



Permit No.	Scan Date	DIN
3612-INDUS-2008	September 26, 2016	26764

526 South Church Street:
Mail Code EC13K
Charlotte, North Carolina 28202
704-382-4761

RECEIVED
September 23, 2016
Solid Waste Section
Asheville Regional Office

September 23, 2016

North Carolina Department of Environmental Quality
Division of Waste Management
Solid Waste Section
2090 U.S. Highway 70
Swannanoa, North Carolina 28778

Attn: Mr. Larry Frost

Re: Retired Ash Basin (RAB) Ash Landfill
South Drainage Channel Improvements – Plans and Specifications
Permit No.: 3612-INDUS
Allen Steam Station
Gaston County
Belmont, North Carolina 28012

Dear Mr. Frost,

As previously discussed, Duke Energy plans to make improvements to the drainage channel that runs along the southern edge of the Retired Ash Basin (RAB) Ash Landfill at Allen Steam Station (Permit No. 3612-INDUS). Engineering consultant S&ME, Inc. has prepared plans and specifications for these improvements, which are attached for your review. Duke would appreciate concurrence from the Division concerning these plans prior to commencing construction activities.

If there are any questions regarding these plans, please contact me at (704) 382-4761.

Respectfully Submitted,

Sean DeNeale
Environmental Services

Cc (via e-mail): Ed Mussler, NCDEQ

Kyle Baucom, Duke Energy
Scott Harris, Duke Energy

Steve Loskota, S&ME, Inc.
Mark Taylor, S&ME, Inc.

Attachments: Plans (drawings prepared by S&ME, Inc.)
Specifications (document prepared by S&ME, Inc.)

SOUTH CHANNEL DRAINAGE IMPROVEMENTS ALLEN STEAM STATION RAB LANDFILL

BELMONT, GASTON COUNTY, NORTH CAROLINA

S&ME PROJECT NO. 7235-15-035
09/02/2016

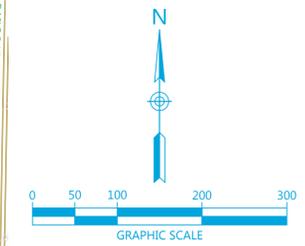
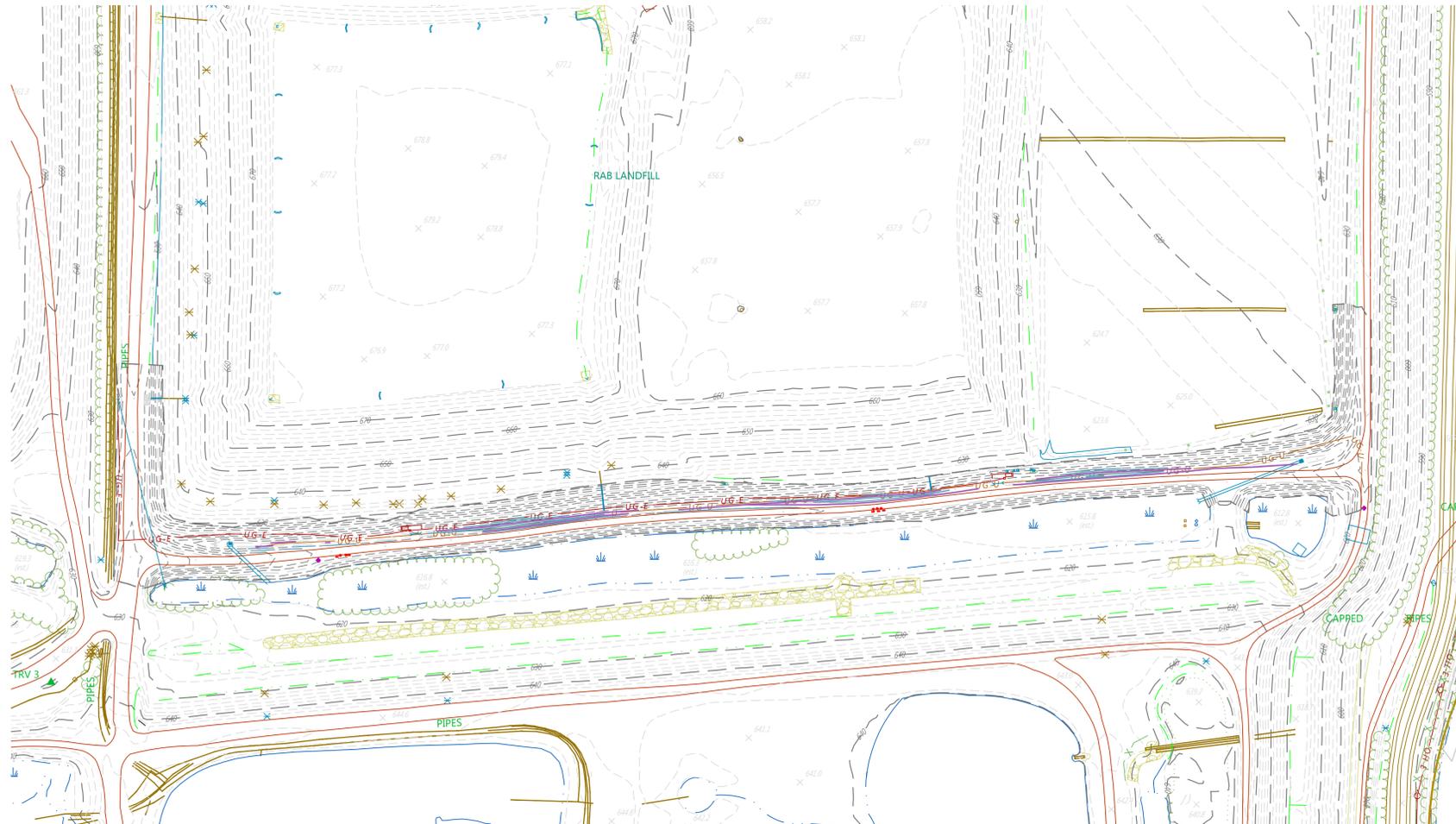


VICINITY MAP
NOT TO SCALE

SITE DATA

OWNER: DUKE ENERGY
ADDRESS: 253 PLANT ALLEN ROAD
BELMONT, NORTH CAROLINA 28012
980.373.6344
PHONE NO.:
CONTACT NAME: KYLE BAUCOM, P.E.
CONTACT E-MAIL ADDRESS: kyle.baucom@duke-energy.com

PROJECT ENGINEER: S&ME, INC.
ADDRESS: 9751 SOUTHERN PINE BLVD.
CHARLOTTE, NC 28273
704.523.4726
PHONE NO.:
CONTACT NAME: STEVE LOSKOTA
CONTACT E-MAIL ADDRESS: slokosta@smeinc.com



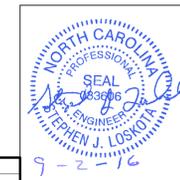
SHEET LIST

SHEET NO.	SHEET TITLE	DUKE DRAWING NO.
1	COVER	ALN_C907.001.001
2	EXISTING CONDITIONS	ALN_C907.001.002
3	PLAN AND PROFILE-WEST	ALN_C907.001.003
4	PLAN AND PROFILE-EAST	ALN_C907.001.004
5	SECTIONS	ALN_C907.001.005
6	EROSION CONTROL PLAN	ALN_C907.001.006
7	DETAILS	ALN_C907.001.007
8	DETAILS AND NOTES	ALN_C907.001.008

PREPARED FOR



253 PLANT ALLEN ROAD
BELMONT, NORTH CAROLINA 28012
980.373.6344



WWW.SMEINC.COM
9751 SOUTHERN PINE BLVD
CHARLOTTE, NC 28273
(704) 523-4726
ENGINEERING FIRM LICENSE NUMBER: F-0176

TITLE: COVER
SOUTH DRAINAGE CHANNEL IMPROVEMENTS
RETIRED ASH BASIN (RAB) ASH LANDFILL
ALLEN STEAM STATION
BELMONT, GASTON COUNTY, NORTH CAROLINA
FOR ISSUED FOR CONSTRUCTION

SCALE: 1"=100'	DES: BCW
DWG TYPE: DWG	DFTR: BCW
JOB NO: 7235-15-035	CHKD: PLM
DATE: 09/02/2016	ENGR: SJL
APPD: SJL	
FILENAME: 7235-15-035_cov.1.dwg	
DWG SIZE: ARCH D 24.0"x35.5"	DRAWING NO. ALN_C907.001.001
	REVISION 0

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION



- GENERAL SURVEY NOTES:**
1. BASIS OF BEARINGS: NC GRID NAD83/2011.
 2. ELEVATIONS ARE BASED ON NAVD88.
 3. THE AREA WITHIN THE SURVEY LIMITS IS BASED ON A FIELD SURVEY BY WSP CONDUCTED ON APRIL 26-27, 2016.
 4. THE CONTOUR INTERVAL IS ONE FOOT INSIDE THE SURVEY LIMITS, BENCHMARKS AS SHOWN.
 5. THIS MAP IS NOT A BOUNDARY SURVEY.
 6. THE DASHED PLANIMETRIC LOCATION ON THIS MAP OUTSIDE OF THE SURVEY LIMITS IS BASED ON PHOTOGRAMMETRIC MAPPING OF IMAGERY COLLECTED ON APRIL 17, 2014. [ALTITUDE OF SENSOR = 3,600' / SENSOR FOCAL LENGTH = 153.53mm] THE IMAGERY CAPTURED IS SUITABLE TO CREATE 1" = 100' SCALE MAPPING AND CONTOURS AT AN INTERVAL OF 2'; AND MEETS THE NATIONAL MAP ACCURACY STANDARDS FOR 1" = 100' SCALE MAPPING. DATA PROVIDED WHERE CLEAR AND VISIBLE ON THE IMAGERY IS WITHIN 2' OF ITS TRUE POSITION. NO INFORMATION OUTSIDE THE SURVEY LIMITS WAS UPDATED FOR THIS EXHIBIT.
 7. UNDERGROUND UTILITIES SHOWN HEREON WERE MARKED IN THE FIELD BY PYRAMID ENVIRONMENTAL ON APRIL 25, 2016.
 8. FLOOD LINES NOT SHOWN HEREON, FLOOD HAZARD AREA IS OUTSIDE OF THE SURVEY LIMITS. PER WWW.FRIS.NC.GOV.
 9. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
 10. THE AREA SHOWN HEREON WAS COMPUTED USING THE COORDINATE COMPUTATION METHOD.
 11. LINES NOT SURVEYED ARE SHOWN AS BROKEN LINES FROM INFORMATION REFERENCED ON THE FACE OF THIS PLAT.
 12. PROPERTY SUBJECT TO ALL EASEMENTS AND RESTRICTIONS OF RECORD.

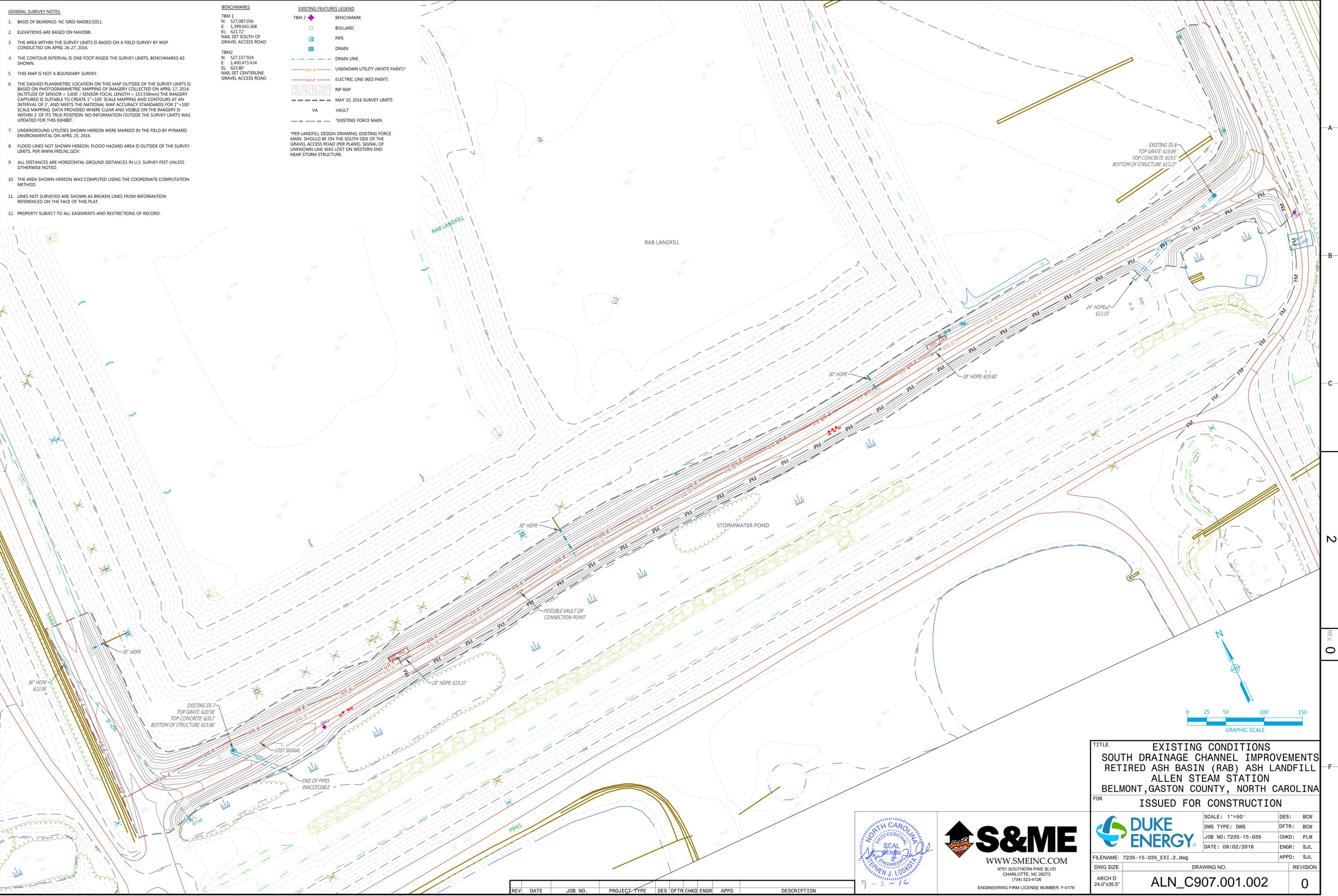
BENCHMARKS

TBM 1
 N: 527.087.056
 E: 1.399.043.368
 EL: 621.72'
 NAIL SET SOUTH OF GRAVEL ACCESS ROAD

TBM 2
 N: 527.157.924
 E: 1.400.473.434
 EL: 623.80'
 NAIL SET CENTERLINE GRAVEL ACCESS ROAD

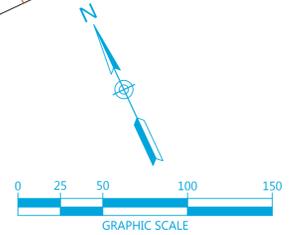
- EXISTING FEATURES LEGEND**
- TBM 1 BENCHMARK
 - TBM 2 BENCHMARK
 - BOLLARD
 - PIPE
 - DRAIN
 - DRAIN LINE
 - UNKNOWN UTILITY (WHITE PAINT)*
 - ELECTRIC LINE (RED PAINT)
 - RIP RAP
 - MAY 10, 2016 SURVEY LIMITS
 - VAULT
 - EXISTING FORCE MAIN

*PER LANDFILL DESIGN DRAWING, EXISTING FORCE MAIN SHOULD BE ON THE SOUTH SIDE OF THE GRAVEL ACCESS ROAD (PER PLANS). SIGNAL OF UNKNOWN LINE WAS LOST ON WESTERN END NEAR STORM STRUCTURE.



EXISTING DI-8
 TOP GRATE: 619.84'
 TOP CONCRETE: 619.5'
 BOTTOM OF STRUCTURE: 613.27'

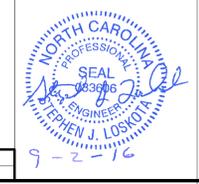
EXISTING DI-7
 TOP GRATE: 620.58'
 TOP CONCRETE: 620.2'
 BOTTOM OF STRUCTURE: 615.80'



TITLE
EXISTING CONDITIONS
SOUTH DRAINAGE CHANNEL IMPROVEMENTS
RETIRED ASH BASIN (RAB) ASH LANDFILL
ALLEN STEAM STATION
BELMONT, GASTON COUNTY, NORTH CAROLINA
 FOR
ISSUED FOR CONSTRUCTION

SCALE: 1"=50'	DES: BCW
DWG TYPE: DWG	DFTR: BCW
JOB NO: 7235-15-035	CHKD: PLM
DATE: 09/02/2016	ENGR: SJL
FILENAME: 7235-15-035_EX1.2.dwg	APPD: SJL

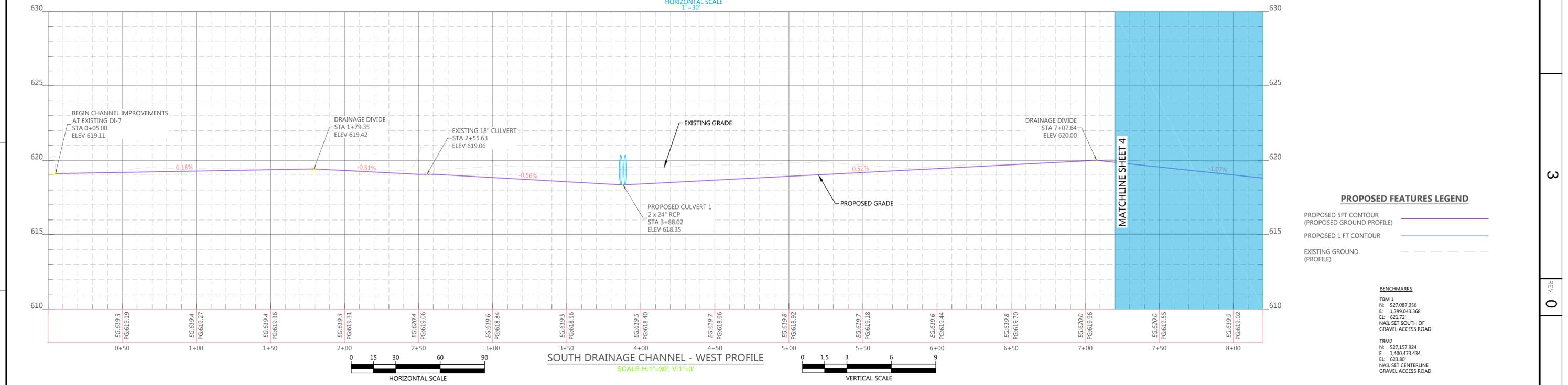
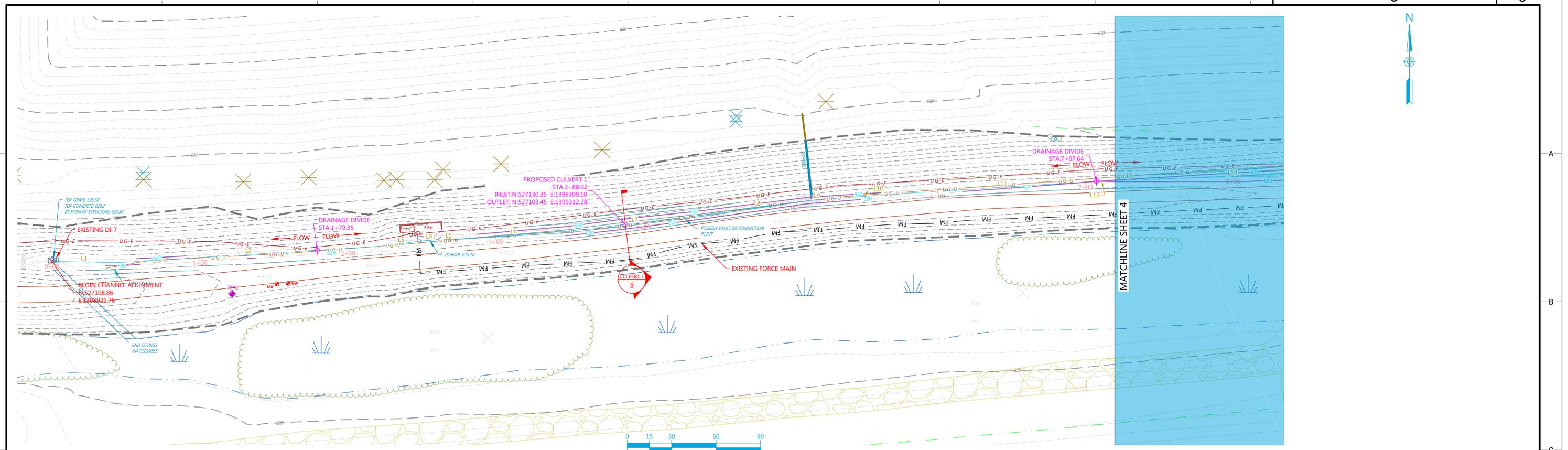
DWG SIZE: ARCH D 24.0"x35.5"
 DRAWING NO.: ALN_C907.001.002
 REVISION: 0



