MACTEC

GEOTECHNICAL BORING LOG

Prepared By JSJ Date 12/09/09
Checked By NAR Date 12/16/09

BECHTEL PROJECT NO.: 25161	MACTEC PROJECT NO.: 6468-09-2473	COUNTY: Louisa, VA	GEOLOGIST: B. Mabie
SITE DESCRIPTION: North Anna 3 Project Supplement 2		DRILLER: D. Rhodes/K. Guy	FLUID LEVEL (ft)
BORING NO.: M-28	DRILL METHOD: Mud Rotary/Rock Core	DRILL MACHINE: CME-45C Track (RAL)	0 HR. NA
GROUND ELEV.: 308.2 ft (NAVD88)	NORTHING: 3,909,636 US ft (NAD83)	EASTING: 11,685,672 US ft (NAD83)	24 HR. 24.5
TOTAL DEPTH: 150.0 ft	SAMPLE METHODS: ASTM D 1586-08a; 2488-09a; 2113-08; 6032-08	ROD TYPE: AWJ	HAMMER (ID):140-lb. Auto (MEC-12)
DATE STARTED: 9/10/09	COMPLETED: 9/13/09	HOLE DIA.: 3"	CASING DEPTH: 21.6 ft / CORE SIZE: NQ3 / BITS USED: 2-7/8" Tri-Cone

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
308.2					Ground Surface				308.2 / 0.0
									No sampling from 0.0 to 7.6 feet due to soft dig utility clearance by Dominion Personnel
300.6	7.6								300.6 / 7.6
		5	5	4	9	SS-1			299.1 / 9.1 RESIDUAL SOIL: Well Graded SAND (SW), yellowish brown (10YR 5/8), loose, wet, fine to coarse grained sand, trace of organic matter, relict rock fabric
298.1	10.1								
		6	12	18	30	SS-2			
295.4	12.8								RESIDUAL SOIL: Silty SAND (SM), brownish yellow (10YR 6/6), medium dense, moist, fine to coarse grained sand, trace mica, relict rock fabric
		15	19	25	44	SS-3			12.8 ft: Very pale brown (10YR 7/3), dense
292.6	15.6								15.6 ft: Very dense
		25	47	53/0.4	100/0.9	SS-4			
289.4	18.8								
		12	10	55	65	SS-5			287.2 / 21.0 21.0 ft: Hard drilling
284.4	23.8								285.2 / 23.0 WEATHERED ROCK: Severely weathered BIOTITE QUARTZ GNEISS - Not sampled
284.0	24.2	50/0.0			50/0.0	SS-6			284.0 / 24.2 23.0 ft: Very hard drilling
		50/0.0			50/0.0	SS-7			HARD ROCK and WEATHERED ROCK: BIOTITE QUARTZ GNEISS (SPT Refusal with no penetration)
									HARD ROCK and WEATHERED ROCK: Light gray to light brown, with orange staining, severely to moderately weathered, with slightly weathered zones, very close to moderately close fracturing, medium hard to moderately hard, BIOTITE QUARTZ GNEISS
									265.2 / 43.0
									HARD ROCK: Light gray with orange staining, slightly weathered to fresh, close fracturing, moderately hard to very hard, BIOTITE QUARTZ GNEISS

NORTH ANNA 3 BORE NORTH ANNA 3 PROJECT.GPJ NORTH ANNA 3.GDT 12/4/09

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BECHTEL PROJECT NO.: 25161	MACTEC PROJECT NO.: 6468-09-2473	COUNTY: Louisa, VA	GEOLOGIST: B. Mabie
SITE DESCRIPTION: North Anna 3 Project Supplement 2		DRILLER: D. Rhodes/K. Guy	FLUID LEVEL (ft)
BORING NO.: M-28	DRILL METHOD: Mud Rotary/Rock Core	DRILL MACHINE: CME-45C Track (RAL)	0 HR. NA
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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
233.4					Continued from previous page				
									233.2 — 75.0: HARD ROCK: Light to dark gray, moderately to slightly weathered, close fracturing, moderately hard, QUARTZ BIOTITE GNEISS
									223.2 — 85.0: HARD ROCK: Light gray to gray, with orange staining, moderately to slightly weathered, close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS
									203.2 — 105.0: HARD ROCK: Light gray to gray, with orange staining, moderately to slightly weathered, close to very close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS with zones of WEATHERED ROCK: BIOTITE QUARTZ GNEISS
									188.2 — 120.0: HARD ROCK: Gray with orange staining, moderately to very slightly weathered, close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS

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158.6					Continued from previous page				
									158.2 Boring and coring terminated at 150.0 feet. 150.0
									Boring closed by tremie method with cement-bentonite grout.
									24 hour water level measured on 9/13/2009 prior to drilling. Borehole was at a depth of 115.0 feet.

