

**FINAL DATA REPORT
Revision 0
GEOTECHNICAL EXPLORATION AND TESTING
SUPPLEMENT 1
DOMINION POWER
NORTH ANNA NUCLEAR POWER STATION
NORTH ANNA 3 PROJECT
MINERAL, LOUISA COUNTY, VIRGINIA**

December 10, 2009

VOLUME 1

**APPENDIX B
Geotechnical Field Data**

Prepared By:

**MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA**

MACTEC PROJECT No. 6468-09-2473

Prepared For:

**Bechtel Power Corporation
Subcontractor No. 25161-500-HC4-CY00-00001**

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**APPENDIX B.1
Geotechnical Boring Logs**

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KEY TO CLASSIFICATION AND SYMBOLS

SOILS

Soils classified under the Unified Soil Classification System (USCS) and in accordance with ASTM D 2488-08

CORRELATION OF SPT RESISTANCE WITH RELATIVE DENSITY-CONSISTENCY				MOISTURE CONTENT	MODIFIERS	
GRANULAR MATERIAL		SILTS AND CLAYS		DRY-Absence of moisture	Approximate %	Modifiers
RELATIVE DENSITY	SPT N Value (blows/ft)	CONSISTENCY	SPT N Value (blows/ft)	MOIST-Damp/no visible H2O	<5%	TRACE
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	WET-Visible free water	5 to 10%	FEW
LOOSE	5 - 10	SOFT	3 - 4		15 to 25%	LITTLE
MEDIUM DENSE	11 - 30	MEDIUM STIFF	5 - 8	<u>HCl Reaction</u>	30 to 45%	SOME
DENSE	31 - 50	STIFF	9 - 15	NONE - No visible reaction	50 to 100%	MOSTLY
VERY DENSE	> 50	VERY STIFF	16 - 30	WEAK - Some reaction/slow	Modifiers provide an estimate of the percentages of gravel, sand, and fines (silt or clay size particles) or other material such as organics, mica, mineral components, etc.	
		HARD	> 30	STRONG - Violent reaction		
COLOR of Soil/Rock: see Munsell Soil Color Charts				SPT Sample Numbering: SS-1, SS-2, SS-3, etc.		
Particle Size Range for Sand: Fine, Medium, Coarse				Tested Rock Sample Numbering: RS-1, RS-2, etc.		
Particle Size Range for Gravel: Fine or Coarse				Example Soil Description: Silty SAND (SM), light gray (10Y7/1), medium dense, wet, fine to coarse sand, little mica, relict rock fabric		
Measurements: Horizontal measurements are rounded to nearest foot. Vertical measurements, such as SPT sample recovery or penetration, sample depths, core run depth, core run length, core recovery, core RQD, etc. are rounded to nearest tenth of a foot (0.1 ft).				Coordinate System and Datum Reference Information: Horizontal - Virginia State Plane Coordinate System, South Zone, NAD 83 (COR96)(EPOCH 2002); Elevation - NAVD88 (Geoid03)		
 Borehole fluid level at time of drilling completion				 Borehole fluid level 24 hours after drilling completion		

ROCK

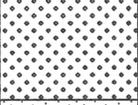
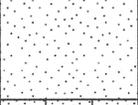
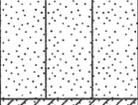
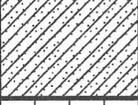
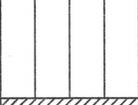
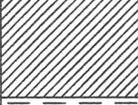
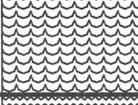
In general, the North Anna Site is composed of moderately to strongly metamorphosed rock of granitic composition commonly described as quartz gneiss and biotite gneiss (or a combination of these); locally zones of schist and/or pegmatitic zones may be encountered.	Example Rock Core Run Description: Light gray with trace orange staining, slightly weathered, moderately close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS with trace magnetite (2 Joints at 45°, tight with trace orange staining; 2 joints at 60°, open with clay)
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WEATHERING DESCRIPTION		FRACTURE SPACING		ROCK HARDNESS DESCRIPTION	
SEVERE	Rock except quartz discolored or stained; severe loss in strength; some fragments of strong rock remain	VERY CLOSE	< 0.15 ft (2")	VERY SOFT	Can be carved with knife; pieces >1" can be broken by finger pressure; crumbles easily
MODERATELY SEVERE	Rock except quartz discolored or stained; crystals dull, show clay alteration; thud sound when struck by hammer	CLOSE	0.15 ft (2") to 1 foot	SOFT	Can be gouged/grooved with knife; small thin pieces broken by finger pressure
MODERATE	Significant portions show discoloration and weathering effects; crystals dull; dull sound under hammer blows	MODERATELY CLOSE	1 to 3 feet	MEDIUM HARD	Can be gouged/grooved by knife with firm pressure; easily broken by hammer
SLIGHT	Rock generally fresh; joints stained; discoloration extends into rock, may contain clay; some crystals dull	WIDE	>3 feet	MODERATELY HARD	Can be scratched by knife or steel pick; moderate hammer blows to break sample
VERY SLIGHT	Rock generally fresh; joints stained, may show thin clay coatings; crystals bright; rock rings under hammer blows	JOINT DESCRIPTION	Tight -Core pieces fit tightly together; no gaps	HARD	Rock core rings when struck with a hammer; Can be scratched by knife or steel pick only with difficulty
FRESH	Rock fresh, crystals bright, few joints may show slight staining, rock rings under hammer blows		Open -Core pieces fit loosely together; has gaps	VERY HARD	Rock core rings when struck with a hammer; Cannot be scratched by knife or steel pick