S&ME
 WWW.SMEINC.COM
 9751 SOUTHERN PINE BLVD
 CHARLOTTE, NC 28273
 (704) 523-4726
 ENGINEERING FIRM LICENSE NUMBER: F-0176

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION





PROPOSED FEATURES LEGEND

- PROPOSED 5 FT CONTOUR (PROPOSED GROUND PROFILE)
- PROPOSED 1 FT CONTOUR
- EXISTING GROUND (PROFILE)

BENCHMARKS

TBM 1
 N: 527,087.056
 E: 1,399,043.368
 EL: 621.72'
 NAIL SET SOUTH OF GRAVEL ACCESS ROAD

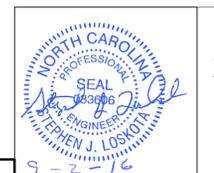
TBM 2
 N: 527,157.924
 E: 1,400,473.434
 EL: 623.80'
 NAIL SET CENTERLINE GRAVEL ACCESS ROAD

Line #	Length	Direction	Start Point	End Point
L1	43.49	S88° 53' 42.08"E	(1398921.76,527108.86)	(1398965.24,527108.02)
L2	179.14	N86° 28' 18.26"E	(1398965.24,527108.02)	(1399144.05,527119.05)
L3	27.60	N82° 36' 01.80"E	(1399144.05,527119.05)	(1399171.42,527122.60)
L4	10.80	N85° 14' 37.74"E	(1399171.42,527122.60)	(1399182.18,527123.50)
L5	15.08	N88° 42' 59.95"E	(1399182.18,527123.50)	(1399197.25,527123.84)
L6	73.05	N85° 50' 17.51"E	(1399197.25,527123.84)	(1399270.11,527129.14)
L7	91.52	N83° 14' 36.17"E	(1399270.11,527129.14)	(1399360.99,527139.90)
L8	75.55	N82° 13' 23.72"E	(1399360.99,527139.90)	(1399435.84,527150.13)
L9	4.96	N87° 47' 27.80"E	(1399435.84,527150.13)	(1399440.80,527150.32)

Line #	Length	Direction	Start Point	End Point
L10	59.37	N85° 46' 15.68"E	(1399440.80,527150.32)	(1399500.01,527154.70)
L11	127.09	N86° 24' 08.37"E	(1399500.01,527154.70)	(1399626.84,527162.67)
L12	7.20	N87° 47' 17.69"E	(1399626.84,527162.67)	(1399634.04,527162.95)
L13	27.72	N87° 52' 34.33"E	(1399634.04,527162.95)	(1399661.74,527163.98)
L14	114.17	N87° 56' 29.57"E	(1399661.74,527163.98)	(1399775.83,527168.08)
L15	97.64	N85° 07' 33.54"E	(1399775.83,527168.08)	(1399873.13,527176.37)
L16	14.21	N79° 27' 31.64"E	(1399873.13,527176.37)	(1399887.09,527178.97)
L17	27.53	N80° 20' 01.77"E	(1399887.09,527178.97)	(1399914.23,527183.59)
L18	54.14	N82° 17' 28.11"E	(1399914.23,527183.59)	(1399967.88,527190.86)

Line #	Length	Direction	Start Point	End Point
L19	10.20	N82° 42' 26.93"E	(1399967.88,527190.86)	(1399978.00,527192.15)
L20	15.49	S89° 54' 43.61"E	(1399978.00,527192.15)	(1399993.48,527192.13)
L21	104.78	N85° 12' 59.64"E	(1399993.48,527192.13)	(1400097.90,527200.87)
L22	135.58	N85° 55' 08.54"E	(1400097.90,527200.87)	(1400233.14,527210.51)
L23	36.46	N85° 54' 57.67"E	(1400233.14,527210.51)	(1400269.50,527213.11)
L24	55.60	N86° 51' 20.00"E	(1400269.50,527213.11)	(1400325.02,527216.16)
L25	56.64	N84° 13' 59.26"E	(1400325.02,527216.16)	(1400381.38,527221.85)

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION



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 9751 SOUTHERN PINE BLVD
 CHARLOTTE, NC 28273
 (704) 523-4726
 ENGINEERING FIRM LICENSE NUMBER: F-0176

DUKE ENERGY

SCALE: 1"=30'
 DWG TYPE: DWG
 JOB NO: 7235-15-035
 DATE: 09/02/2016

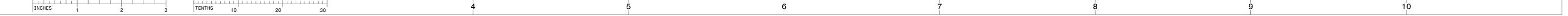
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 CHKD: PLM
 ENGR: SJL
 APPD: SJL

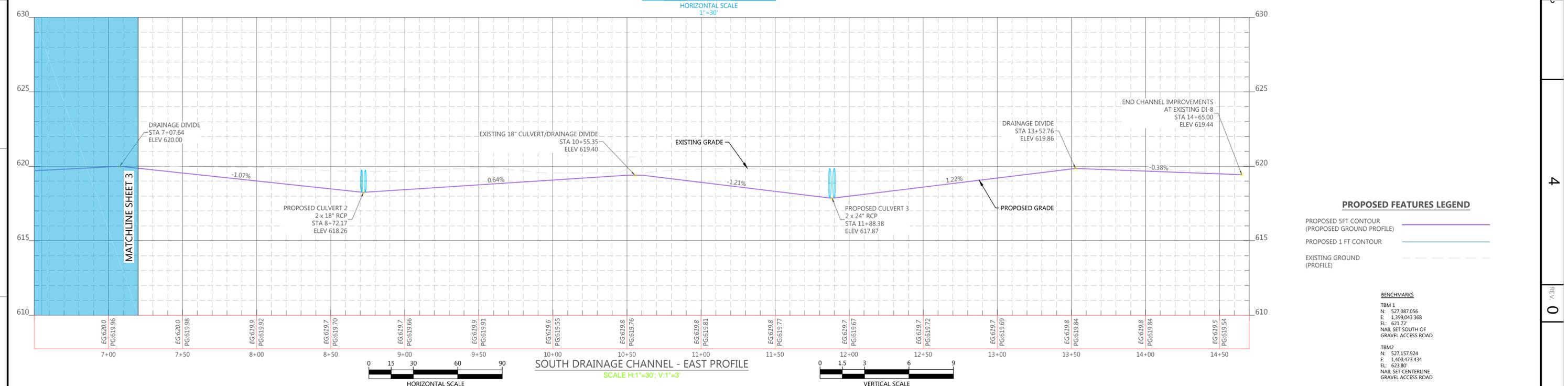
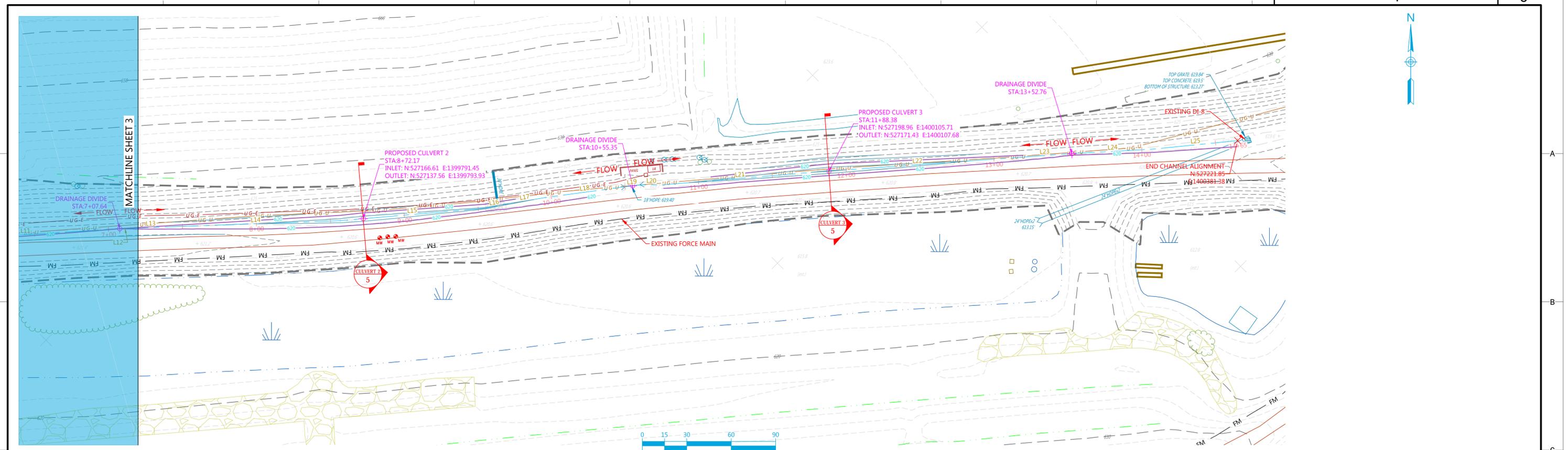
FILENAME: 7235-15-035_GRA.3.4.5.dwg
 ARCH D
 24.0"x35.5"

TITLE: **PLAN AND PROFILE-WEST SOUTH DRAINAGE CHANNEL IMPROVEMENTS RETIRED ASH BASIN (RAB) ASH LANDFILL ALLEN STEAM STATION BELMONT, GASTON COUNTY, NORTH CAROLINA**
 ISSUED FOR CONSTRUCTION

DRAWING NO: **ALN_C907.001.003**

REVISION: **0**





PROPOSED FEATURES LEGEND

- PROPOSED SFT CONTOUR (PROPOSED GROUND PROFILE)
- PROPOSED 1 FT CONTOUR
- EXISTING GROUND (PROFILE)

BENCHMARKS

TBM 1
 N: 527,087.055
 E: 1,399,043.368
 EL: 621.72'
 NAIL SET SOUTH OF GRAVEL ACCESS ROAD

TBM 2
 N: 527,157.924
 E: 1,400,473.434
 EL: 623.80'
 NAIL SET CENTERLINE GRAVEL ACCESS ROAD

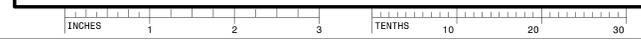
TITLE PLAN AND PROFILE-EAST
 SOUTH DRAINAGE CHANNEL IMPROVEMENTS
 RETIRED ASH BASIN (RAB) ASH LANDFILL
 ALLEN STEAM STATION
 BELMONT, GASTON COUNTY, NORTH CAROLINA
 FOR ISSUED FOR CONSTRUCTION

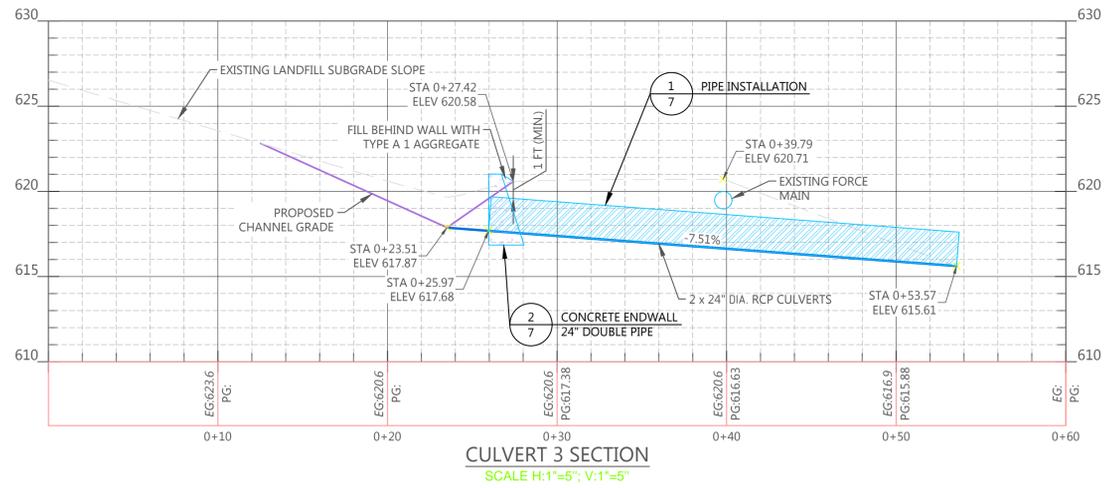
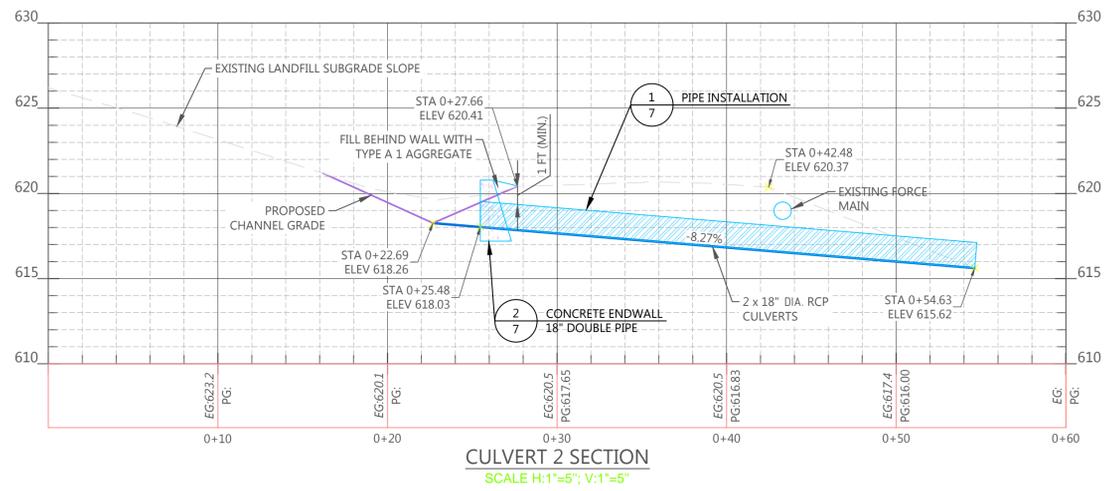
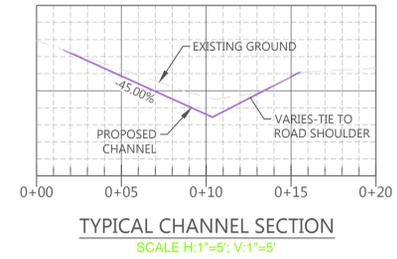
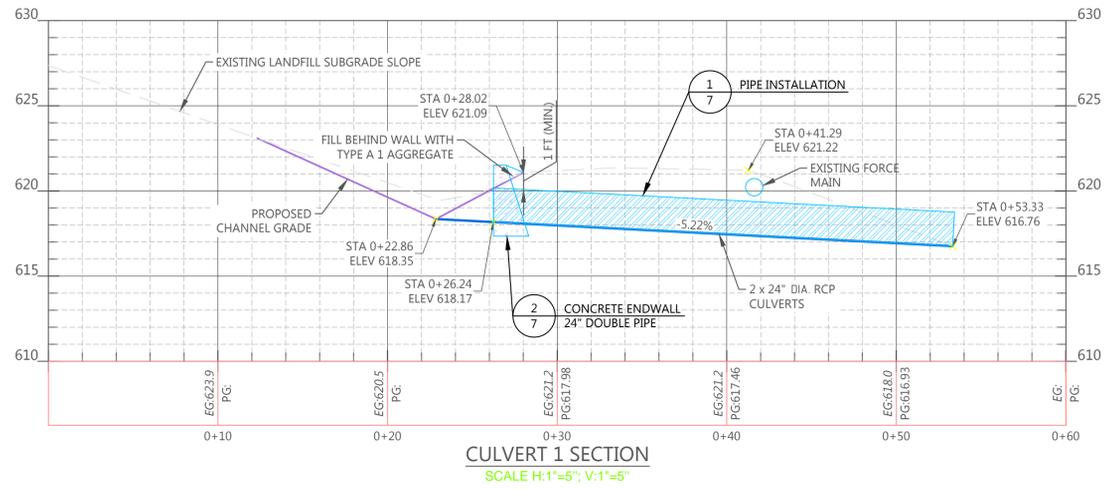
	SCALE: 1"=30' DWG TYPE: DWG JOB NO: 7235-15-035 DATE: 09/02/2016	DES: BCW DFTR: BCW CHKD: PLM ENGR: SJL APPD: SJL
FILENAME: 7235-15-035_GRA_3.4.5.dwg DWG SIZE: ARCH D 24.0"x36.5"	DRAWING NO. ALN_C907.001.004	REVISION 0



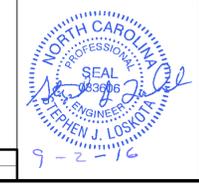
S&ME
 WWW.SMEINC.COM
 9761 SOUTHERN PINE BLVD
 CHARLOTTE, NC 28273
 (704) 523-4726
 ENGINEERING FIRM LICENSE NUMBER: F-0176

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION



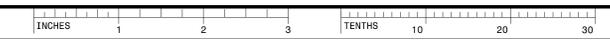


TITLE
SECTIONS
 SOUTH DRAINAGE CHANNEL IMPROVEMENTS
 RETIRED ASH BASIN (RAB) ASH LANDFILL
 ALLEN STEAM STATION
 BELMONT, GASTON COUNTY, NORTH CAROLINA
 FOR
ISSUED FOR CONSTRUCTION

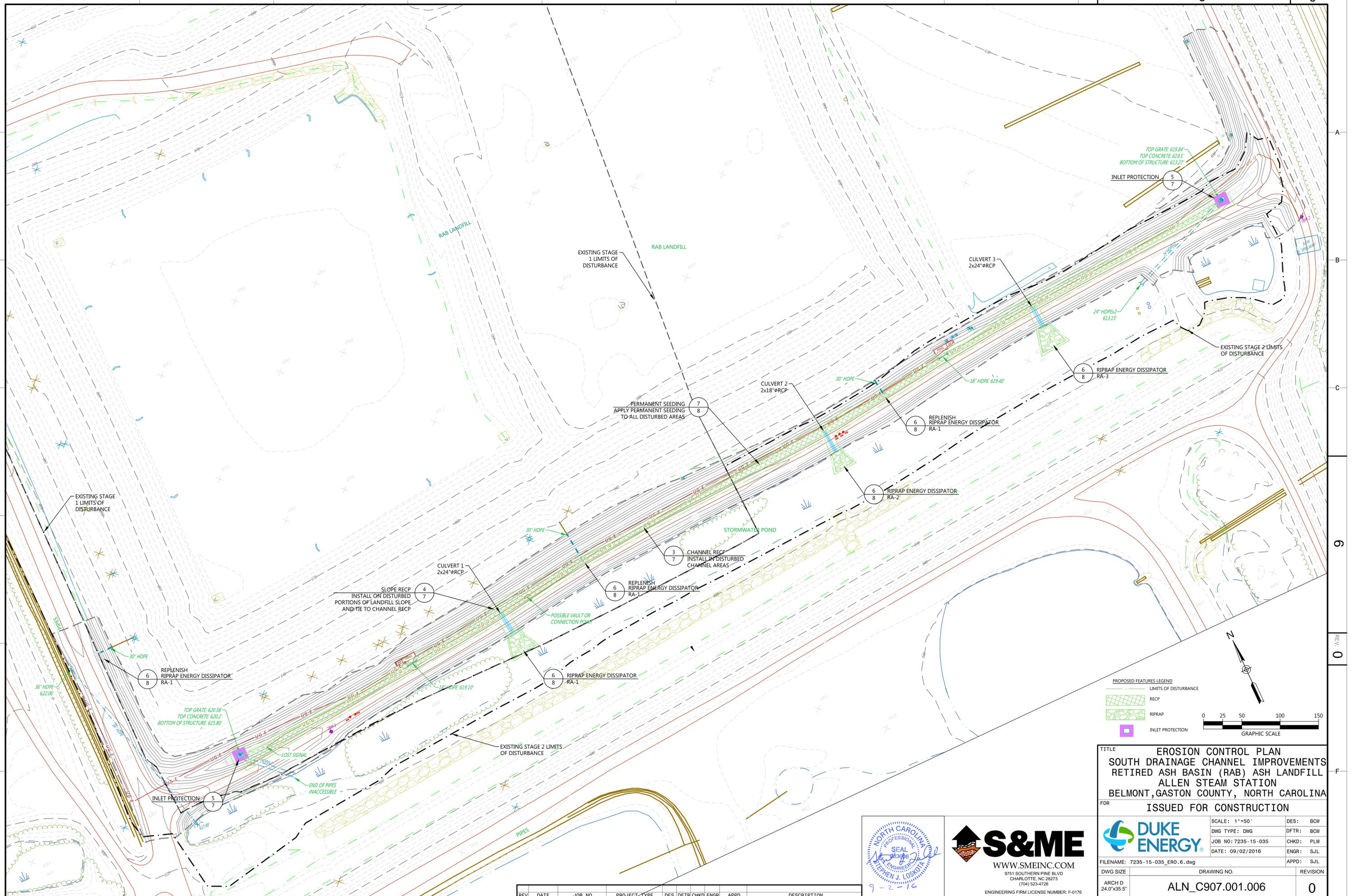


DUKE ENERGY	SCALE: 1"=5'	DES: BCW
	DWG TYPE: DWG	DFTR: BCW
	JOB NO: 7235-15-035	CHKD: PLM
	DATE: 09/02/2016	ENGR: SJL
FILENAME: 7235-15-035_GRA_3.4.5.dwg	APPD: SJL	
DWG SIZE: ARCH D 24.0"x35.5"	DRAWING NO. ALN_C907.001.005	REVISION: 0

