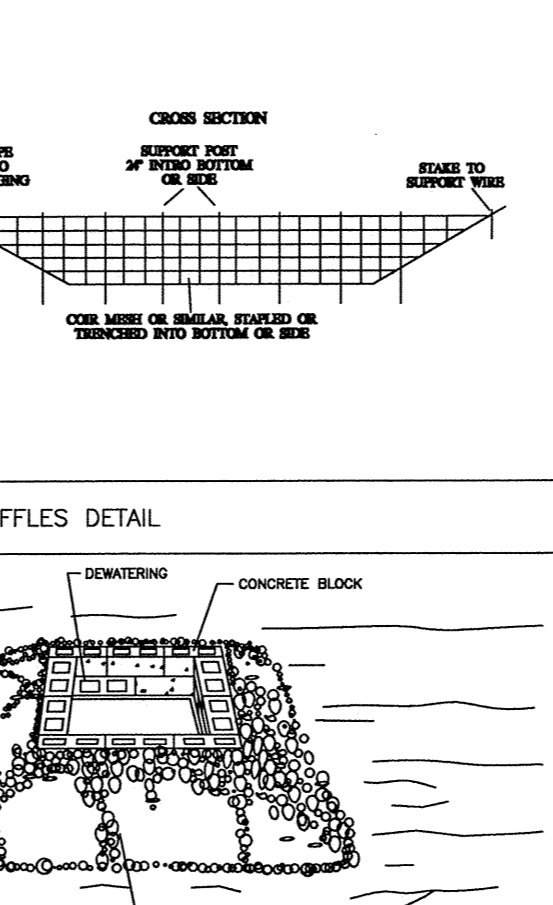
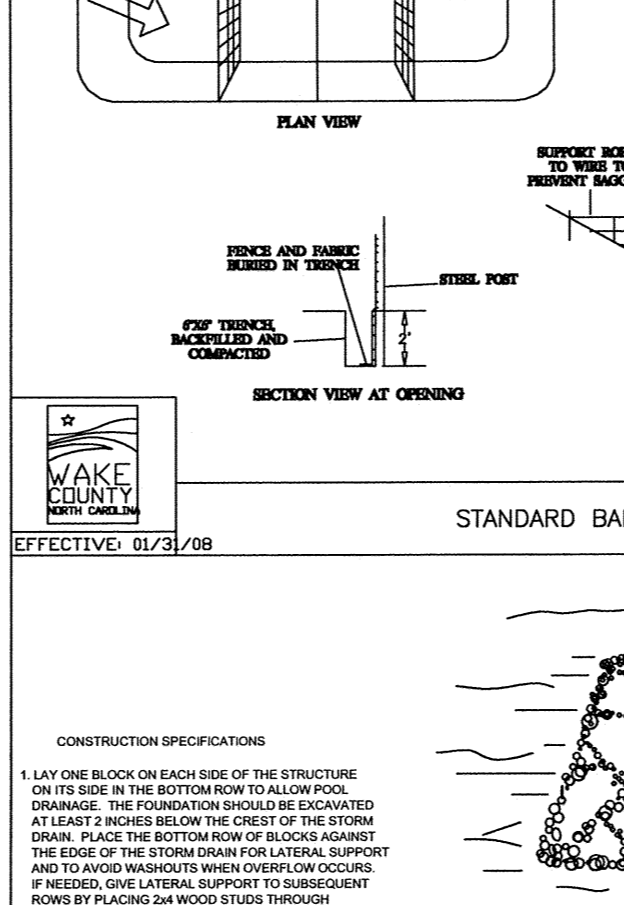
Effective September 1, 2008  
Soil stockpiles shall be located on the approved plan and shall adhere to the following requirements:

**Design Criteria**

- A 25-foot temporary maintenance and access easement shall be shown around all proposed stockpiles (erosion control measures surrounding the stockpile shall be shown at the outer limit of this easement).
- Stockpile footprints shall be setback a minimum of 25' from adjacent property lines.
- A wire shall be provided on the approved plan that stockpile height shall not exceed 35 feet.
- Stockpile slopes shall be 2:1 or flatter.
- Approved BMPs shall be shown on a plan to control any potential sediment loss from a stockpile.
- Stockpiling materials adjacent to a ditch, drainage, watercourse, wetland, stream buffer, or other body of water shall be avoided unless an alternative location is demonstrated to be unavailable.
- Any concentrated flow likely to affect the stockpile shall be diverted to an approved BMP.
- Off-site spill or borrow areas must be in compliance with Wake County LID and State Regulations. All spill areas over an acre are required to have an approved sediment control plan. Developer/contractor shall notify Wake County of any off-site disposal of soil, prior to disposal. Fill of 20.0% of blowways and Non-construction Areas are prohibited except as otherwise provided by subsection 14-19-2 of the Wake County Unified Development Ordinance (ordinances and permits required).

