

Permit No.	Date	Document ID No.
1812	February 4, 2011	12843



February 3, 2011

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Solid Waste Section

Asheville Regional Office

APPROVED DOCUMENT

Division of Waste Management

Solid Waste Section

Date **February 4, 2011** By **LY Frost**

North Carolina Department of Environment and Natural Resources
Solid Waste Section, Division of Waste Management
Asheville Regional Office
2090 US Highway 70
Swannanoa, North Carolina 28778

Attention: Mr. Larry Frost

Reference: Cells 1 and 2 Financial Assurance Cost Estimate

Marshall Steam Station Industrial Landfill No. 1, Permit No. 18-12

Duke Energy – Marshall Steam Station

8320 NC Highway 150 East, Terrell, Catawba County, North Carolina

S&ME Project No. 1356-08-122

North Carolina P.E. License No. F-0176

Dear Mr. Frost:

On behalf of Duke Energy, S&ME is pleased to provide this financial assurance cost estimate for the closure, post-closure, and potential assessment and corrective action costs associated with Cells 1 and 2. The following items are provided along with this letter, some of which are from the Permit to Construct (PTC) Application for Phase 1 of the Marshall Steam Station – Industrial Landfill No. 1 (dated November 2009):

Financial Assurance Cost Estimate Tables:

- Table 1. Closure Cost Estimate
- Table 2. Post-Closure Cost Estimate
- Table 3. Potential Assessment and Corrective Action Cost Estimate

Cover System Drawings from the PTC:

- C8 Cell 1 and 2 Stormwater Management Plan
- D6 E&SC Details 1
- D8 Interim Cover Stormwater Management Details
- D9 Final Cover System Details 1
- D10 Final Cover System Details 2

Please note that, for Cells 1 and 2, there is a stormwater management plan and that a final cover plan was not developed for these cells alone. A final cover plan was prepared, however, for the entire (final build-out) landfill including Phases 1 through 5 which contain Cells 1 through 13. Closure costs were estimated by converting stormwater management features for Cells 1 and 2 to final cover system features (converting tack-on benches to rain gutters and adding geosynthetics). A summary of the costs provided in the financial assurance cost estimate tables is presented below:

- Cells 1 and 2 closure, Table 1 - \$2,549,200 (\$130,700 per acre);
- Cells 1 and 2 post-closure, Table 2 - \$1,180,300 (\$39,300 annually over a 30 year period);
- Cells 1 and 2 potential assessment and corrective action, Table 3 - \$142,800 (\$4,800 annually over a 30 year period) (this is less than the minimum required amount of \$3,000,000); and finally,
- The total financial assurance for Cells 1 and 2 is \$6,729,500.

It is our understanding that upon your approval of the total financial assurance amount, Duke Energy intends to provide documentation of the financial assurance amount as well as a description of the mechanism of this financial assurance to North Carolina Department of Environment and Natural Resources.

Should you have any questions or comments, please contact us.

Respectfully submitted,

S&ME, Inc.



William M. Harrison, E.I.
Staff Professional



Kenneth R. Daly, P.E.
Senior Project Engineer
Engineer of Record

Cc – Dean Snyder, Duke Energy
Cc – Ed Sullivan, Duke Energy

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Marshall Industrial Landfill\Financial
Assurance\Letter.doc

TABLE 1
 CLOSURE COST ESTIMATE
 DUKE ENERGY - MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
 PERMIT NO. 18-12
 CATAWBA COUNTY, NC
 FEBRUARY 2011

	Quantity	Unit	Unit Cost	Total Cost
Final Cover System Construction Costs				
Demolition of Interim Cover Measures	19.5	AC	\$1,000.00	\$19,500
Fine Grading of Interim Cover	19.5	AC	\$3,800.00	\$74,100
40 mil LLDPE Geomembrane	849,420	SF	\$0.50	\$424,710
Geocomposite Drainage Layer	849,420	SF	\$0.78	\$662,548
6" Vegetative Layer	15,730	CY	\$10.00	\$157,300
18" Protective Cover	47,190	CY	\$4.00	\$188,760
Rain Gutter (12" Diameter with Geotextile and Stone)	10,400	LF	\$20.00	\$208,000
Down Drains (18" Diameter)	1,040	LF	\$36.00	\$37,440
Drop Inlets	13	EA	\$5,000.00	\$65,000
Outlet Protection Aprons	3	EA	\$2,000.00	\$6,000
Grass-Lined Channels	580	LF	\$24.00	\$13,920
Cover System Access Road	305	TN	\$38.00	\$11,571
Surveys	19.5	AC	\$1,400.00	\$27,300
Final Landscaping (Seeding, Fertilizing, and Mulching)	19.5	AC	\$1,800.00	\$35,100
Subtotal				\$1,931,249
Mobilization/Demobilization (5% of Subtotal)				\$96,562
Engineering Services, CQA/CQC (12% of Subtotal)				\$231,750
Contingency (15% of Subtotal)				\$289,687
Total				\$2,549,200
Cost Per Acre (for 19.5 acres)				\$130,700

TABLE 2
 POST-CLOSURE COST ESTIMATE
 DUKE ENERGY - MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
 PERMIT NO. 18-12
 CATAWBA COUNTY, NC
 FEBRUARY 2011

	Quantity	Unit	Unit Cost	Total Cost
Administration/Inspection/Recordkeeping⁽¹⁾				
Staff Professional (80 Hrs/Yr @ \$85/Hr)	30	Yr	\$6,800.00	\$204,000
Technician (40 Hrs/Yr @ \$60/Hr)	30	Yr	\$2,400.00	\$72,000
Clerical (8 Hrs/Yr @ \$50/hr)	30	Yr	\$400.00	\$12,000
Maintenance				
Fencing, Gates, Signs, Etc.	30	Yr	\$1,000.00	\$30,000
Access Roads	30	Yr	\$2,000.00	\$60,000
Mowing (\$100 per acre per quarter over 19.5 acres)	30	Yr	\$7,800.00	\$234,000
Stormwater Structures	30	Yr	\$5,000.00	\$150,000
Leachate Collection and Storage	30	Yr	\$1,000.00	\$30,000
Final Cover System (\$1,500 per acre) ⁽²⁾	30	Yr	\$7,312.50	\$219,375
Fees				
Annual Permit Fee	30	Yr	\$500.00	\$15,000
Subtotal				\$1,026,375
Contingency (15% of Subtotal)				\$153,956
30 Year Total				\$1,180,300
30 Year Total Per Acre (for 19.5 acres)				\$60,500
Cost Per Year (Includes 15% Contingency)				\$39,300
Cost Per Year Per Acre (for 19.5 acres)				\$2,015