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION



A B C D E F 5 0



TOP GRATE: 619.84
 TOP CONCRETE: 619.5
 BOTTOM OF STRUCTURE: 613.27

INLET PROTECTION 5
 7

EXISTING STAGE 1 LIMITS OF DISTURBANCE

RAB LANDFILL

CULVERT 3
 2x24" RCP

24" HDPE 2
 613.15

EXISTING STAGE 2 LIMITS OF DISTURBANCE

6
 8 RIPRAP ENERGY DISSIPATOR
 RA-3

CULVERT 2
 2x18" RCP

6
 8 REPLENISH RIPRAP ENERGY DISSIPATOR
 RA-1

PERMANENT SEEDING
 APPLY PERMANENT SEEDING
 TO ALL DISTURBED AREAS

7
 8

6
 8 RIPRAP ENERGY DISSIPATOR
 RA-2

EXISTING STAGE 1 LIMITS OF DISTURBANCE

3
 7 CHANNEL RECP
 INSTALL IN DISTURBED
 CHANNEL AREAS

6
 8 REPLENISH RIPRAP ENERGY DISSIPATOR
 RA-1

SLOPE RECP
 INSTALL ON DISTURBED
 PORTIONS OF LANDFILL SLOPE
 AND TIE TO CHANNEL RECP

4
 7

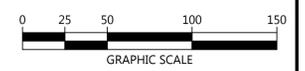
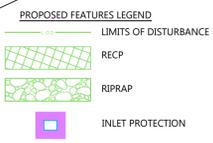
CULVERT 1
 2x24" RCP

6
 8 RIPRAP ENERGY DISSIPATOR
 RA-1

6
 8 REPLENISH RIPRAP ENERGY DISSIPATOR
 RA-1

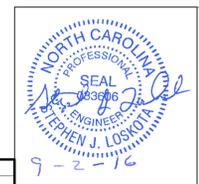
TOP GRATE: 620.58
 TOP CONCRETE: 620.2
 BOTTOM OF STRUCTURE: 615.80

INLET PROTECTION 5
 7



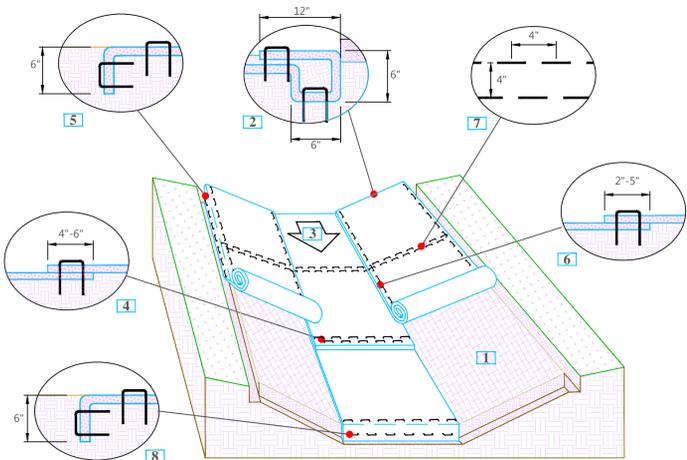
TITLE EROSION CONTROL PLAN
 SOUTH DRAINAGE CHANNEL IMPROVEMENTS
 RETIRED ASH BASIN (RAB) ASH LANDFILL
 ALLEN STEAM STATION
 BELMONT, GASTON COUNTY, NORTH CAROLINA
 FOR ISSUED FOR CONSTRUCTION

SCALE: 1"=50'	DES: BCW
DWG TYPE: DWG	DFTR: BCW
JOB NO: 7235-15-035	CHKD: PLM
DATE: 09/02/2016	ENGR: SJL
FILENAME: 7235-15-035_ERO.6.dwg	APPD: SJL
DWG SIZE: ARCH D 24.0"x35.5"	DRAWING NO. ALN_C907.001.006
	REVISION 0



REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION





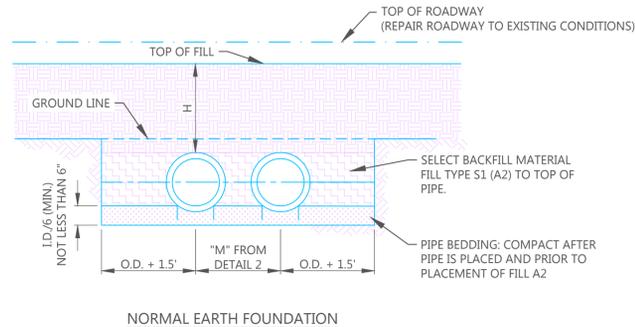
3 CHANNEL RECP INSTALLATION

NOT TO SCALE

- NOTES:
1. NAG S75BN OR APPROVED EQUAL SHALL BE APPLIED TO ALL DISTURBED CHANNEL AND SLOPE AREAS.
 2. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECPs), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
 3. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE RECPs IN A 6"(15CM) DEEP X 6"(15CM) WIDE TRENCH WITH APPROXIMATELY 12"(30CM) OF RECPs EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. USE SHOREMAX MAT AT THE CHANNEL/CULVERT OUTLET AS SUPPLEMENTAL SCOUR PROTECTION AS NEEDED. ANCHOR THE RECPs WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12"(30CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO THE COMPACTED SOIL AND FOLD THE REMAINING 12"(30CM) PORTION OF RECPs BACK OVER THE SEED AND COMPACTED SOIL. SECURE RECPs OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE RECPs.
 4. ROLL CENTER RECPs IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. RECPs WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECPs MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.
 5. PLACE CONSECUTIVE RECPs END-OVER-END (SHINGLE STYLE) WITH A 4"-6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE RECPs.
 6. FULL LENGTH EDGE OF RECPs AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12"(30CM) APART IN A 6"(15CM) DEEP X 6"(15CM) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
 7. ADJACENT RECPs MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5-12.5CM) (DEPENDING ON RECPs TYPE) AND STAPLED.
 8. IN HIGH FLOW CHANNEL APPLICATIONS A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (9 -12M) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4"(10CM) APART AND 4"(10CM) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
 9. THE TERMINAL END OF THE RECPs MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30CM) APART IN A 6"(15CM) DEEP X 6"(15CM) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
 10. SOURCE: NORTH AMERICAN GREEN.

CRITICAL POINTS
 A. OVERLAPS AND SEAMS
 B. PROJECTED WATER LINE
 C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

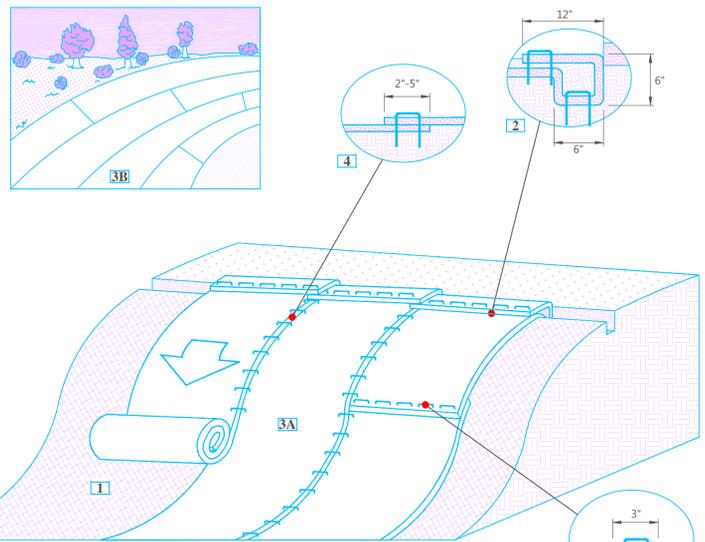
NOTES:
 *HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
 **IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6"(15CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECPs.



1 PIPE INSTALLATION

NOT TO SCALE

- NOTES:
1. PIPE SHALL BE CLASS IV OR CLASS V REINFORCED CONCRETE PIPE (AASHTO M170).
 2. I.D. IS THE MAXIMUM HORIZONTAL INSIDE DIAMETER OF THE PIPE.
 3. O.D. IS THE MAXIMUM HORIZONTAL OUTSIDE DIAMETER OF THE PIPE.
 4. H IS THE FILL HEIGHT VERTICALLY TO ANY POINT ALONG THE PIPE FROM THE TOP OF THE PIPE TO THE TOP OF THE EMBANKMENT AT THAT POINT.
 5. MINIMUM H SHALL BE 1 FOOT AS MEASURED FROM THE TOP OF PIPE TO BOTTOM OF PAVEMENT STRUCTURE.
 6. BEDDING MATERIAL SHALL BE LOOSELY PLACED SELECT MATERIAL AGGREGATE A2. LEAVE SECTION DIRECTLY BENEATH PIPE UNCOMPACTED AS PIPE SEATING AND BACKFILL WILL ACCOMPLISH COMPACTION.
 7. SOURCE: NCDOT STANDARD DRAWING 300.01.

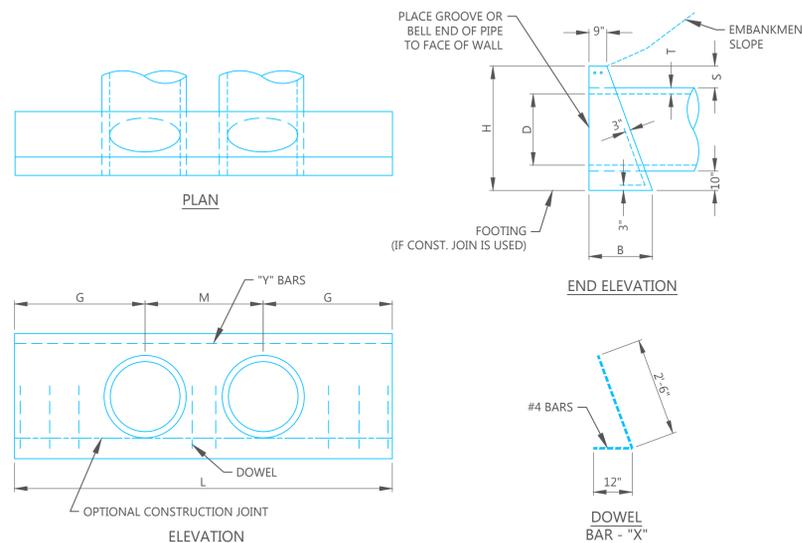


4 SLOPE RECP INSTALLATION

NOT TO SCALE

- NOTES:
1. NAG S75BN OR APPROVED EQUAL SHALL BE APPLIED TO ALL DISTURBED CHANNEL AND SLOPE AREAS.
 2. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECPs), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
 3. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECPs IN A 6"(15CM) DEEP X 6"(15CM) WIDE TRENCH WITH APPROXIMATELY 12" (30CM) OF RECPs EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECPs WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO THE COMPACTED SOIL AND FOLD THE REMAINING 12"(30CM) PORTION OF RECPs BACK OVER THE SEED AND COMPACTED SOIL. SECURE RECPs OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12"(30CM) APART ACROSS THE WIDTH OF THE RECPs.
 4. ROLL THE RECPs (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. RECPs WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECPs MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.
 5. THE EDGES OF PARALLEL RECPs MUST BE STAPLED WITH APPROXIMATELY 2" - 5" (5-12.5CM) OVERLAP DEPENDING ON THE RECPs TYPE.
 6. CONSECUTIVE RECPs SPICED DOWN THE SLOPE MUST BE END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3"(7.5CM) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12"(30CM) APART ACROSS ENTIRE RECPs WIDTH.

*NOTE:
 IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6"(15CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECPs.



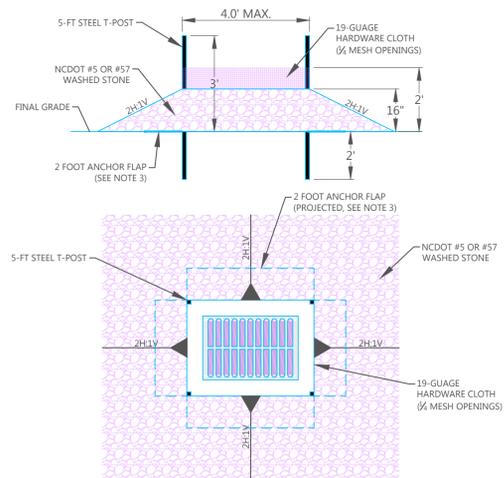
2 CONCRETE ENDWALL

NOT TO SCALE

LOC.	PIPE DIA.	SINGLE PIPE								DOUBLE PIPE							
		15"	18"	24"	30"	36"	42"	48"	15"	18"	24"	30"	36"	42"	48"		
G	QTY.	2	2	3	3	4	4	4	5	5	6	6	7	7	8	8	
M	QTY.	-	-	-	-	-	-	2	-	2	1	1	2	2	2	2	
G	QTY.	2	2	3	3	4	4	4	5	5	6	6	7	7	8	8	
TOTAL	LBS.	9	9	14	14	19	19	55	65	65	12	12	19	19	23	23	

DIMENSIONS AND CONCRETE QUANTITIES USING CONCRETE PIPE																					
COMMON DIMENSIONS					SINGLE PIPE					DOUBLE PIPE											
D	H	B	g	T	S	L	yd ³	M	L	yd ³	D	H	B	g	T	S	L	yd ³			
15"	3'-3"	1'-8"	2'-8"	2 1/4"	9 1/2"	5'-8"	0.7	2'-2"	7'-8"	1.0	18"	3'-7"	1'-10"	3'-2"	2 1/2"	10"	8'-0"	1.0	2'-7"	8'-11"	1.3
24"	4'-2"	2'-11"	4'-0"	3"	10"	8'-0"	1.5	3'-5"	11'-5"	2.0	30"	5'-0"	2'-6"	4'-7"	4 1/4"	11 1/2"	9'-2"	2.3	4'-3"	13'-5"	3.1
36"	5'-8"	2'-8"	5'-6"	4 3/4"	11 1/2"	11'-0"	3.4	4'-3"	15'-5"	4.5	42"	6'-2"	3'-1"	6'-4"	5 1/4"	11 1/2"	12'-8"	4.5	5'-10"	18'-6"	6.0
48"	6'-9"	3'-5"	7'-2"	6 3/4"	11 1/2"	14'-4"	6.0	6'-8"	21'-0"	8.0											

- NOTES:
1. CHAMFER ALL CORNERS 1" OR HAVE A RADIUS OF 1".
 2. PLACE 2 #6 "Y" BARS IN THE TOP OF ALL ENDWALL FOR PIPE CULVERTS 42" AND OVER WITH A MINIMUM OF 3" COVER AND A LENGTH OF 6" LESS THAN ENDWALL LENGTH.
 3. CONSTRUCT BOTTOM SLAB WITH FORMS.
 4. DO NOT INTERPRET WALL THICKNESS (T) FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.
 5. IF CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR "X" DOWELS IN THE BASE AS SHOWN. SPACE BARS APPROXIMATELY ON 12" CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
 6. IF THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE AND POUR THE BASE SEPARATELY, LEAVE THE POUR ROUGH.
 7. CONCRETE SHALL BE CLASS "B" CONCRETE.
 8. SOURCE: NCDOT STANDARD DRAWING 838.01.

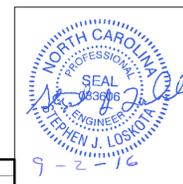


5 INLET PROTECTION

NOT TO SCALE

- CONSTRUCTION SPECIFICATIONS:
1. UNIFORMLY GRADE A SHALLOW DEPRESSION APPROACHING THE INLET.
 2. DRIVE 5-FOOT STEEL POSTS 2 FEET INTO THE GROUND SURROUNDING THE INLET. SPACE POSTS EVENLY AROUND THE PERIMETER OF THE INLET, A MAXIMUM OF 4 FEET APART. OMIT THIS STEP IF STEEL POSTS CANNOT BE INSTALLED (I.E. DUE TO LOCATION IN CONCRETE CHANNEL).
 3. SURROUND THE POSTS WITH WIRE MESH HARDWARE CLOTH. SECURE THE WIRE MESH TO THE STEEL POSTS AT THE TOP, MIDDLE AND BOTTOM. PLACING A 2-FOOT FLAP OF THE WIRE MESH UNDER THE GRAVEL FOR ANCHORING IS RECOMMENDED. OMIT THIS STEP IF STEEL POSTS CANNOT BE INSTALLED (I.E. DUE TO LOCATION IN CONCRETE CHANNEL).
 4. PLACE CLEAN GRAVEL (NCDOT #5 OR #57 STONE) ON A 2:1 SLOPE WITH A HEIGHT OF 16 INCHES AROUND THE WIRE, AND SMOOTH TO AN EVEN GRADE.
 5. ONCE THE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED, REMOVE ACCUMULATED SEDIMENT, AND ESTABLISH FINAL GRADING ELEVATIONS.
 6. COMPACT THE AREA PROPERLY AND STABILIZE IT WITH GROUND COVER.
 7. CONTRACTOR TO REMOVE INLET PROTECTION UPON ATTAINMENT OF FINAL STABILIZATION.
- MAINTENANCE NOTES:
1. INSPECT INLETS AT LEAST WEEKLY AND AFTER EACH RAINFALL EVENT THAT EXCEEDS 0.5 INCHES WITHIN A 24 HOUR PERIOD. CLEAR THE MESH WIRE OF ANY DEBRIS OR OTHER OBJECTS TO PROVIDE ADEQUATE FLOW FOR SUBSEQUENT RAINS. TAKE CARE NOT TO DAMAGE OR UNDERCUT THE WIRE MESH DURING SEDIMENT REMOVAL. REPLACE STONE AS NEEDED.
- *REF: 6.51.2 NC Erosion and Sediment Control Planning and Design Manual, 2006

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENGR	APPD	DESCRIPTION



TITLE: DETAILS SOUTH DRAINAGE CHANNEL IMPROVEMENTS RETIRED ASH BASIN (RAB) ASH LANDFILL ALLEN STEAM STATION BELMONT, GASTON COUNTY, NORTH CAROLINA FOR ISSUED FOR CONSTRUCTION

SCALE: N.T.S. DES: BCW
 DWG TYPE: DWG DFTR: BCW
 JOB NO: 7235-15-035 CHKD: PLM
 DATE: 09/02/2016 ENGR: SJL
 APPD: SJL

FILENAME: 7235-15-035_DET.7.8.dwg
 DWG SIZE: 24.0"x35.5" DRAWING NO. ALN_C907.001.007 REVISION 0

TECHNICAL SPECIFICATIONS
SOUTH DRAINAGE CHANNEL IMPROVEMENTS
ALLEN STEAM STATION RAB LANDFILL
BELMONT, NORTH CAROLINA
S&ME Project No. 7235-15-035

Prepared for:



Duke Energy – Allen Steam Station
253 Plant Allen Road
Belmont, North Carolina 28012

Prepared by:



Charlotte, North Carolina

September 2016

**TECHNICAL SPECIFICATIONS
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DIVISION 01

GENERAL REQUIREMENTS



SECTION 01 0000
GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Summary Work
 - a. Project Summary
 - b. Engineer Responsibilities
 - c. Contractor and Subcontractor Qualifications
 - d. Work Sequence
 2. Schedule
 - a. General Requirements
 - b. Schedule
 - c. Meetings
 3. Construction Work Plan
 - a. Preliminary Work Plan
 - b. Contractor's Work Plan Contents
 - c. Delays and Recovery
 4. Price Payment
 - a. Measurement
 - b. Calculation of Quantities
 - c. Payment
 - d. Change Procedures.
 - e. Defect Assessment
 - f. Force Account Work
 - g. Unit Prices
 - h. Dewatering
 5. Administrative Requirements
 - a. Project Management
 - b. Construction Coordination
 - c. Meetings
 - d. Submittal Procedures
 6. Quality Requirements
 - a. Quality Control and Control of Installation
 - b. Tolerances
 - c. Testing and Observation Requirements
 - d. Certificates of Compliance
 7. Temporary Facility Controls
 - a. Temporary Controls
 - b. Temporary Facilities
 - c. Site Security
 8. Environmental Protection
 - a. General
 - b. Protection of Land Resources
 - c. Protection of Water Resources
 - d. Storage and Disposal of Petroleum Products
 - e. Control of Air Pollutants

9. Product Requirements
 - a. Product Substitution Procedures
10. Execution Requirements
 - a. Closeout Procedures
 - b. Project Record Documents
11. Performance Acceptance Criteria
12. References

PART 2 SUMMARY WORK

2.01 PROJECT SUMMARY

- A. The summary of work is defined in Section 01 1000.
- B. Perform Work of Contract under stipulated sum with Duke Energy (Owner) in accordance with Conditions of Contract.
- C. Work of Contract shall be constructed to the lines and elevations as shown on the Drawings and as identified in these Technical Specifications. Any deviations from the Drawings or Technical Specifications require the prior written approval of S&ME Inc. (ENGINEER) and must be documented by "record" revisions to the Drawings and/or Technical Specifications.
- D. During phases of construction, construction will be tested, monitored, and evaluated prior to approval.

