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April 13, 2018

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

**Existing Liner Assessment Stilling
Pond 2C and Sluice Channel
EPA Final CCR Rule
TVA Bull Run Fossil Plant Clinton,
Tennessee**

1.0 PURPOSE

This letter documents AECOM's certification of the existing liner assessment for the TVA Bull Run Fossil Plant's inactive Stilling Pond 2C and the Sluice Channel.

2.0 EXISTING LINER ASSESSMENT

As required by 40 CFR 257.71, an inactive existing surface impoundment must be evaluated as to whether or not it was constructed with a liner as described in 40 CFR 257.71(a)(1)(i)-(iii).

3.0 Conclusion

The attached report presents the analysis for the existing liner assessment. The Stilling Pond 2C and the Sluice Channel at Bull Run Fossil Plant was evaluated relative to the CCR Rule requirements for liner certification for existing inactive CCR surface impoundments (40 CFR §257.71(a)(1)). Based on the evaluation of design drawings and available construction records, neither Stilling Pond 2C nor the Sluice Ditch were constructed with a liner and therefore does not meet the design criteria specified in 40 CFR §257.71(a)(1).

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4.0 Qualified Professional Engineer Certification

I, Thomas A Kovacic, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

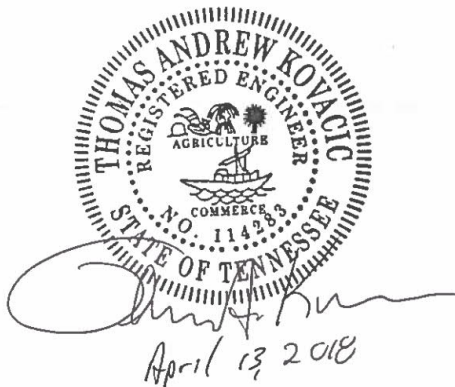
1. That the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. That the information contained herein is accurate as of the date of my signature below; and
3. That the TVA Bull Run Fossil Plant's Stilling Pond 2C is considered an unlined inactive CCR surface impoundment as described in 40 CFR §257.71(a)(3).

SIGNATURE _____ DATE 4-13-2018

ADDRESS: AECOM
1300 E. 9th Street, Suite 500,
Cleveland, OH 44114

TELEPHONE: (216)-622-2300

ATTACHMENTS: Liner Design Demonstration (40 CFR §257.71) for Coal Combustion Residuals (CCR)



COAL COMBUSTION PRODUCT DISPOSAL PROGRAM

TENNESSEE VALLEY AUTHORITY – STILLING POND 2C AND SLUICE CHANNEL
CLINTON, TENNESSEE

LINER DESIGN DEMONSTRATION (40 CFR § 257.71) FOR COAL COMBUSTION RESIDUALS (CCR) INACTIVE SURFACE IMPOUNDMENT – BULL RUN FOSSIL PLANT

Prepared for



Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402-2801

April 13, 2018

Prepared by

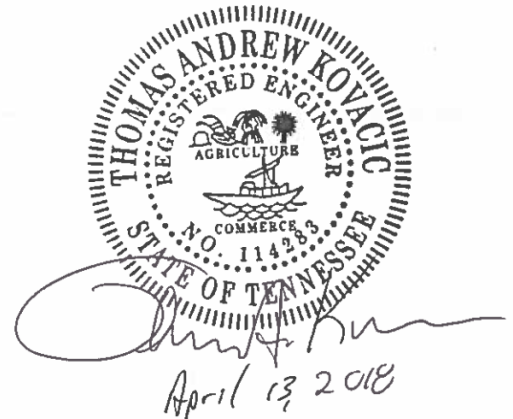




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1.0 BACKGROUND

1.1 INTRODUCTION

On April 17, 2015, EPA published the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities final rule (CCR Rule or the Rule) in the Federal Register. The Tennessee Valley Authority (TVA) contracted AECOM to evaluate compliance relative to § 257.71—the Rule’s liner design criteria—at the Bull Run Fossil Plant (BRF) Stilling Pond 2C, which is an existing but inactive CCR surface impoundment.

The BRF facility is located in Anderson County, situated along the banks of the Clinch River (Melton Hill Reservoir) and Bull Run Creek in Clinton, Tennessee, approximately 20 miles west of Knoxville, Tennessee. Stilling Pond 2C is an inactive CCR surface impoundment.

