amec

GEOTECHNICAL CORING LOG

Prepared By: MBL Date: 3/5/14

Checked By: JCM Date: 3/5/14

SHEET 1 OF 4

BECHTEL PROJECT NO.: 25847	**AMEC PROJECT NO.: 6468-13-1072**	**COUNTY: Roane, TN**	**GEOLOGIST: R. Clark**
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee		**DRILLER: S. Snow/D. King**	**Boring Orientation**
BORING NO.: MP-104	**DRILL METHOD: Mud Rotary/Core**	**DRILL MACHINE: CME-55 (TSD)**	**Inclination: Vertical**
GROUND ELEV.: 797.7 ft (NAVD88)	**NORTHING: 570,094 US ft (NAD83)**	**EASTING: 2,448,449 US ft (NAD83)**	**Azimuth: NA**
TOTAL DEPTH: 177.2 ft	**SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08**		**HAMMER (ID): 140-lb Auto (373705)**
DATE STARTED: 8/3/13	**COMPLETED: 8/6/13**	**CASING DEPTH: 12.0 ft**	**CORE BARREL TYPE: HQ3/Diamond Impregnated core bits**

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	LOG	ROCK DESCRIPTION AND REMARKS
								Begin Coring @ 12.1 ft
785.6 782.7	12.1 15.0	2.9	5:06 3:03 2:51/0.9	(2.2) 76%	(1.5) 52%	Run 1		785.6 WEATHERED ROCK: LIMESTONE-No recovery 12.1 784.9 12.8 LIMESTONE (MICRITE), gray (5Y 5/1) to light olive gray (5Y 6/2) and bluish gray (5PB 6/1) to dark bluish gray (5PB 4/1), medium strong, thinly to moderately bedded, moderately to slightly weathered, interbedded with few to little laminated Calcareous SILTSTONE; trace calcite filled and few open pits, strong HCl reaction **(Benbolt Formation-Unit E)**
777.7	20.0	5.0	4:10 6:04 3:27 3:34 5:56	(5.0) 100%	(3.9) 78%	Run 2		13.8,14.2,14.4ft: BJ, 35°, PS, T-PO, B, III 15.5,16.7,17.5,17.8,18.3,18.7,19.0ft: BJ, 35°, PS-PR, PO, B, III 15.8-16.0ft: FZ/BJ, 35°, PS, O, C-D, IV 18.2ft: J, 50°, PR, O, C, III
772.7	25.0	5.0	3;26 2:17 2:03 3:20 3:55	(4.4) 88%	(2.3) 46%	Run 3		20.0,21.3,21.8,22.5,22.7,23.3,23.6,24.5ft: BJ, 35°, PS, T, B, II-III 20.3-20.7ft: FZ/BJ, 35°, PS, T-PO, B, III 22.8ft: J, 50°, PR, PO, B, III 23.7-24.5ft: FZ 24.7ft: J, 60°, PR, O, D, III
767.7	30.0	5.0	3:54 4:25 4:07 3:37 6:28	(5.0) 100%	(4.7) 94%	Run 4		26.1,26.8,27.4ft: BJ, 30°, SS-PS, T-PO-O, B-C, II-III 28.0-28.6ft: Partial dissolution cavity
762.7	35.0	5.0	4:37 3:08 2:55 1:51 2:52	(5.0) 100%	(4.3) 86%	Run 5		30.0ft: As above, becoming slightly weathered to fresh 30.3,31.4,33.3ft: BJ, 30°, PS, T, B, II-III 30.4ft: J, 65°, PS, PO-O, C, IV 32.6ft: J, 65°, PR, T, B, III 33.6ft: J, 10°, PR, T-UT, B, III 34.8ft: J, 65°, PR, T, B, II
758.8	38.9	3.9	3:38 3:41 3:49 3:41/0.9	(3.9) 100%	(2.5) 64%	Run 6		762.4 35.3 LIMESTONE (MICRITE), gray (N 5/), strong, laminated to very thinly bedded, fresh, interbedded with some laminated Calcareous SILTSTONE, very dark gray (N 3/); slight bioturbation, strong HCl reaction
755.5	42.2	3.3	2:30 3:18 2:45 1:03/0.3	(3.3) 100%	(3.3) 100%	Run 7		36.0,36.7,37.2ft: BJ, 35°, PS, T, B, II 37.5-37.9,38.4-38.9ft: FZ/BJ, 30°, PS, T, B, II 37.8ft: J, 40°, SR, T, B, II 40.0,40.8ft: BJ, 30°, PS, T, B, II 42.8ft: J, 65°, UR, PO, B, III
750.5	47.2	5.0	1:57 2:02 2:27 2:17 2:45	(5.0) 100%	(3.6) 72%	Run 8		754.5 43.2 LIMESTONE (MICRITE/WACKESTONE), gray (N 5/) to bluish gray (5PB 5/1), strong, very thinly to moderately bedded, fresh, interbedded with few laminated to very thin Calcareous SILTSTONE, very dark gray (N 3/), and few very thin chert beds, lenses, and nodules (dark gray to black, with calcite filled tensional fractures orthogonal to bedding); strong HCl reaction
745.5	52.2	5.0	2:34 2:42 2:11 2:46 2:58	(5.0) 100%	(3.8) 76%	Run 9		43.3,44.9,45.3,45.6,45.8,46.7ft: BJ, 30°, PS, T, B, II 43.9-44.2ft: FZ/BJ, 30°, PS, T-PO, B, II 47.3,47.6,48.1,49.8,50.6,51.2ft: BJ, 30°, PS, T, B, II 746.4 51.3
740.5	57.2	5.0	2:20 3:10 3:36 2:16 3:28	(5.0) 100%	(4.7) 94%	Run 10		LIMESTONE (MICRITE), gray (N 5/) to bluish gray (5PB 5/1), strong, laminated to thinly bedded, fresh, interbedded with little to some laminated to very thin Calcareous SILTSTONE, very dark gray (N 3/); strong HCl reaction 51.3,51.5ft: BJ, 30°, PS, T, B, II 53.2ft: J, 65°, PS, T, B, III 53.5,53.9,56.3,56.9ft: BJ, 30°, PS, T, B, II 54.8ft: J, 70°, PS, T, B, III
		5.0	1:46 2:09 2:43	(5.0) 100%	(5.0) 100%	Run 11		58.4,59.5ft: BJ, 30°, PS, T, B, II