2.02 ENGINEER RESPONSIBILITIES

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth as follows and will not be changed without written consent of Owner and Engineer.
 1. Neither Engineer's authority or responsibility under this Section or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Vendor (Contractor), any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
 2. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
 3. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
 4. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by the Contract Documents will only be to determine generally that their

content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

5. The limitations upon authority and responsibility set forth in this Section shall also apply to the Resident Project Representative, if any, and assistants, if any.

2.03 CONTRACTOR AND SUBCONTRACTOR QUALIFICATIONS

- A. General Contractor (Contractor AND Subcontractor):
 1. The Contractor AND Subcontractor must be qualified and experienced in construction work and must submit qualifications as required by the Bid Instructions.
- B. Surveyor:
 1. All field layouts shall be performed by or under the supervision of a licensed Professional Land Surveyor registered in the state where the Work is to be conducted. The Contractor shall establish and maintain a minimum of two permanent benchmarks. Horizontal and vertical locations of the benchmarks shall be recorded on the Record Drawings.

2.04 WORK SEQUENCE

- A. General Order of Construction. During and prior to construction period, coordinate construction schedule and operations with Owner, Engineer, and any other applicable parties.
- B. The work sequence shall generally follow the work description summarized in Section 01 1000, and shall be consistent with the work sequences identified in the Erosion Control Plan and existing NPDES permit.

PART 3 SCHEDULE

3.01 GENERAL REQUIREMENTS

- A. The platform for this schedule shall be in an electronic format agreeable to the Owner.
- B. Specific schedule format shall include activities, start date, finish date, duration, activity logic (predecessor and successor activities), percent progress, and milestones.
- C. The Contractor shall only be permitted to work during daylight hours. The Contractor may seek exceptions to these work hours with Owner authorization.
- D. The schedule calendar shall be depicted with defined work hours i.e. 4 – 10's, 5 – 10's, etc.
- E. Bidders shall submit a proposed project schedule with their bids and the successful Bidder shall submit a final project schedule within 15 days of award.
- F. Bidders shall comply with Duke Energy Safety Handbook, including MICCS card program, Site Orientation, daily pre-job briefs, JHAs, supplemental EHS requirements.

3.02 SCHEDULE

- A. It is suggested that the schedule include at a minimum those items described in the scope of work in Section 01 1000.
- B. The schedule shall include but not be limited to the following milestones:

1. Install erosion and sediment control measures
 2. Locate utilities within the work area
 3. Excavate and re-grade existing drainage channel
 4. Construct culverts
 5. Construct headwalls and endwalls
 6. Construct outlet stabilization
 7. Seeding and site stabilization
 8. Project Substantial Completion
 9. Demobilization
 10. Acceptance of Work
- C. During construction, the schedule shall be updated on a monthly basis.

3.03 MEETINGS

- A. The successful bidder shall allow and plan for the following meetings in the project schedule:
1. Preconstruction meeting with the Owner, Engineer, and NCDENR regulatory personnel if required
 2. Regular weekly construction progress meetings with the Owner.

PART 4 CONSTRUCTION WORK PLAN

4.01 PRELIMINARY WORK PLAN

- A. Prepare and submit with Bid, a preliminary Work Plan.
- B. Owner will review the preliminary Work Plan as part of the bid evaluation.
- C. The Contractor may be interviewed by the Owner to determine the Contractor's understanding of the project, and ability to complete the work in a timely and efficient manner.
- D. Submit final Work Plan 10 days after signing Contractor / Owner Agreement.

4.02 CONTRACTOR'S WORK PLAN CONTENTS

- A. Work Plan shall summarize personnel, equipment, and procedures required to accomplish specific items of work, including:
1. Safety readiness review, safety matrix and any other pertinent safety requirements in order to start work.
 2. Organization chart, showing Contractor, Subcontractors, Subconsultants and key personnel.
 3. Equipment and routes for moving and stockpiling materials on site.
 4. Methods for conditioning the moisture content of soils prior to using them for constructing engineered fills.
 5. Methods and equipment for hauling and placing materials.
 6. Dewatering construction methods.
 7. Methods for erosion prevention and sediment control.
 8. Plans for maintaining as-built information.
 9. Project Schedule as specified in this Section.

4.03 DELAYS AND RECOVERY

- A. If, at any time during Project, Contractor fails to complete an activity by its latest scheduled completion date, Contractor must submit, within two working days, a written statement which details the methods by which Contractor proposes to return to current construction schedule.
- B. The Project Manager may require the Contractor to implement some or all of the following:
 - 1. Increase construction staffing in such quantities and crafts.
 - 2. Increase number of working hours per shift, shifts per work day, work days per week, or amount of construction equipment, or combination of foregoing.
 - 3. Reschedule work items to achieve concurrence of accomplishment.
- C. Under no circumstances will the addition of equipment or construction resources, an increase in working hours or any other method, manner or procedure implemented to return the project to current Construction Progress Schedule be considered justification for a contract modification or treated as an acceleration.

PART 5 PRICE PAYMENT

5.01 MEASUREMENT

- A. Performed according to United States Standard measure.
- B. Based on actual units installed or neat line dimensions of work completed.

5.02 CALCULATION OF QUANTITIES

- A. Progress Payment Quantities:
 - 1. Contractor will compute all quantities of Work performed, or of materials and equipment delivered to the site for progress payment purposes.
 - 2. Owner may at any time verify quantities calculated by Contractor.
- B. Final Payment Quantities: Contractor will compute all quantities of Work performed, or of materials and equipment delivered to the site for final payment purposes. Owner may verify all quantities.
- C. Earthwork quantities: Quantities of earthwork will be measured in their final installed location only. It is anticipated that soil disposal or stockpiling may require multiple handling of materials. Include any necessary costs for multiple handling of materials or temporary stockpiling in bid item prices for other specified work.

5.03 PAYMENT

- A. In accordance with lump sum, unit prices, or force account rates shown on the Bid Proposal Form.
- B. Includes all costs for overhead and profit and for supplying materials, labor, equipment, tools, necessary to complete the Work in accordance with the Specifications, Drawings, and Contract Conditions.

5.04 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Owner will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time.
- C. The Owner may issue a Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change, and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within five days.
- D. Contractor may propose changes by submitting a request for change to Owner, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with this Specification.
- E. Work Directive Change: Owner may issue directive instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

5.05 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer and/or Owner, it is not practical to remove and replace the Work, the Engineer will direct appropriate remedy or adjust payment.
- C. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- D. Authority of Engineer and/or Owner to assess defects and identify payment adjustments is final.
- E. Non-Payment for Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

5.06 FORCE ACCOUNT WORK

- A. Payment for Force Account work will be determined as follows:
- B. Labor.
 - 1. Payment for labor will be based on the Force Account Labor Rate Schedule submitted with the bid.
 - 2. Payment constitutes full compensation for labor including wages, benefits, overhead, and

profit for each individual.

C. Equipment.

1. Payment for equipment will be based on the Force Account Equipment Rate Schedule submitted with the bid.
2. Payment constitutes full compensation for supplying equipment and includes all costs for maintenance, fuel, insurance, overhead, profit and any other costs necessary to provide and operate the equipment. Payment does not include operator labor cost.

D. Materials.

1. Payment for materials will be paid for at cost plus 10 percent.
2. Payment will be based on invoices from suppliers indicating cost to Contractor.
3. Where invoices are not available, a unit cost must be approved by the Owner prior to use of the material.

E. Where requested by Owner, force account work will be based on three bids from suppliers or Subcontractors.

F. Standby Time:

1. Payment for standby time will be based on the Force Account Labor Rate, Force Account Equipment Rate (minus an agreed upon percentage for fuel, maintenance and wear and tear) and Overhead Profit Percentage.
2. Measurement will be by written approval of the Owner dated prior to Standby time starting.

5.07 UNIT PRICES

A. Unit Quantities

1. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.
2. Take measurements and compute quantities. Engineer will verify measurements and quantities.
3. Quantities and measurements indicated in Bid Form and/or Contract Documents are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
 - a. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit prices contracted.
 - b. When actual Work requires 30 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim for Contract Price adjustment.

B. Unit Prices

1. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.
2. Specific Item Unit Pricing is delineated in the individual specification sections.
3. Mobilization
 - a. Basis of Measurement: By lump sum.
 - b. Basis of Payment: Includes mobilization for the project.
4. Surveying

- a. Basis of Measurement: By lump sum.
- b. Basis of Payment: Includes surveying to the locations and grades according to the plans and specifications and providing record drawings, and any incidentals in completing the contract. Surveys required to complete record drawings shall include, at a minimum, the following:
 - 1) Existing Conditions Survey: after clearing, before stripping.
 - 2) Final Subgrade Survey: after excavation, cut, and fill for construction of drainage channel.
 - 3) Installed stormwater piping and associated structures..

5.08 DEWATERING

- A. No measurement or payment will be made for dewatering.
- B. Include unit rate cost for this work in other bid items, dewatering may not be limited to:
 1. Lowering groundwater to perform excavation for drainage channel excavation.
 2. Providing, installing, and operating temporary pump for groundwater control for trenching, and placement of outlet stabilization in the existing sediment pond.
 3. Constructing any necessary temporary storm water drainage features.

PART 6 ADMINISTRATIVE REQUIREMENTS

6.01 PROJECT MANAGEMENT

- A. Owner will provide a Project Manager. The Project Manager represents the Owner. Any reference to coordination or communication, both written and verbal, with the Owner, must be through the Project Manager.
- B. The Project Manager also represents the various Engineer's and consultants responsible for project design. All communication with the Engineers and consultants must go through the Project Manager.
- C. Project Manager: To be identified at the pre-construction meeting.

6.02 CONSTRUCTION COORDINATION

- A. Cooperate with the Project Manager in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- B. During construction, coordinate use of site and facilities through the Project Manager.
- C. Comply with Project Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination of drawings, and recommendations; and resolution of ambiguities and conflicts.
- D. Comply with instructions of the Project Manager for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Manager.

6.03 MEETINGS

- A. Pre-construction meeting.

1. Owner will schedule a preconstruction meeting and location after Notice of Award
 2. Attendance:
 - a. Contractor's On-Site Field Superintendent.
 - b. Any Subcontractors or Supplier's representatives whom Contractor may desire to invite or Owner may request.
 - c. Engineer.
 - d. Owner's Representatives.
 - e. Project Manager.
 3. An agenda will be prepared by the Project Manager and may include the following:
 - a. Presentation of a proposed construction progress schedule and submittals per this Section.
 - b. Review of critical work sequencing.
 - c. Procedures for handling submittals and proposed substitutions.
 - d. Direction of correspondence, coordinating responsibility between Contractor and Owner, and defining lines of communication and authority.
 - e. Weekly progress meetings.
 - f. Establish procedures for reviewing test data and correcting non-conforming work.
 - g. Procedures for field decisions and change orders.
 - h. Health and safety.
 - i. Site security.
 - j. Owner's site regulations.
 - k. Review the construction drawings, specifications, CQA plan, and related issues.
 - l. Provide all parties with relevant documents.
 - m. Review responsibilities for each party, and key personnel.
 - n. Establish reporting and documenting procedures.
 - o. Conduct a site inspection to discuss work area, stockpile areas, lay down areas, access roads, haul roads, and related items.
 4. The meeting will be documented by the Owner in the form of meeting minutes. Copies of the minutes and relevant documents will be provided to all parties, following the meeting.
- B. Weekly Progress Meetings.
1. Project Manager will hold progress meetings at the project site at regular intervals, once per week or as required. Project Manager will coordinate and schedule meeting dates and times and notify parties that need to attend.
 2. Attendance:
 - a. Contractor's superintendent.
 - b. Subcontractors as appropriate to agenda.
 - c. Suppliers as appropriate to agenda.
 - d. CQA Field Manager.
 - e. Project Manager.
 3. Meeting requirements:
 - a. Owner will administer and document the following general requirements for progress meetings:
 - 1) Prepare agenda for meetings.
 - 2) Make physical arrangements for meetings.
 - 3) Preside at meetings.
 - b. Owner will record significant proceedings and decisions of meeting and reproduce and distribute copies of meeting record within 3 days after each meeting to participants in meeting and to parties affected by decisions made at meeting.

- c. Contractor shall prepare and distribute a brief report at each weekly meeting that includes:
 - 1) Summary and progress to date.
 - 2) Potential problems and impacts to the project.
 - 3) Status of Submittals.
 - 4) Status of Requests for Information.
 - 5) Summary of following weeks activities.
 - 6) Updated schedule.This report will form part of the meeting minutes.

4. Suggested Agenda:
 - a. Review and approval of record minutes of previous meeting.
 - b. Health and safety.
 - c. Review of work progress since previous meeting with weekly quantities.
 - d. Progress planned for next week.
 - e. Field decisions.
 - f. Problems which impede work schedule.
 - g. Anticipated future problems.
 - h. Maintenance of quality and work standards (QA/QC).
 - i. Review of as-built documentation.
 - j. Review of submittal schedule and status of submittals.
 - k. Pending changes and substitutions.
 - l. Review of off-site delivery schedules.
 - m. Review and revisions to project schedule.
 - n. Erosion and sediment control.
 - o. Other business.

C. DAILY PROGRESS MEETINGS

1. An informal progress meeting may be conducted daily before the start of work. At a minimum, this meeting will be attended by the Owner and Contractor to review the previous day's activities and accomplishments. This meeting will be documented by the Contractor in his daily report.

D. OTHER MEETINGS

1. The Project Manager will hold other meetings at his discretion during the Contract.

6.04 SUBMITTAL PROCEDURES

- A. Contractor shall submit a submittal register in duplicate within 10 days after Notice of Award and prior to preconstruction meeting. Submittal register shall identify all submittal requirements contained in the plans and specifications, with references to the plan or specification numbers.
- B. Transmit each submittal with Owner accepted form.
- C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- D. Identify Project, Contractor, Subcontractor and Supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of

- information is in accordance with requirements of the Work and Contract Documents.
- F. Schedule submittals to expedite the Project and deliver in the time frame specified. Coordinate submission of related items.
 - G. Allow 10 days review time for each submittal excluding delivery time to and from the Contractor.
 - H. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of completed Work.
 - I. If necessary, revise and resubmit, and identify all changes made since previous submission.
 - J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.
 - K. When revised for resubmission, identify changes made since previous submission.
 - L. Submittals not requested will not be recognized or processed.

PART 7 LAYOUT OF WORK AND SURVEYS

7.01 SUMMARY

- A. Section includes general requirements for survey work to be performed by the Contractor.
 - 1. Set offset stakes, slope stakes, and grade stakes for field layout of features of the Work.
 - 2. Perform surveys for measurement of pay quantities.
 - 3. Perform surveys to record as-built conditions of the project.

7.02 DESCRIPTION

- A. **Reference Points.** Prior to construction, verify with Owner the locations of site reference points and survey control points. Notify Owner if survey control points are damaged upon discovery. Also notify Owner of any damage caused by Contractor, then repair or replace control points at no additional cost to Owner. The Owner reserves the right to perform any desired checking and correction of the Contractor 's surveys but this does not relieve the Contractor of the responsibility for adequate performance of the Work.
- B. **Equipment and Personnel.** Provide instruments and other survey equipment that is accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times. Perform work under the direct supervision of a licensed surveyor licensed in the state of North Carolina.
- C. **Field Notes and Records.** Record surveys in field notebooks. Electronic notes may be used if printouts are furnished to the Owner by request and if the format of the printed information is approved by the Owner.
- D. **Use by the OWNER.** The Owner may at any time use line and grade points and markers established by the Contractor. The Contractor 's surveys are a part of the Work and may be checked by the Owner or representatives of the Owner at any time. The Contractor is responsible for (1) any lines, grades, or measurements which do not comply with specified design criteria or proper tolerances, or which are otherwise defective, and (2) for any resultant defects in the Work. The Contractor will be required to conduct re-surveys or check

surveys to correct errors indicated by review of the field notebooks or otherwise detected.

7.03 SURVEYS FOR LAYOUT AND PERFORMANCE OF WORK

- A. Perform surveys for layout and performance of the Work, reduce the field notes, make necessary calculations, and prepare drawings necessary to carry out such work.

7.04 SURVEYS FOR RECORD DRAWINGS AND MEASUREMENT FOR PAYMENT

- A. When the Specifications require items of work to be measured by surveying methods, the Contractor will perform the surveys and perform necessary calculations to determine payment quantities. The Owner may perform independent checks.
- B. Items requiring surveys for determining pay quantities are given in this Section, Price Payment.
- C. Provide record (as-built) drawings to the Owner for the following items:
 - 1. Drainage Channel.
 - 2. Elevation and limits for earthwork.
 - 3. Stormwater culvert locations, invert elevations.
 - 4. Leachate force main piping, where found.
 - 5. Ditch flow lines if necessary.
 - 6. Initial and finish grades for the surface water control features.
 - 7. Limits of hydroseeding.
 - 8. Stockpile grades if necessary.
- D. Provide as-built survey drawings in digital format, same stationing, and same orientation for each element as shown on the design drawings. Provide as-built survey information and associated pint data on the same datum and coordinate basis as design drawings. All point data must have clear, easy to understand descriptions. Submit survey information to the Owner before the items are covered.
- E. Provide information in digital format in accordance with Owner’s request.
- F. As-built survey drawings are due on or before substantial completion date.

7.05 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

- A. Perform control traverse field surveys and computations to an accuracy of at least 1:10,000.
- B. The tolerances applicable in setting survey stakes are set forth below. Such tolerances do not supersede stricter tolerances required by the Drawings or Specifications, and do not otherwise relieve the Contractor of responsibility for measurements in compliance therewith.