NORTH ANNA 3 BORE NORTH ANNA 3 PROJECT.GPJ NORTH ANNA 3.GDT 12/4/09

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DATE STARTED: 9/10/09	COMPLETED: 9/13/09	CASING DEPTH: 21.6 ft	CORE BARREL TYPE: Wireline NQ3 Triple Tube, series 6 bit

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 @ 24.2 ft
284.0	24.2	0.8	N=50/0.0	(0.8)	(0.8)	RUN 1	(10.6)	(6.9)		284.0 HARD ROCK and WEATHERED ROCK: Light gray to light brown, with orange staining, severely to moderately weathered, with slightly weathered zones, very close to moderately close fracturing, medium hard to moderately hard, BIOTITE QUARTZ GNEISS 24.2
283.2	25.0	5.0	1:49/0.8	100%	100%	RUN 2	56%	37%		(Several fractures at 80-90°, 1 joint at 70°, open)
			2:35	(1.9)	(1.6)					
			2:30	38%	32%					
			1:31							
			0:25							
278.2	30.0		1:08							
		5.0	1:46	(2.6)	(1.9)	RUN 3				(3 joints at 30-50°, tight; 1 joint at 80°, tight)
			2:32	52%	38%					
			2:08							
			2:02							
273.2	35.0		2:39							
		5.0	2:48	(3.4)	(1.8)	RUN 4				(Abundant open fractures 20-60° and 80-90°)
			2:06	68%	36%					
			1:58							
			2:15							
268.2	40.0		2:00							
		3.0	2:30	(1.9)	(0.8)	RUN 5				(Abundant open fractures 0-90°)
			2:39	63%	27%					
265.2	43.0		6:34							265.2 43.0
		2.0	2:43	(2.0)	(1.9)	RUN 6	(31.6)	(27.6)		HARD ROCK: Light gray with orange staining, slightly weathered to fresh, close fracturing, moderately hard to very hard, BIOTITE QUARTZ GNEISS
263.2	45.0		2:56	100%	95%		99%	86%		(2 joints at 20-30°, tight)
		5.0	3:02	(4.9)	(4.0)	RUN 7				(2 joints at 0°, tight; 5 joints at 20-50°, tight to open)
			2:57	98%	80%					
			3:04							
			3:07							
258.2	50.0		3:36							
		5.0	4:38	(4.8)	(4.7)	RUN 8				(4 joints at 20-60°, tight to open; vertical fractures at 80-90°)
			5:16	96%	94%					
			4:49							
			5:18							
253.2	55.0		5:23							
		5.0	3:46	(5.0)	(5.0)	RUN 9				(4 joints at 40-50°, tight; 1 joint at 70°, open)
			3:43	100%	100%					
			3:49							
			4:42							
248.2	60.0		5:32							
		5.0	5:17	(5.0)	(3.0)	RUN 10				(5 joints at 30-40°, open; 3 joints at 60-70°, open; 1 joint at 80-90°, open; all with orange staining)
			5:48	100%	60%					
			7:25							
			4:48							
243.2	65.0		6:32							
		5.0	4:13	(5.0)	(4.2)	RUN 11				(4 joints at 20-40°, open; 3 joints at 70-80°, tight)
			3:45	100%	84%					
			3:48							
			3:50							
238.2	70.0		4:39							
		4.0	4:06	(3.9)	(3.2)	RUN 12				(2 joints at 20-30°, open; 4 joints at 40-50°, open; 1 joint at 80°, open; all with orange staining)
			3:09	98%	80%					
			3:34							
234.2	74.0		3:38							
233.2	75.0	1.0	3:26	(1.0)	(0.8)	RUN 13				233.2 (1 joint at 80°, open with trace clay and orange staining) 75.0
		5.0	2:50	100%	80%	RUN 14	(9.0)	(8.4)		(5 joints at 30-40°, tight to open)
			2:40	(4.0)	(3.6)		90%	84%		HARD ROCK: Light to dark gray, moderately to slightly weathered, close fracturing, moderately hard, QUARTZ BIOTITE GNEISS
			2:37	80%	72%					
			2:07							
228.2	80.0		2:24							
		5.0	2:31	(5.0)	(4.8)	RUN 15				(7 joints at 20-50°, tight to open; 1 joint at 90°, open with trace clay)
			1:48	100%	96%					
			2:04							
			2:21							
223.2	85.0		2:16							223.2 85.0
		5.0	2:33	(4.6)	(4.0)	RUN 16	(18.2)	(15.2)		HARD ROCK: Light gray to gray, with orange staining, moderately to slightly weathered, close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS
			2:54	92%	80%		91%	76%		(4 joints at 70-80°, tight to open)
			3:26							
			2:08							
218.2	90.0		2:33							
		3.0	2:46	(2.9)	(2.1)	RUN 17				(Abundant high angle fractures at 70-90°)
			2:23	97%	70%					Recovered 0.3 ft of RUN 17 with RUN 18
215.2	93.0		3:18							
		2.0	3:06	(2.0)	(2.0)	RUN 18				(1 joint at 90°, tight)
213.2	95.0		3:20	100%	100%					Recovered 0.3 ft of RUN 18 with RUN 19
		5.0	3:17	(5.0)	(4.3)	RUN 19				(10 joints at 50-60°, tight to open)
			2:57	100%	86%					Recovered 0.3 ft of RUN 18 with RUN 19
			2:50							
			3:12							