**Maintenance Requirements to be Noted on the Plan**

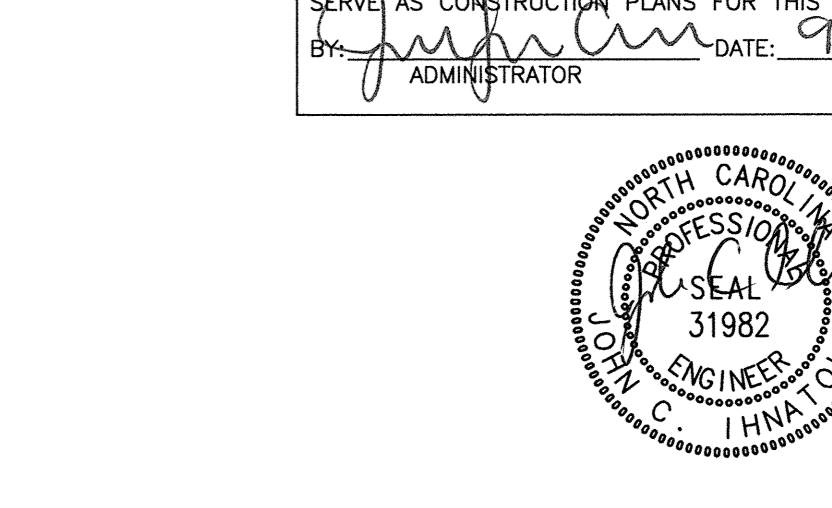
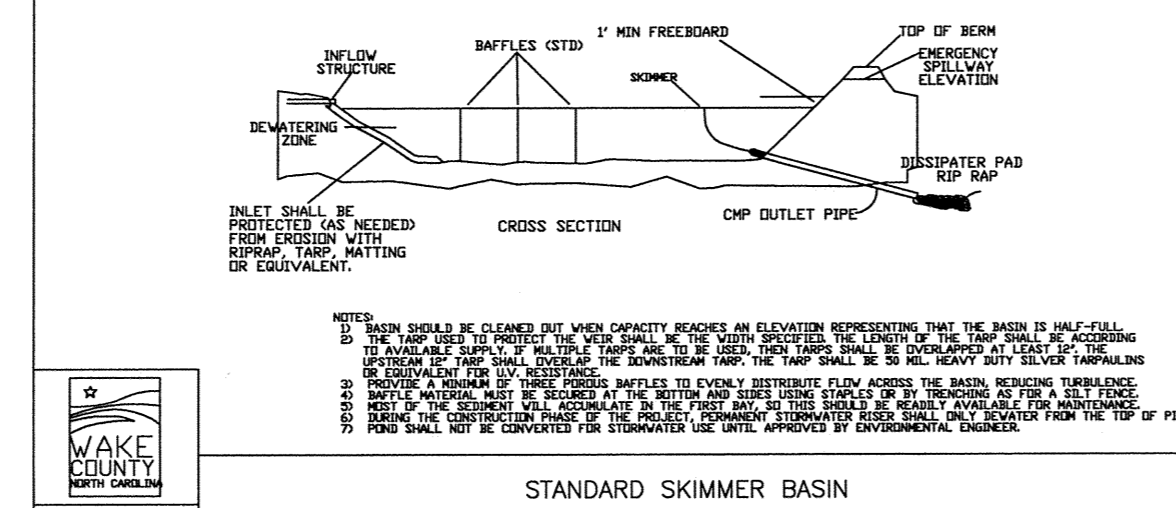
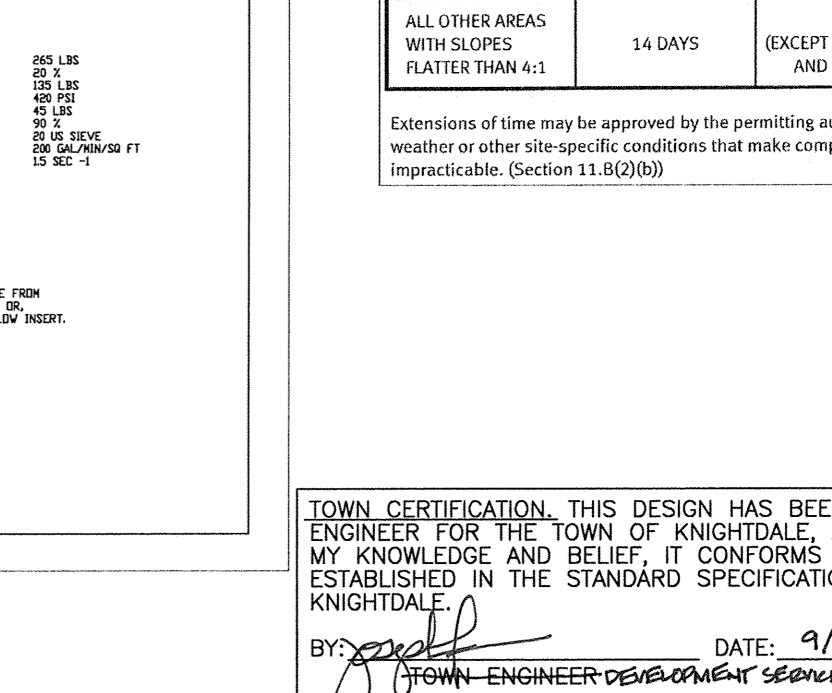
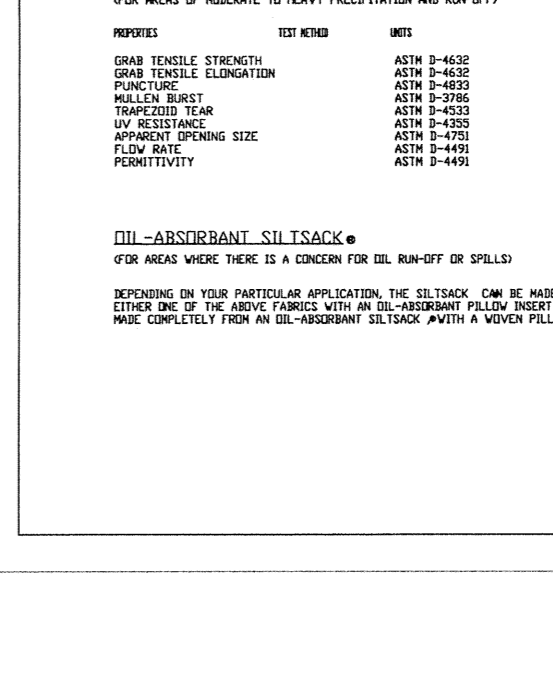
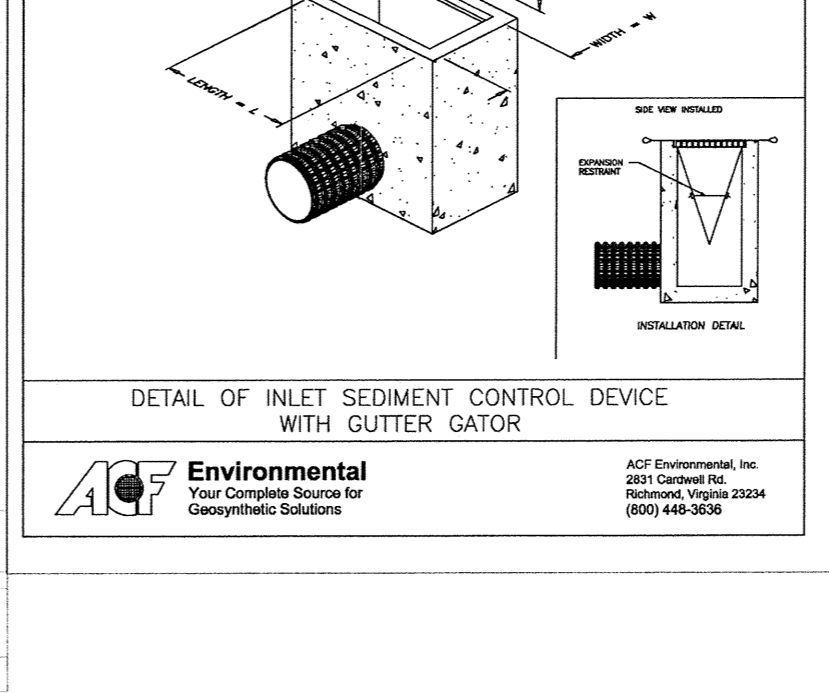
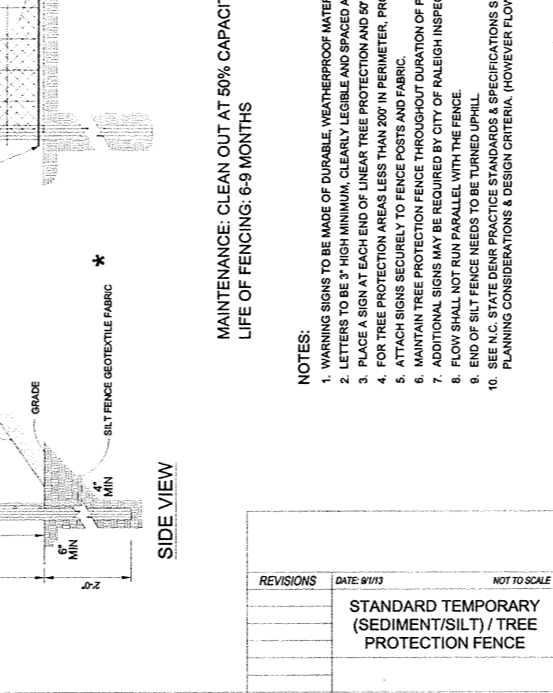
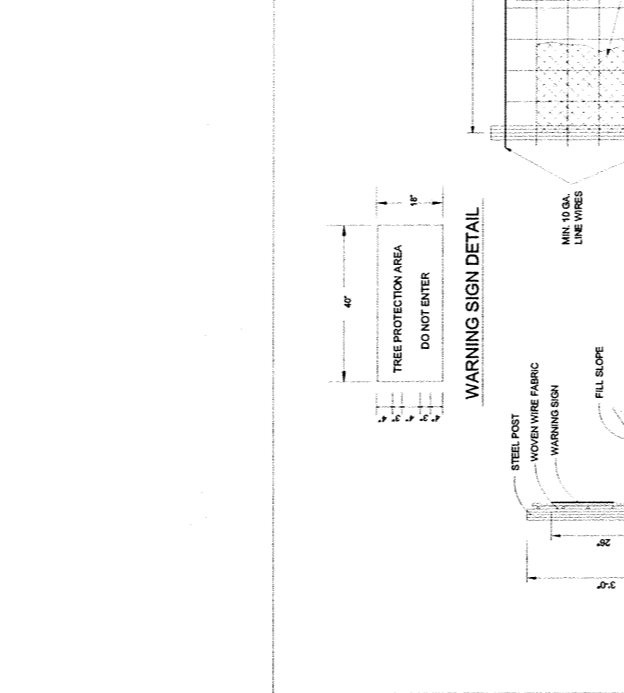
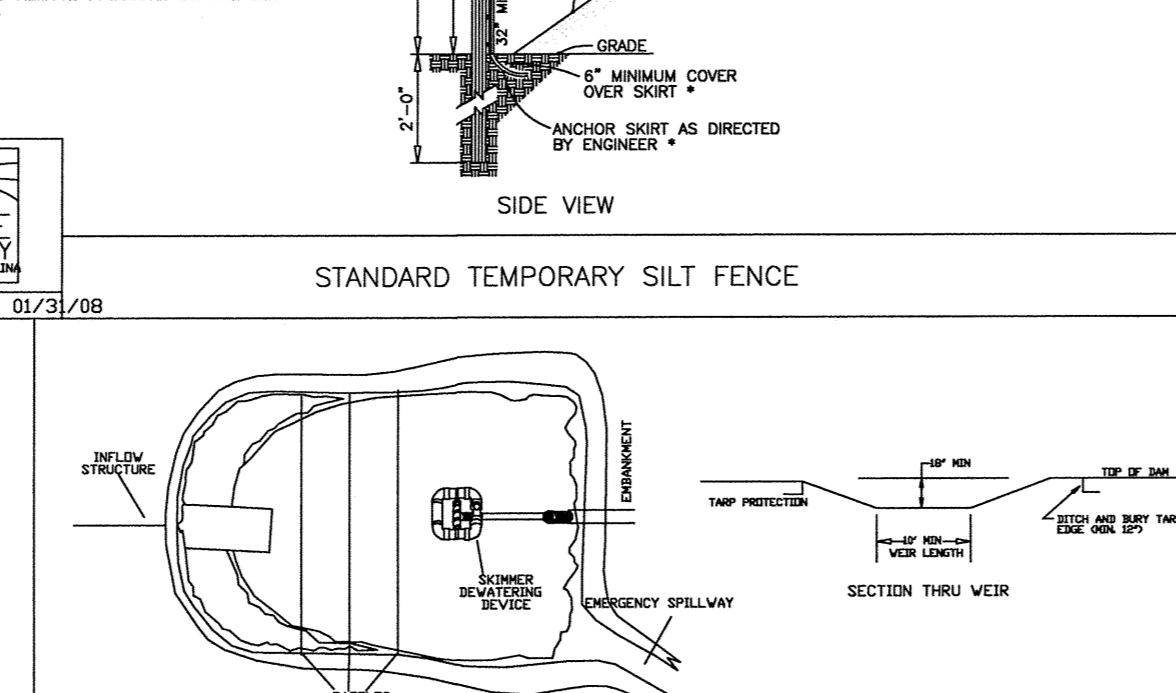
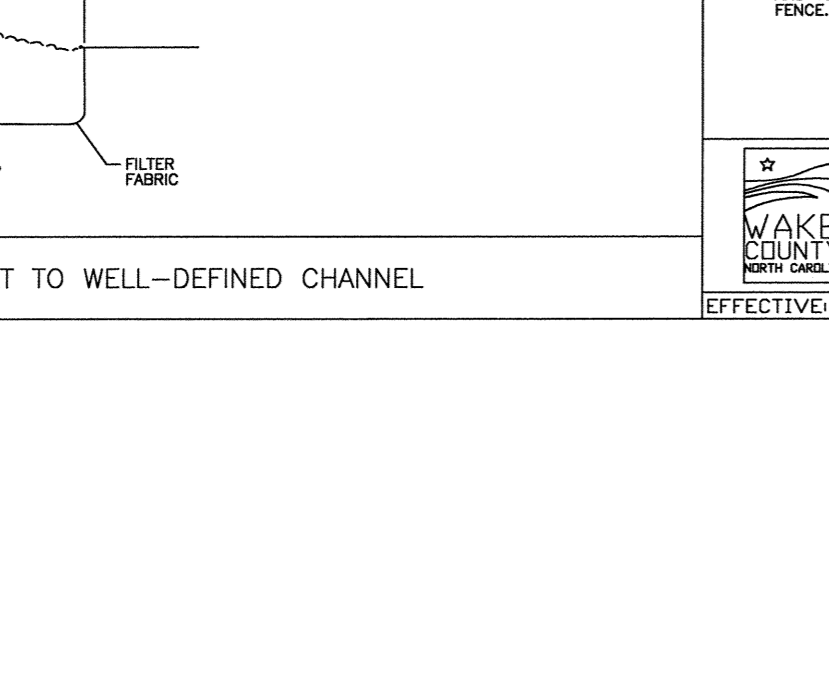
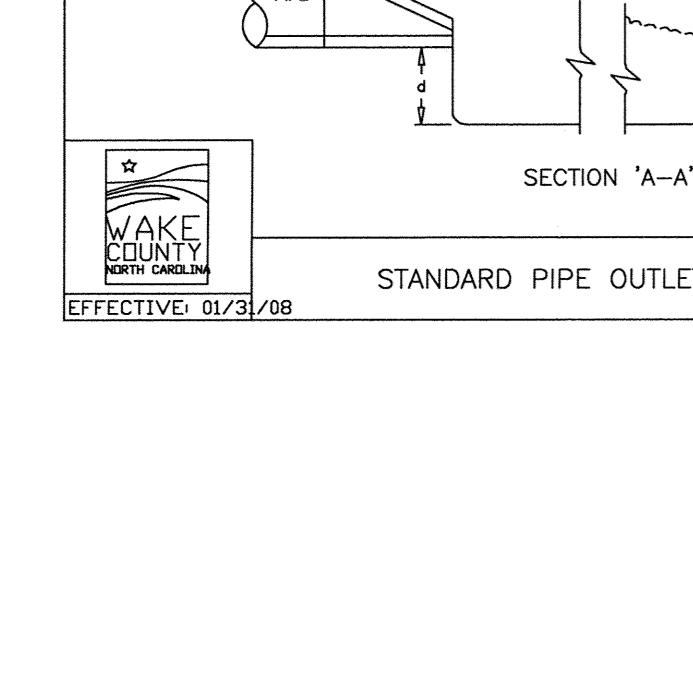
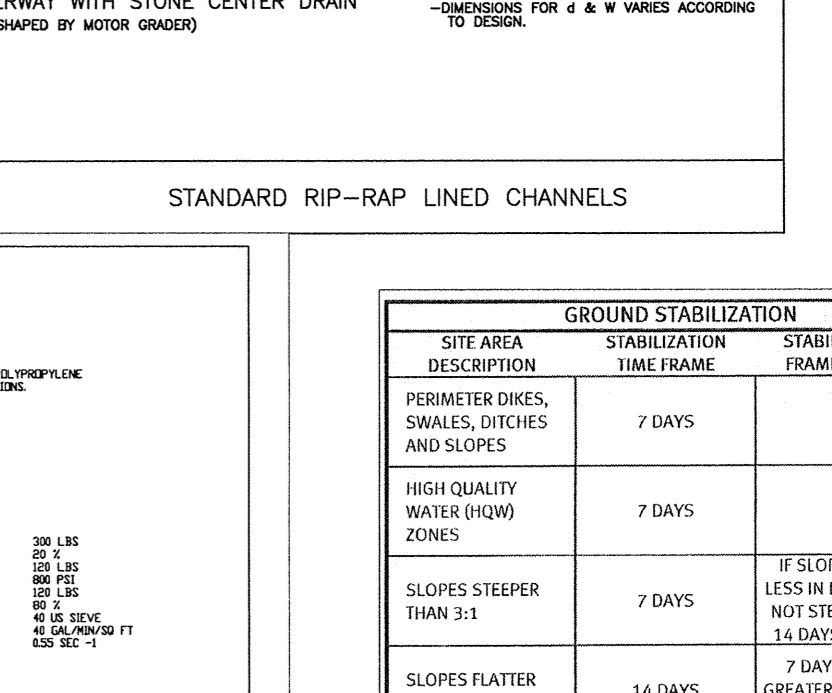
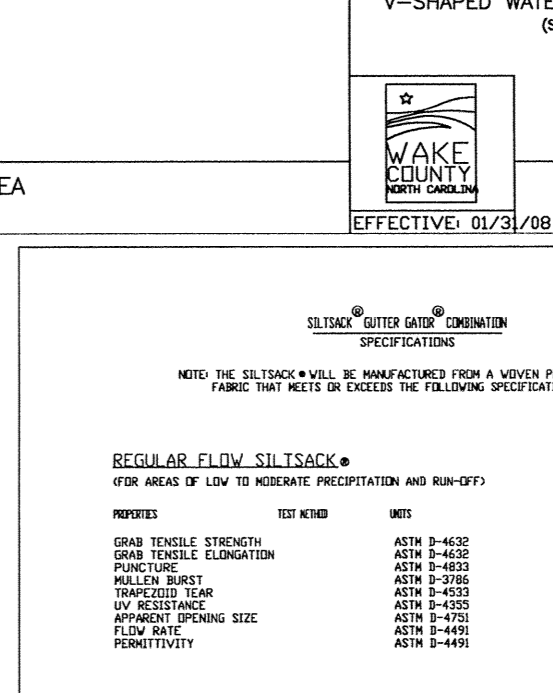
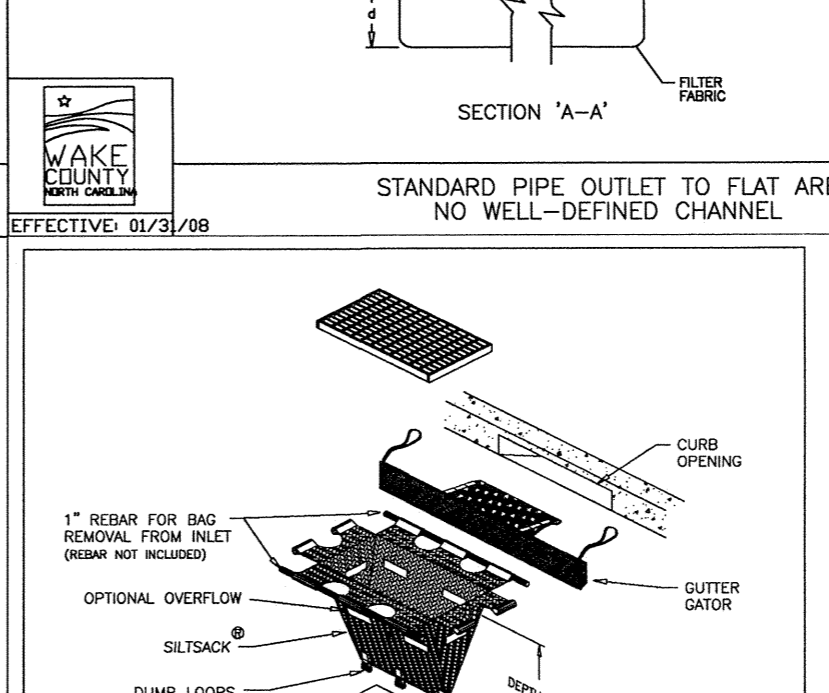
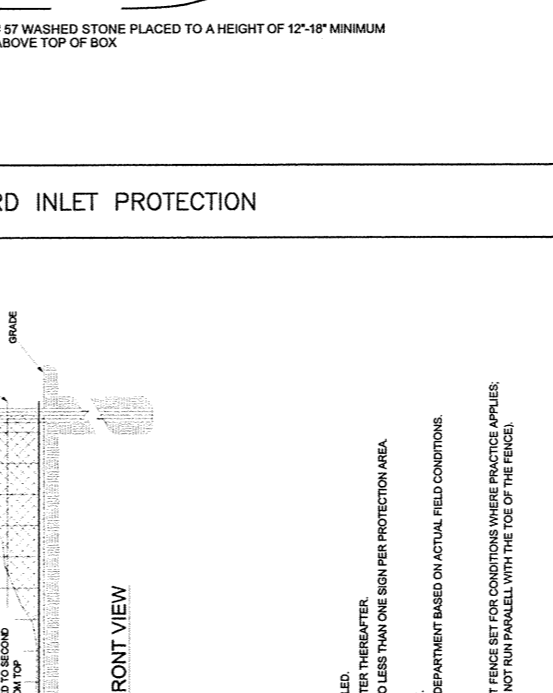
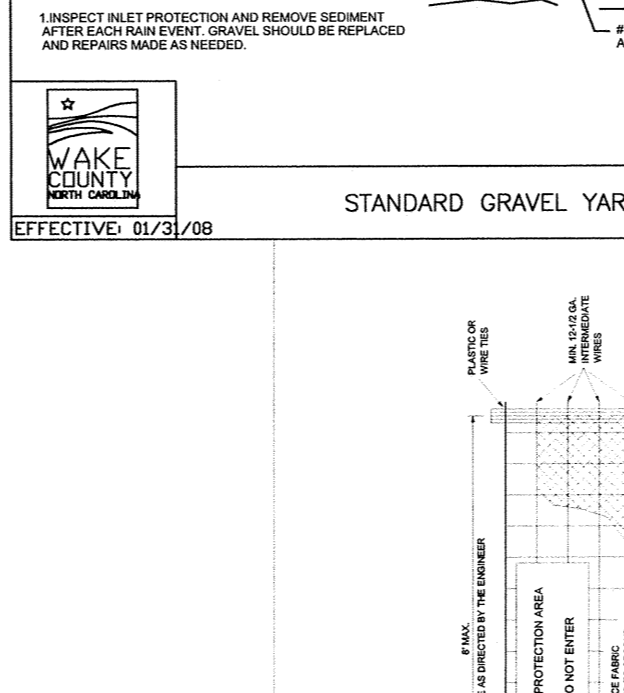
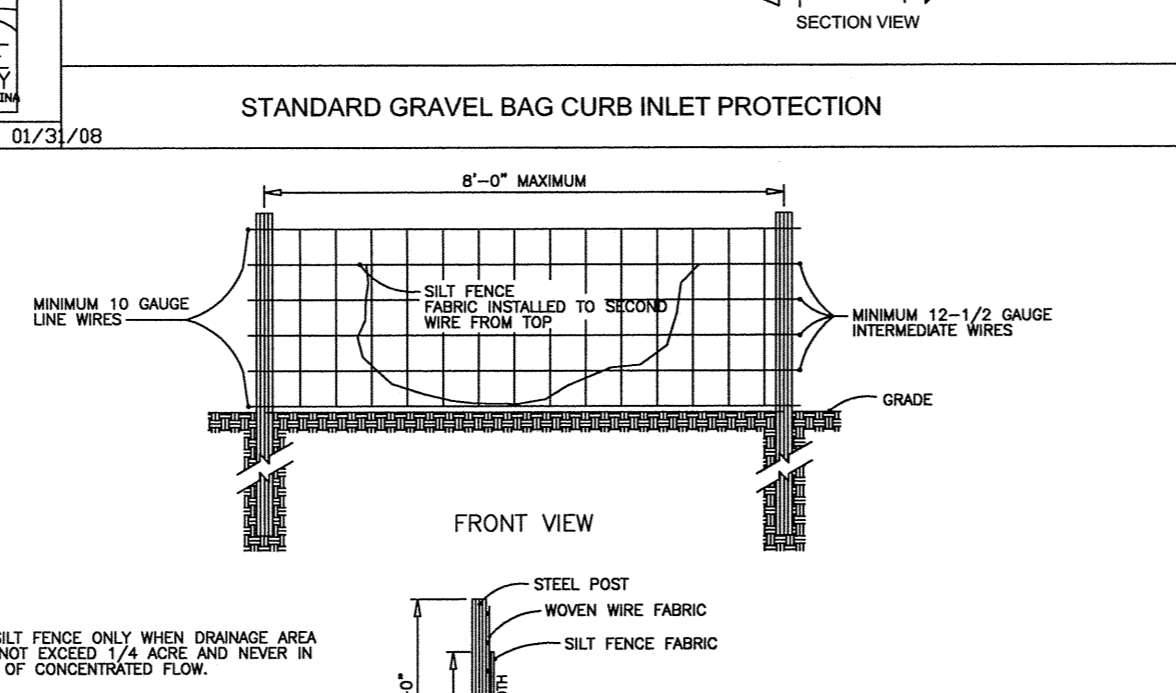
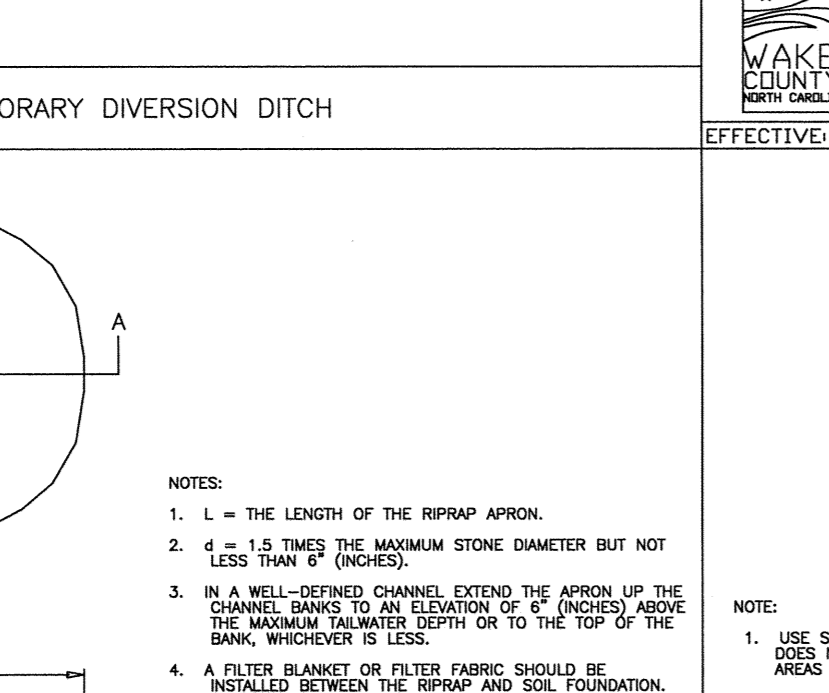
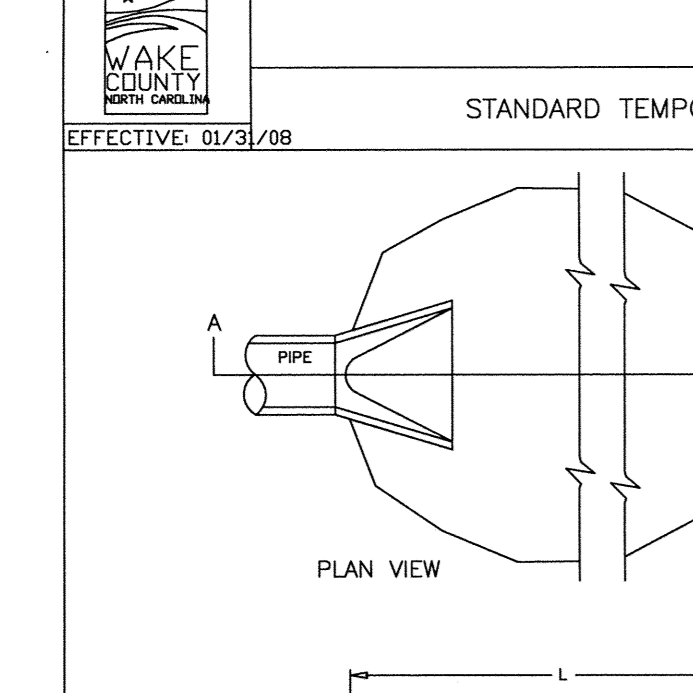
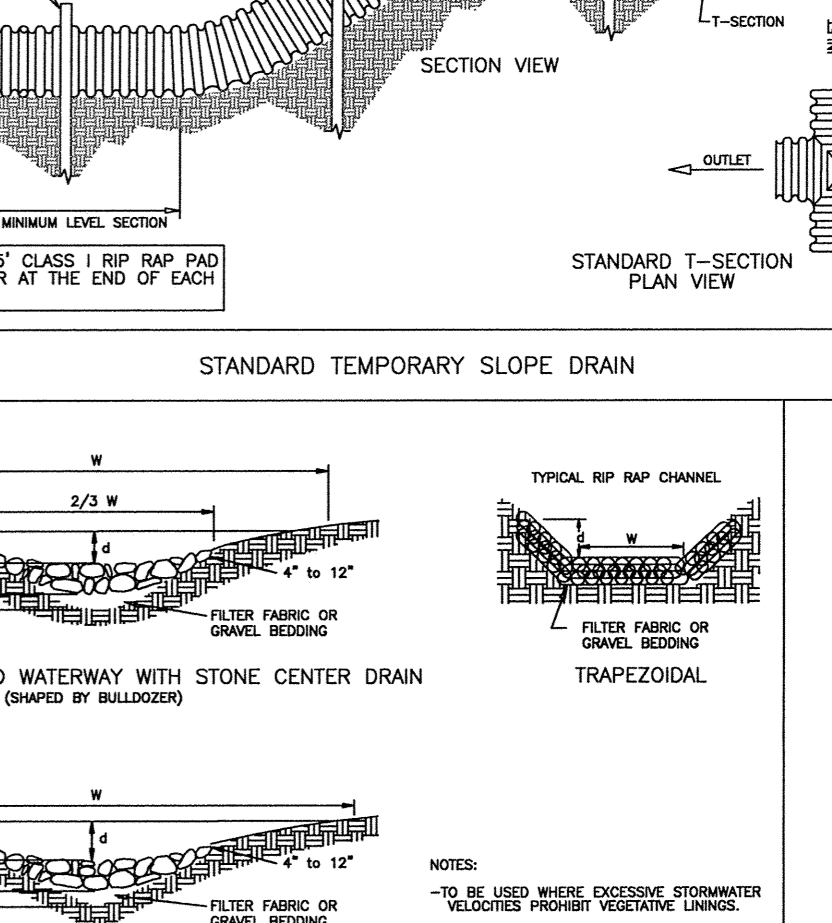
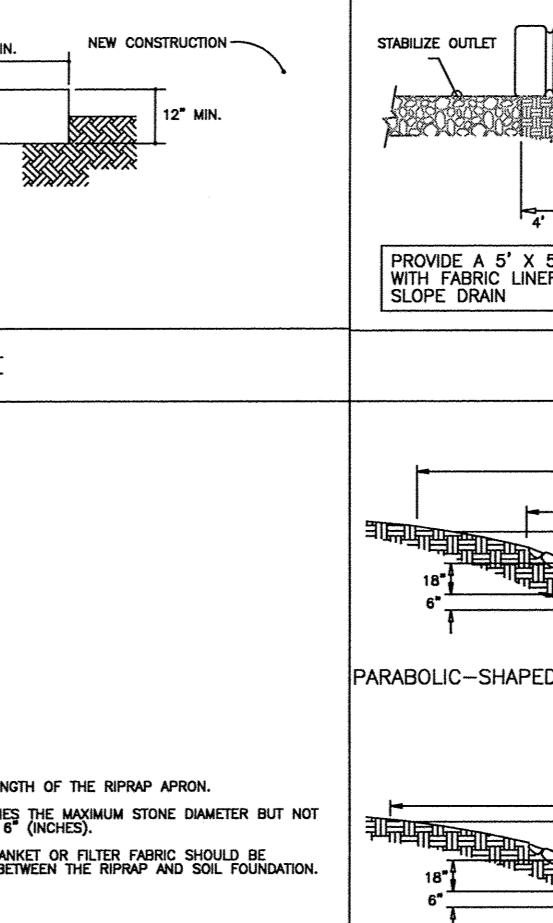
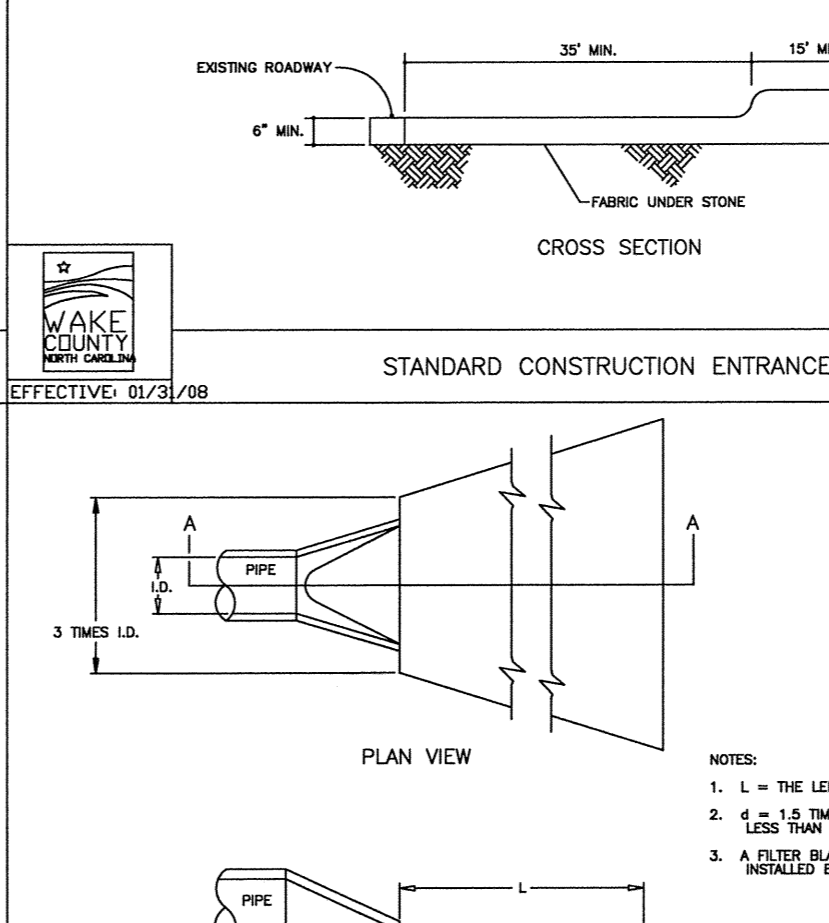
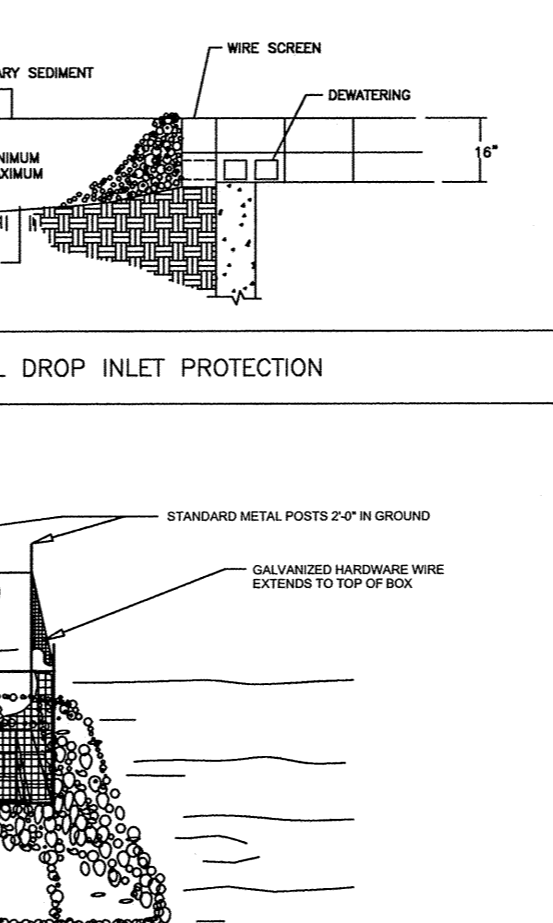
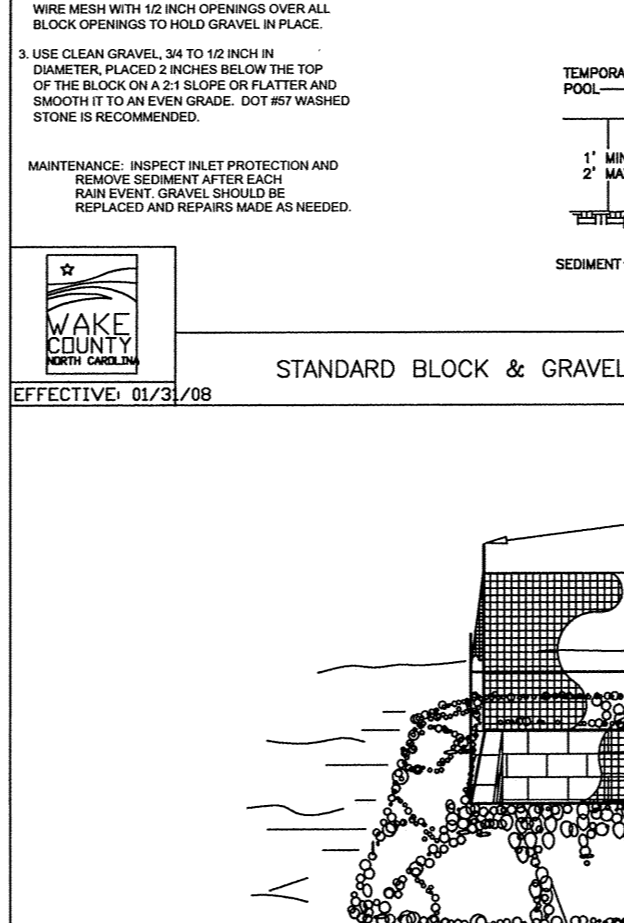
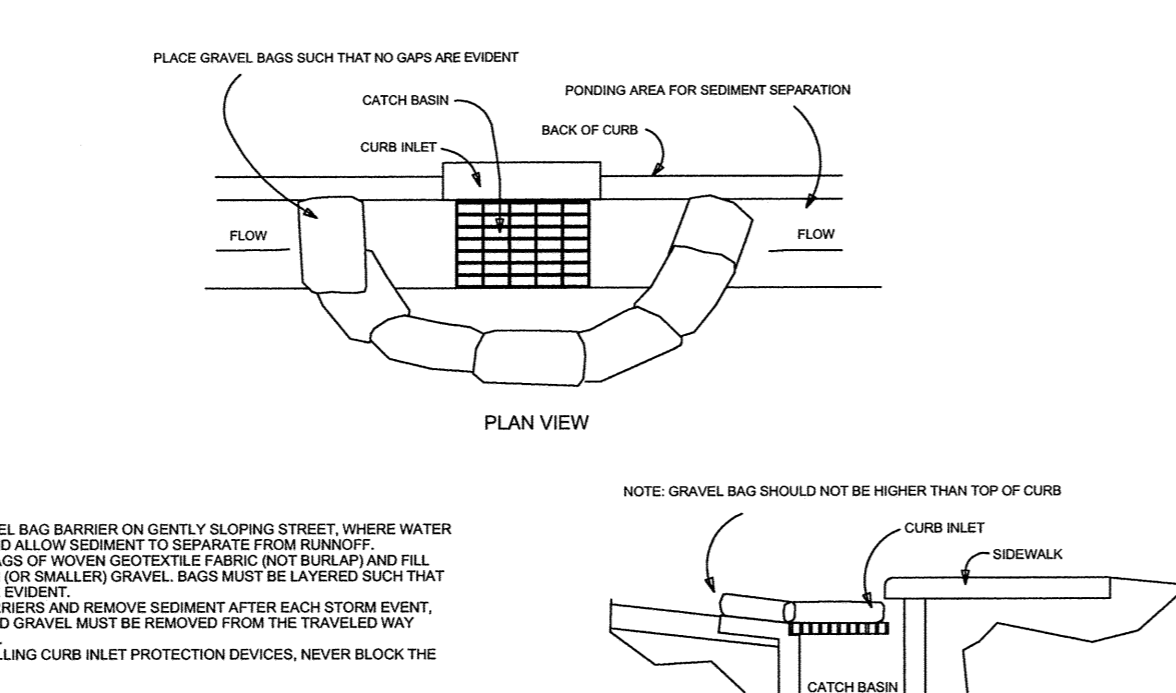
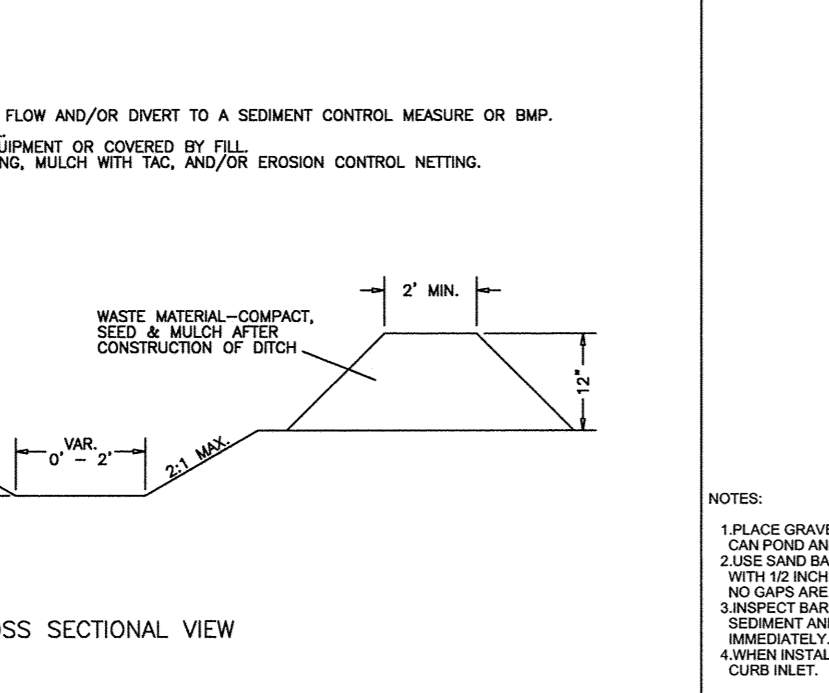
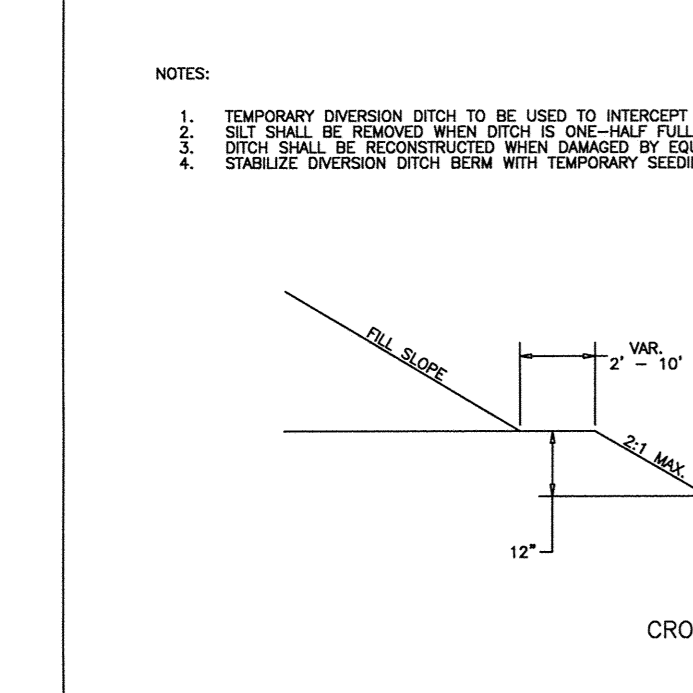
- Sowing or covering stockpiles with traps or mats is required and will reduce erosion problems. Traps should be located in the top of the slope to keep water from running underneath the plants.
- If a stockpile is to remain for future use after the project is complete (builders, etc.), the financial responsible party must notify Wake County of a new responsible party for that stockpile.
- The approved plan shall provide for the use of staged seeding and mulching on a continual basis while the stockpile is in use.
- Establish and maintain a vegetative buffer at the toe of the slope (where practical).