TABLE OF MARK	HORIZONTAL POSTION	ELEVATION
Permanent reference points	1 in 10,000	± .01 ft
General excavation and earthwork	± 1.0 ft	± .10 ft

- C. Tolerances for designed thicknesses shown on Drawings shown on the Drawings are minimum thicknesses, unless otherwise specified.

7.06 MONITORING DEVICE PROTECTION

- A. Prior to beginning any site work, locate all monitoring wells, piezometers, utility boxes, valve boxes, leachate force main piping, electrical lines or other utilities.
- B. Install markers identifying the location of these devices.
- C. The purpose of the work is to protect these items during construction.
- D. Any items damaged during construction by the Contractor will be replaced by the Contractor at no cost to the Owner.
- E. An example replacement cost for a monitoring well is approximately \$7,500.

7.07 COORDINATION WITH OWNER

- A. Keep Owner informed on progress of survey work to allow Owner sufficient time and ample opportunity to verify survey work without inconvenience or delay to Contractor.

PART 8 QUALITY REQUIREMENTS

8.01 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' and/or supplier's instructions, including each step in sequence.
- C. When manufacturers' and/or supplier's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Construction Drawings or as instructed by manufacturer.
- G. Materials stored off the site shall be stored in accordance with Manufacturer recommendations and stored in a bonded warehouse and shall be clearly marked as being for this project.

8.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

- C. Adjust products to appropriate dimensions; position before securing products in place.

8.03 TESTING AND OBSERVATION REQUIREMENTS

- A. Testing and observation services for the purpose of conducting tests shall be performed by the Engineer or approved third party contractor as required by the technical specifications. All costs of testing shall be paid by the Owner. The entity providing the testing and observation services shall be referred to as the construction quality assurance (CQA) agent herein.
- B. Testing, observations and source quality control may occur on or off project site. Perform off-site testing as required by Engineer or Owner.
- C. Cooperate with CQA agent; furnish samples of materials, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. The Contractor shall give ample advance notice to the CQA agent and Engineer prior to expected time for operations requiring testing services and/or before covering up items that require inspection.
 - 2. Make arrangements with CQA agent and pay for additional samples and tests required for Contractor's use.
- D. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- E. Re-testing or observation required because of non-conformance to specified requirements shall be performed by same CQA agent on instructions by Engineer. Payment for re-testing will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- F. CQA Agent Responsibilities:
 - 1. Provide qualified personnel at site. Cooperate with Owner, Engineer and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials with requirements of Contract Documents.
 - 4. Promptly notify Owner, Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests required by Owner, Engineer.
 - 6. Attend preconstruction meetings and progress meetings.

8.04 CERTIFICATES OF COMPLIANCE

- A. Contractor may use certificates of compliance for certain materials and products in lieu of the specified sampling and testing procedures. Certificates must be signed by an authorized representative of the producer or manufacturer and state that the material complies in all respects with the requirements of the Contract Documents. In the case of multiple shipments, each shipment must be accompanied or preceded by a Certificate of Compliance.
- B. Owner reserves the right to refuse the use of certain materials on the basis of a Certificate of Compliance.

PART 9 TEMPORARY FACILITY CONTROLS

9.01 TEMPORARY CONTROLS

- A. Barriers
 - 1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Water Control
 - 1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
 - 2. Provide water barriers as required to protect site from soil erosion according to project's Erosion Control Plan.
- C. Dust Control
 - 1. Execute Work by methods to minimize raising dust from construction operations.
 - 2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- D. Erosion and Sediment Control
 - 1. Follow project's Erosion Control Plan.
 - 2. Perform any and all inspections required by the project's Erosion Control Plan. The Contractor or designated Owner representative shall perform Erosion and Sediment Control (E&SC) inspections until site stabilization and closeout of the project E&SC permit, or up to 6 months following Substantial Completion.
 - 3. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 4. Minimize surface area of bare soil exposed at one time.
 - 5. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow across disturbed areas.
 - 6. Construct fill and waste areas by selective placement to avoid erosive surface.
 - 7. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- E. Traffic and Safety Controls
 - 1. Provide barricades or safety cones, barrels, etc., to protect workers and site personnel from trenching operations at the site.
 - 2. Control traffic associated with the contract work so that ongoing maintenance and operations of the landfill and its vendors are not disrupted.

9.02 TEMPORARY FACILITIES

- A. Contractor shall provide portable toilet and hand-wash facilities for their employees and subcontractors in accordance with OSHA's per-person ratio, at no additional expense to the owner (price to be included in the base bid). Toilets will be serviced and maintained such that no sustained nuisance odors come from them.

9.03 SITE SECURITY

- A. The Contractor is responsible for securing the work area, equipment, and materials. Owner will not be responsible for vandalism, damage, or theft of equipment and materials on the job site.

PART 10 ENVIRONMENTAL PROTECTION

10.01 GENERAL

- A. The control of environmental pollution, which could result from construction operations under this PO, requires consideration of land, water, and air quality at the site.
- B. The Contractor shall comply with all applicable federal, state, and local laws and regulations concerning environmental pollution control or abatement. The Contractor shall make sure that necessary permits have been obtained and that this work is in compliance with such permits concerning environmental protection.
- C. The Owner and the Contractor shall establish the criteria for compliance and administration of the environmental pollution control program prior to commencement of work.
- D. The Owner will notify the Contractor in writing of any noncompliance with this specification and the action to be taken. The Contractor shall immediately take corrective action.

10.02 PROTECTION OF LAND RESOURCES

- A. Land resources adjacent to the project boundaries shall be preserved in their present condition or restored to a natural appearance.
- B. The Contractor shall exercise care in conducting all operations on private property to minimize the amount of disturbance and damage related to gaining access to, and working at the planned location(s). The Contractor shall not injure or destroy trees or shrubs adjacent to the project site. Construction activities shall be confined within the construction limits shown on the drawings.
- C. The Contractor shall maintain a stable, clean, workable surface in the construction area. Contractor will be responsible for purchasing, hauling and placement of stone, if needed. The Contractor shall be responsible for prevention of littering, removal of all trash and material from the site, and all reasonable preventive measures to maintain all private property in a condition acceptable to the Owner.
- D. The Contractor shall perform the final restoration of the construction area (e.g., plant grass). Repairs which are, in the opinion of the Owner, required to restore any land, structures, or appurtenances damaged through carelessness, negligence, or irresponsible acts on the part of the Contractor, or any of their employees, shall be the sole responsibility of the Contractor and will not be paid for by the Owner. Such repairs shall be carried out in a timely manner at the direction of, and to the satisfaction of the Owner in accordance with the station specific Vegetation Maintenance Implementation Plan.

10.03 PROTECTION OF WATER RESOURCES

- A. The Contractor shall not adversely affect the existing water quality within or adjacent to the project site. No construction wastes or other harmful materials shall be permitted to enter these water resources.
- B. Surface drainage from work activities shall be protected by effective erosion and sediment control measures as shown on the drawings or as directed by the Engineer to control erosion and siltation within acceptable limits in accordance with the North Carolina Erosion and

Sediment Control Planning and Design Manual, latest edition. These measures shall be incorporated into the project at the earliest practicable time and maintained until permanent drainage and erosion control facilities are completed.

- C. Unless otherwise approved in writing by the Engineer, construction operations in jurisdictional rivers, streams and other water impoundments shall be restricted to those areas where channel changes are shown in the drawings and to those areas which must be entered for the construction or removal of temporary or permanent structures as shown on the drawings.
- D. All work in or over jurisdictional waters shall be in accordance with conditions contained in the permit obtained by the Owner from the regulatory authority granting the permit. The Contractor shall prepare drawings necessary to obtain any permit addenda that may be required for means and methods of construction operations that are not included in the Owner's permit. The Contractor shall coordinate the permit addenda submission with the Engineer and Owner.
- E. Exercise every reasonable precaution throughout the life of the project to prevent pollution of ground waters and surface waters. Do not discharge onto the ground or surface waters any pollutants. Operate and maintain equipment on site in a manner as to prevent the potential or actual pollution of surface or ground waters. Accidental releases shall be reported in accordance with the Erosion and Sediment Control Plan.

10.04 STORAGE AND DISPOSAL OF PETROLEUM PRODUCTS

- A. During project construction, store all petroleum products in such a way as to prevent contamination of all ground and surface waters. Petroleum products include gasoline, diesel fuel, lubricants, heating oils, and refined and used oil. Provide storage with secondary containment greater than or equal to the volume of stored petroleum products.
- B. Lubricating oil may be brought into the project area in steel drums or other means, as Contractor elects. Store used lubricating oil in steel drums, or other approved means, and return to the supplier for disposal. Do not burn or otherwise dispose of at the project area.
- C. If the total volume of stored petroleum products is greater than 1,320 gallons and these products are stored above ground, prepare a spill prevention control and countermeasure plan in accordance with applicable EPA and other state regulations. Submit plan to Owner.

10.05 CONTROL OF AIR POLLUTANTS

- A. No fires shall be allowed to dispose of debris unless approved by the Owner.
- B. The Contractor shall maintain the project site and access roads free from dust, which would cause a hazard or nuisance to others.

PART 11 PRODUCT REQUIREMENTS

11.01 PRODUCT SUBSTITUTION PROCEDURES

- A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- E. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and/or Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- G. Substitution Submittal Procedure:
 - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 3. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 12 EXECUTION REQUIREMENTS

12.01 CLOSEOUT PROCEDURES

- A. Final Application for Payment shall be accompanied by the following documents:
 - 1. Record Drawings (reproducible).
 - 2. Guarantees of all materials and workmanship.
 - 3. Contractor's Affidavit, Release and Waiver of Claims.
 - 4. Consent of Surety (if applicable).
 - 5. Final State/County Sales/Use Tax Statement (if applicable).
 - 6. Complete list of all Subcontractors and areas of work performed.
 - 7. Proof of Compliance with Building Standards.
 - 8. MWBE Documentation of Final Contract Payments (if applicable).
 - 9. Warranties as required.

12.02 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
 2. Specifications.
 3. Erosion Control Plan.
 4. Addenda.
 5. Change Orders and other modifications to the Contract.
 6. Reviewed Shop Drawings, Product Data, and Samples.
 7. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly. For each item, include percentage of work complete versus percentage of work invoiced.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings: Certified by a Professional Land Surveyor licensed in the state of North Carolina. Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- G. Submit documents to Engineer.

PART 13 REFERENCES

13.01 DESCRIPTIONS

- A. The Contract Documents contain references to various standard Specifications, codes, practices, and requirements for materials, workmanship, installation inspections, and tests, which references are published and issued by the organizations, societies, and associations listed below by abbreviation and name. Such references are hereby made a part of the Contract Documents to the extent cited.
- B. Any material, method, or procedure specified by reference to the number, symbol, or title of a specific Specification or standard, such as a Commercial Standard, American National Standard, Federal or State Specification, Industry or Government Code, a trade association code or standard, or other similar standard, must comply with the requirements of the edition in effect on the date of Bid Opening.
- C. The code, specification, or standard referred to, except as modified in these Specifications, will have full force and effect as though printed in these Specifications. These Specifications and standards are not furnished to bidders since manufacturers and trades involved are assumed to be familiar with their requirements. Owner will furnish, upon request,

information as to how copies of the standard Specifications and other standards referred to may be obtained.

13.02 ABBREVIATIONS

A. Whenever in the Contract the following abbreviations are used, their meanings shall be as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
COE	Corps of Engineers
CRSI	Concrete Reinforcing Steel Institute
GRI	Geosynthetics Research Institute
FS	Federal Specifications
NCDOT	North Carolina Department of Transportation
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PPI	Plastic Pipe Institute
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories straight

END OF SECTION

SECTION 01 1000 SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Project Considerations
 2. Start / Completion Schedule
 3. Scope of Work
 4. General Project Information and Design Considerations
 5. Applicable Codes and Standards
 6. Project Requirements
 7. Construction Drawings
 8. Technical Specifications
 9. Bid Worksheet
 10. CQA Plan
 11. Erosion and Sediment Control Plan

PART 2 PROJECT CONSIDERATIONS

2.01 PERMITS

- A. All related permits, such as erosion and sediment control permits, wetlands permits, must be “in-hand” before construction can start. The Contractor shall verify with the Owner prior to starting work that related permits are in-hand. The Contractor will be responsible for obtaining local permits required for burning clearing debris on-site, and prior to construction of temporary facilities.
- B. Vendor shall maintain erosion and sediment control measures consistent with the *North Carolina Erosion and Sediment Control Planning & Design Manual (NCESCPDM)*. North Carolina Department of Environment and Natural Resources (now NCDEQ), June, 2006, Chapters 6 and 8 revised May, 2013.
- C. Maintenance of Erosion and Sediment Control devices shall continue until the site is stabilized, or the provisions of the Seeding Maintenance Warranty are met. Following stabilization, temporary erosion and sediment control measures shall be removed.

2.02 CONSTRUCTION

- A. The construction of drainage improvements to the South Drainage Channel, located on the south side of the existing RAB landfill.
- B. Installation of culverts, headwalls and outlet protection to convey stormwater from the South Drainage Channel into the adjacent sediment pond.

PART 3 START/COMPLETION SCHEDULE

Project Completion: Construction to be completed by October 7, 2016.

PART 4 SCOPE OF WORK

Work Description: Work includes and consists of furnishing all labor, materials, supervision, equipment and services necessary to complete the project construction as indicated in the Technical Specifications, Construction Drawings, and Bid Worksheet for construction. The work will include but not necessarily limited to the following items:

1. Install erosion and sediment control measures
2. Locate utilities within the work area
3. Excavate and re-grade existing drainage channel
4. Construct culverts
5. Construct headwalls and endwalls
6. Construct outlet stabilization
7. Seeding, roadway repairs, and site stabilization

PART 5 GENERAL PROJECT INFORMATION AND DESIGN CONSIDERATIONS

The subject scope of work includes the construction of drainage improvements as described above. The project is located at the Duke Energy, Allen Steam Station in Belmont, North Carolina. The drainage channel to be improved is located at the base of an existing flyash landfill.

The subsurface conditions in the work area consist of soil fill over flyash on the landfill side of the drainage channel and soil fill over natural residual soils in other areas.

Duke Energy contractors may be actively placing flyash into the landfill at the time the work is to be performed. The Vendor shall coordinate work activities with the Duke Energy landfill contractor.

The Vendor is responsible for verifying existing as-built conditions and dimensions. No additional charges will be allowed for changes required due to evident as-built conditions if different from that shown on the drawings provided in this Specification.

PART 6 APPLICABLE CODES AND STANDARDS

The following codes and standards shall be a part of this specification. The latest issue of each, along with additions or amendments as of the date of the Purchase Order shall apply, unless noted otherwise:

- A. American Society for Testing and Materials (ASTM)
- B. "Erosion and Sediment Control Planning and Design Manual", North Carolina Department of Environmental and Natural Resources, 2006.
- C. "Standard Specifications for Roads and Structures", North Carolina Department of Transportation.

PART 7 PROJECT REQUIREMENTS

7.01 PROJECT DOCUMENTS

- A. The detailed project requirements and scope of work is communicated in the following documents referred to collectively as the Project Documents: Construction Drawings; Technical Specifications and Bid Worksheet. These documents are summarized as follows.

7.02 CONSTRUCTION DRAWINGS

- A. Construction Drawings prepared by S&ME, Inc.
- B. Drawing Title: South Channel, Drainage Improvements, Allen Steam Station RAB Landfill

1	ALN_C907.001.001	Cover Sheet
2	ALN_C907.001.002	Existing Conditions
3	ALN_C907.001.003	Plan and Profile - West
4	ALN_C907.001.004	Plan and Profile - East
5	ALN_C907.001.005	Sections
6	ALN_C907.001.006	Erosion Control Plan
7	ALN_C907.001.007	Details
8	ALN_C907.001.008	Details and Notes

7.03 TECHNICAL SPECIFICATIONS

DIVISION 01 – GENERAL REQUIREMENTS

- 01 0000 General Requirements
- 01 1000 Summary of Work

DIVISION 03 - CONCRETE

- 03 1000 Concrete Forms and Accessories
- 03 3000 Cast-In-Place Concrete
- 03 4800 Precast Concrete Specialties

DIVISION 31 - EARTHWORK

- 31 0516 Aggregate
- 31 0519.13 Geotextiles (Non-Woven) for Earthwork
- 31 1100 Clearing and Grubbing
- 31 1413.16 Soil Stockpiling
- 31 2316 Excavation
- 31 2316.13 Trenching
- 31 2319 Dewatering
- 31 2323.13 Backfill
- 31 2500 Erosion and Sediment Control Devices

DIVISION 32 – EXTERIOR IMPROVEMENTS

- 32 9219 Seeding

DIVISION 33 – UTILITIES

- 33 4213 Stormwater Culverts

7.04 BID WORKSHEET

- A. The bid worksheet, prepared by Duke Energy, defines specific work elements established for bidding and payment purposes. The completed bid worksheet shall be incorporated into the contract documents.

7.05 CQA PLAN

A. NA.

7.06 EROSION AND SEDIMENT CONTROL PLAN

- A. The erosion control plan prepared by S&ME, Inc., consists of Drawings 6, 7 and 8 within the drawing set. The primary Erosion Control Plan is Drawing 6, titled: Erosion Control Plan, South Drainage Channel Improvements, Retired Ash Basin (RAB) Ash Landfill, Allen Steam Station, Belmont, Gaston County, North Carolina.
- B. The site falls under an existing DEQ E&SC Permit ID 2009-GASTO-001 for the construction of the landfill. Sediment generated as a result of improvements to the south drainage channel (0.74 acres of total disturbance), is discharged to and treated by, an existing active sediment pond on-site. As such, a formal erosion and sediment control plan is not required by the North Carolina Department of Environmental Quality (NCDEQ).

END OF SECTION

DIVISION 03

CONCRETE



**SECTION 03 1000
CONCRETE FORMS AND ACCESSORIES**

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Form accessories.
4. Form stripping.

B. Related Sections:

1. Section 31 2500 - Erosion and Sediment Control Devices.
2. Section 03 3000 - Cast-In-Place Concrete.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Formwork for cast-in-place concrete:

1. Basis of Measurement: N/A. Included with Section 03 3000.
2. Basis of Payment: N/A. Included with Section 03 3000.

1.03 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 347 - Guide to Formwork for Concrete.

1.04 DESIGN REQUIREMENTS

- A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.05 SUBMITTALS

- A. N/A

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI 318, and ACI 347.
- B. For wood products furnished for work of this Section, comply with the American Forest and Paper Association (AF & PA).
- C. Perform Work in accordance with NCDOT standards.

1.07 QUALIFICATIONS

- A. Design formwork under direct supervision of Professional Engineer experienced in design of

this Work and licensed in State of project.

1.08 COORDINATION

- A. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.01 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor unless otherwise directed by Engineer due to special conditions or situations.

2.02 PREFABRICATED FORMS

- A. Furnish materials in accordance with NCDOT standards.

2.03 FORMWORK ACCESSORIES

- A. Form Ties: At discretion of Contractor unless otherwise directed by Engineer due to special conditions or situations.
- B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- C. Form Anchors and Hangers:
 - 1. Do not use anchors and hangers leaving exposed metal at concrete surface.
 - 2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
 - 3. Penetration of structural steel members is not permitted.
- D. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- B. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Engineer.

3.02 INSTALLATION

- A. Earth Forms:
 - 1. Earth forms are not permitted.
- B. Formwork - General:
 - 1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
 - 2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
 - 4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
 - 5. Complete wedging and bracing before placing concrete.
- C. Forms for Smooth Finish Concrete:
 - 1. Use steel, plywood or lined board forms.
 - 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 - 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 - 4. Use full size sheets of form lines and plywood wherever possible.
 - 5. Tape joints to prevent protrusions in concrete.
 - 6. Use care in forming and stripping wood forms to protect corners and edges.
 - 7. Level and continue horizontal joints.
 - 8. Keep wood forms wet until stripped.
- D. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.
- E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- G. Obtain Engineer's approval before framing openings in structural members not indicated on Drawings.
- H. Install void forms in accordance with manufacturer's recommendations.
- I. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.03 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated

forms with clean water. Keep surfaces coated prior to placement of concrete.

- D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.04 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.
- B. Locate and set in place items required to be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install water stops continuous without displacing reinforcement.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- H. Form Ties:
 - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 - 2. Place ties at least 1 inch away from finished surface of concrete.
 - 3. Leave inner rods in concrete when forms are stripped.
 - 4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
- I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

3.05 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.06 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by formwork design Engineer.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. Leave forms in place for minimum number of days as specified in ACI 347.