Core Terms-Abbreviations	EXPLANATION
DRILL RATE	Time in minutes it takes to core one foot, for each foot or partial foot of a core run. (1:32; 0:54/0.7 ft)
CORE RUN; RUN LENGTH	Cored Interval; Total distance of core run measured to nearest 0.1 ft. Core runs are not to exceed 5 feet.
CORE RECOVERY (REC.)	Total length of recovered core, measured to nearest 0.1 ft, divided by the core run length, and expressed as a percentage.
CORE RQD (RQD)	Rock Quality Designation. Sum of intact core pieces greater than 4 inches in length, measured to the nearest 0.1 ft, divided by the core run length, and expressed as a percentage.

Legend-NORTH ANNA 3, Rev 0

SOIL AND ROCK SYMBOLS AND DESCRIPTIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
ROCK				WR	WEATHERED ROCK	
				HR-WR	HARD ROCK - WEATHERED ROCK	
				HR	HARD ROCK	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
			CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO 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 OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
					CL	INORGANIC CLAYS 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 SAND OR SILTY SOILS		
			CH	INORGANIC CLAYS OF HIGH PLASTICITY		
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
HIGHLY ORGANIC SOILS				PT	MUCK, PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



BECHTEL PROJECT NO.: 25161		MACTEC PROJECT NO.: 6468-09-2473			COUNTY: Louisa, VA		GEOLOGIST: R. Clark								
SITE DESCRIPTION: North Anna Power Station, Unit 3					DRILLER: R. Landeros			FLUID LEVEL (ft)							
BORING NO.: W-1		DRILL METHOD: Mud Rotary/Rock Core			DRILL MACHINE: CME-550X (ATL)				0 HR. NA						
GROUND ELEV.: 306.2 ft (NAVD88)		NORTHING: 3,909,853 US ft (NAD83)		EASTING: 11,685,959 US ft (NAD83)				24 HR. 37.3							
TOTAL DEPTH: 154.0 ft		SAMPLE METHODS: ASTM D 1586-08a; 2488-09a; 2113-08; 6032-08			ROD TYPE: AWJ		HAMMER (ID): 140-lb. Auto (MEC-05)								
DATE STARTED: 10/19/09		COMPLETED: 10/21/09		HOLE DIA.: 3"		CASING DEPTH: 74.0 ft		CORE SIZE: NQ3 BITS USED: 2-7/8" Tri-Cone							
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
231.4					Continued from previous page										
	50/0.0												229.4	76.8	HARD ROCK: Light pinkish gray to light gray with some reddish yellow and yellow staining, slightly weathered, very close to moderately close fracturing, hard to very hard, QUARTZ GNEISS with trace magnetite
													207.2	99.0	96.0 - 96.6 ft: Possible shear zone characterized by soft, yellow-brown clay and rock fragments, oriented approximately 60° to core axis. HARD ROCK: Light gray with pink and yellow staining, fresh, moderately close to wide fracturing, very hard, BIOTITE QUARTZ GNEISS

NORTH ANNA 3 BORE NORTH ANNA 3 PROJECT.GPJ NORTH ANNA 3.GDT 12/3/09



BECHTEL PROJECT NO.: 25161		MACTEC PROJECT NO.: 6468-09-2473		COUNTY: Louisa, VA		GEOLOGIST: R. Clark	
SITE DESCRIPTION: North Anna Power Station, Unit 3				DRILLER: R. Landeros		FLUID LEVEL (ft)	
BORING NO.: W-1		DRILL METHOD: Mud Rotary/Rock Core		DRILL MACHINE: CME-550X (ATL)		0 HR. NA	
GROUND ELEV.: 306.2 ft (NAVD88)		NORTHING: 3,909,853 US ft (NAD83)		EASTING: 11,685,959 US ft (NAD83)		24 HR. 37.3	
TOTAL DEPTH: 154.0 ft		SAMPLE METHODS: ASTM D 1586-08a; 2488-09a; 2113-08; 6032-08				HAMMER (ID): 140-lb. Auto (MEC-05)	
DATE STARTED: 10/19/09		COMPLETED: 10/21/09		CASING DEPTH: 74.0 ft		CORE BARREL TYPE: Wireline NQ3 Triple Tube, series 6 bit	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS
				REC. (%)	RQD (%)		REC. (%)	RQD (%)		
										Begin Coring @ 29.0 ft
277.2	29.0	5.0	1:24 1:04 1:30 1:38 1:42	(2.3) 46%	(1.2) 24%	RUN 1	(2.3) 46%	(1.2) 24%		WEATHERED ROCK - HARD ROCK: Light gray with reddish yellow staining, severely to moderately weathered, moderately close fracturing, medium hard BIOTITE QUARTZ GNEISS 29.0
272.2	34.0									(1 joint at 0-10°, tight with iron staining; 1 joint at 80-90°, tight with iron staining) 34.0
		5.0	1:25 1:35 1:33 1:31 0:35	(0.0) 0%	(0.0) 0%	RUN 2	(0.0) 0%	(0.0) 0%		WEATHERED ROCK: No recovery - Severely weathered BIOTITE QUARTZ GNEISS
267.2	39.0									
		5.0	0:48 0:56 0:48 0:46 0:52	(0.0) 0%	(0.0) 0%	RUN 3				
262.2	44.0									
		5.0	N=50/0.0 1:01 0:45 1:05 1:47 4:28	(0.0) 0%	(0.0) 0%	RUN 4				
257.2	49.0									257.2
		5.0	1:03 1:05 0:59 1:03 1:01	(4.2) 84%	(2.2) 44%	RUN 5	(9.1) 91%	(6.1) 61%		HARD ROCK: Light yellowish gray, moderately weathered, close to moderately close fracturing, medium to moderately hard, QUARTZ GNEISS with trace magnetite (1 joint at 65°, tight with iron staining; 2 joints at 80-90°, tight with iron staining) 49.0
252.2	54.0									
		5.0	1:12 2:10 1:41 1:21 1:06	(4.9) 98%	(3.9) 78%	RUN 6				(6 joints at 10-20°, tight with iron staining; 2 joints at 40-60°, tight with iron staining) 59.0
247.2	59.0									247.2
		5.0	0:32 0:35 0:38 0:41 0:43	(0.3) 6%	(0.0) 0%	RUN 7	(0.3) 2%	(0.0) 0%		WEATHERED ROCK: Light yellowish gray, severely weathered, close fracturing, medium hard, QUARTZ GNEISS; also sampled as Silty SAND (SM), brownish yellow (10YR 6/6), wet, very dense, fine to coarse grained sand and rock fragments
242.2	64.0									
		5.0	1:05 1:03 1:02 1:01 1:18	(0.0) 0%	(0.0) 0%	RUN 8				
237.2	69.0									
		4.6	N=50/0.4 0:59/0.6 1:02 1:05 4:25 5:23	(0.0) 0%	(0.0) 0%	SS-8 RUN 9				Note: Outer core barrel broke during RUN 9. Able to retrieve broken core barrel from hole and continue boring with replacement core barrel.
232.2	74.0									
		5.0	N=50/0.0 3:54 2:25 2:31 4:24 3:48	(2.2) 44%	(0.0) 0%	RUN 10				(12 joints at 0-10°, tight) 76.8
227.2	79.0						(20.4) 92%	(8.5) 38%		229.4
		5.0	3:45 7:26 2:24 3:26 4:16	(5.0) 100%	(4.0) 80%	RUN 11				HARD ROCK: Light pinkish gray to light gray with some reddish yellow and yellow staining, slightly weathered, very close to moderately close fracturing, hard to very hard, QUARTZ GNEISS with trace magnetite (2 joints at 0-10°, tight; 1 joint at 45°, tight; 2 joints at 60°, tight) 76.8
222.2	84.0									
		5.0	2:25 5:24 6:11 6:23 6:38	(4.6) 92%	(1.5) 30%	RUN 12				(5 joints at 10-20°, tight with iron staining and trace clay; 2 joints at 45°, tight with iron staining and trace clay; 1 joint at 80-90°, tight)
217.2	89.0									
		5.0	2:45 2:52 2:58 3:02 3:01	(3.6) 72%	(1.1) 22%	RUN 13				(3 joints at 0-10°, tight with iron staining; 3 joints at 45°, open with severe weathering and loss of recovery; 1 joint at 80-90°, tight)
212.2	94.0									
		1.0	4:37	(1.0) 100%	(0.0) 0%	RUN 14				(horizontal and vertical joints) (3 joints at 60-70°, tight to open with clay)
211.2	95.0									
		4.0	4:24 4:21 3:49 2:45	(4.0) 100%	(1.9) 48%	RUN 15				96.0 - 96.6 ft: Possible shear zone characterized by soft, yellow-brown clay and rock fragments, oriented approximately 60° to core axis. 99.0
207.2	99.0									207.2
		5.0	4:11 5:38 2:45 3:02 3:41	(4.9) 98%	(3.8) 76%	RUN 16	(54.5) 99%	(39.6) 72%		HARD ROCK: Light gray with pink and yellow staining, fresh, moderately close to wide fracturing, very hard, BIOTITE QUARTZ GNEISS (1 joint at 0-10°, tight; 4 joints at 30°, tight with iron staining and trace chlorite/clay; 1 joint at 60°, tight)