1.2 OBJECTIVE

The objective of this demonstration is to evaluate compliance related to 40 CFR § 257.71, specifically whether Stilling Pond 2C and the Sluice Channel was constructed with one of the following:

- A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no greater than 1×10^{-7} cm/sec;
- A composite liner that meets the requirements of § 257.70(b); or
- An alternative composite liner that meets the requirements of § 257.70(c).

The Rule was clarified by the EPA during a presentation on April 15, 2015 titled, “Top 20 Questions on EPA’s CCR Final Rule”. First, an existing natural clay layer, regardless of its hydraulic conductivity, does not meet the Rule as an acceptable clay liner. Second, “compacted soil” means soil that is mechanically compacted in lifts.

1.3 SUMMARY OF HISTORICAL INFORMATION

The wet CCR disposal area, referred to as Ash Disposal Area #2, which includes Stilling Pond 2C, was initially constructed and operated for the disposal of wet sluiced bottom ash, gypsum and fly ash materials when BRF was constructed in the 1960s. Stilling Pond 2C was formed in 1976 with the construction of an internal dike within Ash Disposal Area #2. Since the construction of this internal dike, also known as the splitter dike, water enters Stilling Pond 2C through a rock-lined channel containing a concrete weir near the south end of the splitter dike and then discharges into the Clinch River through NPDES permitted Outfall 001 near the north end of the Stilling Pond. Prior to the construction of Stilling Pond 2C, the Main Ash Pond had a spillway on its southern dike which discharged into Bull Run Creek. In 1981, an internal dike

was constructed within Ash Disposal Area #2 that effectively reduced the area into the current Main Ash Pond. A Location Map, shown in Figure 1, displays the boundary of Stilling Pond 2C.

The dikes which form the perimeter of Stilling Pond 2C and the splitter dike between it and the Main Ash Pond are approximately 3,400 feet in length, combined. The perimeter dikes vary in height from about 13 to 25 feet.



Figure 1. Location Map

The In 2006, a drainage channel, also known as the Sluice Channel, was built during the construction of the Gypsum Disposal Area. The Sluice Channel began approximately 300 feet southeast of the northernmost point of the Bottom Ash Stack and terminated at the Main Ash Pond. The Sluice Channel was used for sluicing ash until 2015, when the plant switched to a dry ash handling system. Process water continued to flow through the Sluice Channel to the Main Ash Pond until 2016, when the Conveyance Ditch was put into operation. The Sluice Channel was subsequently closed in 2017.

2.0 FIELD INVESTIGATION

AECOM reviewed available historical information which included a subsurface investigation performed by Stantec in 2010. The subsurface data collected from the Stantec investigation indicates the dikes are composed of embankment fill consisting of lean clay with depths extending from 13 to 27 feet below the ground surface. The underlying layer beneath the embankment fill consists of alluvium which overlies bedrock consisting of shale interbedded with limestone.



In 2017, AECOM performed a subsurface exploration further examining the Stilling Pond 2C dikes. Below the surficial road material the splitter dike is composed of compacted ash fill material that primarily consists of silty, poorly graded sand as bottom as with varying amounts of fly ash.

Historical drawings were reviewed, and do not show a liner constructed within the footprint of Stilling Pond 2C or within the Sluice Channel. Historical drawings can be found in **Appendix A**.

The Sluice Channel was closed in 2017, and no evidence of a liner was found during construction of the closure. The closure liner system incorporated an impermeable geomembrane, geocomposite drainage layer, two feet of soil, and a vegetative cover.

