HALEY & ALDRICH

BORING LOGS

Well No. MW-8

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

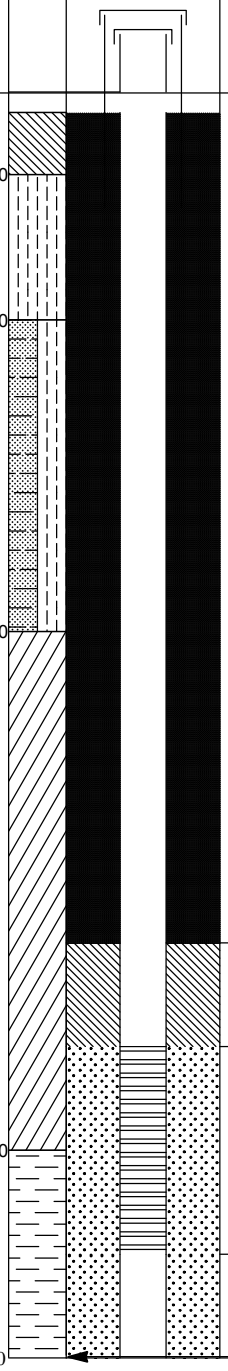
Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	27 Sep 2016
H&A Rep.	P. Kroger
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK

CONDITIONS	DEPTH (ft.)
FILL	3.0
SM Silty sand.	10.0
SP-SM Poorly graded sand with silt.	25.0
CL Lean clay to sandy lean clay.	50.0
SC Clayey sand.	60.0



WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	50.0 ft
Inside diameter	2 inch
Depth of bottom of Guard Pipe	47.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	50.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	40.0 ft
Bentonite	40.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	50.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	60 ft
Bottom of silt trap	NA
Depth of bottom of borehole	60.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

HALEY & ALDRICH

BORING LOGS

Well No. MW-9

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	29 Sep 2016
H&A Rep.	P. Kroger
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
				0.0	
0					
10					
CL Lean clay to lean clay with sand.					
20					
30	31.0				
SP Poorly graded sand.				40.0	
40					
	45.0			45.0	
NO RECOVERY					
50	50.0			50.0	
SP Poorly graded sand.					
	60.0			60.0	

WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.4 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	50.0 ft
Inside diameter	2 inch
Depth of bottom of Guard Pipe	47.6 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	50.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	40.0 ft
Bentonite	40.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	50.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	60 ft
Bottom of silt trap	NA
Depth of bottom of borehole	60.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

HALEY & ALDRICH

BORING LOGS

Well No. MW-10

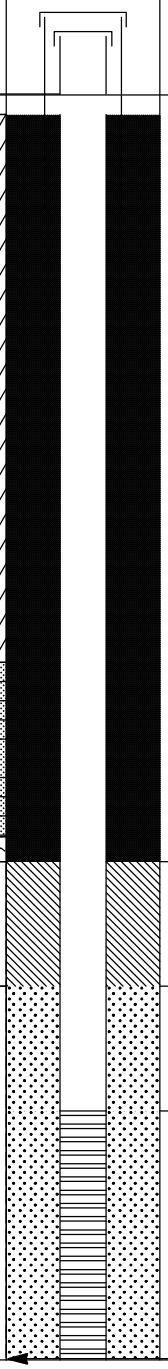
Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	29 Sep 2016
H&A Rep.	P. Kroger
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
	0			0.0	
CL Lean clay.	10, 20				
	22.0				
SP Poorly graded sand.					
	29.0				
SW Well graded sand.	30			30.0	
SW-SM Well graded sand with silt.					
	35.0			35.0	
	40			40.0	
SM Silty sand.					
	50.0			50.0	



WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.6 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	40.0 ft
Inside diameter	2 inch
Depth of bottom of Guard Pipe	37.4 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	40.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	30.0 ft
Bentonite	30.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	40.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	50 ft
Bottom of silt trap	NA
Depth of bottom of borehole	50.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

BORING LOGS

HALEY & ALDRICH

Well No. MW-11

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

Well Diagram

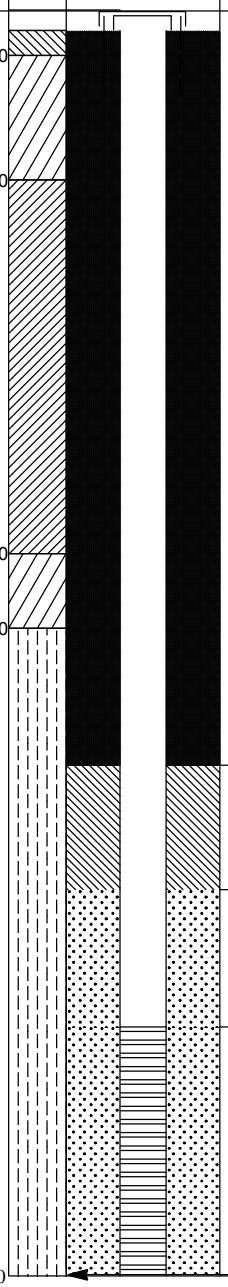
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	04 Oct 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK

CONDITIONS	DEPTH (ft.)
FILL	1.0
CL Sandy lean clay.	6.0
CH Fat clay with sand.	21.0
CL Sandy lean clay.	24.0
SM Silty sand.	50.0

GRAPHIC



WELL DETAILS

DEPTH (ft.): 0.0, 29.5, 34.5, 40.0, 50.0

ELEVATION (ft.)

WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Depth of Roadway Box below ground surface	0.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Flush
Length	40.0 ft
Inside diameter	2.375 inch
Depth of bottom of Roadway Box	40.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	40.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	30.0 ft
Bentonite	30.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	40.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	50 ft
Bottom of silt trap	NA
Depth of bottom of borehole	50.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Feb 7, 17

HALEY & ALDRICH

BORING LOGS

Well No. MW-12

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

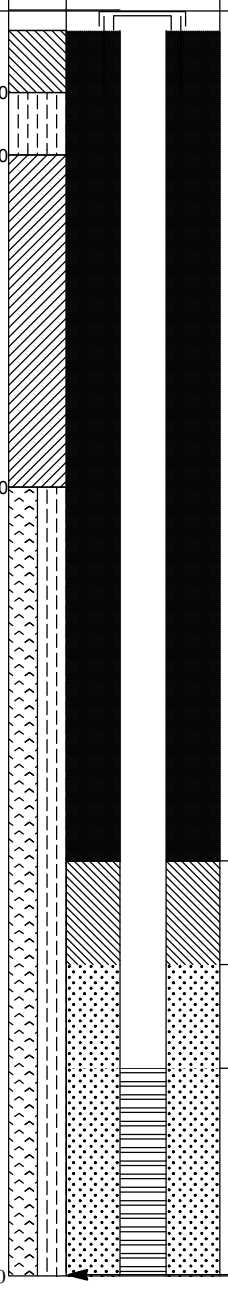
Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	04 Oct 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK

CONDITIONS	DEPTH (ft.)
FILL	3.0
SM Silty sand.	6.0
CH Fat clay with sand.	22.0
SW-SM Well graded sand with silt.	60.0



WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Depth of Roadway Box below ground surface	0.3 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Flush
Length	60.0 ft
Inside diameter	2.375 inch
Depth of bottom of Roadway Box	60.3 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	50.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	40.0 ft
Bentonite	40.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	50.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	60 ft
Bottom of silt trap	NA
Depth of bottom of borehole	60.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Feb 7, 17

HALEY & ALDRICH

BORING LOGS

Well No. MW-13

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

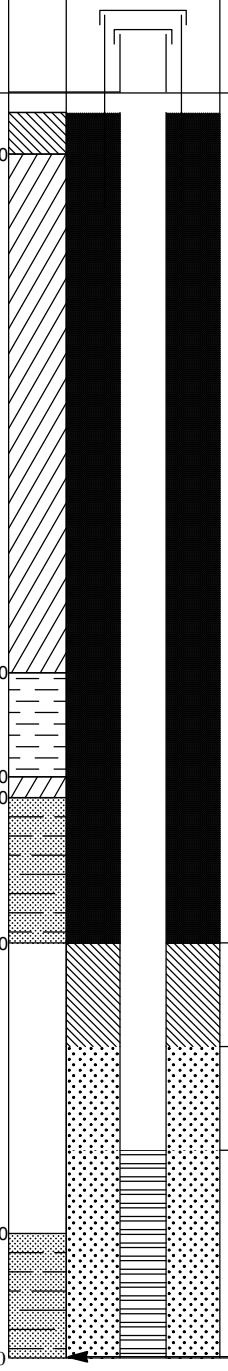
Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	30 Sep 2016
H&A Rep.	P. Kroger
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK

CONDITIONS	DEPTH (ft.)
FILL	2.0
CL Sandy lean clay.	27.0
SC Clayey sand.	32.0
CL Clay with sand and gravel.	33.0
SP Poorly graded sand.	40.0
NO RECOVERY	54.0
SP Poorly graded sand.	60.0



DEPTH (ft.)	ELEVATION (ft.)
0.0	
40.0	
45.0	
50.0	
60.0	

WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	50.0 ft
Inside diameter	2 inch
Depth of bottom of Guard Pipe	47.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	50.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	40.0 ft
Bentonite	40.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	50.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	60 ft
Bottom of silt trap	NA
Depth of bottom of borehole	60.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

HALEY & ALDRICH

BORING LOGS

Well No. MW-14

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	03 Oct 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
				0.0	
0					
CL Sandy lean clay.	6.0				
10					
CH Fat clay with sand.					
20					
	26.0				
30				30.0	
SW-SM Well graded sand with silt..					
	35.0			35.0	
40				40.0	
SW Well graded sand.					
	50.0			50.0	

WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	40.0 ft
Inside diameter	2 inch
Depth of bottom of Guard Pipe	37.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	40.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	30.0 ft
Bentonite	30.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	40.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	50 ft
Bottom of silt trap	NA
Depth of bottom of borehole	50.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AEC\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

BORING LOGS

HALEY & ALDRICH

Well No. MW-15

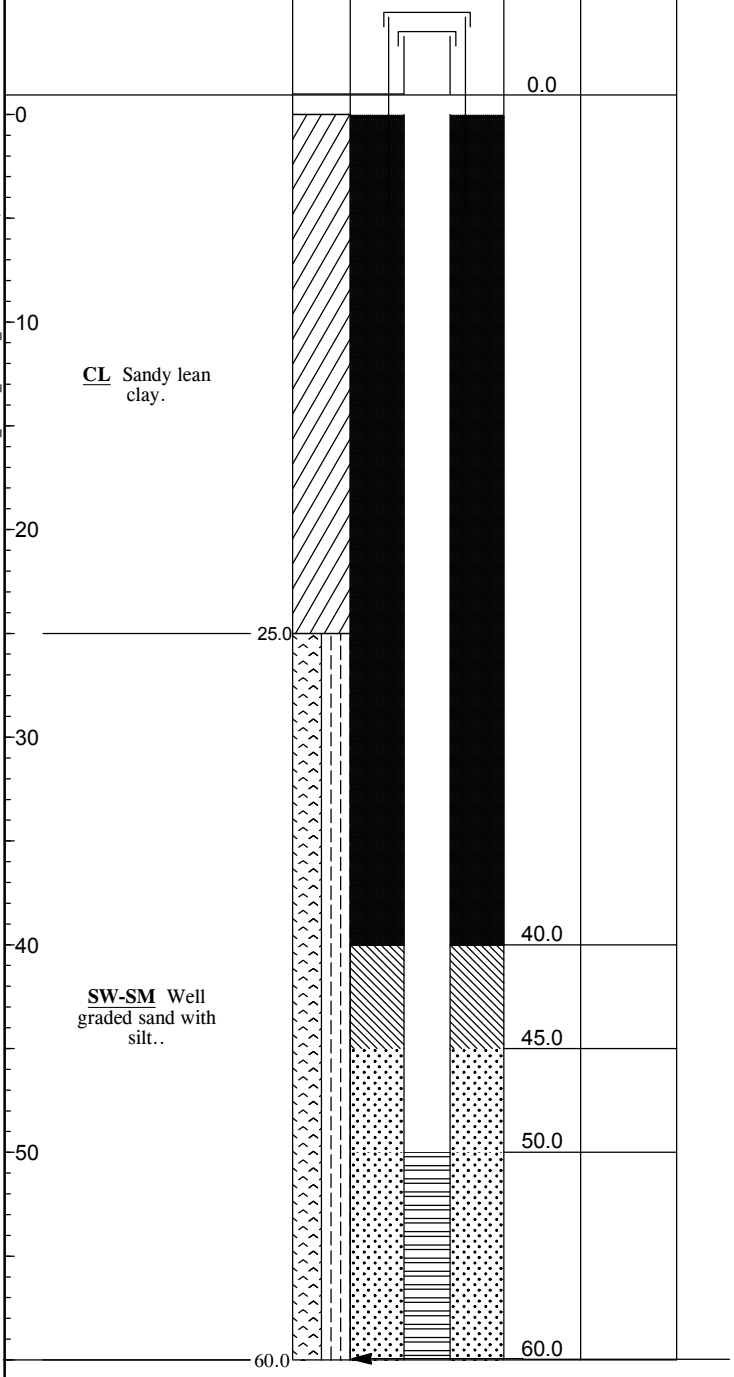
Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	05 Oct 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
				0.0	
CL Sandy lean clay.	0 – 25.0				
SW-SM Well graded sand with silt..	25.0 – 60.0			40.0 / 45.0 / 50.0 / 60.0	



WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.7 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	50.0 ft
Inside diameter	2.375 inch
Depth of bottom of Guard Pipe	47.3 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	50.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	40.0 ft
Bentonite	40.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	50.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	60 ft
Bottom of silt trap	NA
Depth of bottom of borehole	60.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

HALEY & ALDRICH

BORING LOGS

Well No. MW-16

Project	New Madrid Energy Center
Location	Marston, MO
Client	Associated Electric Cooperative, Inc.
Contractor	Bulldog Drilling
Driller	

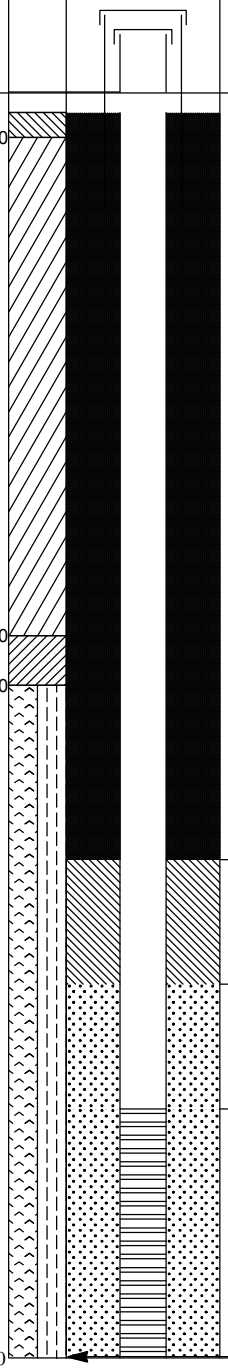
Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	128064-001
Date Installed	06 Oct 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	
Datum	NGVD

SOIL/ROCK

CONDITIONS	DEPTH (ft.)
FILL	1.0
CL Sandy lean clay..	21.0
CH Fat clay with sand.	23.0
SW-SM Well graded sand with silt.	50.0



WELL CONSTRUCTION DETAILS

Type of protective cover	LOCKING CAP
Height of Guard Pipe above ground surface	2.7 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	40.0 ft
Inside diameter	2.375 inch
Depth of bottom of Guard Pipe	37.4 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2 inch
Depth of bottom of riser pipe	40.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	30.0 ft
Bentonite	30.0 ft	5.0 ft
	-	-

Diameter of borehole	8 inch
Depth to top of well screen	40.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2 inch
Type of Backfill around Screen	No. 12-20 silica sand
Depth to bottom of well screen	50 ft
Bottom of silt trap	NA
Depth of bottom of borehole	50.0 ft

MONITORING WELL HA-LIB07-1-BOS1.GLB HA-TB+CORE+WELL-07-1.GDT G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEWMADRID_LOGS_103116_RM.GPJ Nov 8, 16

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No. MW-17

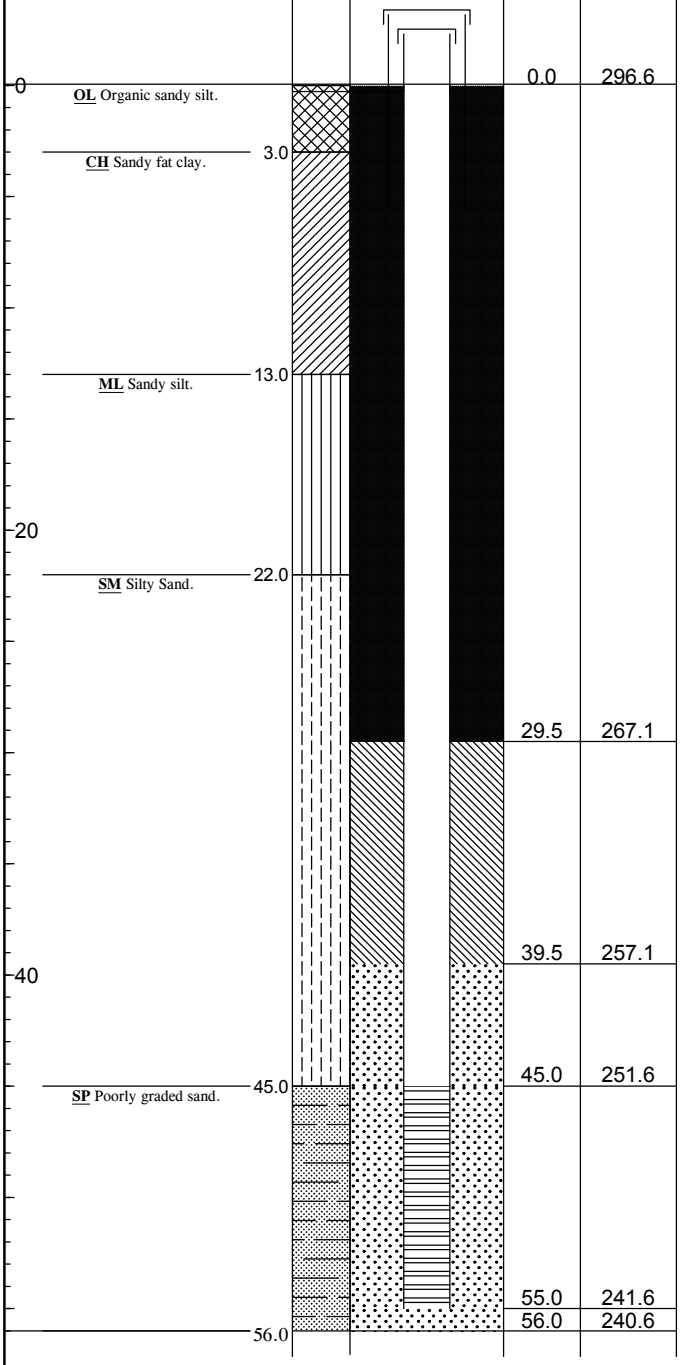
Project New Madrid Power Plant
Location Marston, MO
Client Associated Electric Cooperative, Inc.
Cuttings Collected By Bulldog Drilling Inc.
Cuttings Logged By C. Giusti
Driller John Gates

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

ADWR Reg No.
Date Installed 6 Dec 2018
H&A Rep. C. Giusti
Location See Plan

Ground El. 296.6
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
				0.0	296.6
OL Organic sandy silt.	0				
CH Sandy fat clay.	3.0				
ML Sandy silt.	13.0				
SM Silty Sand.	22.0				
				29.5	267.1
				39.5	257.1
SP Poorly graded sand.	45.0			45.0	251.6
				55.0	241.6
	56.0			56.0	240.6



WELL CONSTRUCTION DETAILS

Type of protective cover: Locking Cap
Height of Guard Pipe above ground surface: 2.6 ft
Height of top of riser above ground surface: 2.2 ft
Type of protective casing: Guard Pipe
Length: 5.0 ft
Inside diameter: NA
Depth of bottom of Guard Pipe: 2.5 ft
Type of riser pipe: Schedule 40 PVC
Inside diameter of riser pipe: 2.0 in.
Depth of bottom of riser pipe: 45 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Cement	0	30
Bentonite	30	10
	-	-

Diameter of borehole: 6.3 in.
Depth to top of well screen: 45 ft
Type of screen: Machine slotted Sch 40 PVC
Screen gauge or size of openings: 0.010 in.
Diameter of screen: 2.0 in.
Type of Backfill around Screen: No. 12-20 Silica Sand
Depth to bottom of well screen: 55 ft
Bottom of silt trap: NA
Depth of bottom of borehole: 56 ft

COMMENTS:

HA-LIB09-BOS - SONIC.GLB GW INSTALLATION REPORT SRP CGS G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEW\MADRID_LOGS_181210.GPJ Apr 15, 19

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No. MW-18

Project New Madrid Power Plant
Location Marston, MO
Client Associated Electric Cooperative, Inc.
Cuttings Collected By Bulldog Drilling Inc.
Cuttings Logged By C. Giusti
Driller John Gates

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

ADWR Reg No.
Date Installed 6 Dec 2018
H&A Rep. C. Giusti
Location See Plan

Ground El. 298.8
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
				0.0	298.8
OL Organic sandy silt.	0				
CH Sandy fat clay.	3.0				
ML Sandy silt.	12.0				
				20.0	278.8
SM Silty sand.	21.0				
SP-SM Poorly graded sand with silt.	33.0				
				40.5	258.3
SP Poorly graded sand.	45.0			45.5	253.3
				55.5	243.3
	56.0				

WELL CONSTRUCTION DETAILS

Type of protective cover: Locking Cap
Height of Guard Pipe above ground surface: 3.0 ft
Height of top of riser above ground surface: 2.7 ft
Type of protective casing: Guard Pipe
Length: 5.0 ft
Inside diameter: NA
Depth of bottom of Guard Pipe: 2.0 ft
Type of riser pipe: Schedule 40 PVC
Inside diameter of riser pipe: 2.0 in.
Depth of bottom of riser pipe: 46 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Cement	0	20
Bentonite	20	21
	-	-

Diameter of borehole: 6.3 in.
Depth to top of well screen: 46 ft
Type of screen: Machine slotted Sch 40 PVC
Screen gauge or size of openings: 0.010 in.
Diameter of screen: 2.0 in.
Type of Backfill around Screen: No. 12-20 Silica Sand
Depth to bottom of well screen: 55.5 ft
Bottom of silt trap: NA
Depth of bottom of borehole: 56 ft

COMMENTS:

HA-LIB09-BOS - SONIC.GLB GW INSTALLATION REPORT SRP CGS G:\PROJECTS\AECI\NEW MADRID\PROJECT DATA\GINT\NEW\MADRID_LOGS_181210.GPJ Apr 15, 19

ATTACHMENT 4

POND 004 GROUNDWATER MONITORING CONSTITUENT CONCENTRATIONS TABLE

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B - 123	11/6/2016	0.0261	94.3	< 5	0.52	34	7.16	394	< 0.0010	0.0024	< 0.0010	0.239	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0276	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.52	0.97 +/- 1.04
	12/12/2016	0.0201	91.0	< 5	0.57	37	7.00	448	< 0.0010	0.0011	< 0.0010	0.206	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0274	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.57	0.71 +/- 0.59
	1/8/2017	0.031	89.0	5.6	0.446	48	7.53	340	< 0.0030	0.0014	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	0.0030	< 0.0010	< 0.0010	< 0.00020	0.446	0.641 +/- 0.589 (1.06)
	1/24/2017	0.014	87	2.8	0.523	35	7.88	410	< 0.0030	0.0017	< 0.0010	0.20	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.032	0.0035	< 0.0010	< 0.0010	0.00087	0.523	1.06 +/- 0.898 (1.45)
	2/23/2017	0.031	90	3.0	0.540	36	7.22	400	< 0.0030	0.0023	< 0.0010	0.22	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	0.0036	< 0.0010	< 0.0010	< 0.00020	0.540	1.37 +/- 0.747 (1.206)
	4/25/2017	0.032	83	3.4	0.532	36	7.36	400	< 0.0030	0.0025	< 0.0010	0.24	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0036	< 0.0010	< 0.0010	< 0.00020	0.532	0.827 +/- 0.851 (1.525)
	5/16/2017	0.023	77	3.2	0.302	33	7.22	380	< 0.0030	0.0020	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	0.0036	< 0.0010	< 0.0010	< 0.00020	0.302	1.35 +/- 0.824 (1.3)
	6/21/2017	0.029	78	3.1	0.429	32	7.28	380	< 0.0030	0.0017	< 0.0010	0.19	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0036	< 0.0010	< 0.0010	< 0.00020	0.429	0.668 +/- 0.909 (1.781)
	8/28/2017	0.030	82	3.5	0.574	32	7.24	360	< 0.0030	0.0020	< 0.0010	0.20	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0034	< 0.0010	< 0.0010	< 0.00020	0.574	1.926 +/- 1.09 (1.50)
	3/14/2018	0.023	79	3.3	0.547	32	7.35	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	0.537	-	-	-	< 0.0030	0.0022	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.026	0.0044	< 0.0010	< 0.0010	< 0.00020	0.537	1.80 +/- 0.979 (1.44)
	9/11/2018	0.027	87	3.7	0.521	31	7.36	330	-	0.0040	-	0.27	-	< 0.0040	< 0.00086	< 0.0010	0.019	0.0040	< 0.0010	-	-	0.521	1.57 +/- 1.18 (1.99)
	10/24/2018	0.034	88	3.9	0.390	33	7.71	370	< 0.0030	0.0029	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	0.0041	< 0.0010	< 0.0010	< 0.00020	0.390	0.818 +/- 0.817 (1.47)
	12/4/2018	0.083	82	4.4	0.582	34	7.39	360	< 0.0030	0.0014	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	0.0038	< 0.0010	< 0.0010	< 0.00020	0.582	0.631 +/- 0.756 (1.31)
	12/17/2018	0.036	78	3.2	0.647	36	7.41	380	< 0.0030	0.0016	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	0.0046	< 0.0010	< 0.0010	< 0.00020	0.647	0.494 +/- 0.751 (1.38)
	1/9/2019	0.036	81	3.5	0.582	30	7.34	340	< 0.0030	0.0024	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0037	< 0.0010	< 0.0010	< 0.00020	0.582	1.01 +/- 0.649 (1.00)
	1/14/2019	0.026	83	3.6	0.565	30	7.22	430	< 0.0030	0.0027	< 0.0010	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0040	< 0.0010	< 0.0010	< 0.00020	0.565	0.745 +/- 0.779 (1.47)
	1/21/2019	0.037	80	3.8	0.480	33	7.37	410	< 0.0030	0.0021	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0042	< 0.0010	< 0.0010	< 0.00020	0.480	0.998 +/- 0.631 (1.000)
	2/8/2019	0.028	78	3.1	0.515	31	7.29	450	< 0.0030	0.0026	< 0.0010	0.22	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	0.0044	< 0.0010	< 0.0010	< 0.00020	0.515	0.998 +/- 0.848 (1.26)
	2/22/2019	0.029	66	3.2	0.579	30	7.48	340	< 0.0030	0.0014	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0040	< 0.0010	< 0.0010	< 0.00020	0.579	0.775 +/- 0.873 (1.78)
	3/4/2019	0.040	80	3.2	0.634	30	7.36	350	< 0.0030	0.0021	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0041	< 0.0010	< 0.0010	< 0.00020	0.634	2.29 +/- 1.13 (1.50)
	3/7/2019	0.048	79	< 5.0	0.620	31	7.53	370	< 0.0030	0.0020	< 0.0010	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.025	0.0043	< 0.0010	< 0.0010	< 0.00020	0.620	0.594 +/- 0.743 (1.38)
	6/5/2019	-	-	-	0.625	-	-	-	< 0.0030	0.0079	< 0.0010	0.33	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0042	< 0.0010	< 0.0010	< 0.00020	0.625	2.18 +/- 1.00 (0.950)
	8/28/2019	0.025	78	2.8	0.602	28	7.51	340	-	0.0022	-	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.031	0.0042	< 0.0010	-	-	0.602	1.76 +/- 1.07 (1.83)
	10/4/2019	0.043	83	3.1	0.598	29	7.26	360	-	0.0011	-	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.027	0.0059	< 0.0010	-	-	0.598	0.0475 +/- 0.872 (1.97)
	10/15/2019	0.052	83	3.2	0.580	28	7.29	340	-	0.0012	-	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.028	0.0040	< 0.0010	-	-	0.580	1.56 +/- 1.04 (1.82)
	11/6/2019	0.079	80	3.0	0.654	29	6.95	410	-	0.0018	-	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0047	< 0.0010	-	-	0.654	0.446 +/- 0.879 (1.79)
	11/6/2019	0.039	80	2.9	0.598	29	7.46	390	-	0.0015	-	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	0.0040	< 0.0010	-	-	0.598	0.136 +/- 0.654 (1.46)
	12/17/2019	0.036	78	3.2	0.647	36	7.41	380	< 0.0030	0.0016	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	0.0046	< 0.0010	< 0.0010	< 0.00020	0.647	0.494 +/- 0.751 (1.38)
	12/18/2019	-	-	-	-	-	-	-	< 0.0030	0.0018	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.032	0.0040	< 0.0010	< 0.0010	< 0.00020	-	0.194 +/- 0.601 (1.15)
	2/21/2020	0.029	62	3.1	0.457	28	7.43	270	-	0.0041	-	0.18	< 0.00089	< 0.0040	0.00098	< 0.0010	0.017	< 0.0010	< 0.0010	-	-	0.457	0.892 +/- 0.810 (1.39)
	5/20/2020	-	-	-	0.518	-	-	-	<0.0030	0.0034	<0.0010	0.21	<0.00089	<0.0040	<0.00086	<0.0010	0.024	0.0037	<0.0010	<0.0010	<0.00020	0.518	0.467 +/- 0.834 (1.72)

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B-126	11/6/2016	0.0342	140	8	0.39	57	6.90	560	< 0.0010	0.0099	< 0.0010	0.400	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0159	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.39	0.7 +/- 1.45
	12/12/2016	0.0273	178	11	0.39	173	6.68	826	< 0.0010	0.0076	< 0.0010	0.447	< 0.0010	0.0013	< 0.0050	< 0.0010	0.0244	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.39	1.11 +/- 0.62
	1/8/2017	0.034	72	6.4	0.376	43	7.49	240	< 0.0030	0.0063	< 0.0010	0.250	< 0.0010	< 0.0040	0.002	0.0011	0.016	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.376	0.342 +/- 0.71 (1.38)
	1/24/2017	0.018	64	3.4	0.457	26	7.37	290	< 0.0030	0.0050	< 0.0010	0.23	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.013	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.457	-0.189 +/- 0.713 (1.49)
	2/23/2017	0.034	85	7.4	0.525	58	7.00	340	< 0.0030	0.0067	< 0.0010	0.28	< 0.0010	< 0.0040	0.0021	< 0.0010	0.015	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.525	1.156 +/- 0.854 (1.37)
	4/25/2017	0.032	57	4.5	0.388	27	6.95	300	< 0.0030	0.0084	< 0.0010	0.21	< 0.0010	0.0047	0.0026	0.0020	0.013	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.388	1.267 +/- 0.807 (1.22)
	5/16/2017	0.022	35	1.7	0.258	5.6	6.93	170	< 0.0030	0.0085	< 0.0010	0.13	< 0.0010	< 0.0040	< 0.0020	< 0.0010	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.258	1.827 +/- 0.854 (1.053)
	6/21/2017	0.031	41	3.2	0.398	7.6	6.91	210	< 0.0030	0.0094	< 0.0010	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.398	0.51 +/- 0.848 (1.663)
	8/28/2017	0.036	63	4.6	0.493	20	6.94	270	< 0.0030	0.0097	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.493	2.01+/- 1.13 (1.21)
	3/14/2018	0.032	82	3.6	0.369	26	7.00	280	-	-	-	-	-	-	-	-	-	-	-	-	-	0.369	-
	5/30/2018	-	-	-	0.383	-	-	-	< 0.0030	0.0086	< 0.0010	0.24	< 0.0010	0.0094	0.0030	0.0043	0.013	0.0014	0.0012	< 0.0010	< 0.00020	0.383	2.20 +/- 1.71 (3.20)
	9/11/2018	0.034	130	1.0	0.284	90	7.00	440	-	0.0052	-	0.31	-	< 0.0040	0.0019	< 0.0010	0.011	< 0.0010	< 0.0010	-	-	0.284	1.13 +/- 1.22 (2.05)
	10/24/2018	0.065	67	4.4	0.280	28	7.17	280	< 0.0030	0.0052	< 0.0010	0.22	< 0.00089	0.0064	0.0015	0.0011	0.012	0.0038	0.0011	< 0.0010	< 0.00020	0.280	1.07 +/- 0.975 (1.71)
	12/4/2018	0.090	44	2.4	0.446	17	7.09	150	< 0.0030	0.0046	< 0.0010	0.19	< 0.00089	0.010	0.0017	0.0022	0.011	0.0016	< 0.0010	< 0.0010	< 0.00020	0.446	0.739 +/- 0.911 (1.83)
	12/18/2018	0.029	32	1.4	0.678	16	6.99	220	< 0.0030	0.0044	< 0.0010	0.16	< 0.00089	0.0078	0.0017	0.0029	0.014	< 0.0010	0.0018	< 0.0010	< 0.00020	0.678	1.13 +/- 1.20 (2.15)
	1/8/2019	0.051	50	2.5	0.501	13	7.04	410	< 0.0030	0.0059	< 0.0010	0.22	< 0.00089	0.012	0.0030	0.0041	0.011	0.0018	0.0013	< 0.0010	< 0.00020	0.501	2.33 +/- 1.30 (1.97)
	1/14/2019	0.025	24	1.1	0.551	7.1	6.97	230	< 0.0030	0.0041	< 0.0010	0.15	< 0.00089	0.0070	0.0018	0.0041	< 0.010	0.0011	0.0028	< 0.0010	< 0.00020	0.551	1.05 +/- 1.01 (1.81)
	1/22/2019	0.024	25	1.0	0.434	6.4	7.00	140	< 0.0030	0.0034	< 0.0010	0.11	< 0.00089	0.0041	0.0011	0.0020	< 0.010	< 0.0010	0.0012	< 0.0010	< 0.00020	0.434	1.50 +/- 0.792 (1.13)
	2/8/2019	0.019	17	< 1.0	0.400	6.5	6.70	440	< 0.0030	0.0038	< 0.0010	0.18	< 0.00089	0.014	0.0023	0.0078	0.012	< 0.0010	0.0031	< 0.0010	< 0.00020	0.400	1.04 +/- 0.992 (1.16)
	3/4/2019	0.026	16	< 1.0	0.556	6.4	6.85	420	< 0.0030	0.0054	< 0.0010	0.17	< 0.00089	0.015	0.0044	0.0090	0.011	< 0.0010	0.0012	< 0.0010	< 0.00020	0.556	1.16 +/- 0.854 (1.35)
	3/7/2019	0.023	29	1.2	0.543	11	7.22	180	< 0.0030	0.0043	< 0.0010	0.15	< 0.00089	0.0098	0.0030	0.0047	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.543	0.969 +/- 1.09 (2.01)
	6/5/2019	-	-	-	0.516	-	-	-	< 0.0030	0.0092	< 0.0010	0.17	< 0.00089	0.0040	0.0023	0.0018	0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.516	1.55 +/- 1.60 (2.93)
	8/28/2019	0.024	56	2.7	0.507	24	7.10	280	-	0.0051	-	0.24	< 0.00089	< 0.0040	0.0018	0.0022	0.015	< 0.0010	0.0010	-	-	0.507	2.20 +/- 1.05 (1.25)
	10/4/2019	0.037	140	8.8	0.409	130	6.98	580	-	0.0049	-	0.33	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.021	< 0.0010	< 0.0010	-	-	0.409	0.884 +/- 1.10 (2.02)
	10/15/2019	0.041	140	10	0.517	130	6.98	630	-	0.0046	-	0.30	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.022	0.0032	< 0.0010	-	-	0.517	0.563 +/- 1.05 (2.22)
	11/6/2019	0.050	67	4.2	0.508	38	7.07	320	-	0.0043	-	0.19	< 0.00089	< 0.0040	0.0012	< 0.0010	< 0.020	< 0.0010	< 0.0010	-	-	0.508	2.68 +/- 1.23 (1.80)
	12/18/2019	0.029	32	1.4	0.678	16	6.99	220	< 0.0030	0.0044	< 0.0010	0.16	< 0.00089	0.0078	0.0017	0.0029	0.014	< 0.0010	0.0018	< 0.0010	< 0.00020	0.678	1.13 +/- 1.20 (2.15)
	2/21/2020	0.031	62	3.9	0.376	27	7.07	230	-	0.0040	-	0.18	< 0.00089	< 0.0040	0.00086	< 0.0010	0.018	< 0.0010	< 0.0010	-	-	0.376	0.469 +/- 0.556 (1.03)
	5/20/2020	-	-	-	0.339	-	-	-	<0.0030	0.0037	<0.0010	0.20	<0.00089	<0.0040	0.0015	<0.0010	0.011	<0.0010	<0.0010	<0.0010	<0.00020	0.339	1.08 +/- 0.841 (1.43)

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-16	11/2/2016	0.0425	157	11	1.22	118	6.82	516	< 0.0010	0.0026	< 0.0010	0.773	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0263	< 0.010	< 0.0010	< 0.0010	< 0.00020	1.22	1.85 +/- 0.91
	12/9/2016	0.0431	154	15	1.37	107	6.89	630	< 0.0010	0.0029	< 0.0010	0.783	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0274	< 0.010	< 0.0010	< 0.0010	< 0.00020	1.37	0.98 +/- 0.64
	1/7/2017	0.039	130	13	1.10	120	7.58	580	< 0.0030	0.0027	< 0.0010	0.800	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.10	2.34 +/- 1.05 (1.165)
	1/30/2017	0.037	130	11	1.55	120	7.40	570	< 0.0030	0.0026	< 0.0010	0.73	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.55	1.777 +/- 1.093 (1.668)
	2/21/2017	0.051	150	12	1.18	95	6.91	560	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.18	1.094 +/- 0.728 (1.32)
	3/28/2017	0.047	130	11	1.44	100	6.88	580	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.44	2.332 +/- 0.978 (1.216)
	4/27/2017	0.060	150	12	1.38	93	6.97	560	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.38	1.843 +/- 0.862 (1.087)
	5/18/2017	0.046	150	13	1.59	97	6.88	600	< 0.0030	0.0027	< 0.0010	0.75	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.59	1.934 +/- 0.991 (1.312)
	6/24/2017	0.036	130	11	1.18	110	7.02	490	< 0.0030	0.0020	< 0.0010	0.72	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.18	1.787 +/- 1.083 (1.687)
	8/15/2017	0.052	140	10	1.27	98	6.89	500	< 0.0030	0.0021	< 0.0010	0.70	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.27	1.396 +/- 1.106 (1.858)
	3/15/2018	0.054	140	12	1.45	84	7.03	580	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	-
	3/15/2018	0.049	140	12	1.45	84	7.03	570	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	-
	5/30/2018	-	-	-	1.20	-	-	-	< 0.0030	0.0020	< 0.0010	0.72	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.025	0.0045	< 0.0010	< 0.0010	< 0.00020	1.20	2.60 +/- 1.10 (1.46)
	9/12/2018	0.051	150	16	1.20	73	6.99	400	-	0.0023	-	0.69	-	< 0.0040	< 0.00086	< 0.0010	0.019	< 0.0010	< 0.0010	-	-	1.20	2.78 +/- 1.35 (1.70)
	10/25/2018	0.034	140	14	1.22	67	7.10	510	< 0.0030	0.0021	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.22	2.30 +/- 1.02 (1.30)
	12/4/2018	0.052	130	11	1.72	74	7.04	500	< 0.0030	0.0024	< 0.0010	0.61	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.72	1.27 +/- 0.878 (1.41)
	12/17/2018	0.067	130	11	1.65	120	7.25	560	< 0.0030	0.0022	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.65	0.752 +/- 0.772 (1.25)
	1/7/2019	0.050	140	12	1.66	87	7.00	540	< 0.0030	0.0028	< 0.0010	0.67	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.66	1.46 +/- 0.694 (0.742)
	1/15/2019	0.071	140	12	1.71	95	6.97	580	< 0.0030	0.0022	< 0.0010	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.022	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.71	2.64 +/- 1.10 (0.855)
	1/21/2019	0.080	140	13	1.41	100	7.04	680	< 0.0030	0.0021	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.41	2.37 +/- 1.01 (1.24)
	2/9/2019	0.082	130	15	< 2.50	99	6.98	690	< 0.0030	0.0018	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	< 2.50	1.91 +/- 1.20 (1.80)
	2/22/2019	0.055	120	13	1.67	90	7.12	520	< 0.0030	0.0024	< 0.0010	0.66	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.67	1.77+/- 1.06 (1.68)
	2/22/2019	0.052	120	14	1.68	92	7.01	520	< 0.0030	0.0023	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.68	1.45 +/- 1.20 (1.93)
	3/5/2019	0.070	130	14	1.78	88	7.09	600	< 0.0030	0.0022	< 0.0010	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.78	1.47 +/- 0.937 (1.39)
	3/7/2019	0.078	130	14	1.71	85	7.08	570	< 0.0030	0.0023	< 0.0010	0.61	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.71	0.225 +/- 0.901 (1.92)
	6/5/2019	-	-	-	1.52	-	-	-	< 0.0030	0.0024	< 0.0010	0.56	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.52	2.09 +/- 1.02 (1.39)
	8/28/2019	0.046	120	16	1.69	73	7.19	520	-	0.0024	-	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	-	-	1.69	3.08 +/- 1.25 (1.67)
	10/3/2019	0.21	130	16	1.66	70	6.94	490	-	0.0022	-	0.65	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.025	< 0.0010	< 0.0010	-	-	1.66	0.0972 +/- 0.959 (2.11)
	10/16/2019	0.065	130	13	1.43	68	7.12	470	-	0.0020	-	0.58	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.026	< 0.0010	< 0.0010	-	-	1.43	1.39 +/- 1.23 (2.08)
	11/9/2019	0.056	120	14	1.47	75	7.22	520	-	0.0024	-	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	< 0.0010	< 0.0010	-	-	1.47	0.809 +/- 0.659 (0.955)
	12/17/2019	0.067	130	83	1.65	120	7.25	560	< 0.0030	0.0022	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.65	0.752 +/- 0.772 (1.25)
	12/19/2019	-	-	-	-	-	-	-	< 0.0030	0.0022	< 0.0010	0.59	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	-	0.991 +/- 0.876 (1.50)
	2/21/2020	0.064	120	13	1.68	56	7.08	510	-	0.0024	-	0.56	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.030	< 0.0010	< 0.0010	-	-	1.68	1.26 +/- 0.793 (1.19)
	5/19/2020	-	-	-	1.52	-	-	-	<0.0030	0.0021	<0.0010	0.53	<0.00089	<0.0040	<0.00086	<0.0010	0.022	<0.0010	<0.0010	<0.0010	<0.00020	1.52	1.31 +/- 0.928 (1.61)

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-10	11/02/2016	0.434	132	5	0.65	94	6.92	476	<0.0010	0.0016	<0.0010	0.118	<0.0010	0.0013	<0.0050	<0.0010	0.014	<0.0100	0.0105	<0.0010	<0.00020	0.650	0.7 +/- 0.56
	12/09/2016	1.18	152	12	0.64	172	6.85	596	<0.0010	0.0078	<0.0010	0.187	<0.0010	<0.0010	<0.0050	<0.0010	0.018	<0.0100	<0.0010	<0.0010	<0.00020	0.640	0.52 +/- 0.57
	1/7/2017	1.500	180	15	0.521	240	7.2	700	<0.0030	0.0029	<0.0010	0.190	<0.0010	<0.0040	0.0038	<0.0010	0.023	0.0012	<0.0010	<0.0010	<0.00020	0.521	1.438 +/- 0.884 (1.451)
	1/28/2017	1.300	160	16	0.767	340	7.65	760	<0.0030	0.0032	<0.0010	0.200	<0.0010	<0.0040	0.0022	<0.0010	0.022	0.0012	<0.0010	<0.0010	<0.00020	0.767	1.363 +/- 0.825 (1.29)
	02/22/2017	0.68	140	10	0.568	280	7.01	600	<0.0030	0.0024	<0.0010	0.140	<0.0010	<0.0040	0.0034	<0.0010	0.018	0.0049	<0.0010	<0.0010	<0.00020	0.568	1.265 +/- 0.745 (1.011)
	03/28/2017	0.62	130	11	0.76	150	6.92	640	<0.0030	0.0026	<0.0010	0.150	<0.0010	<0.0040	0.0028	<0.0010	0.017	0.0014	<0.0010	<0.0010	<0.00020	0.760	0.689 +/- 0.578 (1.005)
	04/27/2017	1.100	150	13	0.505	230	7.03	700	<0.0030	0.0039	<0.0010	0.180	<0.0010	<0.0040	<0.0020	<0.0010	0.022	0.0011	<0.0010	<0.0010	<0.00020	0.505	1.306 +/- 0.789 (1.253)
	04/27/2017	1.100	150	13	0.505	230	6.96	700	<0.0030	0.0036	<0.0010	0.190	<0.0010	<0.0040	<0.0020	<0.0010	0.021	0.0011	<0.0010	<0.0010	<0.00020	0.505	1.30 +/- 0.779 (1.204)
	05/18/2017	0.78	170	9.4	0.338	190	6.87	660	<0.0030	0.0050	<0.0010	0.190	<0.0010	<0.0040	<0.0020	<0.0010	0.020	0.0012	<0.0010	<0.0010	<0.00020	0.338	1.365 +/- 0.986 (1.679)
	05/18/2017	0.800	160	9.6	0.335	190	6.83	680	0.0031	0.0046	<0.0010	0.180	<0.0010	<0.0040	<0.0020	<0.0010	0.020	<0.0010	<0.0010	<0.0010	<0.00020	0.335	1.229 +/- 0.839 (1.413)
	06/23/2017	0.75	140	7.9	0.591	120	7.09	520	<0.0030	0.0022	<0.0010	0.150	<0.0010	<0.0040	0.0026	<0.0010	0.018	0.0013	<0.0010	<0.0010	<0.00020	0.591	1.229 +/- 0.791 (1.138)
	08/15/2017	0.470	130	5.2	0.638	85	7.03	400	<0.0030	0.0014	<0.0010	0.120	<0.0010	<0.0040	0.0029	<0.0010	0.016	0.0040	0.0020	<0.0010	<0.00020	0.638	1.489 +/- 0.869 (0.863)
	03/15/2018	0.68	130	13	0.625	140	7.02	560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	-	-	-	-	<0.0030	0.0024	<0.0010	0.12	<0.0010	<0.0040	<0.0020	<0.0010	0.013	0.0014	<0.0010	<0.0010	<0.00020	0.608	0.381 +/- 0.928 (1.88)
	09/12/2018	0.61	140	11	0.61	100	7.06	440	-	0.0046	--	0.15	--	<0.0040	<0.00086	<0.0010	<0.010	0.0010	<0.0010	--	--	0.610	0.940 +/- 1.01 (1.86)
	03/08/2019	0.36	140	7.6	0.627	110	6.97	550	<0.0030	0.0056	<0.0010	0.16	<0.00089	<0.0040	0.0012	<0.0010	0.013	<0.0010	<0.0010	<0.0010	<0.00020	0.627	1.21 +/- 0.858 (1.56)
	03/08/2019	0.35	140	8.2	0.579	100	7.00	540	<0.0030	0.0054	<0.0010	0.16	<0.00089	<0.0040	0.0014	<0.0010	0.012	<0.0010	<0.0010	<0.0010	<0.00020	0.579	1.80 +/- 1.05 (1.41)
	6/10/2019	-	-	-	-	-	-	-	<0.0030	0.0030	<0.0010	0.15	<0.00089	<0.0040	0.0011	<0.0010	0.018	<0.0010	<0.0010	<0.0010	<0.00020	0.564	0.506 ± 0.601 (1.14)
	08/29/2019	0.37	140	5.7	0.25	95	7.38	540	-	0.0017	--	0.13	--	<0.0040	0.0023	<0.0010	0.026	<0.0010	--	--	--	<0.250	0.431 +/- 0.928 (1.86)
	02/19/2020	0.38	150	5.6	0.497	91	6.93	610	-	0.0021	--	0.14	--	<0.0040	0.0013	<0.0010	<0.020	<0.0010	--	--	--	0.497	0.822 ± 0.894 (1.72)
	5/19/2020	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.11	<0.00089	<0.0040	0.0024	<0.0010	0.016	0.0011	<0.0010	<0.0010	<0.00020	0.513	0.569 +/- 0.787 (1.48)
	08/04/2020	0.4	110	6.8	0.626	58	7.16	380	-	0.0011	-	0.11	-	-	0.00097	<0.0010	0.014	<0.0010	<0.0010	<0.0010	-	0.626	0.641 +/- 0.755 (1.48)

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-11	11/2/2016	1.100	138	11	0.37	182	6.92	604	<0.0010	<0.0010	<0.0010	0.077	<0.0010	<0.0010	<0.0050	<0.0010	0.017	0.0127	<0.0010	<0.0010	<0.00020	0.370	1.2 +/- 0.66
	12/9/2016	0.807	161	10	0.26	222	6.82	720	<0.0010	0.0016	<0.0010	0.122	<0.0010	<0.0010	<0.0050	<0.0010	0.016	<0.0100	<0.0010	<0.0010	<0.00020	0.260	0.31 +/- 0.47
	1/7/2017	0.800	140	9.6	<0.250	190	7.52	540	<0.0030	0.0011	<0.0010	0.100	<0.0010	<0.0040	0.0037	<0.0010	0.019	0.0069	<0.0010	<0.0010	<0.00020	<0.250	1.3579 +/- 0.878 (1.578)
	1/28/2017	0.670	140	10	0.378	230	8.19	630	<0.0030	0.0025	<0.0010	0.110	<0.0010	<0.0040	<0.0020	<0.0010	0.018	0.0057	<0.0010	<0.0010	<0.00020	0.378	0.975 +/- 0.811 (1.401)
	2/22/2017	1.100	160	12	0.294	220	6.97	700	<0.0030	0.0015	<0.0010	0.120	<0.0010	<0.0040	0.0061	<0.0010	0.022	0.0076	<0.0010	<0.0010	<0.00020	0.294	1.517 +/- 0.846 (1.25)
	3/28/2017	0.910	130	12	0.496	230	6.89	700	<0.0030	0.0014	<0.0010	0.120	<0.0010	<0.0040	0.0050	<0.0010	0.022	0.0081	<0.0010	<0.0010	<0.00020	0.496	0.607 +/- 0.671 (1.283)
	4/27/2017	0.790	140	12	0.252	210	7.02	650	<0.0030	0.0024	<0.0010	0.120	<0.0010	<0.0040	0.0026	<0.0010	0.020	0.0057	<0.0010	<0.0010	<0.00020	0.252	2.015 +/- 0.813 (0.754)
	5/18/2017	0.860	160	11	<0.250	200	6.88	640	<0.0030	0.0027	<0.0010	0.120	<0.0010	<0.0040	<0.0020	<0.0010	0.022	0.0043	<0.0010	<0.0010	<0.00020	<0.250	1.096 +/- 0.772 (1.271)
	6/23/2017	1.100	140	11	0.342	200	7.03	560	<0.0030	0.0013	<0.0010	0.100	<0.0010	<0.0040	0.0051	<0.0010	0.022	0.0062	<0.0010	<0.0010	<0.00020	0.342	1.245 +/- 0.873 (1.273)
	8/15/2017	0.830	130	10	0.425	170	7.06	540	<0.0030	<0.0010	<0.0010	0.087	<0.0010	<0.0040	0.0049	<0.0010	0.023	0.0087	<0.0010	<0.0010	<0.00020	0.425	1.538 +/- 1.12 (1.847)
	3/15/2018	0.69	140	11	0.353	220	7.07	640	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	-	-	-	-	<0.0030	0.0012	<0.0010	0.13	<0.0010	<0.0040	0.0040	<0.0010	0.018	0.0070	0.0016	<0.0010	<0.00020	0.371	0.615 +/- 0.870 (1.71)
	3/11/2019	0.61	200	9.9	0.554	190	6.93	770	<0.0030	0.0044	<0.0010	0.75	<0.00089	0.0077	0.0047	0.0080	0.020	0.0053	0.0019	<0.0010	0.00023	0.554	0.996 +/- 0.916 (1.59)
	6/10/2019	-	-	-	-	-	-	-	<0.0030	0.0019	<0.0010	0.31	<0.00089	<0.0040	0.0033	0.0012	0.024	0.0039	<0.0010	<0.0010	<0.00020	0.512	1.38 ± 0.924 (1.39)
	8/29/2019	0.38	140	6.6	1.90	110	8.03	370	-	0.0016	-	0.13	-	<0.0040	0.0021	<0.0010	0.026	<0.0010	-	-	-	1.900	0.781 +/- 1.11 (2.15)
	2/18/2020	0.63	230	11.0	0.6	220	6.9	810	-	0.006	-	0.89	-	0.014	0.0095	0.0130	0.032	0.0063	-	-	-	0.58	1.15 ± 1.22 (1.66)
	5/19/2020	-	-	-	-	-	-	-	<0.0030	0.0014	<0.0010	0.25	<0.00089	<0.0040	0.0050	0.0021	0.025	0.0043	0.0011	<0.0010	<0.00020	0.405	0.0855 +/- 0.921 (2.01)
	8/12/2020	1.3	120	13	0.442	140	7.10	450	-	<0.0010	-	0.094	-	-	0.0021	<0.0010	0.022	0.0098	<0.0010	<0.0010	-	0.442	0.220 +/- 0.824 (1.68)
MW-12	11/2/2016	0.412	185	11	0.98	202	7.02	706	<0.0010	0.0023	<0.0010	0.185	<0.0010	<0.0010	<0.0050	<0.0010	0.024	<0.0100	<0.0010	<0.0010	<0.00020	0.98	0.11 +/- 0.5
	12/9/2016	0.384	162	12	0.76	197	6.89	704	<0.0010	0.0029	<0.0010	0.162	<0.0010	<0.0010	<0.0050	<0.0010	0.025	<0.0100	<0.0010	<0.0010	<0.00020	0.76	0.64 +/- 0.81
	1/7/2017	0.360	140	12	0.729	140	7.41	580	<0.0030	0.0021	<0.0010	0.150	<0.0010	<0.0040	<0.0020	<0.0010	0.028	0.0018	<0.0010	<0.0010	<0.00020	0.729	0.823 +/- 0.606 (0.972)
	1/28/2017	0.310	130	13	0.907	180	7.76	560	<0.0030	0.0023	<0.0010	0.140	<0.0010	<0.0040	<0.0020	<0.0010	0.026	0.0020	<0.0010	<0.0010	<0.00020	0.907	1.251 +/- 0.783 (1.332)
	2/22/2017	0.400	160	12	0.751	180	7.06	630	<0.0030	0.0022	<0.0010	0.160	<0.0010	<0.0040	<0.0020	<0.0010	0.028	0.0022	<0.0010	<0.0010	<0.00020	0.751	0.771 +/- 0.698 (1.269)
	2/22/2017	0.390	160	11	0.742	180	7.06	680	<0.0030	0.0023	<0.0010	0.170	<0.0010	<0.0040	<0.0020	<0.0010	0.029	0.0021	<0.0010	<0.0010	<0.00020	0.742	1.0678 +/- 0.655 (0.994)
	3/28/2017	0.330	140	11	0.995	180	7.00	690	<0.0030	0.0022	<0.0010	0.170	<0.0010	<0.0040	<0.0020	<0.0010	0.028	0.0023	<0.0010	<0.0010	<0.00020	0.995	0.944 +/- 0.786 (1.416)
	4/27/2017	0.340	150	12	0.661	170	7.17	620	<0.0030	0.0026	<0.0010	0.150	<0.0010	<0.0040	<0.0020	<0.0010	0.030	0.0022	<0.0010	<0.0010	<0.00020	0.661	1.977 +/- 0.95 (1.299)
	5/18/2017	0.370	140	13	0.527	150	7.01	600	<0.0030	0.0025	<0.0010	0.130	<0.0010	<0.0040	<0.0020	<0.0010	0.027	0.0016	<0.0010	<0.0010	<0.00020	0.527	1.35 +/- 0.79 (1.069)
	6/23/2017	0.400	130	12	0.809	150	7.14	540	<0.0030	0.0022	<0.0010	0.140	<0.0010	<0.0040	<0.0020	<0.0010	0.026	0.0019	<0.0010	<0.0010	<0.00020	0.809	1.751 +/- 0.992 (1.285)
	8/15/2017	0.440	170	11	0.822	190	7.07	560	<0.0030	0.0021	<0.0010	0.170	<0.0010	<0.0040	<0.0020	<0.0010	0.031	0.0027	<0.0010	<0.0010	<0.00020	0.822	1.861 +/- 0.992 (1.361)
	3/15/2018	0.32	140	12	0.739	150	7.12	580	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	-	-	-	-	<0.0030	0.0024	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	0.021	0.0025	<0.0010	<0.0010	<0.00020	0.844	0.839 +/- 0.956 (1.83)
	9/12/2018	0.37	170	14	0.656	190	7.12	510	--	0.0031	--	0.17	--	<0.0040	<0.00086	<0.0010	0.015	0.0023	<0.0010	--	--	0.656	2.12 +/- 1.08 (0.955)
	3/11/2019	0.30	130	14	0.838	160	7.12	640	<0.0030	0.0033	<0.0010	0.16	<0.00089	<0.0040	<0.00086	0.0014	0.021	0.0018	<0.0010	<0.0010	<0.00020	0.838	0.701 +/- 0.758 (1.08)
	6/10/2019	-	-	-	-	-	-	-	<0.0030	0.0031	<0.0010	0.13	<0.00089	<0.0040	<0.00086	<0.0010	0.029	0.0018	<0.0010	<0.0010	<0.00020	0.811	1.50 ± 0.813 (1.00)
	8/29/2019	0.63	210	14	0.474	140	7.40	560	-	<0.0010	-	0.30	-	<0.0040	0.0039	0.0016	0.037	0.0040	-	-	-	0.474	0.664 +/- 1.07 (2.02)
	8/29/2019	0.33	140	16	0.436	140	6.83	550	-	0.0031	-	0.15	-	<0.0040	<0.00086	<0.0010	0.028	0.0024	-	-	-	0.436	1.54 +/- 1.09 (1.97)
	2/18/2020	0.28	180	11	1.210	120	7.21	430	-	0.0078	-	0.79	-	0.02	0.0060	0.0160	0.031	0.0039	-	-	-	1.210	1.15 ± 0.843 (1.20)
	6/22/2020	-	-	-	-	-	-	-	<0.0030	0.0019	<0.0010	0.41	<0.00089	<0.0040	0.0012	<0.0010	0.022	0.0023	<0.0010	<0.0010	<0.00020	1.08	0.900 +/- 0.801 (1.37)
	6/22/2019	-	-	-	-	-	-	-	<0.0030	0.0018	<0.0010	0.40	<0.00089	<0.0040	0.0012	<0.0010	0.021	0.0022	<0.0010	<0.0010	<0.00020	1.08	0.416 +/- 0.963 (1.91)
	8/12/2020	0.36	150	13	1.05	170	7.08	600	-	0.0030	-	0.33	-	-	<0.0020	<0.0010	0.025	0.0021	<0.0010	<0.0010	-	1.05	1.50 +/- 0.988 (1.56)

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-13	11/1/2016	0.082	94	20	0.540	58	7.31	290	<0.0010	0.0010	<0.0010	0.175	<0.0010	<0.0010	<0.0050	<0.0010	0.007	<0.0100	<0.0010	<0.0010	<0.00020	0.540	0.69 +/- 0.6
	12/9/2016	0.172	186	12	0.350	188	6.90	718	<0.0010	0.0022	<0.0010	0.397	<0.0010	<0.0010	<0.0050	<0.0010	0.016	<0.0100	<0.0010	<0.0010	<0.00020	0.350	1.04 +/- 0.7
	12/9/2016	0.169	187	12	0.350	178	6.91	756	<0.0010	0.0020	<0.0010	0.395	<0.0010	<0.0010	<0.0050	<0.0010	0.016	<0.0100	<0.0010	<0.0010	<0.00020	0.350	0.63 +/- 0.53
	1/7/2017	0.130	130	18	0.324	110	7.44	460	<0.0030	0.0014	<0.0010	0.300	<0.0010	<0.0040	<0.0020	<0.0010	0.014	0.0012	<0.0010	<0.0010	<0.00020	0.324	0.661 +/- 0.727 (1.48)
	1/30/2017	0.084	85	28	0.667	73	8.21	360	<0.0030	0.0013	<0.0010	0.190	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0022	<0.0010	<0.0010	<0.00020	0.667	0.454 +/- 0.859 (1.701)
	1/30/2017	0.065	80	NS	NS	NS	NS	NS	<0.0030	0.0013	<0.0010	0.180	<0.0010	0.0046	<0.0020	<0.0010	<0.010	0.0018	<0.0010	<0.0010	<0.00020	NS	0.849 +/- 0.989 (1.667)
	2/22/2017	0.120	99	20	0.485	74	7.33	380	<0.0030	0.0015	<0.0010	0.220	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0014	<0.0010	<0.0010	<0.00020	0.485	1.023 +/- 0.776 (1.286)
	3/28/2017	0.084	99	20	0.697	83	7.23	430	<0.0030	0.0013	<0.0010	0.230	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0017	<0.0010	<0.0010	<0.00020	0.697	1.278 +/- 0.746 (1.046)
	4/27/2017	0.078	87	20	0.431	88	7.40	420	<0.0030	0.0011	<0.0010	0.190	<0.0010	<0.0040	<0.0020	<0.0010	0.010	0.0016	<0.0010	<0.0010	<0.00020	0.431	1.275 +/- 0.82 (1.192)
	5/18/2017	0.063	83	21	0.521	58	7.40	340	<0.0030	0.0010	<0.0010	0.170	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0016	<0.0010	<0.0010	<0.00020	0.521	0.161 +/- 0.689 (1.455)
	6/23/2017	0.082	85	20	0.511	67	7.45	300	<0.0030	<0.0010	<0.0010	0.160	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0017	<0.0010	<0.0010	<0.00020	0.511	0.188 +/- 0.65 (1.41)
	8/15/2017	0.100	98	22	0.538	76	7.37	300	<0.0030	<0.0010	<0.0010	0.20	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0015	<0.0010	<0.0010	<0.00020	0.538	1.742 +/- 1.13 (1.732)
	3/15/2018	0.040	65	21	0.494	42	7.63	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.14	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0015	0.0018	<0.0010	<0.00020	0.488	0.339 +/- 0.820 (1.70)
	5/30/2018	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.14	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0015	0.0015	<0.0010	<0.00020	0.486	0.265 +/- 0.937 (1.94)
	9/12/2018	0.12	160	21	0.360	120	7.64	480	-	<0.0010	-	0.26	-	<0.0040	0.0019	<0.0010	<0.010	0.0012	<0.0010	-	-	0.360	1.95 +/- 1.27 (1.94)
	9/11/2018	0.12	160	21	0.381	120	7.47	480	-	<0.0010	-	0.26	-	<0.0040	0.0019	<0.0010	<0.010	0.0012	<0.0010	-	-	0.381	1.51 +/- 1.02 (1.62)
	3/11/2019	0.094	130	20	0.296	69	7.72	480	<0.0030	<0.0010	<0.0010	0.18	<0.00089	<0.0040	0.0010	<0.0010	<0.010	0.0013	0.0012	<0.0010	<0.00020	0.296	1.43 +/- 1.03 (1.83)
	6/7/2019	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.14	<0.00089	<0.0040	0.0013	<0.0010	0.011	0.0012	<0.0010	<0.0010	<0.00020	0.462	1.67 ± 0.853 (1.00)
	6/7/2019	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.14	<0.00089	<0.0040	0.0013	<0.0010	0.010	0.0013	<0.0010	<0.0010	<0.00020	0.458	1.47 ± 0.790 (0.940)
	8/29/2019	0.090	120	24	0.441	71	7.61	380	-	<0.0010	-	0.18	-	<0.0040	0.00086	<0.0010	0.018	0.0015	-	-	-	0.441	0.665 +/- 1.09 (2.12)
	2/19/2020	0.073	140	19	0.416	69	7.29	440	-	<0.0010	-	0.19	-	<0.0040	0.00130	<0.0010	<0.020	0.0014	-	-	-	0.416	1.25 ± 0.914 (1.69)
	2/19/2020	0.072	140	19	0.419	69	7.21	430	-	<0.0010	-	0.19	-	<0.0040	0.0012	<0.0010	<0.020	0.0015	-	-	-	0.419	0.0571 ± 0.857 (1.89)
	5/23/2020	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	0.0016	<0.0010	<0.010	0.0012	<0.0010	0.0012	<0.00020	0.398	0.951 +/- 0.937 (1.67)
	8/18/2020	0.062	73	17	0.527	39	7.47	290	-	<0.0010	-	0.11	-	-	< 0.0020	<0.0010	<0.010	0.0020	<0.0010	< 0.0010	-	0.527	1.42 +/- 0.886 (1.49)
	8/18/2020	0.060	72	17	0.495	39	7.66	280	-	<0.0010	-	0.11	-	-	< 0.0020	<0.0010	<0.010	0.0016	<0.0010	< 0.0010	-	0.495	1.10 +/- 0.913 (1.91)
MW-14	11/2/2016	0.320	167	15	0.68	126	7.00	490	<0.0010	<0.0010	<0.0010	0.15	<0.0010	<0.0010	<0.0050	<0.0010	0.015	<0.0100	0.0034	<0.0010	<0.00020	0.680	0.17 +/- 0.44
	11/2/2016	0.303	161	15	0.67	134	6.99	572	<0.0010	<0.0010	<0.0010	0.15	<0.0010	<0.0010	<0.0050	<0.0010	0.014	<0.0100	0.0030	<0.0010	<0.00020	0.670	1.32 +/- 0.74
	12/8/2016	0.426	151	16	0.57	114	7.07	544	<0.0010	0.0019	<0.0010	0.16	<0.0010	<0.0010	<0.0050	<0.0010	0.016	<0.0100	<0.0010	<0.0010	<0.00020	0.570	0.644 +/- 1.031 (1.961)
	1/6/2017	0.350	120	18	0.503	130	7.37	460	<0.0030	0.0017	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	0.018	0.0010	<0.0010	<0.0010	<0.00020	0.503	0.402 +/- 0.819 (1.608)
	1/6/2017	0.350	120	18	0.500	130	7.52	440	<0.0030	0.0016	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	0.018	<0.0010	<0.0010	<0.0010	<0.00020	0.500	0.572 +/- 0.486 (0.571)
	1/30/2017	0.300	120	17	0.504	110	7.72	550	<0.0030	0.0019	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	0.016	<0.0010	<0.0010	<0.0010	<0.00020	0.504	0.424 +/- 0.813 (1.679)
	2/22/2017	0.360	150	15	0.563	120	7.15	540	<0.0030	<0.0010	<0.0010	0.18	<0.0010	<0.0040	0.0050	<0.0010	0.016	0.0013	<0.0010	<0.0010	<0.00020	0.563	0.735 +/- 0.747 (1.463)
	3/28/2017	0.240	130	14	0.782	120	7.03	560	<0.0030	<0.0010	<0.0010	0.18	<0.0010	<0.0040	0.0040	<0.0010	0.017	0.0016	<0.0010	<0.0010	<0.00020	0.782	0.3095 +/- 0.575 (1.096)
	3/28/2017	0.260	140	15	0.793	120	7.03	560	<0.0030	<0.0010	<0.0010	0.18	<0.0010	<0.0040	0.0042	<0.0010	0.016	0.0010	<0.0010	<0.0010	<0.00020	0.793	0.587 +/- 0.766 (1.454)
	4/27/2017	0.240	130	17	0.539	110	7.26	500	<0.0030	<0.0010	<0.0010	0.15	<0.0010	<0.0040	0.0030	<0.0010	0.016	<0.0010	<0.0010	<0.0010	<0.00020	0.539	1.846 +/- 0.968 (1.362)
	5/18/2017	0.140	130	19	0.797	80	7.17	440	<0.0030	<0.0010	<0.0010	0.12	<0.0010	<0.0040	0.0033	<0.0010	0.013	0.0011	<0.0010	<0.0010	<0.00020	0.797	0.860 +/- 0.897 (1.519)
	6/23/2017	0.210	97	23	0.649	72	7.32	350	<0.0030	<0.0010	<0.0010	0.11	<0.0010	<0.0040	0.0028	<0.0010	0.012	<0.0010	<0.0010	<0.0010	<0.00020	0.649	0.657 +/- 0.736 (1.321)
	6/24/2017	0.230	99	22	0.662	71	7.29	330	<0.0030	<0.0010	<0.0010	0.11	<0.0010	<0.0040	0.0027	<0.0010	0.012	<0.0010	<0.0010	<0.0010	<0.00020	0.662	0.465 +/- 0.611 (1.131)
	8/15/2017	0.190	140	12	0.710	120	7.09	480	<0.0030	<0.0010	<0.0010	0.16	<0.0010	<0.0040	0.0051	<0.0010	0.018	0.0012	0.0019	<0.0010	<0.00020	0.710	1.284 +/- 1.17 (2.03)
	3/15/2018	0.20	120	18	0.741	96	7.28	490	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.10	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0011	<0.0010	<0.0010	<0.00020	0.785	0.778 +/- 0.931 (1.78)
	9/11/2018	0.37	170	16	0.531	130	7.14	460	-	<0.0010	-	0.18	-	<0.0040	0.0019	<0.0010	<0.010	<0.0010	<0.0010	--	--	0.531	0.884 +/- 0.963 (1.84)
	3/11/2019	0.094	83	16	0.891	36	7.75	340	<0.0030	<0.0010	<0.0010	0.082	<0.00089	<0.0040	0.0017	<0.0010	<0.010	0.0028	<0.0010	<0.0010	<0.00020	0.891	1.14 +/- 0.745 (1.13)
	6/7/2019	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.083	<0.00089	<0.0040	0.0013	<0.0010	0.013	0.0021	<0.0010	<0.0010	<0.00020	1.07	1.60 ± 0.845 (1.15)
	8/29/2019	0.097	90	21	0.657	48	7.58	520	-	<0.0010	-	0.10	-	<0.0040	0.0014	<0.0010	0.017	0.0016	-	-	-	0.66	0.862 +/- 1.09 (2.05)
	2/19/2020	0.094	100	16	0.861	47	7.27	330	-	<0.0010	-	0.10	-	<0.0040	0.0019	<0.0010	<0.020	0.0019	-	-	-	0.861	0.555 ± 0.737 (1.62)
	5/23/2020	-	-	-	-	-	-	-	<0.0030	<0.0010	<0.0010	0.086	<0.00089	<0.0040	0.0012	<0.0010	0.011	0.0018	<0.0010	<0.0010	<0.00020	0.891	0.182 +/- 0.766 (1.60)
	8/18/2020	0.13	130	11	0.754	87	7.42	520	-	<0.0010	-	0.15	-	-	0.0030	<0.0010	0.014	0.0015	<0.0010	<0.0010	-	0.754	0.300 +/- 0.700 (1.47)

ATTACHMENT 4
SUMMARY OF ANALYTICAL RESULTS - POND 004
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-15	11/1/2016	**0.928**	**181**	**10**	**0.30**	**164**	**6.93**	**642**	<0.0010	**0.0030**	<0.0010	**0.28**	<0.0010	<0.0010	<0.0050	<0.0010	**0.018**	<0.0100	<0.0010	<0.0010	<0.00020	**0.300**	**1.94 +/- 0.91**
	12/8/2016	**1.060**	**174**	**10**	**0.28**	**171**	**6.96**	**646**	<0.0010	**0.0033**	<0.0010	**0.32**	<0.0010	<0.0010	<0.0050	<0.0010	**0.021**	<0.0100	<0.0010	<0.0010	<0.00020	**0.280**	-
	1/6/2017	**1.000**	**150**	**10**	**0.331**	**190**	**7.94**	**640**	<0.0030	**0.0024**	<0.0010	**0.29**	<0.0010	<0.0040	<0.0020	<0.0010	**0.025**	<0.0010	<0.0010	<0.0010	<0.00020	**0.331**	**2.542 +/- 1.023 (0.883)**
	1/30/2017	**0.820**	**130**	**12**	**0.392**	**200**	**7.89**	**640**	<0.0030	**0.0024**	<0.0010	**0.25**	<0.0010	<0.0040	<0.0020	<0.0010	**0.020**	<0.0010	<0.0010	<0.0010	<0.00020	**0.392**	0.686 +/- 0.84 (1.636)
	2/22/2017	**1.000**	**160**	**11**	**0.284**	**150**	**7.03**	**680**	<0.0030	**0.0029**	<0.0010	**0.26**	<0.0010	<0.0040	<0.0020	<0.0010	**0.021**	**0.0027**	<0.0010	<0.0010	<0.00020	**0.284**	**1.757 +/- 0.954 (1.33)**
	3/28/2017	**0.830**	**130**	**13**	**0.498**	**150**	**6.89**	**640**	<0.0030	**0.0028**	<0.0010	**0.25**	<0.0010	<0.0040	<0.0020	<0.0010	**0.020**	<0.0010	<0.0010	<0.0010	<0.00020	**0.498**	**1.2 +/- 0.743 (0.873)**
	4/27/2017	**0.800**	**110**	**20**	**0.280**	**110**	**7.08**	**440**	<0.0030	**0.0023**	<0.0010	**0.20**	<0.0010	<0.0040	<0.0020	<0.0010	**0.018**	<0.0010	<0.0010	<0.0010	<0.00020	**0.280**	0.9941 +/- 0.709 (1.311)
	5/18/2017	**0.500**	**64**	**26**	**0.399**	**64**	**7.02**	**310**	<0.0030	**0.0021**	<0.0010	**0.12**	<0.0010	<0.0040	<0.0020	<0.0010	**0.011**	<0.0010	<0.0010	<0.0010	<0.00020	**0.399**	0.965 +/- 0.813 (1.407)
	6/24/2017	**0.620**	**66**	**26**	**0.353**	**69**	**7.12**	**260**	<0.0030	**0.0020**	<0.0010	**0.13**	<0.0010	<0.0040	<0.0020	<0.0010	**0.012**	<0.0010	<0.0010	<0.0010	<0.00020	**0.353**	0.526 +/- 0.687 (1.3)
	8/15/2017	**0.700**	**98**	**17**	**0.427**	**110**	**6.96**	**460**	<0.0030	**0.0026**	<0.0010	**0.16**	<0.0010	<0.0040	<0.0020	<0.0010	**0.019**	<0.0010	<0.0010	<0.0010	<0.00020	**0.427**	**1.141 +/- 0.834 (0.961)**
	3/15/2018	**0.46**	**68**	**24**	**0.336**	**63**	**7.21**	**240**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	-	-	-	-	<0.0030	**0.0022**	<0.0010	**0.094**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	**0.0012**	<0.0010	<0.0010	<0.00020	**0.458**	0.279 +/- 0.713 (1.54)
	9/11/2018	**0.80**	**130**	**17**	**0.301**	**120**	**7.12**	**460**	--	**0.0024**	--	**0.22**	--	<0.0040	<0.00086	<0.0010	<0.010	<0.0010	<0.0010	--	--	**0.301**	0.701 +/- 0.999 (1.86)
	3/11/2019	**0.36**	**48**	**18**	**0.326**	**48**	**7.35**	**240**	<0.0030	**0.0020**	<0.0010	**0.086**	<0.00089	<0.0040	<0.00086	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	**0.326**	1.20 +/- 0.650 (0.718)
	6/7/2019	-	-	-	-	-	-	-	<0.0030	**0.0018**	<0.0010	**0.085**	<0.00089	<0.0040	<0.00086	<0.0010	**0.010**	**0.0012**	<0.0010	<0.0010	<0.00020	**0.519**	1.33 ± 1.05 (1.63)
	8/29/2019	**0.30**	**56**	**20**	**0.452**	**47**	**7.62**	**260**	-	**0.0022**	-	**0.11**	-	<0.0040	<0.00086	<0.0010	**0.015**	**0.0013**	-	-	-	**0.452**	0.408 +/- 0.937 (1.95)
	2/19/2020	**0.29**	**61**	**18**	**0.380**	**52**	**6.86**	**290**	-	**0.0021**	-	**0.10**	-	<0.0040	<0.00086	<0.0010	<0.020	**0.0011**	-	-	-	**0.380**	0.305 ± 0.821 (1.41)
	5/22/2020	-	-	-	-	-	-	-	<0.0030	**0.0014**	<0.0010	**0.11**	<0.00089	<0.0040	<0.00086	<0.0010	<0.010	**0.0012**	<0.0010	<0.0010	<0.00020	**0.450**	0.206 +/- 0.762 (1.59)
	8/18/2020	**0.41**	**120**	**12**	**0.313**	**99**	**7.23**	**510**	-	**0.0021**	-	**0.21**	-	-	< 0.0020	<0.0010	**0.016**	< 0.0010	<0.0010	<0.0010	-	**0.313**	0.825 +/- 0.827 (1.42)

ABBREVIATIONS AND NOTES:
ND: "Non Detect," the report does not provide reporting limit and instead states "ND."
Bold Value: indicates a detection by the laboratory
mg/L : milligrams per liter
pCi/L : picocuries per liter
su : standard unit
USEPA : United States Environmental Protection Agency
USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

ATTACHMENT 5

UTILITY WASTE LANDFILL GROUNDWATER MONITORING CONSTITUENT CONCENTRATIONS TABLE

ATTACHMENT 5
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - UWL
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B - 123	11/6/2016	0.0261	94.3	< 5	0.52	34	7.16	394	< 0.0010	0.0024	< 0.0010	0.239	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0276	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.52	0.97 +/- 1.04
	12/12/2016	0.0201	91.0	< 5	0.57	37	7.00	448	< 0.0010	0.0011	< 0.0010	0.206	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0274	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.57	0.71 +/- 0.59
	1/8/2017	0.031	89.0	5.6	0.446	48	7.53	340	< 0.0030	0.0014	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	0.0030	< 0.0010	< 0.0010	< 0.00020	0.446	0.641 +/- 0.589 (1.06)
	1/24/2017	0.014	87	2.8	0.523	35	7.88	410	< 0.0030	0.0017	< 0.0010	0.20	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.032	0.0035	< 0.0010	< 0.0010	0.00087	0.523	1.06 +/- 0.898 (1.45)
	2/23/2017	0.031	90	3.0	0.540	36	7.22	400	< 0.0030	0.0023	< 0.0010	0.22	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	0.0036	< 0.0010	< 0.0010	< 0.00020	0.540	1.37 +/- 0.747 (1.206)
	4/25/2017	0.032	83	3.4	0.532	36	7.36	400	< 0.0030	0.0025	< 0.0010	0.24	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0036	< 0.0010	< 0.0010	< 0.00020	0.532	0.827 +/- 0.851 (1.525)
	5/16/2017	0.023	77	3.2	0.302	33	7.22	380	< 0.0030	0.0020	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	0.0036	< 0.0010	< 0.0010	< 0.00020	0.302	1.35 +/- 0.824 (1.3)
	6/21/2017	0.029	78	3.1	0.429	32	7.28	380	< 0.0030	0.0017	< 0.0010	0.19	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0036	< 0.0010	< 0.0010	< 0.00020	0.429	0.668 +/- 0.909 (1.781)
	8/28/2017	0.030	82	3.5	0.574	32	7.24	360	< 0.0030	0.0020	< 0.0010	0.20	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0034	< 0.0010	< 0.0010	< 0.00020	0.574	1.926 +/- 1.09 (1.50)
	3/14/2018	0.023	79	3.3	0.547	32	7.35	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	0.537	-	-	-	< 0.0030	0.0022	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.026	0.0044	< 0.0010	< 0.0010	< 0.00020	0.537	1.80 +/- 0.979 (1.44)
	9/11/2018	0.027	87	3.7	0.521	31	7.36	330	-	0.0040	-	0.27	-	< 0.0040	< 0.00086	< 0.0010	0.019	0.0040	< 0.0010	-	-	0.521	1.57 +/- 1.18 (1.99)
	10/24/2018	0.034	88	3.9	0.390	33	7.71	370	< 0.0030	0.0029	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	0.0041	< 0.0010	< 0.0010	< 0.00020	0.390	0.818 +/- 0.817 (1.47)
	12/4/2018	0.083	82	4.4	0.582	34	7.39	360	< 0.0030	0.0014	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	0.0038	< 0.0010	< 0.0010	< 0.00020	0.582	0.631 +/- 0.756 (1.31)
	12/17/2018	0.036	78	3.2	0.647	36	7.41	380	< 0.0030	0.0016	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	0.0046	< 0.0010	< 0.0010	< 0.00020	0.647	0.494 +/- 0.751 (1.38)
	1/9/2019	0.036	81	3.5	0.582	30	7.34	340	< 0.0030	0.0024	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0037	< 0.0010	< 0.0010	< 0.00020	0.582	1.01 +/- 0.649 (1.00)
	1/14/2019	0.026	83	3.6	0.565	30	7.22	430	< 0.0030	0.0027	< 0.0010	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0040	< 0.0010	< 0.0010	< 0.00020	0.565	0.745 +/- 0.779 (1.47)
	1/21/2019	0.037	80	3.8	0.480	33	7.37	410	< 0.0030	0.0021	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0042	< 0.0010	< 0.0010	< 0.00020	0.480	0.998 +/- 0.631 (1.000)
	2/8/2019	0.028	78	3.1	0.515	31	7.29	450	< 0.0030	0.0026	< 0.0010	0.22	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	0.0044	< 0.0010	< 0.0010	< 0.00020	0.515	0.998 +/- 0.848 (1.26)
	2/22/2019	0.029	66	3.2	0.579	30	7.48	340	< 0.0030	0.0014	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0040	< 0.0010	< 0.0010	< 0.00020	0.579	0.775 +/- 0.873 (1.78)
	3/4/2019	0.040	80	3.2	0.634	30	7.36	350	< 0.0030	0.0021	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0041	< 0.0010	< 0.0010	< 0.00020	0.634	2.29 +/- 1.13 (1.50)
	3/7/2019	0.048	79	< 5.0	0.620	31	7.53	370	< 0.0030	0.0020	< 0.0010	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.025	0.0043	< 0.0010	< 0.0010	< 0.00020	0.620	0.594 +/- 0.743 (1.38)
	6/5/2019	-	-	-	0.625	-	-	-	< 0.0030	0.0079	< 0.0010	0.33	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0042	< 0.0010	< 0.0010	< 0.00020	0.625	2.18 +/- 1.00 (0.950)
	8/28/2019	0.025	78	2.8	0.602	28	7.51	340	-	0.0022	-	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.031	0.0042	< 0.0010	-	-	0.602	1.76 +/- 1.07 (1.83)
	10/4/2019	0.043	83	3.1	0.598	29	7.26	360	-	0.0011	-	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.027	0.0059	< 0.0010	-	-	0.598	0.0475 +/- 0.872 (1.97)
	10/15/2019	0.052	83	3.2	0.580	28	7.29	340	-	0.0012	-	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.028	0.0040	< 0.0010	-	-	0.580	1.56 +/- 1.04 (1.82)
	11/6/2019	0.079	80	3.0	0.654	29	6.95	410	-	0.0018	-	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0047	< 0.0010	-	-	0.654	0.446 +/- 0.879 (1.79)
	11/6/2019	0.039	80	2.9	0.598	29	7.46	390	-	0.0015	-	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	0.0040	< 0.0010	-	-	0.598	0.136 +/- 0.654 (1.46)
	12/17/2019	0.036	78	3.2	0.647	36	7.41	380	< 0.0030	0.0016	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	0.0046	< 0.0010	< 0.0010	< 0.00020	0.647	0.494 +/- 0.751 (1.38)
	12/18/2019	-	-	-	-	-	-	-	< 0.0030	0.0018	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.032	0.0040	< 0.0010	< 0.0010	< 0.00020	-	0.194 +/- 0.601 (1.15)
	2/21/2020	0.029	62	3.1	0.457	28	7.43	270	-	0.0041	-	0.18	< 0.00089	< 0.0040	0.00098	< 0.0010	0.017	< 0.0010	< 0.0010	-	-	0.457	0.892 +/- 0.810 (1.39)
	5/20/2020	-	-	-	0.518	-	-	-	<0.0030	0.0034	<0.0010	0.21	<0.00089	<0.0040	<0.00086	<0.0010	0.024	0.0037	<0.0010	<0.0010	<0.00020	0.518	0.467 +/- 0.834 (1.72)

ATTACHMENT 5
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - UWL
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B-126	11/6/2016	0.0342	140	8	0.39	57	6.90	560	< 0.0010	0.0099	< 0.0010	0.400	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0159	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.39	0.7 +/- 1.45
	12/12/2016	0.0273	178	11	0.39	173	6.68	826	< 0.0010	0.0076	< 0.0010	0.447	< 0.0010	0.0013	< 0.0050	< 0.0010	0.0244	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.39	1.11 +/- 0.62
	1/8/2017	0.034	72	6.4	0.376	43	7.49	240	< 0.0030	0.0063	< 0.0010	0.250	< 0.0010	< 0.0040	0.002	0.0011	0.016	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.376	0.342 +/- 0.71 (1.38)
	1/24/2017	0.018	64	3.4	0.457	26	7.37	290	< 0.0030	0.0050	< 0.0010	0.23	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.013	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.457	-0.189 +/- 0.713 (1.49)
	2/23/2017	0.034	85	7.4	0.525	58	7.00	340	< 0.0030	0.0067	< 0.0010	0.28	< 0.0010	< 0.0040	0.0021	< 0.0010	0.015	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.525	1.156 +/- 0.854 (1.37)
	4/25/2017	0.032	57	4.5	0.388	27	6.95	300	< 0.0030	0.0084	< 0.0010	0.21	< 0.0010	0.0047	0.0026	0.0020	0.013	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.388	1.267 +/- 0.807 (1.22)
	5/16/2017	0.022	35	1.7	0.258	5.6	6.93	170	< 0.0030	0.0085	< 0.0010	0.13	< 0.0010	< 0.0040	< 0.0020	< 0.0010	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.258	1.827 +/- 0.854 (1.053)
	6/21/2017	0.031	41	3.2	0.398	7.6	6.91	210	< 0.0030	0.0094	< 0.0010	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.398	0.51 +/- 0.848 (1.663)
	8/28/2017	0.036	63	4.6	0.493	20	6.94	270	< 0.0030	0.0097	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.493	2.01+/- 1.13 (1.21)
	3/14/2018	0.032	82	3.6	0.369	26	7.00	280	-	-	-	-	-	-	-	-	-	-	-	-	-	0.369	-
	5/30/2018	-	-	-	0.383	-	-	-	< 0.0030	0.0086	< 0.0010	0.24	< 0.0010	0.0094	0.0030	0.0043	0.013	0.0014	0.0012	< 0.0010	< 0.00020	0.383	2.20 +/- 1.71 (3.20)
	9/11/2018	0.034	130	1.0	0.284	90	7.00	440	-	0.0052	-	0.31	-	< 0.0040	0.0019	< 0.0010	0.011	< 0.0010	< 0.0010	-	-	0.284	1.13 +/- 1.22 (2.05)
	10/24/2018	0.065	67	4.4	0.280	28	7.17	280	< 0.0030	0.0052	< 0.0010	0.22	< 0.00089	0.0064	0.0015	0.0011	0.012	0.0038	0.0011	< 0.0010	< 0.00020	0.280	1.07 +/- 0.975 (1.71)
	12/4/2018	0.090	44	2.4	0.446	17	7.09	150	< 0.0030	0.0046	< 0.0010	0.19	< 0.00089	0.010	0.0017	0.0022	0.011	0.0016	< 0.0010	< 0.0010	< 0.00020	0.446	0.739 +/- 0.911 (1.83)
	12/18/2018	0.029	32	1.4	0.678	16	6.99	220	< 0.0030	0.0044	< 0.0010	0.16	< 0.00089	0.0078	0.0017	0.0029	0.014	< 0.0010	0.0018	< 0.0010	< 0.00020	0.678	1.13 +/- 1.20 (2.15)
	1/8/2019	0.051	50	2.5	0.501	13	7.04	410	< 0.0030	0.0059	< 0.0010	0.22	< 0.00089	0.012	0.0030	0.0041	0.011	0.0018	0.0013	< 0.0010	< 0.00020	0.501	2.33 +/- 1.30 (1.97)
	1/14/2019	0.025	24	1.1	0.551	7.1	6.97	230	< 0.0030	0.0041	< 0.0010	0.15	< 0.00089	0.0070	0.0018	0.0041	< 0.010	0.0011	0.0028	< 0.0010	< 0.00020	0.551	1.05 +/- 1.01 (1.81)
	1/22/2019	0.024	25	1.0	0.434	6.4	7.00	140	< 0.0030	0.0034	< 0.0010	0.11	< 0.00089	0.0041	0.0011	0.0020	< 0.010	< 0.0010	0.0012	< 0.0010	< 0.00020	0.434	1.50 +/- 0.792 (1.13)
	2/8/2019	0.019	17	< 1.0	0.400	6.5	6.70	440	< 0.0030	0.0038	< 0.0010	0.18	< 0.00089	0.014	0.0023	0.0078	0.012	< 0.0010	0.0031	< 0.0010	< 0.00020	0.400	1.04 +/- 0.992 (1.16)
	3/4/2019	0.026	16	< 1.0	0.556	6.4	6.85	420	< 0.0030	0.0054	< 0.0010	0.17	< 0.00089	0.015	0.0044	0.0090	0.011	< 0.0010	0.0012	< 0.0010	< 0.00020	0.556	1.16 +/- 0.854 (1.35)
	3/7/2019	0.023	29	1.2	0.543	11	7.22	180	< 0.0030	0.0043	< 0.0010	0.15	< 0.00089	0.0098	0.0030	0.0047	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.543	0.969 +/- 1.09 (2.01)
	6/5/2019	-	-	-	0.516	-	-	-	< 0.0030	0.0092	< 0.0010	0.17	< 0.00089	0.0040	0.0023	0.0018	0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.516	1.55 +/- 1.60 (2.93)
	8/28/2019	0.024	56	2.7	0.507	24	7.10	280	-	0.0051	-	0.24	< 0.00089	< 0.0040	0.0018	0.0022	0.015	< 0.0010	0.0010	-	-	0.507	2.20 +/- 1.05 (1.25)
	10/4/2019	0.037	140	8.8	0.409	130	6.98	580	-	0.0049	-	0.33	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.021	< 0.0010	< 0.0010	-	-	0.409	0.884 +/- 1.10 (2.02)
	10/15/2019	0.041	140	10	0.517	130	6.98	630	-	0.0046	-	0.30	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.022	0.0032	< 0.0010	-	-	0.517	0.563 +/- 1.05 (2.22)
	11/6/2019	0.050	67	4.2	0.508	38	7.07	320	-	0.0043	-	0.19	< 0.00089	< 0.0040	0.0012	< 0.0010	< 0.020	< 0.0010	< 0.0010	-	-	0.508	2.68 +/- 1.23 (1.80)
	12/18/2019	0.029	32	1.4	0.678	16	6.99	220	< 0.0030	0.0044	< 0.0010	0.16	< 0.00089	0.0078	0.0017	0.0029	0.014	< 0.0010	0.0018	< 0.0010	< 0.00020	0.678	1.13 +/- 1.20 (2.15)
	2/21/2020	0.031	62	3.9	0.376	27	7.07	230	-	0.0040	-	0.18	< 0.00089	< 0.0040	0.00086	< 0.0010	0.018	< 0.0010	< 0.0010	-	-	0.376	0.469 +/- 0.556 (1.03)
	5/20/2020	-	-	-	0.339	-	-	-	<0.0030	0.0037	<0.0010	0.20	<0.00089	<0.0040	0.0015	<0.0010	0.011	<0.0010	<0.0010	<0.0010	<0.00020	0.339	1.08 +/- 0.841 (1.43)

ATTACHMENT 5
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - UWL
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-16	11/2/2016	0.0425	157	11	1.22	118	6.82	516	< 0.0010	0.0026	< 0.0010	0.773	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0263	< 0.010	< 0.0010	< 0.0010	< 0.00020	1.22	1.85 +/- 0.91
	12/9/2016	0.0431	154	15	1.37	107	6.89	630	< 0.0010	0.0029	< 0.0010	0.783	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0274	< 0.010	< 0.0010	< 0.0010	< 0.00020	1.37	0.98 +/- 0.64
	1/7/2017	0.039	130	13	1.10	120	7.58	580	< 0.0030	0.0027	< 0.0010	0.800	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.10	2.34 +/- 1.05 (1.165)
	1/30/2017	0.037	130	11	1.55	120	7.40	570	< 0.0030	0.0026	< 0.0010	0.73	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.55	1.777 +/- 1.093 (1.668)
	2/21/2017	0.051	150	12	1.18	95	6.91	560	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.18	1.094 +/- 0.728 (1.32)
	3/28/2017	0.047	130	11	1.44	100	6.88	580	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.44	2.332 +/- 0.978 (1.216)
	4/27/2017	0.060	150	12	1.38	93	6.97	560	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.38	1.843 +/- 0.862 (1.087)
	5/18/2017	0.046	150	13	1.59	97	6.88	600	< 0.0030	0.0027	< 0.0010	0.75	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.59	1.934 +/- 0.991 (1.312)
	6/24/2017	0.036	130	11	1.18	110	7.02	490	< 0.0030	0.0020	< 0.0010	0.72	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.18	1.787 +/- 1.083 (1.687)
	8/15/2017	0.052	140	10	1.27	98	6.89	500	< 0.0030	0.0021	< 0.0010	0.70	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.27	1.396 +/- 1.106 (1.858)
	3/15/2018	0.054	140	12	1.45	84	7.03	580	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	-
	3/15/2018	0.049	140	12	1.45	84	7.03	570	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	-
	5/30/2018	-	-	-	1.20	-	-	-	< 0.0030	0.0020	< 0.0010	0.72	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.025	0.0045	< 0.0010	< 0.0010	< 0.00020	1.20	2.60 +/- 1.10 (1.46)
	9/12/2018	0.051	150	16	1.20	73	6.99	400	-	0.0023	-	0.69	-	< 0.0040	< 0.00086	< 0.0010	0.019	< 0.0010	< 0.0010	-	-	1.20	2.78 +/- 1.35 (1.70)
	10/25/2018	0.034	140	14	1.22	67	7.10	510	< 0.0030	0.0021	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.22	2.30 +/- 1.02 (1.30)
	12/4/2018	0.052	130	11	1.72	74	7.04	500	< 0.0030	0.0024	< 0.0010	0.61	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.72	1.27 +/- 0.878 (1.41)
	12/17/2018	0.067	130	11	1.65	120	7.25	560	< 0.0030	0.0022	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.65	0.752 +/- 0.772 (1.25)
	1/7/2019	0.050	140	12	1.66	87	7.00	540	< 0.0030	0.0028	< 0.0010	0.67	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.66	1.46 +/- 0.694 (0.742)
	1/15/2019	0.071	140	12	1.71	95	6.97	580	< 0.0030	0.0022	< 0.0010	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.022	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.71	2.64 +/- 1.10 (0.855)
	1/21/2019	0.080	140	13	1.41	100	7.04	680	< 0.0030	0.0021	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.41	2.37 +/- 1.01 (1.24)
	2/9/2019	0.082	130	15	< 2.50	99	6.98	690	< 0.0030	0.0018	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	< 2.50	1.91 +/- 1.20 (1.80)
	2/22/2019	0.055	120	13	1.67	90	7.12	520	< 0.0030	0.0024	< 0.0010	0.66	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.67	1.77+/- 1.06 (1.68)
	2/22/2019	0.052	120	14	1.68	92	7.01	520	< 0.0030	0.0023	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.68	1.45 +/- 1.20 (1.93)
	3/5/2019	0.070	130	14	1.78	88	7.09	600	< 0.0030	0.0022	< 0.0010	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.78	1.47 +/- 0.937 (1.39)
	3/7/2019	0.078	130	14	1.71	85	7.08	570	< 0.0030	0.0023	< 0.0010	0.61	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.71	0.225 +/- 0.901 (1.92)
	6/5/2019	-	-	-	1.52	-	-	-	< 0.0030	0.0024	< 0.0010	0.56	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.52	2.09 +/- 1.02 (1.39)
	8/28/2019	0.046	120	16	1.69	73	7.19	520	-	0.0024	-	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	-	-	1.69	3.08 +/- 1.25 (1.67)
	10/3/2019	0.21	130	16	1.66	70	6.94	490	-	0.0022	-	0.65	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.025	< 0.0010	< 0.0010	-	-	1.66	0.0972 +/- 0.959 (2.11)
	10/16/2019	0.065	130	13	1.43	68	7.12	470	-	0.0020	-	0.58	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.026	< 0.0010	< 0.0010	-	-	1.43	1.39 +/- 1.23 (2.08)
	11/9/2019	0.056	120	14	1.47	75	7.22	520	-	0.0024	-	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	< 0.0010	< 0.0010	-	-	1.47	0.809 +/- 0.659 (0.955)
	12/17/2019	0.067	130	83	1.65	120	7.25	560	< 0.0030	0.0022	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.65	0.752 +/- 0.772 (1.25)
	12/19/2019	-	-	-	-	-	-	-	< 0.0030	0.0022	< 0.0010	0.59	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	-	0.991 +/- 0.876 (1.50)
	2/21/2020	0.064	120	13	1.68	56	7.08	510	-	0.0024	-	0.56	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.030	< 0.0010	< 0.0010	-	-	1.68	1.26 +/- 0.793 (1.19)
	5/19/2020	-	-	-	1.52	-	-	-	<0.0030	0.0021	<0.0010	0.53	<0.00089	<0.0040	<0.00086	<0.0010	0.022	<0.0010	<0.0010	<0.0010	<0.00020	1.52	1.31 +/- 0.928 (1.61)

ATTACHMENT 5
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - UWL
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-1	11/6/2016	0.0261	72.7	7	0.19	37	6.71	340	<0.0010	<0.0010	<0.0010	0.222	<0.0010	<0.0010	<0.0050	<0.0010	0.011	<0.0100	0.0015	<0.0010	<0.00020	0.190	0.51 +/- 1.07
	12/11/2016	<0.0200	67.0	7	0.19	36	6.67	292	<0.0010	<0.0010	<0.0010	0.224	<0.0010	<0.0010	<0.0050	<0.0010	0.012	<0.0100	0.002	<0.0010	<0.00020	0.190	1.04 +/- 0.79
	12/11/2016	<0.0200	70.3	7	0.19	37	5.97	418	<0.0010	<0.0010	<0.0010	0.226	<0.0010	<0.0010	<0.0050	<0.0010	0.011	<0.0100	0.002	<0.0010	<0.00020	0.190	1.79 +/- 0.82
	1/9/2017	0.015	67	9.6	<0.250	48	7.39	270	<0.0030	<0.0010	<0.0010	0.220	<0.0010	<0.0040	<0.0020	<0.0010	0.014	<0.0010	0.002	<0.0010	<0.00020	<0.250	0.442 +/- 0.817 (1.606)
	1/26/2017	0.019	65	7.7	0.310	43	7.35	320	<0.0030	<0.0010	<0.0010	0.22	<0.0010	<0.0040	<0.0020	<0.0010	0.013	<0.0010	0.002	<0.0010	<0.00020	0.310	1.51 +/- 1.084 (1.77)
	2/24/2017	0.034	68	14	0.298	44	6.86	290	<0.0030	<0.0010	<0.0010	0.22	<0.0010	<0.0040	<0.0020	<0.0010	0.012	<0.0010	0.002	<0.0010	<0.00020	0.298	0.38 +/- 0.637 (0.881)
	3/29/2017	0.025	64	8.4	0.283	37	6.81	320	<0.0030	<0.0010	<0.0010	0.21	<0.0010	<0.0040	<0.0020	<0.0010	0.012	<0.0010	0.001	<0.0010	<0.00020	0.283	0.331 +/- 0.653 (1.35)
	4/25/2017	0.029	53	7.1	0.279	35	7.06	220	<0.0030	<0.0010	<0.0010	0.18	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.279	0.962 +/- 0.802 (1.38)
	5/16/2017	0.015	40	7.6	0.297	27	6.94	240	<0.0030	<0.0010	<0.0010	0.13	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.297	1.035 +/- 0.822 (1.18)
	6/22/2017	0.11	58	8.2	0.260	28	6.98	240	<0.0030	0.0056	<0.0010	0.19	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0016	<0.0010	<0.0010	<0.00020	0.260	1.28 +/- 0.696 (0.739)
	6/22/2017	0.063	40	8	0.260	29	6.98	250	<0.0030	0.0013	<0.0010	0.14	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.260	0.968 +/- 0.709 (0.909)
	8/29/2017	0.025	61	8.1	0.363	38	7.05	220	<0.0030	<0.0010	<0.0010	0.19	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.363	1.84 +/- 1.03 (1.37)
	3/14/2018	0.016	51	8.5	0.296	31	7.16	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	0.029	77	9.2	<0.250	19	7.12	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	0.025	35	5.9	0.287	12	6.84	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	0.019	57	8.1	<0.250	31	7.02	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/20/2020	0.023	42	7.4	<0.250	22	6.95	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/5/2020	0.022	55	8.0	<0.250	37	6.89	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-2	11/5/2016	0.024	42	11	0.21	19	6.60	220	<0.0010	0.0022	<0.0010	0.224	<0.0010	0.001	<0.0050	<0.0010	0.008	<0.0100	<0.0010	<0.0010	<0.00020	0.210	0.44 +/- 1.22
	12/10/2016	<0.0200	47	13	0.21	22	6.70	196	<0.0100	0.0016	<0.0010	0.220	<0.0010	<0.0010	<0.0050	<0.0010	0.008	<0.0100	<0.0010	<0.0010	<0.00020	0.210	1.19 +/- 0.81
	1/9/2017	0.024	44	14	<0.250	26	7.23	180	<0.0030	0.0010	<0.0010	0.220	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	1.353 +/- 0.754 (1.211)
	1/25/2017	0.026	43	11	0.297	20	7.40	260	<0.0030	0.0011	<0.0010	0.21	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.297	0.632 +/- 0.76 (1.46)
	1/25/2017	0.022	45	11	<0.250	19	7.29	220	<0.0030	0.0011	<0.0010	0.22	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	0.868 +/- 1.063 (1.96)
	2/24/2017	0.034	46	11	0.304	19	6.76	240	<0.0030	0.0011	<0.0010	0.22	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.304	0.447 +/- 0.648 (1.26)
	3/29/2017	0.027	45	12	0.474	19	6.73	260	<0.0030	0.0013	<0.0010	0.22	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.474	0.9712 +/- 0.942 (1.11)
	4/26/2017	0.033	42	11	0.28	23	6.81	210	<0.0030	0.0014	<0.0010	0.21	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.278	0.788 +/- 0.91 (1.73)
	4/26/2017	0.031	39	12	0.250	22	6.86	220	<0.0030	0.0015	<0.0010	0.19	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.250	0.668 +/- 0.90 (1.735)
	5/17/2017	0.027	37	11	0.265	19	6.64	210	<0.0030	0.0013	<0.0010	0.20	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.265	1.108 +/- 0.689 (1.06)
	6/22/2017	0.028	38	11	0.276	18	6.71	240	<0.0030	0.0015	<0.0010	0.19	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.276	1.32 +/- 0.952 (1.61)
	8/30/2017	0.032	39	11	0.38	17	6.70	200	<0.0030	0.0013	<0.0010	0.19	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.376	0.430 +/- 0.910 (2.00)
	3/14/2018	0.024	44	12	0.311	18	6.72	190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	0.028	41	11	<0.250	9	6.90	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	0.033	33	9.6	0.31	17	6.71	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	0.023	38	6.7	0.39	21	7.08	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/20/2020	0.028	40	6.7	0.3	22	6.8	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/20/2020	0.029	40	6.6	0.26	22	6.77	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/4/2020	0.032	48	6	<0.250	38	6.79	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-3	11/6/2016	0.032	76	7	0.27	29	6.74	320	<0.0010	0.0037	<0.0010	0.346	<0.0010	0.0014	<0.0050	0.0016	0.0079	<0.0100	<0.0010	<0.0010	<0.00020	0.270	1.29 +/- 1.03
	11/6/2016	0.031	77	7	0.27	29	6.79	330	<0.0010	0.0040	<0.0010	0.343	<0.0010	<0.0010	<0.0050	<0.0010	0.0075	<0.0100	<0.0010	<0.0010	<0.00020	0.270	1.44 +/- 1.12
	12/10/2016	<0.0200	75	5	0.280	48	6.57	376	<0.0010	0.0056	<0.0010	0.336	<0.0010	<0.0010	<0.0050	<0.0010	0.0068	<0.0100	<0.0010	<0.0010	<0.00020	0.280	1.66 +/- 0.84
	1/9/2017	0.021	72	8	0.276	65	7.32	300	<0.0030	0.0055	<0.0010	0.300	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0020	<0.0010	<0.0010	<0.00020	0.276	1.288 +/- 0.721 (1.095)
	1/26/2017	0.017	74	6	0.425	65	7.34	550	<0.0030	0.0067	<0.0010	0.31	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0017	<0.0010	<0.0010	<0.00020	0.425	0.818 +/- 0.826 (1.52)
	2/23/2017	0.032	74	12	0.508	72	6.77	340	<0.0030	0.0071	<0.0010	0.30	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0018	<0.0010	<0.0010	<0.00020	0.508	0.677 +/- 0.948 (1.895)
	3/29/2017	0.020	72	5	0.351	56	6.70	350	<0.0030	0.0069	<0.0010	0.29	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0015	<0.0010	<0.0010	<0.00020	0.351	0.993 +/- 0.736 (1.11)
	4/25/2017	0.024	66	6	0.331	57	6.82	320	<0.0030	0.0065	<0.0010	0.27	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0014	<0.0010	<0.0010	<0.00020	0.331	1.04 +/- 0.749 (1.23)
	5/17/2017	0.022	70	5	0.352	52	6.71	300	<0.0030	0.0065	<0.0010	0.31	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0016	<0.0010	<0.0010	<0.00020	0.352	1.94 +/- 0.878 (1.14)
	6/25/2017	0.031	66	6	0.293	43	6.78	340	<0.0030	0.0046	<0.0010	0.29	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0012	<0.0010	<0.0010	<0.00020	0.293	1.84 +/- 0.83 (0.746)
	8/30/2017	0.030	69	7	0.432	33	6.84	270	<0.0030	0.0037	<0.0010	0.34	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0010	<0.0010	<0.0010	<0.00020	0.432	1.83 +/- 1.25 (2.02)
	3/14/2018	0.019	73	6	0.342	34	6.81	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	0.025	77	7.8	0.34	30	6.96	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	0.031	62	7	0.376	32	6.85	310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	0.021	63	5	0.446	27	6.96	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/21/2020	0.026	65	5.5	0.306	26	6.90	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/5/2020	0.027	66	5	0.287	24	6.93	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ATTACHMENT 5
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - UWL
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-4	11/6/2016	<0.0200	67	6	0.100	38	7.47	274	<0.0010	0.0023	<0.0010	0.256	<0.0010	0.0012	<0.0050	<0.0010	0.0069	<0.0100	<0.0010	<0.0010	<0.00020	0.100	1.07 +/- 1.09
	12/11/2016	<0.0200	64	6	0.120	39	7.40	258	<0.0010	0.0018	<0.0010	0.256	<0.0010	<0.0010	<0.0050	<0.0010	0.0075	<0.0100	<0.0010	<0.0010	<0.00020	0.120	2.09 +/- 0.77
	1/9/2017	<0.010	63	8	<0.250	51	7.92	230	<0.0030	0.0012	<0.0010	0.24	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.002	<0.0010	<0.0010	<0.00020	<0.250	0.134 +/- 0.629 (1.297)
	1/25/2017	0.014	68	7	<0.250	48	7.99	260	<0.0030	0.0018	<0.0010	0.27	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0017	<0.0010	<0.0010	<0.00020	<0.250	0.218 +/- 0.569 (1.15)
	2/23/2017	0.031	60	7	<0.250	50	7.56	240	<0.0030	0.0019	<0.0010	0.23	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0020	<0.0010	<0.0010	<0.00020	<0.250	0.391 +/- 0.58 (1.08)
	3/29/2017	0.017	71	6	<0.250	41	7.42	320	<0.0030	0.0018	<0.0010	0.25	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0017	<0.0010	<0.0010	<0.00020	<0.250	1.15 +/- 0.71 (1.05)
	4/25/2017	0.018	62	7	<0.250	42	7.60	260	<0.0030	0.0017	<0.0010	0.25	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0013	<0.0010	<0.0010	<0.00020	<0.250	1.62 +/- 0.883 (1.296)
	5/17/2017	0.016	76	7	<0.250	37	7.41	300	<0.0030	0.002	<0.0010	0.31	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0013	<0.0010	<0.0010	<0.00020	<0.250	1.206 +/- 0.713 (0.909)
	6/25/2017	0.021	72	7	<0.250	35	7.45	360	<0.0030	0.0015	<0.0010	0.29	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0012	<0.0010	<0.0010	<0.00020	<0.250	1.306 +/- 0.752 (0.824)
	8/29/2017	0.013	66	6	0.306	39	7.62	230	<0.0030	0.0013	<0.0010	0.24	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0016	<0.0010	<0.0010	<0.00020	0.306	1.78 +/- 1.42 (2.58)
	3/14/2018	0.013	22	1	<0.250	2	6.94	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/13/2018	0.095	16	<1.0	<0.250	1	6.70	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/26/2019	0.017	23	<1.0	0.372	3	6.88	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	0.014	40	2.2	0.458	<1.0	7.28	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/21/2020	0.02	59	5.2	0.407	<1.0	6.88	190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/5/2020	0.02	57	5	0.382	4	7.03	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW-5	11/5/2016	<0.0200	69	12	0.22	25	7.01	286	<0.0010	0.0061	<0.0010	0.210	<0.0010	<0.0010	<0.0050	<0.0010	0.0086	<0.0100	<0.0010	<0.0010	<0.00020	0.220	2.06 +/- 1.39
	12/11/2016	<0.0200	67	12	0.23	25	6.54	314	<0.0010	0.003	<0.0010	0.205	<0.0010	<0.0010	<0.0050	<0.0010	0.0080	<0.0100	<0.0010	<0.0010	<0.00020	0.230	0.62 +/- 0.51
	1/9/2017	<0.010	66	14	<0.250	36	7.45	240	<0.0030	0.0023	<0.0010	0.190	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0100	<0.0010	<0.0010	<0.00020	<0.250	0.549 +/- 0.712 (1.336)
	1/25/2017	0.017	63	12	0.302	43	7.48	300	<0.0030	0.0025	<0.0010	0.17	<0.0010	<0.0040	<0.0020	<0.0010	0.010	0.0013	<0.0010	<0.0010	<0.00020	0.302	0.463 +/- 0.814 (1.59)
	2/23/2017	0.027	59	10	0.326	42	7.22	300	<0.0030	0.0020	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0013	<0.0010	<0.0010	<0.00020	0.326	1.205 +/- 0.923 (1.47)
	3/29/2017	0.022	58	8	0.289	41	7.18	300	<0.0030	0.0020	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0012	<0.0010	<0.0010	<0.00020	0.289	0.813 +/- 0.72 (1.23)
	3/29/2017	0.022	55	8	0.282	41	7.18	300	<0.0030	0.002	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0011	<0.0010	<0.0010	<0.00020	0.282	0.994 +/- 0.652 (0.818)
	4/25/2017	0.026	51	8	0.277	39	7.35	280	<0.0030	0.002	<0.0010	0.15	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0010	<0.0010	<0.0010	<0.00020	0.277	0.297 +/- 0.695 (1.38)
	5/16/2017	0.018	51	7	0.261	30	7.21	280	<0.0030	0.003	<0.0010	0.17	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0010	<0.0010	<0.0010	<0.00020	0.261	1.06 +/- 0.79 (1.36)
	6/22/2017	15.000	160	12	<0.250	24	7.09	300	<0.0030	0.006	<0.0010	0.099	<0.0010	<0.0040	<0.0020	<0.0010	0.022	0.910	<0.0010	<0.0010	<0.00020	<0.250	1.44 +/- 1.1 (1.9)
	8/29/2017	0.017	69	13	0.396	26	7.12	260	<0.0030	0.003	<0.0010	0.19	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	0.0014	<0.0010	<0.0010	<0.00020	0.396	1.51 +/- 1.34 (2.32)
	3/14/2018	0.014	61	8	0.279	29	7.35	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	0.018	70	12	0.291	24	7.32	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	0.028	57	11	0.326	24	7.07	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	0.02	63	10	0.397	23	7.01	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/21/2020	0.022	67.	12.	0.255	23	7.07	280.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/5/2020	0.02	65	11	0.258	21	7.25	250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B-2	11/6/2016	0.041	82	8.0	0.24	53	6.80	350	<0.0010	<0.0010	<0.0010	0.126	<0.0010	<0.0010	<0.0050	<0.0010	0.014	<0.0100	<0.0010	<0.0010	<0.00020	0.240	0.18 +/- 1.11
	12/12/2016	0.028	77	8.0	0.26	53	6.87	354	<0.0010	<0.0010	<0.0010	0.129	<0.0010	<0.0010	<0.0050	<0.0010	0.014	<0.0100	<0.0010	<0.0010	<0.00020	0.260	0.84 +/- 0.73
	1/8/2017	0.052	77	8.3	0.260	65	7.66	260	<0.0030	<0.0010	<0.0010	0.10	<0.0010	<0.0040	<0.0020	<0.0010	0.016	0.0012	0.0018	<0.0010	<0.00020	0.260	0.343 +/- 0.59 (0.976)
	1/25/2017	0.060	85	12	0.402	71	7.46	360	<0.0030	<0.0010	<0.0010	0.10	<0.0010	<0.0040	<0.0020	<0.0010	0.015	0.0011	0.0055	<0.0010	<0.00020	0.402	0.255 +/- 0.63 (1.31)
	2/24/2017	0.052	84	7.9	0.351	54	6.87	380	<0.0030	<0.0010	<0.0010	0.11	<0.0010	<0.0040	<0.0020	<0.0010	0.015	<0.0010	<0.0010	<0.0010	<0.00020	0.351	0.802 +/- 0.881 (1.81)
	3/29/2017	0.087	95	4.0	0.326	84	6.88	430	<0.0030	<0.0010	<0.0010	0.12	<0.0010	<0.0040	<0.0020	<0.0010	0.016	0.0011	0.0073	<0.0010	<0.00020	0.326	0.450 +/- 0.654 (0.715)
	4/25/2017	0.038	75	8.7	0.299	53	7.08	320	<0.0030	<0.0010	<0.0010	0.093	<0.0010	<0.0040	<0.0020	<0.0010	0.014	<0.0010	0.0015	<0.0010	<0.00020	0.299	0.554 +/- 0.673 (1.34)
	5/16/2017	0.071	92	6.0	0.332	67	7.05	420	<0.0030	<0.0010	<0.0010	0.094	<0.0010	<0.0040	<0.0020	<0.0010	0.015	<0.0010	0.0045	<0.0010	<0.00020	0.332	0.43 +/- 0.584 (1.18)
	6/24/2017	0.047	21	8.0	0.278	52	7.07	340	<0.0030	0.0074	<0.0010	0.16	<0.0010	<0.0040	<0.0020	<0.0010	0.014	0.0010	<0.0010	<0.0010	<0.00020	0.278	1.51 +/- 1.01 (1.64)
	8/28/2017	0.037	76	7.1	0.424	76	6.88	360	<0.0030	<0.0010	<0.0010	0.14	<0.0010	<0.0040	<0.0020	<0.0010	0.015	0.0012	<0.0010	<0.0010	<0.00020	0.424	0.567 +/- 1.15 (2.16)
	3/14/2018	0.076	86	4.5	0.359	65	7.19	360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/25/2018	0.039	--	--	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	0.140	110	5.9	0.298	71	7.07	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	0.057	78	<5.0	0.328	100	6.78	340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	0.049	77	5.6	0.33	100	6.82	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	0.057	120	3.9	0.404	100	7.22	460	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/20/2020	0.092	110	4.2	0.308	110	7.05	380	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/4/2020	0.062	94	3.9	0.29	110	6.99	390	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ATTACHMENT 5
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - UWL
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B-5R	6/22/2017	**0.049**	**40**	**11**	<0.250	**24**	**6.39**	**180**	<0.0030	**0.0013**	<0.0010	**0.14**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	**1.12 +/- 0.709 (0.852)**
	7/28/2017	**0.016**	**23**	**9.6**	<0.250	**20**	**6.40**	**160**	<0.0030	**0.0073**	<0.0010	**0.15**	<0.0010	<0.0040	<0.0020	<0.0010	0.011	**0.0014**	<0.0010	<0.0010	<0.00020	<0.250	1.062 +/- 0.725 (1.15)
	8/1/2017	**0.016**	**22**	**9.6**	<0.250	**20**	**6.48**	**120**	<0.0030	**0.0071**	<0.0010	**0.15**	<0.0010	<0.0040	<0.0020	<0.0010	0.012	**0.0011**	<0.0010	<0.0010	<0.00020	<0.250	1.416 +/- 0.83 (1.31)
	8/9/2017	**0.016**	**21**	**8.5**	<0.250	**20**	**6.37**	**160**	<0.0030	**0.0079**	<0.0010	**0.14**	<0.0010	<0.0040	<0.0020	<0.0010	0.013	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	**1.217 +/- 0.744 (0.946)**
	8/16/2017	**0.029**	**22**	**8.7**	**0.32**	**19**	**6.34**	**140**	<0.0030	**0.0079**	<0.0010	**0.14**	<0.0010	<0.0040	<0.0020	<0.0010	0.013	**0.0012**	<0.0010	<0.0010	<0.00020	**0.323**	1.15 +/- 0.902 (1.48)
	8/25/2017	**0.025**	**20**	**9.8**	<0.250	**22**	**6.43**	**170**	<0.0030	**0.0085**	<0.0010	**0.15**	<0.0010	<0.0040	<0.0020	0.001	0.013	**0.0027**	<0.0010	<0.0010	<0.00020	<0.250	1.30 +/- 0.773 (1.27)
	8/30/2017	**0.017**	**23**	**9.7**	**0.31**	**23**	**6.37**	**160**	<0.0030	**0.0082**	<0.0010	**0.15**	<0.0010	<0.0040	<0.0020	<0.0010	0.012	**0.0011**	<0.0010	<0.0010	<0.00020	**0.308**	0.814 +/- 0.782 (1.02)
	9/8/2017	**0.017**	**25**	**8.5**	**0.33**	**21**	**6.38**	**130**	<0.0030	**0.0086**	<0.0010	**0.15**	<0.0010	<0.0040	<0.0020	<0.0010	0.014	<0.0010	<0.0010	<0.0010	<0.00020	**0.327**	0.794 +/- 0.829 (1.54)
	9/11/2017	**0.023**	**21**	**8.5**	**0.32**	**22**	**6.50**	**140**	<0.0030	**0.0084**	<0.0010	**0.16**	<0.0010	<0.0040	<0.0020	<0.0010	0.014	**0.0010**	<0.0010	<0.0010	<0.00020	**0.318**	**1.78 +/- 1.03 (1.38)**
	3/14/2018	**0.013**	**25**	**9.6**	**0.28**	**20**	**6.48**	**140**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/14/2018	**0.014**	**26**	**9.5**	<0.250	**20**	**6.55**	**150**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	**0.024**	**26**	**9.4**	**0.25**	**20**	**6.46**	**140**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	**0.027**	**21**	**7.8**	**0.29**	**18**	**6.56**	**150**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	**0.015**	**21**	**7.4**	<0.250	**15**	**7.36**	**180**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/20/2020	**0.023**	**23**	**7.3**	<0.250	**17**	**6.51**	**130**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/4/2020	**0.018**	**22**	**6.3**	<0.250	**14**	**6.64**	**130**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/4/2020	**0.019**	**22**	**6.3**	<0.250	**15**	**6.54**	**140**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B-41	11/6/2016	<0.0200	**15.9**	<5	<0.10	**13**	**6.26**	**122**	<0.0010	**0.0015**	<0.0010	**0.0834**	<0.0010	**0.0015**	<0.0050	<0.0010	<0.0050	<0.0100	<0.0010	<0.0010	<0.00020	<0.10	0.12 +/- 1.18
	12/12/2016	<0.0200	**15.3**	<5	<0.10	**14**	**6.04**	**152**	<0.0010	**0.0019**	<0.0010	**0.0845**	<0.0010	**0.0013**	<0.0050	<0.0010	<0.0050	<0.0100	<0.0010	<0.0010	<0.00020	<0.10	0.68 +/- 0.75
	1/8/2017	<0.010	**14**	**3.3**	<0.250	**13**	**6.84**	**140**	<0.0030	<0.0010	<0.0010	**0.0780**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	**0.0011**	<0.0010	<0.00020	<0.250	0.235 +/- 0.512 (1.01)
	1/25/2017	<0.010	**14**	**3.3**	<0.250	**16**	**6.99**	**140**	<0.0030	<0.0010	<0.0010	**0.073**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	0.539 +/- 0.696 (0.833)
	2/23/2017	**0.014**	**16**	**3.3**	<0.250	**18**	**6.49**	**120**	<0.0030	<0.0010	<0.0010	**0.074**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	0.19 +/- 0.69 (1.50)
	3/29/2017	**0.011**	**16**	**2.9**	<0.250	**17**	**6.41**	**160**	<0.0030	<0.0010	<0.0010	**0.083**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	**0.0010**	<0.0010	<0.00020	<0.250	0.170 +/- 0.658 (1.26)
	4/26/2017	**0.014**	**14**	**2.6**	<0.250	**14**	**6.56**	**130**	<0.0030	<0.0010	<0.0010	**0.069**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	**0.0015**	<0.0010	<0.00020	<0.250	0.512 +/- 0.745 (1.40)
	5/17/2017	<0.010	**17**	**2.7**	<0.250	**16**	**6.44**	**120**	<0.0030	<0.0010	<0.0010	**0.081**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	0.73 +/- 0.573 (0.993)
	6/24/2017	**0.018**	**37**	**4.2**	**0.27**	**21**	**7.17**	**230**	<0.0030	<0.0010	<0.0010	**0.110**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	**0.273**	0.772 +/- 0.628 (0.804)
	8/30/2017	<0.010	**34**	**4.1**	**0.33**	**21**	**7.20**	**190**	<0.0030	**0.0011**	<0.0010	**0.110**	<0.0010	<0.0040	<0.0020	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	**0.331**	0.753 +/- 0.967 (1.72)
	3/14/2018	<0.010	**15**	**3.1**	<0.250	**12**	**6.49**	**130**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/12/2018	**0.011**	**29**	**4.8**	<0.250	**12**	**7.20**	**160**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3/12/2019	**0.024**	**37**	**7.4**	<0.250	**25**	**7.34**	**180**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/28/2019	**0.013**	**46**	**7.9**	<0.250	**25**	**7.00**	**220**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/20/2020	**0.002**	**49**	**4.0**	<0.250	**21**	**7.28**	**180**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/4/2020	**0.016**	**32**	**3.5**	<0.250	**11**	**6.90**	**170**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ABBREVIATIONS AND NOTES:

ND: "Non Detect," the report does not provide reporting limit and instead states "ND."

Bold Value: indicates a detection by the laboratory

mg/L : milligrams per liter

pCi/L : picocuries per liter

su : standard unit

USEPA : United States Environmental Protection Agency

USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

ATTACHMENT 6

LINED POND GROUNDWATER MONITORING CONSTITUENT CONCENTRATIONS TABLE

ATTACHMENT 6
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - LINED POND
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B - 123	11/6/2016	0.0261	94.3	< 5	0.52	34	7.16	394	< 0.0010	0.0024	< 0.0010	0.239	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0276	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.52	0.97 +/- 1.04
	12/12/2016	0.0201	91.0	< 5	0.57	37	7.00	448	< 0.0010	0.0011	< 0.0010	0.206	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0274	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.57	0.71 +/- 0.59
	1/8/2017	0.031	89.0	5.6	0.446	48	7.53	340	< 0.0030	0.0014	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	0.0030	< 0.0010	< 0.0010	< 0.00020	0.446	0.641 +/- 0.589 (1.06)
	1/24/2017	0.014	87	2.8	0.523	35	7.88	410	< 0.0030	0.0017	< 0.0010	0.20	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.032	0.0035	< 0.0010	< 0.0010	0.00087	0.523	1.06 +/- 0.898 (1.45)
	2/23/2017	0.031	90	3.0	0.540	36	7.22	400	< 0.0030	0.0023	< 0.0010	0.22	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	0.0036	< 0.0010	< 0.0010	< 0.00020	0.540	1.37 +/- 0.747 (1.206)
	4/25/2017	0.032	83	3.4	0.532	36	7.36	400	< 0.0030	0.0025	< 0.0010	0.24	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0036	< 0.0010	< 0.0010	< 0.00020	0.532	0.827 +/- 0.851 (1.525)
	5/16/2017	0.023	77	3.2	0.302	33	7.22	380	< 0.0030	0.0020	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	0.0036	< 0.0010	< 0.0010	< 0.00020	0.302	1.35 +/- 0.824 (1.3)
	6/21/2017	0.029	78	3.1	0.429	32	7.28	380	< 0.0030	0.0017	< 0.0010	0.19	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0036	< 0.0010	< 0.0010	< 0.00020	0.429	0.668 +/- 0.909 (1.781)
	8/28/2017	0.030	82	3.5	0.574	32	7.24	360	< 0.0030	0.0020	< 0.0010	0.20	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.029	0.0034	< 0.0010	< 0.0010	< 0.00020	0.574	1.926 +/- 1.09 (1.50)
	3/14/2018	0.023	79	3.3	0.547	32	7.35	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5/30/2018	-	-	-	0.537	-	-	-	< 0.0030	0.0022	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.026	0.0044	< 0.0010	< 0.0010	< 0.00020	0.537	1.80 +/- 0.979 (1.44)
	9/11/2018	0.027	87	3.7	0.521	31	7.36	330	-	0.0040	-	0.27	-	< 0.0040	< 0.00086	< 0.0010	0.019	0.0040	< 0.0010	-	-	0.521	1.57 +/- 1.18 (1.99)
	10/24/2018	0.034	88	3.9	0.390	33	7.71	370	< 0.0030	0.0029	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	0.0041	< 0.0010	< 0.0010	< 0.00020	0.390	0.818 +/- 0.817 (1.47)
	12/4/2018	0.083	82	4.4	0.582	34	7.39	360	< 0.0030	0.0014	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	0.0038	< 0.0010	< 0.0010	< 0.00020	0.582	0.631 +/- 0.756 (1.31)
	12/17/2018	0.036	78	3.2	0.647	36	7.41	380	< 0.0030	0.0016	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	0.0046	< 0.0010	< 0.0010	< 0.00020	0.647	0.494 +/- 0.751 (1.38)
	1/9/2019	0.036	81	3.5	0.582	30	7.34	340	< 0.0030	0.0024	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0037	< 0.0010	< 0.0010	< 0.00020	0.582	1.01 +/- 0.649 (1.00)
	1/14/2019	0.026	83	3.6	0.565	30	7.22	430	< 0.0030	0.0027	< 0.0010	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0040	< 0.0010	< 0.0010	< 0.00020	0.565	0.745 +/- 0.779 (1.47)
	1/21/2019	0.037	80	3.8	0.480	33	7.37	410	< 0.0030	0.0021	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0042	< 0.0010	< 0.0010	< 0.00020	0.480	0.998 +/- 0.631 (1.000)
	2/8/2019	0.028	78	3.1	0.515	31	7.29	450	< 0.0030	0.0026	< 0.0010	0.22	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	0.0044	< 0.0010	< 0.0010	< 0.00020	0.515	0.998 +/- 0.848 (1.26)
	2/22/2019	0.029	66	3.2	0.579	30	7.48	340	< 0.0030	0.0014	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	0.0040	< 0.0010	< 0.0010	< 0.00020	0.579	0.775 +/- 0.873 (1.78)
	3/4/2019	0.040	80	3.2	0.634	30	7.36	350	< 0.0030	0.0021	< 0.0010	0.21	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0041	< 0.0010	< 0.0010	< 0.00020	0.634	2.29 +/- 1.13 (1.50)
	3/7/2019	0.048	79	< 5.0	0.620	31	7.53	370	< 0.0030	0.0020	< 0.0010	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.025	0.0043	< 0.0010	< 0.0010	< 0.00020	0.620	0.594 +/- 0.743 (1.38)
	6/5/2019	-	-	-	0.625	-	-	-	< 0.0030	0.0079	< 0.0010	0.33	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0042	< 0.0010	< 0.0010	< 0.00020	0.625	2.18 +/- 1.00 (0.950)
	8/28/2019	0.025	78	2.8	0.602	28	7.51	340	-	0.0022	-	0.20	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.031	0.0042	< 0.0010	-	-	0.602	1.76 +/- 1.07 (1.83)
	10/4/2019	0.043	83	3.1	0.598	29	7.26	360	-	0.0011	-	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.027	0.0059	< 0.0010	-	-	0.598	0.0475 +/- 0.872 (1.97)
	10/15/2019	0.052	83	3.2	0.580	28	7.29	340	-	0.0012	-	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.028	0.0040	< 0.0010	-	-	0.580	1.56 +/- 1.04 (1.82)
	11/6/2019	0.079	80	3.0	0.654	29	6.95	410	-	0.0018	-	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	0.0047	< 0.0010	-	-	0.654	0.446 +/- 0.879 (1.79)
	11/6/2019	0.039	80	2.9	0.598	29	7.46	390	-	0.0015	-	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	0.0040	< 0.0010	-	-	0.598	0.136 +/- 0.654 (1.46)
	12/17/2019	0.036	78	3.2	0.647	36	7.41	380	< 0.0030	0.0016	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	0.0046	< 0.0010	< 0.0010	< 0.00020	0.647	0.494 +/- 0.751 (1.38)
	12/18/2019	-	-	-	-	-	-	-	< 0.0030	0.0018	< 0.0010	0.18	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.032	0.0040	< 0.0010	< 0.0010	< 0.00020	-	0.194 +/- 0.601 (1.15)
	2/21/2020	0.029	62	3.1	0.457	28	7.43	270	-	0.0041	-	0.18	< 0.00089	< 0.0040	0.00098	< 0.0010	0.017	< 0.0010	< 0.0010	-	-	0.457	0.892 +/- 0.810 (1.39)
	5/20/2020	-	-	-	0.518	-	-	-	<0.0030	0.0034	<0.0010	0.21	<0.00089	<0.0040	<0.00086	<0.0010	0.024	0.0037	<0.0010	<0.0010	<0.00020	0.518	0.467 +/- 0.834 (1.72)

ATTACHMENT 6
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - LINED POND
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
B-126	11/6/2016	0.0342	140	8	0.39	57	6.90	560	< 0.0010	0.0099	< 0.0010	0.400	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0159	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.39	0.7 +/- 1.45
	12/12/2016	0.0273	178	11	0.39	173	6.68	826	< 0.0010	0.0076	< 0.0010	0.447	< 0.0010	0.0013	< 0.0050	< 0.0010	0.0244	< 0.010	< 0.0010	< 0.0010	< 0.00020	0.39	1.11 +/- 0.62
	1/8/2017	0.034	72	6.4	0.376	43	7.49	240	< 0.0030	0.0063	< 0.0010	0.250	< 0.0010	< 0.0040	0.002	0.0011	0.016	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.376	0.342 +/- 0.71 (1.38)
	1/24/2017	0.018	64	3.4	0.457	26	7.37	290	< 0.0030	0.0050	< 0.0010	0.23	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.013	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.457	-0.189 +/- 0.713 (1.49)
	2/23/2017	0.034	85	7.4	0.525	58	7.00	340	< 0.0030	0.0067	< 0.0010	0.28	< 0.0010	< 0.0040	0.0021	< 0.0010	0.015	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.525	1.156 +/- 0.854 (1.37)
	4/25/2017	0.032	57	4.5	0.388	27	6.95	300	< 0.0030	0.0084	< 0.0010	0.21	< 0.0010	0.0047	0.0026	0.0020	0.013	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.388	1.267 +/- 0.807 (1.22)
	5/16/2017	0.022	35	1.7	0.258	5.6	6.93	170	< 0.0030	0.0085	< 0.0010	0.13	< 0.0010	< 0.0040	< 0.0020	< 0.0010	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.258	1.827 +/- 0.854 (1.053)
	6/21/2017	0.031	41	3.2	0.398	7.6	6.91	210	< 0.0030	0.0094	< 0.0010	0.16	< 0.0010	< 0.0040	< 0.0020	< 0.0010	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.398	0.51 +/- 0.848 (1.663)
	8/28/2017	0.036	63	4.6	0.493	20	6.94	270	< 0.0030	0.0097	< 0.0010	0.21	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.493	2.01+/- 1.13 (1.21)
	3/14/2018	0.032	82	3.6	0.369	26	7.00	280	-	-	-	-	-	-	-	-	-	-	-	-	-	0.369	-
	5/30/2018	-	-	-	0.383	-	-	-	< 0.0030	0.0086	< 0.0010	0.24	< 0.0010	0.0094	0.0030	0.0043	0.013	0.0014	0.0012	< 0.0010	< 0.00020	0.383	2.20 +/- 1.71 (3.20)
	9/11/2018	0.034	130	1.0	0.284	90	7.00	440	-	0.0052	-	0.31	-	< 0.0040	0.0019	< 0.0010	0.011	< 0.0010	< 0.0010	-	-	0.284	1.13 +/- 1.22 (2.05)
	10/24/2018	0.065	67	4.4	0.280	28	7.17	280	< 0.0030	0.0052	< 0.0010	0.22	< 0.00089	0.0064	0.0015	0.0011	0.012	0.0038	0.0011	< 0.0010	< 0.00020	0.280	1.07 +/- 0.975 (1.71)
	12/4/2018	0.090	44	2.4	0.446	17	7.09	150	< 0.0030	0.0046	< 0.0010	0.19	< 0.00089	0.010	0.0017	0.0022	0.011	0.0016	< 0.0010	< 0.0010	< 0.00020	0.446	0.739 +/- 0.911 (1.83)
	12/18/2018	0.029	32	1.4	0.678	16	6.99	220	< 0.0030	0.0044	< 0.0010	0.16	< 0.00089	0.0078	0.0017	0.0029	0.014	< 0.0010	0.0018	< 0.0010	< 0.00020	0.678	1.13 +/- 1.20 (2.15)
	1/8/2019	0.051	50	2.5	0.501	13	7.04	410	< 0.0030	0.0059	< 0.0010	0.22	< 0.00089	0.012	0.0030	0.0041	0.011	0.0018	0.0013	< 0.0010	< 0.00020	0.501	2.33 +/- 1.30 (1.97)
	1/14/2019	0.025	24	1.1	0.551	7.1	6.97	230	< 0.0030	0.0041	< 0.0010	0.15	< 0.00089	0.0070	0.0018	0.0041	< 0.010	0.0011	0.0028	< 0.0010	< 0.00020	0.551	1.05 +/- 1.01 (1.81)
	1/22/2019	0.024	25	1.0	0.434	6.4	7.00	140	< 0.0030	0.0034	< 0.0010	0.11	< 0.00089	0.0041	0.0011	0.0020	< 0.010	< 0.0010	0.0012	< 0.0010	< 0.00020	0.434	1.50 +/- 0.792 (1.13)
	2/8/2019	0.019	17	< 1.0	0.400	6.5	6.70	440	< 0.0030	0.0038	< 0.0010	0.18	< 0.00089	0.014	0.0023	0.0078	0.012	< 0.0010	0.0031	< 0.0010	< 0.00020	0.400	1.04 +/- 0.992 (1.16)
	3/4/2019	0.026	16	< 1.0	0.556	6.4	6.85	420	< 0.0030	0.0054	< 0.0010	0.17	< 0.00089	0.015	0.0044	0.0090	0.011	< 0.0010	0.0012	< 0.0010	< 0.00020	0.556	1.16 +/- 0.854 (1.35)
	3/7/2019	0.023	29	1.2	0.543	11	7.22	180	< 0.0030	0.0043	< 0.0010	0.15	< 0.00089	0.0098	0.0030	0.0047	< 0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.543	0.969 +/- 1.09 (2.01)
	6/5/2019	-	-	-	0.516	-	-	-	< 0.0030	0.0092	< 0.0010	0.17	< 0.00089	0.0040	0.0023	0.0018	0.010	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.516	1.55 +/- 1.60 (2.93)
	8/28/2019	0.024	56	2.7	0.507	24	7.10	280	-	0.0051	-	0.24	< 0.00089	< 0.0040	0.0018	0.0022	0.015	< 0.0010	0.0010	-	-	0.507	2.20 +/- 1.05 (1.25)
	10/4/2019	0.037	140	8.8	0.409	130	6.98	580	-	0.0049	-	0.33	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.021	< 0.0010	< 0.0010	-	-	0.409	0.884 +/- 1.10 (2.02)
	10/15/2019	0.041	140	10	0.517	130	6.98	630	-	0.0046	-	0.30	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.022	0.0032	< 0.0010	-	-	0.517	0.563 +/- 1.05 (2.22)
	11/6/2019	0.050	67	4.2	0.508	38	7.07	320	-	0.0043	-	0.19	< 0.00089	< 0.0040	0.0012	< 0.0010	< 0.020	< 0.0010	< 0.0010	-	-	0.508	2.68 +/- 1.23 (1.80)
	12/18/2019	0.029	32	1.4	0.678	16	6.99	220	< 0.0030	0.0044	< 0.0010	0.16	< 0.00089	0.0078	0.0017	0.0029	0.014	< 0.0010	0.0018	< 0.0010	< 0.00020	0.678	1.13 +/- 1.20 (2.15)
	2/21/2020	0.031	62	3.9	0.376	27	7.07	230	-	0.0040	-	0.18	< 0.00089	< 0.0040	0.00086	< 0.0010	0.018	< 0.0010	< 0.0010	-	-	0.376	0.469 +/- 0.556 (1.03)
	5/20/2020	-	-	-	0.339	-	-	-	<0.0030	0.0037	<0.0010	0.20	<0.00089	<0.0040	0.0015	<0.0010	0.011	<0.0010	<0.0010	<0.0010	<0.00020	0.339	1.08 +/- 0.841 (1.43)

ATTACHMENT 6
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - LINED POND
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-16	11/2/2016	0.0425	157	11	1.22	118	6.82	516	< 0.0010	0.0026	< 0.0010	0.773	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0263	< 0.010	< 0.0010	< 0.0010	< 0.00020	1.22	1.85 +/- 0.91
	12/9/2016	0.0431	154	15	1.37	107	6.89	630	< 0.0010	0.0029	< 0.0010	0.783	< 0.0010	< 0.0010	< 0.0050	< 0.0010	0.0274	< 0.010	< 0.0010	< 0.0010	< 0.00020	1.37	0.98 +/- 0.64
	1/7/2017	0.039	130	13	1.10	120	7.58	580	< 0.0030	0.0027	< 0.0010	0.800	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.10	2.34 +/- 1.05 (1.165)
	1/30/2017	0.037	130	11	1.55	120	7.40	570	< 0.0030	0.0026	< 0.0010	0.73	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.55	1.777 +/- 1.093 (1.668)
	2/21/2017	0.051	150	12	1.18	95	6.91	560	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.18	1.094 +/- 0.728 (1.32)
	3/28/2017	0.047	130	11	1.44	100	6.88	580	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.44	2.332 +/- 0.978 (1.216)
	4/27/2017	0.060	150	12	1.38	93	6.97	560	< 0.0030	0.0025	< 0.0010	0.76	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.38	1.843 +/- 0.862 (1.087)
	5/18/2017	0.046	150	13	1.59	97	6.88	600	< 0.0030	0.0027	< 0.0010	0.75	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.59	1.934 +/- 0.991 (1.312)
	6/24/2017	0.036	130	11	1.18	110	7.02	490	< 0.0030	0.0020	< 0.0010	0.72	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.18	1.787 +/- 1.083 (1.687)
	8/15/2017	0.052	140	10	1.27	98	6.89	500	< 0.0030	0.0021	< 0.0010	0.70	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.033	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.27	1.396 +/- 1.106 (1.858)
	3/15/2018	0.054	140	12	1.45	84	7.03	580	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	-
	3/15/2018	0.049	140	12	1.45	84	7.03	570	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	-
	5/30/2018	-	-	-	1.20	-	-	-	< 0.0030	0.0020	< 0.0010	0.72	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.025	0.0045	< 0.0010	< 0.0010	< 0.00020	1.20	2.60 +/- 1.10 (1.46)
	9/12/2018	0.051	150	16	1.20	73	6.99	400	-	0.0023	-	0.69	-	< 0.0040	< 0.00086	< 0.0010	0.019	< 0.0010	< 0.0010	-	-	1.20	2.78 +/- 1.35 (1.70)
	10/25/2018	0.034	140	14	1.22	67	7.10	510	< 0.0030	0.0021	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.22	2.30 +/- 1.02 (1.30)
	12/4/2018	0.052	130	11	1.72	74	7.04	500	< 0.0030	0.0024	< 0.0010	0.61	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.027	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.72	1.27 +/- 0.878 (1.41)
	12/17/2018	0.067	130	11	1.65	120	7.25	560	< 0.0030	0.0022	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.65	0.752 +/- 0.772 (1.25)
	1/7/2019	0.050	140	12	1.66	87	7.00	540	< 0.0030	0.0028	< 0.0010	0.67	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.66	1.46 +/- 0.694 (0.742)
	1/15/2019	0.071	140	12	1.71	95	6.97	580	< 0.0030	0.0022	< 0.0010	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.022	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.71	2.64 +/- 1.10 (0.855)
	1/21/2019	0.080	140	13	1.41	100	7.04	680	< 0.0030	0.0021	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.41	2.37 +/- 1.01 (1.24)
	2/9/2019	0.082	130	15	< 2.50	99	6.98	690	< 0.0030	0.0018	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	< 2.50	1.91 +/- 1.20 (1.80)
	2/22/2019	0.055	120	13	1.67	90	7.12	520	< 0.0030	0.0024	< 0.0010	0.66	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.67	1.77+/- 1.06 (1.68)
	2/22/2019	0.052	120	14	1.68	92	7.01	520	< 0.0030	0.0023	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.68	1.45 +/- 1.20 (1.93)
	3/5/2019	0.070	130	14	1.78	88	7.09	600	< 0.0030	0.0022	< 0.0010	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.023	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.78	1.47 +/- 0.937 (1.39)
	3/7/2019	0.078	130	14	1.71	85	7.08	570	< 0.0030	0.0023	< 0.0010	0.61	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.021	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.71	0.225 +/- 0.901 (1.92)
	6/5/2019	-	-	-	1.52	-	-	-	< 0.0030	0.0024	< 0.0010	0.56	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.024	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.52	2.09 +/- 1.02 (1.39)
	8/28/2019	0.046	120	16	1.69	73	7.19	520	-	0.0024	-	0.63	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	-	-	1.69	3.08 +/- 1.25 (1.67)
	10/3/2019	0.21	130	16	1.66	70	6.94	490	-	0.0022	-	0.65	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.025	< 0.0010	< 0.0010	-	-	1.66	0.0972 +/- 0.959 (2.11)
	10/16/2019	0.065	130	13	1.43	68	7.12	470	-	0.0020	-	0.58	< 0.0010	< 0.0040	< 0.0020	< 0.0010	0.026	< 0.0010	< 0.0010	-	-	1.43	1.39 +/- 1.23 (2.08)
	11/9/2019	0.056	120	14	1.47	75	7.22	520	-	0.0024	-	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.026	< 0.0010	< 0.0010	-	-	1.47	0.809 +/- 0.659 (0.955)
	12/17/2019	0.067	130	83	1.65	120	7.25	560	< 0.0030	0.0022	< 0.0010	0.65	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.029	< 0.0010	< 0.0010	< 0.0010	< 0.00020	1.65	0.752 +/- 0.772 (1.25)
	12/19/2019	-	-	-	-	-	-	-	< 0.0030	0.0022	< 0.0010	0.59	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.031	< 0.0010	< 0.0010	< 0.0010	< 0.00020	-	0.991 +/- 0.876 (1.50)
	2/21/2020	0.064	120	13	1.68	56	7.08	510	-	0.0024	-	0.56	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.030	< 0.0010	< 0.0010	-	-	1.68	1.26 +/- 0.793 (1.19)
	5/19/2020	-	-	-	1.52	-	-	-	<0.0030	0.0021	<0.0010	0.53	<0.00089	<0.0040	<0.00086	<0.0010	0.022	<0.0010	<0.0010	<0.0010	<0.00020	1.52	1.31 +/- 0.928 (1.61)

ATTACHMENT 6
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - LINED POND
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
P-6	9/13/2018	1.5	180	11	<0.250	41	6.89	550	<0.0030	<0.0010	<0.0010	0.21	<0.00089	<0.0040	<0.00086	<0.0010	0.014	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	1.42 +/- 1.36 (1.36)
	10/25/2018	1.8	150	9.8	<0.250	34	7.15	480	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	<0.00086	<0.0010	0.021	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	0.264 +/- 0.690 (1.42)
	12/4/2018	1.8	160	9.8	0.251	36	6.96	470	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	0.0010	<0.0010	0.022	<0.0010	<0.0010	<0.0010	<0.00020	0.251	1.47 +/- 0.883 (1.29)
	12/17/2018	1.5	150	8.8	0.268	32	7.02	550	<0.0030	<0.0010	<0.0010	0.20	<0.00089	<0.0040	0.0012	<0.0010	0.024	<0.0010	<0.0010	<0.0010	<0.00020	0.268	0.562 +/- 0.778 (1.43)
	1/7/2019	1.8	150	9.4	0.281	34	6.89	520	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	0.0014	<0.0010	0.016	<0.0010	<0.0010	<0.0010	<0.00020	0.281	0.967 +/- 0.770 (1.34)
	1/9/2019	0.079	160	8.4	0.295	97	7.00	560	<0.0030	<0.0010	<0.0010	0.31	<0.00089	<0.0040	<0.00086	<0.0010	0.011	<0.0010	0.0011	<0.0010	<0.00020	0.295	1.76 +/- 0.799 (0.939)
	1/14/2019	1.6	140	9.9	0.272	31	6.87	510	<0.0030	<0.0010	<0.0010	0.17	<0.00089	<0.0040	0.0014	<0.0010	0.016	<0.0010	<0.0010	<0.0010	<0.00020	0.272	1.65 +/- 1.00 (1.60)
	1/14/2019	1.7	150	9.5	<0.250	32	6.95	590	<0.0030	<0.0010	<0.0010	0.20	<0.00089	<0.0040	0.0016	<0.0010	0.017	0.0012	<0.0010	<0.0010	<0.00020	<0.250	0.708 +/- 0.841 (1.48)
	1/21/2019	1.7	150	11	<0.250	33	6.96	600	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	0.0015	<0.0010	0.017	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	1.62 +/- 0.931 (1.37)
	2/5/2019	1.8	140	11	0.304	31	7.38	490	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	0.00094	<0.0010	0.022	<0.0010	<0.0010	<0.0010	<0.00020	0.304	0.242 +/- 0.770 (1.61)
	2/8/2019	1.7	140	9.3	<0.250	31	6.91	560	<0.0030	<0.0010	<0.0010	0.19	<0.00089	<0.0040	0.0011	<0.0010	0.019	0.0017	<0.0010	<0.0010	<0.00020	<0.250	1.33 +/- 0.993 (1.57)
	2/22/2019	1.9	140	9.3	< 0.250	31	7.06	470	<0.0030	<0.0010	< 0.0040	0.22	< 0.00089	< 0.016	0.0019	< 0.0010	0.017	< 0.0010	< 0.0010	< 0.0010	< 0.00020	< 0.250	0.605 +/- 0.801 (1.50)
	3/5/2019	1.8	130	12	0.289	31	7.06	480	<0.0030	< 0.0010	< 0.0010	0.19	< 0.00089	< 0.0040	0.0019	< 0.0010	0.019	< 0.0010	< 0.0010	< 0.0010	< 0.00020	0.289	0.619 +/- 0.749 (1.40)
	12/18/2019	-	-	-	-	-	-	-	<0.0030	< 0.0010	< 0.0010	0.22	< 0.00089	< 0.0040	0.0011	< 0.0010	0.030	< 0.0010	< 0.0010	< 0.0010	< 0.00020	-	0.727 ± 0.965 (1.70)
	12/18/2019	-	-	-	-	-	-	-	<0.0030	< 0.0010	< 0.0010	0.22	< 0.00089	< 0.0040	0.0011	< 0.0010	0.029	0.002	< 0.0010	< 0.0010	0.00025	-	1.04 ± 0.757 (1.20)
	2/19/2020	1.9	140	9.1	<0.250	28	6.98	450	-	<0.0010	-	0.18	-	-	0.0013	<0.0010	0.023	<0.0010	<0.0010	-	-	<0.250	1.24 ± 0.840 (1.43)
	2/19/2020	1.9	140	9.1	<0.250	29	6.96	440	-	<0.0010	-	0.18	-	-	0.0014	<0.0010	0.022	<0.0010	<0.0010	-	-	<0.250	0.224 ± 0.818 (1.93)
	8/17/2020	1.5	150	9.6	<0.250	31	7.39	530	-	<0.0010	-	0.21	-	-	<0.0020	<0.0010	0.023	0.0011	<0.0010	-	-	<0.250	0.944 +/- 0.807 (1.48)
	8/17/2020	1.5	160	9.5	<0.250	77	7.25	500	-	<0.0010	-	0.20	-	-	<0.0020	<0.0010	0.025	<0.0010	<0.0010	-	-	<0.250	0.646 +/- 0.643 (1.18)
P-7	9/13/2018	0.078	170	8.8	<0.250	73	6.99	490	<0.0030	<0.0010	<0.0010	0.31	<0.00089	<0.0040	<0.00086	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	1.95 +/- 1.45 (1.35)
	10/25/2018	0.11	160	11	<0.250	73	7.07	500	<0.0030	<0.0010	<0.0010	0.30	<0.00089	<0.0040	<0.00086	<0.0010	0.017	<0.0010	0.0017	<0.0010	<0.00020	<0.250	0.627 +/- 0.741 (1.38)
	10/25/2018	0.061	160	9.8	<0.250	70	7.13	520	<0.0030	<0.0010	<0.0010	0.29	<0.00089	<0.0040	<0.00086	<0.0010	0.016	<0.0010	0.0022	<0.0010	<0.00020	<0.250	0.294 +/- 0.625 (1.22)
	12/4/2018	0.16	140	7.7	0.407	66	7.17	460	<0.0030	<0.0010	<0.0010	0.26	<0.00089	<0.0040	<0.00086	<0.0010	0.016	0.0012	<0.0010	<0.0010	<0.00020	0.407	0.872 +/- 0.818 (1.38)
	12/17/2018	0.091	130	6.8	0.502	94	7.10	500	<0.0030	<0.0010	<0.0010	0.26	<0.00089	<0.0040	<0.00086	<0.0010	0.017	0.0013	0.0012	<0.0010	<0.00020	0.502	0.700 +/- 0.897 (1.68)
	1/7/2019	0.073	160	8.5	0.285	100	6.94	620	<0.0030	<0.0010	<0.0010	0.31	<0.00089	<0.0040	<0.00086	<0.0010	0.012	<0.0010	0.0010	<0.0010	<0.00020	0.285	0.975 +/- 0.782 (1.29)
	1/14/2019	0.074	140	8.6	0.272	92	6.91	590	<0.0030	<0.0010	<0.0010	0.27	<0.00089	<0.0040	<0.00086	<0.0010	0.011	<0.0010	<0.0010	<0.0010	<0.00020	0.272	1.18 +/- 0.935 (1.62)
	1/21/2019	0.086	140	7.6	<0.250	81	7.03	580	<0.0030	<0.0010	<0.0010	0.26	<0.00089	<0.0040	<0.00086	<0.0010	0.011	0.0011	<0.0010	<0.0010	<0.00020	<0.250	1.30 +/- 0.853 (1.39)
	2/5/2019	0.083	150	10	0.314	89	7.47	580	<0.0030	<0.0010	<0.0010	0.29	<0.00089	<0.0040	<0.00086	<0.0010	0.016	<0.0010	<0.0010	<0.0010	<0.00020	0.314	0.773 +/- 0.802 (1.52)
	2/22/2019	0.10	150	9.6	< 0.250	68	7.15	540	< 0.0030	< 0.0010	< 0.0010	0.29	< 0.00089	<0.0040	<0.00086	<0.0010	0.011	<0.0010	<0.0010	<0.0010	< 0.00020	< 0.250	1.70 +/- 1.00 (1.56)
	3/5/2019	0.077	150	11	0.323	85	7.13	560	< 0.0030	< 0.0010	< 0.0010	0.30	< 0.00089	<0.0040	< 0.00086	<0.0010	0.015	0.0010	< 0.0010	< 0.0010	< 0.00020	0.323	0.776 +/- 0.916 (1.76)
	12/18/2019	-	-	-	-	-	-	-	< 0.0030	< 0.0010	< 0.0010	0.30	< 0.00089	<0.0040	< 0.00086	<0.0010	0.025	0.0011	< 0.0010	< 0.0010	< 0.00020	-	0.605 ± 1.01 (1.86)
	2/19/2020	0.064	160	8.3	<0.250	86	6.97	550	-	<0.0010	-	0.29	-	-	<0.00086	<0.0010	0.020	0.0010	<0.0010	-	-	<0.250	1.18 ± 0.894 (1.55)
	8/17/2020	0.088	140	7.2	<0.250	19	7.11	590	-	<0.0010	-	0.31	-	-	< 0.0020	<0.0010	0.017	0.0012	0.0035	-	-	<0.250	0.562 +/- 0.880 (1.74)
MW-8	9/12/2018	16	180	10	0.290	320	7.20	700	-	0.0045	-	0.082	-	<0.0040	0.0016	<0.0010	0.012	0.86	<0.0010	-	-	0.290	0.840 +/- 0.855 (1.47)
	10/24/2018	15	170	9.2	0.400	290	7.48	680	<0.0030	0.0052	<0.0010	0.080	<0.00089	<0.0040	0.00086	<0.0010	0.016	0.92	<0.0010	<0.0010	<0.00020	0.400	1.08 +/- 0.906 (1.55)
	12/3/2018	15	170	9.6	0.354	300	7.22	740	<0.0030	0.0054	<0.0010	0.082	<0.00089	<0.0040	<0.00086	<0.0010	0.021	0.92	<0.0010	<0.0010	<0.00020	0.354	1.27 +/- 0.947 (1.57)
	12/4/2018	15	170	12	0.412	310	7.14	770	<0.0030	0.0055	<0.0010	0.083	<0.00089	<0.0040	<0.00086	<0.0010	0.018	0.93	<0.0010	<0.0010	<0.00020	0.412	0.387 +/- 0.807 (1.58)
	12/17/2018	14	170	9.6	0.447	340	7.37	860	<0.0030	0.0059	<0.0010	0.089	<0.00089	<0.0040	<0.00086	<0.0010	0.021	0.99	<0.0010	<0.0010	<0.00020	0.447	0.264 +/- 0.782 (1.60)
	1/7/2019	16	200	9.0	0.404	360	7.15	960	<0.0030	0.0063	<0.0010	0.098	<0.00089	<0.0040	<0.00086	<0.0010	0.016	1.0	<0.0010	<0.0010	<0.00020	0.404	1.44 +/- 0.723 (0.965)
	1/15/2019	17	200	9.2	0.355	400	7.09	1000	<0.0030	0.0060	<0.0010	0.097	<0.00089	<0.0040	<0.00086	0.0024	0.016	0.91	<0.0010	<0.0010	<0.00020	0.355	0.890 +/- 0.859 (1.51)
	1/22/2019	18	200	9.6	<0.250	380	7.12	940	<0.0030	0.0062	<0.0010	0.10	<0.00089	<0.0040	<0.00086	<0.0010	0.016	0.88	<0.0010	<0.0010	<0.00020	<0.250	1.81 +/- 0.948 (1.31)
	2/5/2018	20	200	7.6	0.392	400	7.64	1000	<0.0030	0.0066	<0.0010	0.12	<0.00089	<0.0040	<0.00086	<0.0010	0.019	1.0	<0.0010	<0.0010	<0.00020	0.392	1.35 +/- 0.902 (1.05)
	2/22/2019	26	170	5.9	0.305	410	7.18	1000	< 0.0030	0.0071	< 0.0010	0.12	<0.00089	<0.0040	<0.00086	< 0.0010	0.017	1.1	<0.0010	<0.0010	<0.00020	0.305	1.51 +/- 0.973 (1.60)
	3/5/2019	30	240	6.5	0.386	360	7.24	950	< 0.0030	0.016	0.0027	0.14	0.0067	0.0070	0.0036	0.014	0.020	1.1	0.0069	0.0061	<0.00020	0.386	1.05 +/- 0.949 (1.65)
	12/19/2019	-	-	-	-	-	-	-	< 0.0030	0.0045	< 0.0010	0.095	<0.00089	<0.0040	0.0018	< 0.0010	0.029	0.87	<0.0010	<0.0010	<0.00020	-	0.852 ± 0.823 (1.43)
	2/19/2020	33	210	5.7	0.289	290	7.21	880	-	0.0064	-	0.097	<0.00089	<0.0040	<0.00086	<0.0010	0.024	1.5	<0.0010	-	-	0.289	0.902 +/- 0.689 (1.21)
	8/10/2020	18	200	8	0.336	360	8.15	1100	-	0.0043	-	0.086	-	-	< 0.0020	<0.0010	0.036	1.0	<0.0010	-	-	0.336	0.320 +/- 0.899 (1.85)

ATTACHMENT 6
SUMMARY OF ANALYTICAL RESULTS
ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT - LINED POND
Marston, MO

Location	Date	Detection Monitoring - USEPA Appendix III Constituents (mg/L)							Assessment Monitoring - USEPA Appendix IV Constituents (mg/L)														
		Boron, Total	Calcium, Total	Chloride	Fluoride	Sulfate	pH (lab) (SU)	TDS	Antimony, Total	Arsenic, Total	Beryllium, Total	Barium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Lead, Total	Lithium, Total	Molybdenum, Total	Selenium, Total	Thallium, Total	Mercury, Total	Fluoride	Radium-226 & 228, Combined (pCi/L)
MW-9	9/12/2018	2.4	110	20	0.440	110	7.34	470	--	<0.0010	--	0.074	--	<0.0040	<0.00086	<0.0010	0.021	0.34	<0.0010	-	-	0.440	0.216 +/- 0.875 (1.80)
	10/25/2018	2.3	110	19	0.567	110	7.42	440	<0.0030	<0.0010	<0.0010	0.071	<0.00089	<0.0040	<0.00086	<0.0010	0.024	0.34	<0.0010	<0.0010	<0.00020	0.567	0.466 +/- 0.708 (1.39)
	12/3/2018	2.8	110	21	0.456	110	7.22	440	<0.0030	<0.0010	<0.0010	0.076	<0.00089	<0.0040	<0.00086	<0.0010	0.029	0.35	<0.0010	<0.0010	<0.00020	0.456	0.635 +/- 0.846 (1.59)
	12/17/2018	2.3	110	35	0.538	110	7.51	540	<0.0030	<0.0010	<0.0010	0.077	<0.00089	<0.0040	<0.00086	<0.0010	0.030	0.35	<0.0010	<0.0010	<0.00020	0.538	0.906 +/- 0.898 (1.58)
	12/18/2018	2.2	110	34	0.544	110	7.48	620	<0.0030	<0.0010	<0.0010	0.078	<0.00089	<0.0040	<0.00086	<0.0010	0.030	0.35	<0.0010	<0.0010	<0.00020	0.544	0.790 +/- 0.945 (1.74)
	1/7/2019	2.5	120	22	0.467	100	7.19	520	<0.0030	<0.0010	<0.0010	0.082	<0.00089	<0.0040	<0.00086	<0.0010	0.025	0.33	<0.0010	<0.0010	<0.00020	0.467	0.931 +/- 0.695 (1.12)
	1/15/2019	2.2	110	24	0.435	100	7.13	560	<0.0030	<0.0010	<0.0010	0.074	<0.00089	<0.0040	<0.00086	<0.0010	0.023	0.30	<0.0010	<0.0010	<0.00020	0.435	1.05 +/- 0.901 (1.56)
	1/21/2019	2.2	110	24	0.378	96	7.32	590	<0.0030	<0.0010	<0.0010	0.077	<0.00089	<0.0040	<0.00086	<0.0010	0.022	0.33	<0.0010	<0.0010	<0.00020	0.378	1.51 +/- 0.834 (1.25)
	1/22/2019	2.0	110	23	0.382	100	7.39	510	<0.0030	<0.0010	<0.0010	0.075	<0.00089	<0.0040	<0.00086	<0.0010	0.022	0.32	<0.0010	<0.0010	<0.00020	0.382	1.57 +/- 0.818 (1.14)
	2/5/2019	2.5	110	24	0.399	100	7.57	540	<0.0030	<0.0010	<0.0010	0.082	<0.00089	<0.0040	<0.00086	<0.0010	0.027	0.32	<0.0010	<0.0010	<0.00020	0.399	0.849 +/- 0.718 (1.22)
	2/22/2019	2.5	92	21	0.361	100	7.24	540	< 0.0030	<0.0010	< 0.0010	0.088	<0.00089	<0.0040	<0.00086	<0.0010	0.027	0.30	< 0.0010	< 0.0010	< 0.00020	0.361	0.512 +/- 0.652 (1.29)
	3/5/2019	2.7	120	21	0.483	100	7.32	520	< 0.0030	<0.0010	< 0.0010	0.088	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.028	0.31	< 0.0010	< 0.0010	< 0.00020	0.483	1.02 +/- 0.896 (1.55)
	3/5/2019	2.5	130	22	0.467	100	7.25	540	< 0.0030	< 0.0010	< 0.0010	0.087	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.028	0.32	< 0.0010	< 0.0010	< 0.00020	0.467	0.867 +/- 0.763 (1.35)
	12/18/2019	-	-	-	-	-	-	-	< 0.0030	< 0.0010	< 0.0010	0.080	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.038	0.29	< 0.0010	< 0.0010	< 0.00020	-	0.835 ± 0.756 (1.35)
	2/19/2020	2.6	130	22	0.380	100	7.12	480	-	<0.0010	-	0.088	<0.00089	<0.0040	<0.00086	<0.0010	0.034	0.30	<0.0010	-	-	0.380	0.511 +/- 0.660 (1.39)
	8/10/2020	2.1	130	19	0.452	150	8.09	620	-	0.0013	-	0.087	-	-	< 0.0020	<0.0010	0.043	0.23	<0.0010	-	-	0.452	1.04 +/- 0.779 (1.31)
MW-17	12/7/2018	0.038	91	15	0.327	54	7.08	400	<0.0030	0.0027	<0.0010	0.37	<0.00089	<0.0040	0.0012	<0.0010	0.017	0.0012	<0.0010	<0.0010	<0.00020	0.327	1.67 +/- 1.02 (1.495)
	12/18/2018	0.044	95	8.3	0.342	43	7.04	420	<0.0030	0.0030	<0.0010	0.36	<0.00089	0.0044	<0.00086	<0.0010	0.019	<0.0010	<0.0010	<0.0010	<0.00020	0.342	2.00 +/- 1.03 (1.35)
	1/8/2019	0.030	95	9.3	0.276	38	6.58	440	<0.0030	0.0030	<0.0010	0.34	<0.00089	<0.0040	<0.00086	<0.0010	0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.276	2.30 +/- 0.964 (1.24)
	1/15/2019	0.088	82	13	0.260	51	7.00	450	<0.0030	0.0025	<0.0010	0.29	<0.00089	<0.0040	<0.00086	<0.0010	0.016	0.0049	<0.0010	<0.0010	<0.00020	0.260	1.61 +/- 0.916 (1.30)
	1/22/2019	0.092	88	13	<0.250	48	7.13	380	<0.0030	0.0025	<0.0010	0.29	<0.00089	<0.0040	<0.00086	<0.0010	0.015	0.0038	<0.0010	<0.0010	<0.00020	<0.250	2.59 +/- 1.06 (1.20)
	2/8/2019	0.10	88	8.9	<0.250	44	7.02	490	<0.0030	0.0027	<0.0010	0.32	<0.00089	<0.0040	<0.00086	<0.0010	0.014	0.0011	<0.0010	<0.0010	<0.00020	<0.250	2.41 +/- 1.16 (1.35)
	2/22/2019	0.075	68	11	< 0.250	38	7.22	400	<0.0030	0.0031	<0.0010	0.33	<0.00089	<0.0040	<0.00086	<0.0010	< 0.010	0.0017	<0.0010	<0.0010	<0.00020	< 0.250	0.702 +/- 0.770 (1.51)
	3/4/2019	0.13	91	12	0.311	37	7.11	400	< 0.0030	0.0027	< 0.0010	0.32	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.013	< 0.0010	< 0.0010	< 0.0010	<0.00020	0.311	0.927 +/- 0.861 (1.53)
	12/18/2019	-	-	-	-	-	-	-	< 0.0030	0.0027	< 0.0010	0.27	< 0.00089	< 0.0040	< 0.00086	< 0.0010	0.02	< 0.0010	< 0.0010	< 0.0010	<0.00020	-	0.992 ±0.907 (1.57)
	2/19/2020	0.028	91	9.1	<0.250	35	6.97	400	-	0.0028	-	0.27	-	-	<0.00086	<0.0010	<0.020	<0.0010	<0.0010	-	-	<0.250	1.65 ± 1.08 (1.64)
	8/18/2020	0.050	100	38	<0.250	52	7.13	520	-	0.0018	-	0.30	-	-	< 0.0020	< 0.0010	0.017	0.0011	<0.0010	-	-	<0.250	0.565 +/- 0.619 (1.05)
MW-18	12/7/2018	0.029	52	9.0	0.355	41	6.92	220	<0.0030	<0.0010	<0.0010	0.14	<0.00089	<0.0040	0.0014	<0.0010	0.011	<0.0010	0.0017	<0.0010	<0.00020	0.355	1.09 +/- 0.908 (1.49)
	12/18/2018	0.038	58	9.2	0.376	51	7.02	290	<0.0030	<0.0010	<0.0010	0.15	<0.00089	<0.0040	0.0016	<0.0010	0.015	<0.0010	<0.0010	<0.0010	<0.00020	0.376	0.629 +/- 0.725 (1.34)
	1/8/2019	0.029	63	10	0.333	37	6.92	280	<0.0030	<0.0010	<0.0010	0.15	<0.00089	<0.0040	0.0016	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.333	1.59 +/- 0.804 (0.833)
	1/15/2019	0.064	62	8.9	0.316	39	6.91	300	<0.0030	<0.0010	<0.0010	0.15	<0.00089	<0.0040	0.0016	<0.0010	<0.010	<0.0010	<0.0010	<0.0010	<0.00020	0.316	1.61 +/- 0.997 (1.50)
	1/22/2019	0.099	63	10	<0.250	39	6.98	280	<0.0030	<0.0010	<0.0010	0.15	<0.00089	<0.0040	0.0017	<0.0010	<0.010	0.0021	<0.0010	<0.0010	<0.00020	<0.250	0.975 +/- 0.656 (1.11)
	2/8/2019	0.075	66	9.4	<0.250	37	6.92	410	<0.0030	<0.0010	<0.0010	0.16	<0.00089	<0.0040	0.0010	0.0014	0.010	<0.0010	<0.0010	<0.0010	<0.00020	<0.250	0.421 +/- 0.704 (1.37)
	2/22/2019	0.034	58	9.4	0.319	38	7.02	300	<0.0030	<0.0010	<0.0010	0.17	< 0.00089	<0.0040	0.0015	< 0.0010	< 0.010	< 0.0010	<0.0010	<0.0010	<0.00020	0.319	1.84 +/- 1.36 (2.44)
	3/4/2019	0.12	71	9.1	0.404	37	7.09	340	< 0.0030	<0.0010	<0.0010	0.18	< 0.00089	< 0.0040	0.0019	< 0.0010	< 0.010	0.0012	< 0.010	< 0.010	<0.00020	0.404	0.570 +/- 0.817 (1.54)
	12/19/2019	-	-	-	-	-	-	-	< 0.0030	0.0010	<0.0010	0.16	< 0.00089	< 0.0040	0.0047	0.0016	<0.020	< 0.0010	0.0054	0.001	<0.00020	-	0.878 ±0.923 (1.60)
	2/19/2020	0.025	65	12	0.329	36	6.91	270	-	<0.0010	-	0.14	-	-	0.0019	<0.0010	<0.020	<0.0010	<0.0010	-	-	0.329	0.412 ± 0.824 (1.64)
	8/18/2020	0.035	50	13	0.294	38	6.93	330	-	<0.0010	-	0.12	-	-	0.0026	<0.0010	0.012	<0.0010	<0.0010	-	-	0.294	0.891 +/- 0.742 (1.15)

ABBREVIATIONS AND NOTES:
Bold Value: indicates a detection by the laboratory
mg/L : milligrams per liter
pCi/L : picocuries per liter
su : standard unit
USEPA : United States Environmental Protection Agency
USEPA. 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

ATTACHMENT 7

POND 004 STRATIGRAPHIC CROSS-SECTION

LEGEND

MONITORING WELL

CROSS SECTION PATH

POND 004

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. GROUNDWATER ELEVATIONS MEASURED AUGUST 2020.
3. AERIAL IMAGERY SOURCE: ESRI, APRIL 21, 2019

N

0 140 280

SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COPPERATIVE, INC.
NEW MADRID POWER GENERATING FACILITY
NEW MADRID COUNTY, MISSOURI

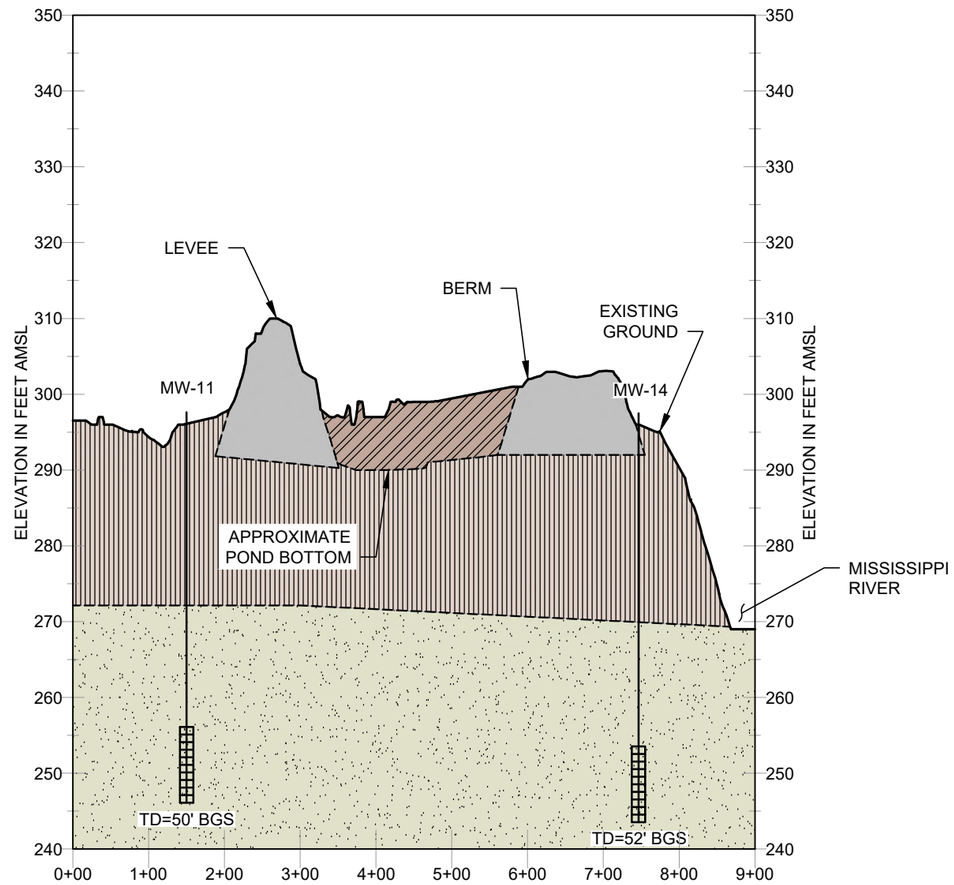
POND 004
B - B' CROSS SECTION

aeci

NOVEMBER 2020

FIGURE 1

GIS FILE PATH: G:\Projects\AECI\New Madrid\GIS\MXDs\2020_11\128064_001_0001_POND004_B_B'_X-SECTION.mxd — USER: dzinsmaster — LAST SAVED: 11/23/2020 9:04:27 AM



LEGEND

- CCR
- ALLUVIUM MATERIAL
- SILT
- CLAYS
- BERM/LEVEE MATERIAL

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. VERTICAL SCALE IS EXAGGERATED 10 TIMES.
3. POND BOTTOM IS APPROXIMATED BASED ON PAST DESIGN DOCUMENTS DATED JUNE 2020.
4. CCR - COAL COMBUSTION RESIDUALS
5. BGS - BELOW GROUND SURFACE
6. FOR GEOLOGIC MATERIALS BETWEEN DEPICTED BORINGS OR WELL LOCATIONS SHOWN ON THE SECTION, THAT MATERIAL IS EXPECTED TO BE AN ALLUVIUM MATERIAL CONSISTING OF SAND INTERBEDDED WITH SILTS AND CLAYS.

HORIZ. 0 200 400
VERT. 0 20 40
SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
MARSTON, MISSOURI

POND 004 GENERALIZED CROSS SECTION B-B'

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE 2

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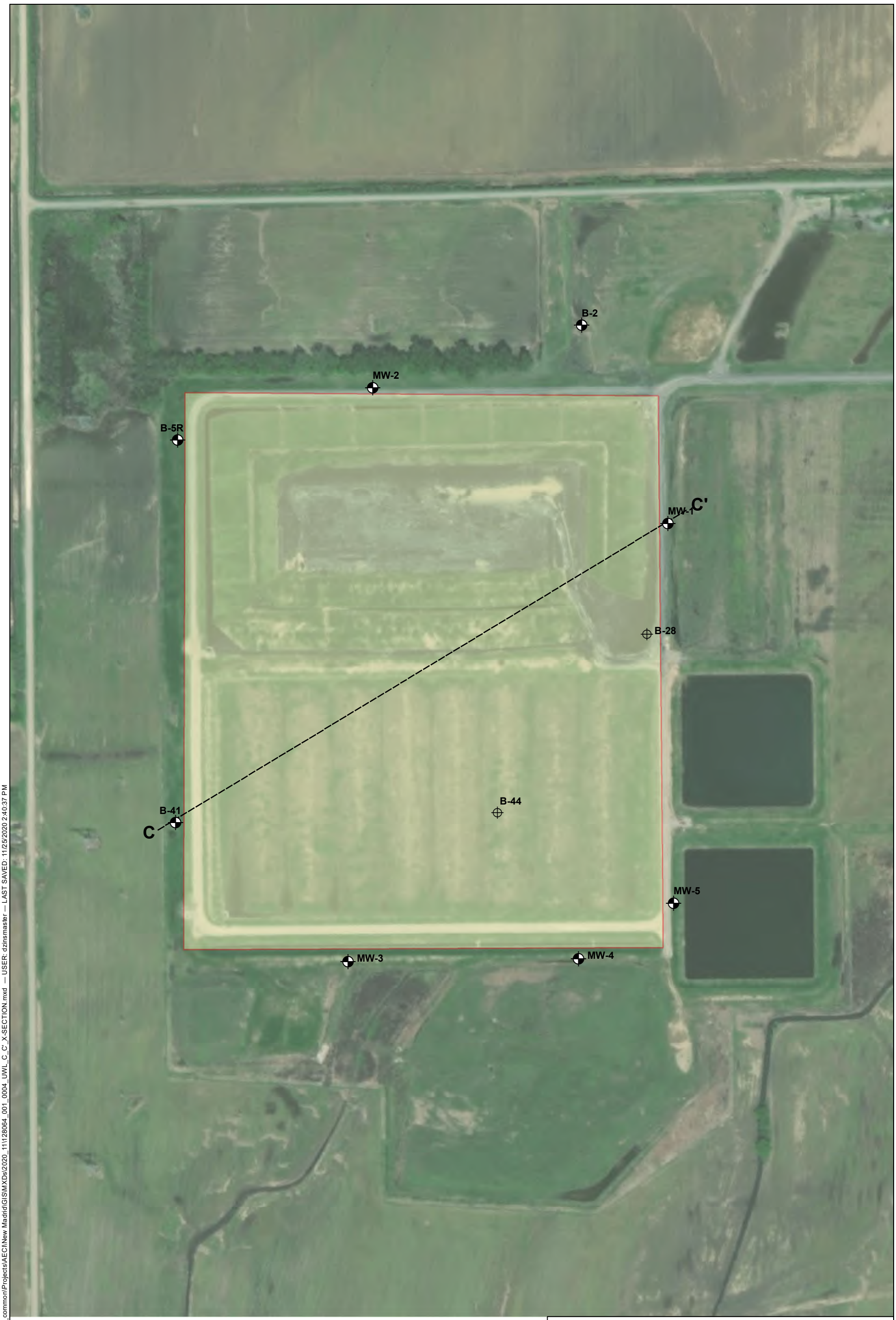
ATTACHMENT 8

UTILITY WASTE LANDFILL STRATIGRAPHIC CROSS-SECTION



LEGEND

- MONITORING WELL
- GEOTECHNICAL BORINGS
- CROSS SECTION PATH
- UTILITY WASTE LANDFILL (UWL) BOUNDARY

NOTE

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI, APRIL 21, 2019.

N

0 340 680

SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
MARSTON, MISSOURI

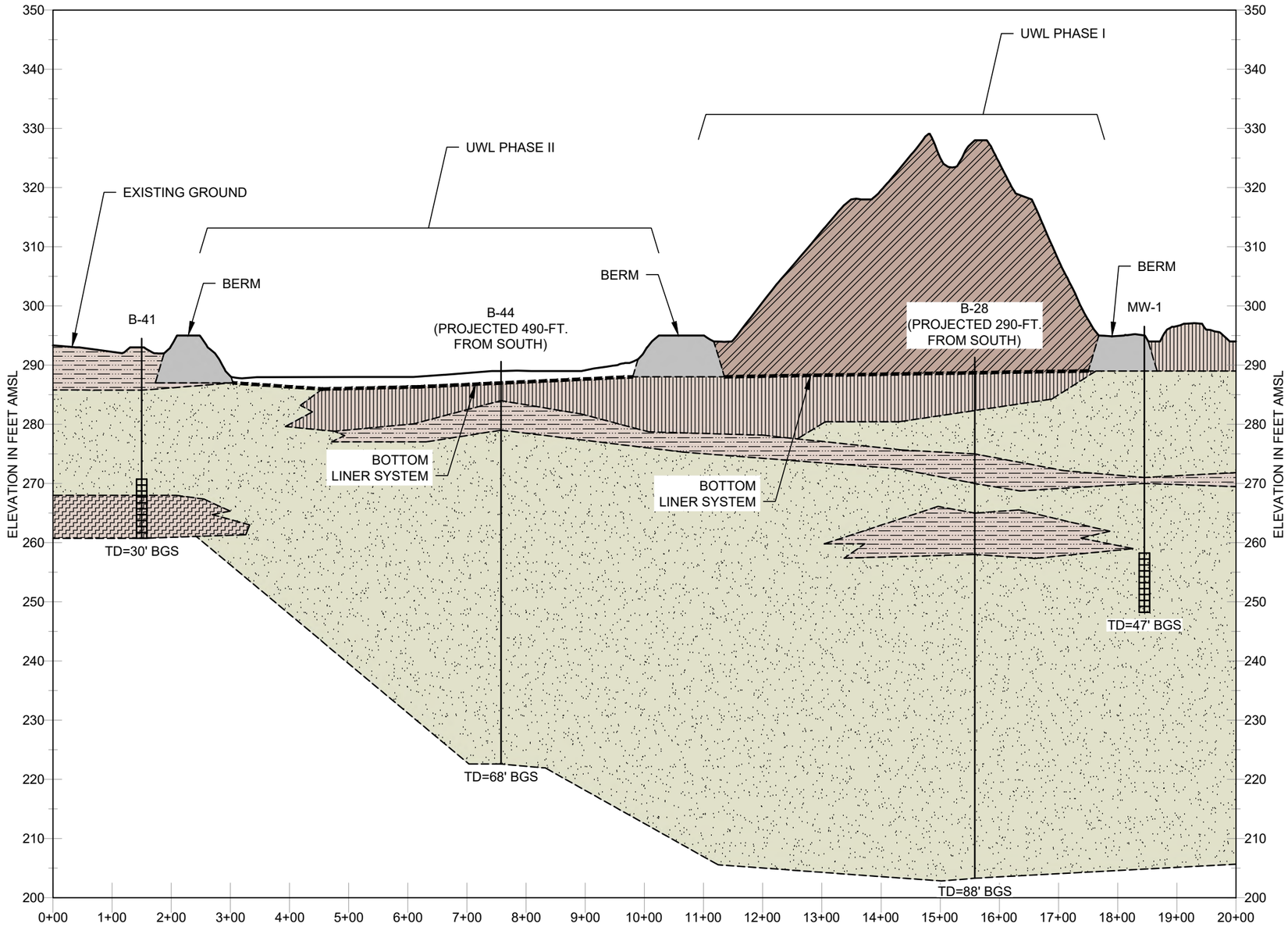
UTILITY WASTE LANDFILL
MONITORING WELL
LOCATION MAP

aeci

NOVEMBER 2020
SCALE: AS SHOWN

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\phx_common\Projects\AEC\New Madrid\GIS\MXDs\2020_11\128064_001_0004_UWL_C_C'_X-SECTION.mxd — USER: dzinsmaster — LAST SAVED: 11/25/2020 2:40:37 PM



LEGEND

- CCR
- ALLUVIUM MATERIAL
- SILTS
- LAMINATED SILTS AND CLAYS
- CLAYS
- BERM/LEVEE MATERIAL
- BOTTOM LINER

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. VERTICAL SCALE IS EXAGGERATED 10 TIMES.
3. CCR - COAL COMBUSTION RESIDUALS
4. BGS - BELOW GROUND SURFACE
5. BORINGS B-28 AND B-44 ARE SHOWN FOR CONTEXT AND ARE GEOTECHNICAL BORINGS ONLY. THESE BORINGS WERE NOT CONVERTED TO WELLS OR USED AS PART OF THE MONITORING PROGRAM.
6. B-28 AND B-44 ARE PROJECTED LOCATIONS ON PROFILE.
7. FOR GEOLOGIC MATERIALS BETWEEN DEPICTED BORINGS OR WELL LOCATIONS SHOWN ON THE SECTION, THAT MATERIAL IS EXPECTED TO BE AN ALLUVIUM MATERIAL CONSISTING OF SAND INTERBEDDED WITH SILTS AND CLAYS.

HORIZ. 0 200 400
VERT. 0 20 40
SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
MARSTON, MISSOURI

UTILITY WASTE
LANDFILL GENERALIZED
CROSS SECTION C-C'

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE 2

SAUNDERS, LEE Printed: 11/25/2020 3:38 PM Layout: UWL_CC
\\HALEYALDRICH.COM\SHARE\PHX_COMMON\PROJECTS\AECI\NEW MADRID\CAD\X-SECTIONS\129342_016_00F1_CROSSSECTIONAA.DWG

ATTACHMENT 9

LINED POND STRATIGRAPHIC CROSS-SECTION

LEGEND

MONITORING WELL

CROSS SECTION PATH

LINED ASH

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

3. AERIAL IMAGERY SOURCE: ESRI, APRIL 21, 2019

N

0 300 600

SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COPPERATIVE, INC.
NEW MADRID POWER GENERATING FACILITY
NEW MADRID COUNTY, MISSOURI

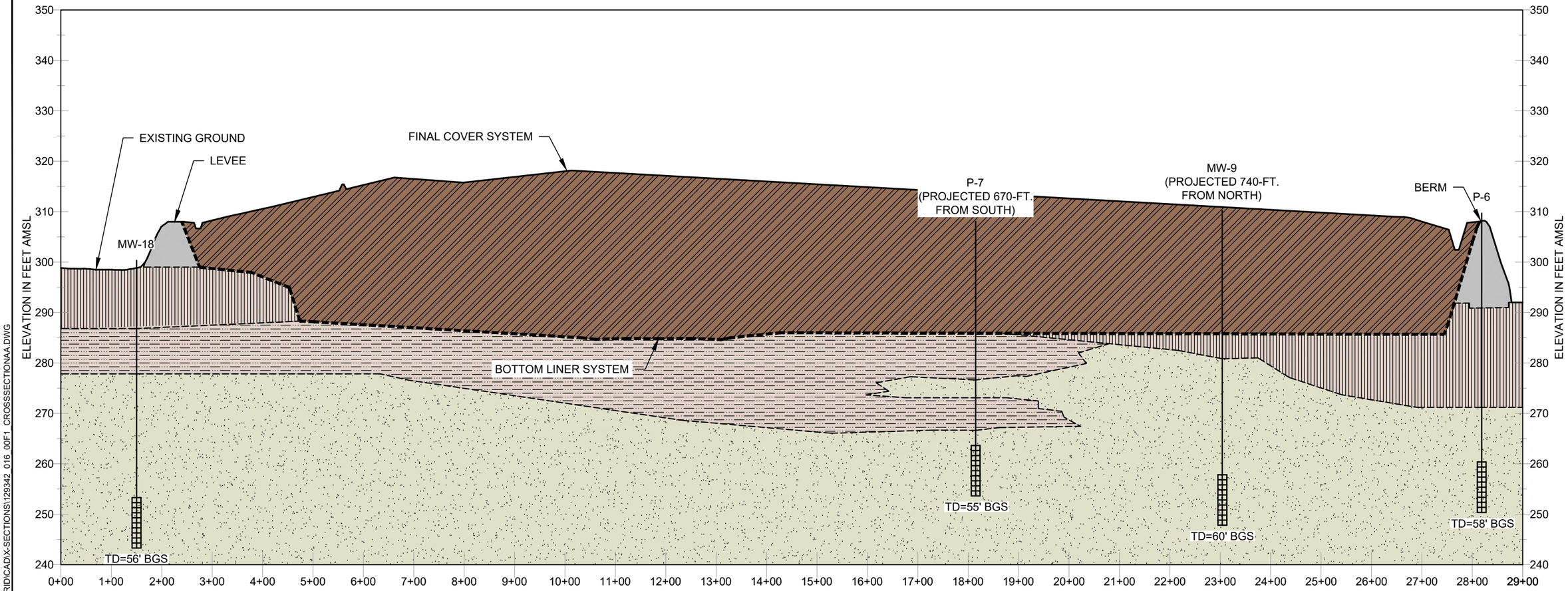
INACTIVE LINED POND
D - D' CROSS SECTION

aeci

NOVEMBER 2020

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\phx_common\Projects\AECI\New Madrid\GIS\MXDs\2020_111128064_001_0000_LP_D_D'_X-SECTION.mxd — USER: dzinsmaster — LAST SAVED: 11/23/2020 11:26:07 AM



LEGEND

- CCR
- ALLUVIUM MATERIAL
- SILT
- CLAYS
- BERM/LEVEE MATERIAL
- BOTTOM LINER

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. VERTICAL SCALE IS EXAGGERATED 10 TIMES.
3. IMPOUNDMENT IS IN CLOSURE CONSTRUCTION.
4. CCR - COAL COMBUSTION RESIDUALS
5. BGS - BELOW GROUND SURFACE
6. P-7 AND MW-9 ARE PROJECTED LOCATIONS ON PROFILE.
7. FOR GEOLOGIC MATERIALS BETWEEN DEPICTED BORINGS OR WELL LOCATIONS SHOWN ON THE SECTION, THAT MATERIAL IS EXPECTED TO BE AN ALLUVIUM MATERIAL CONSISTING OF SAND INTERBEDDED WITH SILTS AND CLAYS.

HORIZ. 0 200 400
VERT. 0 20 40
SCALE IN FEET

HALEY ALDRICH

ASSOCIATED ELECTRIC COOPERATIVE, INC.
NEW MADRID POWER PLANT
MARSTON, MISSOURI

INACTIVE LINED POND
GENERALIZED CROSS
SECTION D-D'

SCALE: AS SHOWN
NOVEMBER 2020

FIGURE 2

SAUNDERS, LEE Printed: 11/25/2020 3:39 PM Layout: ILAP_DD
\\HALEYALDRICH.COM\SHARE\PHX_COMMON\PROJECTS\AEC\NEW MADRID\CAD\X-SECTIONS\129342_016_00F1_CROSSSECTIONAA.DWG

ATTACHMENT 10

POND 004 STRUCTURAL STABILITY ASSESSMENT

www.haleyaldrich.com

REPORT ON

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
POND 004
NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
New Madrid, Missouri

File No. 40616-300
October 2016

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

16 October 2016
File No. 40616-300

Associated Electric Cooperative, Inc.
New Madrid Power Plant
P.O. Box 156
New Madrid, MO 63689

Attention: Ms. Jenny Burns
Environmental Analyst

Subject: Initial Periodic Structural Stability Assessment
Pond 004
New Madrid Power Plant
New Madrid, MO

Ms. Burns:

Enclosed please find our report on the Initial Periodic Structural Stability Assessment (Assessment) for the Associated Electric Cooperative, Inc. (AECI) coal combustion residuals (CCR) surface impoundment referred to as Pond 004 located at the New Madrid Power Plant (NMPP) in New Madrid, Missouri.

This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of AECI in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(d).

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Pond 004 surface impoundment; 2) visit the site to observe Pond 004; 3) evaluate whether the design, construction, operation, and maintenance of Pond 004 are consistent with recognized and generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our assessment including recommendations.

Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Steven F. Putrich, P.E.
Project Principal

Enclosures

Cc: Denis Bell-Haley & Aldrich

www.haleyaldrich.com

REPORT ON
INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
POND 004
NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
New Madrid, Missouri

File No. 40616-300
October 2016

Executive Summary

This report summarizes the results of our Initial Periodic Structural Stability Assessment for the Associated Electric Cooperative, Inc. (AECI) owned and operated Pond 004, including our site inspection of the unit. Pond 004 is designated as an existing coal combustion residuals (CCRs) surface impoundment, located at the New Madrid Power Plant in New Madrid, Missouri.

Our assessment was conducted in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Parts 257 and 261 (CCR Rule).

The dike consists of an earthen embankment with a crest length of approximately 3,000 feet around the entire impoundment. In addition, the western embankment consists of the Mississippi River Levee for about 1,050 ft and the dike abuts into the Levee. The dike embankment is approximately 6 to 15 feet in height and according to records, and the embankment is constructed of locally available silty clay.

Pond 004 was constructed for the purpose of storing and managing CCR and plant process water.

Dam Inspection Assessment and Recommendations

Based on conditions observed during our visual inspection of Pond 004, discussions with site personnel, a review of available documents and subsequent site visits, the following deficiencies were noted:

- Minor rutting and erosion in the upstream slope.
- Minor erosion and rutting of the gravel access road on the Northern embankment.
- Sparse vegetation exceeding 6 in. in height and minor brush on upstream slope within riprap.
- Sparse vegetation exceeding 6 in. height and brush on upstream slope.
- Vegetation exceeding 6 in. in height on the downstream slope.

Haley & Aldrich recommends the following actions:

- Cut/mow the embankments and routinely mow the embankment slopes (upstream and downstream) and downstream areas to maintain vegetation at a height of 6 in. or less.
- Repair minor ruts and erosion at the Pond 004 dikes and crest.
- Conduct a video inspection of outlet pipe from the drop inlet structure at a time that is reasonable based on operation of the impoundment.

Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected Pond 004 as described above. Based on our review of available information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

1. §257.73(d)(1)(i) – Stable Foundations and Abutments:

   Based on our review of available or developed subsurface information, as-built records, survey data, and observations during our inspection, the impoundment was judged to have stable foundations and abutments.

2. §257.73(d)(1)(ii) – Adequate Slope Protection:

   Based on observations during our site visits, at the southern portion of the dike, the upstream slope was graded about 2-1/2H:1V to 3H:1V. The top half of the slope was covered with grass and the bottom half was covered with riprap. The downstream slope of Pond 004 included portions that were vegetated with grass that appeared to be regularly mowed and portions that consisted of rip rap. The unit was determined to have adequate slope protection.

3. §257.73(d)(1)(iii) – Dikes Mechanically Compacted:

   Although records on the construction of the Pond 004 are not available, the test borings and laboratory testing performed by Haley & Aldrich, the results indicate that the berm fill was mechanically compacted during construction.

4. §257.73(d)(1)(iv) – Height of Vegetation:

   At the time of our impoundment inspection, portions of the east and south downstream slopes had vegetation taller than 6 inches in height, but this higher vegetation was sporadic and not excessively high.

5. §257.73(d)(1)(v)(A) – Spillway Cover:

   Pond 004 discharges through a concrete box intake structure located at the south end of the impoundment. Being a concrete structure, the structure is non-erodible and appears to be in good condition. There is no emergency spillway.

6. §257.73(d)(1)(v)(B) – Spillway Capacity:

   The spillway capacity for the impoundment will be modeled and calculated in accordance with §257.82 Hydrologic and Hydraulic Capacity Requirements for CCR surface impoundments. AECI will complete that capacity requirement under separate cover, consistent with the CCR Rule Preamble reference to the same.

7. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

   Only limited portions of the intake and outlet structures were visible during our inspection. Regarding the 18-in. corrugated metal pipe, the pipe is buried below the dike and only the downstream end of the pipe is visible. The visible portion of the pipe appeared sound and during our inspection, we observed no signs that would indicate seepage or internal erosion along the length of the pipe where it penetrates the east dike. The headwall was in good condition as well.

8. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

   The impoundment is located adjacent to the Mississippi River and has the potential to be inundated under higher than normal river elevations. Typically, the river has a gradual rise and fall over days and weeks, as opposed to a significant rapid drawdown on a much shorter timescale. To account for the unlikely event the Mississippi River experiences a significant low pool or sudden drawdown occurrence, a representative rapid drawdown review was considered to simulate the potential impact on the slopes. The results indicate that the impoundment will maintain adequate slope stability under this condition.

9. §257.73(d)(2) – Deficiencies and Recommendations:

   The Structural Stability Assessment did not identify any structural stability deficiencies for Pond 004.

PREFACE

The assessment of the general condition of Pond 004 is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the described condition of Pond 004 is based on observations of field conditions at the time of inspection and other site visits, along with other data available. It is important to note that the condition of the structure depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the structure will continue to represent the condition of the structure at some point in the future.

CERTIFICATION

I certify that the Periodic Structural Stability Assessment for AECI's Pond 004 at the New Madrid Power Plant was conducted in accordance with the requirements of §257.73(d) of the USEPA's CCR Rule.

Signed:_____

Certifying Engineer

Print Name:	Steven F. Putrich
Missouri License No.:	2014035813
Title:	Project Principal
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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Figure No.	Title
1	Project Locus
2	Site Plan
3	Photo Location Plan

1. Description of Project

1.1 GENERAL

1.1.1 Authority

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Associated Electric Cooperative, Inc. (AECI) to perform the Initial Periodic Structural Stability Assessment (Assessment) for the AECI Pond 004 coal combustion residuals (CCR) surface impoundment located at New Madrid Power Plant (NMPP) in New Madrid, Missouri. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(d).

This report summarizes the results of our Initial Periodic Structural Stability Assessment for the Pond 004 and berms, including our 5 September 2015 visual inspection of the dam and additional site visits. Results of our inspection were also included in our Initial Annual CCR Surface Impoundment PE Inspection Report dated 15 January 2016.

1.1.2 Purpose of Work

The purpose of this assessment was to document whether the design, construction, operation, and maintenance of Pond 004 are consistent with recognized and generally accepted good engineering practices. The visual inspection is intended to identify signs of distress or malfunction of the existing CCR surface impoundment, should they exist. This report summarizes those findings and notes conditions observed that are disrupting or have the potential to disrupt the operation and safety of the surface impoundment.

The investigation is divided into four parts: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Pond 004 surface impoundment; 2) perform a visual inspection of the surface impoundment dike; 3) evaluate whether the design, construction, operation, and maintenance of the impoundment and dike are consistent with generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation, including recommendations and remedial actions.

1.1.3 Definitions

To provide the reader a better understanding of the report, definitions of commonly used terms associated with dams/dikes are provided in Appendix C. Many of these terms may be included in this report. The terms are presented under common categories associated with surface impoundments which include: 1) orientation; 2) dam/dike components; 3) hazard potential classification; and 4) miscellaneous.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

The Pond 004, also referred to historically as the Slag Dewatering Pond, is located at the NMPP in New Madrid, Missouri. The site is located about 3 miles east of Marston, Missouri. The Site is accessible from the west via State Highway EE (off US route 55) and from the north and south from Levee Road. Pond 004 is located adjacent to the power plant, which is located at North latitude 36° 30.9' and West longitude 89° 33.6', as shown on the attached Project Locus in Figure 1. The impoundment can be accessed by vehicles from earthen access roads from the NMPP. Access to the site and dikes is restricted by full time security and barriers/fences at the plant.

1.2.2 Owner/Operator

Pond 004 is owned and maintained by Associated Electric Cooperative, Inc.

	Dam Owner/Caretaker
Name	AECI New Madrid Power Plant
Mailing Address	P.O. Box 156
Town, State, Zip	New Madrid, MO 63869
Contact	Roger Neumeyer
Title	Plant Manager
Email Address	rneumeyer@aeci.org
Emergency Phone	911

1.2.3 Purpose of Pond 004

The NMPP is a two-unit coal-fired power plant, with a maximum generating capacity of approximately 1200 Megawatts. Unit 1 was constructed in 1972 and Unit 2 was constructed in 1977. As part of plant operations, two impoundments were constructed for the purpose of storing and managing CCR and plant process water. The impoundments are known as Pond 004 and Pond 003 as related to their NPDES Outfall discharge names.

Pond 003 was constructed in 1972 and Pond 004 was constructed in 1984. The dikes function to impound fly ash and boiler slag for sedimentation and storage.

1.2.4 Description of the Dam and Appurtenances

Pond 004 is located east of the NMPP and north of Pond 003 with a Site Plan shown on Figure 2.

The dike consists of an earthen embankment with a crest length of approximately 3,000 feet around the entire impoundment. However, the northern portion of the impoundment consists of stage boiler slag within the impoundment footprint at the crest location which varies from about 100 to 200 ft in width for a length of about 800 ft. In addition, the western embankment consists of the Mississippi Levee for about 1,050 ft and the dike abuts into the Levee. For the purposes of this report, the entire 3,000 ft of

embankment surrounding the impoundment is considered the dike. The dike embankment is approximately 6 to 15 feet in height and according to records, and the embankment is constructed of locally available silty clay.

The impoundment has a surface area of approximately 10 acres at a water level elevation of 294 feet NAVD88. A gravel access road is present on the crest of the dam at El. 300 NAVD88.

As noted above, much of the northern portion of Pond 004 is filled with CCR that has settled in-place or has been staged within the impoundment footprint. Process water and CCR are discharged into the impoundment via four pipelines located at the north end of the pond. Process water and CCR are then decanted over/through a berm within the pond into the southern portion of the pond for final settling and flow management. Flows are directed to a concrete drop inlet structure with concrete stop logs and into a discharge pipe. Decant water discharges from the dam flow into the Mississippi River.

The downstream slopes are vegetated with grass cover and the upstream slopes are covered with grass cover and riprap at the water line.

1.2.5 Standard Operational Procedures

The impoundment is operated and maintained by NMPP personnel. Operation of the impoundment includes using the stop logs at the drop inlet structures to regulate the water levels and removal/recovery of settled CCR for reuse. Maintenance of the dike includes regular mowing of the downstream upstream and downstream slopes and removing vegetation from the riprap on upstream slopes. Weekly inspections are also completed.

The NMPP personnel monitor and inspect the dike according to a series of informal, unwritten and written protocols. These protocols include:

- Observation of the impoundment embankments during normal operation;
- Inspecting the slope protection, including the vegetation and riprap;
- Monitoring the water levels; and
- Historic semi-annual inspection of the impoundments by NMPP personnel (now completed weekly).

1.2.6 Hazard Potential Classification

Hazard Potential Classification is being completed outside the scope of this report in accordance with the applicable regulations. Results will be provided under separate cover.

1.3 PERTINENT ENGINEERING DATA

1.3.1 Drainage Area

Based on the original design documents and observations from the site visit, Pond 004 does not receive drainage from the surrounding areas, only the immediate access roads on top of the dike and direct precipitation. Water is directed to the impoundment from the NMPP operations (i.e. discharge of process water).

1.3.2 Reservoir

Pond 004 has an estimated surface area of approximately 10 acres and a storage volume of at least 14 acre-ft.

In general, the reservoir contains varying amounts of fly ash and boiler slag mixed with water. At some locations the ash has settled, or been staged, to levels above water levels and abuts the dams.

1.3.3 Discharges from Pond 004

Water discharged into Pond 004 flows from the north end of the reservoir through an open channel within the impoundment. CCR is separated from the water through settling and decant water flows to a concrete drop inlet structure at the southeastern end of the reservoir. Water is directed to a discharge pipe extending through the dike which flows to the Mississippi River.

1.3.4 Relevant Elevations

Elevations referenced in this report are in feet and are based on the North American Vertical Datum of 1988 (NAVD88).

The low point on crest elevation is at approximate El. 300 and the normal pool is generally at El. 293.6.

A.	Top of Dam	301
B.	Normal Pool	293.6
C.	Spillway Crest	301
D.	Upstream Water at Time of Inspection	296 (stoplogs temporarily at higher elevation)
E.	Spillway Type	Concrete Drop Inlet with corrugated metal pipe
F.	Spillway Invert	El. 289.3

1.3.5 Design and Construction Records

Pond 004 was constructed in 1984 to impound boiler slag. The dike was designed by Burns & McDonnell per plant personnel, however records of the design were not readily available.

1.3.6 Operating Records

Written operational records have not been historically maintained for the impoundment prior to the CCR Rule. AECI has been completing weekly inspections per the CCR Rule and maintains an operating record for required information.

2. Inspection

2.1 VISUAL INSPECTION

On 1 September 2015, Haley & Aldrich completed a visual inspection of Pond 004. The following paragraphs describe the conditions of the impoundment and dike observed during the inspection. In addition, refer to the photographs and checklist forms included in Appendices A and B, respectively for additional comments.

2.1.1 General Findings

2.1.1.1 *Upstream Slope*

The northern portion of the impoundment is utilized for CCR recovery operations and the CCR is at, or slightly above the crest at this location. The CCR recovery operation and the temporary staging created a dam crest that was essentially 150 ft wide or wider at some locations. This section of the impoundment was filled-in with CCR. The upstream slope of the dike was not exposed at the northern portion of the impoundment.

At the southern portion of the impoundment, the upstream slope was graded about 2-1/2H:1V to 3H:1V. The top half of the slope was covered with grass and the bottom half was covered with riprap. Overgrown vegetation was observed along the southern portion of the dike. Isolated pockets of erosion were observed at the western portion of the dike. Along the southern portion of the impoundment, the dike was graded into the Mississippi River Levee crest and upstream slope, which is about 6 to 8 ft above the dike general elevation. The water level at the time of the site visit was approximately El. 296.

2.1.1.2 *Crest*

The northern, eastern, and southern portions of the Pond 004 crest consisted of a gravel access road. The western portion of the crest consisted of a paved levee access road, which is also the Mississippi River Levee. The crest alignment appeared generally level in most locations. Minor rutting of the gravel access road was observed on the southern and eastern portion of the dike. In addition, an access ramp has been installed along the eastern side of the impoundment which cuts through the crest and downstream slope. The access ramp consists of loose gravel without erosion protection. The southern portion of the crest is graded at a slope up to the crest elevation of the Mississippi River Levee to provide vehicle access along the road system.

2.1.1.3 *Downstream Slope*

The downstream slope of Pond 004 included portions that were vegetated with grass that appeared to be regularly mowed and portions that consisted of rip rap. A series of pipes are present along the downstream slope of the western embankment which lead to Pond 003. Additionally, a road with an unlined drainage ditch is located along the downstream toe of the western embankment.

2.1.1.4 *Emergency Spillway*

Four (4) 10 in. pipes discharge CCR and water into Pond 004. There were no leaks or defects observed in the discharge pipes that required repair.

Water flows out of Pond 004 through a concrete drop outlet at the southeast corner of the impoundment. The water level in the impoundment is controlled by concrete stop logs. Water flows over the stoplogs and into an 18 in. diameter drain pipe and flow is discharged at a concrete headwall along the banks of the Mississippi River approximately 175 ft downstream. The concrete headwall is about 15 ft in length, 4 ft in height and 10 in. thick. An 18 in. diameter corrugated metal drain pipe with a metal backflow preventer extends about 4 ft out beyond the headwall.

The concrete drop inlet spillway appeared to have minor, isolated, concrete chips and weathering. Minor, surficial rusting was observed on the stoplog removal winch and frame. Deficiencies in the discharge headwall and drainage pipe were not observed.

No other emergency spillway exists.

2.1.1.5 *Downstream Area*

Downstream of the impoundment is a grassed area which varied in height from about 4 to 8 in. and appeared mowed. An overgrown area of brush and trees, less than 6 in. diameter, exists about 40 to 80 ft downstream of the downstream toe. The overgrown area is generally the top banks of the Mississippi River.

2.2 CARETAKER INTERVIEW

On the day of the inspection, Haley & Aldrich met with AECI personnel familiar with the operations, maintenance and construction of Pond 004. Information provided by AECI personnel has been incorporated into this report.

2.3 OPERATION AND MAINTENANCE PROCEDURES

The impoundment is operated and maintained by NMPP personnel. Operation of the impoundment includes using the stop logs at the drop inlet structures to regulate the water levels and removal/recovery of settled CCR for reuse. Maintenance of the dike includes regular mowing of the downstream upstream and downstream slopes and removing vegetation from the riprap on upstream slopes. Weekly inspections are also completed. A formal operations and maintenance plan does not exist for the unit.

2.4 EMERGENCY ACTION PLAN

A written Emergency Action Plan (EAP) does not exist for unit; however, plant personnel are generally familiar with dam operations and construction. Also, the site is staffed full time and heavy earthmoving construction equipment is at the site. A communications plan is in place for the Plant.

2.5 OVERTOPPING POTENTIAL

Based on the inflow to the impoundment from only plant water and direct precipitation, the overtopping potential of the dam is low based on management of water within the impoundment.

3. Impoundment Inspection Assessment and Recommendations

3.1 ASSESSMENT

We provide the following assessment of Pond 004. The following deficiencies were observed at Pond 004:

- Minor rutting and erosion in the upstream slope.
- Minor erosion and rutting of the gravel access road on the Northern embankment.
- Sparse vegetation exceeding 6 in. in height and minor brush on upstream slope within riprap.
- Sparse vegetation exceeding 6 in. height and brush on upstream slope.
- Vegetation exceeding 6 in. in height on the downstream slope.

3.2 RECOMMENDATIONS

Maintenance of the dike is required and should include cutting/mowing of vegetation on the dike and embankments for continued ability to adequately inspect the impoundment. Mowing of the vegetation should be completed as needed to maintain healthy grass cover at less than 6 in. in height in the current CCR Rule requirements. Additional evaluation of the outlet pipe is recommended as well to confirm integrity.

3.3 REMEDIAL MEASURES

We recommend the following remedial measures be undertaken:

- Cut/mow the embankments and routinely mow the embankment slopes (upstream and downstream) and downstream areas to maintain vegetation at a height of 6 in. or less.
- Repair minor ruts and erosion at the Pond 004 dikes and crest.
- Conduct a video inspection of outlet pipe from the drop inlet structure at a time that is reasonable based on operation of the impoundment.

4. Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected Pond 004 as described above. Based on our review of available information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

10. §257.73(d)(1)(i) – Stable Foundations and Abutments:

    Based on our review of available or developed subsurface information, as-built records, survey data, and observations during our inspection, the impoundment was judged to have stable foundations and abutments.

11. §257.73(d)(1)(ii) – Adequate Slope Protection:

    Based on observations during our site visits, at the southern portion of the dike, the upstream slope was graded about 2-1/2H:1V to 3H:1V. The top half of the slope was covered with grass and the bottom half was covered with riprap. The downstream slope of Pond 004 included portions that were vegetated with grass that appeared to be regularly mowed and portions that consisted of rip rap. The unit was determined to have adequate slope protection.

12. §257.73(d)(1)(iii) – Dikes Mechanically Compacted:

    Although records on the construction of the Pond 004 are not available, the test borings and laboratory testing performed by Haley & Aldrich, the results indicate that the berm fill was mechanically compacted during construction.

13. §257.73(d)(1)(iv) – Height of Vegetation:

    At the time of our impoundment inspection, portions of the east and south downstream slopes had vegetation taller than 6 inches in height, but this higher vegetation was sporadic and not excessively high.

14. §257.73(d)(1)(v)(A) – Spillway Cover:

    Pond 004 discharges through a concrete box intake structure located at the south end of the impoundment. Being a concrete structure, the structure is non-erodible and appears to be in good condition. There is no emergency spillway.

15. §257.73(d)(1)(v)(B) – Spillway Capacity:

    The spillway capacity for the impoundment will be modeled and calculated in accordance with §257.82 Hydrologic and Hydraulic Capacity Requirements for CCR surface impoundments. AECI will

complete that capacity requirement under separate cover, consistent with the CCR Rule Preamble reference to the same.

16. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

    Only limited portions of the intake and outlet structures were visible during our inspection. Regarding the 18-in. corrugated metal pipe, the pipe is buried below the dike and only the downstream end of the pipe is visible. The visible portion of the pipe appeared sound and during our inspection, we observed no signs that would indicate seepage or internal erosion along the length of the pipe where it penetrates the east dike. The headwall was in good condition as well.

17. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

    The impoundment is located adjacent to the Mississippi River and has the potential to be inundated under higher than normal river elevations. Typically, the river has a gradual rise and fall over days and weeks, as opposed to a significant rapid drawdown on a much shorter timescale. To account for the unlikely event the Mississippi River experiences a significant low pool or sudden drawdown occurrence, a representative rapid drawdown review was considered to simulate the potential impact on the slopes. The results indicate that the impoundment will maintain adequate slope stability under this condition.

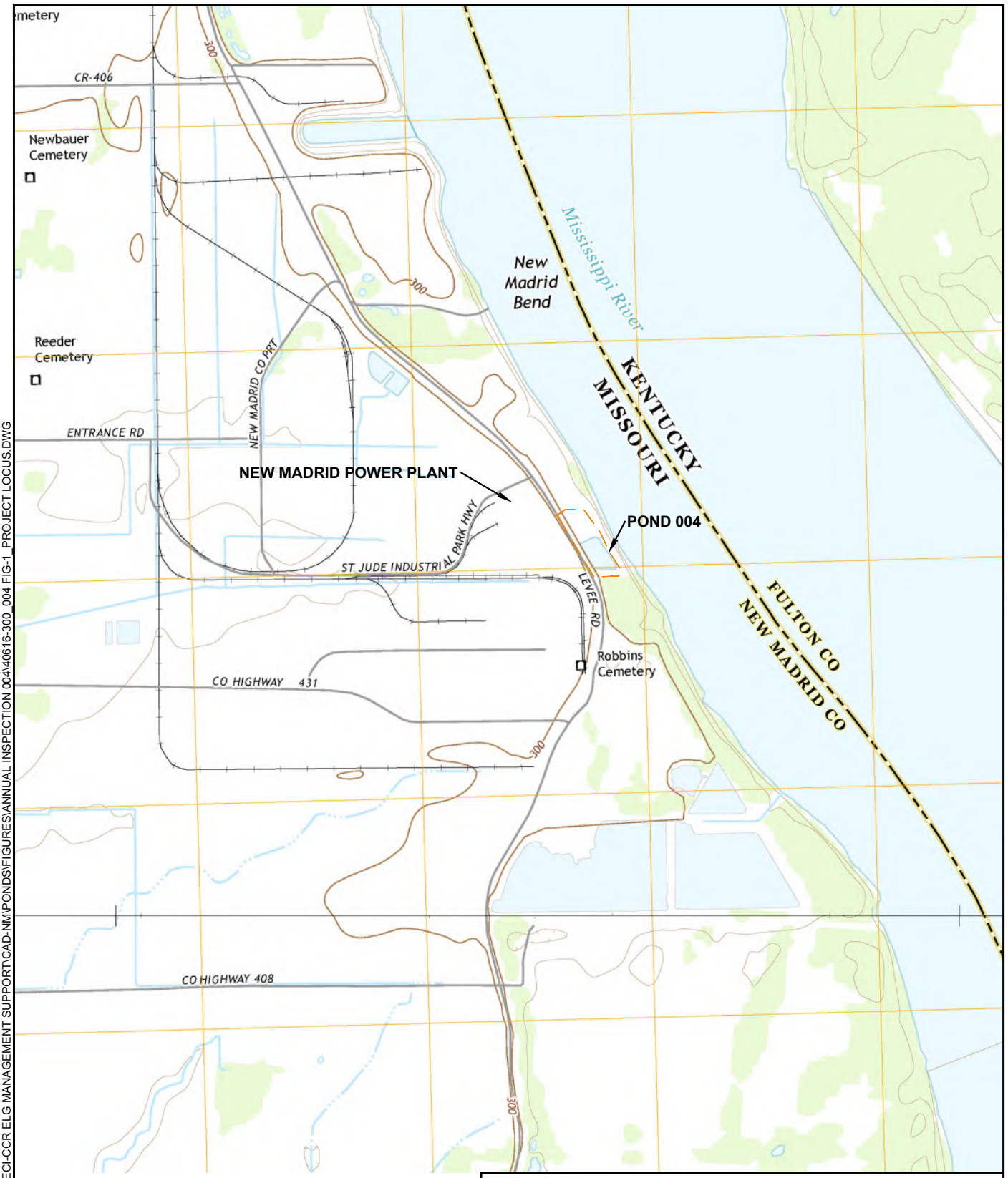
18. §257.73(d)(2) – Deficiencies and Recommendations:

    The Structural Stability Assessment did not identify any structural stability deficiencies for Pond 004.

AECI is performing a Safety Factor Assessment in accordance EPA's Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Parts 257 and 261. The results of the Safety Factor Assessment will be provided under separate cover.

5. References

1. GZA GeoEnvironmental, Inc., “Round 7 Dam Assessment, Associated Electric Cooperative, Inc. New Madrid Power Plant Ash Pond 1 & 2 and Slag Pond 1 & 2 Impoundments,” June 2011.



MAPSOURCE: USGS
NEW MADRID, MO-KY
POINT PLEASANT, MO-TN-KY
2015

HALEY ALDRICH

ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
POND 004
NEW MADRID POWER PLANT
NEW MADRID, MO

PROJECT LOCUS

APPROXIMATE SCALE: 1" = 2000'
JANUARY 2016

FIGURE 1

LUCAS, ANDY Printed: 1/15/2016 3:11 PM Layout: PROJECT LOCUS
\\CLE\COMMON\PROJECTS\40616 AECI-CCR ELG MANAGEMENT SUPPORT\CAD-NM\POND\SI\FIGURES\ANNUAL INSPECTION 004\40616-300_004 FIG-1 PROJECT LOCUS.DWG

LEGEND

APPROXIMATE LIMITS OF POND 004

NOTES

1. AERIAL IMAGERY PROVIDED BY AECI AND WAS CONDUCTED BY PICTOMETRY INTERNATIONAL CORP BETWEEN 4-8 OCTOBER 2014.

N

0 120 240
SCALE IN FEET

HALEY ALDRICH

ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
POND 004
NEW MADRID POWER PLANT
NEW MADRID, MO

SITE PLAN

SCALE: AS SHOWN
JANUARY 2016

FIGURE 2

LUCAS, ANDY Printed: 1/15/2016 3:10 PM Layout: SITE PLAN
\\GLE\COMMON\PROJECTS\40616_AECI-CCR ELG MANAGEMENT SUPPORT\CAD-NM\PONDS\FIGURES\ANNUAL INSPECTION 004\40616-300_004 FIG-2_SITE PLAN.DWG

LEGEND

APPROXIMATE LIMITS OF POND 004

1 PHOTO LOCATION/DIRECTION

NOTES

1. AERIAL IMAGERY PROVIDED BY AECI AND WAS CONDUCTED BY PICTOMETRY INTERNATIONAL CORP BETWEEN 4-8 OCTOBER 2014.

N

0 120 240

SCALE IN FEET

HALEY ALDRICH

ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
POND 004
NEW MADRID POWER PLANT
NEW MADRID, MO

PHOTO LOCATION PLAN

SCALE: AS SHOWN
JANUARY 2016

FIGURE 3

LUCAS, ANDY Printed: 1/15/2016 2:47 PM Layout: PHOTO LOCATIONS PLAN
\\GLE\COMMON\PROJECTS\40616_AECI-CCR ELG MANAGEMENT SUPPORT\CAD-NM\PONDS\FIGURES\ANNUAL INSPECTION 004\40616-300_004 FIG-3_PHOTO LOCATION PLAN.DWG

APPENDIX A

Photographs

Photograph No. 1
Slag Dewatering Pond Dam (004 Pond)
Four inlet pipes with headwall

Photograph No. 2
Slag Dewatering Pond Dam (004 Pond)
Minor rutting and erosion in upstream slope

Photograph No. 3
Slag Dewatering Pond Dam (004 Pond)
Upstream slope of western embankment

Photograph No. 4
Slag Dewatering Pond Dam (004 Pond)
Upstream slope of northern embankment

Photograph No. 5
Slag Dewatering Pond Dam (004 Pond)
Upstream slope of eastern embankment with riprap and vegetation

Photograph No. 6
Slag Dewatering Pond Dam (004 Pond)
Crest of eastern embankment

Photograph No. 7
Slag Dewatering Pond Dam (004 Pond)
Downstream slope of eastern embankment with ruts and uneven surface

Photograph No. 8
Slag Dewatering Pond Dam (004 Pond)
Downstream slope of eastern embankment with riprap

Photograph No. 9
Slag Dewatering Pond Dam (004 Pond)
Upstream slope with riprap and vegetation

Photograph No. 10
Slag Dewatering Pond Dam (004 Pond)
Downstream slope with Mississippi River Levee in Background

Photograph No. 11
Slag Dewatering Pond Dam (004 Pond)
Concrete drop inlet spillway with stoplogs
Mississippi River in background

Photograph No. 12
Slag Dewatering Pond Dam (004 Pond)
Discharge pipe to Mississippi River with backflow preventer

APPENDIX B

Inspection Checklist

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Slag Dewatering Pond (004 Pond) Dam

STATE ID #: MO-0001171

REGISTERED: (YES/NO) No

NID ID #: N/A

STATE SIZE CLASSIFICATION: Small

STATE HAZARD CLASSIFICATION: TBD

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: (YES/NO)

DAM LOCATION INFORMATION

CITY/TOWN: New Madrid

COUNTY/STATE: *New Madrid/Missouri*

DAM LOCATION: (street address if known) 41 St. Jude Park, Marston, MO

ALTERNATE DAM NAME: N/A

USGS QUAD.: New Madrid, MO-KY

LAT.: 36° 30.9' N

LONG.: 89° 33.6' W

DRAINAGE BASIN: N/A

RIVER: Mississippi River

IMPOUNDMENT NAME(S): Pond 004

GENERAL DAM INFORMATION

TYPE OF DAM: Earthen Incised and Bermed

OVERALL LENGTH (FT): 3000

PURPOSE OF DAM: Sedimentation and Storage Basin

NORMAL POOL STORAGE (ACRE-FT):

YEAR BUILT: 1984

MAXIMUM POOL STORAGE (ACRE-FT): 14

STRUCTURAL HEIGHT (FT): 20

EL. NORMAL POOL (FT): 294.0

HYDRAULIC HEIGHT (FT): 6

EL. MAXIMUM POOL (FT): 300.0 (minimum crest elevation)

RESERVOIR SURFACE AREA (ACRES): 10

WINTER DRAWDOWN (FT BELOW NORMAL POOL) 0.0

PUBLIC ROAD ON CREST: No

DRAWDOWN VOL. (AC-FT) 0.0

PUBLIC BRIDGE OVER SPILLWAY: No

NAME OF DAM: Pond 004 STATE ID #: MO-0001171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

INSPECTION SUMMARY

DATE OF INSPECTION: September , 2015 DATE OF PREVIOUS INSPECTION: October 6, 2010

TEMPERATURE/WEATHER: Sunny, 88 ARMY CORPS PHASE I: (YES/NO) No If YES, date

CONSULTANT: Haley & Aldrich, Inc. PREVIOUS ALT. PHASE I: (YES/NO) No If YES, date

BENCHMARK/DATUM: NAVD88

OVERALL PHYSICAL CONDITION OF DAM: DATE OF LAST REHABILITATION: N/A

SPILLWAY CAPACITY:

EL. POOL DURING INSP.: 296 EL. TAILWATER DURING INSP.: 296

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Denis Bell	Senior Engineer	Haley & Aldrich, Inc
Andy Lucas	Staff Engineer	Haley & Aldrich, Inc
Dennis Cox		AECI

NAME OF DAM:	Pond 004	STATE ID #:	MO-0001171
INSPECTION DATE:	September 1, 2015	NID ID #:	N/A

OWNER:	ORGANIZATION	Associated Electric Cooperative, I	CARETAKER:	ORGANIZATION	Associated Electric Cooperative, Inc.
	NAME/TITLE	Mr. Dennis Cox		NAME/TITLE	Mr. Dennis Cox
	STREET	P.O. Box 156		STREET	P.O. Box 156
	TOWN, STATE, ZIP	New Madrid, MO 63869		TOWN, STATE, ZIP	New Madrid, MO 63869
	PHONE			PHONE	
	EMERGENCY PH. #			EMERGENCY PH. #	
	FAX			FAX	
	EMAIL			EMAIL	
	OWNER TYPE	Private			

PRIMARY SPILLWAY TYPE	Decant Structure		
SPILLWAY LENGTH (FT)	N/A	SPILLWAY CAPACITY (CFS)	N/A
AUXILIARY SPILLWAY TYPE	N/A	AUX. SPILLWAY CAPACITY (CFS)	N/A
NUMBER OF OUTLETS	One	OUTLET(S) CAPACITY (CFS)	Unknown
TYPE OF OUTLETS	One Decant	TOTAL DISCHARGE CAPACITY (CFS)	Unknown
DRAINAGE AREA (SQ MI)	0.02	SPILLWAY DESIGN FLOOD (PERIOD/CFS)	Unkown
HAS DAM BEEN BREACHED OR OVERTOPPED? (YES/NO):	No	IF YES, PROVIDE DATE(S)	
FISH LADDER (LIST TYPE IF PRESENT)	Unkown		
DOES CREST SUPPORT PUBLIC ROAD? (YES/NO)	No	IF YES, ROAD NAME:	
PUBLIC BRIDGE WITHIN 50' OF DAM? (YES/NO):	No	IF YES, ROAD/BRIDGE NAME:	
		MHD BRIDGE NO. (IF APPLICABLE)	

NAME OF DAM: Pond 004 STATE ID #: MO-0001171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None observed	X		
	2. SLOPE PROTECTION TYPE AND COND.	None observed	X		
	3. SINKHOLE/ANIMAL BURROWS	None observed	X		
	4. EMB.-ABUTMENT CONTACT	None observed	X		
	5. EROSION	Erosion and rutting noted in the Northwestern portion of the impoundment			X
	6. UNUSUAL MOVEMENT	None observed	X		
	7. VEGETATION (PRESENCE/CONDITION)	None observed	X		

ADDITIONAL COMMENTS: Ash has been stockpiled to an elevation equal to the embankment in the Northern portion of the Slag Dewatering Pond. Therefore, the upstream slope was covered by ash and not visible for inspection.

NAME OF DAM: Pond 004 STATE ID #: MO-0001171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Gravel access road, western crest was paved levee road	X		
	2. SURFACE CRACKING	None observed	X		
	3. SINKHOLES, ANIMAL BURROWS	None observed	X		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	None observed	X		
	5. HORIZONTAL ALIGNMENT	None observed	X		
	6. RUTS AND/OR PUDDLES	None observed	X		
	7. VEGETATION (PRESENCE/CONDITION)	Regularly mowed grass	X		
	8. ABUTMENT CONTACT	N/A	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Pond 004 STATE ID #: MO-0001171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None observed	X		
	2. SEEPAGE	None observed	X		
	3. SLIDE, SLOUGH, SCARP	None observed	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. SINKHOLE/ANIMAL BURROWS	None observed	X		
	6. EROSION	None observed	X		
	7. UNUSUAL MOVEMENT	None observed	X		
	8. VEGETATION (PRESENCE/CONDITION)	Woody vegetation near toe of embankment			X

ADDITIONAL COMMENTS: Near the Northeast portion, woody vegetation was observed near the toe of the embankment of the downstream slope.

NAME OF DAM: Pond 004 STATE ID #: MO-000171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Decant structure	X		
	WEIR TYPE	Concrete stoplogs in decant structure	X		
	SPILLWAY CONDITION	Fair	X		
	TRAINING WALLS	None present	X		
	SPILLWAY CONTROLS AND CONDITION	None present	X		
	UNUSUAL MOVEMENT	None present	X		
	APPROACH AREA	Fair	X		
	DISCHARGE AREA	Fair	X		
	DEBRIS	None present	X		
	WATER LEVEL AT TIME OF INSPECTION	294	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Pond 004 STATE ID #: MO-000171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	Outlet - 18 in. diameter currugated HDPE. Discharge to Mississippi River			
	INTAKE STRUCTURE	Decant structure with stoplogs			
	TRASHRACK	N/A			
	PRIMARY CLOSURE	N/A			
	SECONDARY CLOSURE	N/A			
	CONDUIT	N/A			
	OUTLET STRUCTURE/HEADWALL	15 ft. length, 4 ft. height, 10 in. thick. Appears stable			
	EROSION ALONG TOE OF DAM	None			
	SEEPAGE/LEAKAGE	None			
	DEBRIS/BLOCKAGE	None			
	UNUSUAL MOVEMENT	None			
	DOWNSTREAM AREA	Heavily vegetated. Woody vegetation.			
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

NAME OF DAM: Pond 004 STATE ID #: MO-000171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	None Present	X		
	2. FOUNDATION SEEPAGE	None Present	X		
	3. SLIDE, SLOUGH, SCARP	None Present	X		
	4. WEIRS	None Present	X		
	5. DRAINAGE SYSTEM	None Present	X		
	6. INSTRUMENTATION	None Present	X		
	7. VEGETATION	Grass less than 6"	X		
	8. ACCESSIBILITY	Gravel access road along crest. Full time security and fence	X		
	9. DOWNSTREAM HAZARD DESCRIPTION				
	10. DATE OF LAST EAP UPDATE				

ADDITIONAL COMMENTS:

NAME OF DAM: Pond 004 STATE ID #: MO-0001171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	None present	X		
	2. OBSERVATION WELLS	None present	X		
	3. STAFF GAGE AND RECORDER	None present	X		
	4. WEIRS	None present	X		
	5. INCLINOMETERS	None present	X		
	6. SURVEY MONUMENTS	None present	X		
	7. DRAINS	None present	X		
	8. FREQUENCY OF READINGS	No measurements are taken	X		
	9. LOCATION OF READINGS	N/A	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Pond 004 STATE ID #: MO-000171

INSPECTION DATE: September 1, 2015 NID ID #: N/A

UNDERLYING HYDRAULIC STRUCTURES/PIPES

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
UNDERLYING HYDRAULIC STRUCTURES /PIPES	TYPE	18" corrugated HDPE outlet	X		
	INLET				
	CONDUIT				
	OUTLET STRUCTURE/HEADWALL	Fair	X		
	EROSION ALONG STRUCTURE	None present	X		
	SEEPAGE/LEAKAGE	None present	X		
	DEBRIS/BLOCKAGE	None present	X		
	UNUSUAL MOVEMENT				
	DOWNSTREAM AREA				
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

Note: Use additional sheets for additional outlets.

APPENDIX C

Definitions

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions, refer to the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate there from including but not be limited to spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Size Classification

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height and having a storage capacity of less than 15 acre-feet.

Hazard Classification
(In the event the impoundment should fail, the following would occur):

Less Than Low Hazard Potential - Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

Low Hazard Potential - Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential - Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential - Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

General

EAP – Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. On million U.S. gallons = 3.068 acre feet

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Condition Rating

Unsafe - Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

Poor - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

ATTACHMENT 11

LINED POND STRUCTURAL STABILITY ASSESSMENT

www.haleyaldrich.com

REPORT ON

INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
INACTIVE LINED POND
NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
New Madrid, Missouri

File No. 129342-015
April 2018

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

17 April 2018
File No. 129342-015

Associated Electric Cooperative, Inc.
New Madrid Power Plant
P.O. Box 156
New Madrid, MO 63689

Attention: Ms. Jenny Burns
Environmental Analyst

Subject: Initial Periodic Structural Stability Assessment
Inactive Lined Pond
New Madrid Power Plant
New Madrid, MO

Ms. Burns:

Enclosed please find our report on the Initial Periodic Structural Stability Assessment (Assessment) for the Associated Electric Cooperative, Inc. (AECI) inactive coal combustion residuals (CCR) surface impoundment referred to as the Inactive Lined Pond (Lined Pond) located at the New Madrid Power Plant (NMPP) in New Madrid, Missouri.

This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of AECI in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(d). Based on the USEPA's issued CCR Rule Partial Vacatur in 2016, the inactive Lined Pond impoundment at the NMPP is subject to applicable requirements of the CCR Rule.

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Lined Pond surface impoundment; 2) visit the site to observe Lined Pond; 3) evaluate whether the design, construction, operation, and maintenance of Lined Pond are consistent with recognized and generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our assessment including recommendations.

Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Steven F. Putrich, P.E.
Project Principal

Enclosures

www.haleyaldrich.com

REPORT ON
INITIAL PERIODIC STRUCTURAL STABILITY ASSESSMENT
INACTIVE LINED POND
NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
New Madrid, Missouri

File No. 129342-015
April 2018

Executive Summary

This report summarizes the results of our Initial Periodic Structural Stability Assessment for the Associated Electric Cooperative, Inc. (AECI) owned and operated Inactive Lined Pond (Lined Pond), including our site inspection of the unit. The Lined Pond is designated as an inactive coal combustion residuals (CCRs) surface impoundment, located at the New Madrid Power Plant in New Madrid, Missouri.

Our assessment was conducted in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Parts 257 and 261 (CCR Rule). Based on the USEPA's issued CCR Rule Partial Vacatur in 2016, the inactive Lined Pond impoundment at the NMPP is subject to applicable requirements of the CCR Rule.

The dike consists of an earthen embankment with a crest length of approximately 7,700 feet around the entire impoundment. In addition, the western embankment consists of the US Army Corps of Engineers operated and maintained Mississippi River Levee system for about 1,600 ft and the dike abuts into the Levee. The embankment is approximately 6 to 25 feet in height.

The Lined Pond was constructed for the purpose of storing fly ash, which continued between 1994 and approximately 2007. After 2007, fly ash has been directed to the on-site Utility Waste Landfill.

Dam Inspection Assessment and Recommendations

Based on conditions observed during our visual inspection of the Lined Pond, discussions with site personnel, a review of available documents and a site visit, the following deficiencies were noted:

- Unseeded areas on the downstream slope and downstream bench area of eastern embankment.
- Erosion rills less than 6 inches deep on downstream slope of eastern embankment.
- Minor erosion and rutting of the gravel access road on the southern embankment.
- Slough on downstream slope of eastern embankment.
- Grass exceeding 6 inches in height at majority of the areas on downstream slopes of eastern, southern and western embankments.
- Sparse vegetation exceeding 6 inches in height on the upstream and downstream sides of the crest of eastern embankment and downstream side of crest of western embankment.
- Accumulation of water, forming within a depression area in downstream toe area of southern embankment.

Haley & Aldrich recommends the following actions:

- Mow grass exceeding 6 inches in height on downstream slopes of eastern, southern and western embankments, and mow/cut vegetation exceeding 6 inches in height on the upstream and downstream sides of the crest of eastern embankment and downstream side of crest of western embankment.
- Repair minor ruts and erosion along the gravel access road on the crest of southern embankment.
- Seed unseeded areas of downstream slope of eastern embankment to establish vegetation.

- Re-work depressed area in the downstream toe area of southern embankment so that water will not continue to pond at the toe after a rainfall event. Property boundaries may need to be evaluated to allow for this activity to be completed.

Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected the Lined Pond as described above. Based on our review of available information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

1. <u>§257.73(d)(1)(i) – Stable Foundations and Abutments:</u>

   Based on review of available documents pertaining to Lined Pond and our observations during the inspection, the Lined Pond appears to have stable foundations and abutments. A Safety Factor Assessment for the Lined Pond is being completed and it will be provided under separate cover.

2. <u>§257.73(d)(1)(ii) – Adequate Slope Protection:</u>

   Based on our observations, the downstream slopes of southern and western embankments have an approximate slope of 3H:1V and these slopes are covered with grass. The upstream slope is exposed at the southeastern part of the pond, where parts of southern and eastern embankments have unprotected Hyperflex liner exposed on the approximately 3.0H:1.0V upstream slope of these embankments. This part of the Lined Pond is occupied with ponded water. It is understood that the downstream slope of the eastern embankment, which also has an approximate slope of 3H:1V, historically exhibited significant sloughing and these were remedied in 2012 through installation of plate-piles along this slope. During our inspection, we observed that a bench has been constructed at the lower part of the downstream slope (where it reaches approximately the Raw Water Pond water level elevation) using rip rap and this bench was covered with a compacted soil layer. Rip-rap is present along the contact between the downstream slope/bench and the water level in the Raw Water Pond. Due to repairs and re-grading along the downstream slope of eastern embankment, we observed that parts of the downstream slope of eastern embankment have not been seeded, as of the date of the inspection. Minor erosion rills (less than 6 inches in depth) were observed on the unseeded portions of the slope.

   The Lined Pond was determined to have adequate slope protection except for the unprotected liner areas on the upstream slope of eastern and southern embankments, and the unseeded portions of the downstream slope of eastern embankment.

3. <u>§257.73(d)(1)(iii) – Dikes Mechanically Compacted:</u>

   Based on drawings described as conforming to construction records, dikes appear to have been constructed of compacted fill. Based on explorations performed by Haley & Aldrich in 2017, the consistency of fine-grained soils encountered in embankment fill material was generally stiff. These

subsurface information and observations made during our visit indicate that the dikes were mechanically compacted.

4. §257.73(d)(1)(iv) – Height of Vegetation:

   At the time of our inspection, much of the downstream slope of eastern, southern and western embankments were covered with grassy vegetation that exceeded 6 inches in height. Sporadic and isolated bushes reaching up to 2 feet were also present in some parts of the eastern part of the crest of eastern embankment and upper parts of the downstream slope of the western embankment. In the downstream toe area of the southern embankment, but beyond the embankment toe, trees and tall bushes are present.

5. §257.73(d)(1)(v)(A) – Spillway Cover:

   The Lined Pond does not have a spillway, therefore §257.73(d)(1)(v)(A) does not apply to Lined Pond.

6. §257.73(d)(1)(v)(B) – Spillway Capacity:

   The Lined Pond does not have a spillway, therefore §257.73(d)(1)(v)(B) does not apply to Lined Pond.

7. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

   Two 18-inch pipes pass through the eastern embankment. Only the discharge/outfall part of the pipes were partially visible on the downstream side of eastern embankment (i.e. Raw Water Pond side). Along the alignment of these two buried pipes, no settlement of ground surface was observed on the crest, upstream slope, and downstream slope of eastern embankment.

8. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

   The Lined Pond is not located directly adjacent to the Mississippi River, however the Raw Water Pond, which forms the downstream toe area of the eastern embankment of Lined Pond, is located adjacent to Mississippi River and has the potential to be inundated under higher than normal river elevations. This could cause inundation of the downstream slope of eastern embankment of Lined Pond.

9. §257.73(d)(2) – Deficiencies and Recommendations:

   The Structural Stability Assessment did not identify any structural stability deficiencies for Lined Pond.

PREFACE

The assessment of the general condition of Lined Pond is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the described condition of Lined Pond is based on observations of field conditions at the time of inspection and other site visits, along with other data available. It is important to note that the condition of the structure depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the structure will continue to represent the condition of the structure at some point in the future.

CERTIFICATION

I certify that the Periodic Structural Stability Assessment for AECI's Inactive Lined Pond at the New Madrid Power Plant was conducted in accordance with the requirements of §257.73(d) of the USEPA's CCR Rule.

Signed:_____

Certifying Engineer

Print Name:	Steven F. Putrich
Missouri License No.:	2014035813
Title:	Project Principal
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY ALDRICH

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1. Description of Project

1.1 GENERAL

1.1.1 Authority

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Associated Electric Cooperative, Inc. (AECI) to perform the Initial Periodic Structural Stability Assessment (Assessment) for the Inactive Lined Pond (Lined Pond) coal combustion residuals (CCR) surface impoundment located at New Madrid Power Plant (NMPP) in New Madrid, Missouri. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(d). Based on the USEPA's issued CCR Rule Partial Vacatur in 2016, the inactive Lined Pond impoundment at the NMPP is subject to applicable requirements of the CCR Rule.

This report summarizes the results of our Initial Periodic Structural Stability Assessment for the Lined Pond, including observations from our 6 February 2018 visual inspection of the impoundment embankments.

1.1.2 Purpose of Work

The purpose of this assessment was to document whether the design, construction, operation, and maintenance of the Lined Pond are consistent with recognized and generally accepted good engineering practices. The visual inspection is intended to identify signs of distress or malfunction of the CCR surface impoundment, should they exist. This report summarizes those findings and notes conditions observed that are disrupting or have the potential to disrupt the operation and safety of the surface impoundment.

The investigation is divided into four parts: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Lined Pond surface impoundment; 2) perform a visual inspection of the surface impoundment dike; 3) evaluate whether the design, construction, operation, and maintenance of the impoundment and dike are consistent with generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation, including recommendations and remedial actions.

1.1.3 Definitions

To provide the reader a better understanding of the report, definitions of commonly used terms associated with dams/dikes are provided in Appendix C. Many of these terms may be included in this report. The terms are presented under common categories associated with surface impoundments which include: 1) orientation; 2) dam/dike components; 3) hazard potential classification; and 4) miscellaneous.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

The Lined Pond is located at the NMPP in New Madrid, Missouri. The site is located about 3 miles east of Marston, Missouri. The Site is accessible from the west via State Highway EE (off US route 55) and from the north and south from Levee Road. The Lined Pond is located south of Pond 003, at North latitude 36° 30.1' and West longitude 89° 33.6', as shown on the attached Project Locus in Figure 1. The impoundment can be accessed by vehicles from earthen access roads from the NMPP. Access to the site and dikes is restricted by full time security and barriers/fences at the plant and a fence at the southwest corner of the Lined Pond.

1.2.2 Owner/Operator

The Lined Pond is owned and maintained by Associated Electric Cooperative, Inc.

	Dam Owner/Caretaker
Name	AECI New Madrid Power Plant
Mailing Address	P.O. Box 156
Town, State, Zip	New Madrid, MO 63869
Contact	Roger Neumeyer
Title	Plant Manager
Email Address	rneumeyer@aeci.org
Emergency Phone	911

1.2.3 Purpose of Lined Pond

AECI managed CCR by placing fly ash into the Lined Pond from 1994 to approximately 2007 when the plant converted to dry fly ash handling. The impoundment relied on evaporation as the main source of discharge from the unit, with no primary spillway existing (emergency flows can be diverted to the Raw Water Pond, Pond 003, or the 003 Outfall discharge channel).

1.2.4 Description of the Dam and Appurtenances

The Lined Pond is a surface impoundment with an approximate footprint of 78 acres located south of Pond 003. A site plan is shown in Figure 2. The Lined Pond was constructed in 1994. Access roads run along the perimeter of the pond and the approximate crest elevation is approximately 307 feet MSL. The impoundment is located on the east side of the US Army Corps of Engineers levee system of the Mississippi River. Immediately adjacent to the east side of the Lined Pond is the Raw Water Pond that exists as an overflow for high water elevation conditions and was constructed to act as a second phase of the Lined Pond. The Lined Pond at NMPP is currently inactive as defined by the CCR Rule.

The majority of the Lined Pond is full and contains an unused area in the southeastern corner that collects runoff. It is understood that currently, there is no inflow into the lined Pond. The Lined Pond subgrade and embankments were constructed of native soils and were overlain with 60-mil (side slopes) and 80-mil (bottom) geomembranes. Two 18 in. pipes in the southeastern corner of the pond have

historically been used to pump water from the Raw Water Pond to the Lined Pond to prevent uplift of the liner; this practice is no longer being used. These pipes have a valve control system that can be managed from the crest of the eastern embankment.

1.2.5 Standard Operational Procedures

The impoundment is operated and maintained by NMPP personnel. Maintenance of the dike includes regular mowing of the downstream slopes and downstream slopes and removing vegetation from the riprap on upstream slopes. Weekly inspections are also completed.

The NMPP personnel monitor and inspect the dike according to a series of informal, unwritten and written protocols. These protocols include:

- Observation of the impoundment embankments during normal operation;
- Inspecting the slope protection, including the vegetation and riprap;
- Monitoring the water levels; and
- Historic semi-annual inspection of the impoundments by NMPP personnel (now completed weekly).

1.2.6 Hazard Potential Classification

Hazard Potential Classification is being completed outside the scope of this report in accordance with the applicable regulations. Results will be provided under separate cover.

1.3 PERTINENT ENGINEERING DATA

1.3.1 Drainage Area

Based on the original design documents and observations from the site visit, the Lined Pond does not receive drainage from the surrounding areas, only the immediate access roads on top of the dike and direct precipitation.

1.3.2 Reservoir

The Lined Pond has an estimated surface area of approximately 78 acres and a storage volume of approximately 2.7 million cubic yards. There is an area of ponded water on the southeastern part of the impoundment. Water level of ponded water at the time of our site visit was not defined but below 293 feet msl.

1.3.3 Discharges from Lined Pond

There is no discharge into Lined Pond. Emergency flows from Lined Pond can be diverted to the Raw Water Pond through the pipes incorporated within the eastern embankment, to Pond 003, or the 003 Outfall discharge channel through pumping. Discharge occurs in accordance with the applicable NPDES permit.

1.3.4 Relevant Elevations

Elevations referenced in this report are in feet and are based on the North American Vertical Datum of 1988 (NAVD88).

The low point on crest elevation is at approximate El. 307 and the normal pool is generally at El. 293.

A.	Top of Dam	307
B.	Normal Pool	293 or lower
C.	Spillway Crest	No spillway is present
D.	Upstream Water at Time of Inspection	Below 293
E.	Spillway Type	No spillway is present
F.	Spillway Invert	No spillway is present

1.3.5 Design and Construction Records

The Lined Pond was constructed in 1994 to impound fly ash and process water. It is understood that the Lined Pond was designed by Burns & McDonnell, based on construction drawings provided by AECI.

1.3.6 Operating Records

Written operational records have not been historically maintained for the impoundment prior to the CCR Rule. AECI has been completing weekly inspections per the CCR Rule and maintains an operating record for required information.

2. Inspection

2.1 VISUAL INSPECTION

On 6 February 2018, Haley & Aldrich completed a visual inspection of the Lined Pond. The following paragraphs describe the conditions of the impoundment and dike observed during the inspection. In addition, refer to the photographs and checklist forms included in Appendices A and B, respectively for additional comments.

2.1.1 General Findings

2.1.1.1 *Upstream Slope*

Upstream slope of the dike is only visible at the southeastern part of the Lined Pond. At this area, the liner installed on the upstream slope is exposed without protection. It is understood that an attempt was made to place protective soil cover over the liner at the southwest corner of the pond, however this effort was not continued throughout the entire exposed area since placed soil did not stay stable on the smooth liner inclined at an approximately 3H:1V slope. At the time of our inspection, exposed portions of upstream slope with the liner appeared stable and no defects were visible on the liner.

2.1.1.2 *Crest*

The northern, eastern and southern embankment crests are gravel-covered roads. The western embankment crest is the US Army Corps of Engineers operated and maintained levee system, which consists of a non-gravel crest surface. The crest surrounding the Lined Pond is at an approximate elevation of 307 feet. Generally, all crests/roads were observed to be in good condition. Minor ruts and pot holes and minor erosion were observed on the southern embankment crest. In addition, sparse vegetation taller than 6 inches was observed on the upstream and downstream sides of the crest of eastern embankment and downstream side of crest of western embankment (i.e. levee).

2.1.1.3 *Downstream Slope*

The downstream slope is visible on eastern, southern and western embankments. All downstream slopes were constructed with an approximately 3H:1V slope.

On the eastern embankment, the downstream slope has historically exhibited significant surficial sloughing, and these were remedied in 2012 through installation of plate-piles along this slope. Plate-piles were not visible from the surface. During our inspection, we observed that an approximately 15-feet-wide bench has been constructed at the lower part of the downstream slope (where it reaches approximately the Raw Water Pond water level elevation) using rip-rap, and this bench was covered with a compacted soil layer. Rip-rap is present along the contact between the downstream slope/bench and the water level in the Raw Water Pond. Due to repairs and re-grading along the downstream slope of eastern embankment, we observed that parts of the downstream slope of eastern embankment have not been seeded as of the date of the inspection. Minor erosion rills (less than 6 inches in depth) were observed on the unseeded portions of the slope.

At the southern end of the downstream slope of eastern embankment, we observed sloughing which formed an irregularity on the slope surface. The irregularity formed by sloughing is approximately

15 feet long, 2 feet wide and 1 feet deep. This sloughing was observed within the grassed portion of the slope and did not appear to affect the immediate structural stability of the eastern embankment. However, we recommend that AECI monitor this area for potential further movements and undertake appropriate repairs if movements are observed.

Throughout much of the vegetated portions of the downstream slope of eastern embankment, we observed grass taller than 6 inches.

No seepage or other unusual movements were observed on the downstream slope of eastern embankment.

Downstream slopes of southern and western embankments were observed to be in good condition, with no unusual movements or seepage. Similar to downstream slope of eastern embankment. Grassy vegetation covering the downstream slopes of southern and western embankments were mostly taller than 6 inches during our inspection.

2.1.1.4 *Emergency Spillway*

Lined Pond does not have an emergency spillway.

2.1.1.5 *Downstream Area*

Downstream area along the eastern embankment consists of the Raw Water Pond. Water level at the Raw Water Pond at the time of our inspection was approximately 296 feet.

Downstream area along the southern embankment consists of a zone of dense, rooted vegetation with heights exceeding several feet and trees with flat, open farming field further south. An area of ponded water at the downstream toe area, at the western end of the southern embankment, was observed during our inspection. The ponded water appeared to have accumulated due to recent rainfall. No other ponded water or seepage was observed in the downstream area of southern embankment.

Downstream area of western embankment (i.e. levee) consists of an open field. No ponded water, seepage or unusual movement was observed in the downstream area of the western embankment.

2.2 CARETAKER INTERVIEW

On the day of the inspection, Haley & Aldrich met with AECI personnel familiar with the operations, maintenance and construction of the Lined Pond. Information provided by AECI personnel has been incorporated into this report.

2.3 OPERATION AND MAINTENANCE PROCEDURES

The impoundment is operated and maintained by NMPP personnel. Operation of the impoundment includes pumping stormwater to manage pond elevations. Maintenance of the dike includes regular mowing of grass on the downstream slopes and removing vegetation from the crest and downstream slopes. Weekly inspections are also completed. A formal operations and maintenance plan does not exist for the unit.

2.4 EMERGENCY ACTION PLAN

A written Emergency Action Plan (EAP) does not exist for Lined Pond; however, plant personnel are generally familiar with pond operations and construction. Also, the site is staffed full time and heavy earthmoving construction equipment is at the site.

2.5 OVERTOPPING POTENTIAL

Based on the inflow to the impoundment from only direct precipitation, the overtopping potential of the dam is low based on management of water within the impoundment.

3. Impoundment Inspection Assessment and Recommendations

3.1 ASSESSMENT

We provide the following assessment of the Lined Pond. The following deficiencies were observed at Lined Pond:

- Unseeded areas on the downstream slope and downstream bench area of eastern embankment.
- Erosion rills less than 6 inches deep on downstream slope of eastern embankment.
- Minor erosion and rutting of the gravel access road on the southern embankment.
- Slough on downstream slope of eastern embankment.
- Grass exceeding 6 inches in height at majority of the areas on downstream slopes of eastern, southern and western embankments.
- Sparse vegetation exceeding 6 inches in height on the upstream and downstream sides of the crest of eastern embankment and downstream side of crest of western embankment.
- Accumulation of water, forming within a depression area in downstream toe area of southern embankment.

3.2 RECOMMENDATIONS

Maintenance of the embankments surrounding the Lined Pond is required and should include cutting/mowing of vegetation on crest and downstream slope of embankments for continued ability to adequately inspect the impoundment. Mowing of the vegetation should be completed as needed to maintain healthy grass cover at less than 6 inches in height according to the current CCR Rule requirements. Maintenance activities should also address erosion and rutting on access roads on the crest of embankment if these become significant.

Shallow erosion rills that were observed on the downstream slope of eastern embankment should be monitored until seeding in these areas are completed.

Unseeded areas on the downstream slope and downstream bench area of eastern embankment should be seeded for vegetation growth.

Unprotected liner exposed on parts of the upstream slope on the eastern and southern embankments should be monitored for integrity.

The linear manifestation of a slough observed on the downstream slope of eastern embankment should be monitored for potential future movements and repairs should be made if further movements are observed.

The ponded water area in the downstream toe area of the southern slope, that formed directly adjacent to toe of the embankment, should be repaired so that water will not pond in this area.

3.3 REMEDIAL MEASURES

We recommend the following remedial measures be undertaken:

- Mow grass exceeding 6 inches in height on downstream slopes of eastern, southern and western embankments, and mow/cut vegetation exceeding 6 inches in height on the upstream and downstream sides of the crest of eastern embankment and downstream side of crest of western embankment.
- Repair minor ruts and erosion along the gravel access road on the crest of southern embankment.
- Seed unseeded areas of downstream slope of eastern embankment to establish vegetation.
- Re-work depressed area in the downstream toe area of southern embankment so that water will not continue to pond at the toe after a rainfall event. Property boundaries may need to be evaluated to allow for this activity to be completed.

4. Structural Stability Assessment

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and inspected the Lined Pond as described above. Based on our review of available information and observations during our inspection, we have concluded the following in accordance with 40 CFR §257.73(d):

1. §257.73(d)(1)(i) – Stable Foundations and Abutments:

   Based on review of available documents pertaining to Lined Pond and our observations during the inspection, the Lined Pond appears to have stable foundations and abutments. A Safety Factor Assessment for the Lined Pond is being completed and it will be provided under separate cover.

2. §257.73(d)(1)(ii) – Adequate Slope Protection:

   Based on our observations, the downstream slopes of southern and western embankments have an approximate slope of 3H:1V and these slopes are covered with grass. The upstream slope is exposed at the southeastern part of the pond, where parts of southern and eastern embankments have unprotected Hyperflex liner exposed on the approximately 3.0H:1.0V upstream slope of these embankments. This part of the Lined Pond is occupied with ponded water. It is understood that the downstream slope of the eastern embankment, which also has an approximate slope of 3H:1V, historically exhibited significant sloughing and these were remedied in 2012 through installation of plate-piles along this slope. During our inspection, we observed that a bench has been constructed at the lower part of the downstream slope (where it reaches approximately the Raw Water Pond water level elevation) using rip rap and this bench was covered with a compacted soil layer. Rip-rap is present along the contact between the downstream slope/bench and the water level in the Raw Water Pond. Due to repairs and re-grading along the downstream slope of eastern embankment, we observed that parts of the downstream slope of eastern embankment have not been seeded, as of the date of the inspection. Minor erosion rills (less than 6 inches in depth) were observed on the unseeded portions of the slope.

   The Lined Pond was determined to have adequate slope protection except for the unprotected liner areas on the upstream slope of eastern and southern embankments, and the unseeded portions of the downstream slope of eastern embankment.

3. §257.73(d)(1)(iii) – Dikes Mechanically Compacted:

   Based on drawings described as conforming to construction records, dikes appear to have been constructed of compacted fill. Based on explorations performed by Haley & Aldrich in 2017, the consistency of fine-grained soils encountered in embankment fill material was generally stiff. These subsurface information and observations made during our visit indicate that the dikes were mechanically compacted.

4. §257.73(d)(1)(iv) – Height of Vegetation:

   At the time of our inspection, much of the downstream slope of eastern, southern and western embankments were covered with grassy vegetation that exceeded 6 inches in height. Sporadic and isolated bushes reaching up to 2 feet were also present in some parts of the eastern part of the crest of eastern embankment and upper parts of the downstream slope of the western embankment. In the downstream toe area of the southern embankment, but beyond the embankment toe, trees and tall bushes are present.

5. §257.73(d)(1)(v)(A) – Spillway Cover:

   The Lined Pond does not have a spillway, therefore §257.73(d)(1)(v)(A) does not apply to Lined Pond.

6. §257.73(d)(1)(v)(B) – Spillway Capacity:

   The Lined Pond does not have a spillway, therefore §257.73(d)(1)(v)(B) does not apply to Lined Pond.

7. §257.73(d)(1)(vi) – Hydraulic Structures Underlying or Passing Through Embankment:

   Two 18-inch pipes pass through the eastern embankment. Only the discharge/outfall part of the pipes were partially visible on the downstream side of eastern embankment (i.e. Raw Water Pond side). Along the alignment of these two buried pipes, no settlement of ground surface was observed on the crest, upstream slope, and downstream slope of eastern embankment.

8. §257.73(d)(1)(vii) – Inundation of Downstream Slopes:

   The Lined Pond is not located directly adjacent to the Mississippi River, however the Raw Water Pond, which forms the downstream toe area of the eastern embankment of Lined Pond, is located adjacent to Mississippi River and has the potential to be inundated under higher than normal river elevations. This could cause inundation of the downstream slope of eastern embankment of Lined Pond.

9. §257.73(d)(2) – Deficiencies and Recommendations:

   The Structural Stability Assessment did not identify any structural stability deficiencies for Lined Pond.

5. References

1. Burns & McDonnell (1995). Ash Disposal Facility Construction Drawing Y42 titled "Ash Pond Grading Plan Cell No. 1 - Revision 3". 9 March 1995.

2. Burns & McDonnell (1993). Ash Disposal Facility Construction Drawing Y44 titled "Typical Sections and Details - Revision 2". 18 June 1993.

3. Burns & McDonnell (1993). Ash Disposal Facility Construction Drawing Y50 titled "Miscellaneous Details - Revision 1". 21 May 1993.