3.07 ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3.08 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Notify Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- C. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

**SECTION 03 3000
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete for the following:
 - 1. Headwalls, endwalls and catch basins.
 - 2. Miscellaneous cast-in-place concrete as needed.
- B. Related Sections:
 - 1. Section 03 1000 - Concrete Forms and Accessories
 - 2. Section 31 2323.13 - Backfill
 - 3. Section 31 2500 - Erosion and Sediment Control Devices

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Headwalls, Endwalls and Catch Basins:
 - 1. Basis of Measurement: By each unit.
 - 2. Basis of Payment: Number of units installed times the unit price per each unit.
 - a. Includes subgrade preparation, placement moisture condition and compaction of ABC subbase, concrete mix design, supplying to site, preparing base, welded wire mesh, reinforcement, placing, floating, finishing, joints, and joint accessories.

1.03 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 305R - Hot Weather Concreting.
 - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 - 4. ACI 308 (American Concrete Institute) - Standard Practice for Curing Concrete.
 - 5. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM International:
 - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 - 3. ASTM C138/C138M-16 – Standard Test Method for Density, Yield, and Air Content of Concrete.
 - 4. ASTM C150 - Standard Specification for Portland Cement.
 - 5. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 6. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
 - 7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
 - 8. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - 9. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 10. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
 - 11. ASTM C1611 - Standard Test Method for Slump Flow of Self-Consolidating Concrete.

1.04 SUBMITTALS

- A. Product Data: Submit data on:
 - 1. Concrete mix design at least 14 days prior to using the mixture.
- B. Design Data:
 - 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 - 2. Identify mix ingredients and proportions, including admixtures.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Perform any waterproofing in accordance with Manufacturer's recommendations..
- C. Acquire cement and aggregate from one source for Work.
- D. Conform to ACI 305R when concreting during hot weather.
- E. Conform to ACI 306.1 when concreting during cold weather.

1.07 QUALIFICATIONS

- A. Waterproofing Material Manufacturer (if applicable): Company specializing in waterproofing membrane with minimum three years documented experience.
- B. Waterproofing Applicator (if applicable): Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I or Type II.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2.02 ADMIXTURES (ENGINEER'S APPROVAL REQUIRED PRIOR TO USING ANY ADMIXTURES).

- A. Furnish materials in accordance with NCDOT standards.
- B. Air Entrainment: ASTM C260.
- C. Chemical: ASTM C494; Type F - Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding.

- D. Fly Ash, Calcined Pozzolan: ASTM C618; Class Type C or F, limit fly ash to maximum 25 percent of cement content by weight.
- E. Plasticizing: ASTM C1017.

2.03 CONCRETE MIX

- A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.
- B. Select proportions for normal weight concrete (if applicable) in accordance with ACI 301.
- C. Select aggregate proportions for light weight concrete (if applicable) in accordance with ACI 301.
- D. Provide concrete to the following criteria:

<u>Unit</u>	<u>Measurement</u>
Compressive Strength (7 day)	3,000 psi
Compressive Strength (28 day)	4,000 psi
Water/Cement Ratio (maximum)	0.45 by weight (mass)
Air Entrained	4 - 6 percent
Slump	2-4 inches

- E. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved by Engineer through submittal process.
 - 1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
 - 2. Use set retarding admixtures during hot weather.
 - 3. Add air entraining agent to normal weight concrete mix for work exposed to exterior.
 - 4. Air Entrainment: ASTM C260.
 - 5. Chemical: ASTM C494 Type A - Water Reducing, Type B – Retarding, Type C – Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating, Type F - Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding.
 - 6. Fly Ash, Calcined Pozzolan: ASTM C618.
 - 7. Plasticizing: ASTM C1017.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.
- C. Verify substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.
- D. Verify items penetrating surfaces to receive waterproofing are securely installed.
- E. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.02 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 318.
- B. Notify Engineer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, and embedded parts are not disturbed during concrete placement.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Do not interrupt successive placement; do not permit cold joints to occur.
- F. If inside lined area, protect liner and all geosynthetic components from damage during installation and placement of concrete. Any damage caused to the liner as a result of the Contractor's action shall be repaired at his expense

3.04 CONCRETE FINISHING

- A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.

3.05 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure all concrete in accordance with ACI 308 unless otherwise directed by Engineer.

3.06 BACKFILLING

- A. Concrete should have a minimum of 75 percent of design 28-day compressive strength prior to backfilling concrete structures unless approved by the Engineer

3.07 FIELD QUALITY CONTROL

- A. Provide free access to Work and cooperate with appointed firm.
- B. Submit proposed mix design of each class of concrete to inspection and testing firm and Engineer for review 14 days prior to commencement of Work.
- C. Tests of cement and aggregates may be performed to ensure conformance with specified

requirements.

- D. A minimum of four concrete test cylinders will be taken for every 100 cubic yards or fraction thereof or a minimum of one set of cylinders per each structure or type/class of concrete placed.
- E. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. One slump test will be taken for each set of test cylinders taken in accordance with ASTM 1611.
- G. One air content and unit weight test will be made for each set of test cylinders taken. In accordance with ASTM C138/C138M-16.
- H. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.08 PATCHING

- A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- C. Patch imperfections in accordance with ACI 301.

3.09 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

**SECTION 03 4800
PRECAST CONCRETE SPECIALTIES**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Precast Concrete Specialties
- B. Related Sections:
 - 1. Section 31 2316 - Excavation
 - 2. Section 31 2323.13 - Backfill

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Precast Concrete Specialties:
 - 1. Basis of Measurement: By each unit.
 - 2. Basis of Payment: Time and Materials not to exceed
 - a. Includes unit, excavating, bedding, backfilling, compacting, joining, sealing, fittings and accessories assembled.

1.03 REFERENCES

- A. American Concrete Institute
 - 1. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 2. ACI 350 - Environmental Engineering Concrete Structures.
- B. ASTM International
 - 1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 3. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 4. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 5. ASTM C150 - Standard Specification for Portland Cement.
 - 6. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 7. ASTM C443 - Joints.
 - 8. ASTM C789 – Pre-cast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.
 - 9. ASTM C 850 – Pre-cast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with less than 2 feet of cover subjected to highway loadings.
 - 10. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Pre-cast Concrete Water and Wastewater Structures.
 - 11. ASTM C913 - Standard Specification for Pre-cast Concrete Water and Wastewater Structures.
 - 12. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
 - 13. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Pre-cast Box Sections Using Preformed Flexible Joints Sealants.

14. ASTM C1433 - Standard Specification for Pre-cast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.
 15. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 16. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 17. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- C. American Association of State Highway and Transportation Officials
1. AASHTO M198 - Butyl Rubber Sealants.
 2. AASHTO M259 – Pre-cast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.
 3. AASHTO M273 – Pre-cast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with less than 2 feet of cover subjected to highway loadings.

1.04 DESIGN REQUIREMENTS

- A. Design Criteria:
1. Honeycombed or retempered concrete is not permitted.
 2. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318, Design for H20 Loading.
 3. Design of Lifting Devices for Pre-cast Structures: In accordance with ASTM C 913.
 4. Design of Joints for Pre-cast Structures: In accordance with ASTM C443.

1.05 SUBMITTALS

- A. Shop Drawing: Indicate structure locations, elevations, piping, sizes and elevations of penetrations.
- B. Product Data: Submit covers, component construction, features, configuration, and dimensions.
- C. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from Materials Suppliers attesting that pre-cast concrete structures provided meet or exceed ASTM Standards and Specification requirements.

1.06 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components and connections.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with State and Local Municipality standards.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Comply with Pre-cast Concrete Manufacturer's instructions for unloading, storing and moving pre-cast structures.
- B. Store pre-cast concrete structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

- C. Mark each pre-cast structure by indentation or waterproof paint showing date of manufacture, Manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE STRUCTURES

- A. Manufacturers products and configurations shall be provided and installed as specified on the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify connections, sizes, locations and inverts are as indicated on Drawings.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify excavations for the structures are correct.

3.02 PREPARATION

- A. Coordinate placement of connecting pipes required by other Sections of Work as described in these Specifications.
- B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
- C. Inspect pre-cast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.03 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for pre-cast concrete structures in accordance with Section 31 2316 of these Specifications in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
 - 2. When groundwater is encountered, prevent accumulation of water in excavations. Place pre-cast concrete structures in dry trench.
 - 3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
- B. Lift pre-cast structures at lifting points designated by Manufacturer.
- C. When lowering pre-cast concrete structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

- D. Set cover frames and covers level without tipping, to correct elevations.
- E. Coordinate with other Sections of Work as described in these Specifications to provide correct size, shape, and location.

3.04 FIELD QUALITY CONTROL

- A. Request observation by Engineer prior to placing cover over piping.
- B. Compaction Testing: In accordance with Section 31 2323.13.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION

DIVISION 31

EARTHWORK



**SECTION 31 0516
AGGREGATE**

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aggregate Type A1 - ABC stone for roadways.
2. Aggregate Type A2 - No. 57 stone for culvert bedding and backfill, drainage aggregate and erosion and sediment control devices.
3. Aggregate Type A3 - Class 1 riprap for erosion and sediment control devices.
4. Aggregate Type A4 - Class 2 riprap for erosion and sediment control devices.

B. Related Sections:

1. Section 31 2323.13 - Backfill
2. Section 31 2500 - Erosion and Sediment Control Devices
3. Section 33 4213 - Culverts

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Coarse and Fine Aggregate:

1. Basis of Measurement: A1, A2, A3, and A4 by the in place cubic yard or as otherwise indicated in other Sections of these Specifications. Installation quantities shall not include quantities placed beyond the lines and grades shown on the Drawings.
2. Basis of Payment: By the cubic yard placed times the unit price for each aggregate type, or as otherwise indicated in these Specifications.
 - a. Includes supplying aggregate materials, hauling, stockpiling, and placement.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T11 – Standard Method of Test for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
2. AASHTO T27 – Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
3. AASHTO T180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop (as modified by NCDOT).

B. ASTM International:

1. ASTM C33 – Standard Specification for Construction Aggregates
2. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
3. ASTM D421 – Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
4. ASTM D422 – Standard Test Method for Particle Size Analysis of Soils.
5. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).

6. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 7. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18 inch Drop.
 8. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 9. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 10. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 11. ASTM D 6938 – Standard Test Methods for In-Place Density and Water Content of soil and Soil-Aggregate by Nuclear Methods.
- C. North Carolina Department of Transportation (NCDOT) Standard specifications for Roads and Structures.

1.04 SUBMITTALS

- A. Materials Source: Submit name of imported materials suppliers and description of material.
- B. Manufacturer's/Supplier's Certificate: Certify materials meet or exceed specified requirements.
- C. For aggregate type A1, submit supplier's Modified Proctor (AASTHTO T180 as modified by NCDOT) curve information.
- D. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer.

1.05 QUALITY ASSURANCE

- A. Furnish each aggregate material type from single source throughout the Work.
- B. Perform Work in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures or as otherwise specified.

PART 2 PRODUCTS

2.01 FINE AND COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1 - Roadways: Conforming to ABC Stone NCDOT standards. Coarse Aggregate Type A1 shall be used for roadways and where shown on the Drawings.
- B. Coarse Aggregate Type A2 – Drainage Aggregate: Subangular, subrounded, rounded, or well rounded particle shaped conforming to No. 57 Stone NCDOT Standards. Coarse Aggregate Type A2 shall be used in the LCS and LDS corridors, sumps, and other drainage applications, for construction of erosion and sediment control structures, and where shown on the Drawings.
- C. Coarse Aggregate Type A3: Conforming to Class 1 Riprap NCDOT standards. Coarse Aggregate Type A3 shall be used for drainage feature inlet and outlet protection, for construction of erosion and sediment control structures, and where shown on the Drawings.

- D. Coarse Aggregate Type A4: Conforming to Class 2 Riprap NCDOT standards. Coarse aggregate Type A4 shall be used for drainage feature outlet protection, for erosion and sediment control structures, and where shown on the Drawings.

2.02 SOURCE QUALITY CONTROL

- A. Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C33, ASTM C136, ASTM D421, ASTM D422, ASTM D4253, ASTM D4254, AASHTO T11, and/or AASHTO T27.
- B. When tests indicate materials do not meet specified requirements, change material or material source and retest.
- C. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 STOCKPILING

- A. Stockpile materials on site at locations agreed upon by Engineer and Owner.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.02 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water and restore to original site conditions.

3.03 EXAMINATION

- A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.04 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.05 AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate to a total compacted thickness as specified on Drawings.
- B. Place aggregate in a maximum layer and compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.

- D. Place aggregate in a maximum layer and compact to specified density.
- E. Level and contour surfaces to elevations and gradients indicated.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- H. Coarse aggregate Type A1, ABC stone for roadways
 - 1. Spread aggregate over prepared substrate to a total compacted thickness as specified on Drawings.
 - 2. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

3.06 TOLERANCES

- A. Scheduled Compacted Thickness: Within $\frac{1}{4}$ inch.
- B. Variation From Design Elevation: Within $\frac{1}{2}$ inch.

3.07 FIELD QUALITY CONTROL

- A. Coarse aggregate Type A1, where used for road surfacing applications, shall be compacted to a density of 95 percent of its modified Proctor (ASTM D1557) maximum dry density and in accordance with these Specifications. Field density testing shall be performed at a minimum frequency of one test per 2,500 square feet per compacted lift.
- B. Compaction testing will be performed in accordance with ASTM D1556, ASTM D2167, ASTM D6938.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION

**SECTION 31 1100
CLEARING and GRUBBING**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Site Clearing and Grubbing.
 - 2. Stripping/Topsoil Excavation.
- B. Related Sections:
 - 1. Section 31 2316 - Excavation
 - 2. Section 31 2500 - Erosion and Sediment Control Devices

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Site Clearing and Grubbing:
 - 1. Basis of Measurement: By the 2-dimensional acre of the original ground surface that is cleared and grubbed. Computation of the quantities of clearing and grubbing will be based on surveyed surface areas (provided by the Contractor) cleared and grubbed and will be mutually agreed to in writing by the Owner, Engineer and Contractor for each particular area.
 - 2. Basis of Payment: By the 2-dimensional acre times unit price per acre for clearing and grubbing.
 - a. Includes clearing and grubbing site and burning waste materials on-site (if local permit conditions at the time allow).
 - b. Optional bid item: includes clearing and grubbing site, loading, hauling, and removing waste materials from site.
- B. Stripping / Topsoil Excavation:
 - 1. Basis of Measurement: By the 2-dimensional acre of the original ground surface that is excavated of topsoil. Computation of the quantities of topsoil excavation will be based on surveyed surface areas (provided by the Contractor) excavated of topsoil and will be mutually agreed to in writing by the Engineer and Contractor for each particular area.
 - 2. Basis of Payment: Made at contract price per 2-dimensional acre for stripping/topsoil excavation.
 - a. Includes removal, loading, hauling, and either stockpiling material approved by the Engineer for re-use as topsoil at the designated on-site stockpile location, or removing waste materials not approved by the Engineer for re-use as topsoil from site (unless permitted to dispose of on-site by Owner).

1.03 SUBMITTALS

- A. Submit results of soil nutrient and organic content testing for materials approved by the Engineer for re-use as topsoil.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State and local standards and ordinances.

- B. Conform to applicable codes for environmental requirements, disposal of debris, and burning debris on site (if allowed by OWNER).

PART 2 PRODUCTS

2.01 MATERIALS

- A. N/A

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify topsoil stockpile area and waste area for materials not approved for re-use as topsoil. May dispose on site if permitted by Owner in Owner designated area.

3.02 PREPARATION

- A. Call Private Utility Line Locator to have utilities marked no less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.03 PROTECTION

- A. Locate, identify, and protect from damage utilities indicated to remain.
- B. Protect trees, plant growth, and features designated to remain as final landscaping as specified on Drawings.
- C. Protect bench marks, survey control points, groundwater monitoring wells, and existing structures from damage or displacement.

3.04 SITE CLEARING AND GRUBBING

- A. Notify Engineer prior to commencing with clearing activities.
- B. Install erosion control devices as shown on the Drawings and as specified in Section 31 2500 – Erosion and Sediment Control Devices.
- C. Clear areas required for access to site and execution of Work.
- D. Remove trees and shrubs within construction area. Remove all trash or debris. Remove all materials to a depth necessary to eliminate soils containing more than 5 percent by weight fibrous organic matter, rubbish, vegetable matter, small stones, stumps, roots, root system, or other objectionable deleterious material within the clearing limits.
- E. Clear undergrowth and deadwood.
- F. Allow inspection of cleared areas by Engineer or his representative prior to beginning other

construction activities.

3.05 REMOVAL

- A. Remove debris, rock, and extracted vegetation from site. If permitted by Owner, may dispose of on-site in Owner specified location.
- B. Remove construction debris and other materials that cannot be used in earthwork construction or final vegetation. Materials shall be disposed off-site unless permitted by Owner to dispose of on-site in Owner designated location.
- C. Do not burn or bury materials on-site unless permitted by State and local ordinances and laws and given permission by Owner to do so. Leave site in clean condition.

3.06 STRIPPING/TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, or re-graded without mixing with foreign materials for use in finish grading. The minimum topsoil stripping depth shall be four inches or as determined by the Engineer.
- B. Stockpile material at the designated on-site stockpile location and protect from erosion.
- C. Remove excess topsoil not intended for reuse, from site unless permitted by owner to dispose of on-site in Owner designated location.

END OF SECTION

**SECTION 31 1413.16
SOIL STOCKPILING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Loading, hauling, placing, and constructing temporary or permanent stockpiles.
- B. Processing in-place soils or stockpiled soils so they can be utilized for various earthfills.

1.02 RELATED SECTIONS

- A. Section 31 1100 - Site Clearing and Grubbing
- B. Section 31 2316 - Excavation
- C. Section 31 2323.13 - Backfill

PART 2 PRODUCTS

2.01 GENERAL FILL

- A. Soil obtained from on-site excavations that meet the requirements of Section 31 2323.13, Part 2.01.

2.02 CLEARED, GRUBBED AND STRIPPED MATERIALS

- A. Grass, trees, shrubbery, roots, logs, boulders.

2.03 IMPORTED SOILS (IF APPLICABLE)

- A. Owner supplied materials that meet the requirements of Section 31 2323.13.
- B. Contractor supplied materials that meet the requirements of Section 31 2323.13.

PART 3 EXECUTION

3.01 STOCKPILING MATERIALS

- A. Construct stockpiles at locations approved per the solid waste permit and by the Owner.
- B. Provide quality control during operations to assure that materials go to appropriate stockpiles.
- C. Provide separation between stockpiles to allow equipment access.

- D. Construct side slopes no steeper than 2H:1V or natural angle of repose, whichever is shallower.
- E. Construct no surface flatter than 5 percent.
- F. Shape each stockpile to uniform lines and grades.
- G. Water or cover stockpiles as necessary to control dust, prevent erosion, and control sediment.
- H. Install erosion and sediment control structures per the Erosion and Sediment Control Plan.

3.02 QUALITY ASSURANCE

- A. Sampling and testing of materials to determine material type may be performed at the stockpile, at the material source, or at the place of use.
- B. Cooperate fully with the Owner in obtaining samples and performing tests. Include all costs for assistance in unit prices for work.

3.03 SOIL MANAGEMENT

- A. Process excavated materials as necessary in stockpiles or in-place, if possible.
- B. As part of the project, plan for soil processing in stockpile areas to process excavated soils.
- C. Processing may be required for, but not necessarily limited to the following, clod size reduction, and conditioning soil to modify moisture.
- D. Monitor organic stockpiles to detect and control fires.

END SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Excavating Soil Materials
 - 2. Excavating Unsuitable Material (Undercut)
 - 3. Stockpiling Excavated Material
- B. Related Sections:
 - 1. Section 03 4800 - Precast Concrete Specialties
 - 2. Section 31 1100 - Site Clearing
 - 3. Section 31 1413.16 - Soil Stockpiling
 - 4. Section 31 2316.13 - Trenching
 - 5. Section 31 2323.13 - Backfill
 - 6. Section 31 2500 - Erosion and Sediment Control Devices

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Excavating Soil Materials:
 - 1. Definition: Soil is defined as any material that can be excavated by conventional methods, up to and including ripping using a D8 dozer with a single-tooth blade.
 - 2. Basis of Measurement: By the cubic yard of excavation.
 - a. The quantity of excavation will be based upon survey information collected before and after the excavation. A grid pattern as approved by the Engineer of ground surface elevations in the area shall be surveyed and reference points installed by the Contractor prior to excavation and prior to placement of overlying fill. The Engineer shall check the as-built finished grades and determine the excavated volume of soil based on survey data provided by the Contractor.
 - b. In the case of small volume areas of excavation, it will be acceptable to use an average depth times area volume computation, if both the Contractor and Owner agree prior to measurement. Both the Contractor and Owner or his designee should be represented when average depth measurements are made.
 - 3. Basis of Payment: By the cubic yard of excavation times the unit price for excavation.
 - a. Includes excavating to required elevations, and any and all necessary de-watering during excavation.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.
- B. Excavating Unsuitable Material (Undercut):
 - 1. Basis of Measurement: By the cubic yard.
 - a. The quantity of undercutting will be based upon survey information collected before and after the undercut. See Part 1.2 A.2.a above.
 - b. In the case of small volume areas of undercutting, it will be acceptable to use an average depth times area volume computation, if both the Contractor and Owner agree prior to measurement. Both the Contractor and Owner or his designee should

- be represented when average depth measurements are made.
- c. Unsuitable materials shall be removed to the satisfaction of the Engineer.
- 2. Basis of Payment: By the cubic yard of undercut times the unit price for undercut.
 - a. Includes excavating to required elevations, loading and placing materials in stockpile by material type, and any and all necessary de-watering during excavation.
- C. Stockpiling Excavated Material:
 - 1. Basis of Measurement: By the cubic yard.
 - a. The quantity of stockpiled excavated material will be based upon the difference of the quantity of excavated material (see Part 1.2.A.2.a above) and the quantity of structural backfill (see Section 31 2323.13).
 - 2. Basis of Payment: By the cubic yard of stockpiled excavated material times the unit price for stockpiling.
 - a. Includes visually classifying material as topsoil or structural fill prior to loading, loading by material type, hauling, and stockpiling by material type as directed by the Owner.

PART 2 PRODUCTS

- 2.01** N/A.

PART 3 EXECUTION

3.01 PREPARATION

- A. Call Private Utility Line Locator to have utilities marked no less than three working days before performing Work.
 - 1. Have the underground utilities to be located and marked within and surrounding construction areas.
- B. The Contractor shall protect all existing facilities, including, but not limited to existing electrical lines and poles, and monitoring wells during excavations and stockpiling. Damaged facilities shall be promptly replaced at the Contractor's expense.
- C. Notify utility company to remove and relocate any utilities.
- D. Perform site clearing, grubbing, rotary mowing, necessary surveys, and topsoil excavation per Section 31 1100 – Clearing and Grubbing. Any depths of removal of twelve inches or less shall be considered Site Clearing and Grubbing.
- E. Identify required lines, levels, contours, and datum locations.
- F. Protect bench marks, survey control points, and existing structures from excavating equipment and vehicular traffic.

3.02 EXCAVATION

- A. Install erosion control measures as specified on the Drawings.
- B. Excavate subsoil to accommodate site structures and construction operations.

- C. Drainage ditch subgrade shall be excavated to the lines and grades shown on the Drawings.
- D. Slope banks with machine to angle of repose or less unless shored as per OSHA standards.
- E. Remove lumped subsoil, boulders, and rock.
- F. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- G. Materials determined unsuitable by the Engineer shall be excavated per the direction of the engineer or his representative.
- H. If ash is encountered in any excavation, the Owner shall be notified and the area shall be overexcavated and backfilled with 2 feet of soil cover.
- I. Excavated unsuitable areas shall be replaced with structural fill, lean concrete, or aggregate as recommended by the Engineer.
- J. If necessary, the area of excavation/undercutting shall be dewatered to a depth of at least one foot below the bottom of the excavation and shall be maintained in the dewatered condition until the excavation is filled with compacted material to a level that is above the original water level or to original ground level, whichever is higher.
- K. Perform temporary dewatering as necessary during excavation to minimize softening of exposed subgrade soils. A temporary sump may be constructed for accumulation of impounded waters resulting from rain or seepage. A pump with adequate capacity shall be provided and operated to maintain a low water level in the sump.
- L. Correct over-excavated areas with select backfill and compact replacement as specified for authorized excavation per Section 31 2323.13 - Backfill. No payment will be made for over-excavation or corrections made to over-excavated areas.
- M. Excavated material not placed as backfill shall be stockpiled by material type (topsoil or structural fill in a designated area free of contaminating soil, clearing debris, or other objectionable materials in an area acceptable to Owner and Engineer. Engineer will assist the Contractor in the determination of soil types for stockpiling.
- N. All reconditioning of structural fill to obtain the required compaction will be the responsibility of the Contractor.
- O. Furnish all labor, materials, supervision, and equipment required for constructing and maintaining temporary diversion measures as required for construction of the landfill and all structures. Furnish, install, maintain, and operate all pumping equipment for diversion or removal of water and maintaining the work area free from water throughout construction including temporary ditches and sump construction.
- P. Protect and or divert stormwater flows from the work area utilizing Erosion and Sediment Control Devices referenced in Section 31 2500.
- Q. Provide survey information before and after excavation.

3.03 FIELD QUALITY CONTROL

- A. Request visual inspection of bearing surfaces by Engineer before installing subsequent work.
- B. Excavation is complete when the Engineer approves the Final Subgrade Survey.

3.04 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath structures from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, stormwater, groundwater and other hazards created by earth operations.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Protect outlet of excavations from potential sediment deposit by placing sediment control measures such as silt fence and/or temporary sediment traps.

END OF SECTION

SECTION 31 2316.13 TRENCHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Trenching for buried pipe.
- B. Related Sections:
 - 1. Section 31 2316 - Excavation
 - 2. Section 31 2323.13 - Backfill
 - 3. Section 33 4216 - Culverts

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Trenching for buried piping:
 - 1. Basis of Measurement: N/A. Included with Section 33 4216.
 - 2. Basis of Payment: N/A. Included with Section 33 4216.

1.03 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society for Testing and Materials (ASTM) standards:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (Standard Proctor Test).
 - 2. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in place by the Sand-Cone Method.
 - 3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³) (Modified Proctor Test).
 - 4. ASTM D2216 - Standard Test Method for Moisture Content.
 - 5. ASTM D2937 – Standard Test Method for Density of Soil in place by the Drive-Cylinder Method Test.
 - 6. ASTM D4959 – Standard Test Method for Determination of Water Content of Soil by Direct Heating.
 - 7. ASTM D 6938 – Standard Test Methods for In-Place Density and Water Content of soil and Soil-Aggregate by Nuclear Methods.

1.04 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.05 SUBMITTALS

- A. As site conditions may dictate, the Contractor shall prepare an excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and

licensed in State of project.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with North Carolina Department of Transportation (NCDOT) standards.
- B. Perform Work in accordance with applicable Federal, State, and local excavation safety standards.

1.07 FIELD MEASUREMENTS

- A. Verify field measurements prior to placement of materials within trench.

1.08 COORDINATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Bedding and backfill for culverts: Type A2 as specified in Section 31 0516.
- B. Structural Fill for culvert backfill: Type S1 as specified in Section 31 2323.13.

PART 3 EXECUTION

3.01 LINES AND GRADES

- A. Grades:
 - 1. Lay pipes to lines and grades indicated on Drawings.
 - 2. Maintain grade alignment of pipe using string line parallel with grade line and vertically above centerline of pipe.
 - a. Establish string line on level batter boards at intervals of not more than 25 feet.
 - b. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
 - c. Set three adjacent batter boards before laying pipe to verify grades and line.
 - d. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route.
 - e. Do not locate pipe using side lines for line or grade.
 - 3. As an alternative method, use laser-beam instrument with qualified operator to establish lines and grades.
- B. Location of Pipe Lines:
 - 1. Location and approximate depths of proposed pipe lines are shown on Drawings.
 - 2. Engineer or Owner reserves right to make changes in lines, grades, and depths of pipe lines and structures when changes are required for Project conditions.

3.02 PREPARATION

- A. Call Local Utility Line Information service and the Owner not less than three working days before performing Work.
 - 1. Underground utilities must be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect bench marks and existing structures from excavating equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities indicated to remain.

3.03 TRENCHING

- A. Implement temporary dewatering measures to reduce softening of exposed subgrade soils as excavation advances, until foundation construction is complete, and until fill placement is a minimum of 3-feet above the groundwater level.
- B. Do not advance open trench more than 100 feet ahead of installed pipe.
- C. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
- D. Excavate bottom of trenches maximum 16 inches wider than outside diameter of pipe or structure.
- E. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for pipe.
- F. Do not disturb subgrade soils within a 45 degree zone of influence with depth of foundations, if applicable.
- G. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this Section.
- H. When required, perform excavations and provide temporary bracing, shoring, and/or benching in accordance with applicable Federal, State, and local excavation safety standards.
- I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered. Backfill according to Part 3.05 of this Section.
- J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type S1 and compact to density equal to or greater than requirements for subsequent backfill material.
- K. Hand trim excavation. Remove loose matter.
- L. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with lean concrete as directed by Engineer. Corrections for over excavation shall be conducted at no cost to the Owner.
- M. Stockpile excavated material in area designated on site and remove excess material not being

used from site unless authorized by Owner to dispose of on-site in an Owner designated location.

3.04 SHEETING AND SHORING

- A. Comply with all OSHA, Federal, State, and local trench safety and excavation requirements.
- B. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- C. Support trenches more than 4 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
- D. Design sheeting and shoring to be removed at completion of excavation work.
- E. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil at no cost to the Owner.
- F. Repair damage to pipe bedding work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.05 BACKFILLING

- A. Trenches with Piping:
 - 1. Cover pipe with Fill Type S1 in loose 8 inch or thinner lifts with unfrozen fill materials, compacted uniformly to a minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density.
 - 2. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.
 - 3. Employ placement method that does not disturb or damage utilities in trench.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Do not leave any trenches open at end of working day. Protect open trench to prevent danger to the public.
- E. Remove surplus fill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.
- F. Protect open trench to prevent danger to Owner.

3.06 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1/2 inch from required elevations.

3.07 FIELD QUALITY CONTROL

- A. Perform laboratory material tests in accordance with ASTM D698, and/or ASTM D1557 as described in Section 31 2323.13.

- B. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D1556, ASTM D6938, ASTM D2937.
 - 2. Moisture Tests: ASTM D2216, ASTM D6938.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- D. Frequency of Tests: One test per compacted lift per culvert location for piping backfill.

3.08 PROTECTION OF INSTALLED CONSTRUCTION

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.
- B. General construction traffic shall be limited to areas designated by the Engineer that have been protected by at least 24 inches of compacted fill material.

END OF SECTION

SECTION 31 2319 DEWATERING

PART 1 GENERAL

1.01 SUMMARY

- A. The Contractor is responsible for dewatering of embankment soils, natural soils, and structure construction locations to allow for excavation, placement and compaction of soil fill or aggregate to the grades depicted on the drawings. The dewatering must be sufficient to provide a stable working surface for the Contractor's equipment during construction and a stable surface after construction is completed. Dewatering shall also be performed to provide stable conditions for utility and foundation excavations and construction where necessary.
- B. Dewatering means and methods are the responsibility of the Contractor. The time to dewater using these methods will depend on numerous variables including but not limited to the Contractor's speed, equipment used, pumping rates, weather conditions, etc.
- C. Dewatering activities shall include provisions to minimize the amount of sediment leaving the work area. Additional erosion and sedimentation control measures beyond those outlined on the Drawings may be required during dewatering activities to prevent sediment from leaving the work area.

1.02 GENERAL SCOPE OF WORK

- A. The scope of work includes but is not limited to providing the required labor, materials, and equipment to perform all necessary efforts to lower and maintain the in-situ water levels within embankment soils, natural soils, and structure construction areas, as well as diverting and controlling stormwater away from areas ready to be excavated to allow all excavations to be performed in dry conditions.
- B. The work shall include the following:
 - 1. Design and installation of sumps and pumps, wells, trenches, underdrains and any other means selected by the Contractor to allow excavation and placement of soil to the lines and grades shown on the contract drawings. Maintenance of the system(s) is also the responsibility of the Contractor.
 - 2. Installation and maintenance of erosion and sediment control devices related to dewatering.
- C. Related Sections:
 - 1. Section 31 0516 - Aggregate
 - 2. Section 31 2316 - Excavation
 - 3. Section 31 2316.13 - Trenching
 - 4. Section 31 2323.13 - Backfill
 - 5. Section 31 2500 - Erosion and Sediment Control Devices

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and perimeter slopes, that excavations do not flood, and that damage to

subgrades and permanent structures is prevented or minimized.

- B. Control surface water that enters excavations by diversions, dikes, pumps or other means.
- C. Accomplish dewatering without damage to existing dams, appurtenances, or other structures.
- D. Remove dewatering systems when no longer required for construction.

1.04 SUBMITTALS

- A. Provide names and credentials of all subcontractors responsible for dewatering, if any.
- B. Provide a detailed plan of the means and methods that are to be used by the Contractor to establish and maintain the dewatering system(s).

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Obtain all required Federal, State or Local permits and approval from the NCDENR.

PART 2 PRODUCTS

The Contractor shall use dewatering products in accordance with the recommendations of the manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect structures, haul roads, access roads, embankments, utilities, and other facilities from potential damages or hazards resulting from dewatering operations.
- B. Design and install dewatering system(s) to ensure minimum interference with haul roads, construction access, stockpiling of materials, and construction activities in general.
- C. Protect and maintain temporary and permanent erosion and sediment control devices during dewatering operations.

3.02 OPERATION

- A. Operate dewatering system as until dewatering is no longer required as directed by the Engineer.
- B. Avoid and/or discontinue pumping that leads to loss of fines, soil “piping”, subgrade softening, or slope instability.
- C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed.
- D. Provide standby equipment, on site and available for immediate operation, to maintain dewatering after storm events or in the event of flooded excavations.

END OF SECTION

SECTION 31 2323.13
BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fill Type S1, Structural Fill, defined as compacted fill for perimeter berms, surface water control systems, roadways, general fill, final cover system construction, or other systems not intended to function as a migration barrier.
2. Fill Type S2, Topsoil or Vegetative Soil Cover, defined as soil material layer for the final cover system of the closed landfill, capable of sustaining vegetation as specified in these Specifications.

B. Related Sections:

1. Section 03 3000 - Cast-In-Place Concrete
2. Section 03 4800 - Precast Concrete Specialties
3. Section 31 0516 - Aggregate
4. Section 31 1413.16 - Soil Stockpiling
5. Section 31 2316 - Excavation
6. Section 31 2316.13 - Trenching
7. Section 31 2500 - Erosion and Sediment Control Devices
8. Section 32 9219 - Seeding
9. Section 40 0533 - High-Density Polyethylene Process Pipe

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fill Type S1, Structural Fill:

1. Basis of Measurement: By the cubic yard filled. The quantity of structural fill will be based upon the in-place volume between the excavated surface or prepared subgrade and the structurally filled surface as determined by survey information collected before and after the structural fill placement. A grid pattern of ground surface elevations as approved by the Engineer in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall check the as-built finished grades and determine the backfilled volume of structural fill based on survey data provided by the Contractor.
2. Basis of Payment: By the cubic yard placed times the unit price for fill Type S1 placement.
 - a. Includes hauling, scraping, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, temporary erosion control measures as needed including temporary stockpile stabilization if necessary, and removing accumulated water during construction.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

B. Fill Type S2, Topsoil or Vegetative Soil Cover:

1. Basis of Measurement: By the cubic yard placed.

2. Basis of Payment: By the cubic yard placed times the unit price for fill Type S3 placement. Payment quantities will be determined by the survey area for topsoil placement times an assumed 6 inch depth of topsoil placement.
 - a. Includes borrow excavation and/or furnishing, hauling, scraping, scarifying fill material, placing, maintenance, and temporary erosion control measures as needed including temporary stockpile stabilization if necessary.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM) standards:
 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 2. ASTM D1556 - Standard Test Method for Density of Soil In Place by the Sand-Cone Method.
 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)
 4. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
 5. ASTM D2487 – Standard Practices for Classification of Soil for Engineering Purposes (Unified Soil Classification System).
 6. ASTM D2937 - Standard Test Method for Density of Soil in place by the Drive-Cylinder Method.
 7. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 8. ASTM D 6913 – Standard Test Methods for Particle Size Distribution of Soils Using Sieve Analysis.
 9. ASTM D 6938 – Standard Test Methods for In-Place Density and Water Content of soil and Soil-Aggregate by Nuclear Methods.
- B. North Carolina Department of Environmental Quality:
 1. *North Carolina Erosion and Sediment Control Planning & Design Manual (NCESCPDM)*. North Carolina Department of Environment and Natural Resources (now NCDEQ), June, 2006, Chapters 6 and 8 revised May, 2013.

1.04 SUBMITTALS

- A. N/A.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Fill Type S1, Structural Fill:
 1. Structural fill is defined as compacted fill for perimeter berms, surface water control systems, roadways, general fill, cover system construction, or other systems not intended to function as a migration barrier.
 2. Natural soil material from designated on-site borrow areas and/or stockpiles.

3. Structural fill shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
 4. Free of topsoil, organic material, roots, stumps, brush, rocks larger than 4 inches, subsoil, debris, vegetation, and other foreign matter.
 5. Structural fill located within 1-foot of geosynthetics components shall be defined as “prepared subgrade”; that is, having a maximum particle size of 3 inches; a smooth surface; and no protrusions greater than 1/2 inch. The material shall be screened by the Earthwork Contractor, if necessary, to remove particle sizes greater than 3 inches in diameter. No more than 5 percent of the material should be retained on the No. 4 sieve.
 6. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.
- B. Fill Type S2, Topsoil and Vegetative Soil Cover:
1. Topsoil or Vegetative Soil Cover is defined as soil material layer for the final cover system of the closed landfill placed to support.
 2. Excavated and reused materials from designated on-site or off-site borrow areas and/or stockpiles.
 3. Shall be classified as SM, SC, SW-SM, SW-SC, SP-SM, ML, MH, or CL soils according to the Unified Soil Classification System (ASTM D2487).
 4. Free of roots, stumps, brush, rocks larger than 2 inches, debris, and other foreign matter.
 5. Topsoil or Vegetative Soil Cover material shall have nutrient content and pH capable of supporting vegetation.
 6. Shall have a minimum organic content of 2% by weight.
 7. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 2 inches in diameter with no more than 15% retained on the No. 4 sieve.

PART 3 EXECUTION

3.01 EXAMINATION

- A. The Engineer will assist the Earthwork Contractor in the determination of Structural Fill and non-select material during excavation operations (see Section 31 2316). The Earthwork Contractor will be responsible for excavating, transporting, stockpiling, placing and compacting all materials as needed.

3.02 PREPARATION

- A. Proof roll subgrade to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material if applicable, otherwise engineer shall visually observe subgrade for soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type S1 fill (as specified by the Engineer) and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 6 inches for areas with overlying soil. Smooth drum roll subgrade surface for areas with overlying geosynthetics.
- D. Grade subgrade to a tolerance of plus or minus 0.10 foot. All grade breaks must have a

minimum radius of 1 foot.

- E. Begin backfilling after Engineer's acceptance of the appropriate survey for underlying surface.

3.03 BACKFILLING

- A. Backfill areas to contours and elevations as shown on Drawings with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Fill Type S1: Place and compact material in loose lifts not exceeding 8 inches in thickness and not exceeding 6 inches compacted thickness. The first lift over geosynthetics shall be not less than 12 inches in loose thickness. Refer to Specification Section 31 2316.13 - Trenching for backfill requirements for drop inlets and culverts.
- D. Fill Type S2: Scarify subgrade, place material in one lift and track in with backhoe or other equipment approved by Engineer.
- E. Employ placement method that does not disturb or damage other work.
- F. Backfill against supported structures. Do not backfill against unsupported structures. Backfill simultaneously on each side of unsupported structures until supports are in place.
- G. Protect backfill from desiccation, crusting, or cracking.
- H. Make gradual grade changes. Blend slope into level areas.
- I. Remove surplus backfill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.
- J. Leave fill material stockpile areas free of excess fill materials.
- K. Provide survey information before and after placement of structural fill.