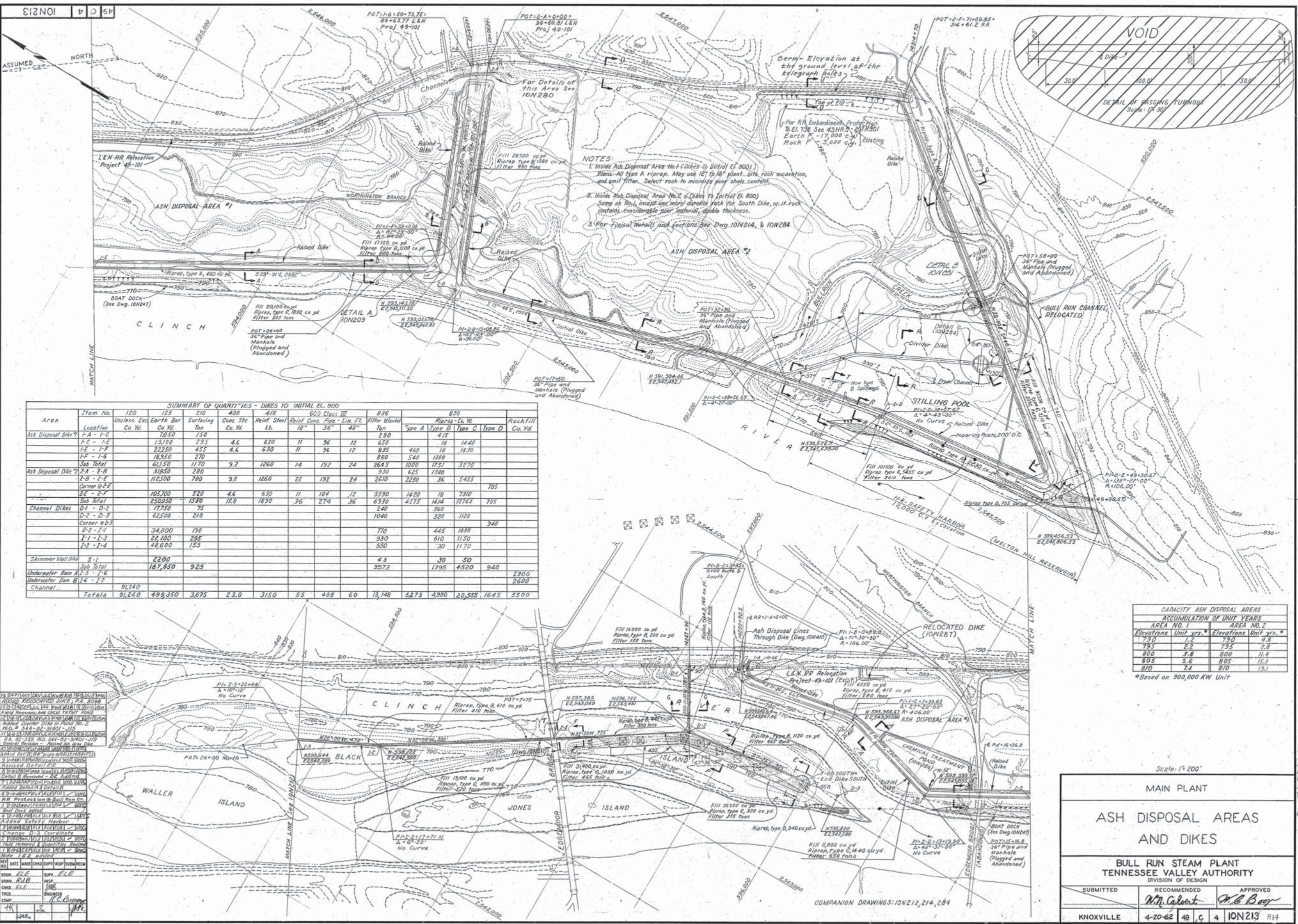
3.0 CONCLUSION

Historical construction documents were reviewed and field work was conducted to evaluate status relative to the EPA Final CCR Rule criteria. Based on historical drawings and construction information no evidence can be found that suggest Stilling Pond 2C and the Sluice Channel at Bull Run Fossil Plant were constructed with a liner that complies with the requirements of § 257.71 of the EPA Final CCR Rule.

4.0 REFERENCES

- AECOM, Geotechnical Report Stilling Pond Dike Evaluation, 2016.
- AECOM, Stilling Pond 2C, History of Construction §257.73(c)(1) prepared for CCR Certification, 2017.

APPENDIX A – HISTORICAL DRAWINGS



SUMMARY OF QUANTITIES - DIKES TO INITIAL EL. 800

Area	Item No.	120	123	210	400	418	836	830	Rock/Fill
Location	Unclass. Elevation	Earth Sur. Cu. Yd.	Surfacing Ton	Coarse Jtc. Cu. Yd.	Reinf. Steel Lbs.	Reinf. Conc. Pipe - Lin. Ft.	Filter Blanket Type A Type B Type C Type D	Riprap - Cu. Yd.	Cu. Yd.
Ash Disposal Dike 1	A-1-E	70,500	1,500				2,900	4,150	
	E-1-E	13,100	2,950	4.6	630	11	56	12	14,400
	E-1-F	22,250	4,550	4.6	630	11	56	12	18,300
	F-1-F	18,350	270				880	540	13,800
	Sub Total	61,200	11,770	9.2	1,260	22	192	24	26,450
Ash Disposal Dike 2	A-2-E	31,850	280				930	625	13,800
	E-2-E	112,500	780	9.2	1,260	22	192	24	26,700
	Corner @ E-2								36
	E-2-F	105,700	520	4.6	630	11	104	12	33,900
	Sub Total	250,000	13,800	13.8	1,890	36	274	36	63,300
Channel Dikes	D-1-D-2	17,750	75				240	360	705
	D-2-D-3	62,500	210				1040	320	1,120
	Corner @ D-3								340
	D-2-E-1	34,800	150				770	445	1,830
	E-1-E-3	22,100	285				930	610	1,150
	E-3-E-4	14,000	155				350	30	1,170
Skimmer Wall Dike	S-1	2,200					43	30	50
	Sub Total	187,950	925				3,573	1,795	4,520
Underwater Dam	A-1-E								2,900
Underwater Dam	B-1-E								2,600
Channel		91,240							
Totals		91,240	499,350	3,675	23.0	3,150	55	488	60
							13,146	6,275	4,980
							20,555	16,450	5,500