Notes:

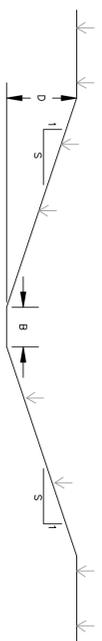
1. Assumes quarterly monitoring and reporting, preparation of annual report, and managing site activities.
2. Assumes erosion repair and seeding for 25 percent of the cover annually.

TABLE 3
 POTENTIAL ASSESMENT AND CORRECTIVE ACTION COST ESTIMATE
 DUKE ENERGY - MARSHALL STEAM STATION INDUSTRIAL LANDFILL NO. 1
 PERMIT NO. 18-12
 CATAWBA COUNTY, NC
 FEBRUARY 2011

	Quantity	Unit	Unit Cost	Total Cost
Compliance Monitoring				
Staff Professional (24 Hrs/Yr @ \$85/Hr) ⁽¹⁾	30	Yr	\$2,040.00	\$61,200
Clerical (2 Hrs/Yr @ \$50/hr)	30	Yr	\$100.00	\$3,000
Analytical				
2 LDS Sumps Sampled and Analyzed Semi-Annually for 30 Years	120	Event	\$500.00	\$60,000
Subtotal				\$124,200
Contingency (15% of Subtotal)				\$18,630
30 Year Total				\$142,800
30 Year Total Per Acre (for 19.5 acres)				\$7,300
Cost Per Year (Includes 15% Contingency)				\$4,800
Cost Per Year Per Acre (for 19.5 acres)				\$246

Notes:

1. Assumes semi-annual compliance monitoring and reporting.



DEFINITION:
A CHANNEL WITH VEGETATIVE LINING CONSTRUCTED TO DESIGN CROSS SECTION AND GRADE FOR CONVEYANCE OF RUNOFF.

PURPOSE:
TO CONVEY AND DISPOSE OF CONCENTRATED SURFACE RUNOFF WITHOUT DAMAGE FROM EROSION, DEPOSITION, OR FLOODING.

CONSTRUCTION SPECIFICATIONS:

- REMOVE ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA AND DISPOSE OF PROPERLY.
- PLACE FILL TO CONSTRUCT THE CHANNEL AND SHAPE IT TO DIMENSIONS SHOWN ON THE CHANNEL SCHEDULES PLUS A 0.2-FT OVERTOP AROUND THE CHANNEL PERMETER TO ALLOW FOR BUILDING DURING SEEDING PREPARATIONS AND SOD BUILDUP.
- REMOVE AND PROPERLY DISPOSE OF ALL EXCESS SOIL SO THAT SURFACE WATER MAY ENTER THE CHANNEL FREELY.
- THE PROCEDURE USED TO ESTABLISH GRASS IN THE CHANNEL WILL DEPEND UPON THE SEVERITY OF THE CONDITIONS AND SELECTION OF GRASS SPECIES (SEE GENERAL SEEDING SPECIFICATIONS). PROTECT THE CHANNEL WITH TEMPORARY MATTING SPECIFIC TO WITHSTAND ANTICIPATED VELOCITIES DURING THE ESTABLISHMENT PERIOD (SEE CHANNEL SCHEDULES).

MAINTENANCE:
DURING THE ESTABLISHMENT PERIOD, CHECK GRASS-LINED CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL. CHECK IT PARTICULARLY IMPORTANT TO CHECK THE CHANNEL, OUTLET AND ALL ROAD CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PINNAC OR SCOUR HOLES.

REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGN CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE SPECIFICATIONS).

INSPECT ALL WELCHES PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION, OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MUDCH. CONTINUE INSPECTIONS UNTIL VEGETATION IS FULLY ESTABLISHED.

CELLS 1 & 2 CHANNEL SCHEDULE

CHANNEL ID	REACH	SIDE SLOPES (S)(H:V)	BASE WIDTH (B) (FT)	DEPTH (D) (FT)	SLOPE (F/FT)	EAS MATTING
EAST PERIMETER CHANNEL (EPC)	1	2	0	5.25	0.0301	DS75
	2	2	0	5.25	0.0441	DS75
	3	2	2	4.75	0.0145	DS75
NORTH HAUL ROAD (NHR)	1	3	3	1.00	0.1000	CI25

PHASE 1 CHANNEL SCHEDULE

CHANNEL ID	REACH	SIDE SLOPES (S)(H:V)	BASE WIDTH (B) (FT)	DEPTH (D) (FT)	SLOPE (F/FT)	EAS MATTING
EAST PERIMETER CHANNEL (EPC)	1	2	0	5.25	0.0301	DS75
	2	2	0	5.25	0.0441	DS75
	3	2	2	4.75	0.0145	DS75
WEST PERIMETER CHANNEL (WPC)	1	2	0	5.25	0.0357	DS150
	2	2	12	2.25	0.0768	CI25
	3	2	0	5.25	0.0216	CI25
NORTH HAUL ROAD (NHR)	1	3	3	1.00	0.1000	CI25

FINAL CHANNEL SCHEDULE

CHANNEL ID	REACH	SIDE SLOPES (S)(H:V)	BASE WIDTH (B) (FT)	DEPTH (D) (FT)	SLOPE (F/FT)	EAS MATTING
EAST PERIMETER CHANNEL (EPC)	1	2	0	5.25	0.0301	DS75
	2	2	0	5.25	0.0441	DS75
	3	2	2	4.75	0.0145	DS75
WEST PERIMETER CHANNEL (WPC)	1	2	0	5.25	0.0357	DS150
	2	2	12	2.25	0.0768	CI25
	3	2	0	5.25	0.0216	DS75
NORTH HAUL ROAD (NHR)	1	3	3	1.00	0.1000	CI25
SOUTH HAUL ROAD (SHR)	1	3	3	1.00	0.1000	DS150
ROAD (SHR)	2	3	3	1.00	0.1000	CI25
OUTLET CHANNEL (OC)	-	2	2	2.00	0.0950	CONCRETE