NORTH ANNA 3 CORE NORTH ANNA 3 PROJECT.GPJ NORTH ANNA 3.GDT 12/16/09

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TOTAL DEPTH: 150.0 ft	SAMPLE METHODS: ASTM D 1586-08a; 2488-09a; 2113-08; 6032-08		HAMMER (ID): 140-lb. Auto (MEC-12)
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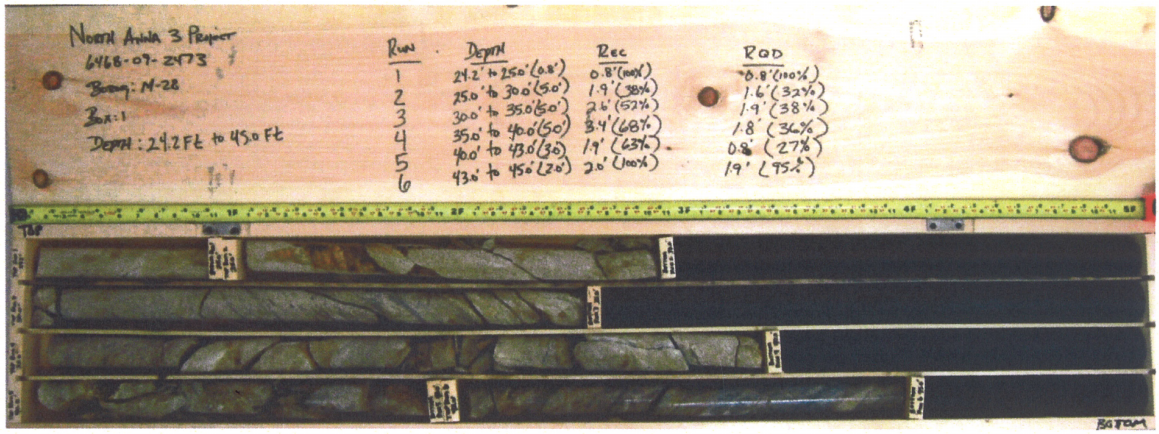
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
										Continued from previous page
208.2	100.0		2:37							HARD ROCK: Light gray to gray, with orange staining, moderately to slightly weathered, close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS *(continued)*
		5.0	2:27	(3.7)	(2.8)	RUN 20				(6 joints at 50-60°, open)
			2:33	74%	56%					
			2:11							
			1:49							
203.2	105.0		2:03							203.2 — 105.0
		4.6	3:23	(2.2)	(1.0)	RUN 21	(7.6)	(3.6)		HARD ROCK: Light gray to gray, with orange staining, moderately to slightly weathered, close to very close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS with zones of WEATHERED ROCK: BIOTITE QUARTZ GNEISS
			2:40	48%	22%		51%	24%		
			2:35							
			1:48							
198.6	109.6		3:26/0.6							
198.2	110.0	0.4	1:12/0.4	(0.1)	(0.0)	RUN 22				(4 joints at 30-50°, open with trace clay)
		5.0	2:15	25%	0%	RUN 23				(6 joints at 30-50°, open)
			1:52	(1.3)	(0.4)					
			2:33	26%	8%					
			3:41							
193.2	115.0		4:16							
		4.0	3:46	(3.5)	(2.2)	RUN 24				(6 joints at 40-50°, tight top open with orange staining and clay; 2 joints at 60°, open with trace clay and orange and brown staining)
			3:01	88%	55%					
			2:37							
189.2	119.0		3:30							
188.2	120.0	1.0	3:03	(0.5)	(0.0)	RUN 25				188.2 — (1 joint at 50°, open with trace orange staining) — 120.0
		5.0	2:20	50%	0%	RUN 26	(29.1)	(26.8)		HARD ROCK: Gray with orange staining, moderately to very slightly weathered, close fracturing, moderately hard to hard, BIOTITE QUARTZ GNEISS
			2:55	(4.3)	(3.3)		97%	89%		(3 joints at 10-20°, open with trace clay and orange staining; 3 joints at 50-60°, tight to open with clay and orange staining)
			3:21	86%	66%					
			3:17							
183.2	125.0		3:12							
		5.0	2:57	(4.8)	(4.5)	RUN 27				(3 joints at 10-20°, tight with trace orange staining; 3 joints at40-50°, tight to open with orange staining; 3 joints at 60-70°, tight to open with trace orange staining)
			2:41	96%	90%					
			2:47							
			2:45							
178.2	130.0		3:23							
		5.0	2:51	(5.0)	(4.8)	RUN 28				(7 joints at 40-50°, tight to open with trace orange staining)
			3:07	100%	96%					
			3:17							
			4:12							
173.2	135.0		3:03							
		5.0	3:25	(5.0)	(4.7)	RUN 29				(4 joints at 30-40°, tight to open with orange staining; 2 joints at 60-70°, open to tight with trace clay and brown staining)
			3:14	100%	94%					
			3:23							
			3:18							
168.2	140.0		3:23							
		5.0	3:06	(5.0)	(4.6)	RUN 30				(5 joints at 20-30°, tight to open with orange staining; 1 joint at 80°, open)
			2:56	100%	92%					
			2:53							
			2:48							
163.2	145.0		2:45							
		5.0	3:03	(5.0)	(4.9)	RUN 31				(4 joints at 30-40°, tight to open; 2 joints at 80°, tight with trace clay)
			2:26	100%	98%					
			3:00							
			2:49							
158.2	150.0		3:02							158.2 — 150.0