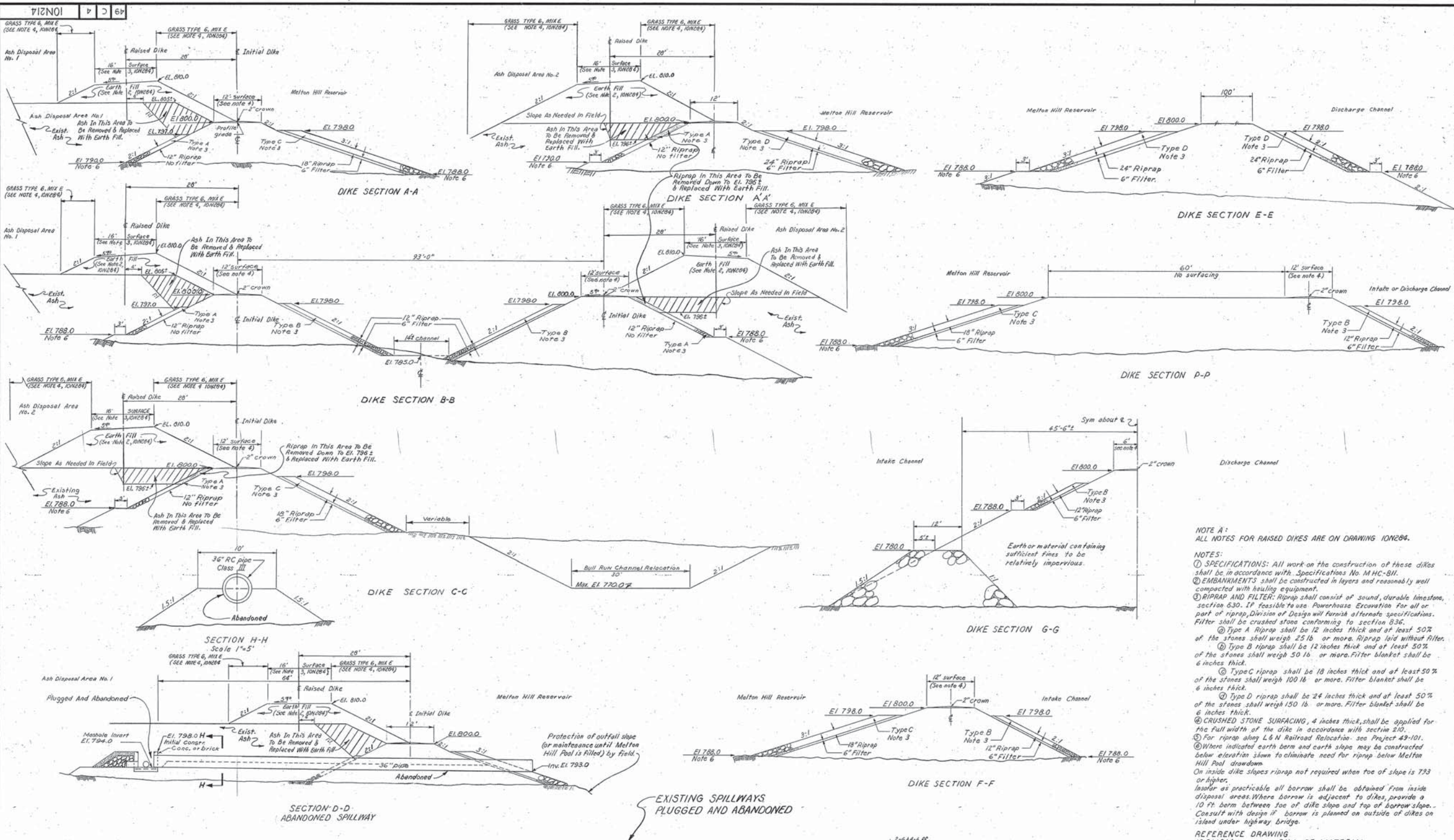
CAPACITY ASH DISPOSAL AREAS - ACCUMULATION OF UNIT YEARS