GEOTECHNICAL CORING LOG

BECHTEL PROJECT NO.: 25847	**AMEC PROJECT NO.:** 6468-13-1072	**COUNTY:** Roane, TN	**GEOLOGIST:** R. Clark
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee		**DRILLER:** S. Snow/D. King	**Boring Orientation**
BORING NO.: MP-104	**DRILL METHOD:** Mud Rotary/Core	**DRILL MACHINE:** CME-55 (TSD)	**Inclination:** Vertical
GROUND ELEV.: 797.7 ft (NAVD88)	**NORTHING:** 570,094 US ft (NAD83)	**EASTING:** 2,448,449 US ft (NAD83)	**Azimuth:** NA
TOTAL DEPTH: 177.2 ft	**SAMPLE METHODS:** ASTM D 1586-11; 2488-09a; 2113-08; 6032-08		**HAMMER (ID):** 140-lb Auto (373705)
DATE STARTED: 8/3/13	**COMPLETED:** 8/6/13	**CASING DEPTH:** 12.0 ft	**CORE BARREL TYPE:** HQ3/Diamond Impregnated core bits

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	LOG	ROCK DESCRIPTION AND REMARKS
								Continued from previous page
735.5	62.2		2:06 3:19					LIMESTONE (MICRITE), gray (N 5/) to bluish gray (5PB 5/1), strong, laminated to thinly bedded, fresh, interbedded with little to some laminated to very thin Calcareous SILTSTONE, very dark gray (N 3/); strong HCl reaction *(continued)*
730.5	67.2	5.0	2:03 2:26 2:08 2:33 2:36	(5.0) 100%	(5.0) 100%	Run 12		
								730.5 -- 67.2
725.5	72.2	5.0	3:12 3:17 2:49 2:52 2:44	(5.0) 100%	(5.0) 100%	Run 13		LIMESTONE (MICRITE/WACKESTONE/GRAINSTONE), gray (N 5/) and bluish gray (5PB 6/1-5/1) to dark bluish gray (5PB 4/1), strong, very thinly to thinly bedded, locally moderately bedded and nodular, fresh, fossiliferous, interbedded with little to some laminated to thin, Calcareous SILTSTONE, very dark gray (N 3/), roughly planar to wavy becoming wispy/irregular and diffuse with depth; trace stylolites, trace pyrite replacing fossils, trace calcite filled pits and vugs (separate/non-touching), strong HCl reaction 69.4,70.1ft: BJ, 30°, PS, T, B, II
720.5	77.2	5.0	2:30 3:08 3:37 2:56 4:01	(5.0) 100%	(5.0) 100%	Run 14		74.2,75.2,76.6ft: 30°, PS, T, B, II 75.2ft: J, 50°, PR, T, B, II
715.5	82.2	5.0	4:11 3:01 3:52 2:44 2:49	(5.0) 100%	(5.0) 100%	Run 15		77.8ft: BJ, 30°, PS, T, B, II, with calcite
710.5	87.2	5.0	2:23 2:34 2:18 2:40 2:44	(5.0) 100%	(5.0) 100%	Run 16		86.1ft: BJ, 30°, PR, PO, B, II
705.5	92.2	5.0	2:15 2:41 2:25 2:19 2:45	(5.0) 100%	(5.0) 100%	Run 17		87.2-87.4ft: J, 55°, PS, VT, A, II 90.5,91.4ft: BJ, 30°, PS, T, B, II 90.9ft: J, 70°, PR, PO, B, II, with calcite
700.5	97.2	5.0	2:35 2:28 1:41 2:21 2:25	(5.0) 100%	(5.0) 100%	Run 18		94.3,96.2ft: J, 45°, PR, T, B, II
695.5	102.2	5.0	3:15 3:13 3:01 3:31 3:39	(5.0) 100%	(4.7) 94%	Run 19		101.2,101.4,101.7,102.0ft: BJ, 30°, PS-US, T-PO, B, II
690.5	107.2	5.0	3:02 2:39 2:47 2:01 2:09	(5.0) 100%	(5.0) 100%	Run 20		104.8ft: BJ, 30°, US, PO, B, II
