MACTEC

SHEET 1 OF 2

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely

SITE DESCRIPTION NORTH ANNA COL

BORING NO. B-919 | **DRILL METHOD: Mud Rotary/Core** | **SAMPLE METHODS: SPT/CORE**

COLLAR ELEV. 317.8 ft **(NAVD88)** | **NORTHING** 3,909,575 **US ft (NAD83)** | **EASTING** 11,685,765 **US ft (NAD83)**

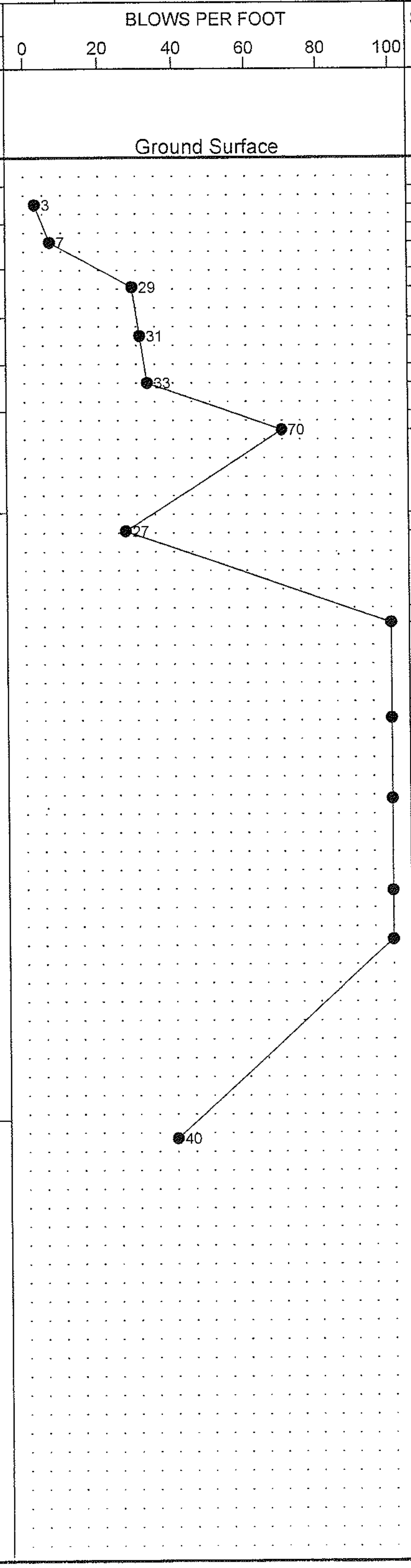
TOTAL DEPTH 76.2 ft | **DRILL MACHINE** CME 55 Truck | **DRILLER: H. Meyerson** | **HAMMER TYPE** 140 lbs Auto

DATE STARTED 9/13/06 | **COMPLETED** 9/15/06 | **CORE BARREL TYPE: HQ 3 triple tube-wireline**

GROUND WATER (ft)

0 HR.	3.1
24 HR.	20.8

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	SAMP. NO.
317.8					
316.3	1.5	1	1	2	919-1
314.3	3.5	3	2	5	919-2
311.9	5.9	12	14	15	919-3
309.3	8.5	11	15	16	919-4
306.8	11.0	17	20	13	919-5
304.3	13.5	20	36	34	919-6
298.9	18.9	14	13	14	919-7
293.9	23.9	23	50/0.4		919-8
288.9	28.9	40	50/0.5		919-9
283.9	33.9	50/0.3			919-10
278.9	38.9	50/0.2			919-11
276.5	41.3	50/0.4			919-12
266.5	51.3	7	17	23	919-13



MOI | LOG

SOIL AND ROCK DESCRIPTION

317.8 — 0.0

Sandy CLAY (CL), strong brown (7.5YR 5/8), moist, very soft, silty, root fragments (Residual Soil)

314.3 — 3.5

Silty, fine to coarse SAND (SM), strong brown (7.5YR 5/8), moist, loose (Residual Soil)

312.3 — 5.5

Silty, fine to coarse SAND (SM), brownish yellow (10YR 6/8-6/6), moist, medium dense to very dense, trace gravel (Residual Soil)

294.8 — 23.0

Weathered Rock: Yellowish brown, very severely to severely weathered, very close to close fracturing, very soft to soft, BIOTITE-QUARTZ GNEISS

264.7 — 53.1

Hard Rock: Brownish gray to gray, moderately severely to moderately weathered, very close to close fracturing, moderately hard to hard, BIOTITE-QUARTZ GNEISS

MACTEC

SHEET 2 OF 2

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely

SITE DESCRIPTION NORTH ANNA COL

BORING NO. B-919 | **DRILL METHOD: Mud Rotary/Core** | **SAMPLE METHODS: SPT/CORE**

COLLAR ELEV. 317.8 ft **(NAVD88)** | **NORTHING** 3,909,575 **US ft (NAD83)** | **EASTING** 11,685,765 **US ft (NAD83)**

TOTAL DEPTH 76.2 ft | **DRILL MACHINE** CME 55 Truck | **DRILLER: H. Meyerson** | **HAMMER TYPE** 140 lbs Auto