Elevations	Unit yrs.	Elevations	Unit yrs.
790	1.2	790	4.8
795	2.2	795	7.8
800	3.8	800	11.4
805	5.6	805	16.3
810	7.4	810	19.1

*Based on 300,000 KW Unit

REVISIONS

NO.	DATE	DESCRIPTION
1	10/20/62	AS SHOWN
2	11/15/62	ADD DETAIL A TO DIKES 1 & 2
3	12/10/62	ADD DETAIL B TO DIKES 1 & 2
4	1/10/63	ADD DETAIL C TO DIKES 1 & 2
5	2/10/63	ADD DETAIL D TO DIKES 1 & 2
6	3/10/63	ADD DETAIL E TO DIKES 1 & 2
7	4/10/63	ADD DETAIL F TO DIKES 1 & 2
8	5/10/63	ADD DETAIL G TO DIKES 1 & 2
9	6/10/63	ADD DETAIL H TO DIKES 1 & 2
10	7/10/63	ADD DETAIL I TO DIKES 1 & 2
11	8/10/63	ADD DETAIL J TO DIKES 1 & 2
12	9/10/63	ADD DETAIL K TO DIKES 1 & 2
13	10/10/63	ADD DETAIL L TO DIKES 1 & 2
14	11/10/63	ADD DETAIL M TO DIKES 1 & 2
15	12/10/63	ADD DETAIL N TO DIKES 1 & 2
16	1/10/64	ADD DETAIL O TO DIKES 1 & 2
17	2/10/64	ADD DETAIL P TO DIKES 1 & 2
18	3/10/64	ADD DETAIL Q TO DIKES 1 & 2
19	4/10/64	ADD DETAIL R TO DIKES 1 & 2
20	5/10/64	ADD DETAIL S TO DIKES 1 & 2
21	6/10/64	ADD DETAIL T TO DIKES 1 & 2
22	7/10/64	ADD DETAIL U TO DIKES 1 & 2
23	8/10/64	ADD DETAIL V TO DIKES 1 & 2
24	9/10/64	ADD DETAIL W TO DIKES 1 & 2
25	10/10/64	ADD DETAIL X TO DIKES 1 & 2
26	11/10/64	ADD DETAIL Y TO DIKES 1 & 2
27	12/10/64	ADD DETAIL Z TO DIKES 1 & 2
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29	2/10/65	ADD DETAIL AB TO DIKES 1 & 2
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55	4/10/67	ADD DETAIL BB TO DIKES 1 & 2
56	5/10/67	ADD DETAIL BC TO DIKES 1 & 2
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190	7/10/78	ADD DETAIL GG TO DIKES 1 & 2
191	8/10/78	ADD DETAIL GH TO DIKES 1 & 2



NOTE A:
ALL NOTES FOR RAISED DIKES ARE ON DRAWING 10N204.

NOTES:

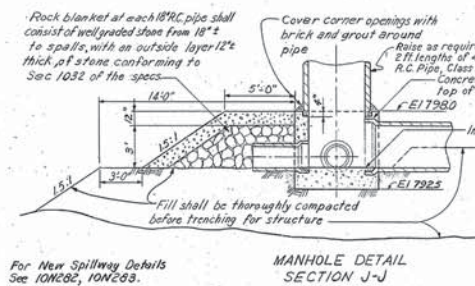
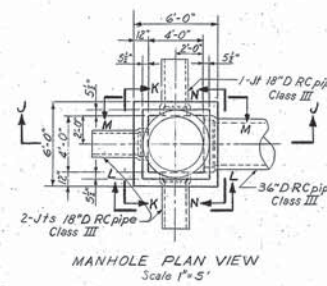
- SPECIFICATIONS: All work on the construction of these dikes shall be in accordance with Specifications No. MHC-811.
- EMBANKMENTS shall be constructed in layers and reasonably well compacted with hauling equipment.
- RIPRAP AND FILTER: Riprap shall consist of sound, durable limestone, section 630. If feasible to use Powerhouse Excavation for all or part of riprap, Division of Design will furnish alternate specifications. Filter shall be crushed stone conforming to section 836.
 - Type A Riprap shall be 12 inches thick and at least 50% of the stones shall weigh 25 lb. or more. Riprap laid without filter.
 - Type B riprap shall be 12 inches thick and at least 50% of the stones shall weigh 50 lb. or more. Filter blanket shall be 6 inches thick.
 - Type C riprap shall be 18 inches thick and at least 50% of the stones shall weigh 100 lb. or more. Filter blanket shall be 6 inches thick.
 - Type D riprap shall be 24 inches thick and at least 50% of the stones shall weigh 150 lb. or more. Filter blanket shall be 6 inches thick.
- CRUSHED STONE SURFACING, 4 inches thick, shall be applied for the full width of the dike in accordance with section 210.
- For riprap along L&N Railroad Relocation - see Project 49-101.
- Where indicated earth berm and earth slope may be constructed below elevation shown to eliminate need for riprap below Melton Hill Pool drawdown.