CHANNEL SCHEDULE NOTES:

- CHANNEL REQUIRES DO NOT REQUIRE EAS MATTING IF CHANNEL HAS ESTABLISHED VEGETATION FROM PREVIOUS LANDFILL BUILDOUT CONDITION.
- REACH 4 FROM PHASE 1 CONDITION SERVES AS A TEMPORARY FEATURE TO DIVERT STORMWATER FROM THE PERIMETER CHANNEL AND SHALL BE REMOVED PRIOR TO FINAL CONDITIONS.

38 GRASS LINED CHANNELS
D6 SCALE: NTS

CELLS 1 & 2 DOWN DRAIN SCHEDULE

DOWN DRAIN ID	NOMINAL INSIDE PIPE DIAMETER (IN)
A	18
B	18
C	18
D	18
E	18
F	18
G	18
H	18

PHASE 1 DOWN DRAIN SCHEDULE

DOWN DRAIN ID	NOMINAL INSIDE PIPE DIAMETER (IN)
A	18
B	18
C	18
D	18
E	18
F	18
G	18
H	18
OUTLET PIPE	36

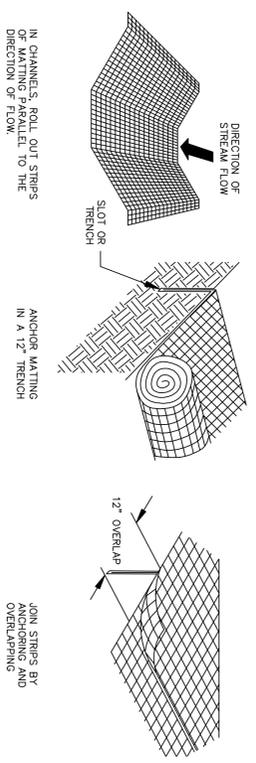
FINAL DOWN DRAIN SCHEDULE

DOWN DRAIN ID	NOMINAL INSIDE PIPE DIAMETER (IN)
A	24
B	24
C	18
D	18
E	18
F	18
G	12
H	12

DOWN DRAIN SCHEDULE NOTES:

- DD-A AND DD-B FROM CELLS 1 & 2 SHALL BE REMOVED PRIOR TO PHASE 1 INTERIM CONDITIONS.
- DD-C UNDER CELLS 1 & 2 CONDITION CORRESPONDS TO DD-D UNDER PHASE 1 CONDITIONS.
- DD-D UNDER CELLS 1 & 2 CONDITION CORRESPONDS TO DD-E UNDER PHASE 1 CONDITIONS.
- OUTLET PIPE FROM PHASE 1 CONDITION SERVES AS A TEMPORARY FEATURE TO DIVERT STORMWATER FROM THE PERIMETER CHANNEL AND SHALL BE REMOVED PRIOR TO FINAL CONDITIONS.

41 DOWN DRAIN SCHEDULE
D6 SCALE: NTS



GENERAL NOTES:

- CHANNELS MUST BE MATTED WITH SPECIFIED (OR EQUIVALENT) MATERIALS PRESENTED IN THE CHANNEL SCHEDULES.
- APPLY SEED (IN ACCORDANCE WITH THE GENERAL SEEDING SPECIFICATION) BEFORE LAYING THE NET OR MAT. IF OPEN-WEAVE MATTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND FERTILIZER AND SEED MAY BE SPREADED ON ATTEMWARD.
- START LAYING THE NET FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES-DO NOT TRENCH.
- TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 12 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. START THE NET EVERY 12 INCHES ACROSS THE TOP END EVERY 3 FEET AROUND THE EDGES AND BOTTOM (OR, OVERLAPED 3 INCHES AND STAPLED TOGETHER). SEEDING SHALL BE MAINTAINED AS SPECIFIED BY THE MANUFACTURER. EACH STRIP OF MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER, EVERY 3 FEET (OR, AS SPECIFIED BY THE MANUFACTURER).
- OTHER MATTING INSTALLATION METHODS (IF EQUIVALENT) MUST BE APPROVED BY THE ENGINEER.

MAINTENANCE NOTES:

- INSPECT GULLED EROSION CONTROL PRODUCTS (GCP) AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAIN FALL EVENT.
- GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE GCP.
- ANY AREAS OF THE GCP THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED.
- IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA PROTECTED.

39 MATTING
D6 SCALE: NTS

CELLS 1 & 2 CULVERT SCHEDULE

CULVERT ID	TYPE	MATERIAL	DIAM. (IN)	NUMBER OF CULVERTS
CELL 1 (C1)	CIRCULAR	HOPE	42	1
CELL 2 (C2)	CIRCULAR	HOPE	48	1
CELL 3 ENTRANCE ROAD (C3E)	CIRCULAR	HOPE	42	1
NORTH HAUL ROAD (NHR)	CIRCULAR	HOPE	24	1

PHASE 1 CULVERT SCHEDULE

CULVERT ID	TYPE	MATERIAL	DIAM. (IN)	NUMBER OF CULVERTS
CELL 3 (C3)	CIRCULAR	HOPE	12	1
CELL 4 (C4)	CIRCULAR	HOPE	38	1
CELL 3 ENTRANCE ROAD (C3E)	CIRCULAR	HOPE	12	1

FINAL CULVERT SCHEDULE

CULVERT ID	CULVERT TYPE	MATERIAL	SECTION SIZE (FT)	NUMBER OF CULVERTS
SOUTH HAUL ROAD (SHR)	BOX	CONCRETE	10 X 4	1
OUTLET CULVERT (OU)	BOX	CONCRETE	10 X 4	2

40 CULVERT SCHEDULE
D6 SCALE: NTS

DEFINITION:
A STRUCTURE DESIGNED TO CONTROL EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT.