REVISIONS	DESCRIPTION	DATE
1	TOWN OF KNIGHTDALE STANDARD DETAILS	2.01

REVISIONS	DESCRIPTION	DATE
1	PLANT PROTECTIVE FENCING	2.10

REVISIONS	DESCRIPTION	DATE
1	STANDARD Baffles DETAIL	2.10
2	STANDARD CHECK DAM DETAIL	2.10
3	STANDARD SKIMMER DETAIL	2.10
4	STANDARD TEMPORARY SLOPE DRAIN DETAIL	2.10
5	STANDARD GRASS BAG CURB INLET PROTECTION DETAIL	2.10



No.	Revision	Date	By	Designer	Scale
1	TOK 1st COMMENTS	08/31/15	JCI	W&R	SEE SHEET

Date	By	Designer	Scale
06/23/15	JCI	W&R	SEE SHEET

**KNIGHTDALE STATION PHASE R3**  
TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

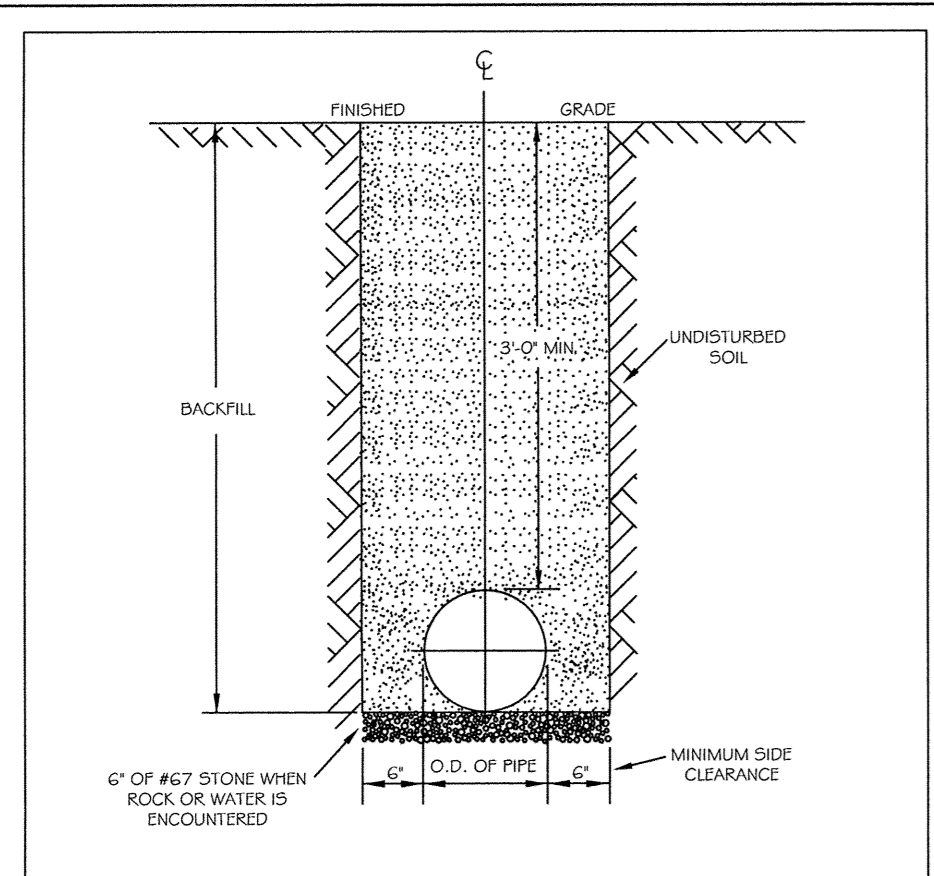
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Your Complete Source for Geosynthetic Solutions

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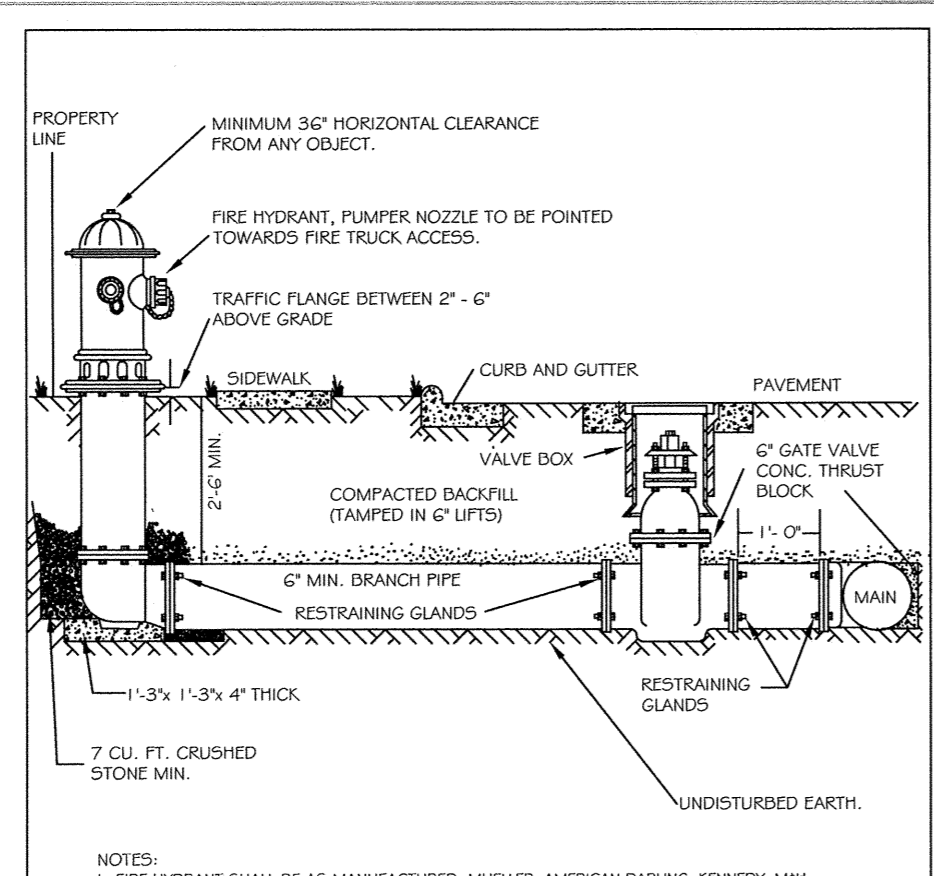
**Environmental**  
Your Complete Source for Geosynthetic Solutions

Sheet No. 18 of 21



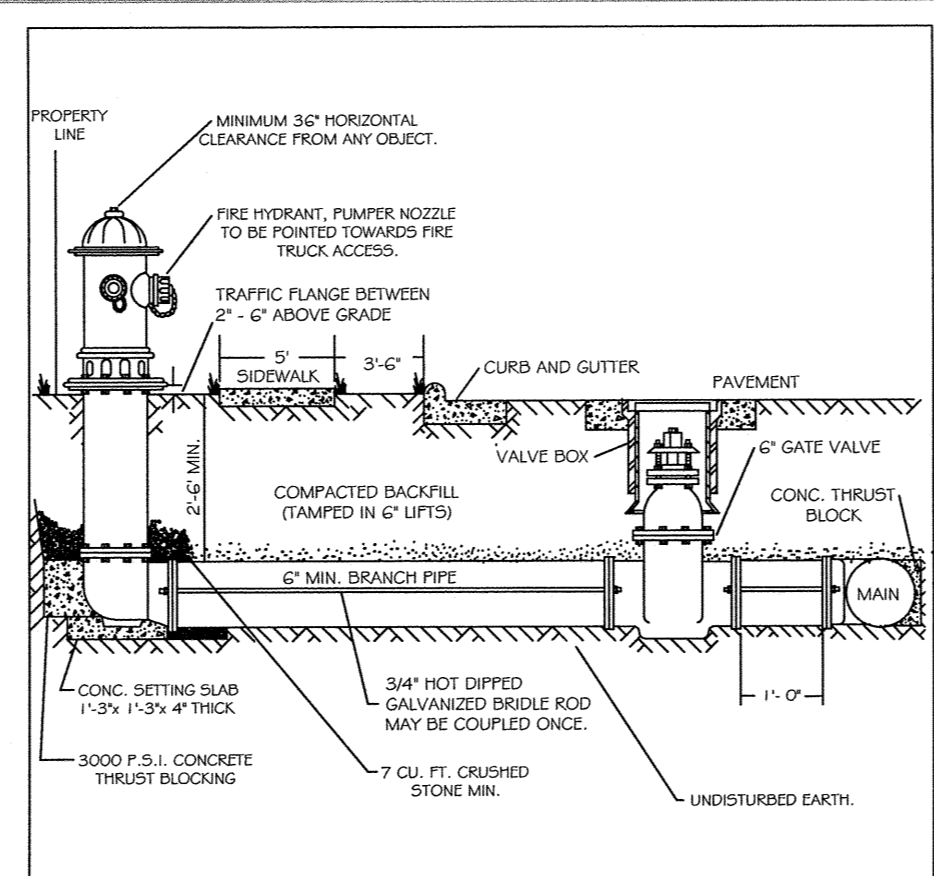
- NOTES:
- TRENCHES REQUIRING SHORING AND BRACING, DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING AND BRACING.
  - NO ROCKS OR BouldERS 4" OR LARGER TO BE USED IN BACKFILL.
  - ALL BACKFILL MATERIAL SHALL BE SUITABLE NATIVE MATERIAL.
  - BACKFILL SHALL BE TAMPED IN 6" LIFTS.
  - ACHIEVE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

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
TRENCH BOTTOM DIMENSIONS & BACKFILLING REQUIREMENTS FOR DUCTILE IRON			
DWG. NO.	REVISIONS	DATE	DATE
W-3	REV. 1	3-2-99	3-11-00
	D.W.C.	D.H.L.	J.P.S.



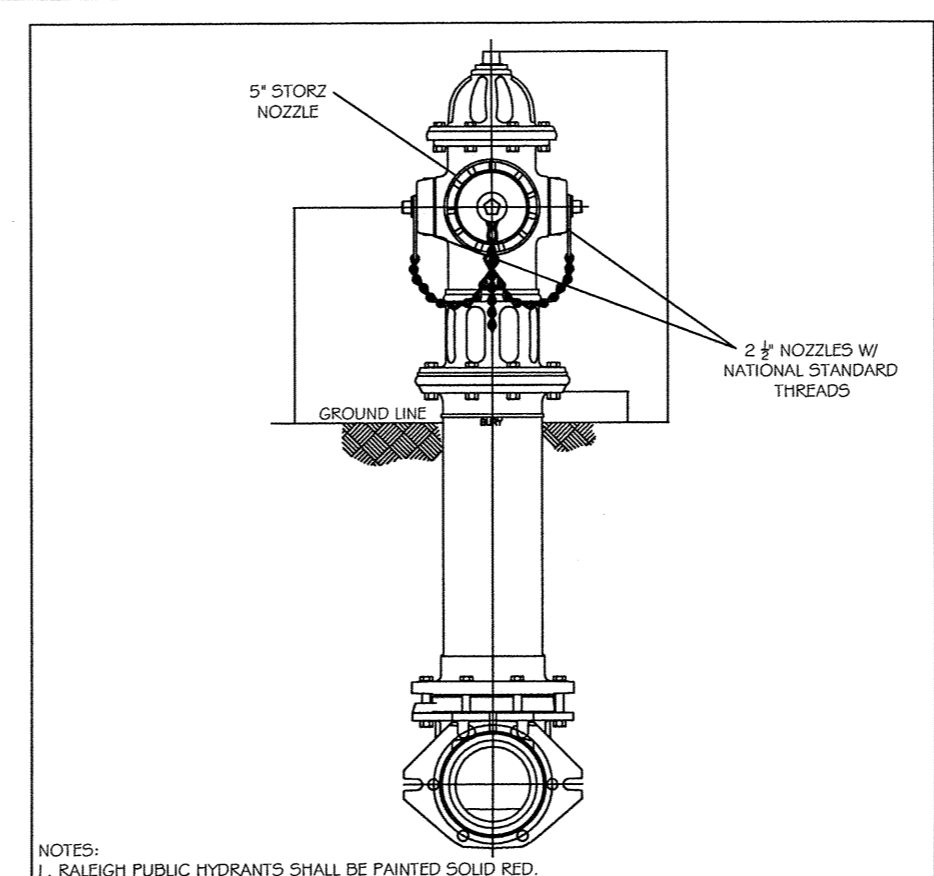
- NOTES:
- FIRE HYDRANT SHALL BE AS MANUFACTURED: MUELLER, AMERICAN DARLING, KENNEDY, MHI, WATERLOO, GLOW, DODI, JORDAN IRON WORKS, OR US PIPE.
  - BRANCH FIRE SHALL BE DUCTILE IRON WITH 150 PSI RATING.
  - 6" GATE VALVE SHALL BE AWWA C500-06 OPEN LIFT.
  - STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPER GALVANIZED.
  - FIRE HYDRANTS WILL BE INSTALLED IN TRUE VERTICAL POSITION.
  - RODS SHALL NOT BE COUPLED MORE THAN ONCE. IF THE LENGTH FROM THE VALVE TO THE HYDRANT EXCEEDS 20' THEN A MECHANICAL RESTRAINING GLAND WITH A REBAR CAGE SHALL BE INSTALLED NO MORE THAN 17' FROM HYDRANT AND FORCED IN CONCRETE.
  - FIRE HYDRANTS TO BE LOCATED IN ROW OR 2 FOOT EASEMENT ADJACENT TO ROW.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
STANDARD FIRE HYDRANT INSTALLATION DETAIL			
DWG. NO.	REVISIONS	DATE	DATE
W-4	REV. 1	4-2-04	3/7/09
	ABB	D.H.L.	J.P.S.



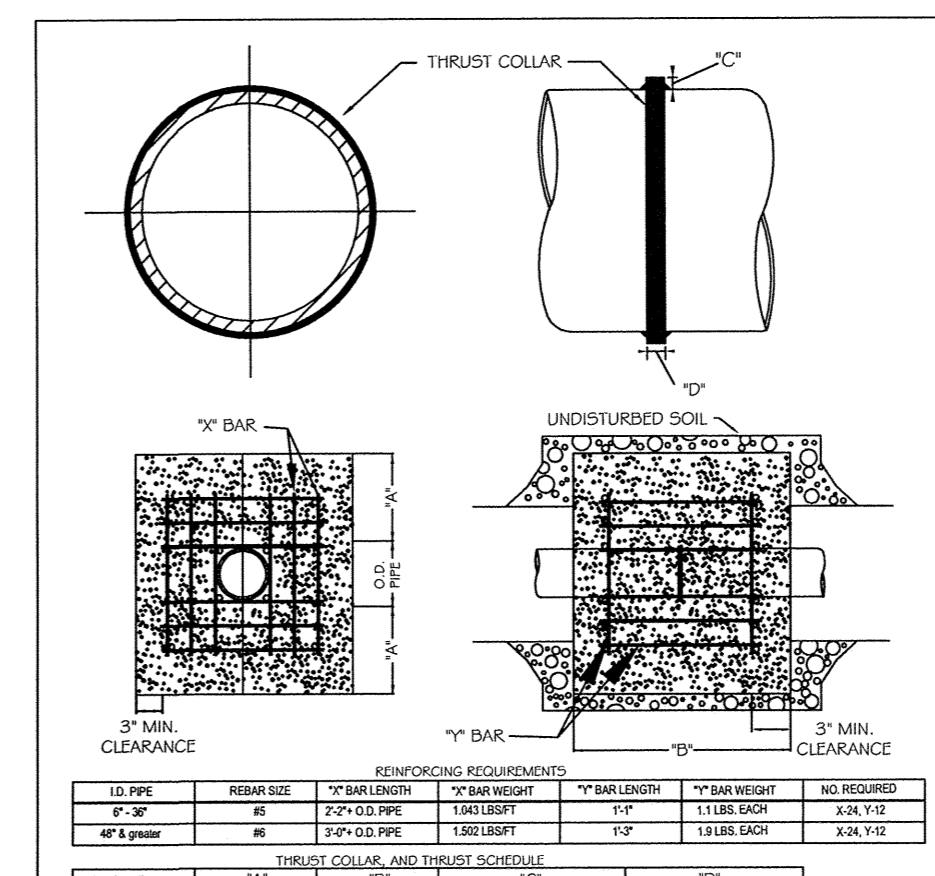
- NOTES:
- FIRE HYDRANT SHALL BE AS MANUFACTURED: MUELLER, AMERICAN DARLING, KENNEDY, MHI, WATERLOO, GLOW, EAST JORDAN IRON WORKS, OR US PIPE.
  - BRANCH FIRE SHALL BE DUCTILE IRON WITH 150 PSI RATING.
  - 6" GATE VALVE SHALL BE AWWA C500-06 OPEN LIFT.
  - STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPER GALVANIZED.
  - FIRE HYDRANTS WILL BE INSTALLED IN TRUE VERTICAL POSITION.
  - RODS SHALL NOT BE COUPLED MORE THAN ONCE. IF THE LENGTH FROM THE VALVE TO THE HYDRANT EXCEEDS 20' THEN A MECHANICAL RESTRAINING GLAND WITH A REBAR CAGE SHALL BE INSTALLED NO MORE THAN 17' FROM HYDRANT AND FORCED IN CONCRETE.
  - FIRE HYDRANTS TO BE LOCATED IN ROW OR 2 FOOT EASEMENT ADJACENT TO ROW.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
STANDARD FIRE HYDRANT WITH 5" STOREZ PUMP NOZZLE			
DWG. NO.	REVISIONS	DATE	DATE
W-5	REV. 1	3-31-00	2-14-00
	RSR	D.H.L.	J.P.S.

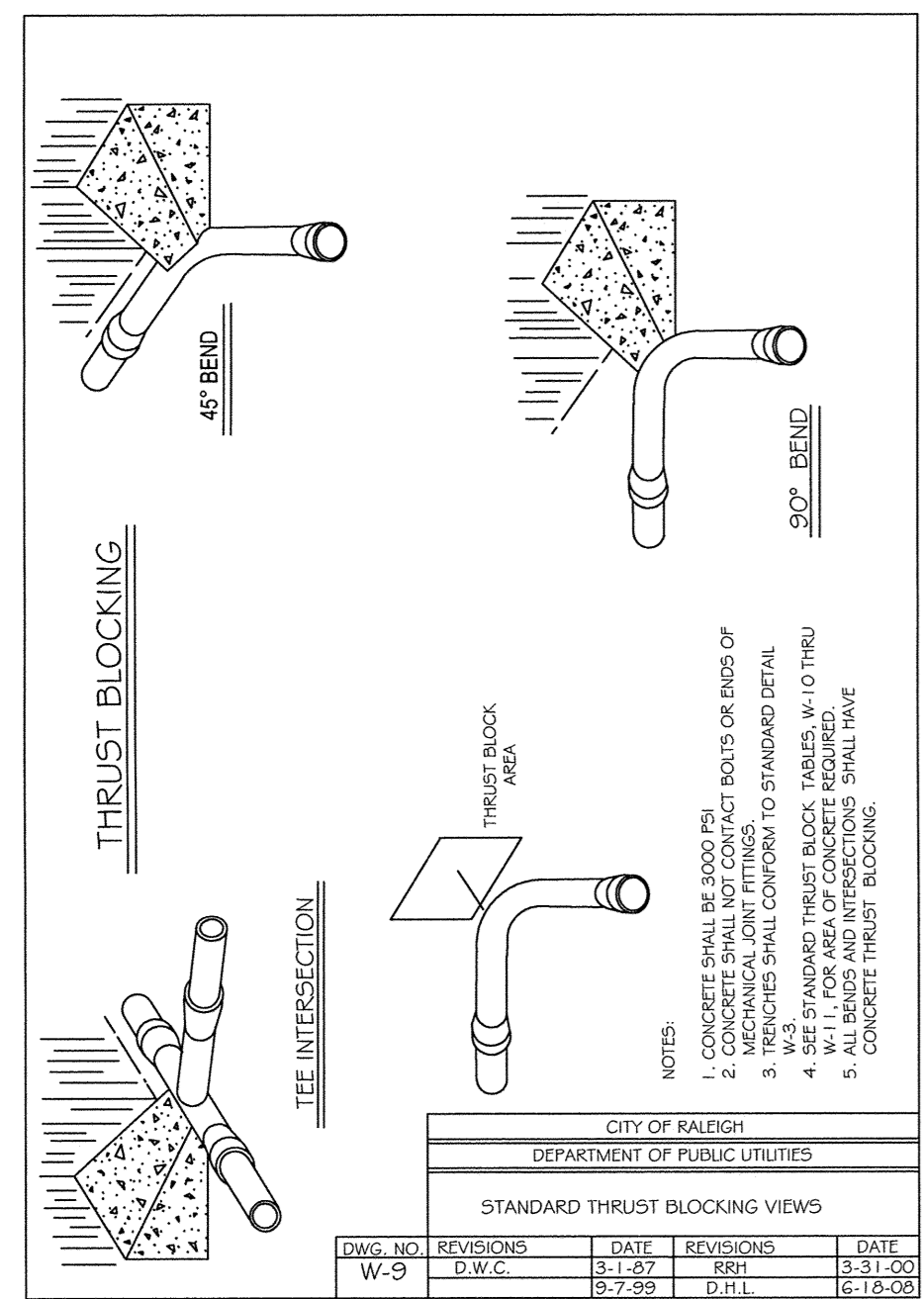


- NOTES:
- RALEIGH PUBLIC HYDRANTS SHALL BE PAINTED SOLID RED.
  - RIGHTSIDE PUBLIC HYDRANTS SHALL BE PAINTED SOLID RED.
  - ZEBULON PUBLIC HYDRANTS SHALL BE PAINTED RED WITH SILVER BONNETS AND OPERATING NUTS.
  - WENDELL PUBLIC HYDRANTS SHALL BE PAINTED SAFETY YELLOW WITH HIGH REFLECTIVE ALUMINUM SILVER CAPS, BONNETS, AND OPERATING NUTS.
  - WAKE FOREST AND GARDNER PUBLIC AND PRIVATE HYDRANTS TO BE PAINTED SAFETY YELLOW WORKER CAPS AND OPERATING NUTS.
  - ROLESVILLE PUBLIC HYDRANTS SHALL BE PAINTED SOLID RED.
  - OPERATING NUTS ON HYDRANTS CONNECTED TO PUBLIC MAINS 12" OR LARGER SHALL BE PAINTED BLACK. OPERATING NUTS ON HYDRANTS ANY OTHER SIZE SHALL BE PAINTED SILVER.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
STANDARD FIRE HYDRANT WITH 5" STOREZ PUMP NOZZLE			
DWG. NO.	REVISIONS	DATE	DATE
W-5	REV. 1	3-31-00	2-14-00
	RSR	D.H.L.	J.P.S.