On inside dike slopes riprap not required when toe of slope is 793 or higher.

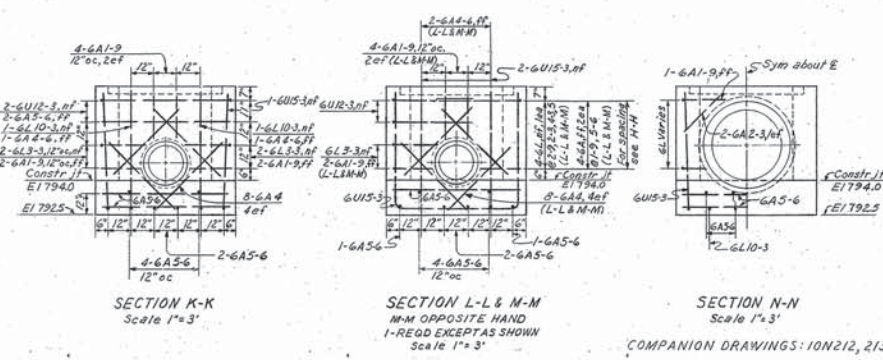
Insofar as practicable all borrow shall be obtained from inside disposal areas. Where borrow is adjacent to dikes, provide a 10 ft. berm between toe of dike slope and top of borrow slope. Consult with design if borrow is planned on outside of dikes on island under highway bridge.