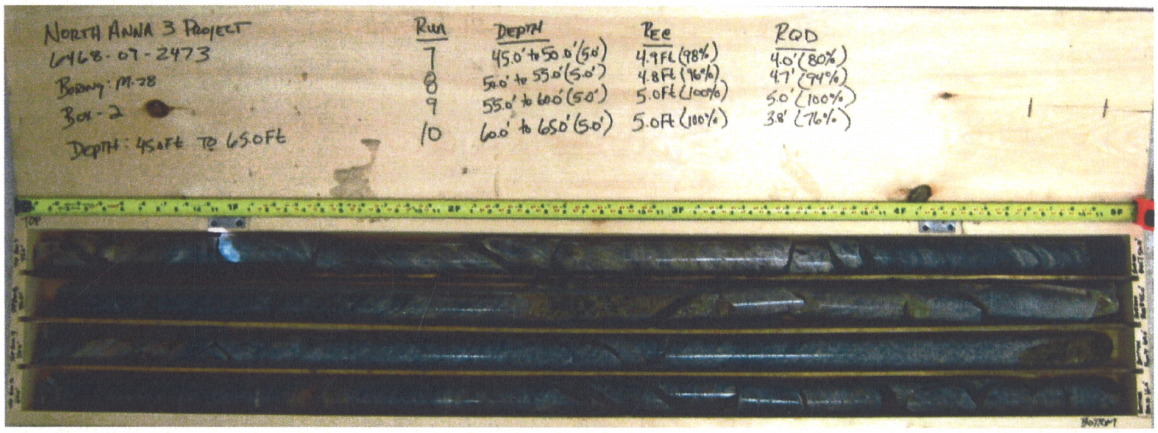
Boring and coring terminated at 150.0 feet.

Boring closed by tremie method with cement-bentonite grout.