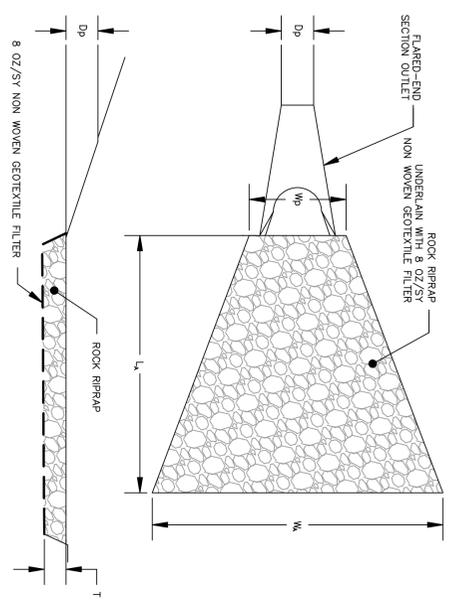
PURPOSE:
TO PREVENT EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT BY REDUCING THE VELOCITY OF FLOW AND DISPERSING THE ENERGY.

CONSTRUCTION SPECIFICATIONS:

- ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.
- THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.
- FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER A MINIMUM OF 1 FT. IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.
- RIPPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.
- THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.
- RIPPRAP SHALL BE NOOT RIPRAP CLASS AS SPECIFIED IN THE OUTLET PROTECTION SCHEDULE, OR APPROVED EQUIVALENT. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.
- CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERTOP AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.
- ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STEADY AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CHANGE IS NEEDED TO FIT SITE CONDITIONS, PLACE IN THE UPPER SECTION OF THE APRON.
- IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

MAINTENANCE:
INSPECT RIPRAP OUTLET STRUCTURES WEEKLY AND AFTER SIGNIFICANT (0.5 INCH OR GREATER) RAINFALL EVENTS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE, OR IF STONES HAVE BEEN DISLOADED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

REFERENCE:
6-41.5 NC EROSION AND SEDIMENTATION CONTROL, PLANNING AND DESIGN MANUAL, 2006



TYPICAL OUTLET PROTECTION SCHEDULE

APRON LABEL	DISCHARGE LOCATION (FT)	Lp (FT)	Wp (FT)	Wb (FT)	CLASS	Drip (IN)	Drip (IN)	Drip (IN)
A1	DD-B (CELLS 1 & 2)	1.5	17	4.5	CLASS B	8	12	18
A2	DD-C (PHASE 1)	1.5	11	4.5	CLASS A	4	6	9
A3	OUTLET PIPE (PHASE 1)	3	20	9	CLASS B	8	12	18

42 OUTLET PROTECTION
D6 SCALE: NTS

NO.	DATE	DESCRIPTION	BY

E&S DETAILS 1
INDUSTRIAL LANDFILL NO. 1

DUKE ENERGY - MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

ENGINEERING LICENSE NO. **F-076**

DRAWN BY: CLD	CHECKED BY: JSR
DESIGNED BY: VMH	APPROVED BY: KRD



S&ME
WWW.SMEINC.COM

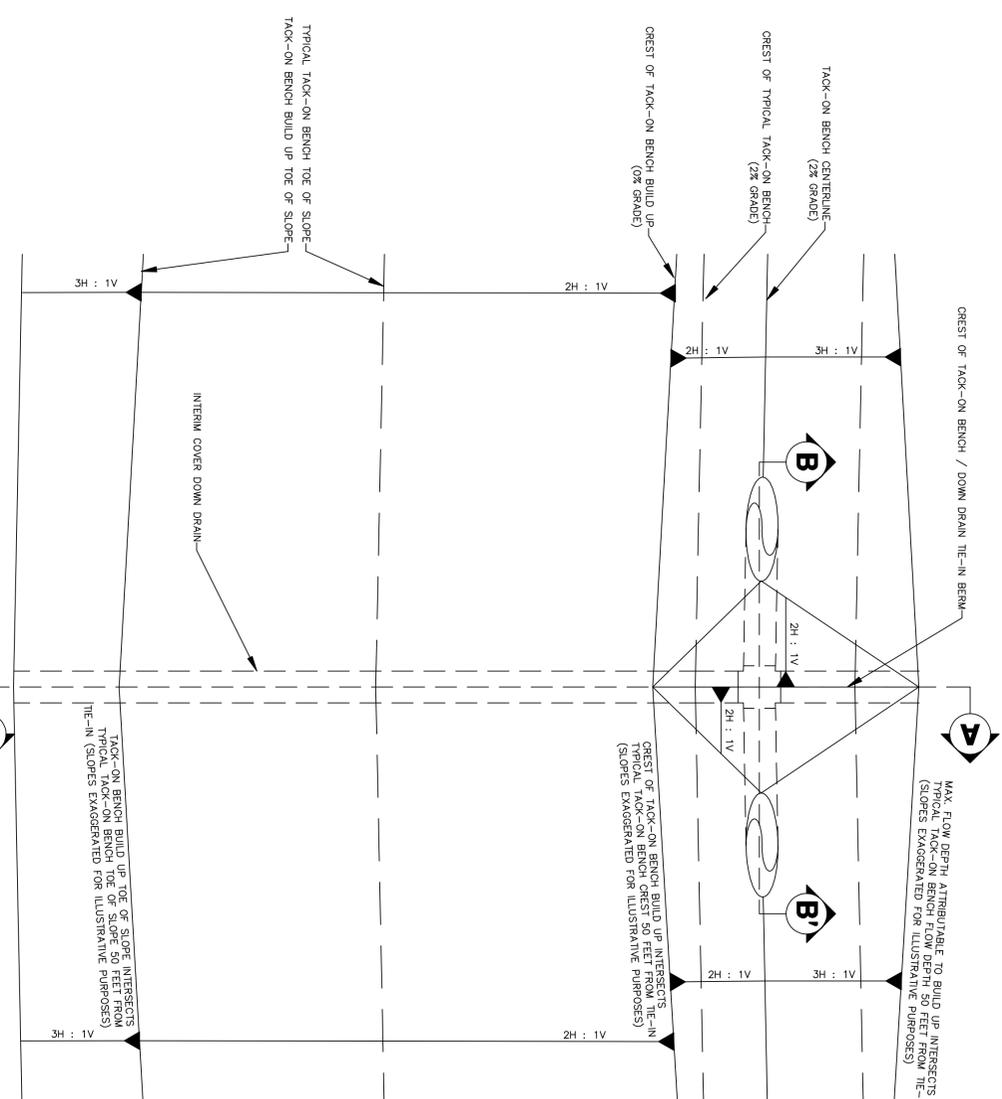
9751 SOUTHERN PINE BLVD.
CHARLOTTE, N.C. 28273
(704)523-4726