DATE STARTED 9/13/06 | **COMPLETED** 9/15/06 | **CORE BARREL TYPE: HQ 3 triple tube-wireline**

GROUND WATER (ft)	
0 HR.	3.1
24 HR.	20.8

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	BLOW COUNT 0.5ft	BLOW COUNT 0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	▼/MOI	LOG	SOIL AND ROCK DESCRIPTION
243.0					Continued from previous page				
								▨	241.6 76.2 Boring and coring terminated at 76.2 ft in Hard Rock: Moderately hard to hard, BIOTITE-QUARTZ GNEISS

GEOTECHNICAL CORING LOG

MACTEC

SHEET 1 OF 1

MACTEC PROJECT NO.: 6468-06-1472 | **COUNTY** Louisa, VA | **GEOLOGIST** S. Nicely

SITE DESCRIPTION NORTH ANNA COL

GROUND WATER (ft)
0 HR. 3.1
24 HR. 20.8

BORING NO. B-919 | **DRILL METHOD: Mud Rotary/Core** | **SAMPLE METHODS: SPT/CORE**

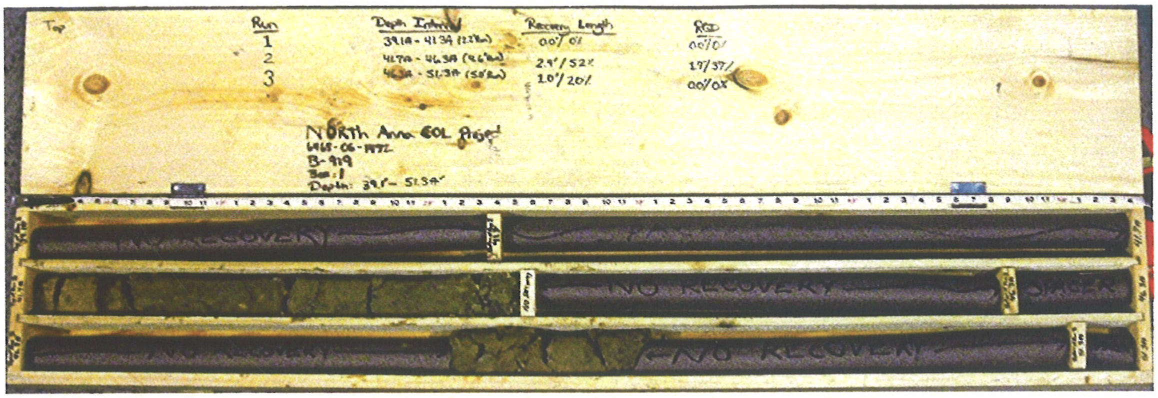
COLLAR ELEV. 317.8 ft **(NAVD88)** | **NORTHING** 3,909,575 **US ft (NAD83)** | **EASTING** 11,685,765 **US ft (NAD83)**

TOTAL DEPTH 76.2 ft | **DRILL MACHINE** CME 55 Truck | **DRILLER: H. Meyerson** | **HAMMER TYPE** 140 lbs Auto

DATE STARTED 9/13/06 | **COMPLETED** 9/15/06 | **CORE BARREL TYPE: HQ 3 triple tube-wireline**