REFERENCE DRAWING
10BM214 ----- BILL OF MATERIAL
Scale: 1"=10'
Except as noted

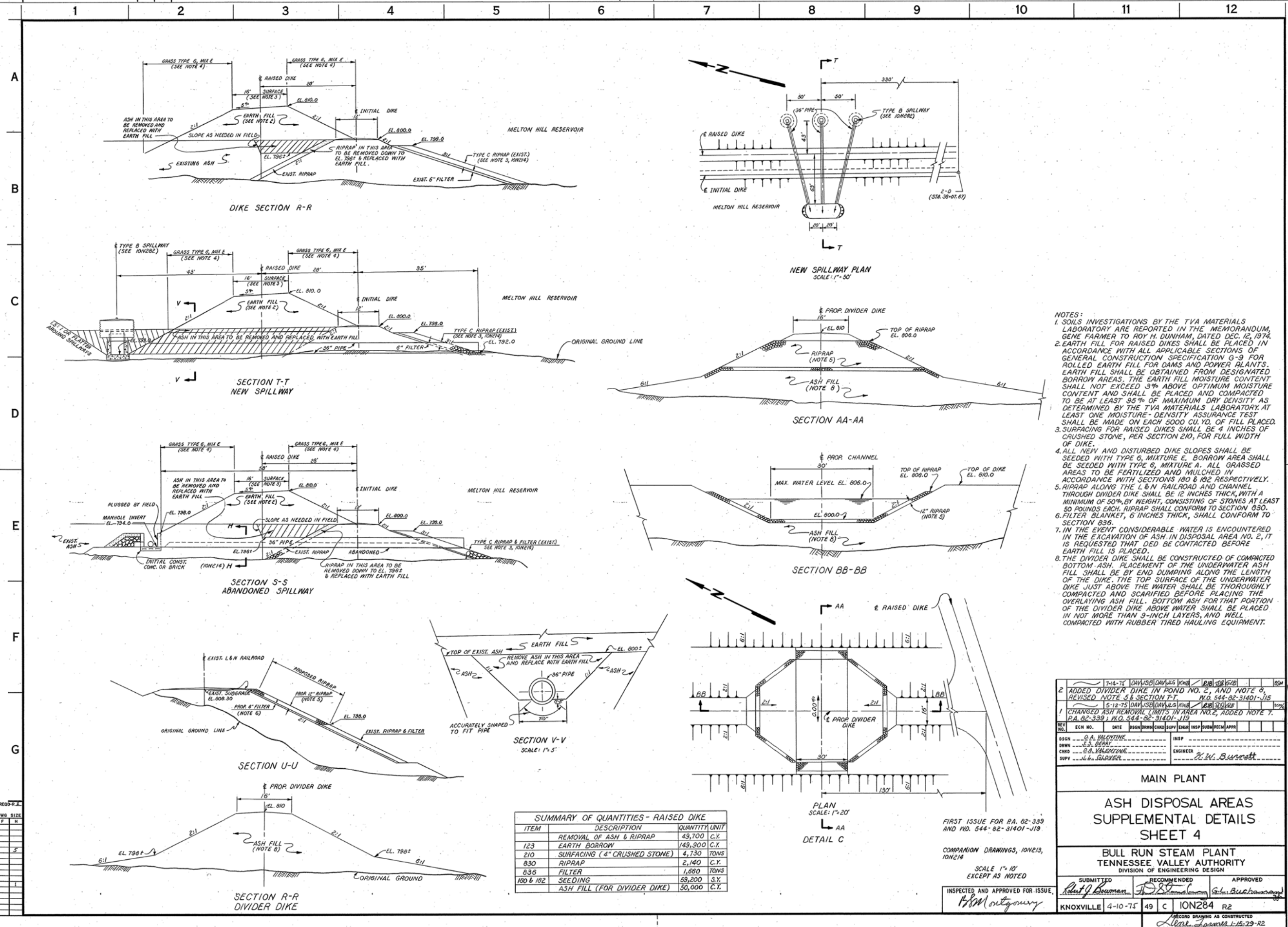
PRINTS RECD.-R.A.	4	REVISIONS	1
BR. #1		DATE	4-20-62
DWG. SITE		BY	W. J. Cabaret
1		CHECKED	W. J. Cabaret
2		APPROVED	W. J. Cabaret
3		DATE	4-20-62
4		BY	W. J. Cabaret
5		CHECKED	W. J. Cabaret
6		APPROVED	W. J. Cabaret
7		DATE	4-20-62
8		BY	W. J. Cabaret
9		CHECKED	W. J. Cabaret
10		APPROVED	W. J. Cabaret
11		DATE	4-20-62
12		BY	W. J. Cabaret
13		CHECKED	W. J. Cabaret
14		APPROVED	W. J. Cabaret
15		DATE	4-20-62
16		BY	W. J. Cabaret
17		CHECKED	W. J. Cabaret
18		APPROVED	W. J. Cabaret
19		DATE	4-20-62
20		BY	W. J. Cabaret
21		CHECKED	W. J. Cabaret
22		APPROVED	W. J. Cabaret
23		DATE	4-20-62
24		BY	W. J. Cabaret
25		CHECKED	W. J. Cabaret
26		APPROVED	W. J. Cabaret
27		DATE	4-20-62
28		BY	W. J. Cabaret
29		CHECKED	W. J. Cabaret
30		APPROVED	W. J. Cabaret



EXISTING SPILLWAYS
PLUGGED AND ABANDONED



MAIN PLANT			
ASH DISPOSAL AREAS SUPPLEMENTAL DETAILS SHEET 3			
BULL RUN STEAM PLANT TENNESSEE VALLEY AUTHORITY DIVISION OF DESIGN			
SUBMITTED	RECOMMENDED	APPROVED	
	W. J. Cabaret	W. J. Cabaret	
KNOXVILLE	4-20-62	49	10N214 R4
COMPANION DRAWINGS: 10N212, 213, 204			