NORTH ANNA 3 CORE NORTH ANNA 3 PROJECT.GPJ NORTH ANNA 3.GDT 12/3/09



BECHTEL PROJECT NO.: 25161		MACTEC PROJECT NO.: 6468-09-2473		COUNTY: Louisa, VA		GEOLOGIST: R. Clark	
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GROUND ELEV.: 306.2 ft (NAVD88)		NORTHING: 3,909,853 US ft (NAD83)		EASTING: 11,685,959 US ft (NAD83)		24 HR. 37.3	
TOTAL DEPTH: 154.0 ft		SAMPLE METHODS: ASTM D 1586-08a; 2488-09a; 2113-08; 6032-08				HAMMER (ID): 140-lb. Auto (MEC-05)	
DATE STARTED: 10/19/09		COMPLETED: 10/21/09		CASING DEPTH: 74.0 ft		CORE BARREL TYPE: Wireline NQ3 Triple Tube, series 6 bit	

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
202.2	104.0	5.0	5:32 8:15 4:50 7:47 4:41	(4.9) 98%	(4.2) 84%	RUN 17				HARD ROCK: Light gray with pink and yellow staining, fresh, moderately close to wide fracturing, very hard, BIOTITE QUARTZ GNEISS (continued) (3 joints at 0-10°, tight; 4 joints at 60-70°, tight)
197.2	109.0	5.0	3:49 3:41 3:32 4:02 5:31	(4.9) 98%	(4.5) 90%	RUN 18				(2 joints at 30°, tight; 1 joint at 45°, tight; 1 joint at 65°, tight)
192.2	114.0	5.0	5:33 4:38 5:21 5:24 6:25	(5.0) 100%	(4.0) 80%	RUN 19				(4 joints at 10-20°, tight; 2 joints at 30°, tight)
187.2	119.0	5.0	1:58 1:52 2:05 2:11 2:14	(5.0) 100%	(5.0) 100%	RUN 20				(1 joint at 20°, tight)
182.2	124.0	5.0	2:25 2:33 2:42 2:45 2:51	(4.8) 96%	(4.7) 94%	RUN 21				(2 joints at 20°, tight; 2 joints at 45°, tight)
177.2	129.0	5.0	4:03 3:25 4:05 2:32 1:32	(5.0) 100%	(4.0) 80%	RUN 22				(4 joints at 10-20°, tight; 2 joints at 45°, tight; 0.1 ft thick quartz vein)
172.2	134.0	5.0	3:28 2:29 2:33 1:25 1:22	(5.0) 100%	(3.2) 64%	RUN 23				(3 joints at 10-20°, tight; 2 joints at 45°, tight; 3 joints at 60°, tight)
167.2	139.0	5.0	2:28 2:33 3:05 2:31 4:28	(5.0) 100%	(3.1) 62%	RUN 24				(8 joints at 30-45°, tight; 3 quartz veins 0.1 to 0.3 feet thick at 30-45°)
162.2	144.0	5.0	3:25 3:28 3:45 4:02 4:21	(5.0) 100%	(1.7) 34%	RUN 25				(13 joints at 10-20°, tight; 2 joints at 45°, tight; 2 joints at 60°, tight)
157.2	149.0	5.0	3:45 3:49 4:05 3:52 3:29	(5.0) 100%	(1.4) 28%	RUN 26				(13 joints at 10-20°, tight)
152.2	154.0								152.2	154.0 Boring and coring terminated at 154.0 feet. Boring closed by tremie method with cement-bentonite grout. 24 hour water level measured on 10/21/2009 prior to drilling. Borehole was at a depth of 104.0 feet.

NORTH ANNA 3 CORE NORTH ANNA 3 PROJECT.GPJ NORTH ANNA 3.GDT 12/3/09



W-1- Box 1



W-1- Box 2



W-1- Box 3



W-1- Box 4



W-1 - Box 5



W-1 - Box 6