AS SHOWN: **D6** OF: **32**

DATE: 11-24-09

DRAWING PATH:



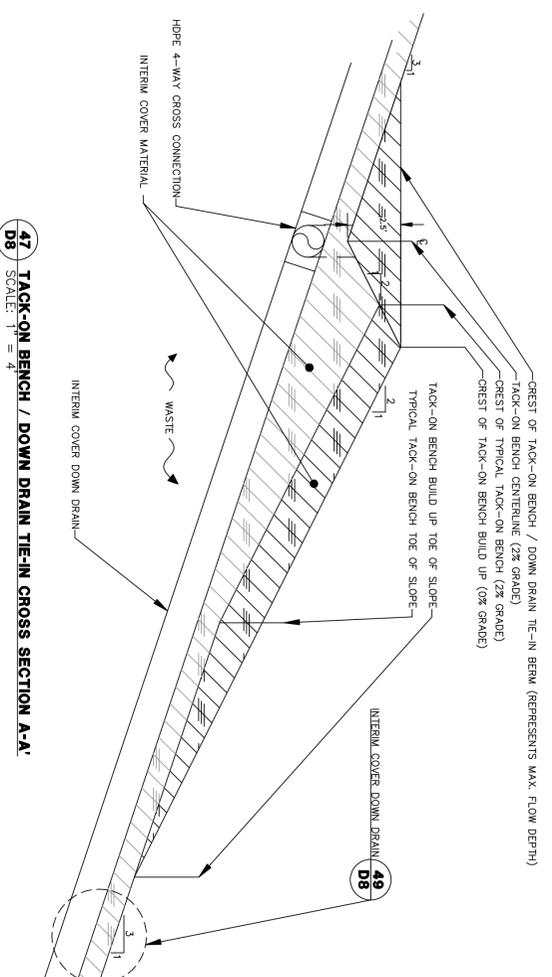
46 TACK-ON BENCH / DOWN DRAIN TIE-IN PLAN
SCALE: 1" = 4'

CELLS 1 & 2					PHASE 1					FINAL							
OUTLET PROTECTION AT PERIMETER CHANNEL SCHEDULE	DOWNDRAIN ID	RR/RAP CLASS	D ₉₀ (IN)	D ₈₅ (IN)	T (IN)	OUTLET PROTECTION AT PERIMETER CHANNEL SCHEDULE	DOWNDRAIN ID	RR/RAP CLASS	D ₉₀ (IN)	D ₈₅ (IN)	T (IN)	OUTLET PROTECTION AT PERIMETER CHANNEL SCHEDULE	DOWNDRAIN ID	RR/RAP CLASS	D ₉₀ (IN)	D ₈₅ (IN)	T (IN)
A ¹	18	CLASS B	8	12	18	A	18	CLASS B	8	12	18	A	18	CLASS B	8	12	18
B ²	18	CLASS A	10	17	25.5	B	18	CLASS 2	14	23	34.5	B	18	CLASS 2	14	23	34.5
C ³	18	CLASS 1	4	6	9	C	18	CLASS 1	10	17	25.5	C	18	CLASS 1	10	17	25.5
D ⁴	18	CLASS A	4	6	9	D	18	CLASS 1	10	17	25.5	E	18	CLASS 1	10	17	25.5
						E	18	CLASS 1	10	17	25.5	F	18	CLASS 1	10	17	25.5
						F	18	CLASS 1	10	17	25.5	G	12	CLASS A	4	6	9
						G	12	CLASS A	4	6	9	H	12	CLASS A	4	6	9

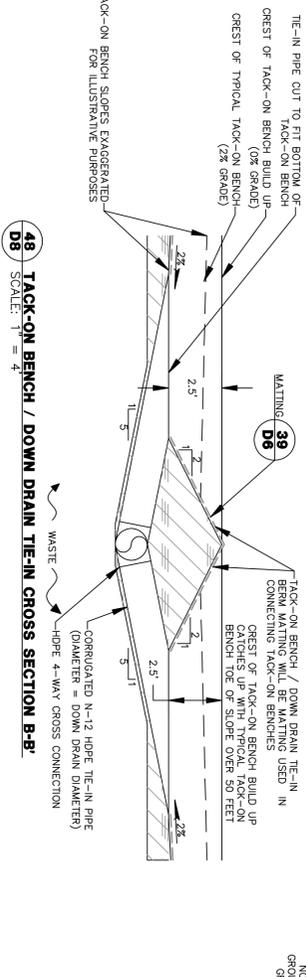
OUTLET PROTECTION AT PERIMETER CHANNEL SCHEDULE NOTES:

- NOTE THAT RR/RAP OUTLET PROTECTION AREAS AT PERIMETER CHANNELS ARE TO BE GROUTED WITH 3000 PSI GROUT AND BROOKED IN PLACE.
- DD-A FROM CELLS 1 & 2 CONDITION IS TEMPORARY FEATURES AND SHALL BE REMOVED DURING PHASE 1 CONDITION.
- DD-B FROM CELLS 1 & 2 CONDITION AND DD-C FROM PHASE 1 CONDITION ARE LOCATED IN OUTLET PROTECTION DETAIL 42 OF SHEET D6.
- DD-C UNDER CELLS 1 & 2 CONDITION CORRESPONDS TO DD-D UNDER PHASE 1 CONDITIONS.
- DD-D UNDER CELLS 1 & 2 CONDITION CORRESPONDS TO DD-E UNDER PHASE 1 CONDITIONS.
- OUTLET PROTECTION AT THE PERIMETER CHANNEL SHALL BE CONSTRUCTED AS SHOWN IN THE DETAIL 53 OF SHEET D8.