- NOTES:
- SOILS INVESTIGATIONS BY THE TVA MATERIALS LABORATORY ARE REPORTED IN THE MEMORANDUM, GENE FARMER TO ROY H. DUNHAM, DATED DEC. 12, 1974.
 - EARTH FILL FOR RAISED DIKES SHALL BE PLACED IN ACCORDANCE WITH ALL APPLICABLE SECTIONS OF GENERAL CONSTRUCTION SPECIFICATION G-9 FOR ROLLED EARTH FILL FOR DAMS AND POWER PLANTS. EARTH FILL SHALL BE OBTAINED FROM DESIGNATED BORROW AREAS. THE EARTH FILL MOISTURE CONTENT SHALL NOT EXCEED 3% ABOVE OPTIMUM MOISTURE CONTENT AND SHALL BE PLACED AND COMPACTED TO BE AT LEAST 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY THE TVA MATERIALS LABORATORY. AT LEAST ONE MOISTURE-DENSITY ASSURANCE TEST SHALL BE MADE ON EACH 5000 CU. YD. OF FILL PLACED.
 - SURFACING FOR RAISED DIKES SHALL BE 4 INCHES OF CRUSHED STONE, PER SECTION 210, FOR FULL WIDTH OF DIKE.
 - ALL NEW AND DISTURBED DIKE SLOPES SHALL BE SEEDED WITH TYPE G, MIXTURE E. BORROW AREA SHALL BE SEEDED WITH TYPE G, MIXTURE A. ALL GRASSED AREAS TO BE FERTILIZED AND MULCHED IN ACCORDANCE WITH SECTIONS 180 & 182 RESPECTIVELY.
 - RIPRAP ALONG THE L & N RAILROAD AND CHANNEL THROUGH DIVIDER DIKE SHALL BE 12 INCHES THICK, WITH A MINIMUM OF 50% BY WEIGHT, CONSISTING OF STONES AT LEAST 50 POUNDS EACH. RIPRAP SHALL CONFORM TO SECTION 830.
 - FILTER BLANKET, 6 INCHES THICK, SHALL CONFORM TO SECTION 836.
 - IN THE EVENT CONSIDERABLE WATER IS ENCOUNTERED IN THE EXCAVATION OF ASH IN DISPOSAL AREA NO. 2, IT IS REQUESTED THAT DED BE CONTACTED BEFORE EARTH FILL IS PLACED.
 - THE DIVIDER DIKE SHALL BE CONSTRUCTED OF COMPACTED BOTTOM ASH. PLACEMENT OF THE UNDERWATER ASH FILL SHALL BE BY END DUMPING ALONG THE LENGTH OF THE DIKE. THE TOP SURFACE OF THE UNDERWATER DIKE JUST ABOVE THE WATER SHALL BE THOROUGHLY COMPACTED AND SCARIFIED BEFORE PLACING THE OVERLYING ASH FILL. BOTTOM ASH FOR THAT PORTION OF THE DIVIDER DIKE ABOVE WATER SHALL BE PLACED IN NOT MORE THAN 9-INCH LAYERS, AND WELL COMPACTED WITH RUBBER Tired HAULING EQUIPMENT.

SUMMARY OF QUANTITIES - RAISED DIKE

ITEM	DESCRIPTION	QUANTITY	UNIT
	REMOVAL OF ASH & RIPRAP	49,700	C.Y.
123	EARTH BORROW	149,900	C.Y.
210	SURFACING (4" CRUSHED STONE)	4,730	TONS
830	RIPRAP	2,140	C.Y.
836	FILTER	1,680	TONS
180 & 182	SEEDING	59,200	S.Y.
	ASH FILL (FOR DIVIDER DIKE)	50,000	C.Y.

REV	NO.	DATE	BY	CHKD	APPV	DESCRIPTION
2		7-4-75	DAV	WLG	KNS	ADDED DIVIDER DIKE IN POND NO. 2, AND NOTE 8, REVISED NOTE 5 & SECTION T-T. NO. 544-82-31401-J15
1		5-12-75	DAV	WLG	KNS	CHANGED ASH REMOVAL LIMITS IN AREA NO. 2, ADDED NOTE 7. P.A. 82-339, NO. 544-82-31401-J12

MAIN PLANT

ASH DISPOSAL AREAS
SUPPLEMENTAL DETAILS
SHEET 4

BULL RUN STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED: *D.A. Valentine*
RECOMMENDED: *R.B. ...*
APPROVED: *G.L. Buchanan*

INSPECTED AND APPROVED FOR ISSUE: *B.M. Outgony*

KNOXVILLE 4-10-75 49 C ION284 R2

SCALE 1"=10' EXCEPT AS NOTED

FIRST ISSUE FOR P.A. 82-339 AND NO. 544-82-31401-J15

COMPANION DRAWINGS, 10N213, 10N214

RECORD DRAWING AS CONSTRUCTED
Gene Farmer 1-15-79-R2

PRINTS READ-TO-TO

PROJ	OWB	SIZE
F	H	
ME		
EE		
CE		
AD		
CD		
ED		
MD		
BF		
SW		
BL		
PA		