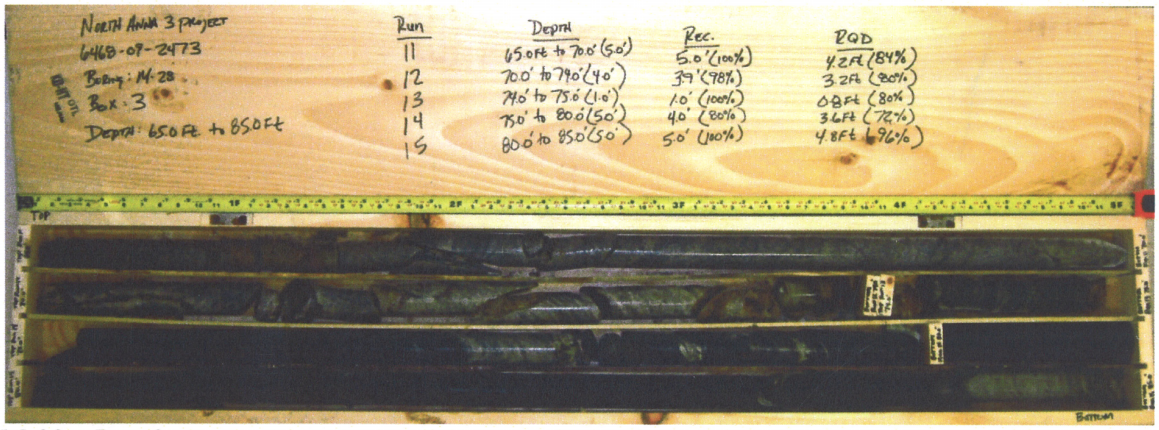
24 hour water level measured on 9/13/2009 prior to drilling. Borehole was at a depth of 115.0 feet.