3.04 TOLERANCES

- A. Top Surface Type S1 fill shall be plus or minus 1 inch from required elevations.

3.05 FIELD QUALITY CONTROL

- A. Laboratory Testing:
 - 1. Perform laboratory material tests in accordance with ASTM D6913, ASTM D698, ASTM D2216, and ASTM D4318.
 - 2. Test at a frequency of:
 - a. 10,000 cubic yards of type S1 placed;
 - b. When materials using for structural fill change; and/or
 - c. When directed by the Engineer.
- B. In Place Compaction and Natural Moisture Content Tests
 - 1. Perform in place compaction tests in accordance with ASTM D1556, ASTM D6938, or ASTM D2937.

2. Perform in place natural moisture content test in accordance with ASTM D6938.
 3. Frequency of compaction/natural moisture content tests:
 - a. General fill, landfill subgrade, surface water control systems, or other systems not intended to function as a migration barrier, in-place density and moisture: Each lift at a minimum frequency of 1 per acre per lift, or as otherwise indicated in these Specifications.
 - b. Perimeter berms and roadways: Each lift at a minimum frequency of 1 per 10,000 sq. ft.
 - c. Drop inlets and culverts: see Section 31 2316.13.
 4. Compaction criteria:
 - a. Type S1 fill shall be compacted to minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density.
 - b. Type S1 fill placed for roadways shall be compacted to a minimum 98 percent of its Standard Proctor (ASTM D 698) maximum dry density.
 - c. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.
 - d. Fill Type S2 should be placed in one continuous loose lift and tracked in by backhoe or other equipment approved by Engineer.
 - e. Culverts: see Section 33 4213.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.06 PROTECTION OF WORK

- A. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 2500
EROSION AND SEDIMENT CONTROL DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Grass-Lined / Matted Channels / Diversion Berms
2. Riprap Energy Dissipater (Outlet Protection Apron)
3. Slope Matting
4. Grassing
5. Erosion Maintenance

B. Related Sections

1. Section 03 1000 - Concrete Forms and Accessories
2. Section 03 3000 - Cast-In-Place Concrete
3. Section 03 4800 - Precast Concrete Specialties
4. Section 31 0516 - Aggregate
5. Section 31 1100 - Site Clearing and Grubbing
6. Section 31 2316 - Excavation
7. Section 31 2323.13 - Backfill
8. Section 32 9219 - Seeding

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grass-Lined / Matted Channels / Diversion Berms:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Linear footage installed, times the unit price per linear foot.
 - a. Includes excavating, windrowing, placing fill, compacting, installing erosion control matting, maintaining during construction, seeding, and mulching for grass-lined channels / diversion berms as indicated on Drawings, maintaining during construction, and removal of temporary E&SC measures following ground stabilization. Refer to Section 32 9219 for seeding and soil supplements for grassing.
 - b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

B. Riprap Energy Dissipater (Outlet Protection Apron):

1. Basis of Measurement: Each unit placed.
2. Basis of Payment: Unit Price for each unit placed.
 - a. Includes labor and materials for clearing, excavating, backfilling, placing embankment, placing non-woven geotextile fabric in accordance with Section 31 0519.13, placing rock, and required grouting as indicated on Drawings, maintaining during construction, and removal of temporary E&SC measures following ground stabilization.

C. Slope Matting:

1. Basis of Measurement: By the square yard.
2. Basis of Payment: Unit Price for each square yard placed.
 - a. Includes labor and materials for installing slope matting, and maintaining during construction.

D. Grassing:

1. Basis of Measurement: By the Acre. Refer to Section 32 9219.
2. Basis of Payment: Unit Price for each acre seeded. Refer to Section 32 9219.

E. Erosion Maintenance:

1. Basis of Measurement: Lump sum.
2. Basis of Payment: Lump sum
 - a. Includes labor and materials for performance of all E&SC inspections as required by NCDEQ throughout the project and until permit closeout, assumed to be 6 months following Substantial Completion.
 - b. Includes labor and materials for maintaining E&SC measures after substantial completion and until permit closeout.

1.03 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.

B. ASTM International:

C. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

D. North Carolina Department of Environmental Quality:

1. *North Carolina Erosion and Sediment Control Planning & Design Manual (NCESCPDM)*. North Carolina Department of Environment and Natural Resources (now NCDEQ), June, 2006, Chapters 6 and 8 revised May, 2013.

1.04 SUBMITTALS

- A. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with requirements of these Project Specifications.
- B. Perform Work in accordance with NCDOT standards.

1.06 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this Section.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not place grout when air temperature is below freezing.
- B. Do not place concrete when base surface temperature is less than 40 degrees F or when surface is wet or frozen.

PART 2 PRODUCTS

2.01 RIPRAP AND GEOTEXTILE MATERIALS

- A. Riprap: As shown on Drawings and as specified in Section 31 0516. Furnish in accordance with NCDOT standards.
- B. Geotextile Fabric: Non-biodegradable, non-woven geotextile, 8 oz/sy, UV stabilized filter fabric as specified in Section 31 0519.13.

2.02 MATTING

- A. Matting: As shown on Drawings.

2.03 CONCRETE MATERIALS AND REINFORCEMENT

- A. Refer to Sections 03 1000, 03 3000, and 03 4800.

2.04 AGGREGATE AND SOIL MATERIALS

- A. Fine and Coarse Aggregate: As shown on Drawings and as specified in Section 31 0516.
- B. Soil Backfill: Soil Type S1 as specified in Section 31 2323.13. Subsoil with no rocks over 4 inches in diameter, frozen earth or foreign matter.

2.05 SILT FENCING

- A. As specified on Drawings.

2.06 PLANTING MATERIALS

- A. Seeding and Soil Supplements: As specified in Section 32 9219.
- B. Mulch: As specified in Section 32 9219.

2.07 ACCESSORIES

- A. Joint Sealers: Furnish in accordance with NCDOT standards and as indicated on Drawings.
- B. Joint Filler: Furnish in accordance with NCDOT standards and as indicated on Drawings.
- C. Grout: Furnish in accordance with NCDOT standards and as indicated on Drawings.

2.08 MIXES

- A. Concrete: as specified in Section 03 3000. Furnish in accordance with NCDOT standards and as indicated on Drawings.

2.09 SOURCE QUALITY CONTROL (AND TESTS)

- A. Perform tests on cement, aggregates, backfill, and mixes to ensure conformance with requirements of associated specifications.
- B. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade or granular base is acceptable and ready to support devices and imposed loads.
- B. Verify gradients and elevations of base or foundation for other work are correct.

3.02 GRASS-LINED / MATTED CHANNELS / DIVERSION BERMS

- A. Windrow excavated material on low side of channel.
- B. Place fill and compact to 95 percent of the maximum dry density as determined by ASTM D698.
- C. On entire channel area, apply soil supplements and sow seed as specified in Section 32 9219.
- D. Mulch seeded areas with straw as specified in Section 32 9219.
- E. Install erosion control matting as specified on Drawings.

3.03 RIPRAP ENERGY DISSIPATOR (OUTLET PROTECTION APRON)

- A. Excavate to indicated depth of rock lining or nominal placement thickness as indicated on Drawings. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 2 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.
- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile. Place as indicated on Drawings.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution. Place evenly and carefully to minimize voids.
 - 1. If grout is used to fill void spaces and where noted on the drawings, saturate rock with water and let all standing water drain. Fill voids between pieces with grout, where shown on Drawings, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.

3.04 SILT FENCING

- A. Install as specified on Drawings.

3.05 SILT FENCE OUTLETS

- A. Locations as indicated on the Drawings and may be field-adjusted with Engineer's approval.

3.06 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion control measures before site disturbance within tributary areas of those measures.
- C. Stockpile and waste pile heights shall not exceed heights indicated on the drawings. Slope stockpile sides at 2(H):1(V) or flatter or as otherwise indicated on the Drawings.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 15 calendar days.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 9219 and as specified on Drawings for temporary seeding.
 - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 9219 permanent seeding specifications.
- E. Stabilize diversion channels and stockpiles immediately.

3.07 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event in accordance with applicable North Carolina regulations. Perform additional inspections as required by the Self-Inspection Program. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. Compaction Testing: As specified in Section 31 2323.13.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

3.08 CLEANING

- A. Remove and dispose of sediment when sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, or as indicated on the Drawings.
- B. Do not damage structure or device during cleaning operations. Any damage caused by cleaning operations shall be repaired at no cost to the Owner.
- C. Do not permit sediment to erode into construction or site areas or natural waterways.
- D. Clean channels when depth of sediment reaches approximately one half channel depth.
- E. Do not damage channel or channel lining material during cleaning operations.

3.09 SCHEDULES

- A. As indicated on Drawings.

END OF SECTION

DIVISION 32

EXTERIOR IMPROVEMENTS



SECTION 32 9219
SEEDING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparation of subsoil.
2. Placing topsoil as needed.
3. Seeding.
4. Hydroseeding.
5. Mulching.
6. Fertilizing.
7. Maintenance.

B. Related Sections:

1. Section 31 2323.13 - Backfill
2. Section 31 2500 - Erosion and Sediment Control Devices

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Seeding:

1. Basis of Measurement: By the acre.
2. Basis of Payment: By the 2-dimensional acre seeded times the unit price for seeding.
 - a. Includes all labor, equipment and materials required to establish a permanent grass cover on all graded surfaces including, but not limited to preparation of subsoil, soil amendments, installation of erosion control matting, fertilizing, and seeding.
 - b. Includes fulfilling requirements of the maintenance agreement.
 - c. Includes any maintenance and protection required to control erosion on embankment fill surfaces prior to beginning permanent grassing operations.

1.03 REFERENCES

A. North Carolina Department of Environmental Quality:

1. *North Carolina Erosion and Sediment Control Planning & Design Manual (NCESCPDM)*. North Carolina Department of Environment and Natural Resources (now NCDEQ), June, 2006, Chapters 6 and 8 revised May, 2013.
2. Vegetation Maintenance Implementation Plan (VMIP), Duke Energy Allen Steam Station, 2011, S&ME Project No. 1265-10-362

1.04 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.05 SUBMITTALS

- A. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.
- B. Soil test results and fertilizer and soil amendment recommendations from the North Carolina Department of Agriculture and Consumer Affairs or a similar soil and nutrient testing

laboratory.

1.06 CLOSEOUT SUBMITTALS

- A. Seeding maintenance warranty.

1.07 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Perform Work in accordance with North Carolina Erosion and Sedimentation Control Planning and Design Manual.
- C. Provide soil testing results indicating required fertilizer, lime, and nutrient demand for on-site soils to promote vigorous vegetative growth.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 SEED MIXTURE

- A. Temporary Seed Mixture: As specified on Drawings.
- B. Permanent Seed Mixture: As specified on Drawings.

2.02 SOIL MATERIALS

- A. Topsoil: Excavated from site, imported, and/or a blend thereof reasonably free of weeds as specified in Section 31 2323.13.

2.03 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry and as described in the North Carolina Erosion and Sediment Control Planning and Design Manual.
- B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated on Drawings.
- C. Lime: Agricultural grade; recommended for grass; of proportion necessary to promote germination of seed as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated on the Drawings.

- D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.
- E. Erosion Fabric: Erosion control matting, as specified by the Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify prepared soil base is ready to receive the Work of this Section.

3.02 PREPARATION OF SUBSOIL

- A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
- C. Tracked soil surface shall be oriented up and down slopes and not parallel to slopes to help prevent erosion.

3.03 FERTILIZING

- A. Provide minimum fertilizer, lime, and nutrient addition as recommend by soil testing results to promote vigorous vegetative growth.
- B. Apply fertilizer after smooth raking of topsoil.
- C. Mix fertilizer thoroughly into upper 2 to 4 inches of soil.
- D. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.04 SEEDING

- A. Stabilization and/or seeding must be completed per the erosion and sediment control permit requirements. This is understood that disturbed areas are to be permanently stabilized or seeded within 15 working days or 90 calendar days.
- B. Apply seed at rate as indicated on Drawings evenly in two intersecting directions and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Rake in lightly.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Planting Season: As indicated on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual.
- E. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- F. Immediately following seeding, apply mulch to thickness as specified on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design

Manual. Maintain clear of shrubs and trees.

- G. Apply water with fine spray immediately after each area has been mulched. Saturate to 2 inches of soil.

3.05 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 2000 lbs. per acres evenly in one pass.
- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.06 MAINTENANCE WARRANTY

- A. The contractor is responsible for providing a sufficient quality vegetation consistent with the engineers approved seeding mixture. The contractor shall be liable for maintenance, substantial growth and acceptance for a period of twelve months after Substantial Completion. The Owner shall retain a Maintenance Bond from the contractor in the amount of 15% of the total price of seeding for a period of twelve months after Substantial Completion.
- B. Vegetation shall be monitored by the Owner or Owners representative and the contractor during agreed upon dates. A corrective punch list and/or approval letter will then be formulated and given to the contractor for each review. If the vegetation is deemed of insufficient quality and/or erosion has occurred due to fault of the contractor, contractor will take corrective measures and or replace at no cost to the owner. Contractor liability for establishing vegetation does not include destructive acts by others including traffic, mowing, chemicals, all other physical activities and force majeure.
- C. Definitions:
 - 1. *corrective measures* - may include any or all of the following: re-fertilizing, re-seeding, correcting erosion issues caused by insufficient vegetation.
 - 2. *force majeure* - acts of severe or abnormal conditions including but not limited to parasitic insects or fungi, wildfire, flooding, wind damage, or extreme drought as defined by the North Carolina Drought Management Advisory Council.
 - 3. *owner's obligations* - The Owner is obligated to monitor the vegetation at the frequency defined above. If corrective measures need to be taken, the owner is responsible for communicating to the Contractor the extent and location where corrective measures are necessary.
 - 4. *sufficient quality of permanent vegetation* - Permanent vegetation will be considered of sufficient quality if the following two conditions are met:
 - a. No bare spots are larger than 25 square feet
 - b. Bare spots make up less than 2% of total seeded area
- D. Terms and conditions of the maintenance warranty may be modified by a Notice of Change if agreeable to the Owner, Engineer, and Contractor.

3.07 SCHEDULE

- A. As indicated on Drawings.

END OF SECTION

DIVISION 33

EXTERIOR IMPROVEMENTS



SECTION 33 4213
CONCRETE CULVERT PIPE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete Culvert Pipe

B. Related Sections:

1. Section 31 2316 - Excavation
2. Section 31 2316-13 – Trenching
3. Section 31 2323.13 – Backfill
4. Section 31 2319 - Dewatering

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Concrete Culvert Pipe:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Linear footage installed, times the unit price per linear foot.
 - a. Includes unit, excavating, bedding, backfilling, compacting, joining, sealing, fittings and accessories assembled.

1.03 REFERENCES

A. American Concrete Institute

1. ACI 318 - Building Code Requirements for Reinforced Concrete.
2. ACI 350 - Environmental Engineering Concrete Structures.

B. ASTM International

1. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
2. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
3. ASTM C33 - Standard Specification for Concrete Aggregates.
4. ASTM C150 - Standard Specification for Portland Cement.
5. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
6. ASTM C443 - Joints.
7. ASTM C913 - Standard Specification for Pre-cast Concrete Water and Wastewater Structures.
8. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
9. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Pre-cast Box Sections Using Preformed Flexible Joints Sealants.
10. ASTM C1433 - Standard Specification for Pre-cast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.
11. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
12. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

13. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. American Association of State Highway and Transportation Officials

1. AASHTO M198 - Butyl Rubber Sealants.

1.04 DESIGN REQUIREMENTS

A. Design Criteria:

1. Honeycombed or retempered concrete is not permitted.
2. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318, Design for H20 Loading.
3. Design of Lifting Devices for Pre-cast Structures: In accordance with ASTM C 913.
4. Design of Joints for Pre-cast Structures: In accordance with ASTM C443.

1.05 SUBMITTALS

- A. Shop Drawing: Indicate structure locations such as adjoining headwalls or endwalls and catch basins in relation to culvert installation for penetration and elevations of penetrations.
- B. Product Data: Submit covers, component construction, features, configuration, and dimensions.
- C. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from Materials Suppliers attesting that concrete pipe provided meet or exceed ASTM Standards and Specification requirements.

1.06 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components and connections.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with NCDOT standards.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Comply with Manufacturer's instructions for unloading, storing and moving concrete pipe sections.
- B. Store culverts to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
- C. Mark each pre-cast structure by indentation or waterproof paint showing date of manufacture, Manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE SECTIONS

- A. Reinforced Concrete Pipe: ASTM C76, with bell and spigot joints to class shown on Drawings
- B. Joints: Rubber gaskets, ASTM C443.
- C. Handling Holes:
 - 1. Permitted only on reinforced concrete storm culvert pipe 21 in. or larger in dia.
 - 2. One handling hole is permitted on straight lengths of pipe, less than 48 in. in dia., and two on pipe 48 in. and larger, connection pipe, and cut off for curves.
 - 3. Plug handling holes with mortar after pipe is laid before cover material is placed. Wipe and clean inside face.
- D. Manufacturer's products and configurations shall be provided and installed as specified on the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify connections, sizes, locations and inverts are as indicated on Drawings.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify excavations meet line and grade requirements as indicated on the drawings.

3.02 PREPARATION

- A. Coordinate placement of connecting pipes required by other Sections of Work as described in these Specifications.
- B. Inspect concrete culvert pipe immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.03 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for pre-cast concrete structures in accordance with Section 31 2316 of these Specifications in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
 - 2. When groundwater is encountered, prevent accumulation of water in excavations. Place pre-cast concrete structures in dry trench.
 - 3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
- B. Lift pipe at lifting points designated by Manufacturer.
- C. When lowering concrete pipes into excavations and joining pipes together or to structures, take precautions to ensure interior of pipeline and structure remains clean.

D. Coupled Joints – Cement Mortar Joint for Tongue and Groove:

1. Wherever possible, use pre-cast connections.
2. Butter groove of last pipe laid with cement mortar on inner face throughout lower half of pipe. Butter tongue of pipe to be laid on outer face throughout upper half.
3. Join and force pipe together until opening on outside of pipe is no less than 1/2 in. nor more than 1/3 length of tongue.
4. Immediately before making joint, lubricate outside of gasket and inside of bell or groove of last pipe with approved lubricant.
5. Trowel outside of joint with mortar and fill open space.
6. Cover outside of pipe joint with paper or tar paper.
7. For pipe 21 in. to 72 in. in diameter completely fill open section of inside joint face with mortar and wipe clean.

E. Bell and Spigot Joints

1. Immediately before making joint, lubricate outside of gasket and inside of bell or groove of last pipe with approved lubricant.
2. Gasket and ends of pipe shall be free of sand or gravel.
3. Insert spigot or tongue of pipe with gasket in place, into bell or groove end of previously laid pipe.
4. Set pipe to line and grade, and jack or push home.
5. Use jack or "come along" to ensure joints are tight.

F. Coordinate with other Sections of Work as described in these Specifications to provide correct size, shape, and location.

3.04 FIELD QUALITY CONTROL

- A. Noticeable variations from true alignment and grade will be considered sufficient cause for rejection of work.
- B. Acceptance of fittings, stubs or other specially fabricated pipe sections shall be based on visual inspection at job site.
- C. Pipe shall be subject to rejection for failure to conform to requirements of Contract Documents or following.
 1. Fractures or cracks passing through pipe wall or socket, except single crack not exceeding 2 in. in length at either end of pipe or single fracture in socket not exceeding 3 in. in width nor 2 in. in length shall not be considered cause for rejection unless these defects exist in more than 5% of entire shipment or delivery.
 2. Chips or fractures on interior of pipe exceeding 2 in. in length, 1 in. in width, and depth more than 1/4 barrel thickness.
 3. Cracks sufficient to impair strength, durability, or serviceability of pipe.
 4. Defects indicating improper proportioning, mixing, and molding.
 5. Variations of more than 1/8 in./lf in alignment of pipe intended to be straight.
 6. Damaged ends, where such damage prevents making satisfactory joint.
- D. Request observation by Engineer prior to placing cover over piping.
- E. Compaction Testing: In accordance with Section 31 2323.13.

END OF SECTION