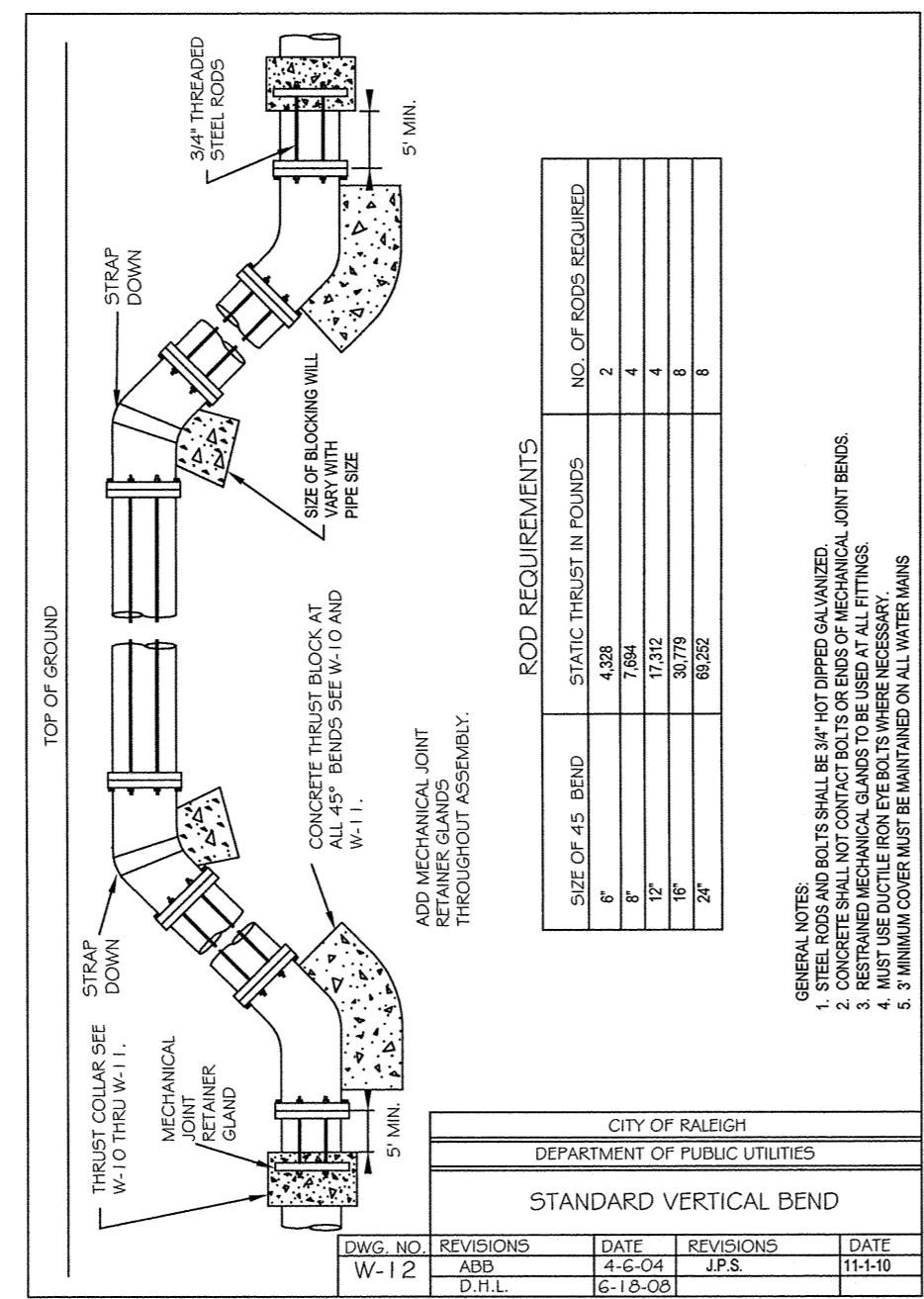


CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
THRUST BLOCKING DESIGN DATA FOR WATER MAINS			
DWG. NO.	REVISIONS	DATE	DATE
W-7	REV. 1	8-18-08	
	D.H.L.	J.P.S.	



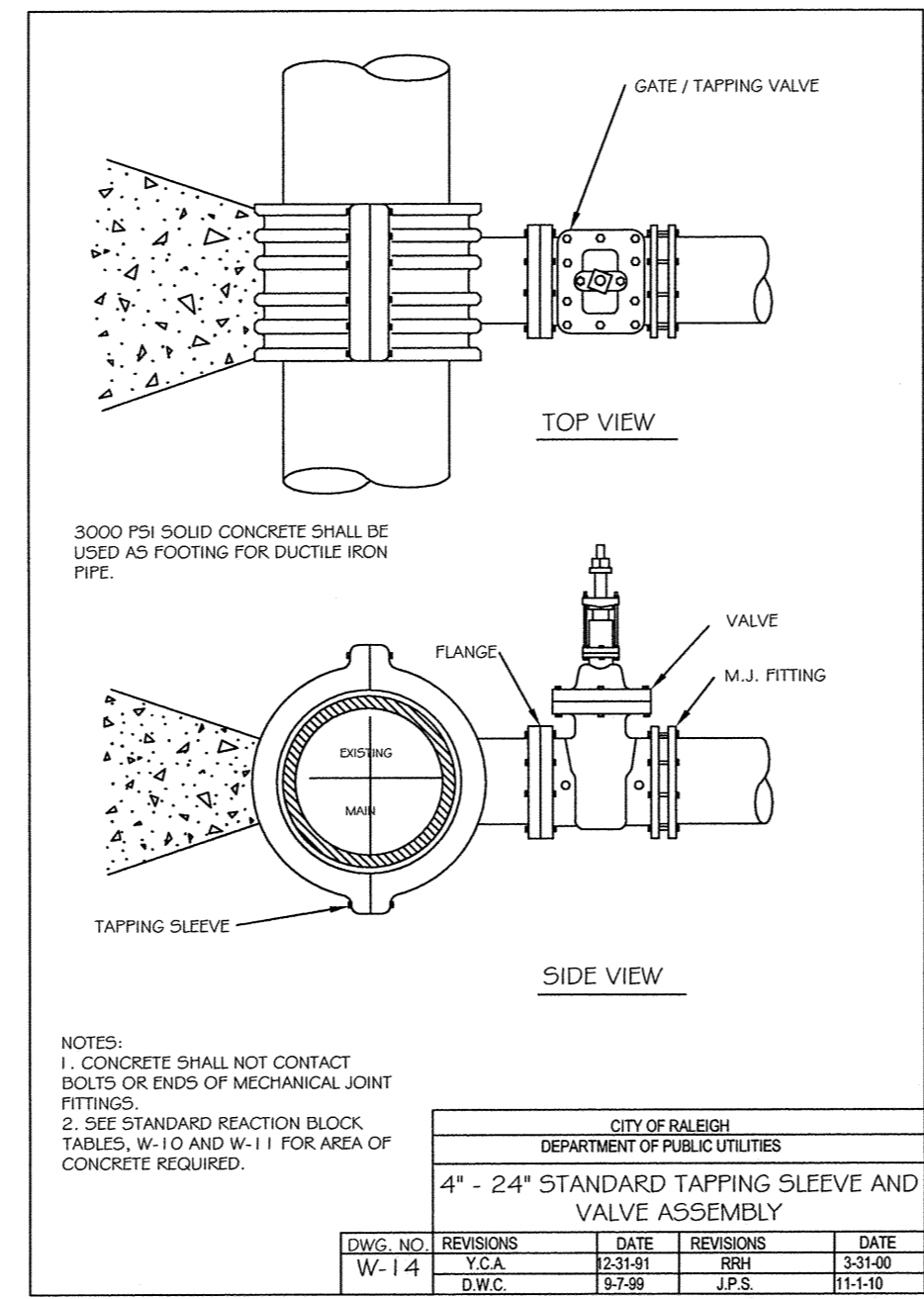
- NOTES:
- THRUST BLOCK SHALL BE AS MANUFACTURED BY: MUELLER, AMERICAN DARLING, KENNEDY, MHI, WATERLOO, GLOW, EAST JORDAN IRON WORKS, OR US PIPE.
  - CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
  - SEE STANDARD REACTION BLOCK TABLES W-10 THRU W-11 FOR AREA OF CONCRETE REQUIRED.
  - ALL 45° BENDS MUST BE INSTALLED WITH 1/2" MECHANICAL RESTRAINING GLAND.
  - CONCRETE THRUST BLOCKINGS SHALL HAVE 1/2" MECHANICAL RESTRAINING GLAND.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
STANDARD THRUST BLOCKING VIEWS			
DWG. NO.	REVISIONS	DATE	DATE
W-9	REV. 1	3-1-97	3-31-00
	D.W.C.	D.H.L.	J.P.S.



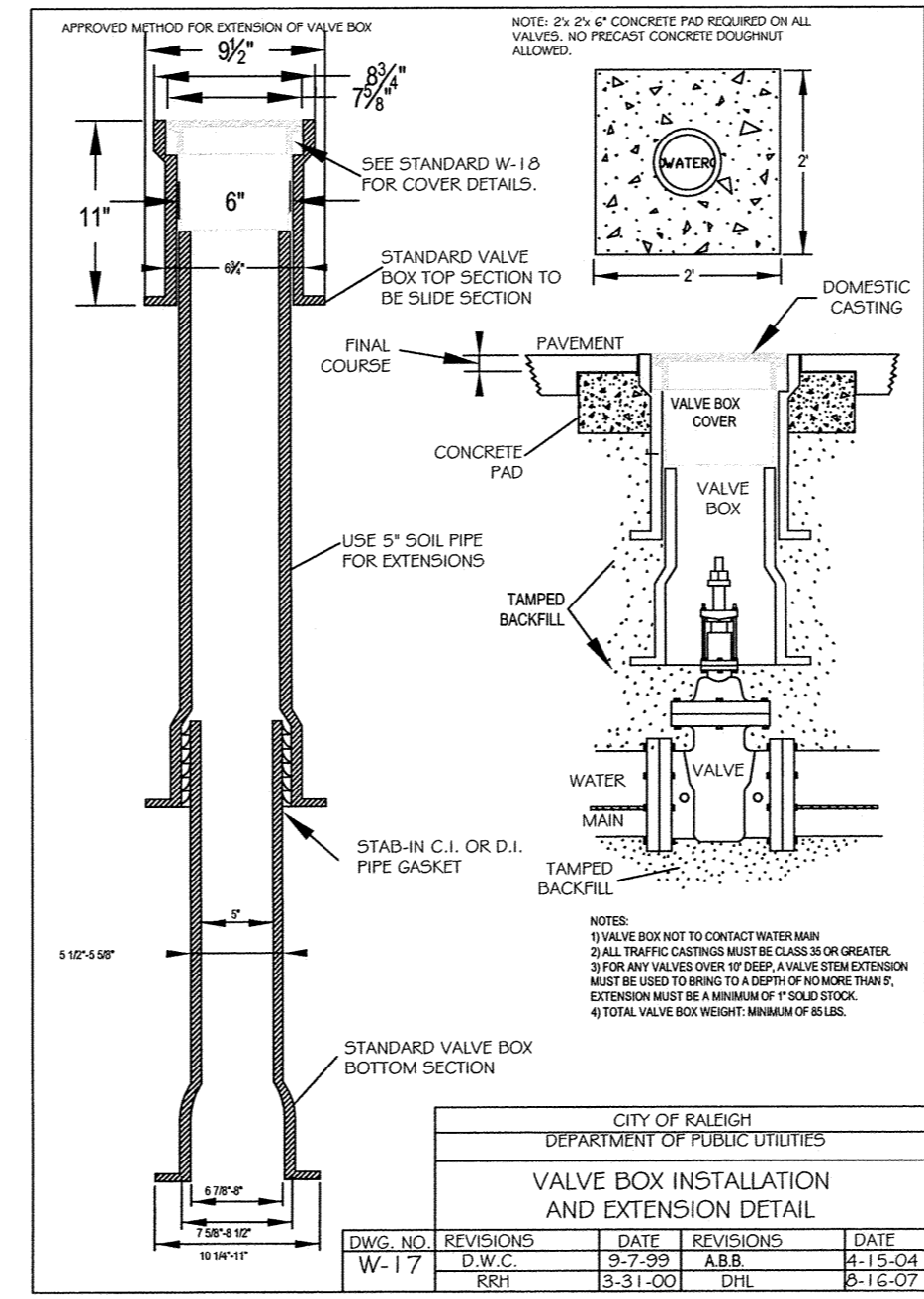
- NOTES:
- STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPER GALVANIZED.
  - CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
  - SEE STANDARD REACTION BLOCK TABLES W-10 AND W-11 FOR AREA OF CONCRETE REQUIRED.
  - ALL 45° BENDS MUST BE INSTALLED WITH 1/2" MECHANICAL RESTRAINING GLAND.
  - CONCRETE THRUST BLOCKINGS SHALL HAVE 1/2" MECHANICAL RESTRAINING GLAND.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
STANDARD VERTICAL BEND			
DWG. NO.	REVISIONS	DATE	DATE
W-12	REV. 1	4-6-04	11-1-10
	ABB	D.H.L.	J.P.S.



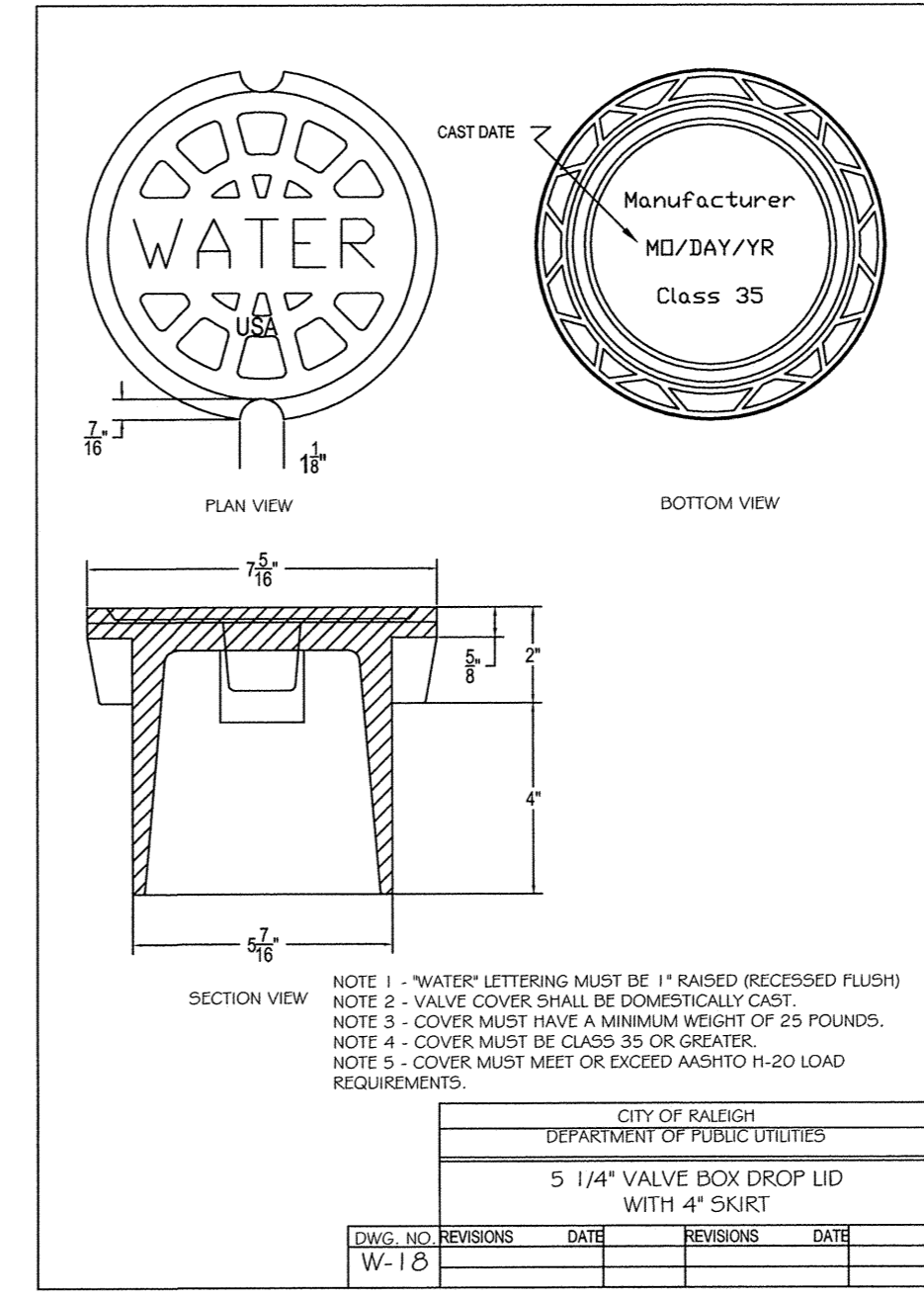
- NOTES:
- CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
  - SEE STANDARD REACTION BLOCK TABLES W-10 AND W-11 FOR AREA OF CONCRETE REQUIRED.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
4" - 24" STANDARD TAPPING SLEEVE AND VALVE ASSEMBLY			
DWG. NO.	REVISIONS	DATE	DATE
W-14	REV. 1	2-21-91	3-31-00
	Y.C.A.	D.H.L.	J.P.S.



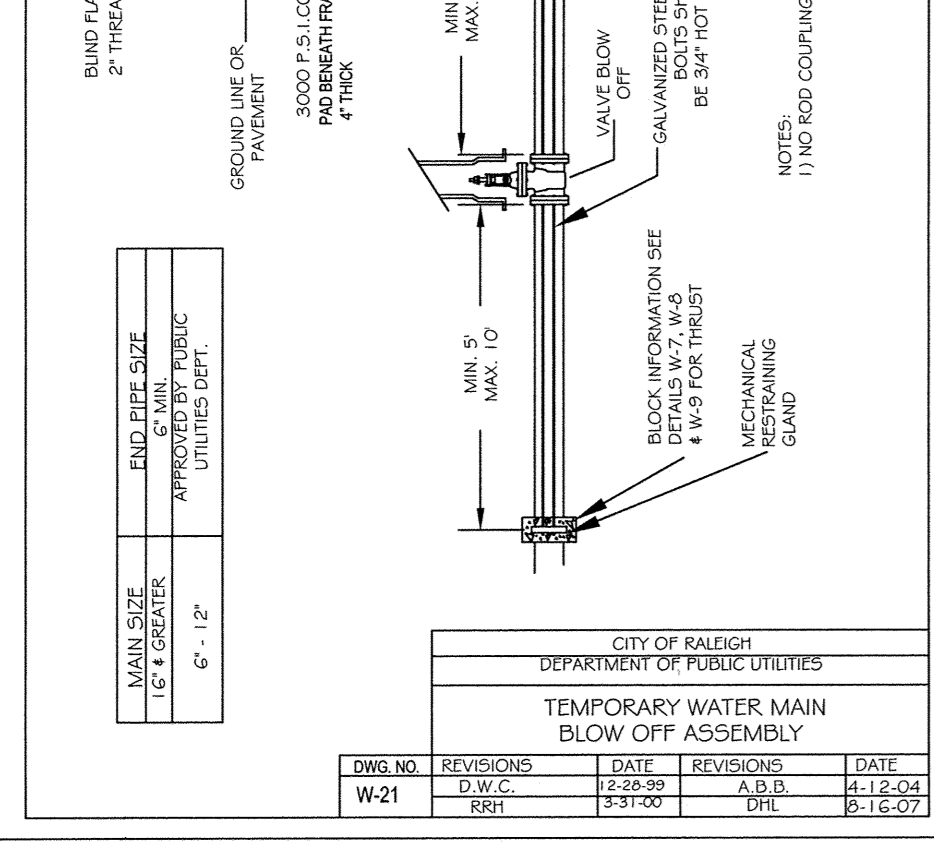
- NOTES:
- VALVE BOX NOT TO CONTACT WITH ROADS.
  - ALL TAPPING OPERATIONS MUST BE DONE BY AN OPERATOR.
  - VALVE BOXES MUST BE USED TO BRING TO A DEPTH OF 48 INCHES TO THE SURFACE.
  - EXTENSION WATER IS A MINIMUM OF 30 INCHES.
  - TOTAL VALVE BOX WEIGHT: MINIMUM OF 25 LBS.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
VALVE BOX INSTALLATION AND EXTENSION DETAIL			
DWG. NO.	REVISIONS	DATE	DATE
W-17	REV. 1	9-7-99	4-15-04
	D.W.C.	D.H.L.	J.P.S.



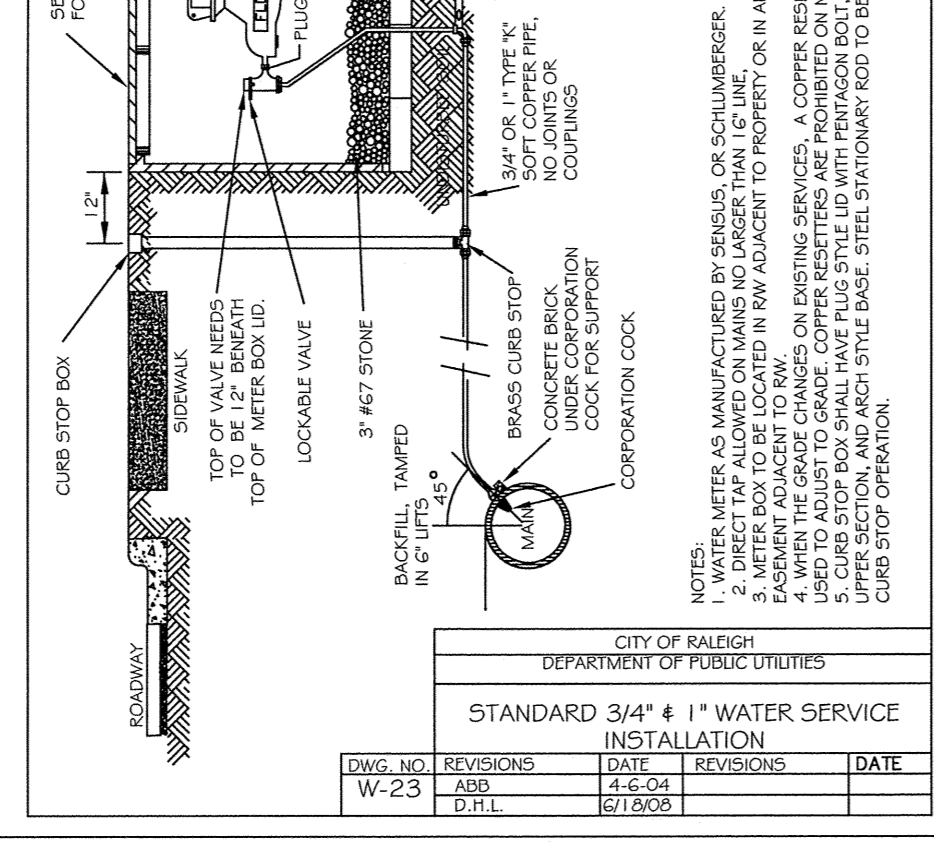
- NOTES:
- "WATER" LETTERING MUST BE 1" RAISED (RECESSED FLUSH).
  - VALVE COVER SHALL BE DOMESTICALLY CAST.
  - COVER MUST HAVE A MINIMUM WEIGHT OF 25 POUNDS.
  - COVER MUST BE CLASS 35 OR GREATER.
  - COVER MUST MEET OR EXCEED AADOTD P-20 LOAD REQUIREMENTS.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
5 1/4" VALVE BOX DROP LID WITH 4" SKIRT			
DWG. NO.	REVISIONS	DATE	DATE
W-18	REV. 1	8-21-00	11-3-08
	D.H.L.	J.P.S.	



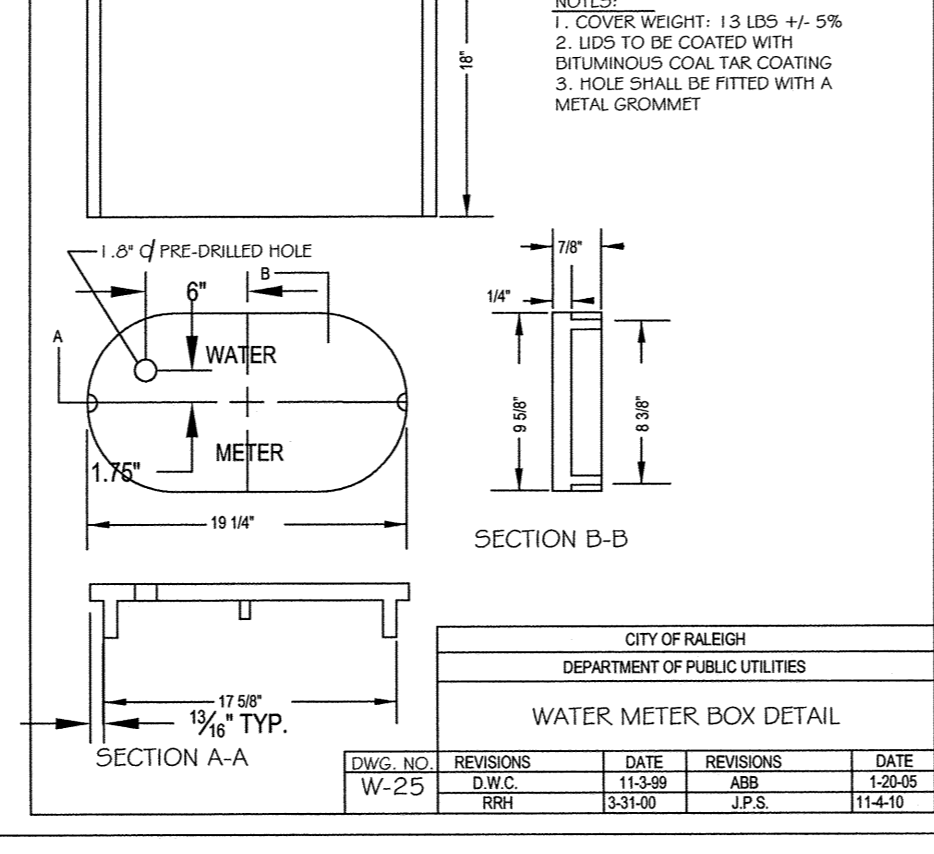
- NOTES:
- WATER MAINS MANUFACTURED BY: SENSUS, OR SCHLUMBERGER.
  - LETTERS MAY BE USED ON MAINS IN AN EASEMENT TO IDENTIFY OR APPROVED EASEMENT ADJACENT TO ROW, OR ON EXISTING SERVICES. A COPIER RESISTENT CAN BE USED TO ADJUST TO GRADE. COPIER RESISTENT IS PROHIBITED ON ANY SERVICES.
  - UPPER SECTION, AND ARCH STYLE BASE, STEEL 5/8" DIAMETER ROD TO BE PROVIDED FOR CURB STOP OPERATION.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
TEMPORARY WATER MAIN BLOW OFF ASSEMBLY			
DWG. NO.	REVISIONS	DATE	DATE
W-21	REV. 1	2-29-09	11-13-09
	D.W.C.	D.H.L.	J.P.S.



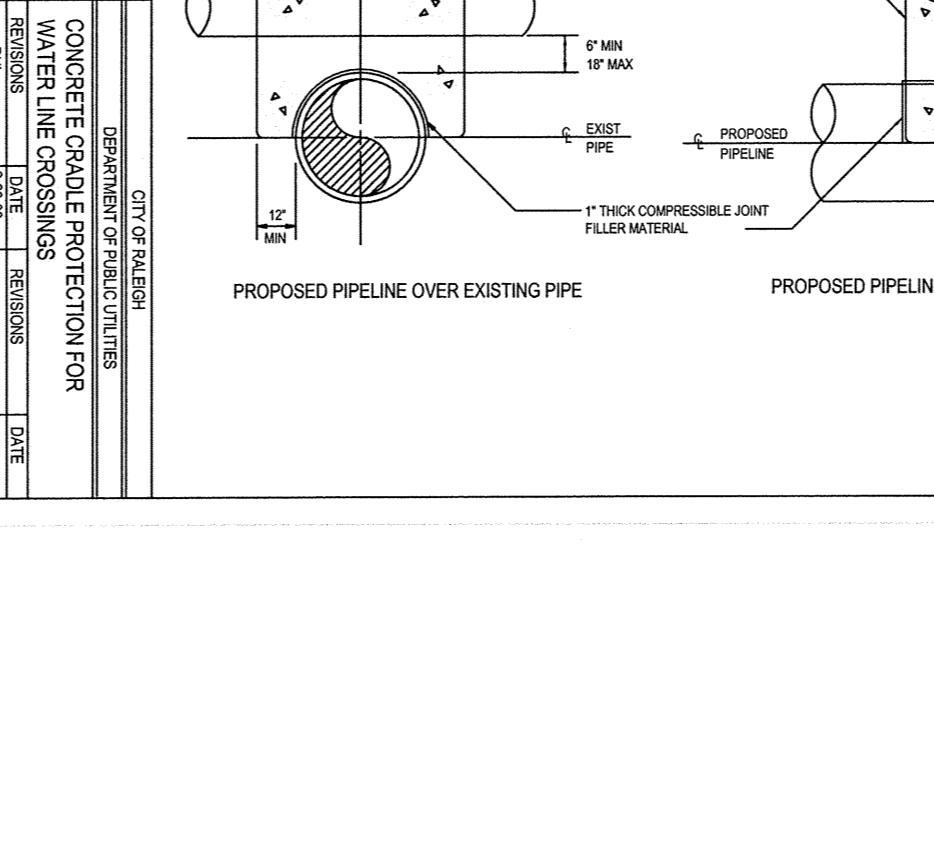
- NOTES:
- WATER MAINS MANUFACTURED BY: SENSUS, OR SCHLUMBERGER.
  - LETTERS MAY BE USED ON MAINS IN AN EASEMENT TO IDENTIFY OR APPROVED EASEMENT ADJACENT TO ROW, OR ON EXISTING SERVICES. A COPIER RESISTENT CAN BE USED TO ADJUST TO GRADE. COPIER RESISTENT IS PROHIBITED ON ANY SERVICES.
  - UPPER SECTION, AND ARCH STYLE BASE, STEEL 5/8" DIAMETER ROD TO BE PROVIDED FOR CURB STOP OPERATION.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
STANDARD 3/4" 4" WATER SERVICE INSTALLATION			
DWG. NO.	REVISIONS	DATE	DATE
W-23	REV. 1	4-6-04	11-1-10
	D.H.L.	J.P.S.	



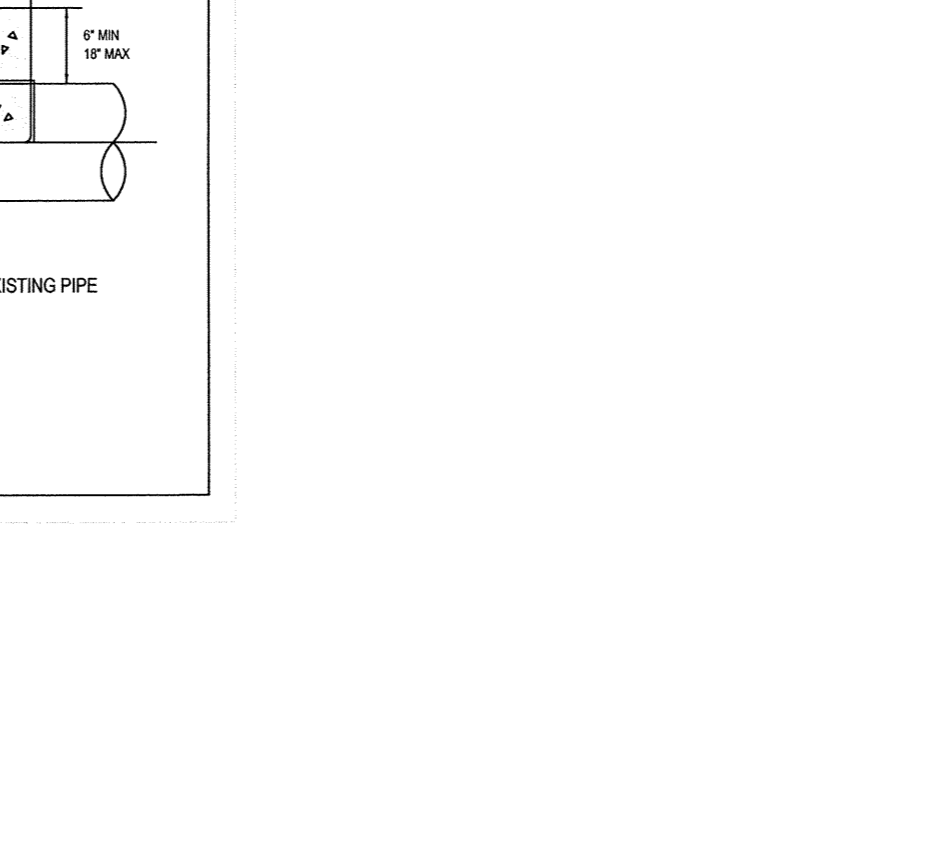
- NOTES:
- COVER WEIGHT: 13 LBS +/- 5%.
  - LIDS TO BE COATED WITH BITUMINOUS COAT. THE COATING.
  - HOLE SHALL BE FITTED WITH A METAL GROMMET.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
WATER METER BOX DETAIL			
DWG. NO.	REVISIONS	DATE	DATE
W-25	REV. 1	11-3-99	1-20-00
	RSR	D.H.L.	J.P.S.



- NOTES:
- NO ENCASUREMENT REQUIRED FOR SPACE GREATER THAN 18" FOR WATER MAINS.

CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
CONCRETE GRADE PROTECTION FOR WATER LINE CROSSINGS			
DWG. NO.	REVISIONS	DATE	DATE
W-26	REV. 1	8-21-00	11-3-08
	D.H.L.	J.P.S.	



- NOTES:
- SEE STANDARD DETAIL W-9 FOR THRUST BLOCK LOCATIONS.
  - CONCRETE SHALL BE 3000 PSI AND TRANSIT MIXED.
  - REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
  - TRENCH BOTTOM WIDTH IN VICINITY OF THRUST BLOCK INSTALLATION SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD DETAIL W-3.
  - BACKFILL TAMPED IN 6" LIFTS PER STANDARD DETAIL W-3.
  - THRUST COLLAR MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH EDGES OF COLLAR AROUND CIRCUMFERENCE.

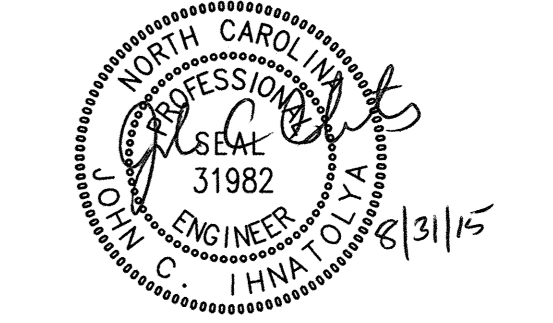
CITY OF RALEIGH			
DEPARTMENT OF PUBLIC UTILITIES			
THRUST BLOCKING DESIGN DATA FOR WATER MAINS			
DWG. NO.	REVISIONS	DATE	DATE
W-7	REV. 1	8-18-08	
	D.H.L.	J.P.S.	

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: 9/23/15  
TOWN ENGINEER-DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
ADMINISTRATOR



No.	Revision	Date	By	Designer	Scale
1	TOK 1st COMMENTS	08/31/15	JCI	W&R	SEE SHEET
				JCI	06/23/15
				JCI	02090251.7

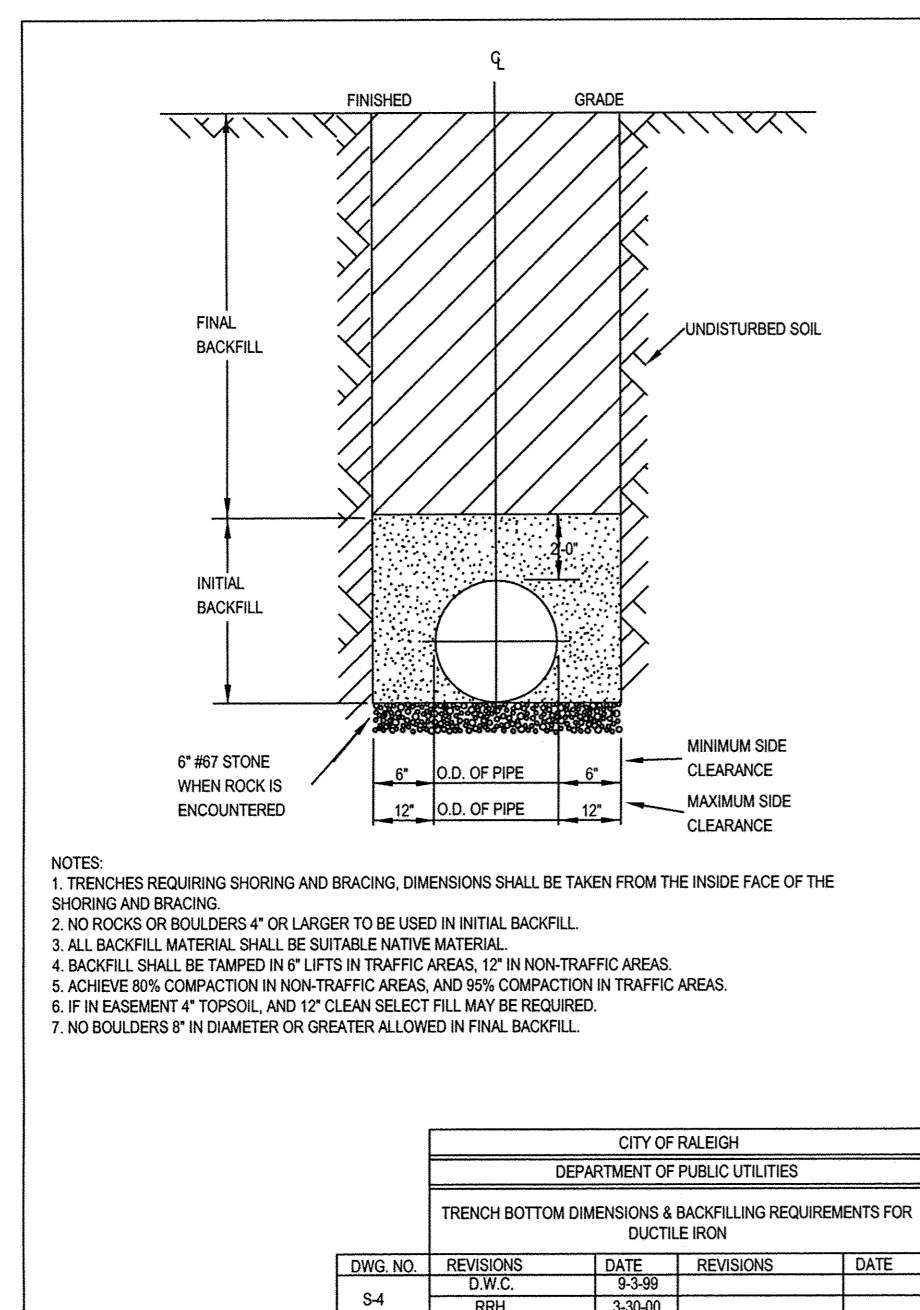
**KNIGHTDALE STATION PHASE R3**  
TOWN OF KNIGHTDALE WAKE COUNTY NORTH CAROLINA

**WATER UTILITY DETAILS**

**WITHERS & RAVENEL**  
ENGINEERS | PLANNERS | SURVEYORS

115 MacKean Drive Cary, North Carolina 27511 tel: 919-469-3340 www.wITHERSRAVENEL.COM License No. C-0832

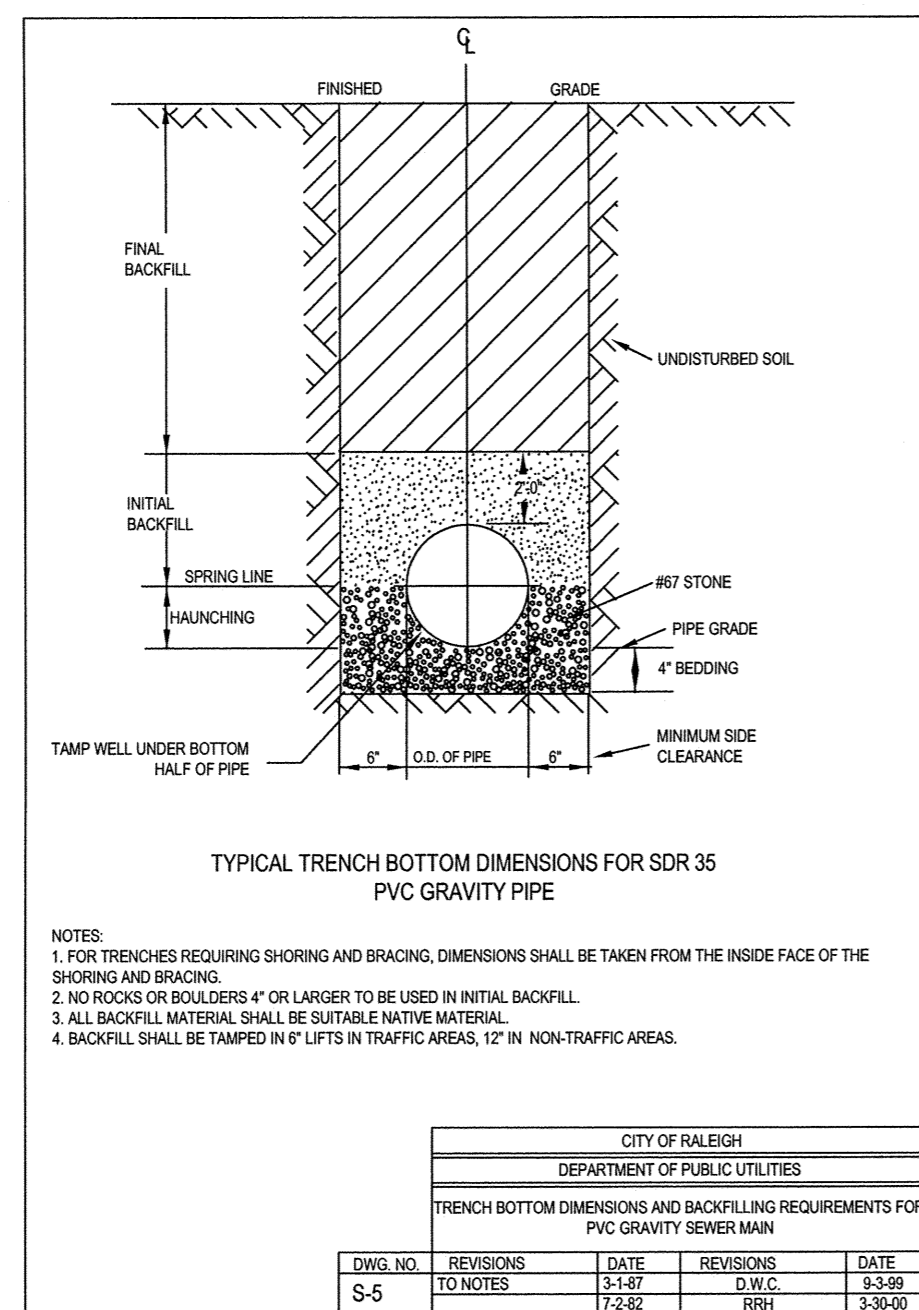
Sheet No. 19 of 21



NOTES:

- TRENCHES REQUIRING SHORING AND BRACING. DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING AND BRACING.
- NO ROCKS OR BOULDERS 4\"/>

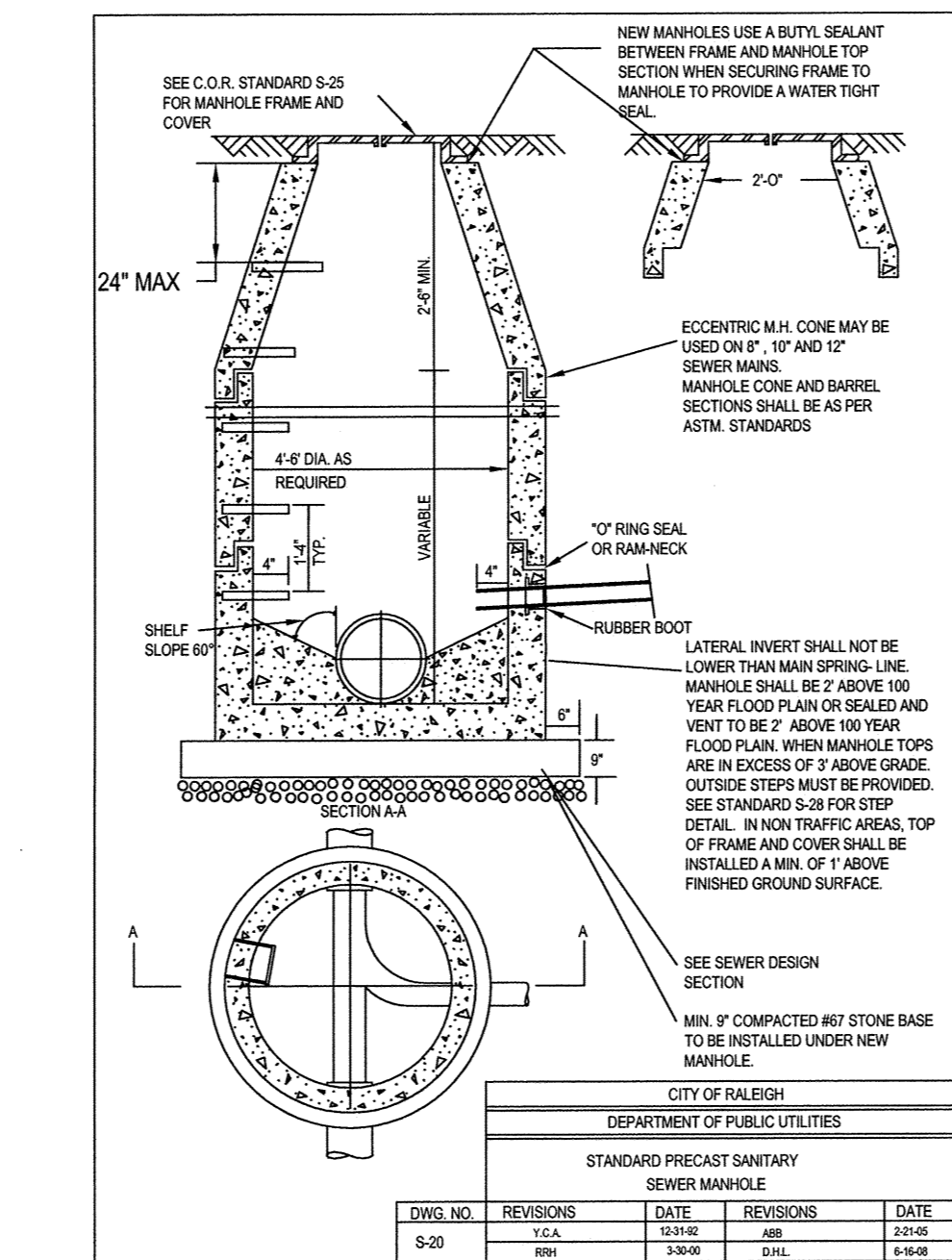
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
D.W.C.	3-3-99			
RRH	3-30-00			



NOTES:

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- NO ROCKS OR BOULDERS 4\"/>

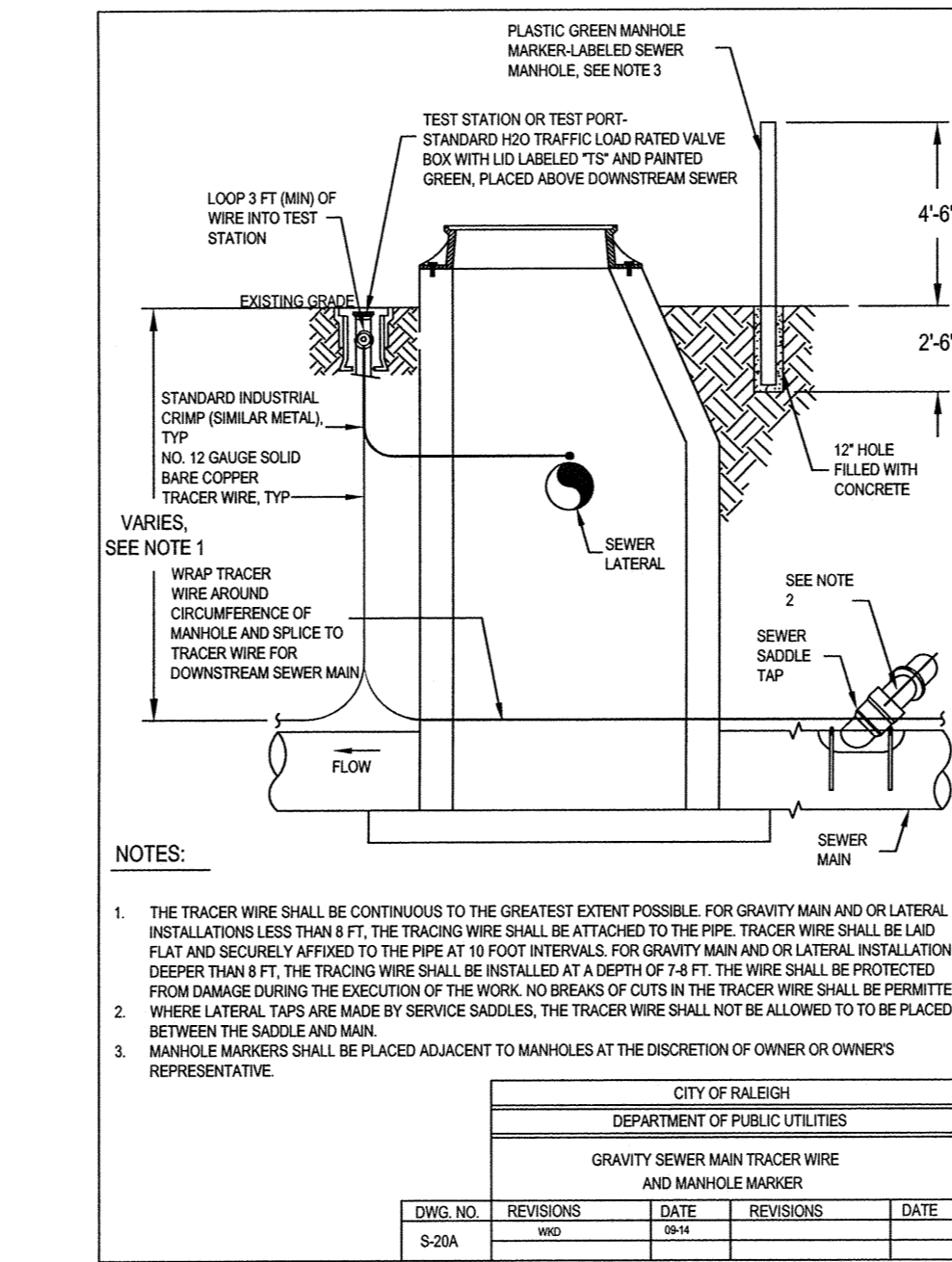
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
D.W.C.	3-3-99			
RRH	3-30-00			



NOTES:

- NEW MANHOLES USE A BUTYL SEALANT BETWEEN FRAME AND MANHOLE TOP SECTION WHEN SECURING FRAME TO MANHOLE TO PROVIDE A WATER TIGHT SEAL.
- ECCENTRIC M.H. CONE MAY BE USED ON 8\"/>

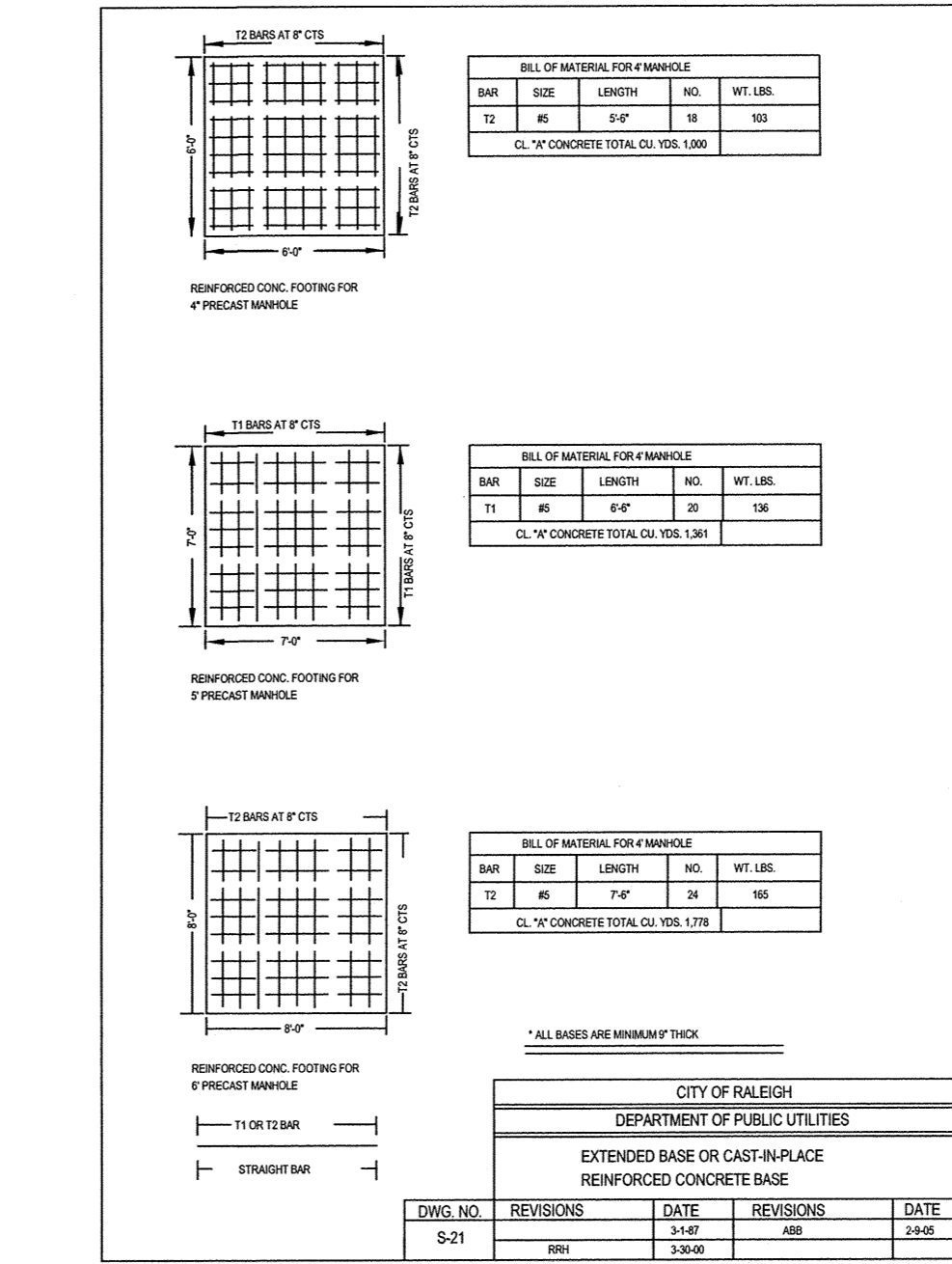
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-20	Y.C.A.	12-16-06	ARB	2-14-08
RRH	3-30-00		DR	5-16-05



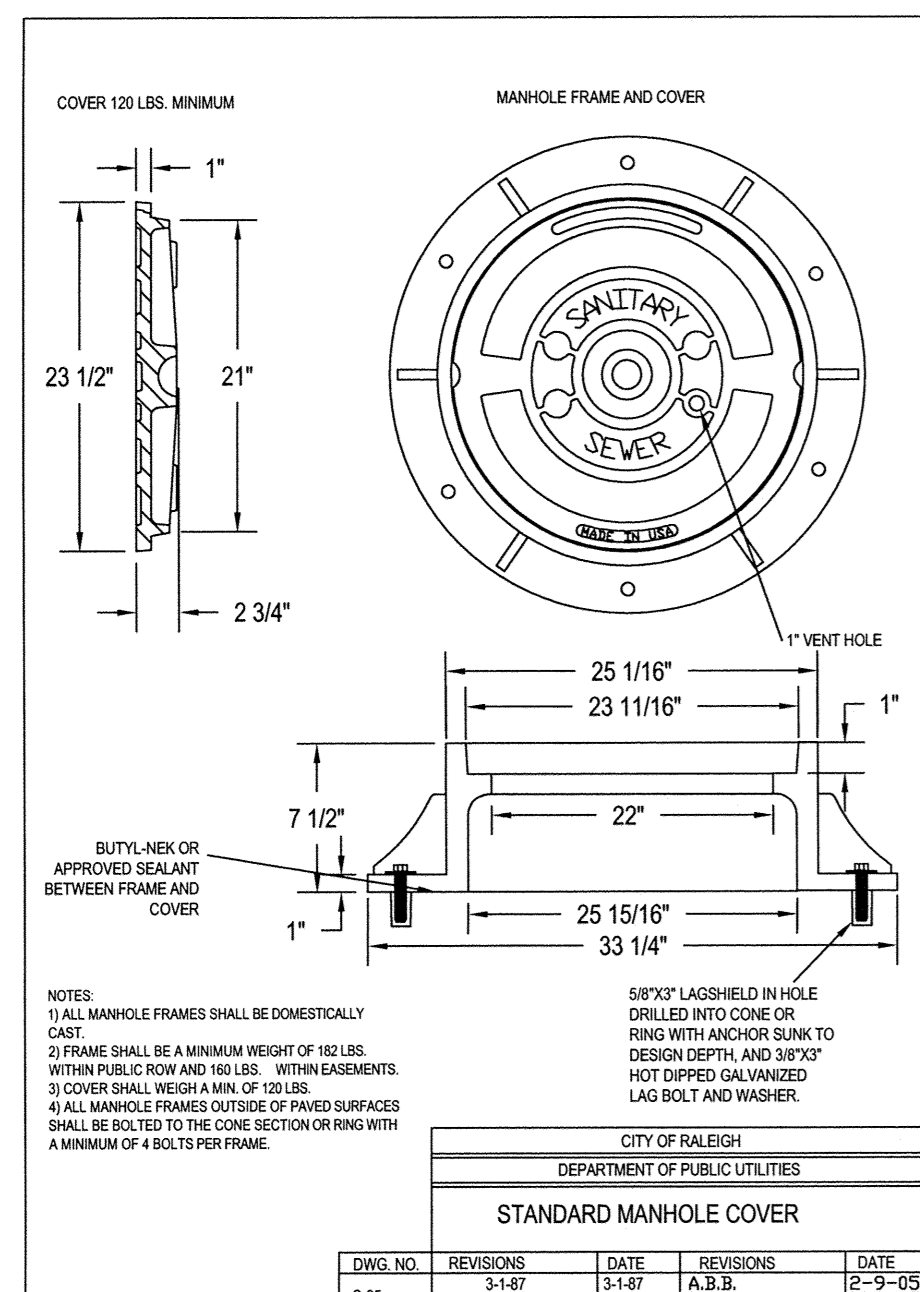
NOTES:

- THE TRACER WIRE SHALL BE CONTINUOUS TO THE GREATEST EXTENT POSSIBLE FOR GRAVITY MAIN AND OR LATERAL INSTALLATIONS LESS THAN 8 FT. THE TRACING WIRE SHALL BE ATTACHED TO THE PIPE. TRACER WIRE SHALL BE LAID FLAT AND SECURELY AFFIXED TO THE PIPE AT 10' FOOT INTERVALS FOR GRAVITY MAIN AND OR LATERAL INSTALLATION DEEPER THAN 8 FT. THE TRACING WIRE SHALL BE INSTALLED AT A DEPTH OF 7-8 FT. THE WIRE SHALL BE PROTECTED FROM DAMAGE DURING THE COURSE OF THE WORK. NO BREAKS OF CUTS IN THE TRACER WIRE SHALL BE PERMITTED WHERE LATERAL TAPS ARE MADE BY SERVICE SADDLES. THE TRACER WIRE SHALL NOT BE ALLOWED TO BE PLACED BETWEEN THE SADDLE AND MAIN MANHOLE MARKERS SHALL BE PLACED ADJACENT TO MANHOLES AT THE DISCRETION OF OWNER OR OWNER REPRESENTATIVE.

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-20A	RRH	3-30-00		



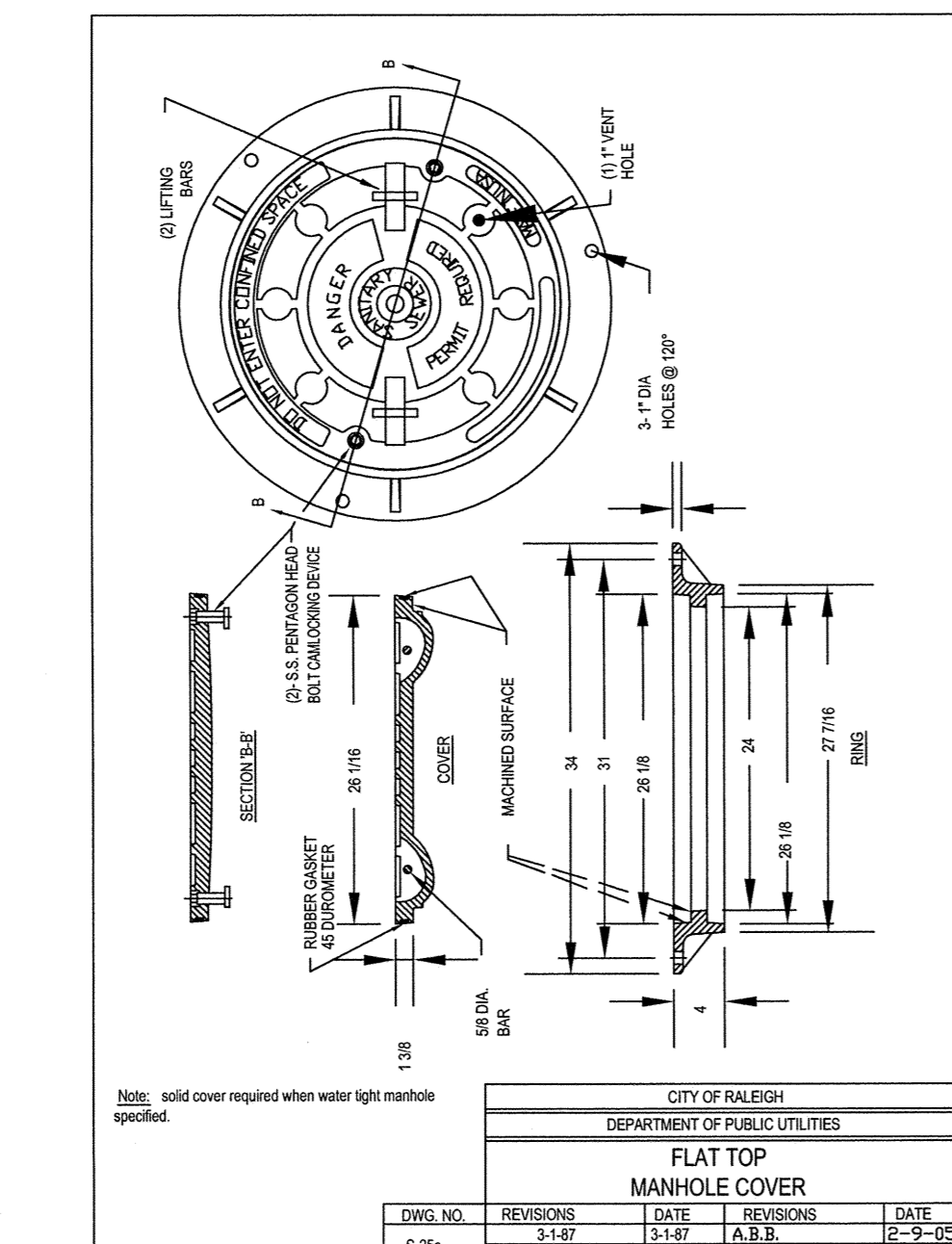
BAR	SIZE	LENGTH	NO.	WT. LBS.
12	#6	7'-0"	24	168
11	#6	7'-0"	24	168
CL. 70 CONCRETE TOTAL QTY. 105.134				



NOTES:

- ALL MANHOLE FRAMES SHALL BE CONCRETE CAST.
- FRAMES SHALL BE A MINIMUM HEIGHT OF 10\"/>

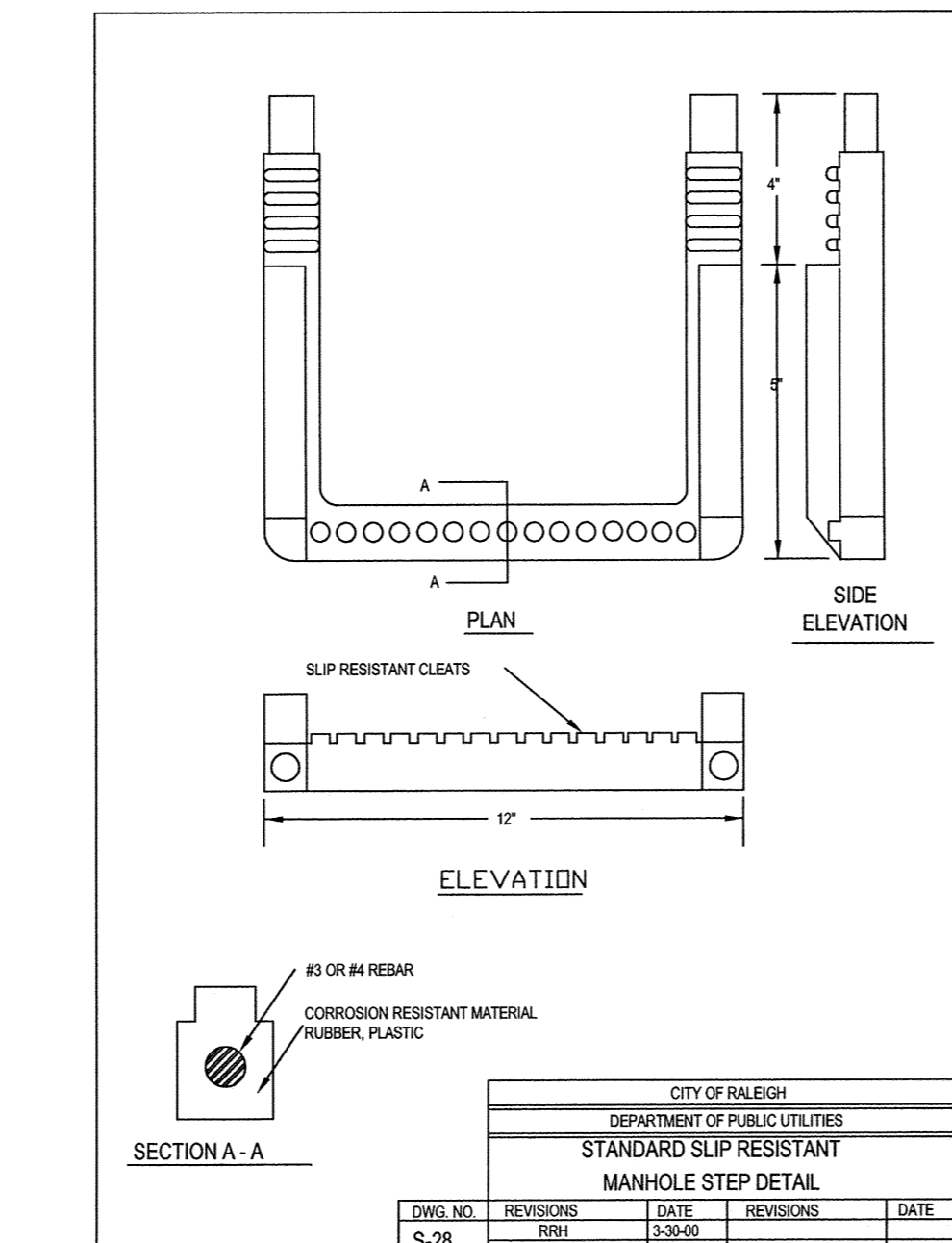
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-29	3-1-87	3-1-87	A.B.B.	2-9-08
RRH	3-30-00	D.H.L.		6-10-04



NOTES:

- COVER SHALL BE 1/2\"/>

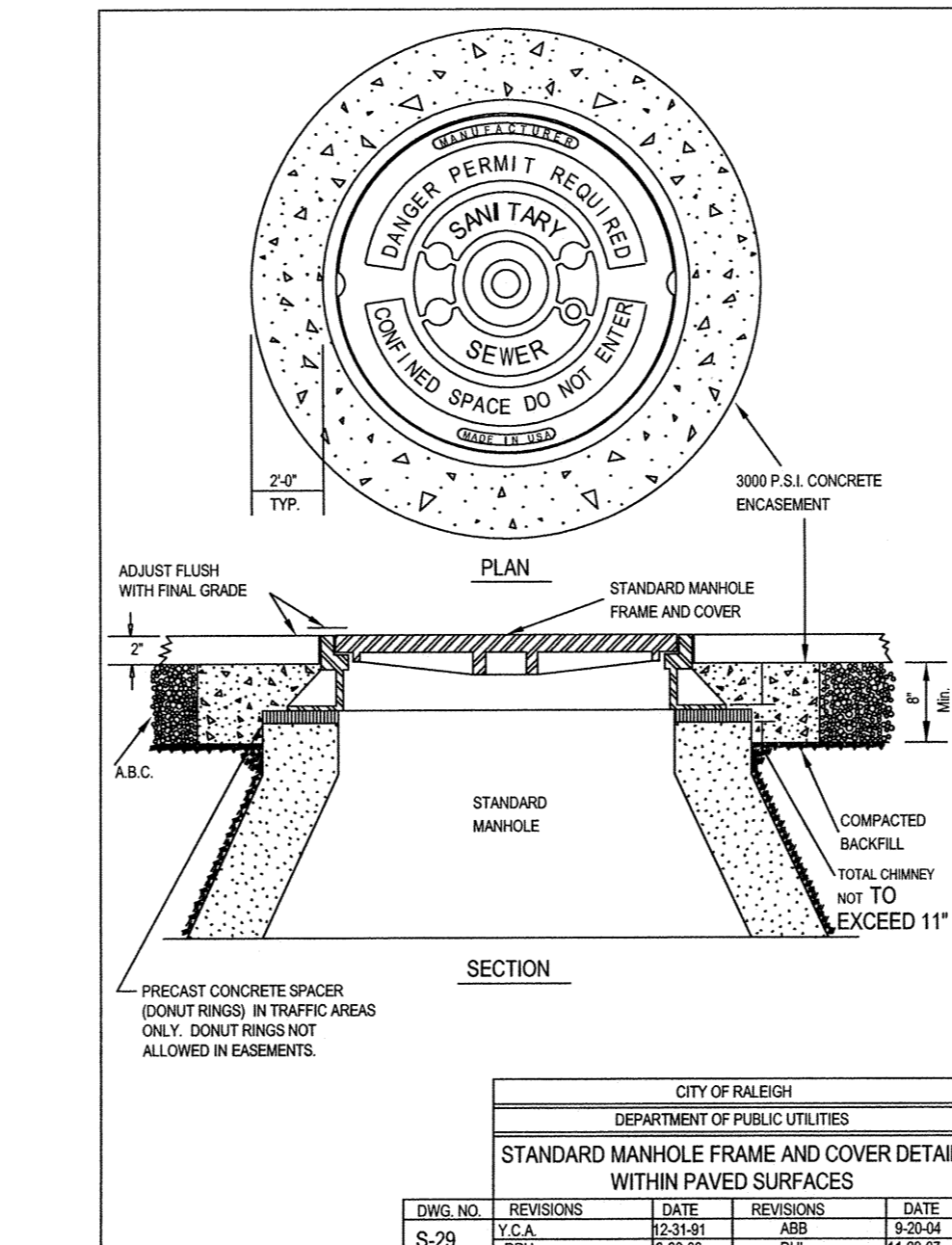
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-29a	3-1-87	3-1-87	A.B.B.	2-9-08
RRH	3-30-00	D.H.L.		6-10-04



NOTES:

- SLIP RESISTANT SURFACE SHALL BE 1/2\"/>

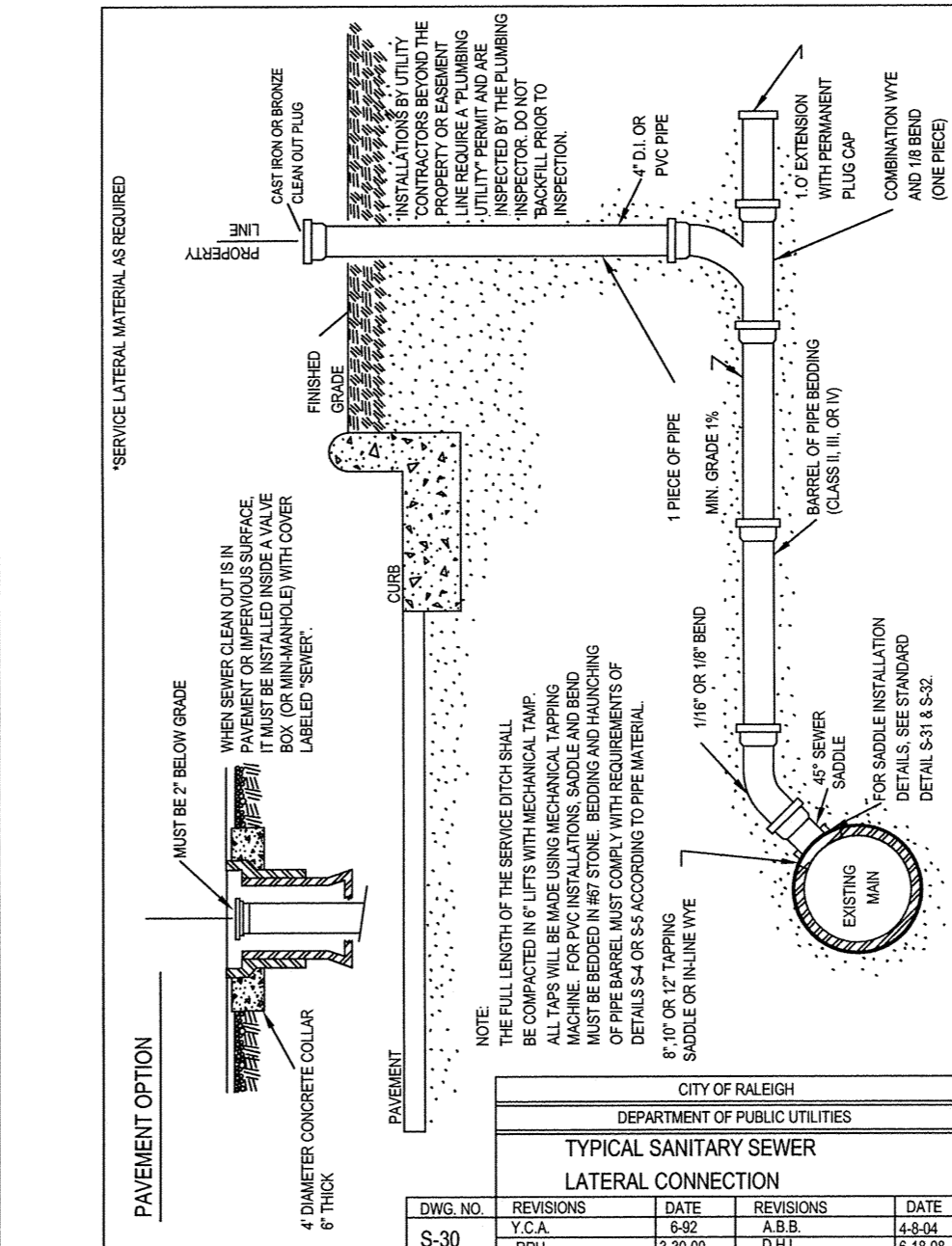
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-28	RRH	3-30-00		



NOTES:

- PRECAST CONCRETE SPACERS (DONUT RINGS) IN TRAFFIC AREAS ONLY. DONUT RINGS NOT ALLOWED IN EASEMENTS.