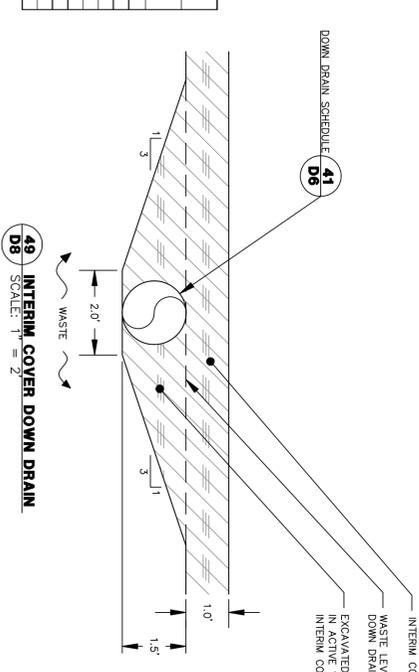
54 OUTLET PROTECTION AT PERIMETER CHANNEL SCHEDULE
SCALE: 1" = 4'



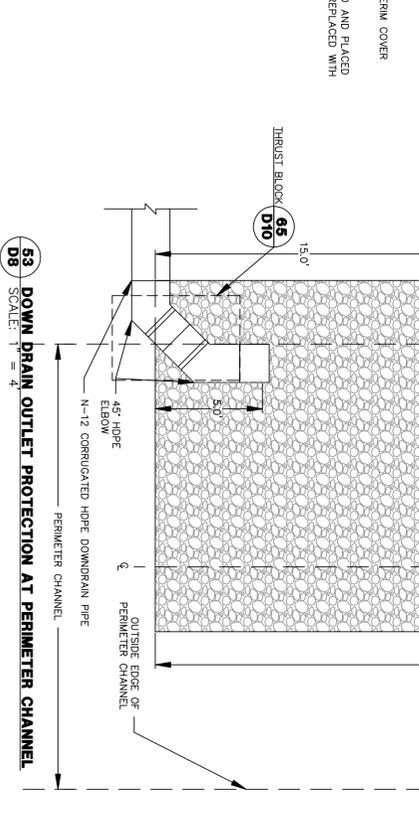
47 TACK-ON BENCH / DOWN DRAIN TIE-IN CROSS SECTION A-A'
SCALE: 1" = 4'



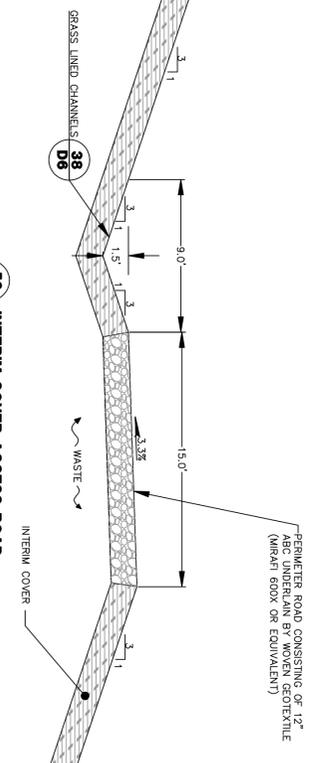
48 TACK-ON BENCH / DOWN DRAIN TIE-IN CROSS SECTION B-B'
SCALE: 1" = 4'



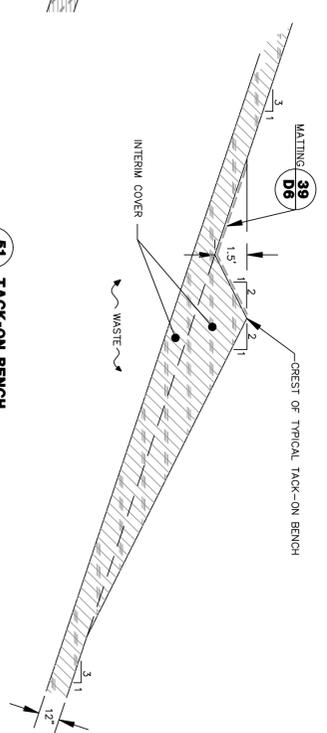
49 INTERIM COVER DOWN DRAIN
SCALE: 1" = 2'



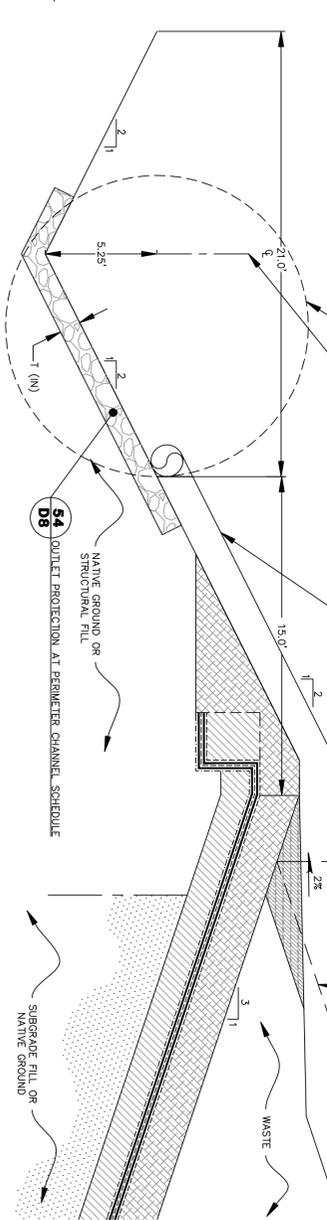
53 DOWN DRAIN OUTLET PROTECTION AT PERIMETER CHANNEL
SCALE: 1" = 4'