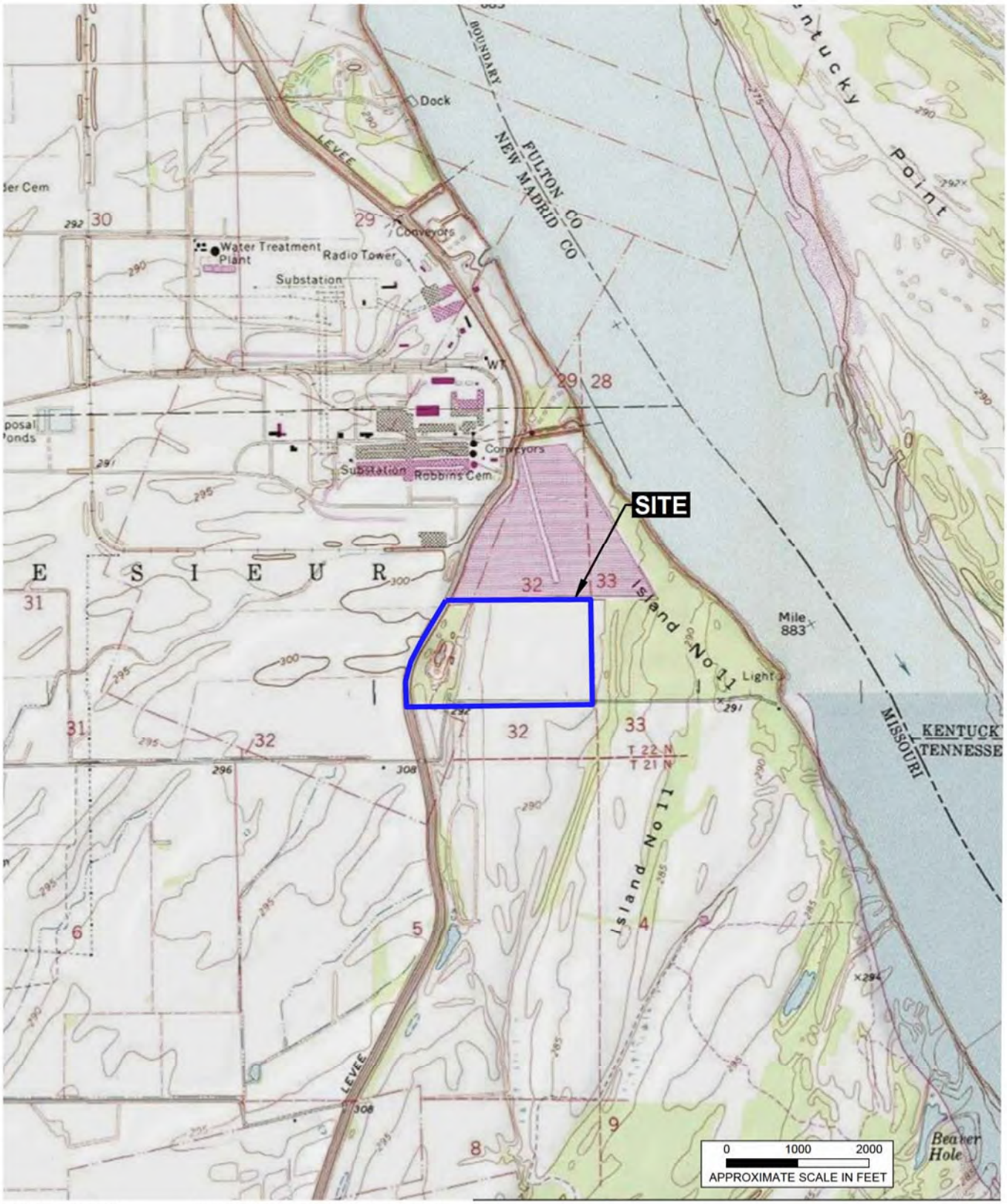
4. Associated Electric Cooperative, Inc. (2017). Lined Ash Pond Dam Safety Inspection Checklists, Date of Inspection: 19 July 2017.

5. Geotechnology, Inc. (2009). Stability Evaluation Slag Pond 1 and Ash Pond 2 AECI New Madrid Power Generating Facility, New Madrid County, Missouri. 22 June 2009.

6. GZA GeoEnvironmental, Inc. (2011). Final Report - Round 7 Dam Assessment, Associated Electric Cooperative, Inc. New Madrid Power Plant Ash Pond 1 & 2 and Slag Pond 1 & 2 Impoundments, New Madrid County, Missouri. 3 June 2011.

7. Haley & Aldrich, Inc. (2017). Data Report on Subsurface Investigation and Laboratory Testing - Lined Pond Closure, New Madrid Power Plant, Marston, Missouri. 2 November 2017.

8. Slope Reinforcement Technology, LLC (2012). Raw Water Pond Slope Repair Drawings. 27 January 2012.



MAP SOURCE: ESRI

SITE COORDINATES: 36°30'14"N, 89°33'36"W

HALEY ALDRICH

LINED POND STRUCTURAL STABILITY ASSESSMENT
AECI, NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

SITE LOCUS

SCALE: AS SHOWN
FEBRUARY 2018

FIGURE 1

POSTOLOWSKI, KEVIN Printed: 2/14/2018 11:07 AM Layout: FIG 1 (2018)
Z:\CLE_COMMON\PROJECTS\129342_AECI-NMPP\CAD\LINED POND\FIGURES\129342_005_FIG-1_LOCUS.DWG

LEGEND

APPROXIMATE LIMITS OF LINED POND

NOTES:

1. BACKGROUND IMAGE IS DATED 2 AUGUST 2014 FROM ESRI GIS.

0 300 600
SCALE IN FEET

HALEY ALDRICH

LINED POND STRUCTURAL STABILITY ASSESSMENT
AECI, NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

SITE PLAN

SCALE: AS SHOWN
FEBRUARY 2018

FIGURE 2

POSTOLOWSKI, KEVIN Printed: 2/13/2018 9:27 PM Layout: FIG 2 (FEB-2018)
Z:\CLE_COMMON\PROJECTS\129342_AECI-NMPP\CAD\LINED POND\FIGURES\129342_005_0003_FIG 2_SUBS EXPL.DWG

LEGEND

APPROXIMATE LIMITS OF LINED POND

NO — PHOTO LOCATION DIRECTION

NOTES:

1. BACKGROUND IMAGE IS DATED 2 AUGUST 2014 FROM ESRI GIS.
2. FIELD INSPECTION PERFORMED 6 FEBRUARY 2018.

N

0 300 600
SCALE IN FEET

HALEY ALDRICH

LINED POND STRUCTURAL STABILITY ASSESSMENT
AECI, NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

PHOTO LOCATION PLAN

SCALE: AS SHOWN
FEBRUARY 2018

FIGURE 3

POSTOLOWSKI, KEVIN Printed: 2/14/2018 11:03 AM Layout: FIG 3
Z:\CLE_COMMON\PROJECTS\129342_AECI-NMPP\CAD\LINED POND\FIGURES\129342_005_0004_PHOTO_LOCATION PLAN.DWG

APPENDIX A

Photographs

Photo 01:
View of repaired downstream slope of eastern embankment (view towards South).

Photo 02:
An unseeded portion of the downstream slope of eastern embankment (view towards northern abutment area).

Photo 03:
Rip-rap placed on lower part of downstream slope of eastern embankment.

Photo 04:
Grassy vegetation taller than 6 inches on downstream slope of eastern embankment.

Photo 05:
View of erosion rills (less than 6 inches deep) at an unseeded portion of downstream slope of eastern embankment.

Photo 06:
View of filled portion and rip-rap along downstream slope of eastern embankment.

Photo 07:
View of the two conduit pipes running from Lined Pond to Raw Water Pond through the eastern embankment, exposed on the Raw Water Pond side.

Photo 08:
View of some of the unseeded areas along the downstream slope of eastern embankment (view towards South).

Photo 09:
View of downstream slope of eastern embankment from the south end. A linear slough on the grassed portion of the slope is visible in the lower right part of the photograph.

Photo 10:
Crest of eastern embankment (view towards North).

Photo 11:
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Photo 12:
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Crest of northern embankment (view towards East).

Photo 14:
Crest of northern embankment as seen in the vicinity of air compressor building (view towards East).

Photo 15:
Crest of western embankment (i.e. US Army Corps of Engineers levee) near northern abutment (view towards North).

Photo 16:
Crest of western embankment (i.e. US Army Corps of Engineers levee) (view towards South).

Photo 17:
Crest of western embankment (i.e. US Army Corps of Engineers levee) (view towards North).

Photo 18
Crest of southern embankment (view towards West).

Photo 19:
Crest of southern embankment (view towards West).

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Exposed liner on upstream slope of eastern and southern embankments (view towards Southwest).

Photo 21:
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Exposed liner on upstream slope of eastern and southern embankments (view towards Southeast).

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Photo 24:
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Photo 25:
Grassy vegetation (taller than 6 inches) on downstream slope of western embankment (i.e. US Army Corps of Engineers levee).

Photo 26
Downstream slope of southern embankment (view towards East).

Photo 27:
Ponded water in downstream toe area of southern embankment, at the western end of the embankment.

Photo 28:
Downstream slope of southern embankment (view towards East).

Photo 29:
Downstream slope of southern embankment (view towards West).

Photo 30:
Downstream slope of southern embankment (view towards East).

APPENDIX B

Inspection Checklist

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Lined Pond

STATE ID #: NONE

REGISTERED: (YES/NO) No

NID ID #: N/A

STATE SIZE CLASSIFICATION: N/A

STATE HAZARD CLASSIFICATION: N/A

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: (YES/NO) No

DAM LOCATION INFORMATION

CITY/TOWN: New Madrid

COUNTY/STATE: *New Madrid/Missouri*

DAM LOCATION: (street address if known) 41 St. Jude Park, Marston, MO

ALTERNATE DAM NAME: N/A

USGS QUAD.: New Madrid, MO-KY

LAT.: 36° 30.4' N

LONG.: 89° 33.5' W

DRAINAGE BASIN: N/A

RIVER: Mississippi River

IMPOUNDMENT NAME(S): Inactive Lined Pond

GENERAL DAM INFORMATION

TYPE OF DAM: Earthen and Bermed

OVERALL LENGTH (FT): 7700

PURPOSE OF DAM: Sedimentation and Storage Basin

NORMAL POOL STORAGE (ACRE-FT): 125

YEAR BUILT: 1994

MAXIMUM POOL STORAGE (ACRE-FT): 1875

STRUCTURAL HEIGHT (FT): 25

EL. NORMAL POOL (FT): 293.0

HYDRAULIC HEIGHT (FT): 3

EL. MAXIMUM POOL (FT): 307.0 (minimum crest elevation)

RESERVOIR SURFACE AREA (ACRES): 78

WINTER DRAWDOWN (FT BELOW NORMAL POOL) 0.0

PUBLIC ROAD ON CREST: No

DRAWDOWN VOL. (AC-FT) 0.0

PUBLIC BRIDGE OVER SPILLWAY: No

NAME OF DAM: Lined Pond

STATE ID #: None

INSPECTION DATE: February 6, 2018

NID ID #: N/A

INSPECTION SUMMARY

DATE OF INSPECTION: February 6, 2018

DATE OF PREVIOUS INSPECTION: July 19, 2017

TEMPERATURE/WEATHER: Sunny, 88

ARMY CORPS PHASE I: No (YES/NO) If YES, date

CONSULTANT: Haley & Aldrich, Inc.

PREVIOUS ALT. PHASE I: No (YES/NO) If YES, date

BENCHMARK/DATUM: NAVD88

OVERALL PHYSICAL CONDITION OF DAM: Good

DATE OF LAST REHABILITATION: N/A

SPILLWAY CAPACITY: N/A

EL. POOL DURING INSP.: Below 293

EL. TAILWATER DURING INSP.: 296

PERSONS PRESENT AT INSPECTION

NAME	TITLE/POSITION	REPRESENTING
Tayfun Gurdal	Technical Specialist	Haley & Aldrich, Inc
Jason Pokorny	Senior Project Manager	Haley & Aldrich, Inc

NAME OF DAM:	Lined Pond	STATE ID #:	None
INSPECTION DATE:	February 6, 2018	NID ID #:	N/A

OWNER:		CARETAKER:	
ORGANIZATION	Associated Electric Cooperative,	ORGANIZATION	Associated Electric Cooperative, Inc.
NAME/TITLE	Mr. Dennis Cox	NAME/TITLE	Mr. Dennis Cox
STREET	P.O. Box 156	STREET	P.O. Box 156
TOWN, STATE, ZIP	New Madrid, MO 63869	TOWN, STATE, ZIP	New Madrid, MO 63869
PHONE		PHONE	
EMERGENCY PH. #		EMERGENCY PH. #	
FAX		FAX	
EMAIL		EMAIL	
OWNER TYPE	Private		

PRIMARY SPILLWAY TYPE	Mechanical Pump w/ Conduit as Secondary		
SPILLWAY LENGTH (FT)	N/A	SPILLWAY CAPACITY (CFS)	N/A
AUXILIARY SPILLWAY TYPE	N/A	AUX. SPILLWAY CAPACITY (CFS)	N/A
NUMBER OF OUTLETS	One	OUTLET(S) CAPACITY (CFS)	Unknown
TYPE OF OUTLETS	Pump	TOTAL DISCHARGE CAPACITY (CFS)	Unknown
DRAINAGE AREA (SQ MI)	0.15	SPILLWAY DESIGN FLOOD (PERIOD/CFS)	Unkown
HAS DAM BEEN BREACHED OR OVERTOPPED? (YES/NO):	No	IF YES, PROVIDE DATE(S)	
FISH LADDER (LIST TYPE IF PRESENT)	No		
DOES CREST SUPPORT PUBLIC ROAD? (YES/NO)	No	IF YES, ROAD NAME:	
PUBLIC BRIDGE WITHIN 50' OF DAM? (YES/NO):	No	IF YES, ROAD/BRIDGE NAME: MHD BRIDGE NO. (IF APPLICABLE)	

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

EMBANKMENT (U/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None observed	X		
	2. SLOPE PROTECTION TYPE AND COND.	U/S slopes are covered with liner, however there are areas where liner is not covered.		X	
	3. SINKHOLE/ANIMAL BURROWS	None observed	X		
	4. EMB.-ABUTMENT CONTACT	None observed	X		
	5. EROSION	None observed	X		
	6. UNUSUAL MOVEMENT	None observed	X		
	7. VEGETATION (PRESENCE/CONDITION)	None observed	X		

ADDITIONAL COMMENTS: Liner exposed/unprotected along portions of eastern and southern embankments. It is understood that soil can not be placed on exposed areas of liner on slope due to smooth liner surface on 3H:1V slope.

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

EMBANKMENT (CREST)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Gravel access road, western crest surface is levee's non-gravel surface.	X		
	2. SURFACE CRACKING	None observed	X		
	3. SINKHOLES, ANIMAL BURROWS	None observed	X		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	None observed	X		
	5. HORIZONTAL ALIGNMENT	None observed	X		
	6. RUTS AND/OR PUDDLES	Minor rutting and erosion on southern crest road.		X	
	7. VEGETATION (PRESENCE/CONDITION)	Sparse vegetation taller than 6 inches			X
	8. ABUTMENT CONTACT	Abutments in good condition	X		

ADDITIONAL COMMENTS: Minor rutting and minor erosion at some places on southern crest. Sparse vegetation taller than 6 inches on the d/s side of crest of western embankent and the d/s and u/s side of crest of eastern embankment.

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

EMBANKMENT (D/S SLOPE)

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None observed	X		
	2. SEEPAGE	None observed	X		
	3. SLIDE, SLOUGH, SCARP	Sloughing on southern end of downstream slope of eastern embankment.		X	
	4. EMB.-ABUTMENT CONTACT	In good condition	X		
	5. SINKHOLE/ANIMAL BURROWS	None observed	X		
	6. EROSION	Erosion rills less than 6 inches deep on unseeded d/s slope areas on eastern embankment		X	
	7. UNUSUAL MOVEMENT	None observed	X		
	8. VEGETATION (PRESENCE/CONDITION)	Grassy vegetation taller than 6 inches present on most areas of d/s slopes			X

ADDITIONAL COMMENTS: Sloughing on d/s slope of eastern embankment is ~20 ft long, ~2 ft wide and ~1ft deep.

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

PRIMARY SPILLWAY

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Mechanical pump	X		
	WEIR TYPE	None present	X		
	SPILLWAY CONDITION	Mechanical pump not working at time of inspection			X
	TRAINING WALLS	None present	X		
	SPILLWAY CONTROLS AND CONDITION	None present	X		
	UNUSUAL MOVEMENT	None present	X		
	APPROACH AREA	Fair	X		
	DISCHARGE AREA	Fair	X		
	DEBRIS	None present	X		
	WATER LEVEL AT TIME OF INSPECTION	Below 293	X		

ADDITIONAL COMMENTS:

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

OUTLET WORKS

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	N/A	X		
	INTAKE STRUCTURE	N/A	X		
	TRASHRACK	N/A	X		
	PRIMARY CLOSURE	N/A	X		
	SECONDARY CLOSURE	N/A	X		
	CONDUIT	N/A	X		
	OUTLET STRUCTURE/HEADWALL	N/A	X		
	EROSION ALONG TOE OF DAM	None	X		
	SEEPAGE/LEAKAGE	None	X		
	DEBRIS/BLOCKAGE	None	X		
	UNUSUAL MOVEMENT	None	X		
	DOWNSTREAM AREA	Regularly mowed.	X		
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

DOWNSTREAM AREA

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	None Present	X		
	2. FOUNDATION SEEPAGE	None Present	X		
	3. SLIDE, SLOUGH, SCARP	None Present	X		
	4. WEIRS	None Present	X		
	5. DRAINAGE SYSTEM	None Present	X		
	6. INSTRUMENTATION	None Present	X		
	7. VEGETATION	Grass taller than 6 inches in most areas of downstream of western and southern slopes.			X
	8. ACCESSIBILITY	Gravel access road along crest. Full time security and fence	X		
	9. DOWNSTREAM HAZARD DESCRIPTION				
	10. DATE OF LAST EAP UPDATE				

ADDITIONAL COMMENTS:

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

INSTRUMENTATION

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	P6 through P8, MW8, MW9 in good condition (not for stability monitoring purposes)	X		
	2. OBSERVATION WELLS	None present	X		
	3. STAFF GAGE AND RECORDER	None present	X		
	4. WEIRS	None present	X		
	5. INCLINOMETERS	None present	X		
	6. SURVEY MONUMENTS	None present	X		
	7. DRAINS	None present	X		
	8. FREQUENCY OF READINGS	No measurements are taken	X		
	9. LOCATION OF READINGS		X		

ADDITIONAL COMMENTS:

NAME OF DAM: Lined Pond STATE ID #: None

INSPECTION DATE: February 6, 2018 NID ID #: N/A

UNDERLYING HYDRAULIC STRUCTURES/PIPES

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
UNDERLYING HYDRAULIC STRUCTURES /PIPES	TYPE	Two 18" pipes through embankment	X		
	INLET	Inlet on u/s slope not visible (under water level)	X		
	CONDUIT	Outfall on d/s side partially visible - in good condition.	X		
	OUTLET STRUCTURE/HEADWALL	Fair	X		
	EROSION ALONG STRUCTURE	None present	X		
	SEEPAGE/LEAKAGE	None present	X		
	DEBRIS/BLOCKAGE	Outfall on d/s side partially visible - no blockage could be observed	X		
	UNUSUAL MOVEMENT	No settlement or uneven ground on embankment and slopes observed	X		
	DOWNSTREAM AREA	Raw water pond	X		
	MISCELLANEOUS				

ADDITIONAL COMMENTS:

Note: Use additional sheets for additional outlets.

APPENDIX C

Definitions

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions, refer to the U.S. Army Corps of Engineers, the Federal Energy Regulatory Commission, the Department of the Interior Bureau of Reclamation, or the Federal Emergency Management Agency.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate there from including but not be limited to spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Size Classification

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height and having a storage capacity of less than 15 acre-feet.

Hazard Classification
(In the event the impoundment should fail, the following would occur):

Less Than Low Hazard Potential - Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

Low Hazard Potential - Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential - Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential - Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

General

EAP – Emergency Action Plan - Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. On million U.S. gallons = 3.068 acre feet

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Condition Rating

Unsafe - Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

Poor - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

ATTACHMENT 12

LINED POND SAFETY FACTOR ASSESSMENT

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REPORT ON
INITIAL SAFETY FACTOR ASSESSMENT
INACTIVE LINED POND
NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
Springfield, Missouri

File No. 129342-015
April 2018

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

17 April 2018
File No. 129342-015

Associated Electric Cooperative, Inc.
2814 South Golden Avenue
P.O. Box 754
Springfield, Missouri 65801

Attention: Jenny Burns
Environmental Analyst

Subject: Report on Initial Safety Factor Assessment
Inactive Lined Pond
New Madrid Power Plant
Marston, Missouri

Ms. Burns:

We are pleased to submit herewith our report entitled, "Report on Initial Safety Factor Assessment, Inactive Lined Pond, New Madrid Power Plant, New Madrid, Missouri." This report includes background information regarding the project and the results of our initial safety factor assessment.

This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of Associated Electric Cooperative, Inc. (AECI) in accordance with the United States Environmental Protection Agency's Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(e). Based on the USEPA's issued CCR Rule Partial Vacatur in 2016, the inactive Lined Pond impoundment at the NMPP is subject to applicable requirements of the CCR Rule. The safety factor assessment discussed herein has been referred to as an "initial" assessment to coincide with the terminology used in §257.73(e) and §257.73(f) to distinguish it from the "periodic" assessments that are required every five years following the "initial" assessment has been completed.

The scope of our work in our initial safety factor assessment consisted of the following: 1) reviewing readily available reports, investigations, plans and data pertaining to the surface impoundment; 2) performing engineering evaluations related to seismic response analysis, liquefaction and slope stability; and 3) preparing and submitting this report presenting the results of our assessment.

Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Derrick A. Shelton
Geotechnical Program Manager | Senior Associate

Steven F. Putrich, P.E.
Project Principal

Enclosures

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HALEY ALDRICH

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3	Design Shear Wave Velocity Profile

1. Introduction

1.1 GENERAL

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Associated Electric Cooperative, Inc. (AECI) to perform the Initial Safety Factor Assessment for the Inactive Lined Pond located at New Madrid Power Plant in New Madrid, Missouri shown on **Figure 1**, "Project Locus". This work was completed in accordance with the United States Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(e) (EPA, 2015).

1.2 PURPOSE OF SAFETY FACTOR ASSESSMENT

The purpose of this study was to review the subsurface soil and water conditions at the site and to perform an initial safety factor assessment in accordance with Section §257.73(e)(1) of the CCR Rule. To achieve the objective discussed above, the scope of work undertaken for this investigation included the tasks listed below.

- Reviewing readily available reports, investigations, plans and data pertaining to the Lined Pond.
- Performing an advanced site-specific seismic response analysis and Newmark displacement analysis of the impoundment embankment.
- Evaluating liquefaction susceptibility of material used to construct the impoundment embankments.
- Performing static and seismic stability analyses for rotational failure surfaces using limit equilibrium methods.

1.3 ELEVATION DATUM AND HORIZONTAL CONTROL

The elevations used in this report are in feet and reference the North American Vertical Datum of 1988 (NAVD88) unless otherwise noted. The horizontal control is Missouri State Plane East, which is based on North American Datum 83 (NAD83).

2. Description of Impoundment

2.1 DESCRIPTION OF LINED POND

The Lined Pond is an inactive lined surface impoundment with an approximate footprint of 78 acres located south of Pond 003. The Lined Pond was designed by Burns & McDonnell and was constructed in 1994. Access roads run along the entire perimeter of the pond and the approximate crest elevation is approximately 308 feet MSL. The impoundment is located on the east side of the US Army Corps of Engineers levee system of the Mississippi River. The east embankment of the Lined Pond serves as a separator dike that bisects the Lined Pond and the Raw Water Pond. The Raw Water Pond exists as an overflow for high water level conditions and was intended as a future phase of the Lined Pond. The Lined Pond at the New Madrid Power Plant (NMPP) is currently inactive as defined by the CCR Rule. The interior and exterior slopes of the pond were designed as 3 horizontal to 1 vertical (3H:1V) slopes. The maximum height of the west embankment (levee side) is approximately 9 ft, and the maximum heights of the south and east embankments (non-levee side) are approximately 15 ft and 24 ft respectively. As mentioned above, the north side of the pond is adjacent to Pond 003, which is at the same surface elevation as the access road that separates the two ponds. As a result, an exposed embankment does not exist on the north side of the pond.

AECI managed CCR by placing fly ash in the Lined Pond via a wetting head from 1994 to approximately 2007 when the plant converted to dry fly ash handling. The impoundment relied on evaporation as the main source of discharge from the unit, with no primary spillway existing (emergency flows can be diverted to the Raw Water Pond, Pond 003, or the 003 Outfall discharge channel). The majority of the Lined Pond is full and contains an unused area in the southeastern corner that collects runoff. The Lined Pond subgrade and embankments were constructed of native soils and were overlaid with 60 mil (side slopes) and 80 mil (bottom) geomembranes. Two 18 in. pipes in the southeastern corner of the pond have historically been used to pump water from the Raw Water Pond to the Lined Pond in order to prevent uplift of the liner.

The downstream side of the east embankment experienced surficial slope movement and sloughing in the past and plate piles were used to stabilize the slope 2012. Additionally, localized areas of sloughing/erosion have recently been repaired by infilling with riprap.

3. Subsurface Explorations, Laboratory Testing, and Subsurface Conditions

The geotechnical data used as the basis of this report can be found in the Haley & Aldrich report entitled "Data Report on Subsurface Investigation and Laboratory Testing, Lined Pond, New Madrid Power Plant, Marston, Missouri", dated April 2018 (Data Report). The referenced geotechnical data report contains recent and historic exploration logs (i.e. cone penetrometer soundings, test pits, observation well installation reports, and test borings), subsurface exploration location plans, and laboratory testing results. The Data Report also includes a detailed description of the site geology, soil conditions encountered in the recent and historic subsurface explorations, and groundwater conditions. The reference data report can be found in **Appendix B**.

4. Safety Factor Assessment

As mentioned previously, the purpose of this study was to perform an initial safety factor assessment in accordance with Section §257.73(e)(1) of the CCR Rule. As required by the Rule, the certified initial safety factor assessment is performed for a CCR unit to determine calculated factors of safety for each CCR unit relative to the minimum prescribed safety factors for the critical cross section of the embankment. The minimum required safety factors are defined as follows:

- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.
- The calculated static factor of safety under the long-term, maximum storage pool loading conditions must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- The calculated seismic factor of safety must equal or exceed 1.00.

Stability analyses have been performed in general conformance with the principles and methodologies described in the USACE Slope Stability Manual (U.S. Army Corps of Engineers, 2003). Conventional static and seismic stability analyses of the impoundment embankments were performed for rotational failures using limit equilibrium methods. Limit equilibrium methods compare forces, moments, and stresses which cause instability of the mass of the embankment to those which resist that instability. The principle of the limit equilibrium method is to assume that if the slope under consideration were about to fail, or at the structural limit of failure, then one must determine the resulting shear stresses along the expected failure surface. These determined shear stresses are then compared with the shear strength of the soils along the expected failure surface to determine the safety factor. The details of the analyses performed for the Lined Pond are presented in the following sections of this report.

4.1 DESIGN WATER LEVELS

In accordance with the CCR Rule, the water retained in an impoundment must be modeled at the maximum storage pool level for the static drained and seismic undrained analyses. The maximum surcharge pool level must be also used to model the ponded water for the static drained analyses. A summary of the maximum storage pool and surcharge pool water levels used in our analyses at the Lined Pond are provided below.

Location	Maximum Storage Pool Level	Maximum Surcharge Pool Level	Available Freeboard
Lined Pond	El. 293	El. 308	15 ft

As shown above, the maximum storage pool water level within the pond has been modeled at El. 293, which corresponds to a level that is approximately 5 ft below water levels observed during our recent exploration program. It is our understanding that AECI has recently lowered the water level within the pond and it will be maintained at or below El. 293 for the future.

The elevation of the groundwater table within the embankment and at the toe of slope were estimated based on groundwater conditions encountered in nearby subsurface explorations and observation wells. Additionally, there is no current evidence of seepage emanating from the exterior slopes of the ponds,

suggesting that the phreatic surface is contained within and/or below the embankments. Accordingly, the following static water levels outside of the impoundment were conservatively used in our analyses.

Location	Elevation
Lined Pond	West Embankment (Toe) – El. 279
	South Embankment (Toe)– El. 281
	East Embankment (Toe)– El. 281
Raw Water Pond	Pond Interior - El. 296

Given the observed static groundwater levels discussed above, a seepage analysis was performed on the east embankment (cross section C-C') to determine the piezometric head between the Raw Water Pond and the interior slope of the Lind Pond's east embankment. The computer software program, Slide 7.0, developed by RocScience, Inc., was used to perform the seepage analyses. Permeability values for each material layer were estimated from typical published values based on material description and correlations to grain size. During the course of the seepage analyses, minor adjustments were made to the permeability values and isotropic permeability ratios to best model the conditions observed in the field. Results from the seepage analysis provided pore pressure values within the model that were used in the stability analysis for the east embankment.

The models suggest that much of the seepage emanating from the Raw Water Pond into the east embankment is moving downward into the more permeable foundation soils and establishing a groundwater table at or near approximately El. 281 beneath the pond rather than moving laterally through the embankment.

At the south and west embankments, the static water level was modeled flowing horizontally at El. 281 and 279, respectively. The phreatic surfaces used in the slope stability models are shown on the slope stability graphical output included in **Appendix A**.

4.2 MATERIAL PROPERTIES

The material properties used in our analyses have been developed using the results of the referenced test borings, CPT soundings, and laboratory testing. When evaluating the CPT results, material strengths were typically determined by averaging the measurements in a particular stratum and choosing conservative strength properties equal to the average value minus one standard deviation. A summary of the material properties is provided below in **Table I**. Additional details are provided in the Data Report contained in **Appendix B**.

TABLE I MATERIAL PROPERTIES						
Material	Material Strength	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Fly Ash Fill	Drained	105	0	34	--	--
	Undrained	105	--	0	0.30	500
Geomembrane Liner Interface	Drained	120	0	19	--	--
	Undrained	120				
Embankment Fill (Levee)	Drained	120	300	15	--	--
	Undrained	120	--	0	0.27	550
Embankment Fill (Non-Levee)	Drained	120	300	28	--	--
	Undrained	120	--	0	0.39	1,000
Alluvial Deposits (Cohesive)	Drained	120	0	30	--	--
	Undrained	120	--	0	0.50	1,000
Alluvial Deposits (Granular)	Drained	120	0	34	--	--
	Undrained	120				
Fluvial Deposits	Drained	125	0	38	--	--
	Undrained	125				

Seismic cone penetration testing was used to obtain in-situ measurements of shear wave velocity during the subsurface exploration program. The insitu measurements were performed to a depth of 95 ft below ground surface. Below that depth, shear wave velocity measurements of the underlying soils were approximated using published data specific to the Mississippi Embayment and the New Madrid Seismic Zone (Cramer, Hashash, Romero, Rosenblad, Van Arsdale). The site-specific shear wave velocity profile is shown on **Figure 3**.

4.3 SITE SPECIFIC SEISMIC RESPONSE ANALYSIS

4.3.1 Seismic Response Analysis

As mentioned previously, the New Madrid Power Plant is located within the New Madrid Seismic Zone and the Mississippi embayment. The natural embayment soils underlying the Lined Pond are estimated to be approximately 1,900-ft thick. It has been demonstrated that strong ground motions are significantly de-amplified at both the short and long periods due to the nonlinear behavior of the soils in the Mississippi embayment. It has also been shown that at short periods, increasing soil thickness correlates with a decreasing hazard due the nonlinear soil behavior. Similarly, at long periods, increasing soil thickness correlates with increasing hazard due to soil resonance (Cramer, 2015).

Accordingly, a site-specific target response spectrum was created for the New Madrid Power Plant to develop the 2,500-year earthquake motions for use in this study. This target spectrum was developed based on the maximum critical risk-targeted (MCE_R) spectral response acceleration for a representative earthquake with a magnitude between 7.5 and 8.0. Two different design methods (probabilistic and deterministic) were used to approximate the MCE_R spectrum and the lesser of the spectral response accelerations from each method at each period was used to create the site-specific target spectrum. The seismic hazard analysis results were then used to compute a 2,500-yr return period deterministic target

spectrum. A special type of target spectrum, called the conditional mean spectrum (CMS), was created for the study because it focuses the mean spectral response of all the ground motions to a particular period along the target spectrum. The CMS target spectrum was generated for the short period (T*=0.1s) related to the sliding mass.

Six time-history records were used to match the CMS target spectrum for the site. The time histories represent the site-specific ground motions associated with the controlling earthquake event and consider the magnitude, distance and focal mechanism. Five of these rock motions were obtained from naturally occurring events and one rock motion was synthetically generated to match a magnitude 8 earthquake associated with the ground response for the Mississippi embayment at Memphis, Tennessee.

A one-dimensional ground response analysis was performed to estimate the surface ground motion at the site using the computer software program Shake2000 to numerically simulate the propagation of rock motions applied to the base of the soil column up through the soil layers to the top of the soil column. **Table II** summarizes the surface PGA estimates at the New Madrid Power Plant. Additional details of the seismic response analysis are included in **Appendix A**.

TABLE II
PREDICTED SURFACE PGA AND NEWMARK MAGNITUDE CORRECTION FACTORS

Earthquake	Original Magnitude	CMS Scaled-Matched PGA	Shake Surface PGA	Newmark Magnitude Correction Factor[1]
Nahinni	6.76	1.60 g	0.33 g	1.41
Chalfant	6.19	1.77 g	0.33 g	1.65
L'Aquila	6.30	1.60 g	0.66 g	1.60
Cape Mendocino	7.01	1.40 g	0.41 g	1.32
Christ Church	6.25	2.00 g	0.41 g	1.65
Synthetic (Atkinson and Beresnev)	8.00	0.95 g	0.47 g	1.00

[1] Determined using the method developed by Bray and Traversarou

4.3.2 Newmark Displacement Analysis

The Newmark displacement analysis is based on the shear stress time history acting along the failure plane within the slope. The yield acceleration determined by the analysis is the minimum amount of ground acceleration necessary to initiate motion along the failure surface and is used to determine the appropriate pseudo-static coefficient for seismic stability analyses.

Shake 2000 was used to perform the Newmark displacement analysis by incorporating the results of the one-dimensional ground response analysis and estimating slope displacement for each of the seven time-histories discussed above. The impoundment cross-sections were evaluated, and the maximum depth of the failure plane was determined to range from 19 to 37 ft below the top of slope, so a conservative value of 15 ft was used in our analyses. Correction factors were applied to scale the displacements to the target magnitude 8 event. Details of the analysis are included in **Appendix A** along with graphical presentation of the results.

4.4 LIQUEFACTION POTENTIAL EVALUATION

During strong earthquake shaking, loose, saturated cohesionless soil deposits may experience a sudden loss of strength and stiffness, sometimes resulting in loss of bearing capacity, large permanent lateral displacements, and/or seismic settlement of the ground. This phenomenon is called soil liquefaction. In accordance with the requirements of §257.73(e)(1), evaluations have been performed to assess the potential for liquefaction of the soils used to construct the impoundment embankment.

The results of the subsurface explorations performed at the site indicate that the soils used to construct the impoundment embankments primarily consist of lean CLAY, fat CLAY, SILT, sandy SILT, and silty SAND. The lean CLAY and fat CLAY materials are generally not susceptible to liquefaction. The SILT, sandy SILT and silty SAND materials can be susceptible to liquefaction when saturated. However, groundwater was observed to be located approximately 12 to 22.5 ft below the embankments. Consequently, the existing embankment soils are not saturated and as a result, are not susceptible to liquefaction. In accordance with the requirements of §257.73(e)(1), a post-liquefaction stability analysis is not required since the soils used to construct the embankment are not susceptible to liquefaction in their current state.

4.5 STABILITY ANALYSIS

4.5.1 Methodology for Analyses

The computer software program Slide 7.0 was used to evaluate the static and seismic stability of the impoundment embankment. Analyses for static stability were performed to evaluate long-term maximum storage pool condition and maximum surcharge pool condition using Spencer's method of slices. Spencer's method of slices was selected because it fully satisfies the requirements of force and moment equilibrium (limit equilibrium method).

Both circular and translational (block) failures were evaluated. Translational failures were only evaluated where subsurface conditions included a relatively weak embankment or foundation layer located above or below a relatively strong foundation layer, such as soft clay overlying dense sand. The results of our evaluation of circular and translational failures indicated that circular failure surfaces represent the critical slope failure case. Accordingly, the results presented herein are limited to the critical case analyses performed for circular failure surfaces.

Seismic stability was evaluated using pseudo-static analyses. Pseudo-static analyses model the seismic shaking as a "permanent" body force that is added to the force-body diagram of a conventional static limit-equilibrium analysis; typically, only the horizontal component of earthquake shaking is modeled because the effects of vertical forces tend to average out to near zero (Jibson, 2011). This is a traditional approach for evaluating the stability of a slope during earthquake shaking and provides a simplified safety factor analysis for one earthquake pulse. A 20 percent reduction in material strength was conservatively incorporated in the pseudo-static analyses to represent the approximate threshold between large and small strains induced by cyclic loading (Duncan, 2014). In pseudo-static analyses, a safety factor greater than or equal to one (FS ≥ 1.0) generally indicates a slope is stable and a safety factor below one (FS < 1.0) generally indicates that a slope is unstable.

4.5.2 Pseudo-static Coefficient

The pseudo-static coefficient, k_s, used in our seismic analyses was selected using the results of the Newmark displacement analysis discussed previously. According to the MSHA Impoundment Design Manual, the acceptable displacement of coal refuse impoundments is 25% of the upstream freeboard (MSHA, 2009)[1]. At the Lined Pond, that equates to 45 in. based on 15 ft of freeboard.

For a 45-in. acceptable displacement, the Newmark displacement curves in **Appendix A** show that the minimum allowable yield acceleration corresponding to the average displacement is approximately 0.195g. A pseudostatic coefficient lower than 0.195g will result in more than 45 in. deformation and one higher than 0.195g will result in less than 45 in. deformation. For the seismic stability analyses performed for the impoundments, a pseudostatic coefficient of 0.20g was selected. This value was selected because it is slightly above the minimum value, which is conservative, and will result in displacements that are below MSHA acceptable values.

4.5.3 Results of Stability Evaluation

The critical cross section is defined as that which is anticipated to be most susceptible to failure amongst all cross sections. To identify the critical cross section at our project site, we examined the following conditions at several cross-section locations at the impoundment:

a. the geometry of the upstream and downstream slopes;
b. phreatic surface levels within and below the cross sections;
c. subsurface soil conditions;
d. presence or lack of surcharge loads behind the crest of the embankments; and
e. presence or lack of reinforcing measures in front of the embankments.

Examination of the conditions noted above resulted in the identification of three cross sections at the Lined Pond that could potentially be considered the critical cross section. The location of each cross section is shown on **Figure 2**. The results of our analyses are presented below in **Table III** and are shown on the Slide output files included in **Appendix A**.

As shown below, the static safety factors are above the minimum required values for the three cross-sections that were evaluated. Similarly, the pseudo-static analyses for the analyzed section indicates an acceptable seismic safety factor.

[1] This document is mentioned in the preamble of the Rule and is one of the reference documents that was used by the EPA to evaluate how to perform static and seismic stability analyses.

TABLE III SUMMARY OF STABILITY EVALUATIONS						
Cross- Section	Condition[1]	Earthquake Event	Soil Strength	Pool Level	Required Safety Factor	Safety Factor Rotational Failure Surface
A-A' (Lined Pond - West Embankment)	Static	-	Drained	Maximum Storage	1.5	3.94
			Drained	Maximum Surcharge	1.4	3.95
	Seismic	2,500-year	Undrained[2]	Maximum Storage	1.0	1.60
B-B' (Lined Pond - South Embankment)	Static	-	Drained	Maximum Storage	1.5	3.28
			Drained	Maximum Surcharge	1.4	3.28
	Seismic	2,500-year	Undrained[2]	Maximum Storage	1.0	1.29
C-C' (Lined Pond – East Embankment)	Static	-	Drained	Maximum Storage	1.5	2.43
			Drained	Maximum Surcharge	1.4	2.43
	Seismic	2,500-year	Undrained[2]	Maximum Storage	1.0	1.28

1. Refer to **Table I** for material properties.
2. Soil strengths have been reduced by 20 percent for seismic analyses to account for the threshold between large and small strains induced by cyclic loading.

4.6 CONCLUSIONS

The analyses associated with the safety factor assessment have been performed in accordance with the requirement of Section §257.73 of the CCR Rule. A summary of our conclusions as they relate to the rule requirements are provided below.

- §257.73(e)(1)(i) - *The calculated static factor of safety under the long-term, maximum storage pool loading conditions must equal or exceed 1.50.*

  As shown in **Table III**, the static safety factors for the long-term maximum storage pool condition are above the minimum required value for the critical section analyzed. Accordingly, this requirement has been met.

- §257.73(e)(1)(ii) - *The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.*

  As shown in **Table III**, the static safety factors for the maximum surcharge pool loading condition are above the minimum required value for the critical section analyzed. Accordingly, this requirement has been met.

- §257.73(e)(1)(iii) - *The calculated seismic factor of safety must equal or exceed 1.00.*

  As shown in **Table III**, the calculated seismic safety factor is above the minimum required value for the critical section analyzed. Accordingly, this requirement has been met.

- §257.73(e)(1)(iv) - *For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.*

  The results of historic subsurface investigations indicate that the material used to construct the impoundment embankment are not susceptible to liquefaction because they are not saturated. Accordingly, this requirement has been met.

5. Certification

Based on our review of the information provided to us by AECI and the results of our field investigations and analyses, it is our opinion that the calculated factors of safety for the critical cross sections of the impoundment embankment meet the minimum factors of safety specified in §257.73(e)(1)(i) through (iv) of the EPA's Final CCR Rule.

Certification Statement

I certify that the Initial Safety Factor Assessment for the Lined Pond at the New Madrid Power Plant meets the requirements of §257.73(e) of the EPA's Final CCR Rule.

Signed: _____

Consulting Engineer

Print Name:	Steven F. Putrich
Missouri License No.:	2014035813
Title:	Project Principal
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY ALDRICH

References

Atkinson G.M., Beresnev I.A. (2002); "Ground Motions at Memphis and St. Louis from M 7.5–8.0 Earthquakes in the New Madrid Seismic Zone", Bulletin of the Seismological Society of America, Vol. 92, No. 3, pp. 1015–1024, April 2002

Bray J.D., T Traversarou (2007); "Simplified Procedure for Estimating Earthquake-Induced Deviatoric Slope Displacements", Journal of Geotechnical and Geoenvironmental Engineering © ASCE / APRIL 2007

Campbell, K. W. and Bozorgnia Y. (2003), Updated near-source ground motion (attenuation) relations for the horizontal and vertical components of peak ground acceleration and acceleration response spectra, Bulletin of the Seismological Society of America, 93(1), 314 -331.

Cramer C.H. (2015); "Charleston Area Earthquake Hazards Mapping Project (CAEHMP) Workshop and Pilot Study: Collaborative Research with the College of Charleston and the University of Memphis", Final technical Report-Award Number: G14AP00023 and G14AP00024, Center for Earthquake Research and Information, University of Memphis

Cushing, E.M., Boswell, E.H., and Hosman, R.L, (1964), "General Geology of the Mississippi Embayment", Department of the Interior, Geological Survey Professional Paper 448-B.

Duncan, J.M., Wright, S.G, and Brandon, T.L. (2014). Soil Strength and Slope Stability. John Wiley & Sons, Upper Saddle River, 2nd Edition, pp. 182-184.

Environmental Protection Agency, (2015), Code of Federal Regulations, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule, "Title 40, Chapter I, Parts 257 and 261, April 17.

Federal Highway Administration (FHWA) (2011); "LRFD Seismic Analysis and Design of Transportation Geotechnical Features and Structural Foundations Reference Manual", FHWA-NHI-11-032, U.S. Dept. of Transportation

Geotechnology, Inc. (June 2009). "Stability Evaluations Slag Pond 1 and Ash Pond 2 AECI New Madrid Power Generating Facility, New Madrid County, Missouri"

Jibson, R.W., (2011), "Methods for assessing the stability of slopes during earthquakes—A Retrospective," Engineering Geology, v. 122, p. 43-50.

Kavazanjian, E.,Jr. and Matasovic, Y.L. (1996), "YSLIP_PM – A Computer Program for Simulation of Dynamic Behavior of a Rigid Block on an Inclined Plane and Calculation of Permanent Displacement of the Block", User's Manual p. 21 (plus appendix).

Mine Safety and Health Administration – U.S. Department of Labor (MSHA), (May 2009. Rev. August 2010). Engineering and Design Manual Coal Refuse Disposal Facilities - Second Edition.

Romero S.M., G.J. Rix (2005); "Ground Motion Amplification of Soils in the Upper Mississippi Embayment", Report No. GIT-CEE/GEO-01-1, National Science Foundation, Mid Atlantic Earthquake Center, Georgia Institute of Technology

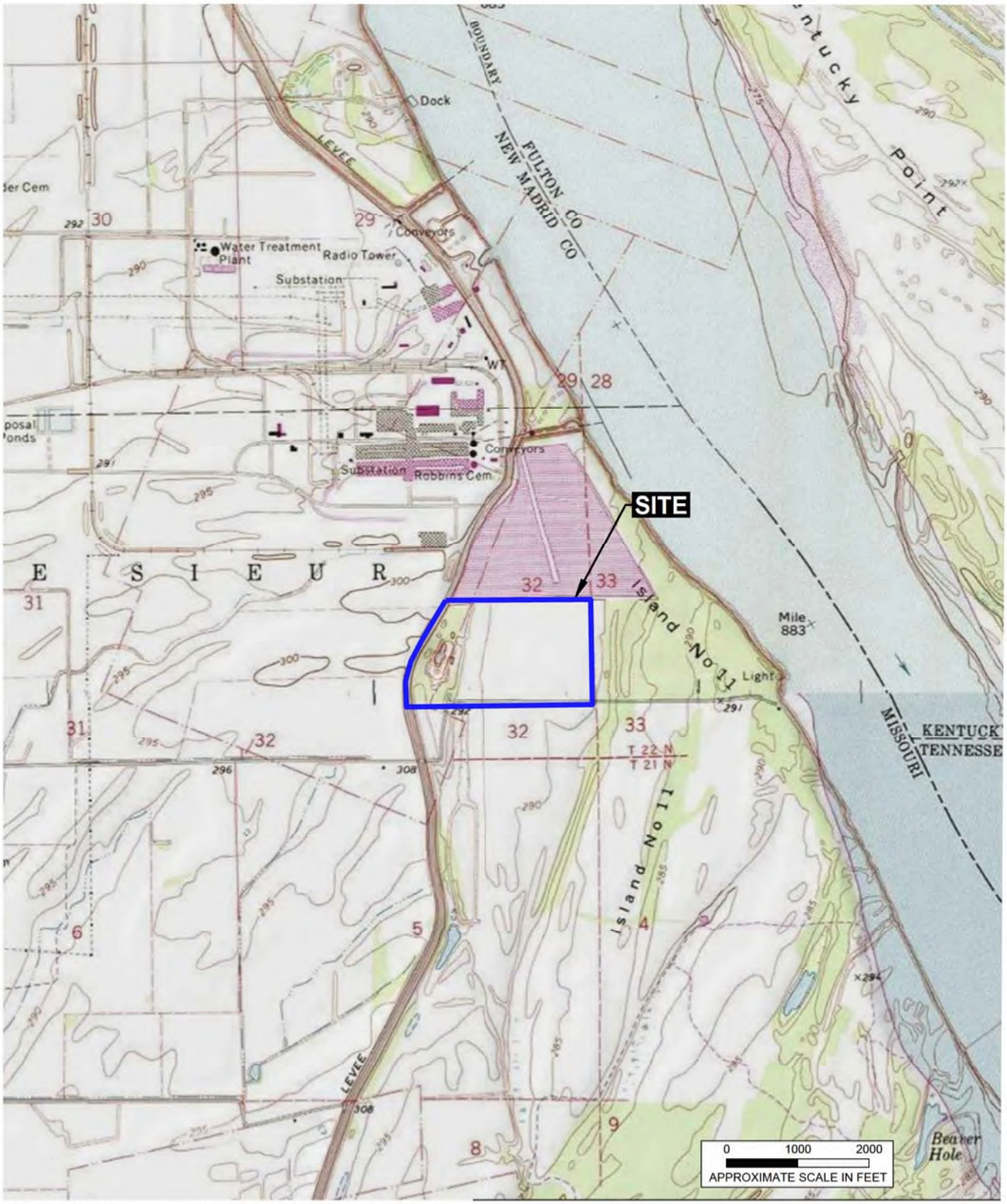
Rosenblad, B.L. (2007), "Deep Shear Wave Velocity Profiles of Mississippi Embayment Sediments Determined from Surface Wave Measurements," Research supported by the U.S.G.S., Department of Interior, under USGS award number 06HQGR0131.

Spencer, E. (1967), "A Method of Analysis of the Stability of Embankments Assuming Parallel Inter-Slice Forces," Geotechnique, Vol. 17, No. 1, pp 11-26.

U.S. Army Corps of Engineers (2003), "Engineering and Design: Slope Stability," Engineer Manual EM-1110-2-1902, Department of the Army, U.S. Army Corps of Engineers, Washington, DC, October.

Van Arsdale, R.B. and TenBrink, R.K. (2000), "Late Cretaceous and Cenozoic Geology of the New Madrid Seismic Zone," Bulletin of the Seismological Society of America, 90, 2, pp. 345-356, April 2000.