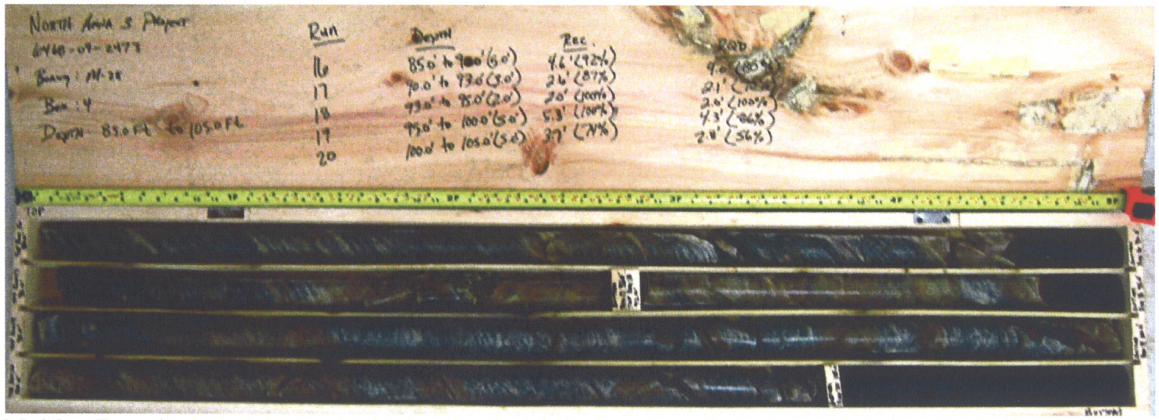
M-28 – Box 1



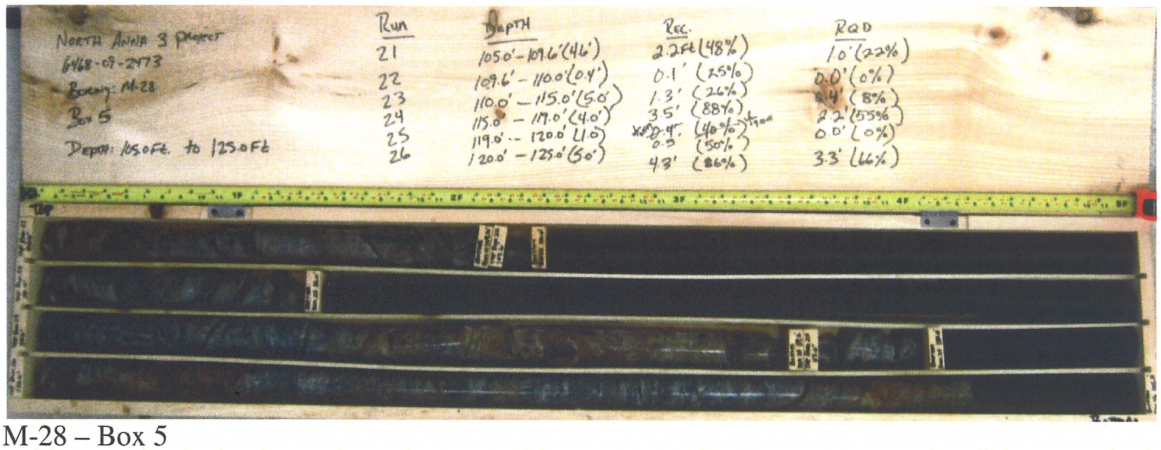
M-28 – Box 2



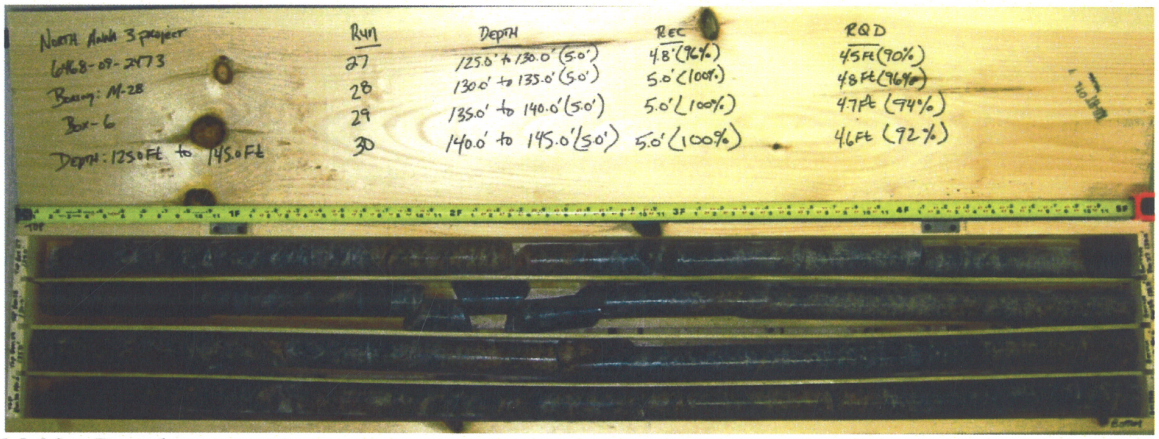
M-28 – Box 3



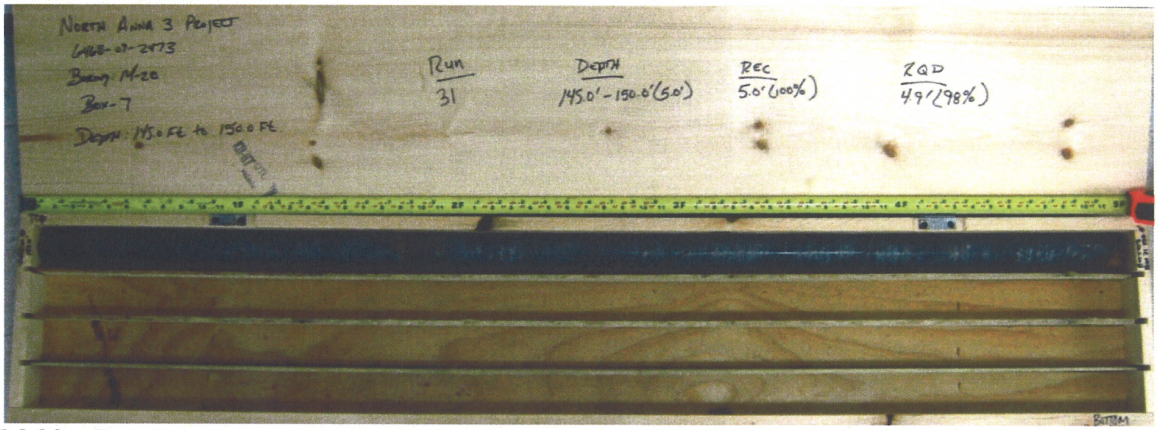
M-28 – Box 4



M-28 – Box 5



M-28 – Box 6



M-28 – Box 7