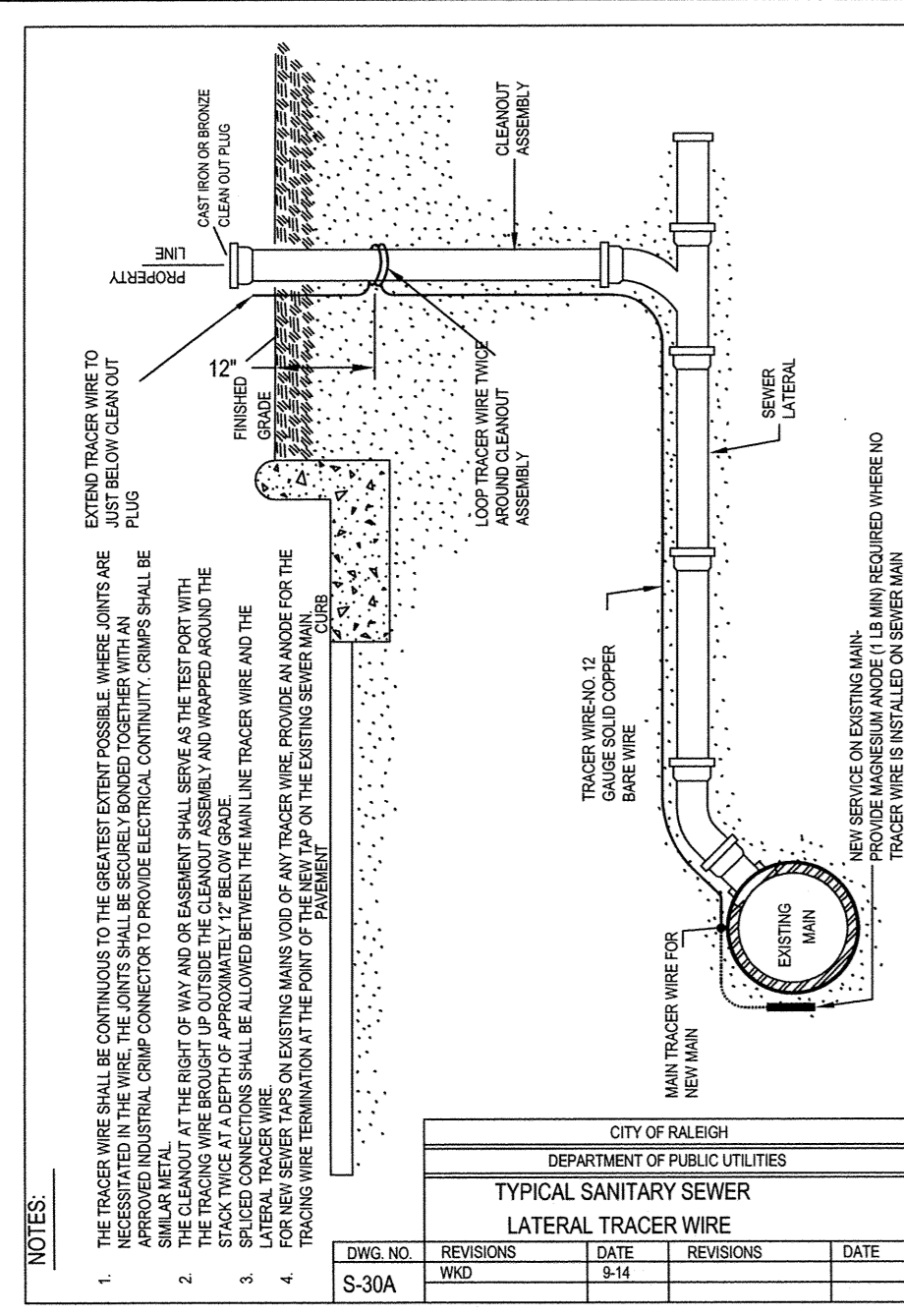
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-29	Y.C.A.	12-31-01	ARB	3-20-04
RRH	3-30-00	D.H.L.		11-20-07



NOTES:

- ALL LAPS SHALL BE MADE BEHIND MECHANICAL TAPPING. ALL TAPS SHALL BE MADE BEHIND MECHANICAL TAPPING. ALL TAPS SHALL BE MADE BEHIND MECHANICAL TAPPING. ALL TAPS SHALL BE MADE BEHIND MECHANICAL TAPPING.

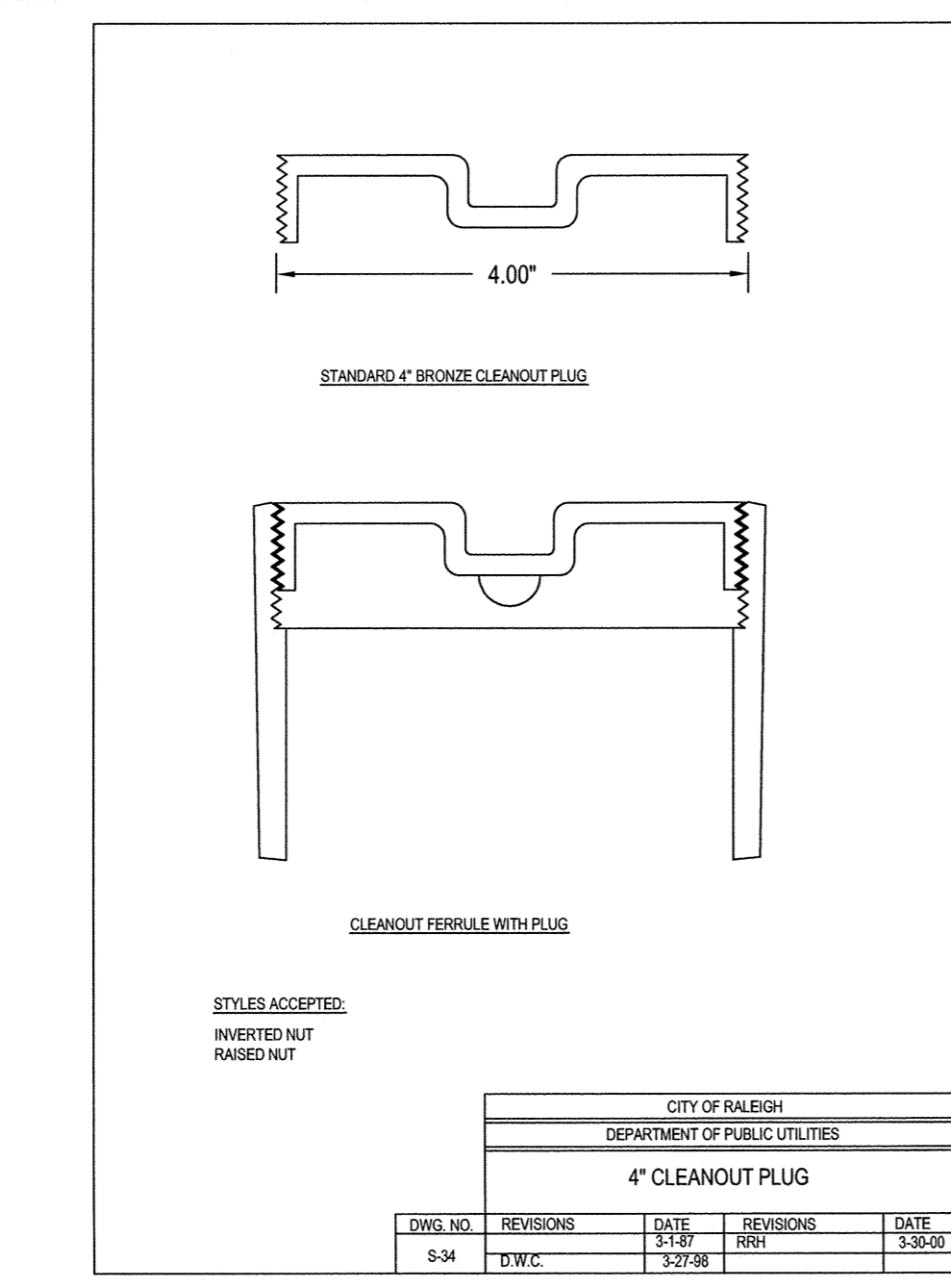
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-30	Y.C.A.	6-02	A.B.B.	6-24-04
RRH	3-30-00	D.H.L.		12-16-06



NOTES:

- THE TRACER WIRE SHALL BE CONTINUOUS TO THE GREATEST EXTENT POSSIBLE. WHERE JOINTS ARE NECESSARY, JOINTS SHALL BE MADE WITH APPROVED INDUSTRIAL CRIMP CONNECTOR TO PROVIDE ELECTRICAL CONTINUITY. CRIMPS SHALL BE MADE AT THE POINT OF CONNECTION TO THE MAINLINE TRACER WIRE AND NOT AT THE POINT OF CONNECTION TO THE LATERAL TRACER WIRE.

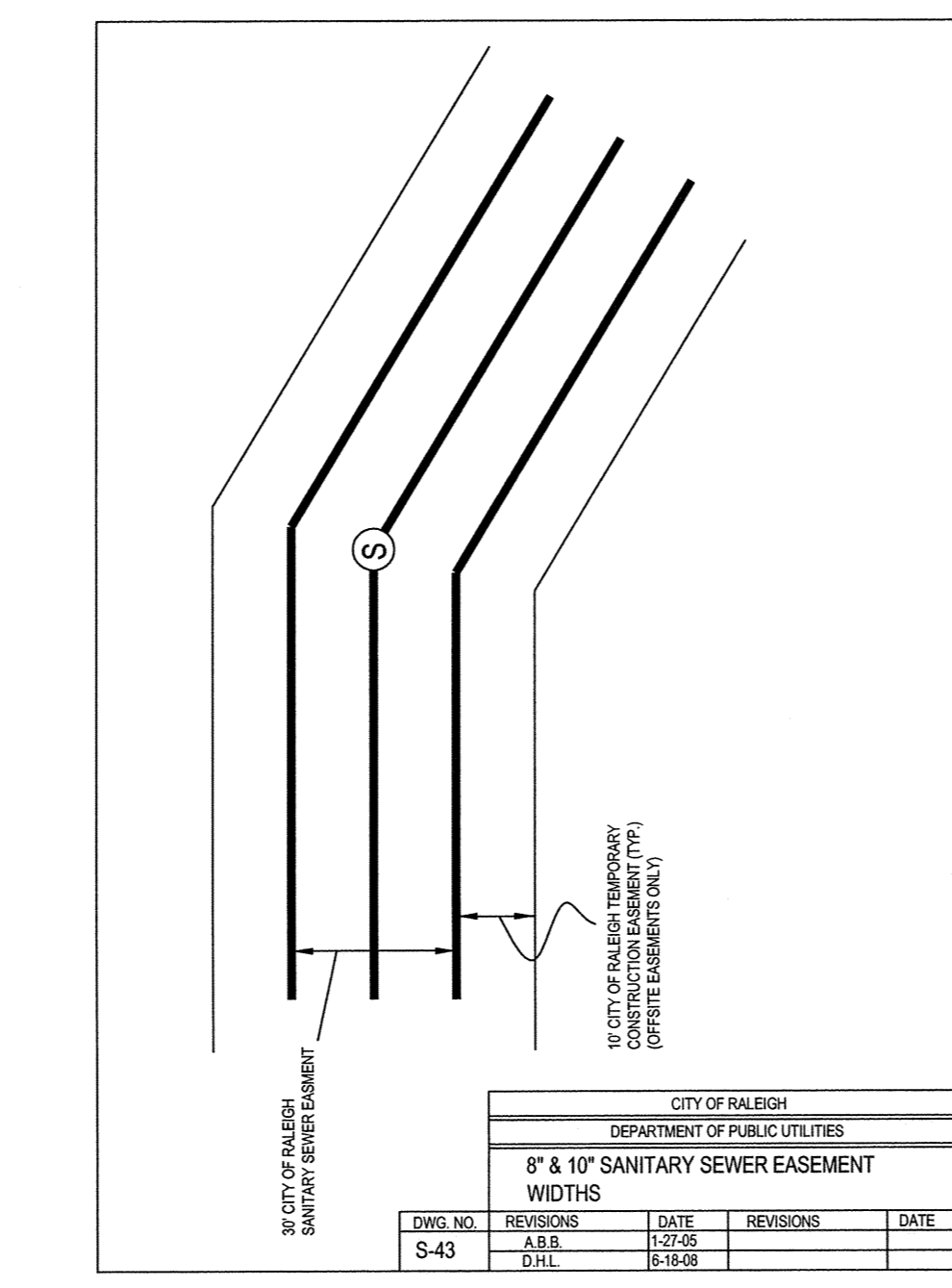
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-30A	RRH	3-30-00		



NOTES:

- STYLES ACCEPTED: RIBBED NUT.

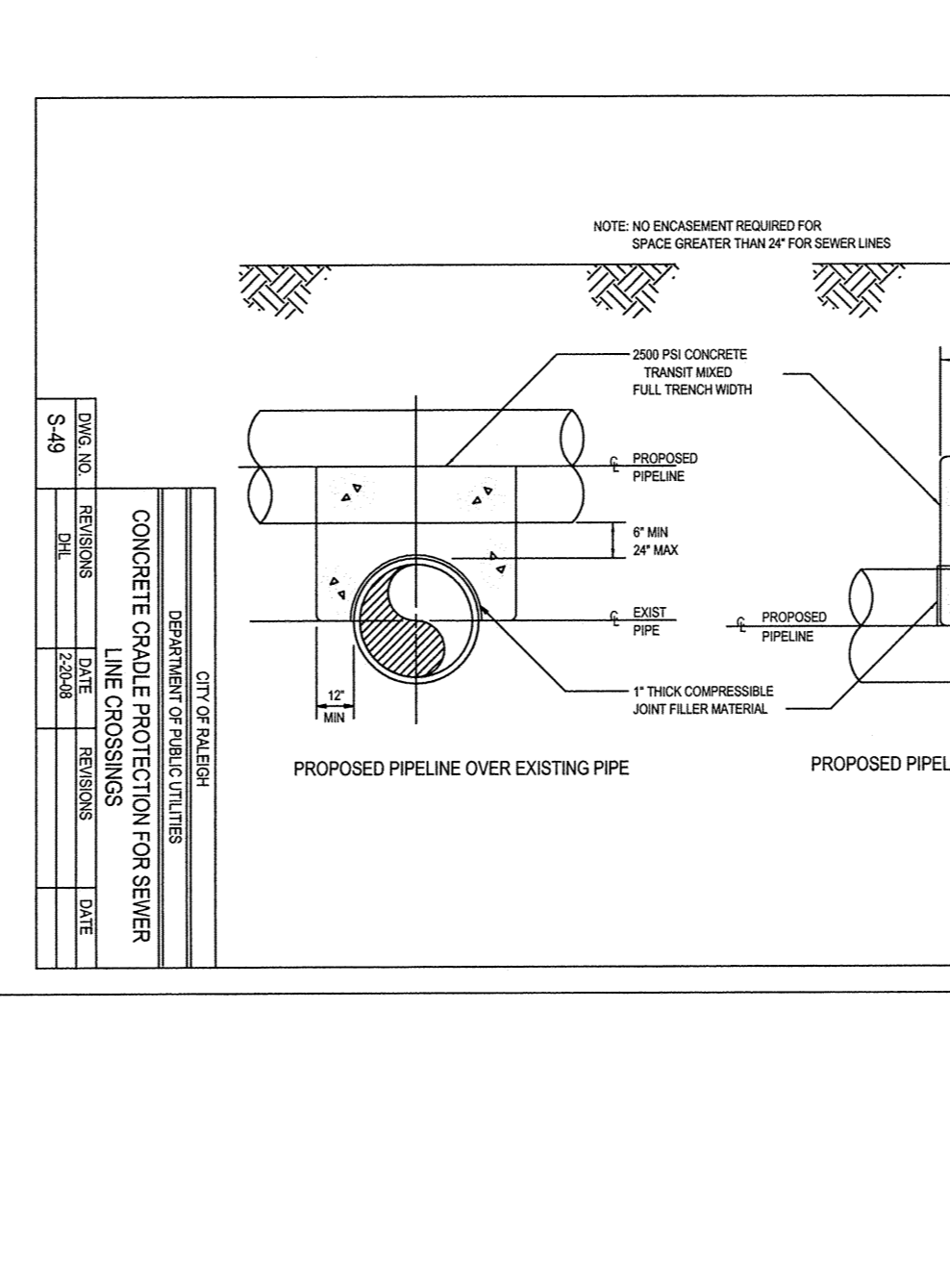
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-34	D.W.C.	3-27-98		



NOTES:

- 1/4\"/>

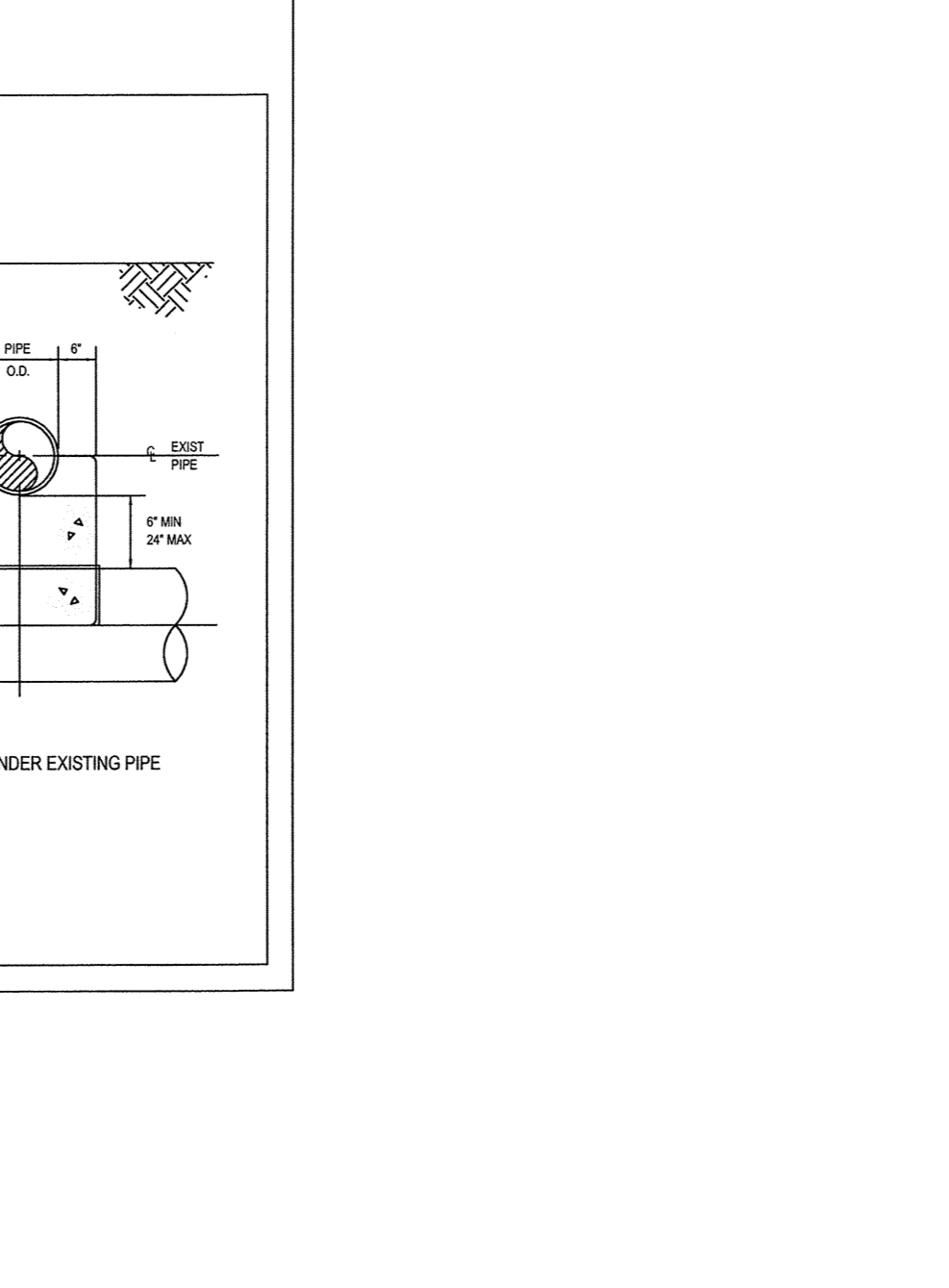
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-43	A.B.B.	12-27-06		
	D.H.L.	6-18-08		



NOTES:

- NOTE: NO ENCASUREMENT REQUIRED FOR SPACE GREATER THAN 24\"/>

DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-49	RRH	3-30-00		



NOTES:

- PAVEMENT SHALL BE 2\"/>

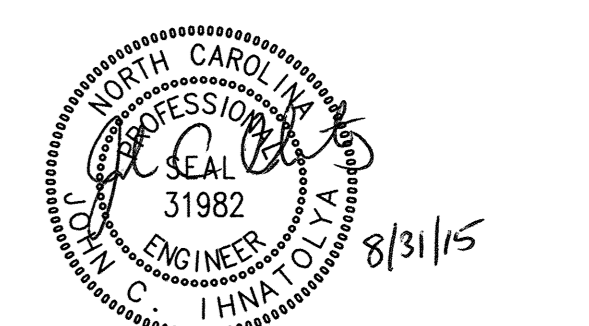
DWG. NO.	REVISIONS	DATE	REVISIONS	DATE
S-30	RRH	3-30-00		

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: 9/23/15  
 TOWN ENGINEER DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
 ADMINISTRATOR



No.	Revision	Date	By
1	TOK 1st COMMENTS	08/31/15	JCI

Designer: W&R  
 Scale: SEE SHEET  
 Drawn By: JCI  
 Date: 06/23/15  
 Checked By: JCI  
 Job No.: 02090251.7