FIGURES



MAP SOURCE: ESRI

SITE COORDINATES: 36°30'14"N, 89°33'36"W

HALEY ALDRICH

LINED POND
AECI, NEW MADRID POWER PLANT
MARSTON, MISSOURI

SITE LOCUS

SCALE: AS SHOWN
APRIL 2018

FIGURE 1

POSTOLOWSKI, KEVIN Printed: 4/9/2018 9:52 AM Layout: FIG 1 (2018-ARPIL)
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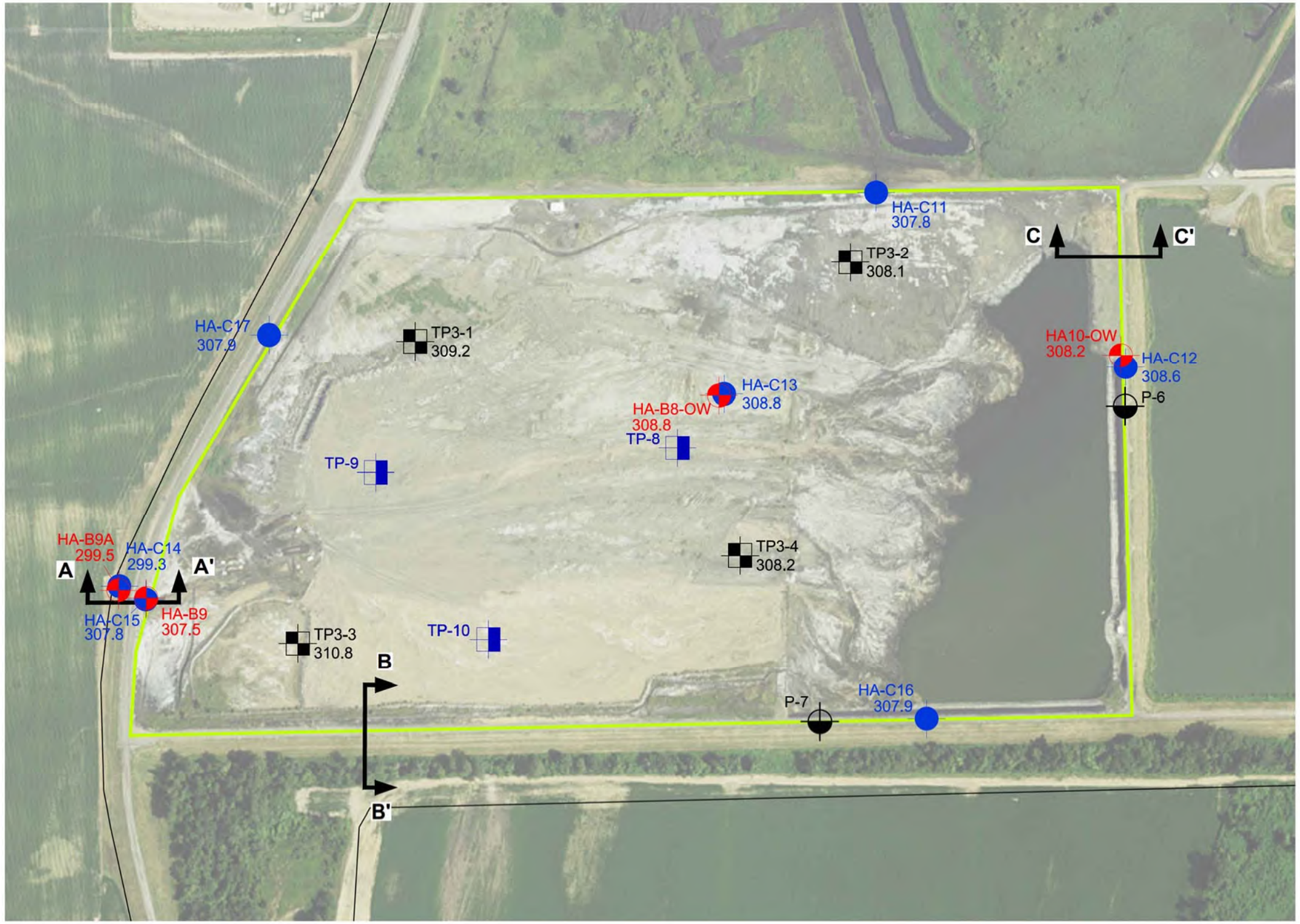


LEGEND

APPROXIMATE LIMIT OF CCR UNIT

HA-B10-OW 308.2 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED BY BULLDOG DRILLING OF DUPO, ILLINOIS DURING THE PERIOD 12 JUNE 2017 TO 14 JUNE 2017. BORINGS WITH AN "OW" DESIGNATION INDICATES THE BORING WAS CONVERTED TO AN OBSERVATION WELL

HA-C12 308.6 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF CONE PENETROMETER SOUNDINGS PERFORMED BY CONETEC, INC. OF WEST BERLIN, NEW JERSEY DURING THE PERIOD 12 JUNE 2017 TO 13 JUNE 2017.

P-7 — APPROXIMATE LOCATION OF EXISTING BORING PERFORMED BY GEOTECHNOLOGY IN 2009.

TP3-1 309.2 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF TEST PITS PERFORMED BY DUMEY CONTRACTING OF BENTON, MISSOURI ON 21 JUNE 2017.

TP-8 — DESIGNATION AND APPROXIMATE LOCATION OF EXISTING TEST PITS PERFORMED BY GEOTECHNOLOGY IN 2009.

A A' — CROSS-SECTION LOCATION

NOTES:

1. BACKGROUND IMAGE IS DATED 2 AUGUST 2014 FROM ESRI GIS.
2. ELEVATIONS INDICATED ON THIS DRAWING ARE IN FEET AND REFER TO NAVD88 DATUM. HORIZONTAL DATUM IS MISSOURI STATE PLANE NAD83, EAST ZONE US FOOT.
3. TECHNICAL MONITORING OF TEST BORINGS, CONE PENETROMETER SOUNDINGS, AND TEST PITS COMPLETED DURING THE PERIOD 12 JUNE 2017 TO 21 JUNE 2017 WAS PERFORMED BY HALEY & ALDRICH, INC.
4. AS DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS OF 2017 TEST BORINGS, CONE PENETROMETER SOUNDINGS, AND TEST PITS WERE DETERMINED IN THE FIELD BY AECI BY ROVER GPS UNIT.

N

0 300 601
SCALE IN FEET

HALEY ALDRICH

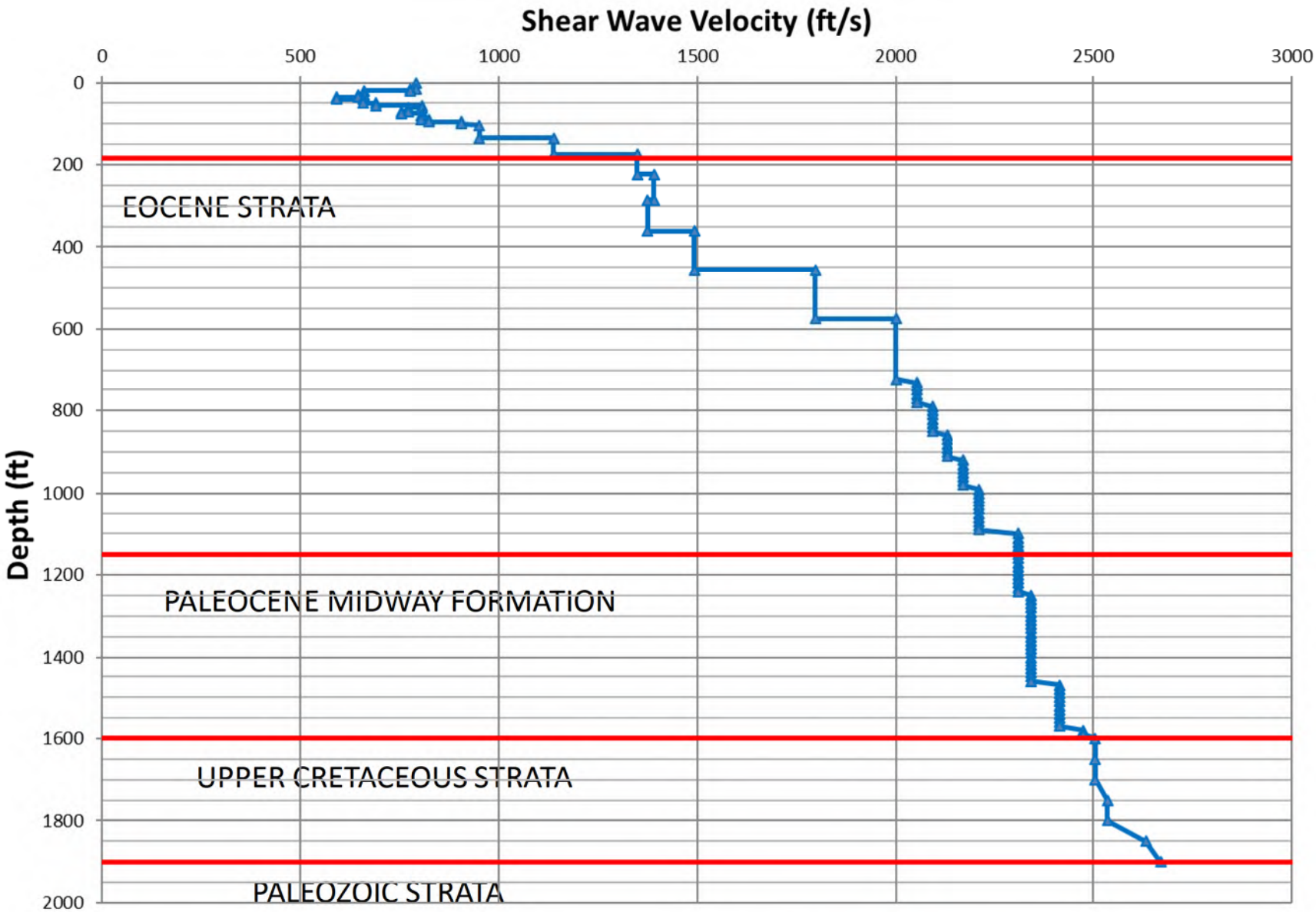
LINED POND
AECI, NEW MADRID POWER PLANT
MARSTON, MISSOURI

SUBSURFACE EXPLORATION LOCATION PLAN

SCALE: AS SHOWN
APRIL 2018

FIGURE 2

POSTOLOWSKI, KEVIN Printed: 2/21/2018 1:17 PM Layout: FIG 2
Z:\CLE_COMMON\PROJECTS\129342 AECI-NMPP\CAD\LINED POND\FIGURES\129342 005 0005 SUB EXPLORATION PLAN.DWG



HALEY ALDRICH

LINED POND
AECI, NEW MADRID POWER PLANT
MARSTON, MISSOURI

DESIGN SHEAR WAVE VELOCITY PROFILE

SCALE : AS SHOWN
APRIL 2018

FIGURE 3

129342-015_FIG 4.PPT

APPENDIX A

Analyses

Seismic Response Analysis

SITE SPECIFIC SEISMIC RESPONSE ANALYSIS

Introduction

The New Madrid Power Plant is located within the New Madrid Seismic Zone (NMSZ) and the Mississippi embayment. The NMSZ is associated with strong ground motions and the Mississippi embayment is associated with thick soil. The natural embayment soils underlying the Lined Pond is estimated to be approximately 1,900-ft thick. It has been demonstrated that the strong ground motions migrating up through the thick soil alter the spectral response at the ground surface so that it is much different than the response in the bedrock below the site. At short periods increasing soil thickness correlates with a decreasing hazard due to the nonlinear soil behavior. Similarly, at long periods, increasing soil thickness correlates with increasing hazard due to soil resonance (Cramer, 2015).

Overview of Site-Specific Seismic Analysis

A one-dimensional ground response analysis was performed to estimate the subsurface response to an earthquake event at New Madrid. Due to the complex nature of the analyses required, Dr. Professor Edward Kavazanjian, Jr. at Arizona State University and Dr. Professor Chris Cramer at the University of Memphis were retained as part of our team to assist with the site-specific seismic analyses.

It is important that the rock and soil characteristics used to develop the ground response model match the engineering and seismic characteristics of the soil and rock at the New Madrid Power Plant. Properly conditioned bedrock strong ground motions (acceleration time histories) are required to perform a site-specific seismic analysis. These rock motions should match the spectral response of characteristic ground motions with respect to the dominant seismic sources affecting New Madrid. Unfortunately, strong motion records from large magnitude events are not available for Central U.S. (Romero and Rix, 2001). Therefore, records were obtained from other sources that approximate the spectral response characteristics at the site.

A site-specific target response spectrum was created for the site to be used as a guide in selecting the proper ground motions for the study. This target spectrum was developed following well established criteria developed for building and infrastructure standards. The common design is based on the maximum critical risk-targeted (MCE_R) spectral response acceleration. Two different design methods (probabilistic and deterministic) are used to approximate the MCE_R spectrum and the lesser of the spectral response accelerations from each method at each period is used to create the site-specific target spectrum. The probabilistic target spectrum is created from the uniform hazard spectrum (UHS) by performing a probabilistic seismic hazard analysis (PSHA). [1] It is then adjusted for maximum ground motion and targeted risk. The deterministic target spectrum is calculated from 84th-percentile ground motions representing a characteristic earthquake on a known or perceived active fault within the region.

[1] The uniform hazard spectrum is calculated by research on potential sources of earthquakes (e.g., faults and locations of past earthquakes), the potential magnitudes of earthquakes from these sources and their frequencies of occurrence, and the potential ground motions generated by these earthquakes. Uncertainty and randomness in each of these components is accounted for in the computation.

The bedrock at the site is classified as NEHRP Site Class A, hard rock. The 2008 UHS, provided by USGS, for a hypothetical Site Class A rock, based on the 2,500 –year return period ground motions, was used to identify the Probabilistic Target Spectrum used for the site-specific evaluation. Ground motions scaled to this spectrum were input in Shake at the base of the soil column as outcrop motions. Shake performs the necessary deconvolution techniques on the motions to adjust to within motions used for the one-dimensional analysis.

USGS Deaggregation and Deterministic Target Spectrum

Unlike the west coast, central and eastern U.S. does not have a well-defined fault system and associated seismic sources needed to properly develop a Deterministic spectral response. Therefore, it is common practice to use pseudo fault locations to develop the deterministic target. Deaggregation data obtained from a probabilistic seismic hazard analysis (PSHA) is used to provide the relevant information needed to develop the deterministic target. The NSHMP PSHA interactive deaggregation web site was used to obtain the characteristics of the most significant earthquakes deemed to contribute the most to the seismic activity at the New Madrid Power Plant. It should be noted that at the time our analyses were performed, USGS had not formerly released the deaggregation data for the 2014 hazard maps. As such, the slightly more conservative 2008 deaggregation data was used to determine the most significant earthquakes that are considered for the seismic hazard for New Madrid. The deaggregation data suggests that the representative design earthquake for ground motions with a return period of 2,500 years should be between magnitude 7.5 and 8.0 at a distance of approximately 11 km from the site (**Figure A-1**). The deterministic spectrum for scenario events (i.e. for events that conformed to the CMS to be discussed later) was based upon the location and magnitude information obtained from the PSHA.

The deterministic target spectrum is based on ground motion prediction equations (GMPEs) that use magnitude and distance to predict the spectral response of the ground motion. According to the USGS PSHA, the largest event predicted to affect New Madrid Power Plant is a magnitude 8 earthquake that is 10.5 km from the site. The computer software program Shake 2000, developed by GeoMotions, provided the central and eastern U.S. (CEUS) GMPEs and the CMS algorithms used to create the target spectrum. Site-specific spectral responses were generated from five appropriate CEUS attenuation relationships using Shake 2000 as shown on **Figure A-2**. These attenuation relationships were based on a magnitude 8 earthquake as a distance of 10.5 km from the source. The GMPE representing the Campbell 2003 attenuation relationship was selected to produce the deterministic target spectrum for the site because it had the largest spectral response among all GMPEs tested.

A special type of target spectrum, called the conditional mean spectrum (CMS), was created for the study because it focuses the mean spectral response of all the ground motions to a particular period along the target spectrum (Baker, 2011). According to a joint venture between NIST and NEHRP (NEHRP, 2011):

> *"The Uniform Hazard Spectrum (UHS) is constructed by enveloping the spectral amplitudes at all periods that are exceeded with a given probability, computed using probabilistic seismic hazard analysis. However, those spectral values at each period are unlikely to all occur in a single ground motion. These conditional spectra instead condition the spectrum calculation on spectral acceleration at a single period, and then compute associated spectral acceleration*

values at all other periods. This conditional calculation assures that ground motions selected to match that spectrum have appropriate properties for naturally occurring ground motions that would occur at the site of interest."

The particular target period selected is related to fundamental period of the structure being analyzed. The fundamental period for the Lined Pond impoundment at New Madrid Power Plant is related to the anticipated height of the sliding mass if failure were to occur. Based on the characteristics of general failure planes determined from slope stability analyses for the impoundment, a target period of 0.1s was chosen for the CMS target spectrum.

Conditional Mean Spectrum Groundmotions Scaled to Target Period T=0.1 s

The CMS spectrum according to Baker, 2011 is to be constructed with the ground motion scaled so that its mean spectral response at the target period, T* matches the spectral response at the CMS Target Spectrum. The target period, T* 0.1s was chosen to approximate the fundamental frequency of the sliding mass which is determined form the location of the failure plane within the slope at a condition of equilibrium (i.e., safety factor equal to 1.0). The shear wave velocity, V_s of the sliding mass was estimated to range between 450 ft/sec and 1,000 ft/sec for the Lined Pond. Our analyses assumed the height of the sliding mass varied from 19 ft to 37 ft.

Shake 2000 software by Geomotion, Inc. was used to provide the CMS spectrum for Campbell 2003 CEUS GMPE using a target period T* = 0.1s and amplifying the CMS to correspond to a mean plus one standard deviation spectrum. The mean plus one standard deviation spectrum shown on **Figure A-3** was used as the deterministic CMS target spectrum for the New Madrid Power Plant.

Rock Motions for the CMS

Six time-history records were selected to match the target response spectrum for the site. Five of these rock motions were obtained from naturally occurring events and one rock motion was synthetically generated to match a magnitude 8 earthquake associated with the ground response for the Mississippi Embayment at Memphis, TN (Atkinson 2002). A primary focus was to match the ground motion spectra to the CMS target spectrum, as suggested by NEHRP (2011) when considering magnitude, distance, and focal mechanism. Rock motion records were selected from the Pacific Earthquake Engineering Research (PEER) Center's Strong Motion Database. The motions are summarized below in **Table I** and depicted graphically on **Figure A-4**. As shown on **Figure A-5**, the arithmetic mean spectrum of the generated records closely matches the CMS bedrock spectrum over the period range of significance.

TABLE I
EARTHQUAKE RECORDS

Event	Return Period	PEER File Name	Earthquake Record Used			
			Earthquake	M	Mechanism	Distance (km)
Conditional Mean Response	2,500-year	RSN497-Nahanni_S3270.AT2	Nahinni	6.76	Reverse	5.32
		RSN550_Chalfant.A_A-CPL070.AT2	Chalfant	6.19	Strike-slip	18.31
		RSN4481_L-Aquila_FA030XTE.AT2	L'Aquila	6.3	Normal	6.81
		RSN825_ CAPEMEND_CPM000.AT2	Cape Mendocino	7.1	Reverse	6.96
		RSN8158_CChurch_LPCCN10W.AT2	Christ Church	6.2	Reverse Oblique	6.12
		N/A	Synthetic (Atkinson and Beresnev)	8.0	N/A	N/A

Due to the unusually large magnitude and close proximity of the earthquake projected for the site, there are not many recorded ground motions that effectively scale to the shorter period portion of the CMS target spectrum. According to the Federal Highway Administration, due to the low number of available ground motions for central and eastern U.S., it is acceptable to spectrally match the ground motions to the lower period portions of the target spectrum (FHWA, 2011). For this reason, the ground motions were spectrally matched to the CMS target spectrum between T=0.02 sec to 0.06 sec as shown on **Figure A-6.**

One-Dimensional Ground Response Analysis

As mentioned previously, a one-dimensional ground response analysis was performed to estimate the surface ground motion at the site. The soil column used as input into the model was constructed from the shear wave velocity profile at the site (from in-situ testing) along with other characteristics such as layer thickness, soil density and the dynamic behavior. The dynamic geotechnical properties (damping, modulus-damping curves, density, etc.) used in the ground response analysis were obtained from prior models developed by Dr. Chris Cramer and are representative of the non-linear, pressure dependent soil properties attributed to the Mississippi Embayment (Romero and Rix, 2005).

The computer software program Shake 2000 was used to numerically simulate the propagation of rock motions applied to the base of the soil column up through the soil layers to the top of the soil column. Shake2000 uses an equivalent linear numerical technique to model the non-linear dynamic soil behavior in the soil column. **Figure A-7** shows the results of the Shake ground response analysis for the six representative rock motions. This figure compares the spectral response of the scaled bedrock motions to the surface ground response and shows the transformation in response caused by wave propagation through the 1,900-ft thick soil column. **Table II** summarizes the surface PGA estimates at the New Madrid Power Plant.

TABLE II PREDICTED SURFACE PGA AND NEWMARK MAGNITUDE CORRECTION FACTOR				
Earthquake	Original Magnitude	CMS Scaled-Matched PGA[1]	Shake Surface PGA	Newmark Magnitude Correction Factor[2]
Nahinni	6.76	1.60 g	0.33 g	1.41
Chalfant	6.19	1.77 g	0.33 g	1.65
L'Aquila	6.30	1.60 g	0.66 g	1.60
Cape Mendocino	7.01	1.40 g	0.41 g	1.32
Christ Church	6.25	2.00 g	0.41 g	1.65
Synthetic (Atkinson and Beresnev)	8.00	0.95 g	0.47 g	1.00

[1] CMS scaled to period range of significance at T*=1.0s
[2] Determined using the method developed by Bray and Traversarou

Newmark Displacement Analysis

The Newmark method predicts the amount of block displacement for a given value of yield acceleration. The Newmark displacement analysis is based on the shear stress time history acting along the failure plane within the slope. The yield acceleration is the minimum amount of ground acceleration necessary to initiate motion along the failure surface and is used to determine the appropriate pseudo-static coefficient for seismic stability analyses.

Shake 2000 was used to perform the Newmark displacement analysis by incorporating the results of the one-dimensional ground response analysis to estimate slope displacement. Shake 2000 incorporates several different variants of the Newmark block displacement method and the numerical approach known as YSLIP developed by Kavazanjian and Matasovic (1996) was chosen for our analysis. All six site-specific bedrock motions were used to evaluate relationships between the Newmark permanent displacements and the associated yield acceleration. Several impoundment cross-sections were evaluated, and the most conservative location of the failure plane was determined to be 15 ft below the top of slope.

After performing the Newmark displacement analysis, it was necessary to adjust the displacement predictions to correspond to the difference between the magnitudes of the ground motions used in the analysis and the magnitude of the representative earthquake event established for the New Madrid Power Plant. Correction factors were applied to scale the displacements to the target magnitude 8 event. The correction factors were determined using the approach developed by Bray and Travasarou (2007), which relates permanent displacement from a Newmark analysis with the magnitude of the earthquake event (Bray, 2007). **Figure A-8** presents the magnitude scaled permanent displacement versus yield acceleration.

REFERENCES

Atkinson G.M., Beresnev I.A. (2002); "Ground Motions at Memphis and St. Louis from M 7.5–8.0 Earthquakes in the New Madrid Seismic Zone", Bulletin of the Seismological Society of America, Vol. 92, No. 3, pp. 1015–1024, April 2002

Baker J.W. (2011); "Conditional Mean Spectrum: Tool for Ground-Motion Selection", J. Struct. Eng. 2011.137:322-331.

Bray J.D., T Travasarou (2007); "Simplified Procedure for Estimating Earthquake-Induced Deviatoric Slope Displacements", Journal of Geotechnical and Geoenvironmental Engineering © ASCE / APRIL 2007

Campbell, K. W. and Bozorgnia Y. (2003), Updated near-source ground motion (attenuation) relations for the horizontal and vertical components of peak ground acceleration and acceleration response spectra, Bulletin of the Seismological Society of America, 93(1), 314 -331.

Cramer C.H. (2015); "Charleston Area Earthquake Hazards Mapping Project (CAEHMP) Workshop and Pilot Study: Collaborative Research with the College of Charleston and the University of Memphis", Final technical Report-Award Number: G14AP00023 and G14AP00024, Center for Earthquake Research and Information, University of Memphis

Federal Highway Administration (FHWA) (2011); "LRFD Seismic Analysis and Design of Transportation Geotechnical Features and Structural Foundations Reference Manual", FHWA-NHI-11-032, U.S. Dept. of Transportation

Hashash Y.M.A, D. Park (2001); "Non-linear one-dimensional seismic ground propagation in the Mississippi Embayment, Engineering Geology 62 (2001) 185-206, Elsevier

Hynes-Griffin, M.E. and Franklin, A.G. (1984). "Rationalizing the seismic coefficient method," [Miscellaneous Paper GL-84-13]. U.S. Army Corp of Engineers Waterways Experiment Station. Vicksburg, Mississippi, 21pp.

Kavazanjian, E., Jr. and Matasovic, Y.L. (1996), "YSLIP_PM – A Computer Program for Simulation of Dynamic Behavior of a Rigid Block on an Inclined Plane and Calculation of Permanent Displacement of the Block", User's Manual p. 21 (plus appendix).

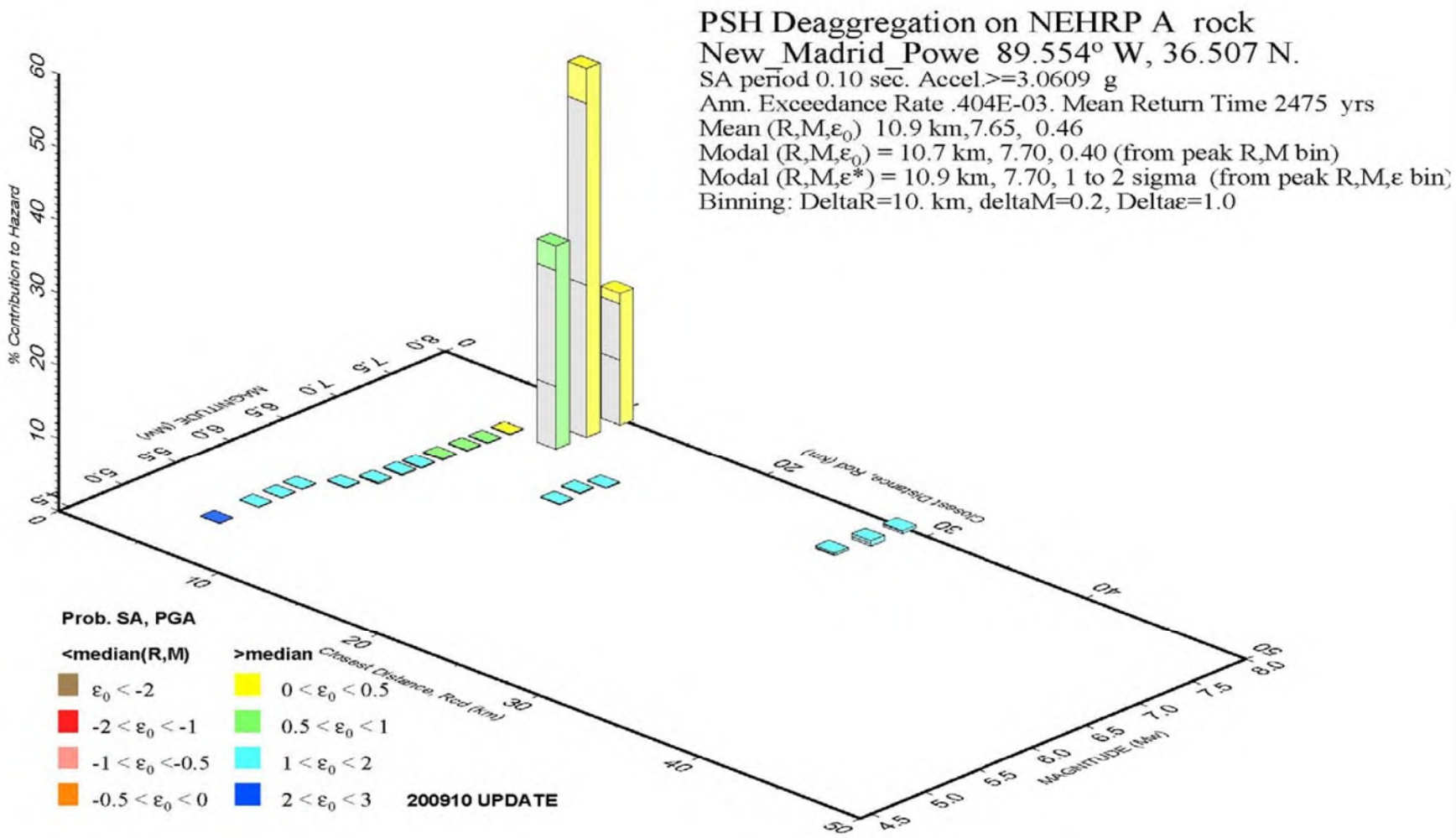
National Earthquakes Hazard Reduction Program (2011); "Selecting and Scaling Earthquake Ground Motions for Performing Response-History Analyses", NIST GCR 11-917-15.

Romero S.M., G.J. Rix (2005); "Ground Motion Amplification of Soils in the Upper Mississippi Embayment", Report No. GIT-CEE/GEO-01-1, National Science Foundation, Mid Atlantic Earthquake Center, Georgia Institute of Technology

Rosenblad, B.L. (2007), "Deep Shear Wave Velocity Profiles of Mississippi Embayment Sediments Determined from Surface Wave Measurements," Research supported by the U.S.G.S., Department of Interior, under USGS award number 06HQGR0131.

Spencer, E. (1967), "A Method of Analysis of the Stability of Embankments Assuming Parallel Inter-Slice Forces," Geotechnique, Vol. 17, No. 1, pp 11-26.

FIGURES



GMT 2015 Nov 17 16:59:44 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs=2000. m/s top 30 m. USGS CGHTPSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

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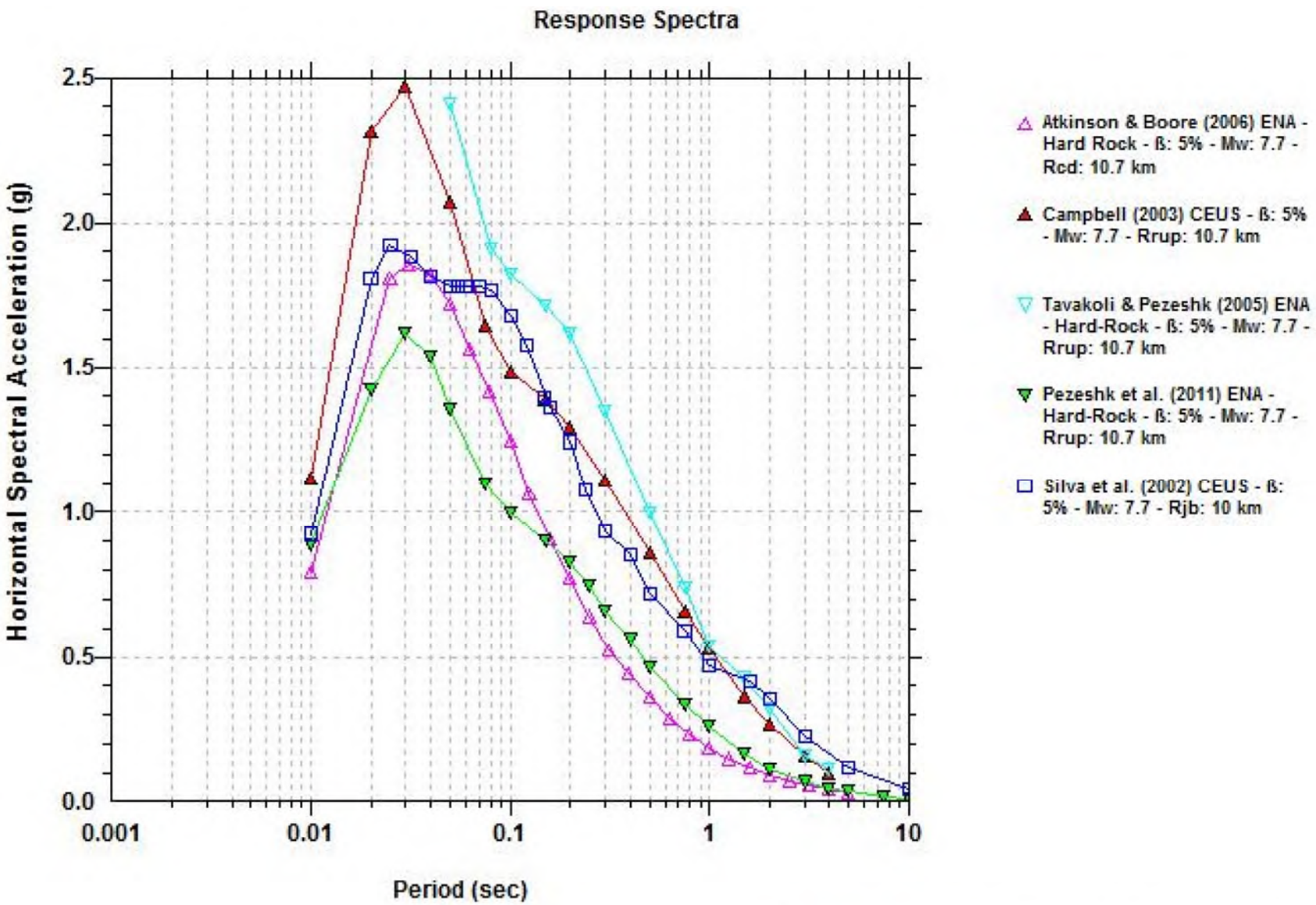
LINED POND
MARSTON, MISSOURI

2008 DEGRADATION PLOT AT PERIOD T=0.1s

SCALE : AS SHOWN
APRIL 2018

FIGURE A-1

129342-015_FIG_A-1.PPT



NOTES
1. Reference: SHAKE 2000

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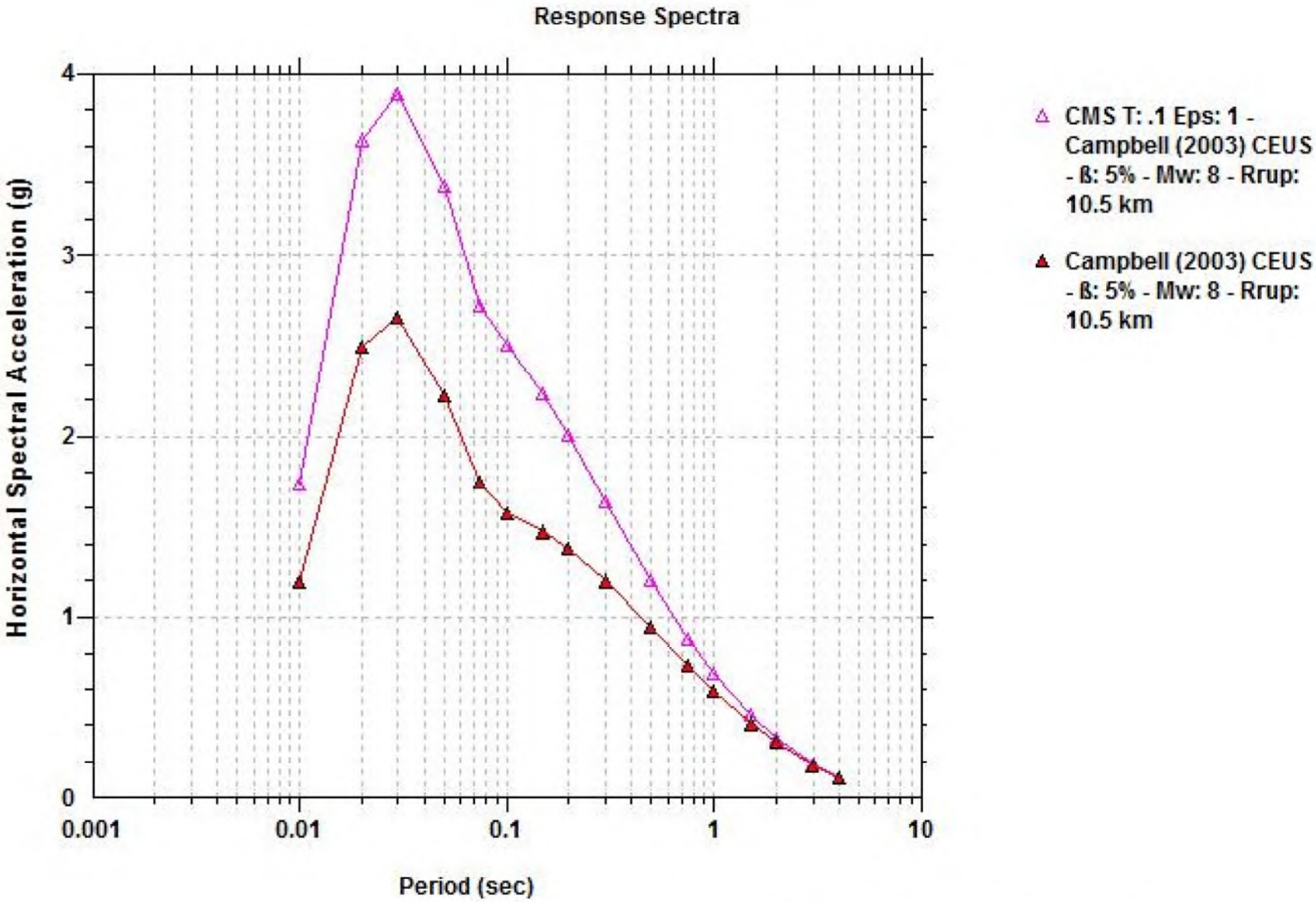
MARSTON, MISSOURI

CENTRAL AND EASTERN U.S. GROUND MOTION ATTENUATION MODELS

SCALE : AS SHOWN
APRIL 2018

FIGURE A-2

129342-015_FIG A-3.PPT



NOTES
1. Reference: SHAKE 2000

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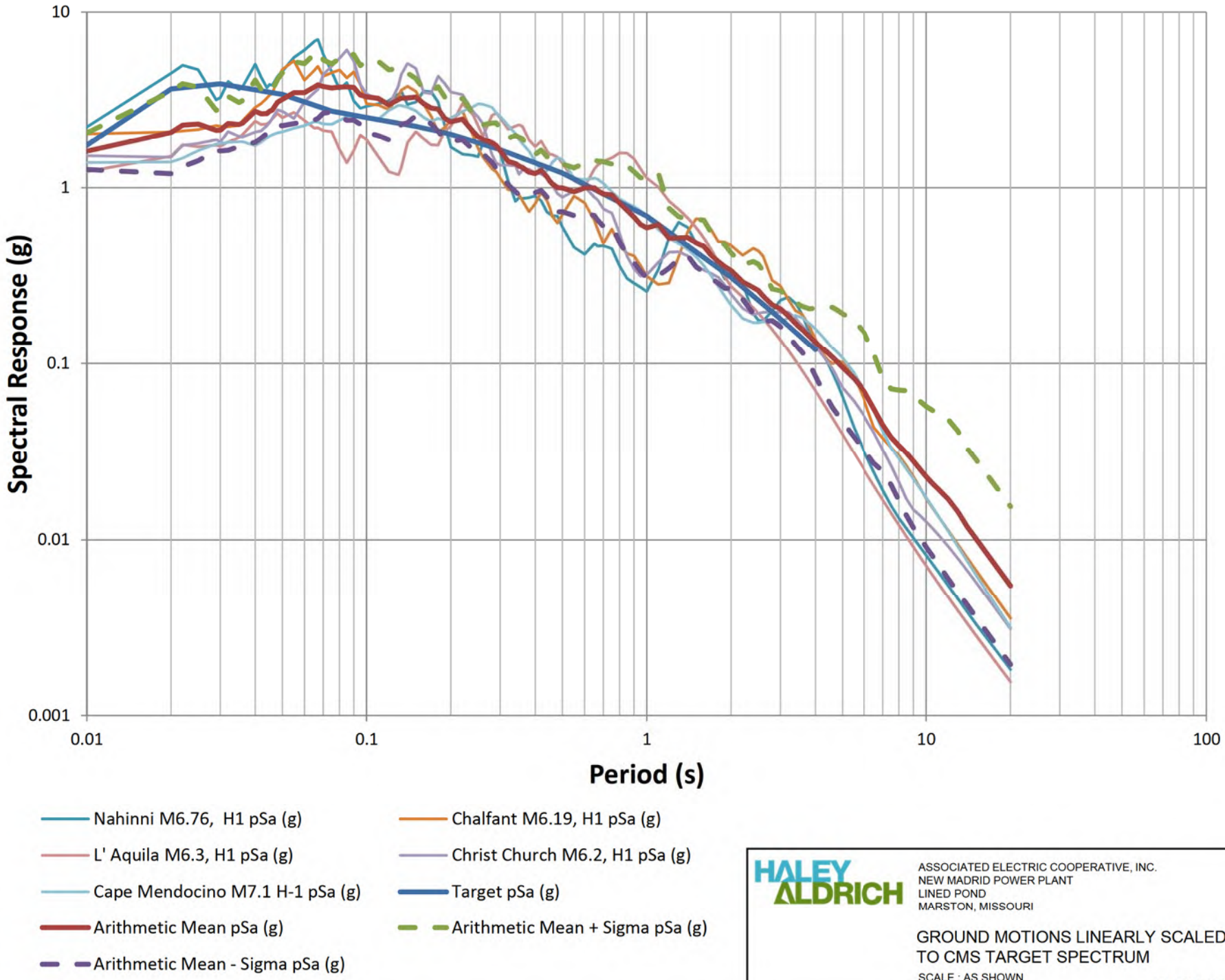
MARSTON, MISSOURI

DETERMINISTIC CONDITIONAL MEAN SPECTRUM (CMS)

SCALE : AS SHOWN
APRIL 2018

FIGURE A-3

129342-015_FIG A-4.PPT



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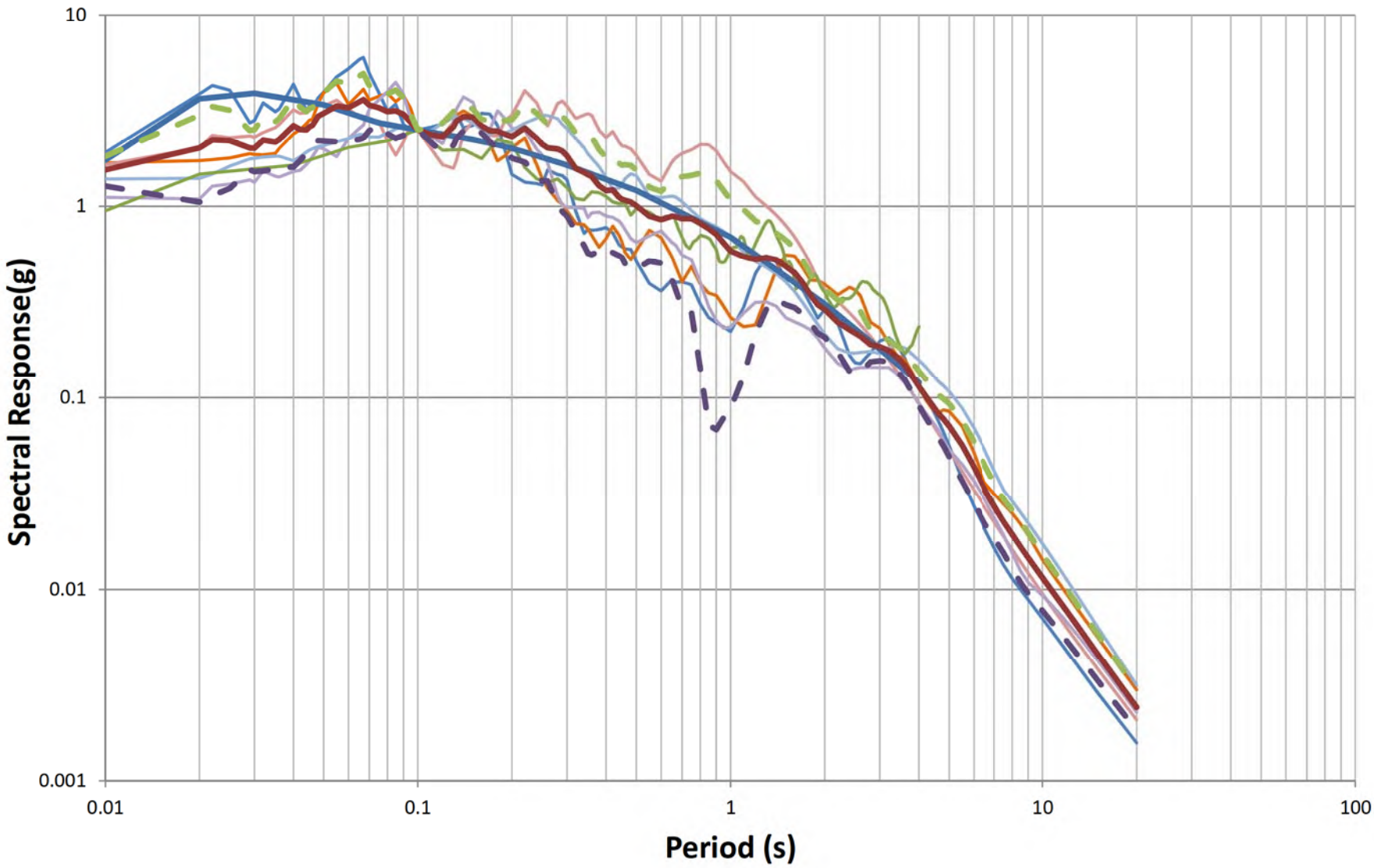
MARSTON, MISSOURI

GROUND MOTIONS LINEARLY SCALED TO CMS TARGET SPECTRUM

SCALE : AS SHOWN
APRIL 2018

FIGURE A-4

129342-015_FIG A-5.PPT



Nahanni-M6.76, H-1 pSa (g)
Chalfant-M6.19, H-1 pSa (g)
L-Aquila-M6.3, Hl-1 pSa (g)
Christ Church-M6.2, H-1 pSa (g)
Cape Mendocino M7.1 H-1 pSa (g)
Synthetic M8, A&B
Target pSa (g)
Arithmetic Mean pSa (g)
Arithmetic Mean + Sigma pSa (g)
Arithmetic Mean - Sigma pSa (g)

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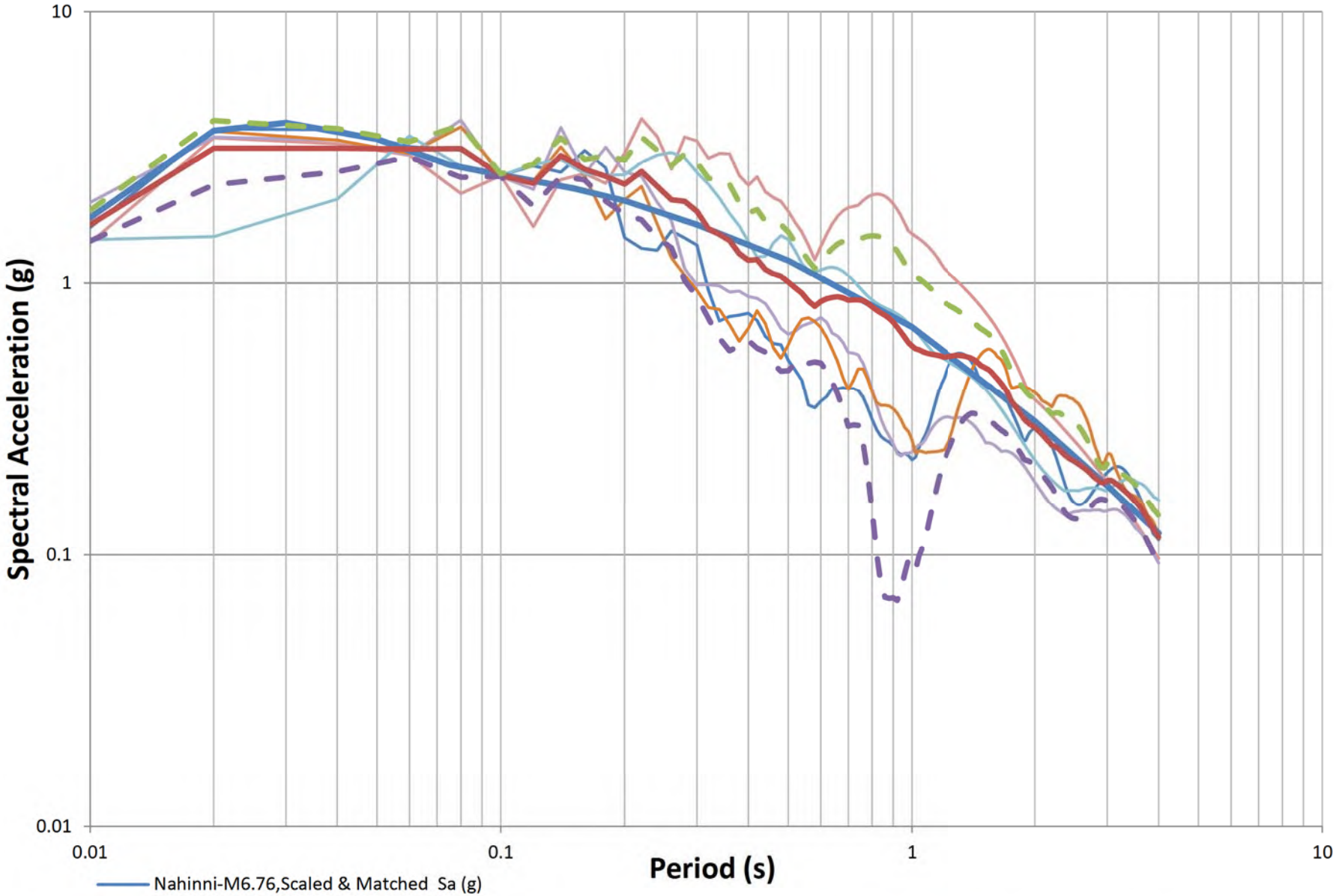
CONDITIONAL MEAN SPECTRUM
TARGET PERIOD = 0.1s

SCALE : AS SHOWN
APRIL 2018

FIGURE A-5

129342-015_FIG A-6.PPT



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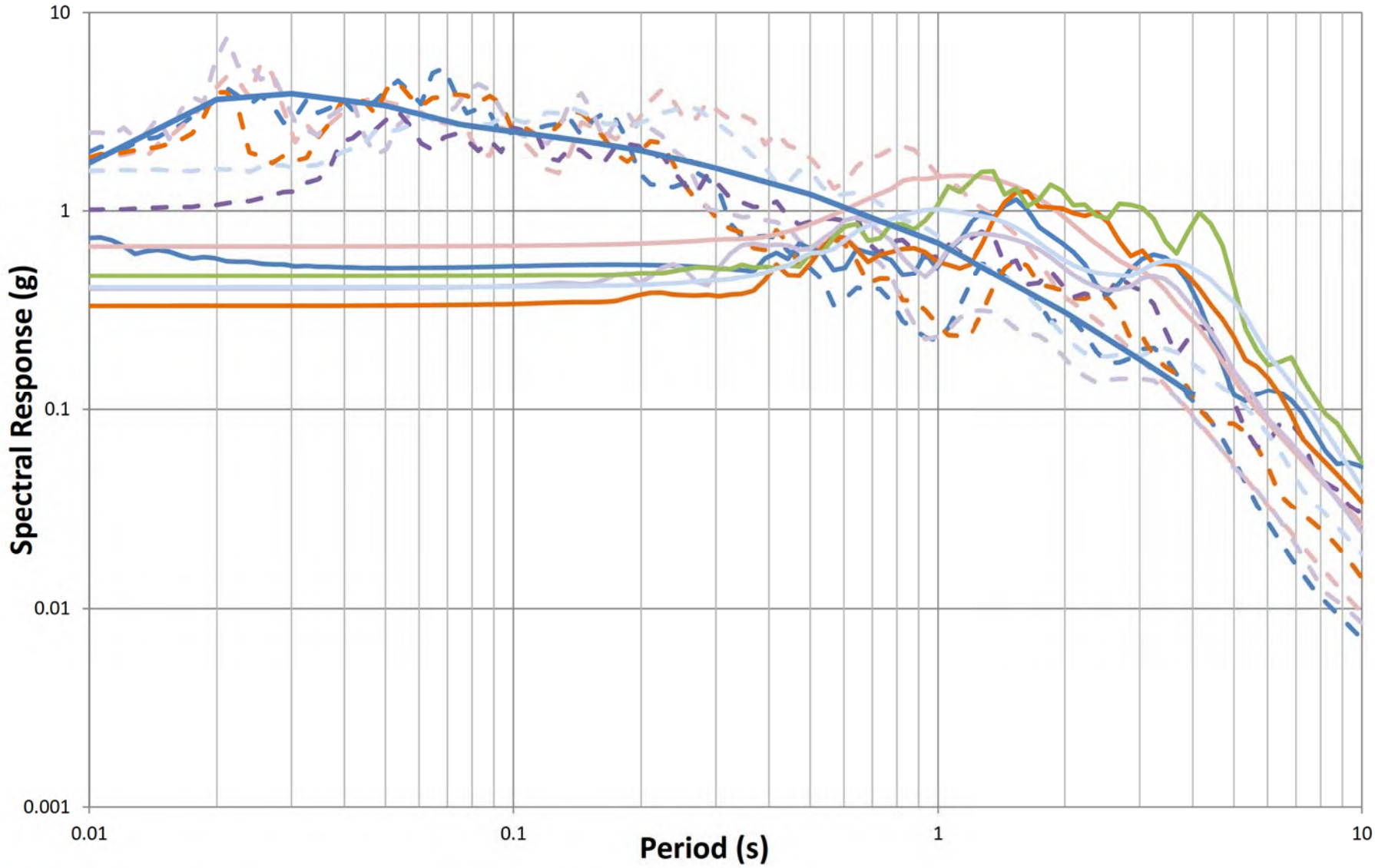
GROUND MOTIONS LINEARLY SCALED TO CMS = 0.1s AND MATCHED BETWEEN T = 0.2s and T=0.06s

SCALE : AS SHOWN
APRIL 2018

FIGURE A-6

129342-015_FIG A-7.PPT



- Nahinni Bedrock Sa(g)
- Chalfant Bedrock Sa(g)
- A&B Synthetic M8 Bedrock Sa(g)
- Nahinni Surface Sa, (g) -SHAKE
- Chalfant Surface Sa, (g) -SHAKE
- A&B Synthetic M8 Surface Sa, (g -SHAKE)
- CMS Target Spectrum
- L'Aquila Bedrock Sa(g)
- Christ Church Bedrock Sa(g)
- Cape Mendocino Bedrock Sa (g)
- L'Aquila Surface Sa, (g) -SHAKE
- Christ Church Surface Sa, (g) -SHAKE
- Cape Mendocino Surface Sa (g) -SHAKE

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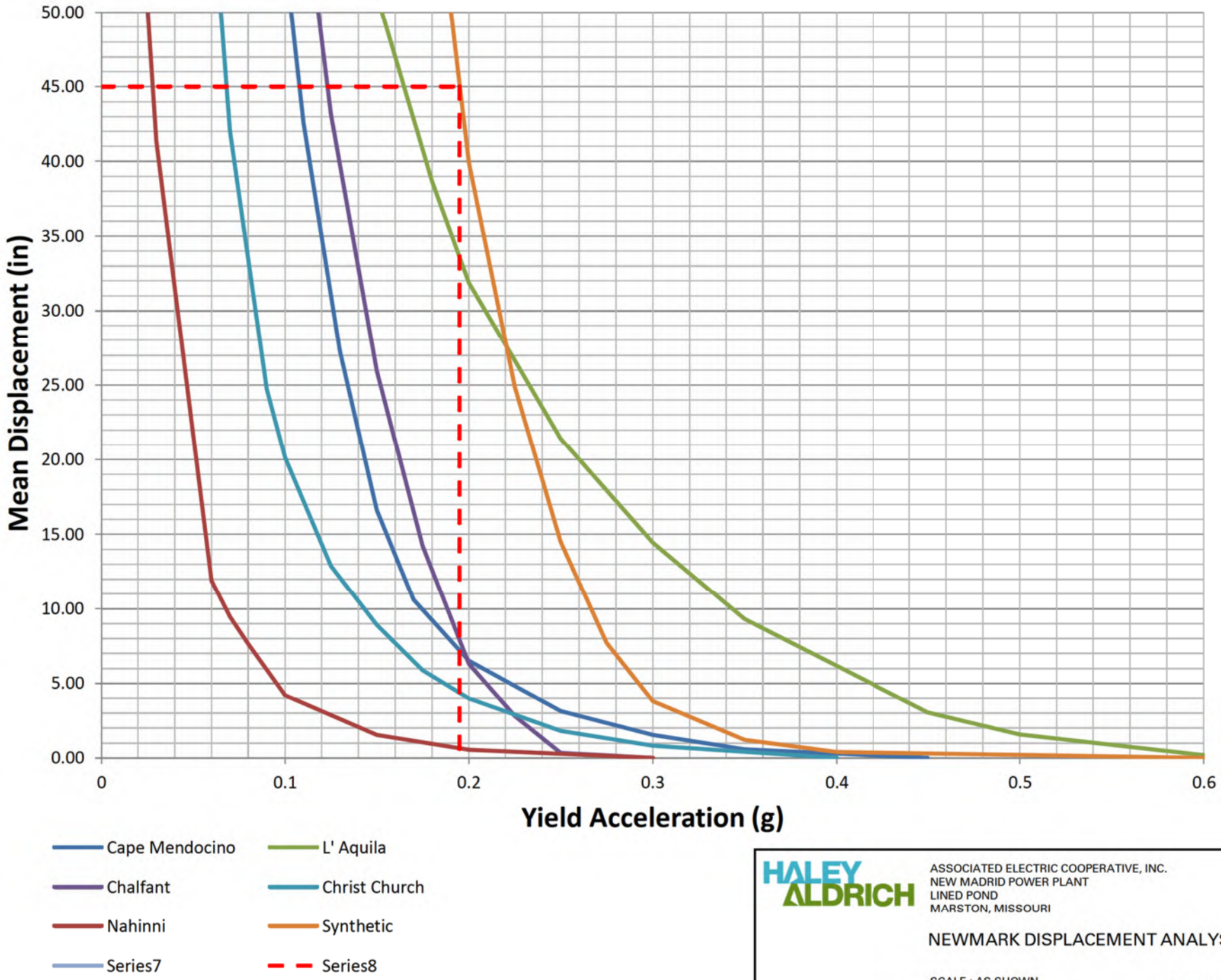
MISSISSIPPI EMBAYMENT
BEDROCK vs SURFACE MOTIONS

SCALE : AS SHOWN
APRIL 2018

FIGURE A-7

129342-015_FIG A-8.PPT



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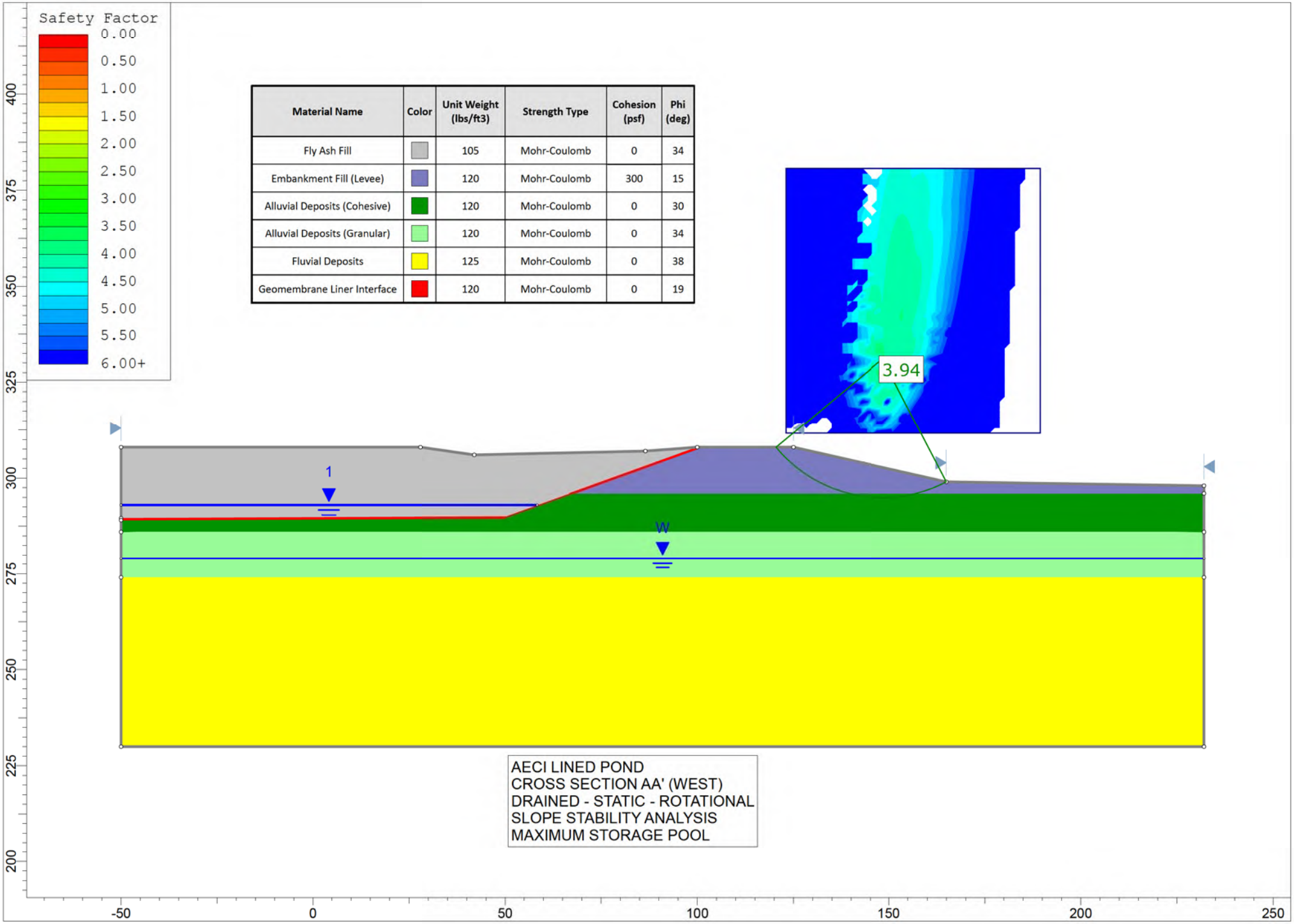
NEWMARK DISPLACEMENT ANALYSIS

SCALE : AS SHOWN
APRIL 2018

FIGURE A-8

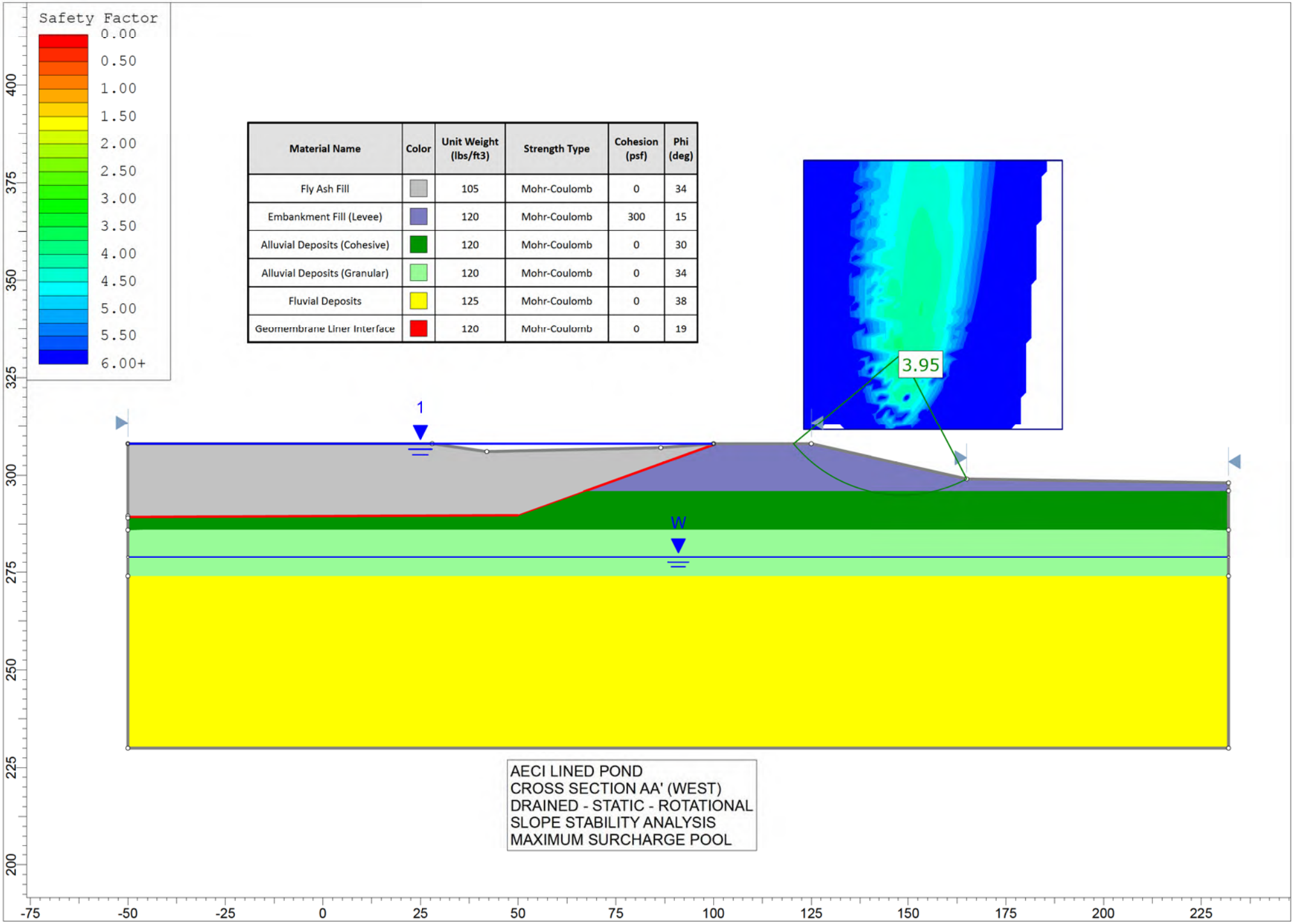
129342-015_FIG A-9.PPT

Slope Stability



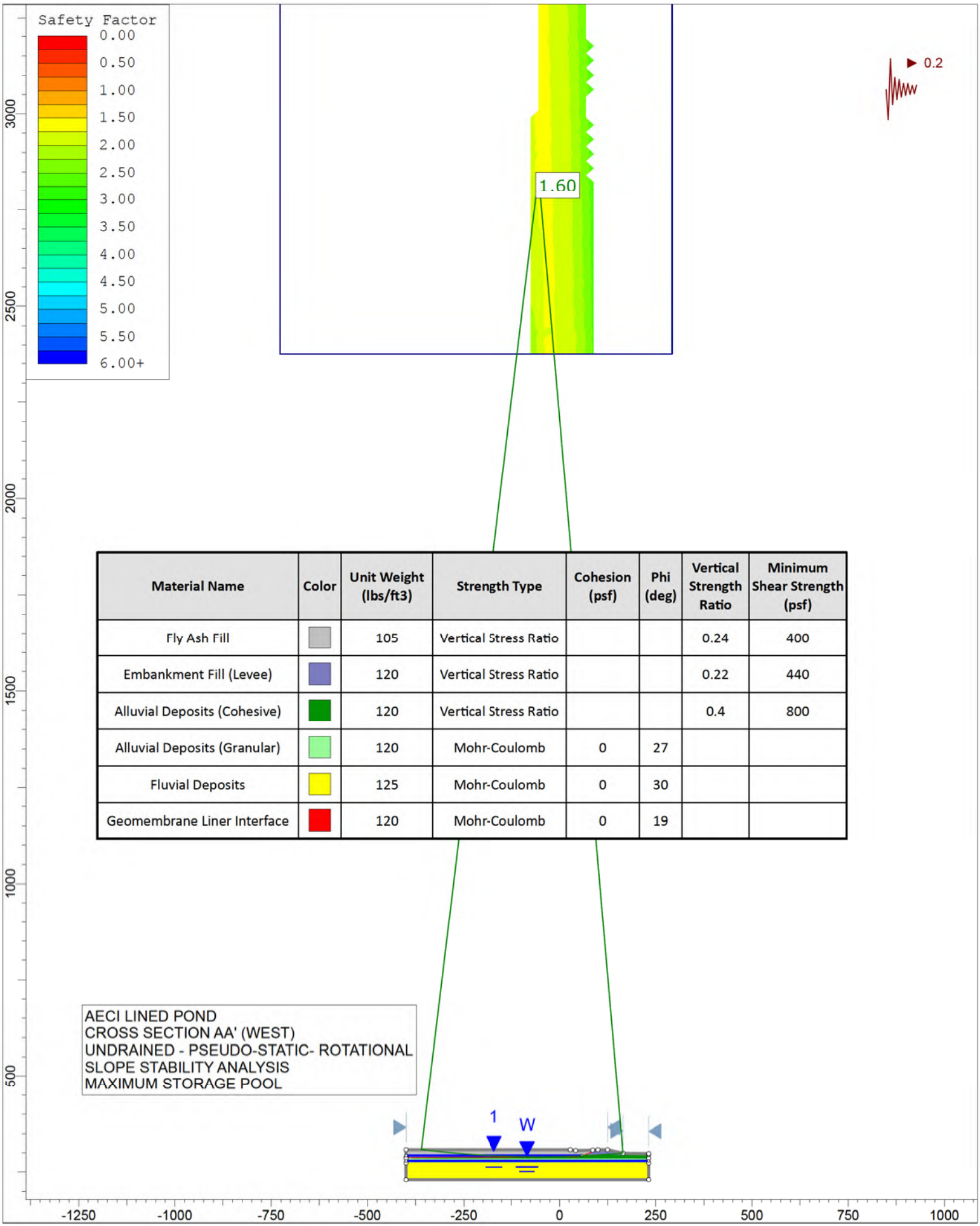
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Fly Ash Fill		105	Mohr-Coulomb	0	34
Embankment Fill (Levee)		120	Mohr-Coulomb	300	15
Alluvial Deposits (Cohesive)		120	Mohr-Coulomb	0	30
Alluvial Deposits (Granular)		120	Mohr-Coulomb	0	34
Fluvial Deposits		125	Mohr-Coulomb	0	38
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19

AECI LINED POND
CROSS SECTION AA' (WEST)
DRAINED - STATIC - ROTATIONAL
SLOPE STABILITY ANALYSIS
MAXIMUM STORAGE POOL

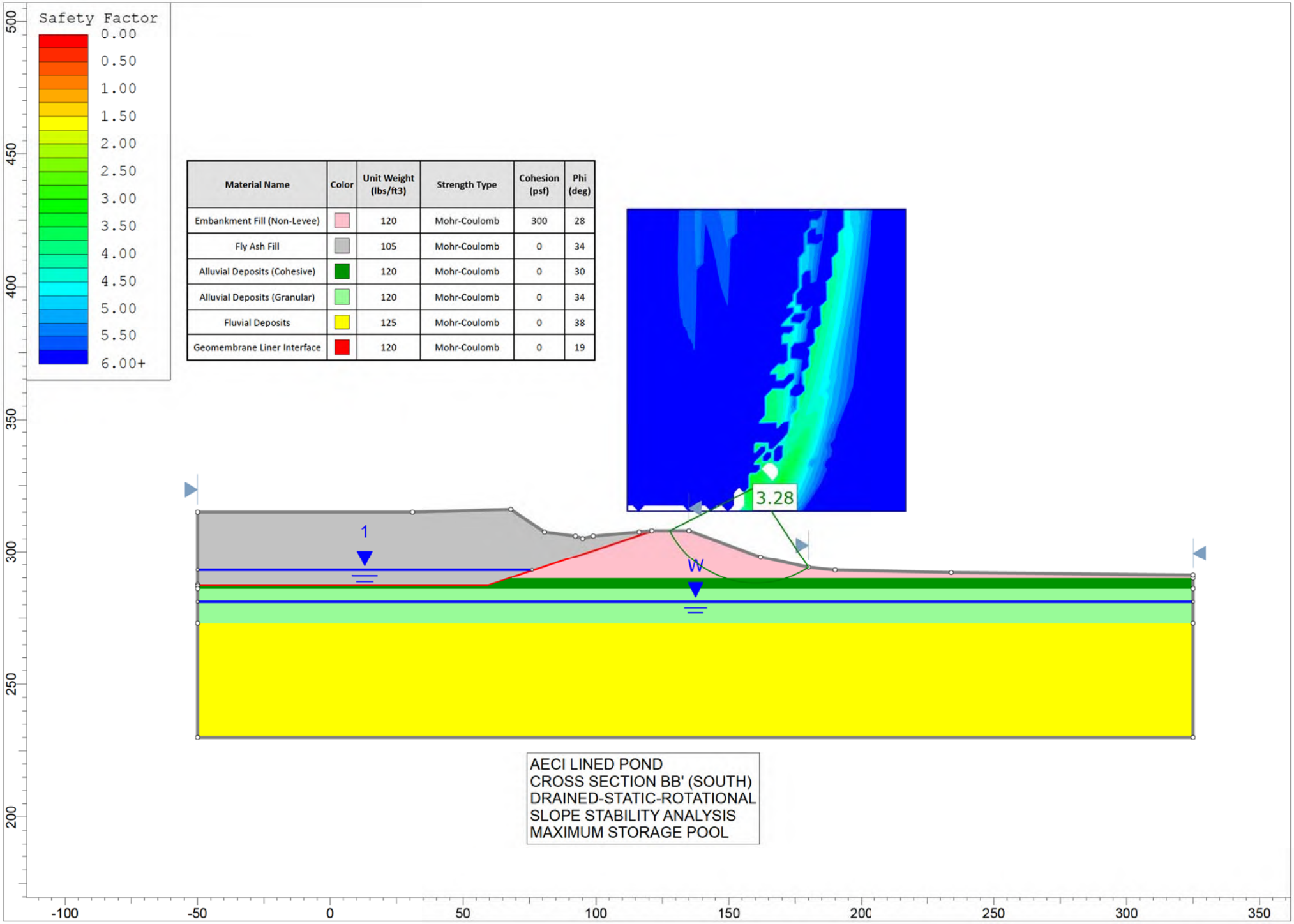


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Fly Ash Fill		105	Mohr-Coulomb	0	34
Embankment Fill (Levee)		120	Mohr-Coulomb	300	15
Alluvial Deposits (Cohesive)		120	Mohr-Coulomb	0	30
Alluvial Deposits (Granular)		120	Mohr-Coulomb	0	34
Fluvial Deposits		125	Mohr-Coulomb	0	38
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19

AECI LINED POND
CROSS SECTION AA' (WEST)
DRAINED - STATIC - ROTATIONAL
SLOPE STABILITY ANALYSIS
MAXIMUM SURCHARGE POOL

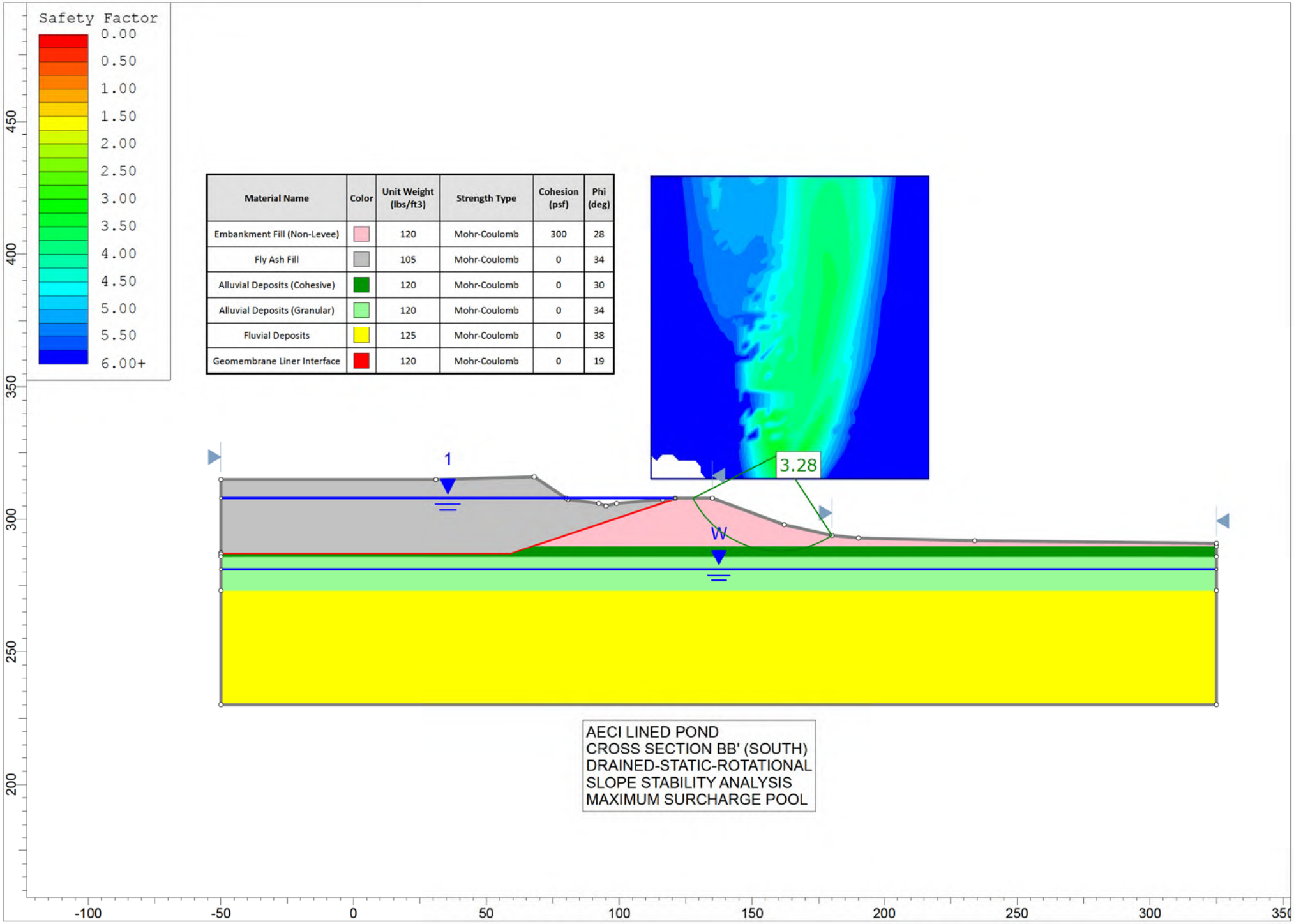


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio	Minimum Shear Strength (psf)
Fly Ash Fill		105	Vertical Stress Ratio			0.24	400
Embankment Fill (Levee)		120	Vertical Stress Ratio			0.22	440
Alluvial Deposits (Cohesive)		120	Vertical Stress Ratio			0.4	800
Alluvial Deposits (Granular)		120	Mohr-Coulomb	0	27		
Fluvial Deposits		125	Mohr-Coulomb	0	30		
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19		



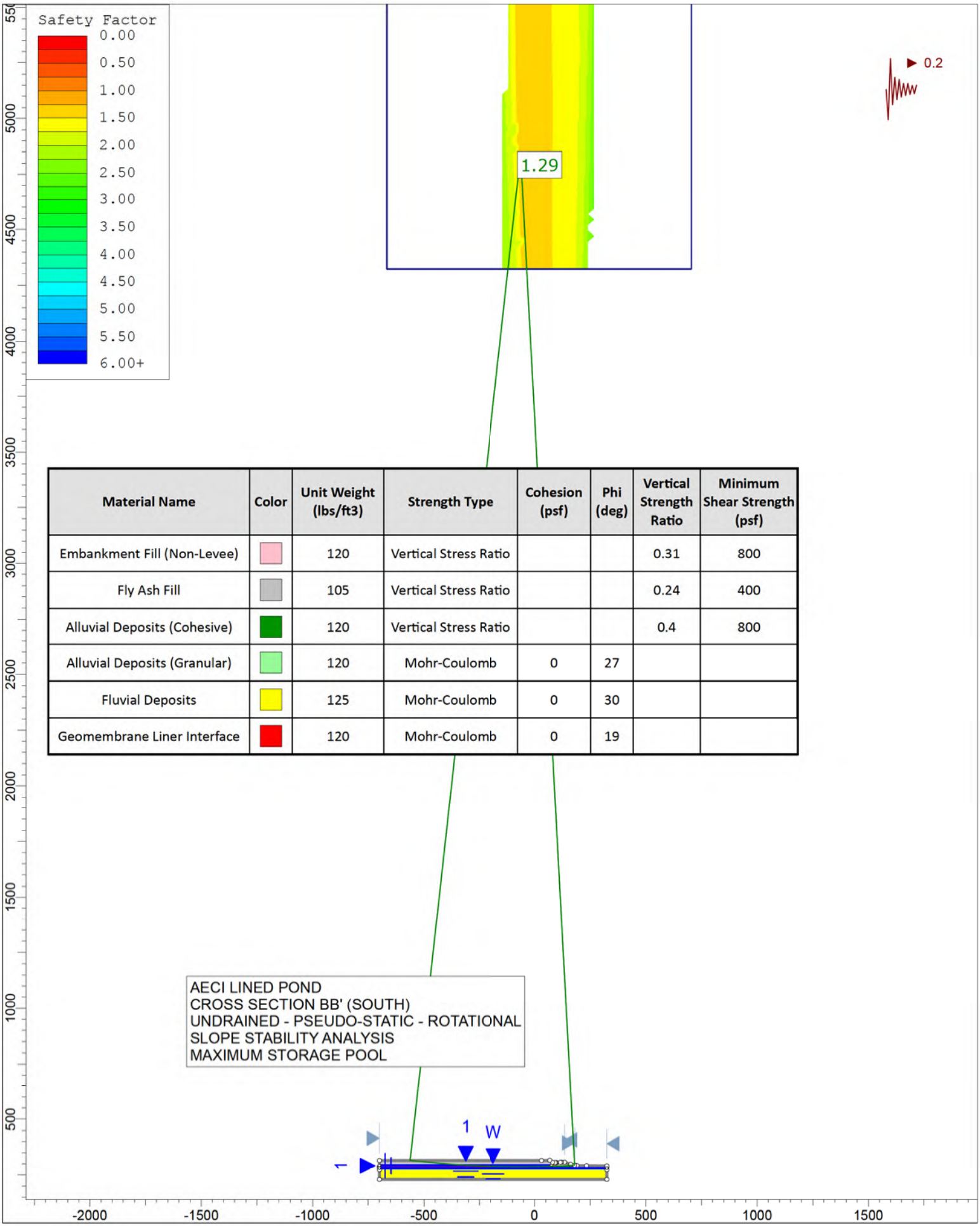
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill (Non-Levee)		120	Mohr-Coulomb	300	28
Fly Ash Fill		105	Mohr-Coulomb	0	34
Alluvial Deposits (Cohesive)		120	Mohr-Coulomb	0	30
Alluvial Deposits (Granular)		120	Mohr-Coulomb	0	34
Fluvial Deposits		125	Mohr-Coulomb	0	38
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19

AECI LINED POND
CROSS SECTION BB' (SOUTH)
DRAINED-STATIC-ROTATIONAL
SLOPE STABILITY ANALYSIS
MAXIMUM STORAGE POOL

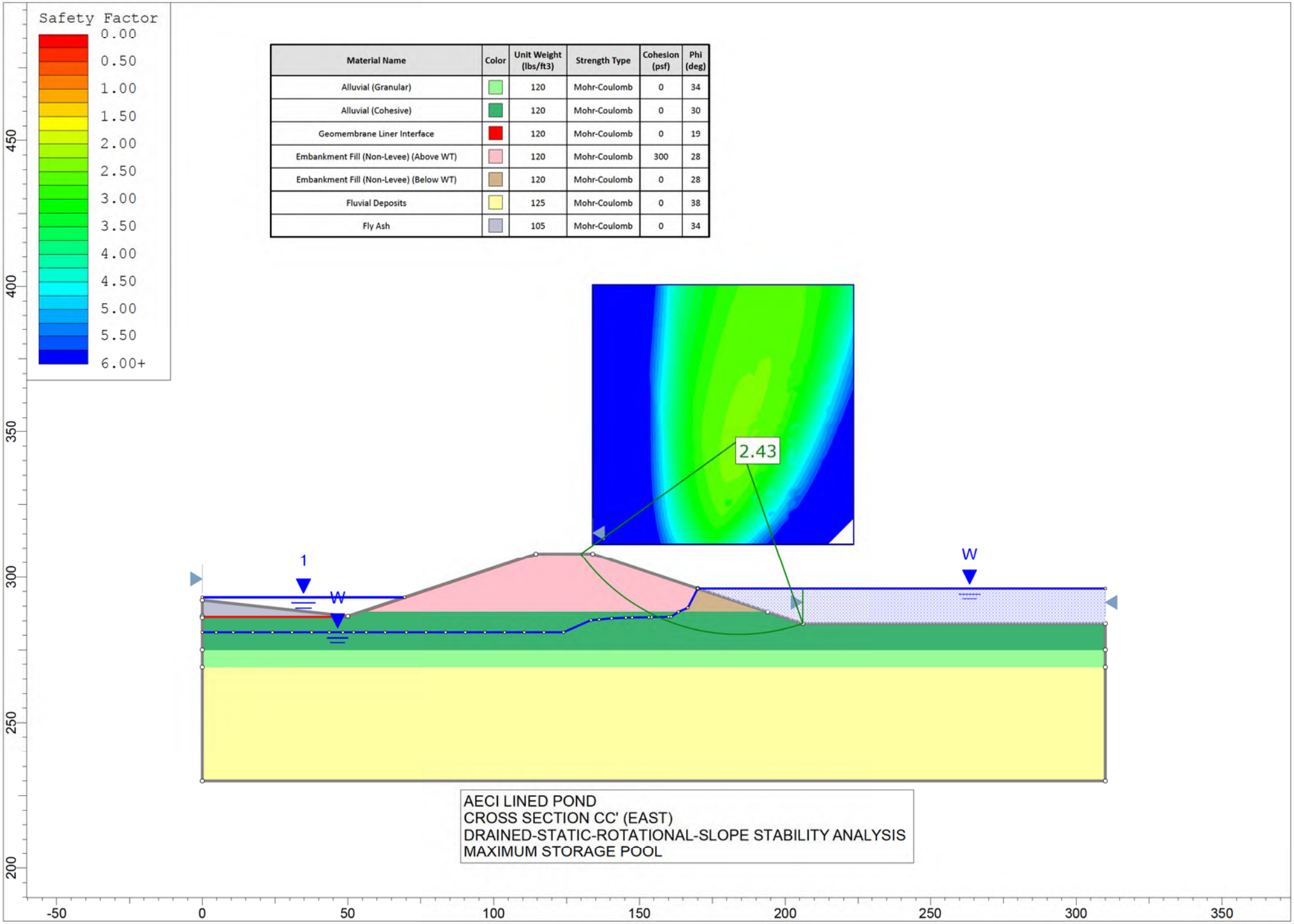


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Embankment Fill (Non-Levee)		120	Mohr-Coulomb	300	28
Fly Ash Fill		105	Mohr-Coulomb	0	34
Alluvial Deposits (Cohesive)		120	Mohr-Coulomb	0	30
Alluvial Deposits (Granular)		120	Mohr-Coulomb	0	34
Fluvial Deposits		125	Mohr-Coulomb	0	38
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19

AECI LINED POND
CROSS SECTION BB' (SOUTH)
DRAINED-STATIC-ROTATIONAL
SLOPE STABILITY ANALYSIS
MAXIMUM SURCHARGE POOL



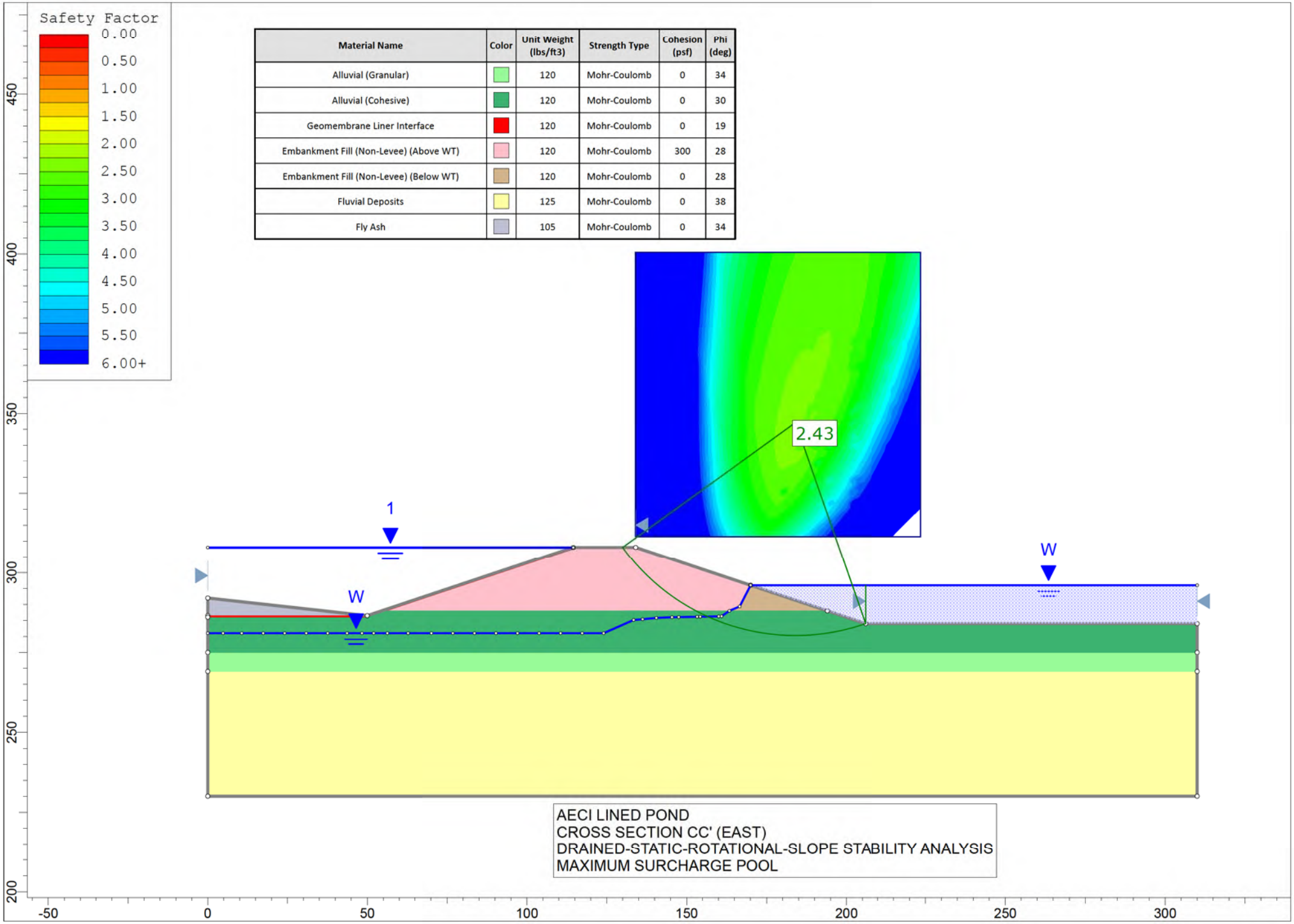
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio	Minimum Shear Strength (psf)
Embankment Fill (Non-Levee)		120	Vertical Stress Ratio			0.31	800
Fly Ash Fill		105	Vertical Stress Ratio			0.24	400
Alluvial Deposits (Cohesive)		120	Vertical Stress Ratio			0.4	800
Alluvial Deposits (Granular)		120	Mohr-Coulomb	0	27		
Fluvial Deposits		125	Mohr-Coulomb	0	30		
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19		



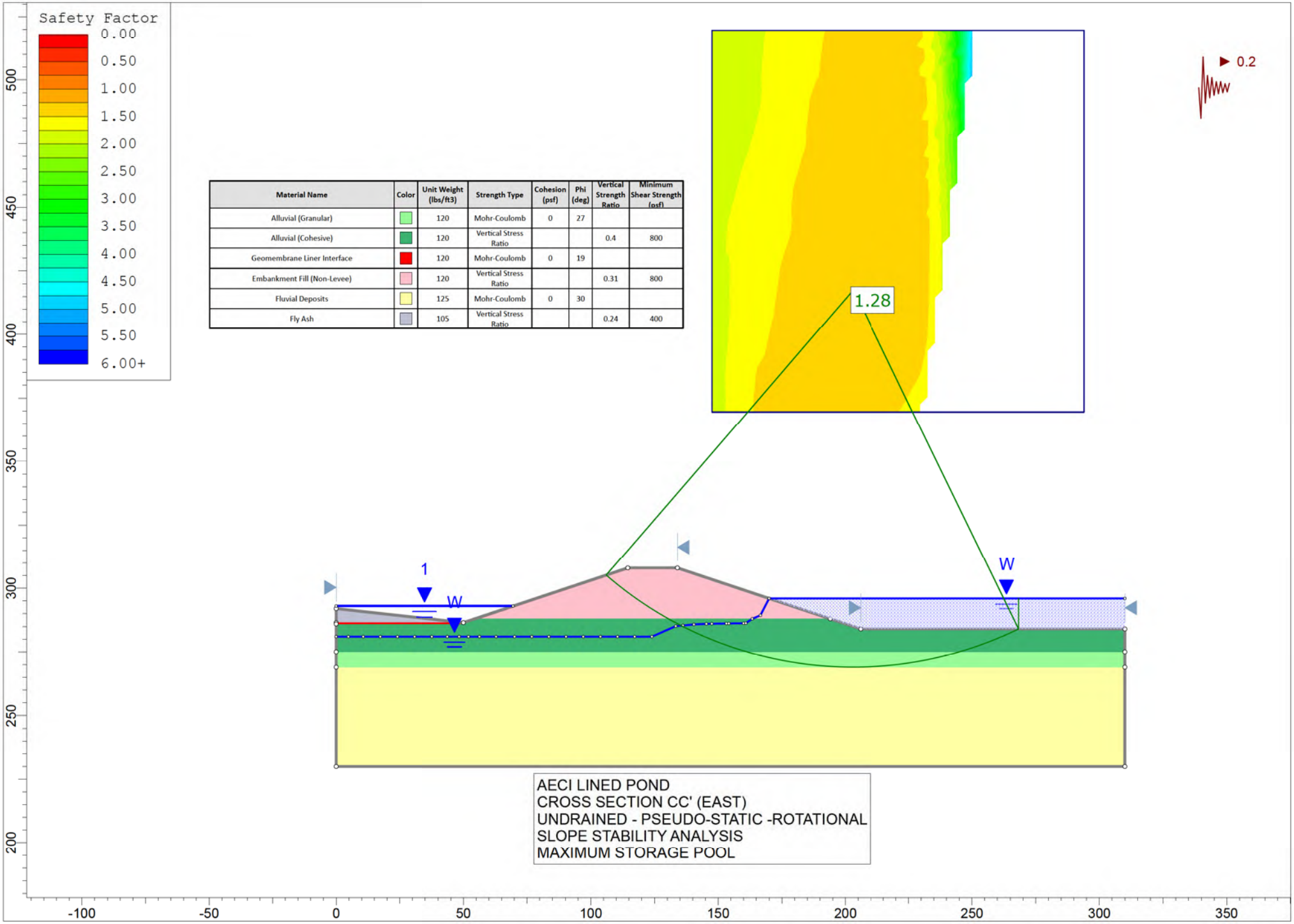
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial (Granular)		120	Mohr-Coulomb	0	34
Alluvial (Cohesive)		120	Mohr-Coulomb	0	30
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19
Embankment Fill (Non-Levee) (Above WT)		120	Mohr-Coulomb	300	28
Embankment Fill (Non-Levee) (Below WT)		120	Mohr-Coulomb	0	28
Fluvial Deposits		125	Mohr-Coulomb	0	38
Fly Ash		105	Mohr-Coulomb	0	34

AECI LINED POND
CROSS SECTION CC' (EAST)
DRAINED-STATIC-ROTATIONAL-SLOPE STABILITY ANALYSIS
MAXIMUM STORAGE POOL

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial (Granular)		120	Mohr-Coulomb	0	34
Alluvial (Cohesive)		120	Mohr-Coulomb	0	30
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19
Embankment Fill (Non-Levee) (Above WT)		120	Mohr-Coulomb	300	28
Embankment Fill (Non-Levee) (Below WT)		120	Mohr-Coulomb	0	28
Fluvial Deposits		125	Mohr-Coulomb	0	38
Fly Ash		105	Mohr-Coulomb	0	34



AECI LINED POND
CROSS SECTION CC' (EAST)
DRAINED-STATIC-ROTATIONAL-SLOPE STABILITY ANALYSIS
MAXIMUM SURCHARGE POOL



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio	Minimum Shear Strength (psf)
Alluvial (Granular)		120	Mohr-Coulomb	0	27		
Alluvial (Cohesive)		120	Vertical Stress Ratio			0.4	800
Geomembrane Liner Interface		120	Mohr-Coulomb	0	19		
Embankment Fill (Non-Levee)		120	Vertical Stress Ratio			0.31	800
Fluvial Deposits		125	Mohr-Coulomb	0	30		
Fly Ash		105	Vertical Stress Ratio			0.24	400

AECI LINED POND
CROSS SECTION CC' (EAST)
UNDRAINED - PSEUDO-STATIC -ROTATIONAL
SLOPE STABILITY ANALYSIS
MAXIMUM STORAGE POOL

APPENDIX B

Data Report

www.haleyaldrich.com

DATA REPORT ON
SUBSURFACE INVESTIGATION AND LABORATORY TESTING
LINED POND
NEW MADRID POWER PLANT
MARSTON, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
Springfield, Missouri

File No. 129342-005
April 2018

HALEY & ALDRICH, INC.
6500 ROCKSIDE ROAD
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CLEVELAND, OH 44131
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17 April 2018
File No. 129342-005

Associated Electric Cooperative, Inc.
2814 South Golden Avenue
P.O. Box 754
Springfield, Missouri 65801

Attention: Russ Weatherly
Supervisor, Land and Water Resources

Subject: Data Report on Subsurface Investigation and Laboratory Testing
Lined Pond
New Madrid Power Plant
Marston, Missouri

Ladies and Gentlemen:

We are pleased to submit herewith our report entitled, "Data Report on Subsurface Investigation and Laboratory Testing, Lined Pond, New Madrid Power Plant, Marston, Missouri." This report has been prepared in accordance with our Work Scope for Consulting Services dated 23 January 2017 and your subsequent authorization.

The purpose of this study was to evaluate the subsurface soil and groundwater conditions at the project site for the existing Lined Pond. This report includes background information regarding the project and summarizes the results of our field investigation program.

We appreciate the opportunity to provide consulting services for this project and look forward to working with you during design and construction. Please do not hesitate to contact us if you have comments or questions regarding this report.

Sincerely yours,
HALEY & ALDRICH, INC.

Derrick A. Shelton, P.E. (VA, MD, DC, TN)
Geotechnical Program Manager | Senior Associate

Steven F. Putrich, P.E.
Vice President

Enclosures

\\haleyaldrich.com\share\was_common\Projects\129342 - AECI\005 - Lined Pond\Deliverables\Reports\Data Report\2018-0417-HAI-Lined Pond Geotechnical Data Report-F.docx

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1. Introduction

1.1 GENERAL

This report presents the results of field and laboratory investigations for the existing Lined Pond at the New Madrid Power Plant (NMPP), located in Marston, Missouri. The site is located at 41 St. Jude Industrial Park Highway in Marston, Missouri as shown on **Figure 1**, "Project Locus."

Associated Electric Cooperative, Inc. (AECI) operates the coal-fired NMPP, which is located approximately 2.5 miles east of Marston, Missouri.

1.2 PURPOSE AND SCOPE

The purpose of this study was to investigate the subsurface soil and groundwater conditions at the site. To achieve this objective, the scope of work undertaken for this investigation included the following:

- Planning and executing a field investigation program to obtain subsurface information. The program consisted of:
  - Four (4) test borings drilled to depths ranging from approximately 20 to 95 ft below ground surface;
  - Two (2) observation wells installed to depths of 20 ft and 34 ft in completed boreholes.
  - Four (4) test pits excavated to depths ranging from approximately 10 to 11 ft below ground surface; and
  - Seven (7) cone penetrometer soundings (CPTs) advanced to depths ranging from approximately 20 to 95 ft below ground surface.
- Conducting a geotechnical laboratory testing program on coal combustion residuals (CCR) and soil samples recovered from subsurface explorations to aid in soil classification and determination of engineering properties required in site development studies.

1.3 ELEVATION DATUM AND HORIZONTAL CONTROL

The elevations used in this report are in feet and reference the North American Vertical Datum of 1988 (NAVD88) unless otherwise noted. The horizontal control is Missouri State Plane East, which is based on North American Datum 83 (NAD83).

1.4 LIMITATIONS

This report has been prepared for specific application to the proposed construction as understood at this time. In the event that changes in the recommended design are planned, the conclusions and recommendations contained in this report should not be considered valid, unless the changes are reviewed by Haley & Aldrich and the conclusions of this report modified or verified in writing.

The geotechnical evaluations and recommendations are based, in part, upon the data obtained from the referenced subsurface explorations. The nature and extent of variations between explorations may not

become evident until construction. If variations appear at that time, it may be necessary to re-evaluate the recommendations of this report.

This report is prepared for the exclusive use of Associated Electric Cooperative, Inc. and their subconsultants in connection with the Lined Pond at New Madrid Power Plant in Marston, Missouri. There are no intended beneficiaries other than Associated Electric Cooperative, Inc. Haley & Aldrich shall owe no duty whatsoever to any other person or entity on account of the Agreement or the report. Use of this report by any person or entity other than Associated Electric Cooperative, Inc. and their subconsultants for any purpose whatsoever is expressly forbidden unless such other person or entity obtains written authorization from Associated Electric Cooperative, Inc. and from Haley & Aldrich. Use of this report by such other person or entity without the written authorization of Associated Electric Cooperative, Inc. and Haley & Aldrich shall be at such other person's or entity's sole risk, and shall be without legal exposure or liability to Haley & Aldrich.

2. Description of Pond

The Lined Pond is an inactive lined surface impoundment with an approximate footprint of 78 acres located south of Pond 003. The Lined Pond was designed by Burns & McDonnell and was constructed in 1994. Access roads run along the entire perimeter of the pond and the approximate crest elevation is approximately 308 feet MSL. The impoundment is located on the east side of the US Army Corps of Engineers levee system of the Mississippi River. The east embankment of the Lined Pond serves as a separator dike that bisects the Lined Pond and the Raw Water Pond. The Raw Water Pond exists as an overflow for high water level conditions and was intended as a future phase of the Lined Pond. The Lined Pond at the New Madrid Power Plant (NMPP) is currently inactive as defined by the CCR Rule. The interior and exterior slopes of the pond were designed as 3 horizontal to 1 vertical (3H:1V) slopes. The maximum height of the west embankment (levee side) is approximately 9 ft, and the maximum heights of the south and east embankments (non-levee side) are approximately 15 ft and 24 ft respectively. As mentioned above, the north side of the pond is adjacent to Pond 003, which is at the same surface elevation as the access road that separates the two ponds. As a result, an exposed embankment does not exist on the north side of the pond.

AECI managed CCR by placing fly ash in the Lined Pond via a wetting head from 1994 to approximately 2007 when the plant converted to dry fly ash handling. The impoundment relied on evaporation as the main source of discharge from the unit, with no primary spillway existing (emergency flows can be diverted to the Raw Water Pond, Pond 003, or the 003 Outfall discharge channel). The majority of the Lined Pond is full and contains an unused area in the southeastern corner that collects runoff. The Lined Pond subgrade and embankments were constructed of native soils and were overlaid with 60 mil (side slopes) and 80 mil (bottom) geomembranes. Two 18 in. pipes in the southeastern corner of the pond have historically been used to pump water from the Raw Water Pond to the Lined Pond in order to prevent uplift of the liner.

The downstream side of the east embankment experienced surficial slope movement and sloughing in the past and plate piles were used to stabilize the slope 2012. Additionally, localized areas of sloughing/erosion have recently been repaired by infilling with riprap.