		5.0	2:29 2:24	(5.0) 100%	(5.0) 100%	Run 21		107.4,111.5ft: BJ, 30°, PS, T, B, II 108.1ft: J, 50°, PR, T, B, III

GEOTECHNICAL CORING LOG

SHEET 3 OF 4

BECHTEL PROJECT NO.: 25847 | **AMEC PROJECT NO.:** 6468-13-1072 | **COUNTY:** Roane, TN | **GEOLOGIST:** R. Clark

SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee | **DRILLER:** S. Snow/D. King | **Boring Orientation**

BORING NO.: MP-104 | **DRILL METHOD:** Mud Rotary/Core | **DRILL MACHINE:** CME-55 (TSD) | **Inclination:** Vertical

GROUND ELEV.: 797.7 ft (NAVD88) | **NORTHING:** 570,094 US ft (NAD83) | **EASTING:** 2,448,449 US ft (NAD83) | **Azimuth:** NA

TOTAL DEPTH: 177.2 ft | **SAMPLE METHODS:** ASTM D 1586-11; 2488-09a; 2113-08; 6032-08 | **HAMMER (ID):** 140-lb Auto (373705)

DATE STARTED: 8/3/13 | **COMPLETED:** 8/6/13 | **CASING DEPTH:** 12.0 ft | **CORE BARREL TYPE:** HQ3/Diamond Impregnated core bits

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	LOG	ROCK DESCRIPTION AND REMARKS
								Continued from previous page
			2:32					LIMESTONE (MICRITE/WACKESTONE/GRAINSTONE), gray (N 5/) and bluish gray (5PB 6/1-5/1) to dark bluish gray (5PB 4/1), strong, very thinly to thinly bedded, locally moderately bedded and nodular, fresh, fossiliferous, interbedded with little to some laminated to thin, Calcareous SILTSTONE, very dark gray (N 3/), roughly planar to wavy becoming wispy/irregular and diffuse with depth; trace stylolites, trace pyrite replacing fossils, trace calcite filled pits and vugs (separate/non-touching), strong HCl reaction *(continued)*
			2:02					
685.5	112.2		1:47					
		5.0	3:35	(5.0) 100%	(5.0) 100%	Run 22		
			2:08					
			2:41					
			2:46					
680.5	117.2		3:10					
		5.0	2:22	(5.0) 100%	(5.0) 100%	Run 23		
			2:48					
			2:36					
			3:10					
675.5	122.2		2:54					
		5.0	2:21	(5.0) 100%	(5.0) 100%	Run 24		
			3:43					
			2:02					
			2:51					
670.5	127.2		2:36					
		5.0	2:27	(5.0) 100%	(4.4) 88%	Run 25		127.6ft: J, 65°, PR, PO, B, III 131.5,131.8,131.9ft: BJ, 30°, PS, T, B, II
			2:21					
			2:43					
			2:29					
665.5	132.2		2:33					
		5.0	2:11	(5.0) 100%	(5.0) 100%	Run 26		
			1:38					
			1:39					
			2:01					
660.5	137.2		2:05					
		5.0	6:34	(5.0) 100%	(5.0) 100%	Run 27		138.9-140.1,140.8,141.8ft: BJ, 30°, PS, T, B, II
			3:59					
			4:01					
			2:36					
655.5	142.2		3:53					
		5.0	3:00	(5.0) 100%	(5.0) 100%	Run 28		
			2:58					
			2:31					
			2:22					
650.5	147.2		2:57					
		5.0	2:33	(5.0) 100%	(5.0) 100%	Run 29		150.2,151.5ft: BJ, 30°, PS, T, B, II
			1:58					
			1:50					
			2:34					
645.5	152.2		2:28					
		5.0	3:20	(5.0) 100%	(5.0) 100%	Run 30		153.0,154.4ft: BJ, 30°, PS, T, B, II
			2:43					
			2:25					
			3:23					
640.5	157.2		2:40					
		5.0	1:51	(5.0)	(5.0)	Run 31		