60 INTERIM COVER ACCESS ROAD
SCALE: 1" = 3'



51 TACK-ON BENCH
SCALE: 1" = 4'



52 INTERIM COVER TIE-IN AT PERIMETER
SCALE: 1" = 4'

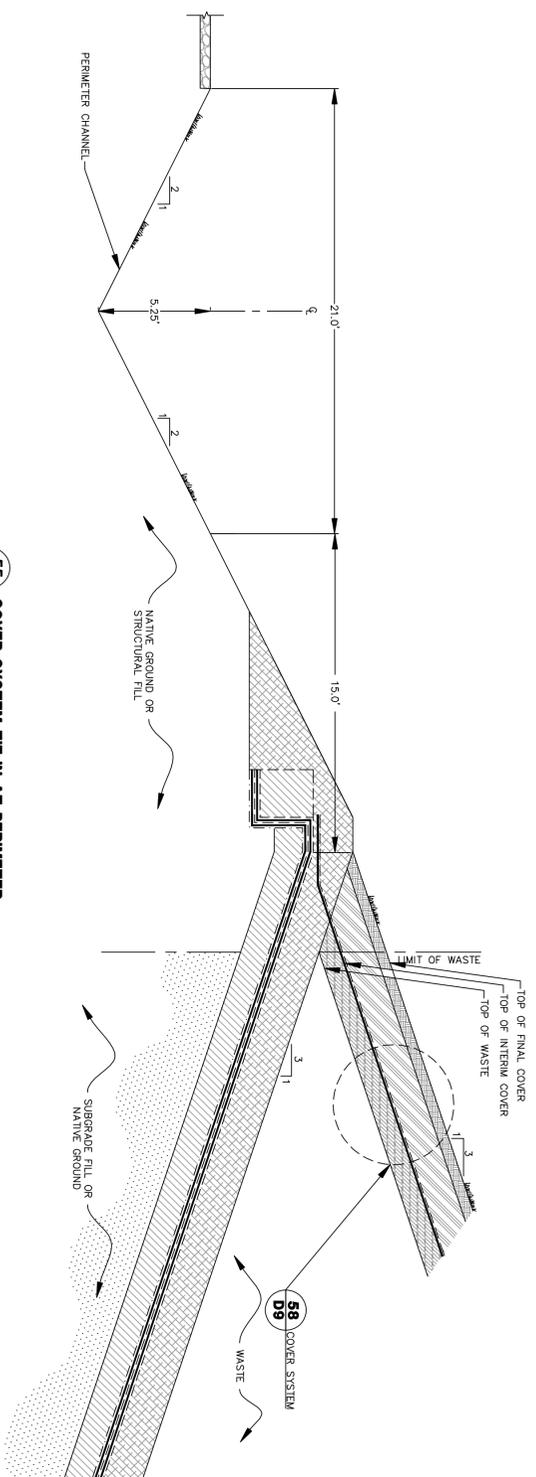
INTERIM COVER STORMWATER MANAGEMENT DETAILS INDUSTRIAL LANDFILL NO. 1 DUKE ENERGY - MARSHALL STEAM STATION TERRELL, NORTH CAROLINA			
NO.	DATE	DESCRIPTION	BY

ENGINEERING LICENSE NO. F-076	DRAWN BY: CLD	DESIGNED BY: WMH	PROJECT NUMBER: 1356-08-122	AS SHOWN DATE: 11-24-09
CHECKED BY: JSR	APPROVED BY: KRD			

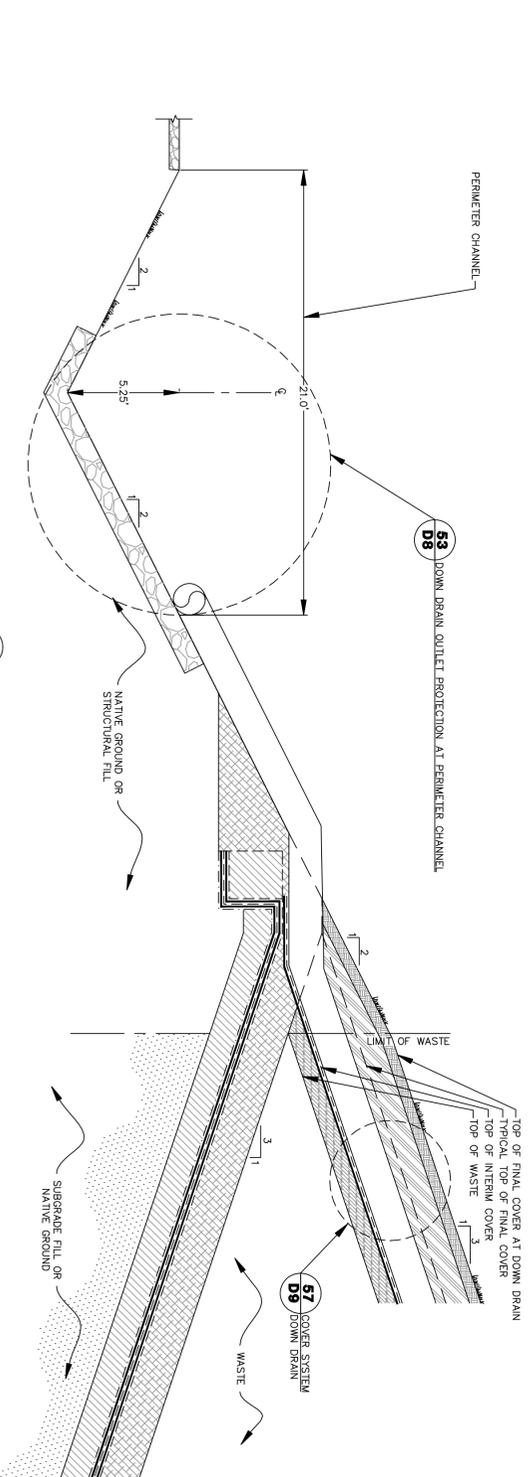


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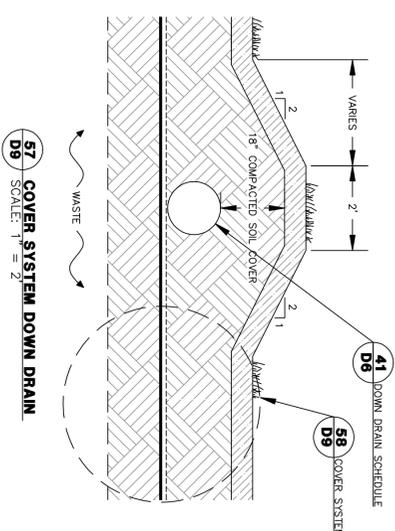