CORE SIZE HQ3 | **TOTAL RUN** 35.2 ft

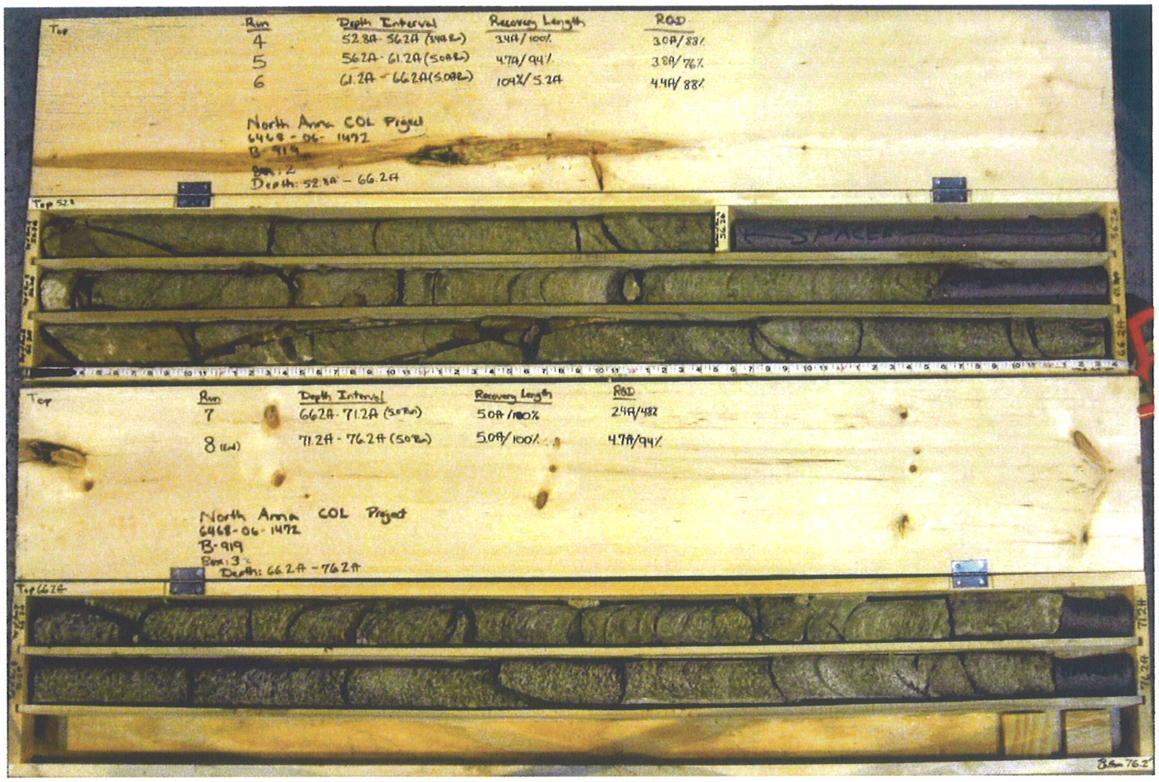
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
										Begin Coring @ 39.1 ft
278.7 276.5	39.1 41.3	2.2	2:49 2:54	(0.0) 0%	(0.0) 0%	1				Weathered Rock: Yellowish brown, very severely to severely weathered, very close to close fracturing, very soft to soft, BIOTITE-QUARTZ GNEISS *(continued)* -No Recovery
			0:35/0.2 *N=50/0.4*			*919-12*				
276.1 271.5	41.7 46.3	4.6	4:39 3:39 3:32 2:19	(2.4) 52%	(1.7) 37%	2				-Poor Recovery
266.5	51.3	5.0	0:48/0.6 1:09 1:36 2:47 1:57 2:18	(1.0) 20%	(0.0) 0%	3				-Poor Recovery
			N=40			*919-13*				264.7 53.1
265.0 261.6	52.8 56.2	3.4	1:48 2:17 3:13 1:00/0.4	(3.4) 100%	(3.0) 88%	4				(3 joints at 20-30° weathered; 2 joints at 10-20° with Fe stain; 1 joint at 75° weathered) Hard Rock: Brownish gray to gray, moderately severely to moderately weathered, very close to close fracturing, moderately hard to hard, BIOTITE-QUARTZ GNEISS
256.6	61.2	5.0	2:32 2:43 2:16 2:10 2:10	(4.7) 94%	(3.8) 76%	5				(2 joints at 40-50° with Fe and Mn stain; 2 joints at 10° with Fe stain)
251.6	66.2	5.0	1:57 2:46 3:10 2:58 3:20	(5.2) 104%	(4.4) 88%	6				(6 joints at 50-60° with Fe and Mn stain; 2 joints at 80-90° with Fe staining and clay; 2 joints at 10-20° with Fe stain; Quartz vein at 62.4 ft)
246.6	71.2	5.0	2:43 2:28 2:55 2:27 2:35	(5.0) 100%	(2.4) 48%	7				(1 joint at 65° with Fe stain; 3 joints at 40-50° with Fe and Mn stain; 9 joints at 30-40° with Fe and Mn stain; 4 joints at 10-20° with Fe and Mn)
241.6	76.2	5.0	2:24 2:27 2:18 2:09 2:12	(5.0) 100%	(4.7) 94%	8				(1 joint at 75° with Fe stain; 4 joints at 30-40° with Fe stain and clay; 4 joints at 10-20° with Fe stain) 241.6 76.2
										Coring terminated at 76.2 ft in Hard Rock: Moderately hard to hard, BIOTITE-QUARTZ GNEISS



Run	Depth Interval	Recovery Length	RQD
1	39.1ft - 41.3ft (2.2'Run)	0.0'/ 0%	0.0'/0%
2	41.7ft - 46.3ft (4.6'Run)	2.4'/52%	1.7'/37%
3	46.3ft - 51.3ft (5.0'Run)	1.0'/20%	0.0'/0%

NORTh Anna COL Project
6468-06-1472
B-919
Box: 1
Depth: 39.1'- 51.3ft'

B-919 – Box 1



Run	Depth Interval	Recovery Length	RQD
4	52.8ft - 56.2ft (3.4ft Run)	3.4ft/100%	3.0ft/88%
5	56.2ft - 61.2ft (5.0ft Run)	4.7ft/94%	3.8ft/76%
6	61.2ft - 66.2ft (5.0ft Run)	104%/5.2ft	4.4ft/88%

North Anna COL Project
6468-06-1472
B-919
Box: 2
Depth: 52.8ft' - 66.2ft

Run	Depth Interval	Recovery Length	RQD
7	66.2ft - 71.2ft (5.0'Run)	5.0ft/100%	2.4ft/48%
8 (End)	71.2ft - 76.2ft (5.0'Run)	5.0ft/100%	4.7ft/94%

North Anna COL Project
6468-06-1472
B-919
Box: 3
Depth: 66.2ft - 76.2ft

B-919 – Box 2
B-919 – Box 3

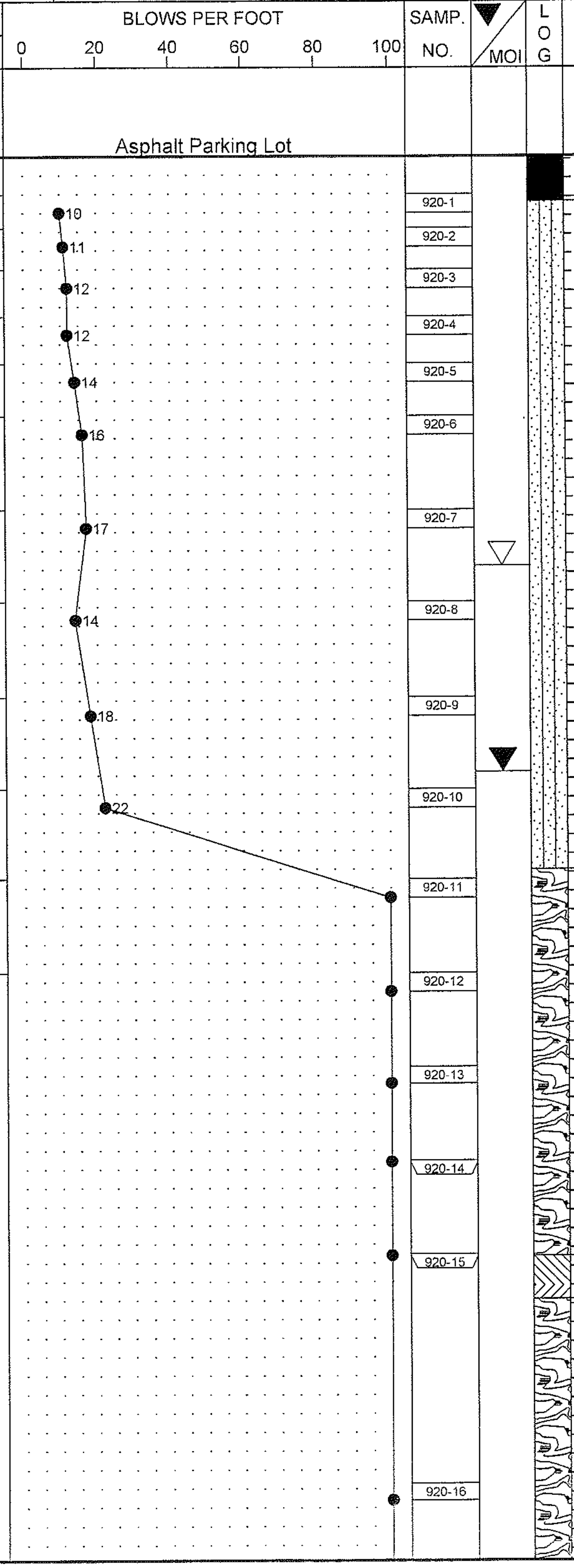
GEOTECHNICAL BORING LOG

MACTEC

SHEET 1 OF 3

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely
SITE DESCRIPTION NORTH ANNA COL		
BORING NO. B-920	**DRILL METHOD: Mud Rotary/Core**	**SAMPLE METHODS: SPT/CORE**
COLLAR ELEV. 327.2 ft **(NAVD88)**	**NORTHING** 3,909,545 **US ft (NAD83)**	**EASTING** 11,685,980 **US ft (NAD83)**
TOTAL DEPTH 150.7 ft	**DRILL MACHINE** CME 55 Truck	**DRILLER: H. Meyerson**
HAMMER TYPE 140 lbs Auto		
DATE STARTED 9/6/06	**COMPLETED** 9/12/06	**CORE BARREL TYPE: HQ 3 triple tube-wireline**

GROUND WATER (ft)	
0 HR.	21.8
24 HR.	32.8



ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT	SAMP. NO.
327.2						
325.2	2.0	3	5	5	10	920-1
323.4	3.8	5	5	6	11	920-2
321.2	6.0	4	5	7	12	920-3
318.7	8.5	3	5	7	12	920-4
316.2	11.0	4	6	8	14	920-5
313.4	13.8	4	6	10	16	920-6
308.4	18.8	5	7	10	17	920-7
303.5	23.7	4	7	7	14	920-8
298.4	28.8	5	8	10	18	920-9
293.5	33.7	7	10	12	22	920-10
288.7	38.5	15	36	50/0.3		920-11
283.7	43.5	25	41	50/0.2		920-12
278.7	48.5	40	50/0.4			920-13
273.7	53.5	50/0.1				920-14
268.7	58.5	50/0.1				920-15
256.5	70.7	32	50/0.4			920-16

	SOIL AND ROCK DESCRIPTION	
327.2	Asphalt and base coarse gravel (Parking Lot)	0.0
324.8	Silty, fine to coarse SAND (SM), dark yellowish brown (10YR 3/6, 4/6, and 4/4), olive (5Y 4/4), and olive brown (2.5Y 4/4), moist, medium dense, trace clay (Residual Soil)	2.4
289.2	Weathered Rock: Strong brown (7.5YR 4/6), very dark grayish brown (10YR 3/2), and greenish black (GLEY1 2.5/1), moist, very dense, BIOTITE GNEISS	38.0
268.6	Hard Rock: Dark brown, moderately severely weathered, very close to close fracturing, soft, BIOTITE GNEISS	58.6
266.3	Weathered Rock: Dark brown to yellowish brown, severely weathered, very close to close fracturing, very soft to moderately hard, BIOTITE GNEISS	60.9

GEOTECHNICAL BORING LOG

MACTEC

SHEET 2 OF 3

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely
SITE DESCRIPTION NORTH ANNA COL		**GROUND WATER (ft)**
BORING NO. B-920 **DRILL METHOD: Mud Rotary/Core**	**SAMPLE METHODS: SPT/CORE**	**0 HR.** 21.8
COLLAR ELEV. 327.2 ft **(NAVD88)** **NORTHING** 3,909,545 **US ft (NAD83)**	**EASTING** 11,685,980 **US ft (NAD83)**	**24 HR.** 32.8
TOTAL DEPTH 150.7 ft **DRILL MACHINE** CME 55 Truck	**DRILLER: H. Meyerson**	**HAMMER TYPE** 140 lbs Auto
DATE STARTED 9/6/06 **COMPLETED** 9/12/06	**CORE BARREL TYPE: HQ 3 triple tube-wireline**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	▼/MOI	LOG	SOIL AND ROCK DESCRIPTION
252.4					Continued from previous page				
251.5	75.7	50/0.1			●	920-17			251.4 — 75.8 Hard Rock-Weathered Rock: Reddish brown, gray, and blackish gray, very severely to moderately weathered, very close to close fracturing, very soft to hard, BIOTITE-QUARTZ GNEISS
241.5	85.7	50/0.4			●	920-18			
231.5	95.7	8	28	50/0.3	●	920-19			
									226.5 — 100.7 Hard Rock: Light to dark gray with white, pink, and green, very slightly weathered to fresh, very close to wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS

NORTH ANNA COL CORE NORTH ANNA COL DATA REPORT REV0.GPJ NORTH ANNA COL.GDT 1/19/07

GEOTECHNICAL BORING LOG

MACTEC

SHEET 3 OF 3

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely	
SITE DESCRIPTION NORTH ANNA COL			**GROUND WATER (ft)**
BORING NO. B-920	**DRILL METHOD: Mud Rotary/Core**	**SAMPLE METHODS: SPT/CORE**	**0 HR.** 21.8
COLLAR ELEV. 327.2 ft **(NAVD88)**	**NORTHING** 3,909,545 **US ft (NAD83)**	**EASTING** 11,685,980 **US ft (NAD83)**	**24 HR.** 32.8
TOTAL DEPTH 150.7 ft	**DRILL MACHINE** CME 55 Truck	**DRILLER: H. Meyerson**	**HAMMER TYPE** 140 lbs Auto
DATE STARTED 9/6/06	**COMPLETED** 9/12/06	**CORE BARREL TYPE: HQ 3 triple tube-wireline**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	▼ / MOI	LOG	SOIL AND ROCK DESCRIPTION
177.6					Continued from previous page				
								▨	176.5 150.7 Boring and coring terminated at 150.7 ft in Hard Rock: Very hard, BIOTITE-QUARTZ GNEISS

NORTH ANNA COL CORE NORTH ANNA COL DATA REPORT REV0.GPJ NORTH ANNA COL.GDT 1/19/07

GEOTECHNICAL CORING LOG

MACTEC

SHEET 1 OF 2

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely	
SITE DESCRIPTION NORTH ANNA COL			**GROUND WATER (ft)**
BORING NO. B-920	**DRILL METHOD: Mud Rotary/Core**	**SAMPLE METHODS: SPT/CORE**	**0 HR.** 21.8
COLLAR ELEV. 327.2 ft **(NAVD88)**	**NORTHING** 3,909,545 **US ft (NAD83)**	**EASTING** 11,685,980 **US ft (NAD83)**	**24 HR.** 32.8
TOTAL DEPTH 150.7 ft	**DRILL MACHINE** CME 55 Truck	**DRILLER: H. Meyerson**	**HAMMER TYPE** 140 lbs Auto
DATE STARTED 9/6/06	**COMPLETED** 9/12/06	**CORE BARREL TYPE: HQ 3 triple tube-wireline**	
CORE SIZE HQ3	**TOTAL RUN** 150.7 ft		

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
										Begin Coring @ 58.6 ft
268.6 266.3	58.6 60.9	2.3	5:36 4:08 0:53/0.3	(2.0) 87%	(0.0) 0%	1				268.6 Hard Rock: Dark brown, moderately severely weathered, very close to close fracturing, soft, BIOTITE GNEISS 58.6 266.3 -Highly fractured and weathered 60.9
261.5	65.7	4.8	2:00 2:03 3:56 3:16 1:36/0.8	(0.6) 13%	(0.0) 0%	2				Weathered Rock: Dark brown to yellowish brown, severely weathered, very close to close fracturing, very soft to moderately hard, BIOTITE GNEISS -Very poor recovery, highly fractured and weathered
256.5	70.7	5.0	3:18 3:18 3:06 3:11 3:43	(0.6) 12%	(0.0) 0%	3				-Very poor recovery, highly fractured and weathered
			N=50/0.4			*920-16*				
255.6 251.5	71.6 75.7	4.1	3:24 2:10 2:04 3:52/1.1	(0.7) 17%	(0.0) 0%	4				-Very poor recovery, highly fractured and weathered 251.4 75.8
251.4 246.5	75.8 80.7	4.9	*N=50/0.1* 4:53 1:05 1:11 1:12 0:51/0.9	(3.9) 80%	(2.7) 55%	*920-17* 5				Hard Rock-Weathered Rock: Reddish brown, gray, and blackish gray, very severely to moderately weathered, very close to close fracturing, very soft to hard, BIOTITE-QUARTZ GNEISS (2 joints at 80° with Fe and Mn staining; 2 joints at 10-20°; 3 joints at 20-30°)
241.5	85.7	5.0	1:02 0:35 1:00 0:44 0:30	(0.8) 16%	(0.0) 0%	6				-Very poor recovery, highly fractured and weathered
241.1 236.5	86.1 90.7	4.6	*N=50/0.4* 1:48 3:52 2:16 2:16 2:00/0.6	(3.7) 80%	(3.1) 67%	*920-18* UC-90.2'				(2 joints at 40-50° with Fe staining; 3 joints at10-20° with Fe staining; highly fractured and severely weathered from 86.1-87.5 ft)
231.5	95.7	5.0	2:30 2:38 1:40 1:47 1:48	(1.4) 28%	(0.0) 0%	8				-Poor recovery, highly fractured and weathered-no recovery from 92.1-95.7 ft
			N=50/0.3			*920-19*				
230.2 226.5	97.0 100.7	3.7	2:38 3:05 2:19 1:12/0.7	(2.4) 65%	(1.4) 38%	9				-Highly fractured and weathered-no recovery from 97.0-98.2 ft; 2 joints at 50-60° 226.5 100.7
221.5	105.7	5.0	2:51 3:56 3:48 6:10 5:38	(5.0) 100%	(2.1) 42%	10				Hard Rock: Light to dark gray with white, pink, and green, very slightly weathered to fresh, very close to wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS -Highly fractured throughout entire run; Quartz+feldspar vein from 101.7-105.7 ft
216.5	110.7	5.0	4:59 5:18 5:30 5:01 4:32	(4.9) 98%	(4.9) 98%	UCS-107.7'				-Quartz+feldspar vein from 105.7-106.9 ft
211.5	115.7	5.0	4:23 4:34 4:14 3:27 3:52	(5.0) 100%	(5.0) 100%	12				-No Joints
206.5	120.7	5.0	3:14 2:59 2:48 2:59 ND	(5.1) 102%	(3.2) 64%	UC-119.1'				-Highly fractured, severely weathered zones from 117.0-118.5 ft and 120.1-120.7 ft
201.5	125.7	5.0	1:38 2:06 3:56 3:38 4:54	(3.7) 74%	(3.0) 60%	14				-Highly fractured, severely weathered zone with no recovery from 120.7-122.0 ft; Quartz vein from 124.2-124.6 ft
196.5	130.7	5.0	4:58 5:37 5:02 5:04 5:30	(5.1) 102%	(5.1) 102%	15				(2 joints at 30-40° with Fe and Mn staining)
		5.0	4:59 6:35	(5.0) 100%	(4.8) 96%	16				(3 joints at 10-20° with Fe stain; 1 joint at 40°)

GEOTECHNICAL CORING LOG

MACTEC

SHEET 2 OF 2

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S. Nicely

SITE DESCRIPTION NORTH ANNA COL

BORING NO. B-920 | **DRILL METHOD: Mud Rotary/Core** | **SAMPLE METHODS: SPT/CORE**

COLLAR ELEV. 327.2 ft **(NAVD88)** | **NORTHING** 3,909,545 **US ft (NAD83)** | **EASTING** 11,685,980 **US ft (NAD83)**

GROUND WATER (ft)	
0 HR.	21.8
24 HR.	32.8

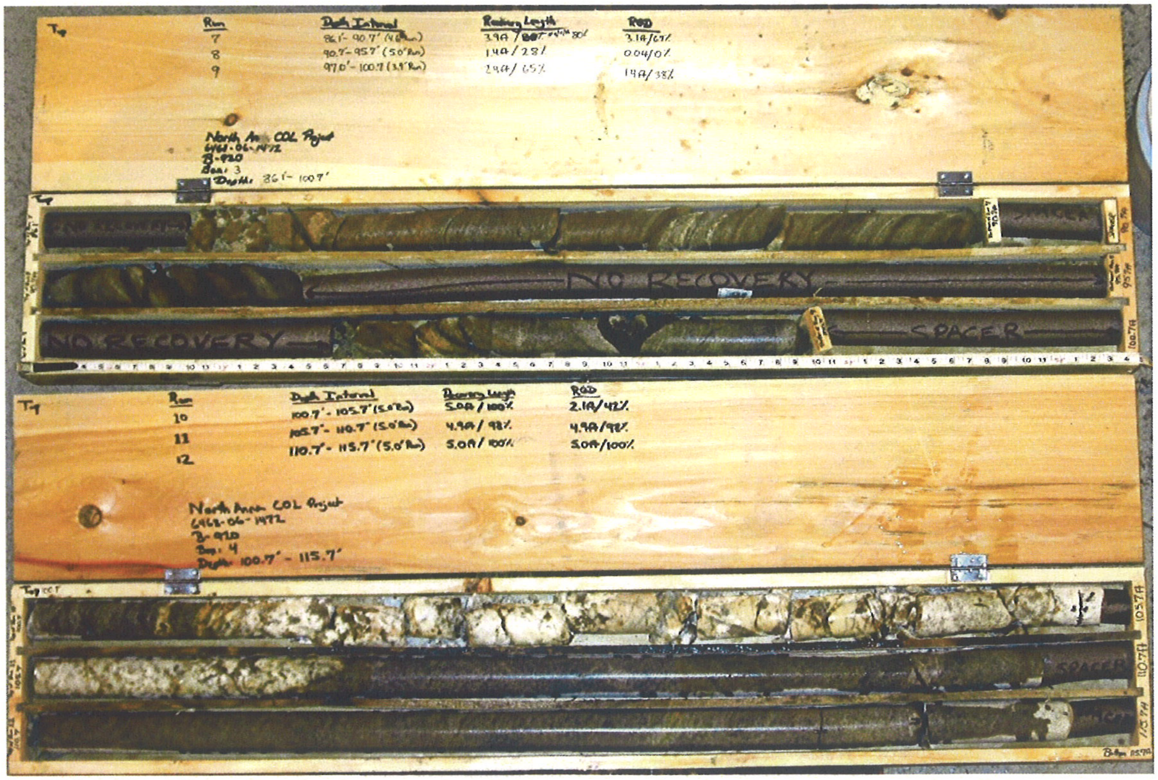
TOTAL DEPTH 150.7 ft | **DRILL MACHINE** CME 55 Truck | **DRILLER: H. Meyerson** | **HAMMER TYPE** 140 lbs Auto

DATE STARTED 9/6/06 | **COMPLETED** 9/12/06 | **CORE BARREL TYPE: HQ 3 triple tube-wireline**

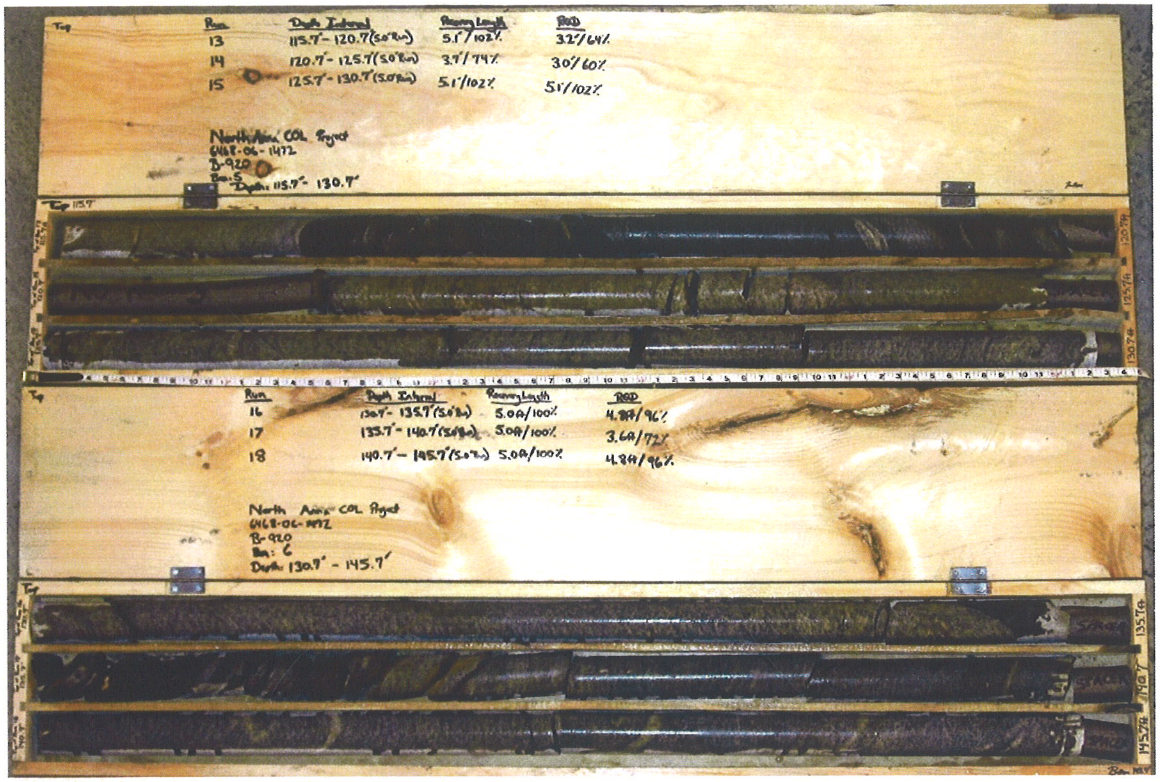
CORE SIZE HQ3 | **TOTAL RUN** 150.7 ft

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %		
										Continued from previous page
191.5	135.7		7:29 9:03 6:45							Hard Rock: Light to dark gray with white, pink, and green, very slightly weathered to fresh, very close to wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS *(continued)* (4 joints at 40-50° highly weathered with Fe and Mn stain; 3 joints at 30-40° with Fe stain; severely weathered zone from 136.9-137.4 ft)
186.5	140.7	5.0	5:17 4:29 3:30 3:07 3:04	(5.0) 100%	(3.6) 72%	17				
181.5	145.7	5.0	1:34 2:53 2:54 3:21 3:43	(5.0) 100%	(4.8) 96%	UCS-141.1				(2 joints at 10-20° with Fe staining)
176.5	150.7	5.0	3:44 3:46 4:07 4:50 4:13	(5.0) 100%	(5.0) 100%	19				-No Joints 176.5 150.7
										Coring terminated at 150.7 ft in Hard Rock: Very hard, BIOTITE-QUARTZ GNEISS

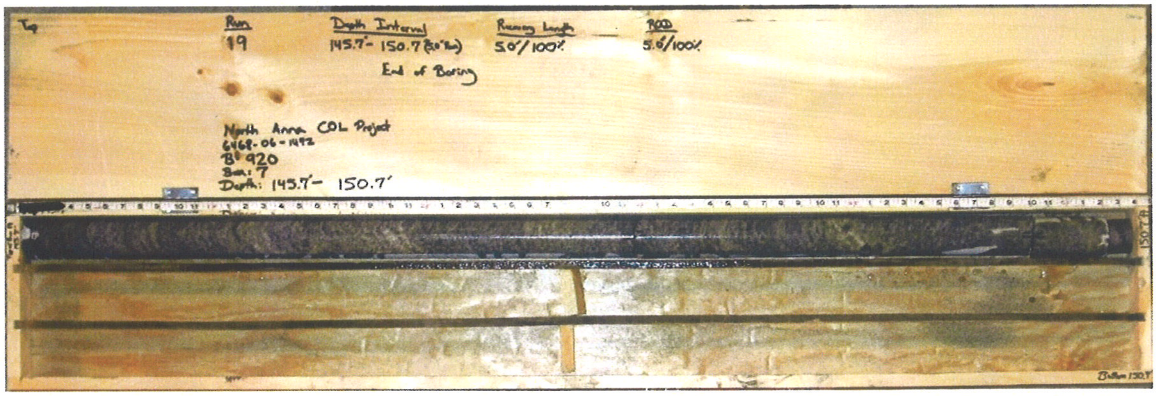
B-920 – Box 1
B-920 – Box 2



B-920 – Box 3
B-920 – Box 4



B-920 – Box 5
B-920 – Box 6



B-920 – Box 7