GEOTECHNICAL CORING LOG

SHEET 4 OF 4

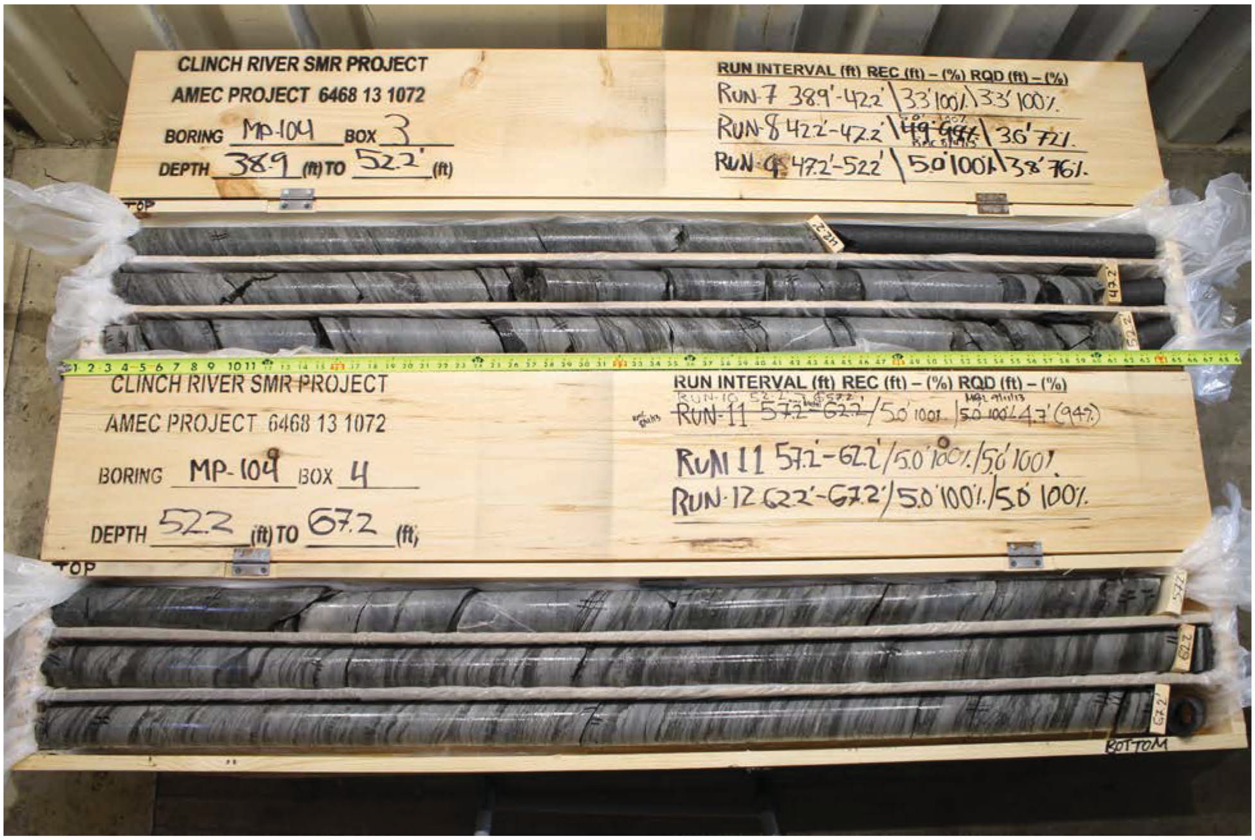
BECHTEL PROJECT NO.: 25847
AMEC PROJECT NO.: 6468-13-1072
COUNTY: Roane, TN
GEOLOGIST: R. Clark
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee
DRILLER: S. Snow/D. King
BORING NO.: MP-104
DRILL METHOD: Mud Rotary/Core
DRILL MACHINE: CME-55 (TSD)
GROUND ELEV.: 797.7 ft (NAVD88)
NORTHING: 570,094 US ft (NAD83)
EASTING: 2,448,449 US ft (NAD83)
Boring Orientation
Inclination: Vertical
Azimuth: NA
TOTAL DEPTH: 177.2 ft
SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08
HAMMER (ID): 140-lb Auto (373705)
DATE STARTED: 8/3/13
COMPLETED: 8/6/13
CASING DEPTH: 12.0 ft
CORE BARREL TYPE: HQ3/Diamond Impregnated core bits

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	LOG	ROCK DESCRIPTION AND REMARKS
								Continued from previous page
635.5	162.2		2:01 2:02 1:57 2:12	100%	100%			LIMESTONE (MICRITE/WACKESTONE/GRAINSTONE), gray (N 5/) and bluish gray (5PB 6/1-5/1) to dark bluish gray (5PB 4/1), strong, very thinly to thinly bedded, locally moderately bedded and nodular, fresh, fossiliferous, interbedded with little to some laminated to thin, Calcareous SILTSTONE, very dark gray (N 3/), roughly planar to wavy becoming wispy/irregular and diffuse with depth; trace stylolites, trace pyrite replacing fossils, trace calcite filled pits and vugs (separate/non-touching), strong HCl reaction *(continued)*
630.5	167.2	5.0	1:46 2:01 2:04 1:55 1:44	(5.0) 100%	(5.0) 100%	Run 32		
625.5	172.2	5.0	2:01 1:49 1:59 2:08 2:03	(5.0) 100%	(5.0) 100%	Run 33		
620.5	177.2	5.0	1:51 1:43 2:02 2:03 2:05	(4.7) 94%	(4.7) 94%	Run 34		174.4ft: BJ, 30°, T, B, II 620.5 177.2
								Boring and coring terminated at 177.2 feet.

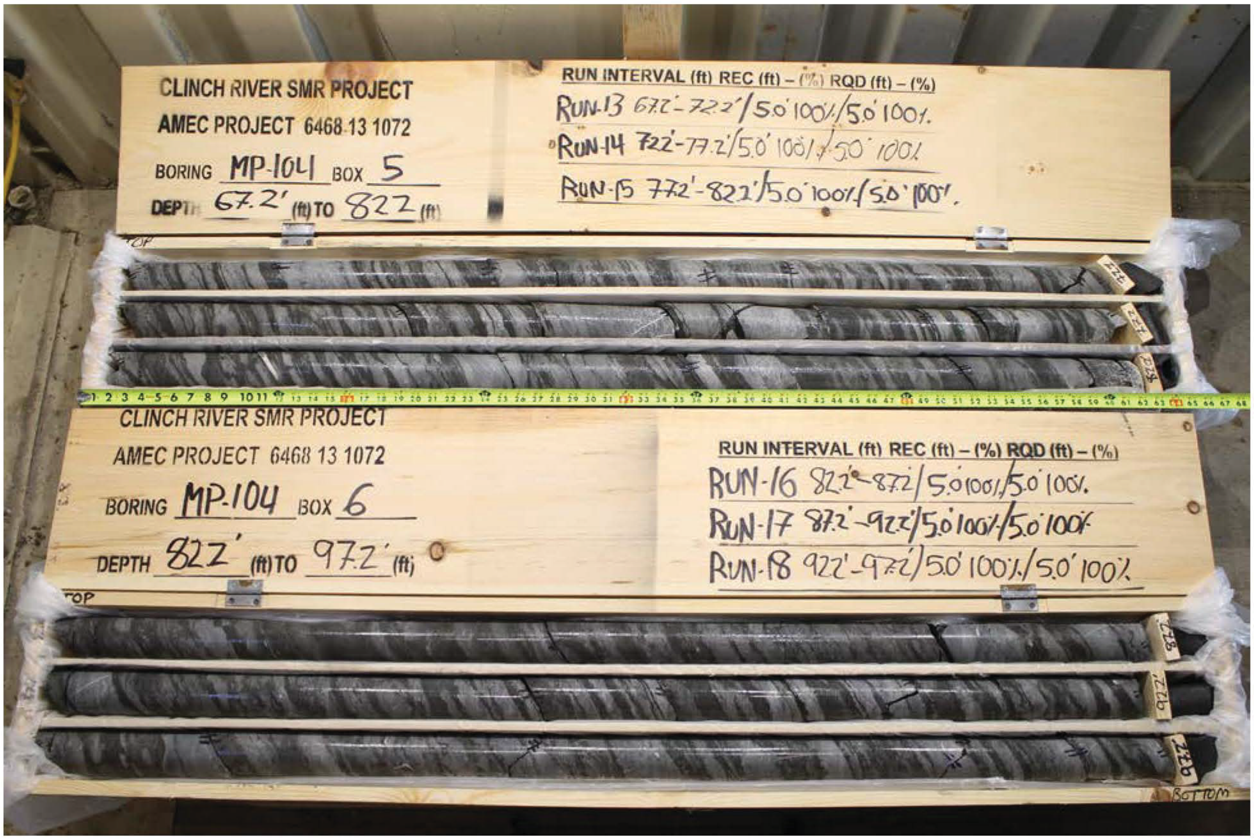
CLINCH RIVER SMR CORE FINAL CLINCH FINAL LOGS.GPJ CLINCH BORING DATA TEMPLATE.GDT 3/5/14

MP-104 – Boxes 1 and 2

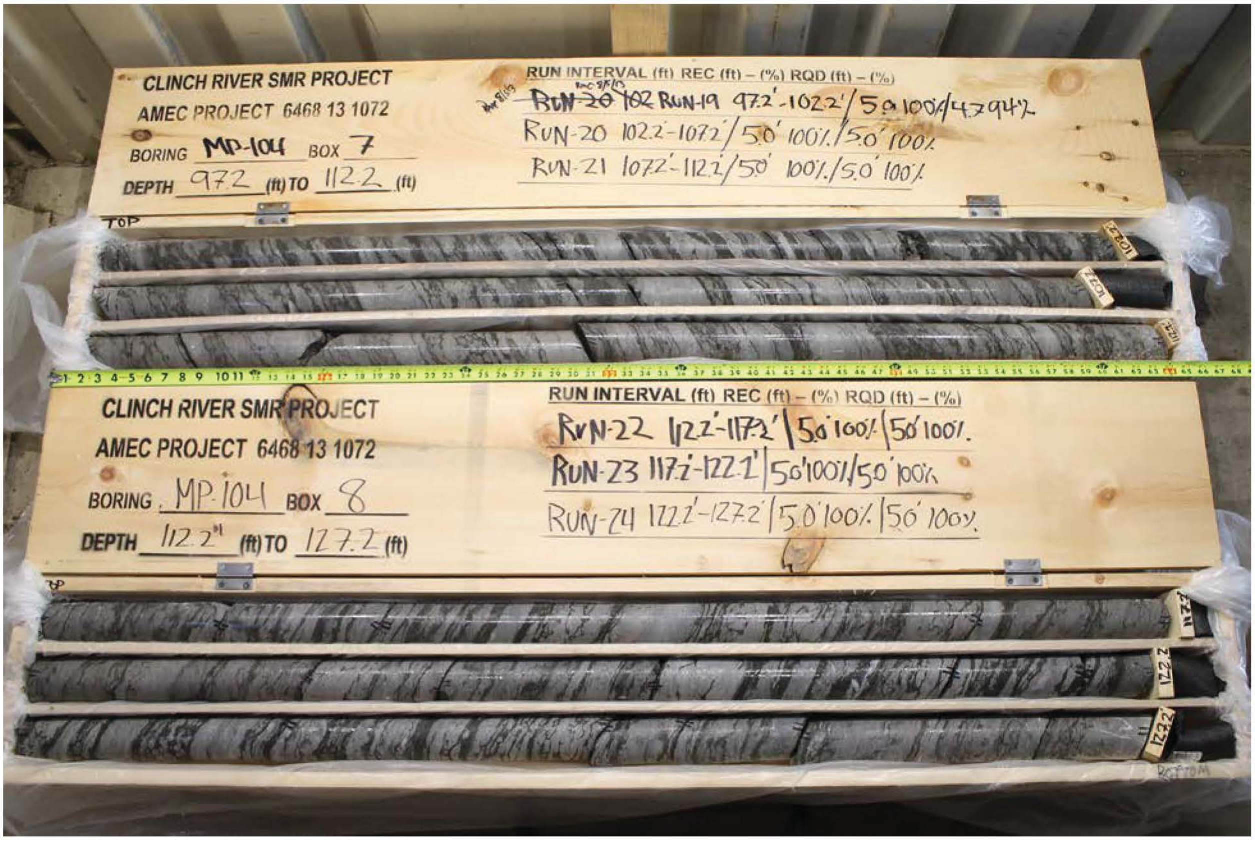
MP-104 – Boxes 3 and 4



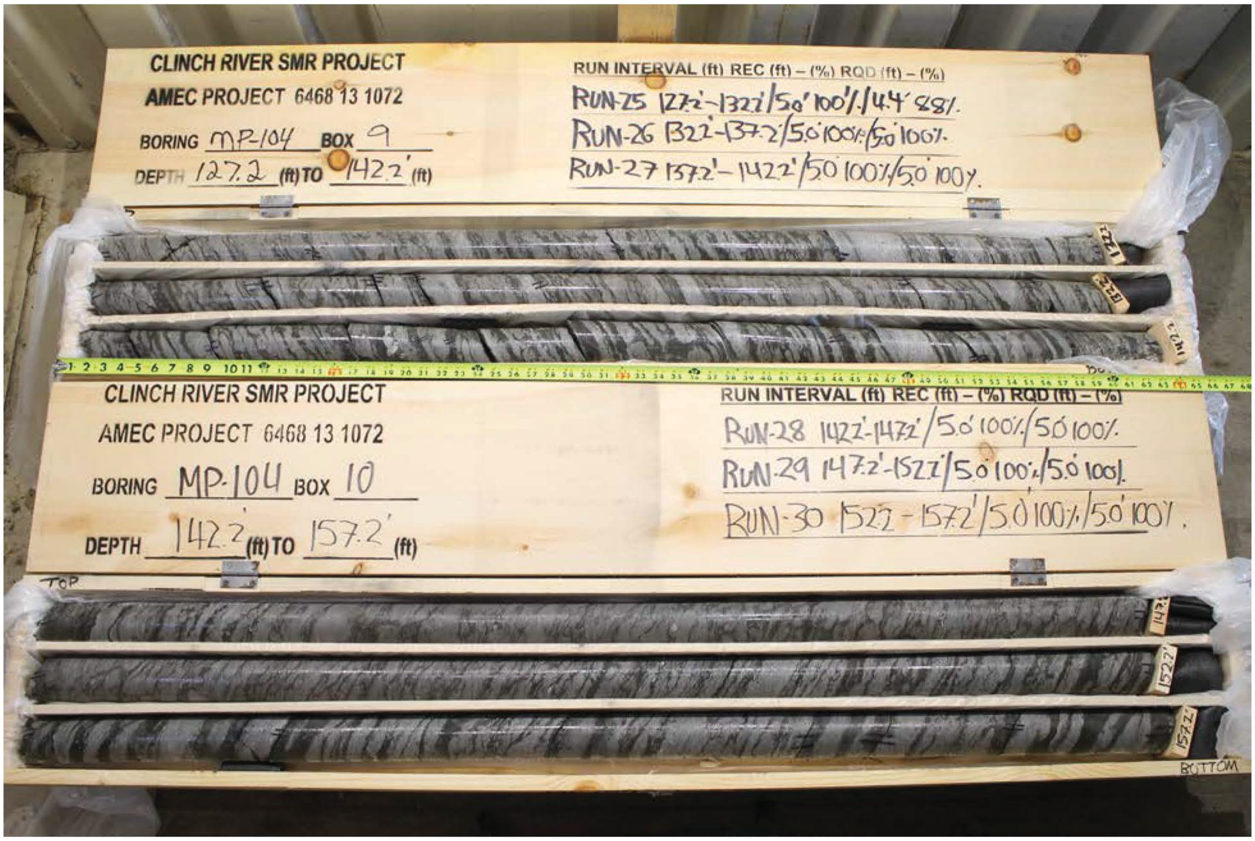
MP-104 – Boxes 5 and 6



MP-104 – Boxes 7 and 8



MP-104 – Boxes 9 and 10



MP-104 – Boxes 11 and 12

GEOTECHNICAL BORING LOG

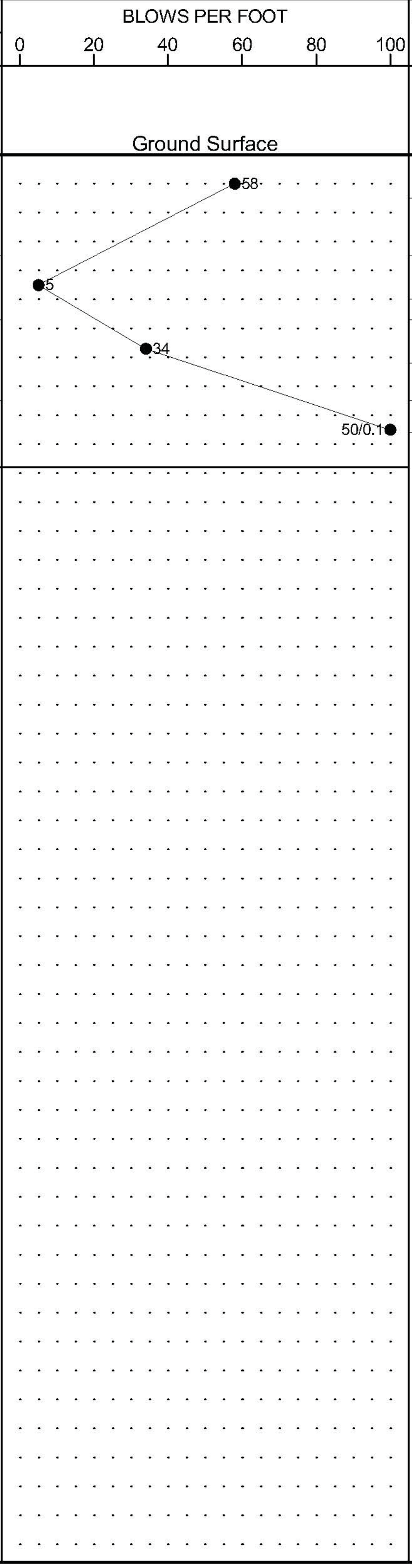
Prepared By: MBL Date: 3/5/14

Checked By: JCM Date: 3/5/14

SHEET 1 OF 1

BECHTEL NO.: 25847	**AMEC PROJECT NO.: 6468-13-1072**	**COUNTY: Roane, TN**	**GEOLOGIST: K. Lloyd**
SITE DESCRIPTION: Clinch River SMR Project, Roane County, Tennessee		**DRILLER: L. Carter/J. Rosser**	**Boring Orientation**
BORING NO.: MP-105	**DRILL METHOD: Mud Rotary/Core**	**DRILL MACHINE: CME-750X (P)**	**Inclination: Vertical**
