CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
338884.FL	GSC-11	SHEET 1 OF 10

SOIL BORING LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

DRILLING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, auto hammer, AWJ rods, 3-7/8" drag bit ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	SAMPLE INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
42.9							Begin drilling at 15:00
							24" split spoon
	3.5						
	5.0	0.8	SS-1	1-2-1 (3)	**Silty Sand (SM)** 3.5-4.25' - grayish orange, (10YR 7/4), wet, very loose, 20% nonplastic fines, fine gravel fragment, non-calcareous, very fine grained to cemented silt, silica sand		
5 37.9							
	8.5						
	10.0	1.1	SS-2	1-1-3 (4)	**Poorly Graded Sand With Organics (SP)** 8.5-9.6' - dusky yellowish brown, (10YR 2/2), wet, very loose, 15-20% fine organics, fine silica sand		
10 32.9							
	13.5						
	15.0	1.1	SS-3	5-6-8 (14)	**Silty Sand (SM)** 13.5-14.6' - pale yellowish brown, (10YR 6/2), wet, medium dense, 20-25% nonplastic fines, trace very fine sand-sized black particles, fine silica sand		SS-3 taken at 15:12
15 27.9							
	18.5						
	20.0	1.5	SS-4	7-10-9 (19)			SS-4 taken at 15:11
20							

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PROJECT NUMBER:	BORING NUMBER:	
338884.FL	GSC-11	SHEET 2 OF 10

SOIL BORING LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

DRILLING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, auto hammer, AWJ rods, 3-7/8" drag bit ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	SAMPLE INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
22.9					**Silty Sand (SM)** 18.5-20.0' - medium dark gray mottled with pale yellowish brown, (N4 with 10YR 6/2), wet, medium dense, trace fine sand-sized black particles, 15-20% nonplastic fines, fine silica sand		
	23.5						
	25.0	1.5	SS-5	5-5-5 (10)	**Silty Sand (SM)** 23.5-25.0' - pale yellowish brown, (10YR 6/2), wet, loose, 20-25% nonplastic fines, trace very fine sand-sized black particles, fine silica sand		SS-5 taken at 15:25
25							
17.9							
	28.5						
	30.0	1.5	SS-6	6-5-3 (8)	**Silty Sand (SM)** 28.5-30.0' - Same as 23.5-25.0' except trace black laminae		SS-6 taken at 15:43
30							
12.9							
	33.5						
	35.0	1.5	SS-7	3-2-2 (4)	**Silty Sand (SM)** 33.5-35.0' - pale yellowish brown, (10YR 6/2), wet, very loose, 20% nonplastic fines, fine silica sand, trace fine black particles		SS-7 taken at 15:49
35							
7.9							
	38.5						
	40.0	1.5	SS-8	4-5-3 (8)	**Silty Sand (SM)** 38.5-40.0' - Same as 33.5-35.0' except loose		SS-8 taken at 15:54
40							

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PROJECT NUMBER:	BORING NUMBER:	
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SOIL BORING LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

DRILLING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, auto hammer, AWJ rods, 3-7/8" drag bit ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	SAMPLE INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
2.9							
	43.5						
	45.0	1.0	SS-9	6-6-8 (14)	**Clayey Sand (SC)** 43.5-44.5' - light bluish gray to light gray mottled with yellowish gray, (5B 7/1 to N7 with 5Y 8/1), wet, medium dense, 35-40% high plastic fines, trace fine black particles, very fine to fine silica sand		SS-9 taken at 16:01
45 -2.1							
	48.5						
	50.0	1.3	SS-10	2-2-3 (5)	**Silty Sand (SM)** 48.5-49.0' - pale yellowish brown, (10YR 6/2), wet, very loose, 30% low plastic fines, very fine to fine silica sand		SS-10 taken at 16:09
50 -7.1					**Clayey Sand (SC)** 49.0-49.75' - dark gray, (N3), wet, loose, 30-35% medium plastic fines, very fine to fine silica sand		
	53.5						Driller's Remark: 16:15 - 52.5' light rig chatter of drag bit
	55.0	1.3	SS-11	8-13-11 (24)	**Silty Gravel With Sand (GM)** 53.5-54.8' - medium dark gray, (N4), wet, medium dense, no HCl reaction, fine to coarse angular gravel, appears to be calcite cemented, fine silica sands, 10-15% nonplastic fines, 20% very fine to fine silica sand		S-11 taken at 16:19
55 -12.1							Driller's Remark: 16:27 switch to 3-7/8" tricone roller bit to continue drilling
	58.5						
	60.0	1.5	SS-12	3-2-3 (5)			SS-12 taken at 16:35
60							