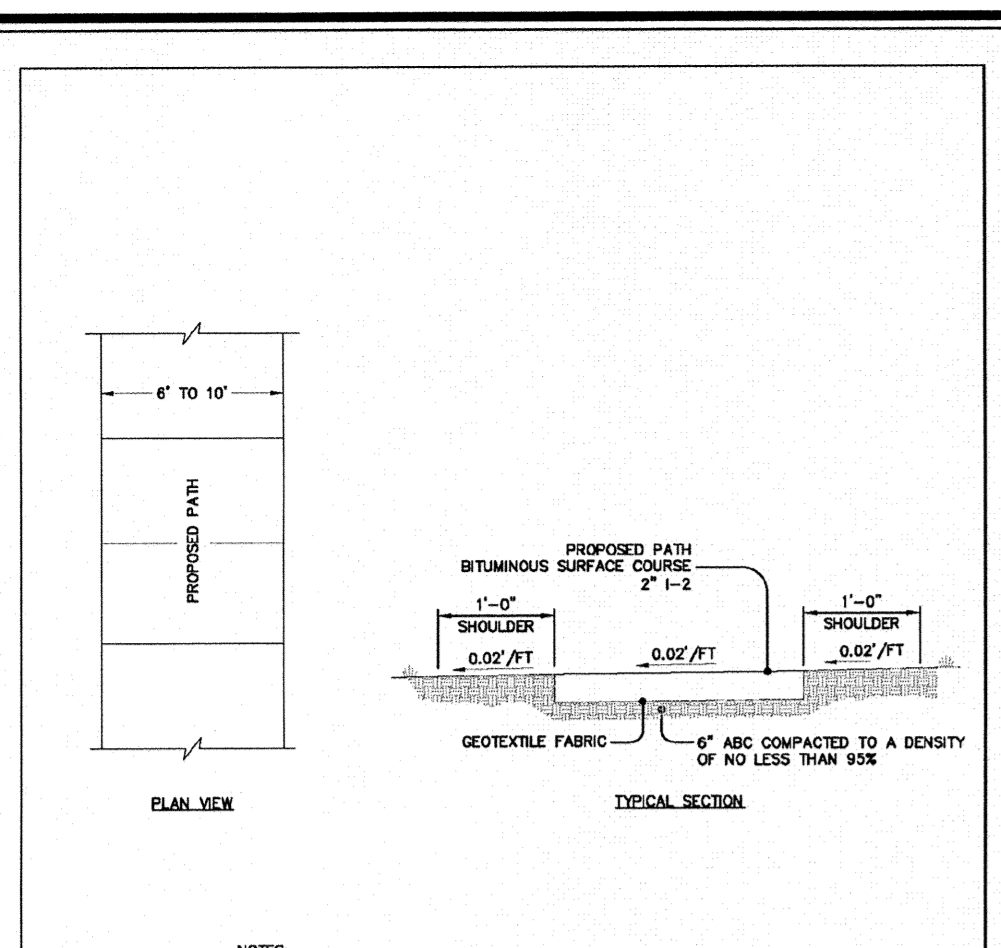
KNIGHTDALE STATION  
 PHASE R3  
 TOWN OF KNIGHTDALE  
 WAKE COUNTY  
 NORTH CAROLINA

SEWER UTILITY DETAILS

**WITHERS & RAVENEL**  
 ENGINEERS | PLANNERS | SURVEYORS

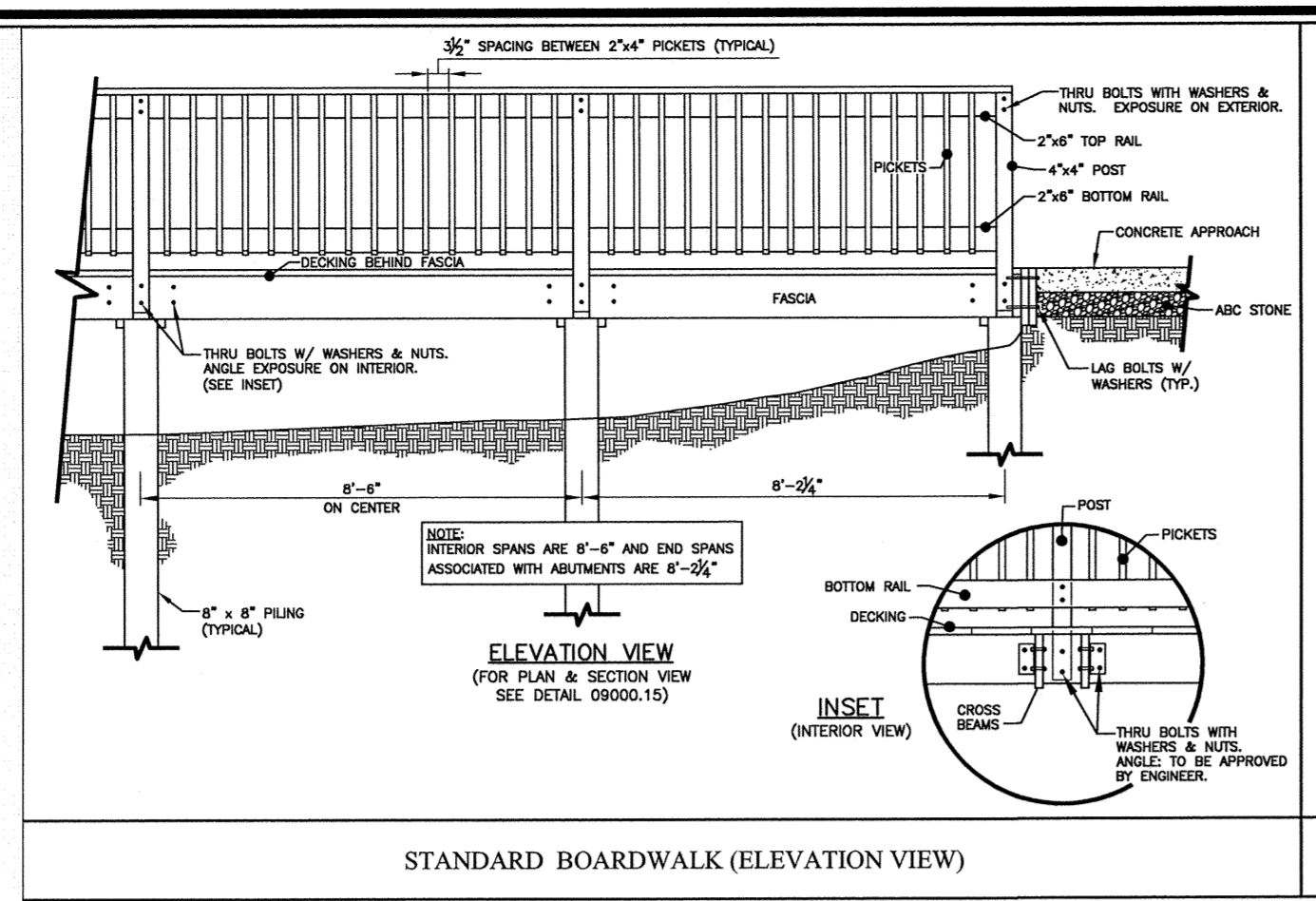
115 MacKean Drive Cary, North Carolina 27511 tel: 919-469-3340 www.wITHERSRV.com License No. C-0832

Sheet No. 20 of 21

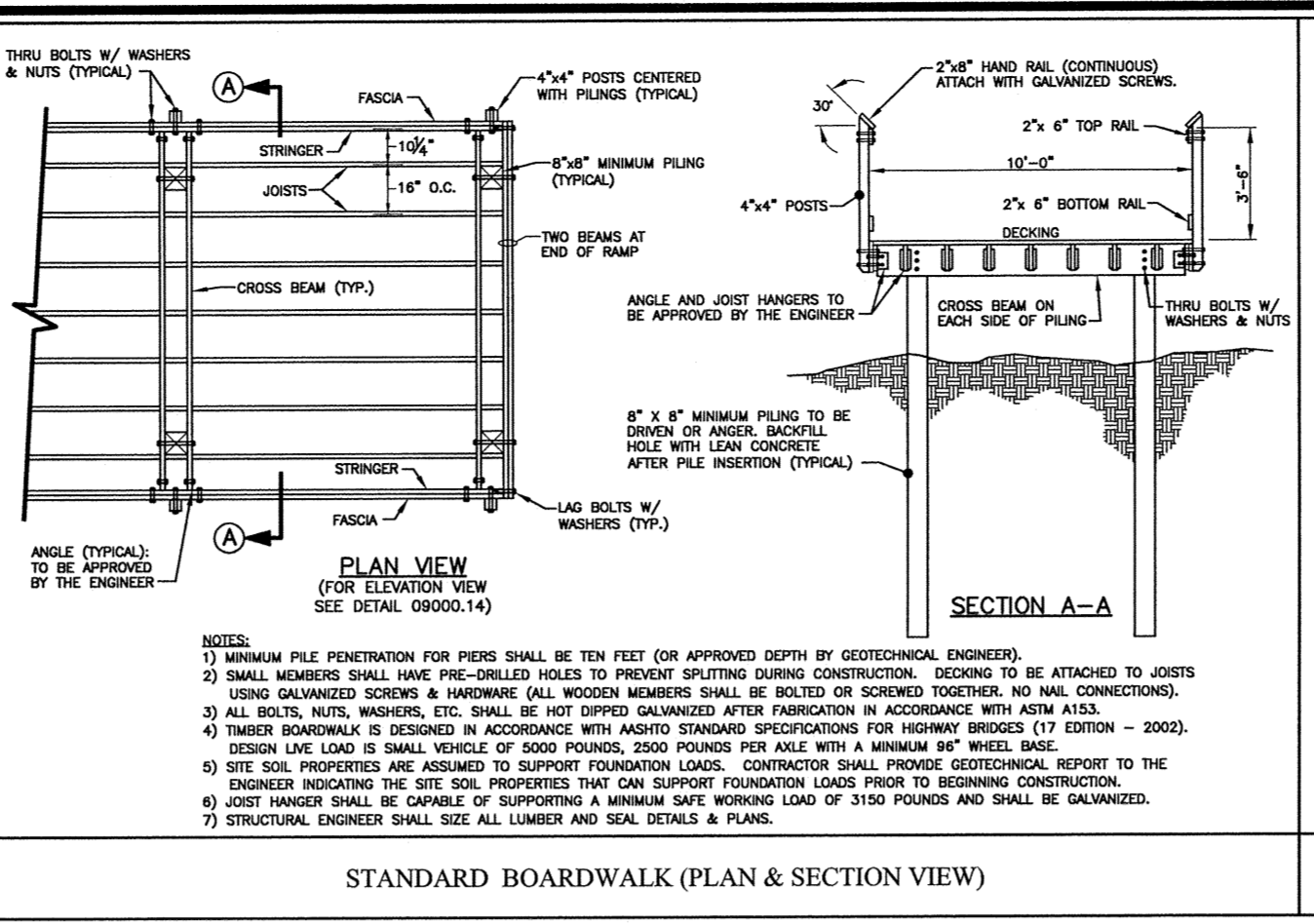


**NOTES:**  
 1. CROSS SLOPE DIRECTION VARIES. SEE LAYOUT PLANS FOR DIRECTION OF SLOPE.  
 2. CONTRACTOR IS RESPONSIBLE FOR REESTABLISHING ALL SLOPES DISTURBED BY CONSTRUCTION.

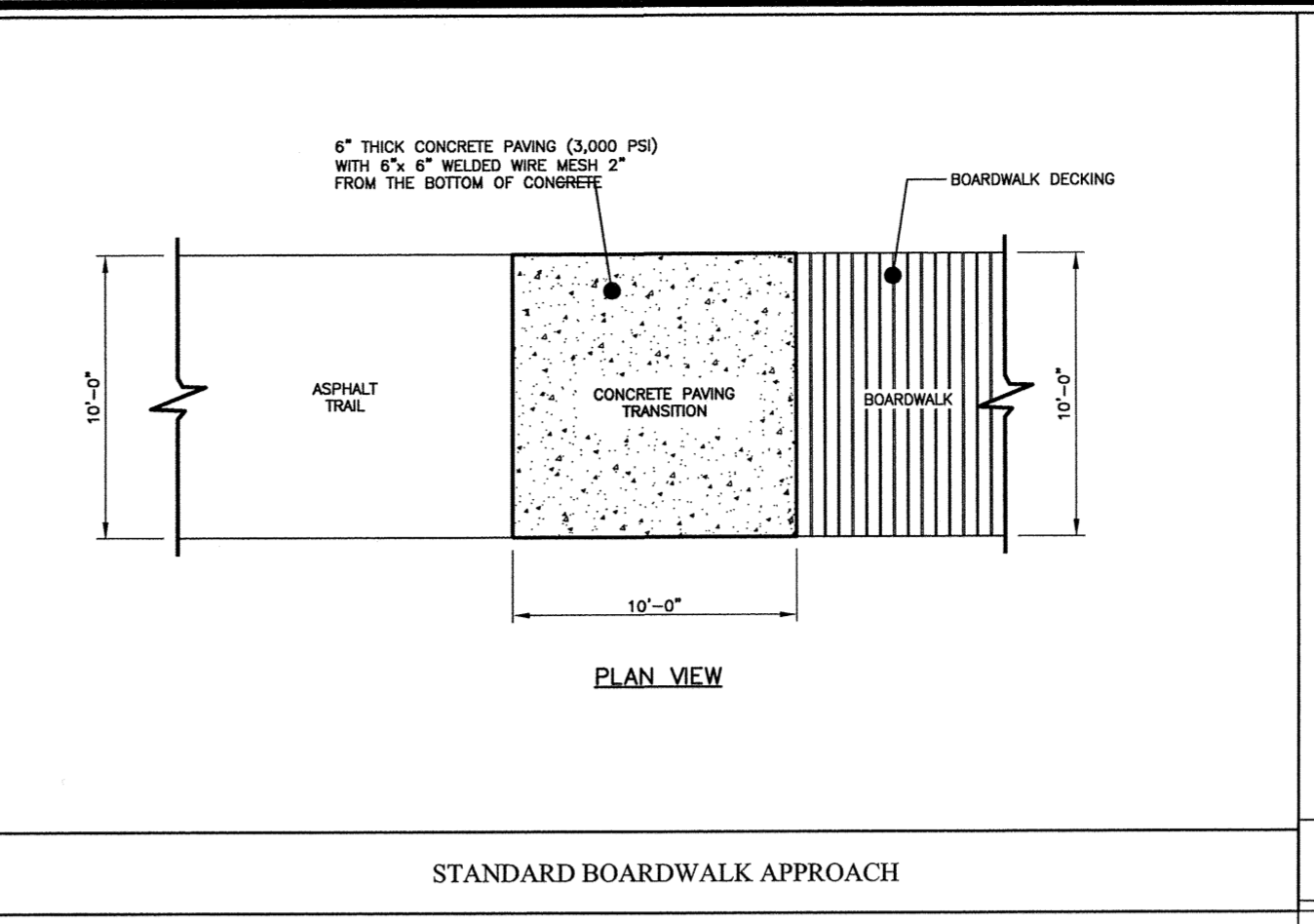
REVISIONS	DATE	DESCRIPTION	SIT. NO.
TOWN OF KNIGHTDALE STANDARD DETAILS		STANDARD MULTI-USE PATH GREENWAY	4.09



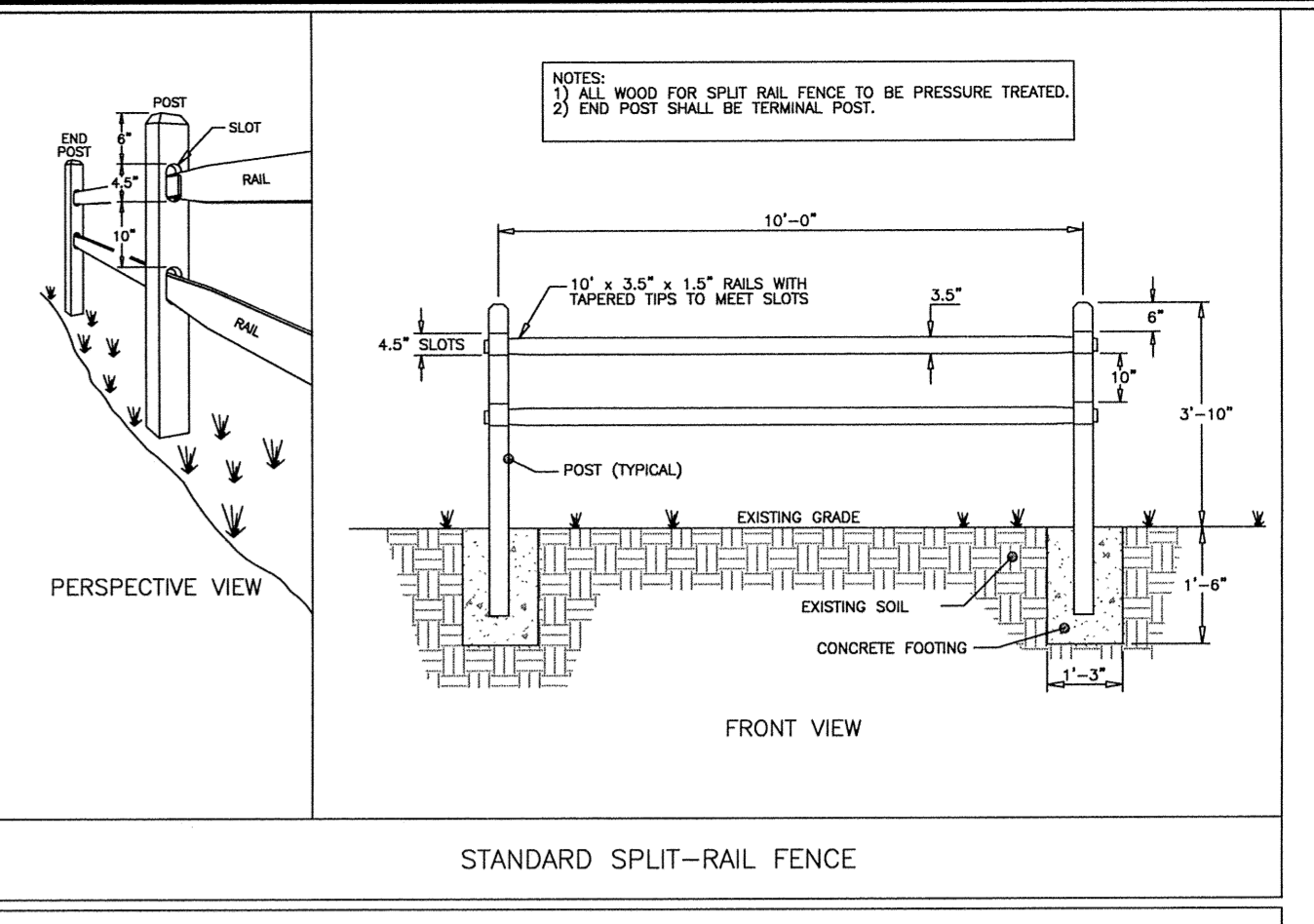
**STANDARD BOARDWALK (ELEVATION VIEW)**



**STANDARD BOARDWALK (PLAN & SECTION VIEW)**

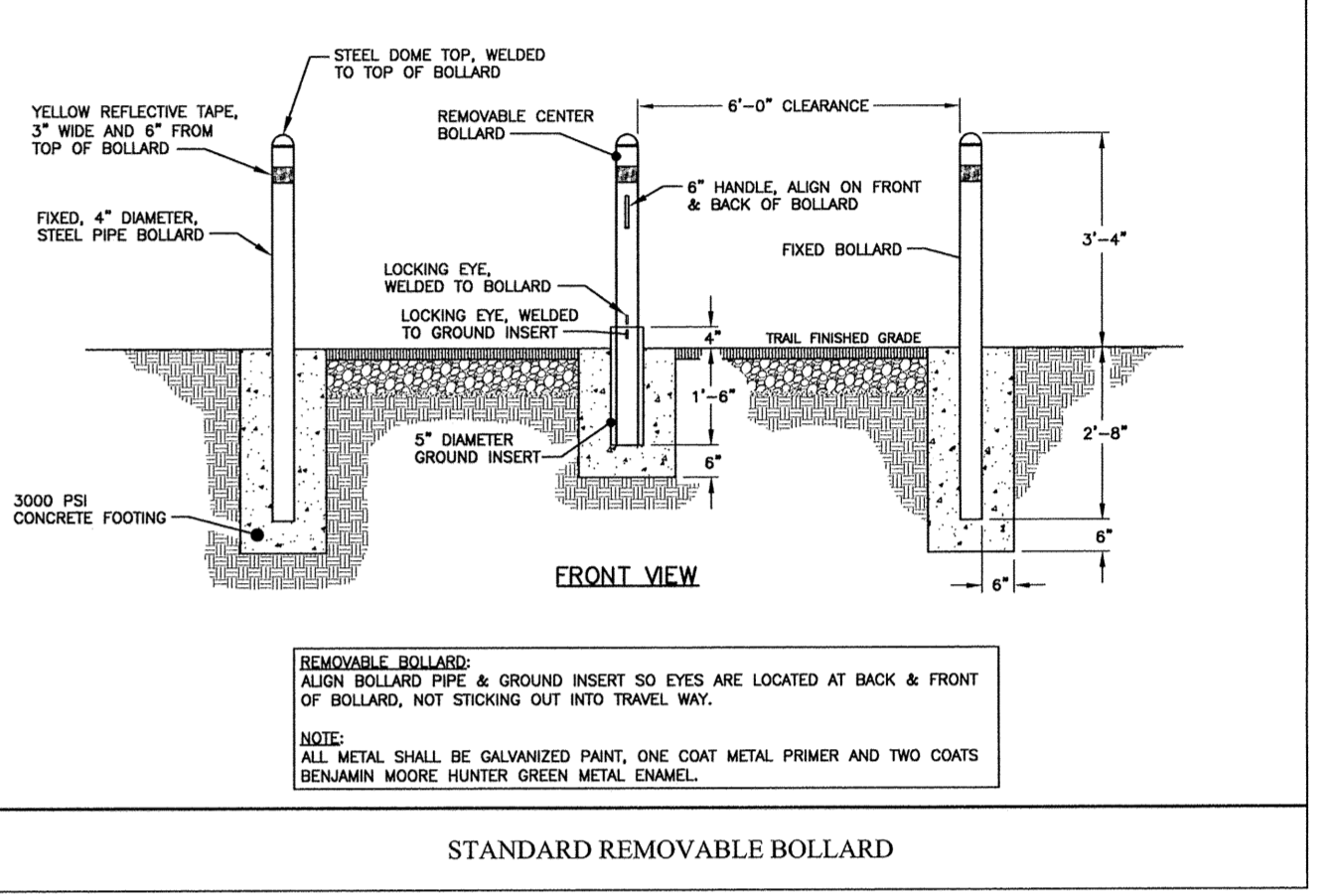


**STANDARD BOARDWALK APPROACH**



**STANDARD SPLIT-RAIL FENCE**

STANDARD BOARDWALK DETAILS SHOWN FOR ILLUSTRATION PURPOSES ONLY, TO BE DESIGNED BY OTHERS.



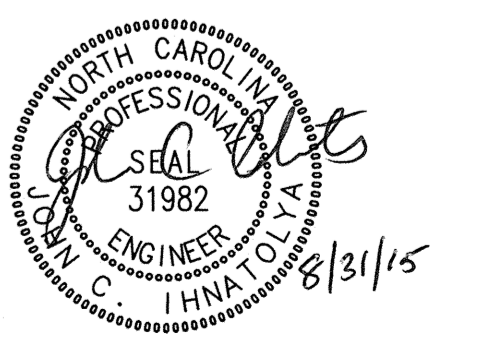
**STANDARD REMOVABLE BOLLARD**

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: 9/23/15  
 TOWN ENGINEER/DEVELOPMENT SERVICES ENGINEER

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

BY: *[Signature]* DATE: 9.25.15  
 ADMINISTRATOR



K:\09-09-0250\0902517-Knightdale Station Phase R3\CAD\Details\DETAILS - R3.dwg - Monday, August 31, 2015 9:44:05 AM - HAMILTON, AUSTIN

No.	Revision	Date	By
1	TOK 1st COMMENTS	08/31/15	JCI

Designer	W&R	Scale	SEE SHEET
Drawn By	JCI	Date	06/23/15
Checked By	JCI	Job No.	02090251.7

**KNIGHTDALE STATION  
 PHASE R3**

TOWN OF KNIGHTDALE      WAKE COUNTY      NORTH CAROLINA

**GREENWAY DETAILS**

**WITHERS & RAVENEL**  
 ENGINEERS | PLANNERS | SURVEYORS

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Sheet No.  
**21** of 21