GROUND ELEV.: 800.2 ft (NAVD88)	**NORTHING: 570,210 US ft (NAD83)**	**EASTING: 2,448,344 US ft (NAD83)**	**Azimuth: NA**

TOTAL DEPTH: 195.2 ft	**SAMPLE METHODS: ASTM D 1586-11; 2488-09a; 2113-08; 6032-08**	**ROD TYPE: AWJ**	**HAMMER (ID): 140-lb Auto (323438)**
DATE STARTED: 8/7/13	**COMPLETED: 8/17/13** **HOLE DIA.: 4"** **CASING DEPTH: 19.5 ft**	**CORE SIZE: HQ3/NQ3**	**BITS USED: 4" Roller Cone**



ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft			SAMP. NO.
800.2					
800.2	0.0	20	31	27	SS-1
796.7	3.5	3	2	3	SS-2
794.5	5.7	5	15	19	SS-3
791.7	8.5	16	40	50/0.1	SS-4

ELEV.	SOIL DESCRIPTION AND REMARKS	DEPTH
800.2		0.0
	FILL: Gravelly SILT (ML), reddish brown (5YR 4/3) and grayish brown (10YR 5/2), hard, dry, non-plastic fines, little fine to coarse subangular gravel, little fine to coarse sand, strong HCl reaction	
797.2		3.0
	FILL: FAT CLAY (CH), strong brown (7.5YR 5/6), medium stiff, moist, high plasticity fines, trace fine to coarse subangular gravel, trace coarse sand, no HCl reaction (PP=1.75 tsf)	
795.2		5.0
	RESIDUAL SOIL: Gravelly FAT CLAY (CH), light yellowish brown (2.5Y 6/4), hard, moist, high plasticity fines, some fine to coarse subangular gravel, trace to few coarse sand, strong HCl reaction (PP=2.0-2.25 tsf)	
790.7		9.5
	WEATHERED ROCK: LIMESTONE	
789.4	Advance casing and begin rock coring at 10.8 feet.	10.8

Soil drilling halted. Log continues on geotechnical coring log

Observed water levels:

13.1 ft bgs, AM 8/8/13
10.8 ft bgs, AM 8/13/13
11.2 ft bgs, AM 8/14/13
11.6 ft bgs, AM 8/15/13
11.3 ft bgs, AM 8/16/13