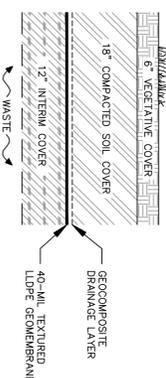
56 COVER SYSTEM TIE-IN AT PERIMETER
SCALE: 1" = 4'



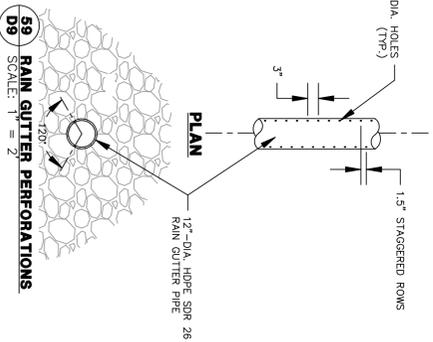
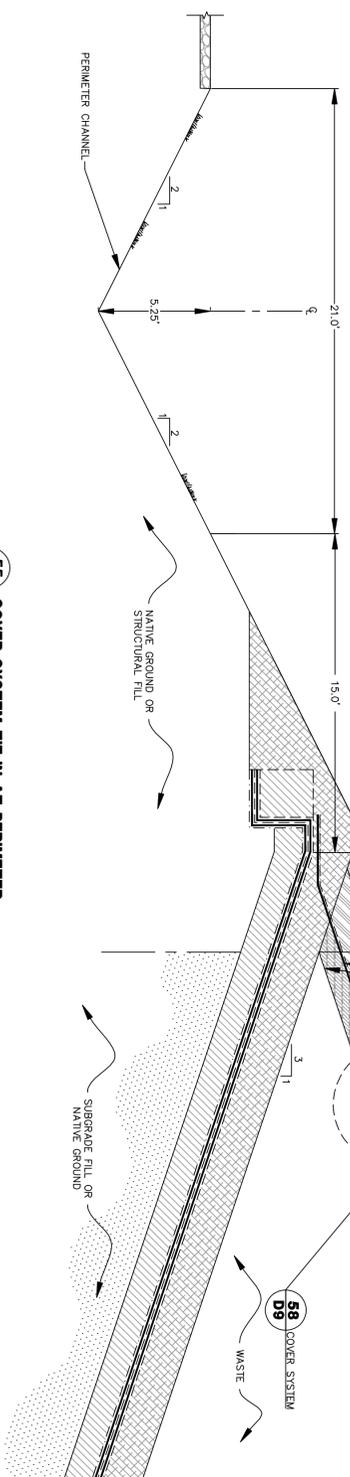
57 COVER SYSTEM DOWN DRAIN TIE-IN AT PERIMETER
SCALE: 1" = 4'



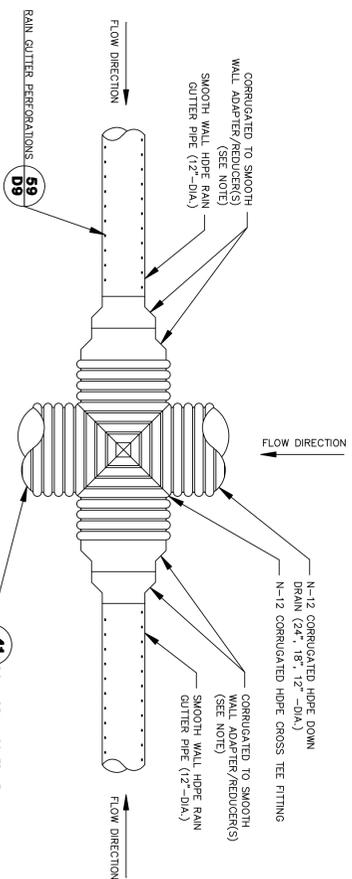
57 COVER SYSTEM DOWN DRAIN
SCALE: 1" = 2'



58 COVER SYSTEM
SCALE: 1" = 2'

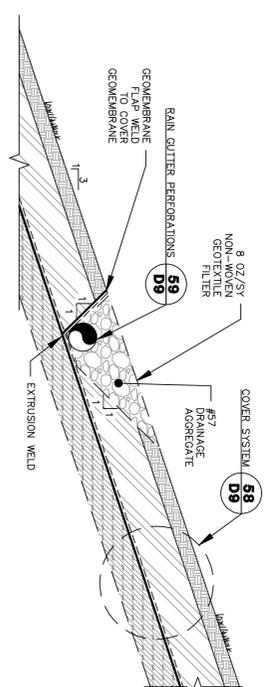


59 RAIN GUTTER PERFORATIONS
SCALE: 1" = 2'



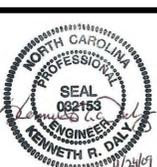
60 RAIN GUTTER /DOWN DRAIN TIE-IN
SCALE: 1" = 2'

NOTE: ADAPTER/REDUCER SIZES FIT DOWN DRAIN AND RAIN GUTTER IN TIE-IN SECTION



61 RAIN GUTTER CROSS SECTION
SCALE: 1" = 3'

NO.	DATE	DESCRIPTION	BY



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**FINAL COVER SYSTEM DETAILS 1
INDUSTRIAL LANDFILL NO. 1**

**DUKE ENERGY - MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA**

ENGINEERING LICENSE NO. F-0776

DRAWN BY: CLD

DESIGNED BY: WMH

PROJECT NUMBER: 1356-08-122

SCALE: AS SHOWN

DRAWING: D9

DATE: 11-24-09

OF: 32

DRAWING PATH:

