APPENDIX B.1

GEOTECHNICAL BORING LOGS
(SOIL AND ROCK)

NORTH ANNA COL

DATA REPORT REV. 0
JANUARY 23, 2007

MACTEC PROJECT NO. 6468-06-1472

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or grave - sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures.
			GC	Clayey gravels, gravel - sand - clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand - silt mixtures
			SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.
			CL	Inorganic lays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

	GROUP SYMBOLS	TYPICAL NAMES
ROCK	WR	Weathered Rock
	HR-WR	Hard Rock-Weathered Rock
	HR	Hard Rock

WEATHERING

FRESH - Rock fresh, crystals bright, few joints may show slight staining, rock rings under hammer blows.

VERY SLIGHT - Rock generally fresh, joints stained, may show thin clay coatings, crystals on a broken face shine brightly, rock rings under hammer blows.

SLIGHT- Rock generally fresh, joints stained, discoloration extends into rock, joints may contain clay, some feldspar crystals are dull and discolored, rock rings under hammer blows.

MODERATE - Significant portions show discoloration and weathering effects, feldspar crystals dull and discolored, dull sound under hammer blows.

MODERATELY SEVERE - All rock except quartz discolored or stained, feldspars dull and discolored and show kaolinization, dull sound under hammer blows, severe loss of strength.

SEVERE - All rock except quartz discolored or stained, very severe loss in strength, some fragments of strong rock may remain.

VERY SEVERE - All rock except quartz discolored or stained, only fragments of strong rock remain, saprolitic.

COMPLETE - Rock reduced to soil, may show rock fabric, quartz may be present as dikes or veins.

ROCK HARDNESS

VERY HARD - Cannot be scratched by knife or pick, very hard blows with hammer required to break.

HARD - Can be scratched by knife or pick only with difficulty, hard hammer blows required to break.

MODERATELY HARD - Can be scratched by knife or pick, can be broken with moderate hammer blows.

MEDIUM HARD - Can be grooved or gouged by knife or pick, breaks easily.

SOFT - Easily grooved or gouged by knife or pick, weak, small pieces maybe broken with finger pressure.

VERY SOFT - Can be carved with knife, very weak, scratched with finger nail.

FRACTURE SPACING

VERY WIDE = > 10 feet

WIDE = 3 to 10 feet

MODERATELY CLOSE = 1 to 3 feet

CLOSE = 0.15 to 1 feet

VERY CLOSE = Less than 0.15 feet

Correlation of Penetration Resistance with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
< 4	Very Loose	< 2	Very Soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very Dense	15 - 30	Very Stiff
		> 30	Hard

▽ Water Table at time of drilling ▼ Water Table after 24 hours

Datum Reference Information	Horizontal - NAD 83(CORS96)(EPOCH:2002)
	Elevation - NAVD88 (Geoid03)

KEY TO SYMBOLS AND DESCRIPTIONS

MACTEC

NORTH ANNA COL, Data Report Rev. 0, 1-23-07, 6468-06-1472

GEOTECHNICAL BORING LOG

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman
SITE DESCRIPTION NORTH ANNA COL		GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes
DATE STARTED 8/10/06	COMPLETED 8/25/06	CORE BARREL TYPE: HQ 3 triple tube-wireline

GROUND WATER (ft)	
0 HR.	ND
24 HR.	21.3

HAMMER TYPE 140 lbs Auto	

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
309.4					Ground Surface				309.4 — 0.0
307.9	1.5								Clayey SILT (ML), yellowish red (5YR 5/6), moist, very stiff, trace sand (Residual Soil)
305.9	3.5	5	7	10	17	901-1			306.4 — 3.0
303.4	6.0	5	7	11	18	901-2			Silty SAND (SM), yellowish red (5YR 5/8), reddish yellow (7. YR 6/8) and pale yellow (2.5Y 7/3), moist, medium dense, relict rock fabric (Residual Soil)
301.9	7.5	4	5	6	11	901-3			
299.9	9.5					901-UD-1			Pushed shelby tube (901-UD-1) from 7.5 to 9.5 ft, recovery=100%
297.9	11.5					901-UD-2			Pushed shelby tube (901-UD-2) from 9.5 to 11.5 ft, recovery=100%
296.4	13.0	5	5	7	12	901-4			
294.4	15.0					901-UD-3			Pushed shelby tube (901-UD-3) from 13.0 to 15.0 ft, recovery=100%
		6	5	7	12	901-5			
287.2	22.2								
		7	8	9	17	901-6			
282.2	27.2								
		4	6	13	19	901-7			279.9 — 29.5
277.2	32.2								Silty, fine SAND (SM), pale yellow (2.5Y 7/3) to light gray and orange brown, moist, dense, clay, trace mafics, rock fragments, mottled iron oxide staining, and relict rock fabric (Residual Soil)
		23	26	23	49	901-8			
272.2	37.2								
		9	13	20	33	901-9			269.4 — 40.0
267.2	42.2								Weathered Rock: Light gray w/ orange, severe to moderately severe weathering, QUARTZ GNEISS with biotite
266.2	43.2	50/0.4				901-10			266.1 — 43.3
		50/0.1				901-11			Hard Rock: Light gray with orange Fe-oxide staining, moderately severe to moderate weathering, close to moderately close fracturing, medium to moderately hard, QUARTZ GNEISS with biotite
									249.4 — 60.0
									Hard Rock: Light gray with orange Fe staining, slight weathering, close to moderately close fracturing, moderately hard, QUARTZ GNEISS with biotite
									239.4 — 70.0

GEOTECHNICAL BORING LOG

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman
SITE DESCRIPTION NORTH ANNA COL		GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)	24 HR. 21.3
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	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
234.6					Continued from previous page				
									Hard Rock: Light gray to dark gray with orange Fe staining, moderately severe to slight weathering, close fracturing, medium to moderately hard, QUARTZ-BIOTITE GNEISS grading into QUARTZ GNEISS with biotite at 73.8 ft *(continued)*
									229.4 — 80.0
									Hard Rock: Light gray to dark gray with orange Fe stains, slight to very slight weathering, close to moderately close fracturing, moderately hard, QUARTZ GNEISS with biotite
									203.8 — 105.6
									Weathered Rock: Dark to light gray, severe weathering, QUARTZ GNEISS with biotite-No recovery from 105.6 to 106.0 ft
									201.9 — 107.5
									Hard Rock: Light to dark gray, moderate to slight weathering, close fracturing, moderately hard, QUARTZ GNEISS with biotite
									198.4 — 111.0
									197.4 — 112.0
									Weathered Rock: Dark gray, severe weathering, QUARTZ GNEISS with biotite
									195.4 — 114.0
									Hard Rock: Light gray, moderate weathering, close fracturing, moderately hard, QUARTZ-MUSCOVITE GNEISS with feldpsar
									193.4 — 116.0
									Weathered Rock: light to dark gray, very severe weathering, close fracturing, medium hard, QUARTZ GNEISS with muscovite
									189.4 — 120.0
									188.4 — 121.0
									Hard Rock: Light gray with orange Fe staining, slight weathering, moderately close fracturing, moderately hard, QUARTZ-MUSCOVITE GNEISS with feldspar
									186.4 — 123.0
									Weathered Rock: Light gray to bluish gray, severely weathered, QUARTZ GNEISS with muscovite and feldspar
									183.8 — 125.6
									Hard Rock: Light gray to bluish gray, moderately severe to moderate weathering, close fracturing, moderately hard, QUARTZ GNEISS with muscovite and feldspar
									Weathered Rock: Severely weathered, QUARTZ GNEISS with muscovite and feldspar-Very poor recovery
									174.4 — 135.0
									Hard Rock: Light to dark gray with orange Fe staining, moderately severe to slight weathering, close to moderately close fracturing, moderately hard, BIOTITE-QUARTZ GNEISS and QUARTZ GNEISS with biotite
									Hard Rock: Light to dark gray, slight weathering to fresh, close to very wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS with feldspar and trace magnetite

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman
SITE DESCRIPTION NORTH ANNA COL		GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)	24 HR. 21.3
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	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
159.8					Continued from previous page				
									Hard Rock: Light to dark gray, slight weathering to fresh, close to very wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS with feldspar and trace magnetite *(continued)*

GEOTECHNICAL BORING LOG

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman
SITE DESCRIPTION NORTH ANNA COL		GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
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TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	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
85.0					Continued from previous page				
									Hard Rock: Light to dark gray, slight weathering to fresh, close to very wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS with feldspar and trace magnetite *(continued)*

GEOTECHNICAL BORING LOG

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman	
SITE DESCRIPTION NORTH ANNA COL			GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)	24 HR. 21.3
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	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
10.2					Continued from previous page				
									9.4 — 300.0 Boring and coring terminated at 300.0 ft in Hard Rock: Very hard, BIOTITE-QUARTZ GNEISS

GEOTECHNICAL CORING LOG

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	**COUNTY** Louisa, VA	**GEOLOGIST** S.Lehman
SITE DESCRIPTION NORTH ANNA COL		**GROUND WATER (ft)**
BORING NO. B-901	**DRILL METHOD:** Mud Rotary/Core	**SAMPLE METHODS:** SPT/UD/CORE — **0 HR.** ND
COLLAR ELEV. 309.4 ft (NAVD88)	**NORTHING** 3,909,778 US ft (NAD83)	**EASTING** 11,685,929 US ft (NAD83) — **24 HR.** 21.3
TOTAL DEPTH 300.0 ft	**DRILL MACHINE** CME 45 Trailer	**DRILLER:** F. Cox/D. Rhodes — **HAMMER TYPE** 140 lbs Auto
DATE STARTED 8/10/06	**COMPLETED** 8/25/06	**CORE BARREL TYPE:** HQ 3 triple tube-wireline
CORE SIZE HQ3	**TOTAL RUN** 256.7 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 @ 43.3 ft
266.1	43.3	0.7	5:40/0.7	(0.6)	(0.0)	1				266.1 — 43.3 Hard Rock: Light gray with orange Fe-oxide staining, moderately severe to moderate weathering, close to moderately close fracturing, medium to moderately hard, QUARTZ GNEISS with biotite
265.4	44.0	1.0	6:40	86%	0%	2				(1 joint at 30° with trace clay)
264.4	45.0	3.8	3:21	(0.8)	(0.0)	3				(3 joints at 45° with trace clay and Fe stain)
			3:20	80%	0%					(7 joints at 45° with clay and Fe stain; 5 joints at 30° with clay; severe weathering along joints)
			4:08							(1 joint at 45° with Fe staining)
260.6	48.8		4:20/0.8	(3.3)	(0.9)					(3 joints at 45° with Fe staining; 3 joints at 30° with trace clay and Fe staining)
259.4	50.0	1.2	1:02/0.2	87%	24%	4				
		5.0	5:20	(1.0)	(1.0)	UC-54.0'				
			4:56	83%	83%					
			3:26	(4.9)	(2.2)					
			3:48	98%	44%					
254.4	55.0		3:20							
			3:05							
		5.0	3:17	(4.9)	(3.8)	6				(Severely weathered from 56.8-57.1 ft; 2 joints at 45° with trace clay and Fe staining; 2 joints at 30° with clay and Fe staining; 1 joint at 70° with Fe staining)
			2:54	98%	76%					
			3:43							
			4:45							
249.4	60.0		4:33							249.4 — 60.0
		5.0	3:40	(5.0)	(4.4)	UCS-60.3'				Hard Rock: Light gray with orange Fe staining, slight weathering, close to moderately close fracturing, moderately hard, QUARTZ GNEISS with biotite
			3:51	100%	88%					(1 joint at 70°, 3 joints at 45°, and 3 joints at 30°-all with trace clay and Fe staining)
			4:24							
			4:56							
244.4	65.0		4:17							
		5.0	3:52	(4.2)	(2.0)	8				(14 joints at 20-30° with clay and Fe staining)
			3:39	84%	40%					
			3:58							
			3:43							
239.4	70.0		2:19							239.4 — 70.0
		4.7	3:35	(4.6)	(0.9)	9				Hard Rock: Light gray to dark gray with orange Fe staining, moderately severe to slight weathering, close fracturing, medium to moderately hard, QUARTZ-BIOTITE GNEISS grading into QUARTZ GNEISS with biotite at 73.8 ft
			4:16	98%	19%					
			3:25							
			2:50							
234.7	74.7		3:13/0.7							
		5.3	0:48/0.3	(5.3)	(2.1)	10				(14 joints at 20-30° with trace clay and Fe staining)
			2:45	100%	40%					(8 joints at 20°, 2 joints at 45°, and 3 joints at 70°-all with trace clay and Fe staining)
			2:54							
			2:10							
			2:38							
229.4	80.0		3:10							229.4 — 80.0
		5.0	3:20	(5.0)	(3.8)	11				Hard Rock: Light gray to dark gray with orange Fe stains, slight to very slight weathering, close to moderately close fracturing, moderately hard, QUARTZ GNEISS with biotite
			3:46	100%	76%					(2 joints at 30°, 1 joint at 50°, and 4 joints at 70°-all with trace clay and Fe staining)
			3:20							
			3:39							
224.4	85.0		3:34							
		5.0	2:56	(4.6)	(2.8)	12				(3 joints at 60°, 1 joint at 45°, and 2 joints at 30°-all with Fe staining)
			2:54	92%	56%					
			3:38							
			3:55							
219.4	90.0		4:50							
		5.0	3:57	(5.0)	(2.7)	13				(2 joints at 80° with trace clay and Fe staining; 2 joints at 45° and 3 joints at 30° with Fe staining; moderate weathering along joints)
			3:41	100%	54%					
			3:19							
			3:18							
214.4	95.0		3:18							
		4.5	3:24	(4.5)	(3.5)	UC-97.9'				(4 joints at 45° with Fe staining; 2 joints at 70° with trace clay and light Fe staining)
			3:20	100%	78%					
			3:40							
			3:39							
209.9	99.5		2:42/0.5							
209.4	100.0	0.5	2:14/0.5	(0.5)	(0.0)	15				(1 joint at 80° with trace clay)
		5.0	3:40	100%	0%	16				(2 joints at 80°, 2 joints at 60°, 2 joints at 45°, and 2 joints at 30°-all with trace clay and Fe staining)
			2:44	(5.0)	(2.8)					
			3:30	100%	56%					
			3:14							
204.4	105.0		2:45							203.8 — 105.6 (1 joint at 80° with trace clay and Fe staining)
202.9	106.5	1.5	3:06	(0.6)	(0.0)	17				201.9 — 107.5 Weathered Rock: Dark to light gray, severe weathering, QUARTZ GNEISS with biotite-No recovery from 105.6 to 106.0 ft
		3.5	3:20/0.5	40%	0%	18				(4 joints at 45° with clay and Fe staining)
			2:21/0.5	(4.0)	(2.2)					
			3:40	114%	63%					
199.4	110.0		4:04							198.4 — 111.0 Hard Rock: Light to dark gray, moderate to slight weathering, close fracturing, moderately hard, QUARTZ GNEISS with biotite
		2.0	3:11	(2.0)	(0.7)	19				197.4 — 112.0 (4 joints at 30° with Fe staining)
197.4	112.0		3:10	100%	35%					Weathered Rock: Dark gray, severe weathering, QUARTZ GNEISS with biotite — 114.0
		3.0	2:24							195.4 — Hard Rock: Light gray, moderate weathering, close fracturing, moderately hard, QUARTZ-MUSCOVITE GNEISS with feldpsar
			2:56	(2.8)	(0.9)	20				193.4 — 116.0 Weathered Rock: light to dark gray, very severe weathering, close fracturing, medium hard, QUARTZ GNEISS with muscovite
			4:13	93%	30%					
194.4	115.0		1:57							
		5.0	5:26	(4.2)	(2.4)	21				
			3:12	84%	48%					
			2:01							

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman	
SITE DESCRIPTION NORTH ANNA COL			GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)	24 HR. 21.3
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	CORE BARREL TYPE: HQ 3 triple tube-wireline	
CORE SIZE HQ3	TOTAL RUN 256.7 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
										Continued from previous page
189.4	120.0		2:00 4:36							(2 joints at 70-80° with trace clay and Fe staining; 1 joint at 45° with trace clay) 189.4 Hard Rock: Light gray with orange Fe staining, slight weathering, moderately close fracturing, moderately hard, QUARTZ-MUSCOVITE GNEISS with feldspar *(continued)* 120.0
186.4	123.0	3.0	5:40 3:48 5:20	(1.4) 47%	(0.0) 0%	22				188.4 121.0 186.4 Weathered Rock: Light gray to bluish gray, severely weathered, QUARTZ GNEISS with muscovite and feldspar 123.0
184.4	125.0	2.0	6:27 3:24	(0.1) 5%	(0.0) 0%	23				(2 joints at 45° and 1 joint at 30° with clay) 125.6
182.4	127.0	2.0	6:38 7:29	(1.4) 70%	(0.0) 0%	24				183.8 Hard Rock: Light gray to bluish gray, moderately severe to moderate weathering, close fracturing, moderately hard, QUARTZ GNEISS with muscovite and feldspar
179.4	130.0	3.0	7:28 5:20 3:38	(2.5) 83%	(1.9) 63%	UC-129.5'				Weathered Rock: Severely weathered, QUARTZ GNEISS with muscovite and feldspar-Very poor recovery (4 joints at 30° with trace clay and Fe staining)
174.4	135.0	5.0	3:21 3:16 3:59 4:54 4:57	(4.6) 92%	(2.5) 50%	26				Hard Rock: Light to dark gray with orange Fe staining, moderately severe to slight weathering, close to moderately close fracturing, moderately hard, BIOTITE-QUARTZ GNEISS and QUARTZ GNEISS with biotite 135.0 174.4 (4 joints at 45° with trace clay and Fe staining) (1 joint at 80°; 10 joints at 45° with clay and some Fe staining)
169.4	140.0	5.0	4:55 4:18 3:31 4:06 3:26	(5.0) 100%	(4.8) 96%	27				Hard Rock: Light to dark gray, slight weathering to fresh, close to very wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS with feldspar and trace magnetite
164.4	145.0	5.0	2:58 3:14 3:16 4:04 4:03	(4.9) 98%	(4.9) 98%	28				(1 joint at 80° and 1 joint at 45° with trace clay, slight weathering along joints) (1 joint at 30° with clay)
159.4	150.0	5.0	4:05 3:45 3:42 3:46 3:06	(5.0) 100%	(4.7) 94%	29				(1 joint at 65° with trace clay; 1 joint at 50° with weathered biotite)
154.4	155.0	5.0	3:25 2:38 2:51 3:10 3:50	(5.0) 100%	(5.0) 100%	30				(1 joint at 45° with trace clay and weathered biotite; 1 joint at 80° with weathered biotite)
149.4	160.0	5.0	3:25 2:23 2:45 2:25 2:32	(5.0) 100%	(5.0) 100%	31				-No Joints
144.4	165.0	5.0	2:22 2:52 2:50 2:54 4:09	(5.0) 100%	(5.0) 100%	32				-No Joints
139.4	170.0	5.0	5:53 5:10 3:18 3:28 3:24	(5.1) 102%	(5.1) 102%	33				-No Joints
134.4	175.0	5.0	3:58 5:20 4:06 4:36 3:29	(5.0) 100%	(5.0) 100%	UCS-170.5'				(1 joint at 45° with trace Fe stain)
129.4	180.0	5.0	5:08 4:34 4:10 3:51 4:09	(5.0) 100%	(5.0) 100%	35				-No Joints
124.4	185.0	5.0	6:06 5:07 5:56 4:43 3:51	(5.0) 100%	(5.0) 100%	36				(2 joints at 70° with trace clay)
123.2	186.2	1.2	6:49	(1.2) 100%	(0.9) 75%	37				(1 joint at 15°)
119.4	190.0	3.8	2:44/0.2 1:02/0.8 4:44 4:10 5:05	(3.8) 100%	(3.8) 100%	38				(1 joint at 80° with trace clay)
		5.0	3:41 3:53	(5.0) 100%	(5.0) 100%	39				-No Joints

MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman	
SITE DESCRIPTION NORTH ANNA COL			GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)	24 HR. 21.3
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	CORE BARREL TYPE: HQ 3 triple tube-wireline	
CORE SIZE HQ3	TOTAL RUN 256.7 ft		

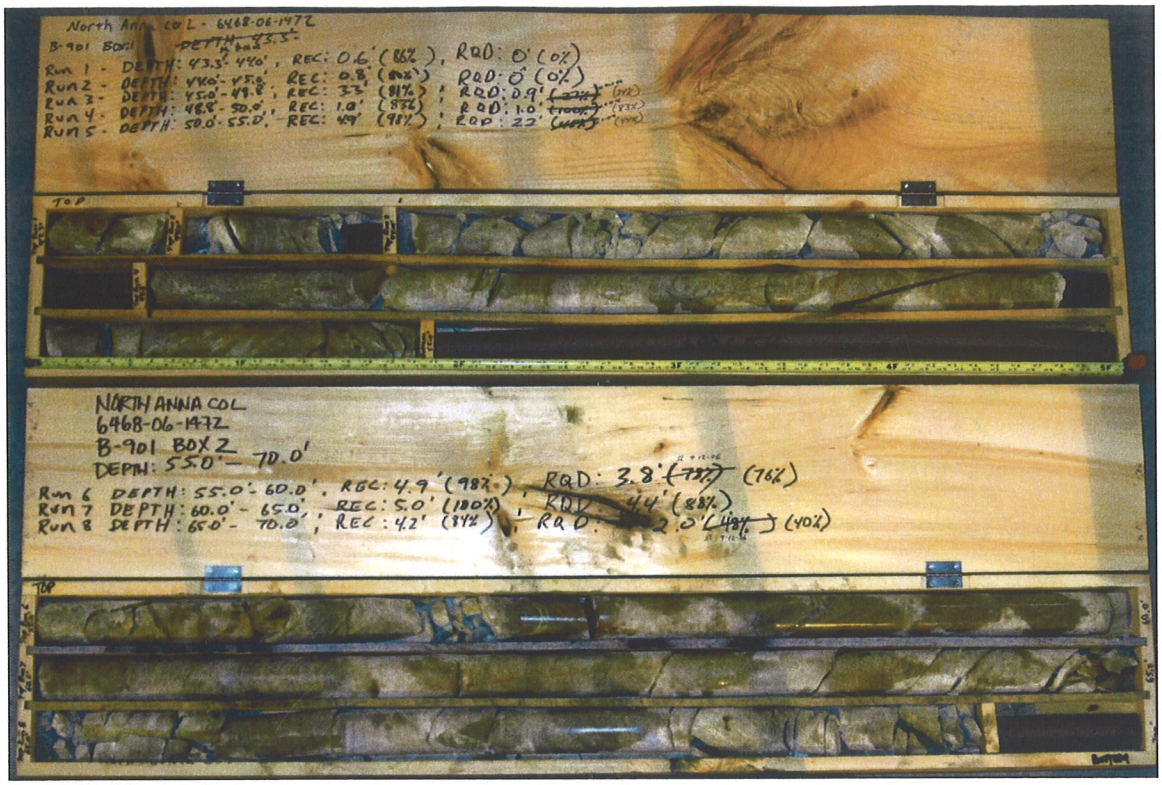
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
										Continued from previous page
114.4	195.0		4:28 4:42 3:55							Hard Rock: Light to dark gray, slight weathering to fresh, close to very wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS with feldspar and trace magnetite *(continued)*
		5.0	4:05 4:29 3:35 4:09 4:06	(5.0) 100%	(5.0) 100%	40				-No Joints
109.4	200.0									
		5.0	4:29 4:45 5:48 5:38 5:58	(5.0) 100%	(5.0) 100%	41				-No Joints
104.4	205.0									
		3.9	9:10 5:15 7:55 8:50/0.9	(3.9) 100%	(3.9) 100%	UC-208.5'				(1 joint at 70° with trace clay)
100.5	208.9									
99.4	210.0	1.1	1:18/0.1	(1.0) 91%	(0.9) 82%	43				-No Joints
		5.0	5:48 7:21 4:41 8:17 5:10 4:12	(5.0) 100%	(5.0) 100%	44				(1 joint at 45° with trace clay)
94.4	215.0									
		3.8	5:05 4:07 4:49 4:43/0.8	(3.9) 103%	(3.9) 103%	45				-No Joints
90.6	218.8									
89.4	220.0	1.2	4:25 0:30/0.2	(1.0) 83%	(1.0) 83%	46				-No Joints
		5.0	5:56 5:27 4:07 4:06 3:53	(5.0) 100%	(5.0) 100%	47				(1 joint at 70-80° with Fe mineralization)
84.4	225.0									
		5.0	3:06 3:37 4:07 4:51 4:30	(5.0) 100%	(5.0) 100%	48				-No Joints
79.4	230.0									
		5.1	4:36 4:46 4:49 4:36 4:58/1.1	(5.1) 100%	(5.1) 100%	49				-No Joints
74.3	235.1									
		4.9	8:13 8:16 6:06 8:29 8:08	(4.9) 100%	(4.9) 100%	50				-No Joints
69.4	240.0									
		5.1	9:56 8:06 8:17 8:16 10:44/1.1	(5.1) 100%	(5.1) 100%	UC-240.5'				-No Joints
64.3	245.1									
		5.0	17:21 17:38 6:56 7:54 4:37	(5.1) 102%	(4.7) 94%	52				(1 joint at 20-30°; 1 joint at 30-40° with chlorite)
59.3	250.1									
		5.0	4:48 4:53 6:28 5:51 5:18	(5.0) 100%	(5.0) 100%	53				(1 joint at 65°)
54.3	255.1									
		4.9	7:23 7:15 6:56 6:00 5:09/0.9	(4.9) 100%	(4.9) 100%	54				(1 joint at 45°)
49.4	260.0									
		5.0	6:30 5:52 6:27 6:56 10:46	(5.0) 100%	(5.0) 100%	55				-No Joints
44.4	265.0									
		5.0	14:33 14:42	(5.0) 100%	(5.0) 100%	56				(1 joint at 40°)

GEOTECHNICAL CORING LOG

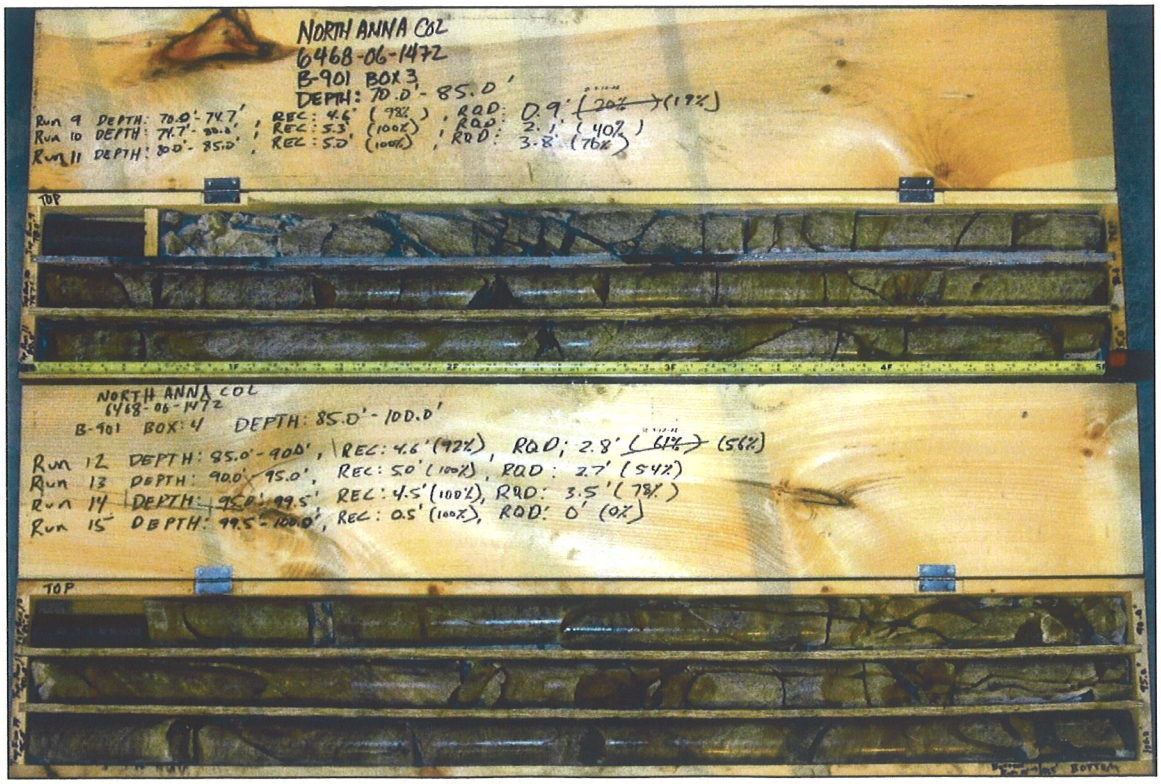
MACTEC

MACTEC PROJECT NO.: 6468-06-1472	COUNTY Louisa, VA	GEOLOGIST S.Lehman	
SITE DESCRIPTION NORTH ANNA COL			GROUND WATER (ft)
BORING NO. B-901	DRILL METHOD: Mud Rotary/Core	SAMPLE METHODS: SPT/UD/CORE	0 HR. ND
COLLAR ELEV. 309.4 ft (NAVD88)	NORTHING 3,909,778 US ft (NAD83)	EASTING 11,685,929 US ft (NAD83)	24 HR. 21.3
TOTAL DEPTH 300.0 ft	DRILL MACHINE CME 45 Trailer	DRILLER: F. Cox/D. Rhodes	HAMMER TYPE 140 lbs Auto
DATE STARTED 8/10/06	COMPLETED 8/25/06	CORE BARREL TYPE: HQ 3 triple tube-wireline	
CORE SIZE HQ3	TOTAL RUN 256.7 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
										Continued from previous page
39.4	270.0		23:03 18:50 25:40							Hard Rock: Light to dark gray, slight weathering to fresh, close to very wide fracturing, hard to very hard, BIOTITE-QUARTZ GNEISS with feldspar and trace magnetite *(continued)*
34.4	275.0	5.0	33:30 4:48 4:35 4:49 5:29	(5.0) 100%	(5.0) 100%	57				-No Joints
29.4	280.0	5.0	4:07 3:00 2:52 3:51 4:43	(5.0) 100%	(5.0) 100%	58				-No Joints
24.4	285.0	5.0	4:21 3:57 5:12 6:05 4:46	(5.0) 100%	(5.0) 100%	UCS-280.5'				-No Joints
19.4	290.0	5.0	5:47 5:21 4:46 4:30 3:28	(5.0) 100%	(5.0) 100%	60				-No Joints
14.4	295.0	5.0	5:27 5:20 6:42 4:50 5:47	(5.0) 100%	(5.0) 100%	61				-No Joints
9.4	300.0	5.0	8:52 6:27 8:15 8:49 7:22	(4.9) 98%	(4.9) 98%	62				-No Joints 9.4 300.0
										Coring terminated at 300.0 ft in Hard Rock: Very hard, BIOTITE-QUARTZ GNEISS



B-901 - Box 1
B-901 - Box 2



B-901 - Box 3
B-901 - Box 4