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PROJECT NUMBER:	BORING NUMBER:	
338884.FL	GSC-11	SHEET 4 OF 10

SOIL BORING LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

DRILLING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, auto hammer, AWJ rods, 3-7/8" drag bit ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	SAMPLE INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
-17.1					**Silty Sand (SM)** 58.5-60.0' - grayish black to black, (N2 to N1), wet, loose, 15-20% low plastic fines, organic soil (OH) lenses 9/16" thick (black [N1] high plasticity, slow dilatancy), very fine to fine silica sands		
	63.5						
	65.0	1.3	SS-13	2-2-2 (4)	**Interbedded Silty Sand And Organic Soil (SM-OH)** 63.5-64.8' - Same as 58.5-60' except 80% silty sand and 20% organics		
65							
-22.1							End drilling for 2/07/07 at 17:12 at 65.0' below ground surface
	68.5						Start drilling on 2/8/07 at 08:30
	70.0	1.5	SS-14	8-18-35 (53)	**Organic Soil (OH)** 68.5-69.0' - brownish black, (5YR 2/1), wet, stiff, medium plasticity, slow dilatancy, laminated in sharp contact with silt below		Driller's Remark: slightly firmer, but no chatter
70					**Silt (ML)** 69.0-70.0' - grayish orange, (10YR 7/4), wet, hard, nonplastic to low plasticity, moderate HCl reaction, laminated over entire interval with black organic beds (up to 1/16" thick), carbonate		
-27.1							
	73.5						
	75.0	1.5	SS-15	28-26-42 (68)	**Silt (ML)** 73.5-75.0' - Same as 69.0-70.0' except yellowish gray, (5Y 7/2), wet, hard, low plasticity, rapid dilatancy, mild HCl reaction, 5-10% thinly bedded (3/16"-1-3/16"), black (N1) organic layers, trace fine black (N1) organic particles in silt, carbonate		SS-15 taken at 08:55
75							
-32.1							
	78.5						
	79.3	0.8	SS-16	24-50/3 (74/9")			SS-16 taken at 09:13
80							

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PROJECT NUMBER:	BORING NUMBER:	
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SOIL BORING LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

DRILLING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, auto hammer, AWJ rods, 3-7/8" drag bit ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	SAMPLE INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
-37.1					**Silty Sand With Limestone (SM)** 78.5-79.3' - yellowish gray, (5Y 7/2), wet, very dense, mild HCl reaction, fine to coarse sand-sized, 25% low plastic fines, 25% fine to coarse gravel-sized limestone fragments, 5% organics, carbonate		
	83.5 83.7	0.0	SS-17	50/2 (50/2")	**Limestone Fragments** 83.5-83.7' - moderate yellowish brown, (10YR 5/4), mild to moderate HCl reaction, two 1/4" thick limestone fragments recovered		SS-17 taken at 09:33 Driller's Remark: Advised driller to begin coring, will use HQ coring assembly 09:44 begin setting casing using 'devils head' bit for 4" casing Resume drilling at 16:40
85 -42.1	85.0				**No Recovery 85.0-90.0'**		
		0.0	R1-HQ				R1: No run time recorded
	90.0 90.2	0.2	SS-18	50/2 (50/2")	**Limestone Fragments** 90.0-90.2' - yellowish gray to moderate yellow, (5Y 7/2 to 5Y 7/6), mild HCl reaction		SS-18 taken at 16:45
90 -47.1					Begin Rock Coring at 90.0 ft bgs See the next sheet for the rock core log		
95 -52.1							
100							

PROJECT NUMBER:	BORING NUMBER:	
338884.FL	GSC-11	SHEET 6 OF 11

ROCK CORE LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

CORING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, HQ/NQ tools, HW casing ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
-47.1	90.0		>10			**Limestone And Limestone Fragments** 90.0-91.0' - dusky yellow to light olive gray, (5Y 6/4 to 5Y 5/2), medium grained, weak to medium strong (R2 to R3), 40-50% voids (<1/16") over surface up to 1/16", unfilled dissolution cavities up to 3/8", highly competent, up to 15% black (N1) organic laminations and coarse-sized particles, limestone gravel is the same as the larger (2-1/2") fragments, strong HCl reaction on pulverized fragments **No Recovery 91.0-95.0'**	Start drilling R2-HQ with core barrel at 18:00 Driller will flush hole, then attempt to core again, the next core run will be R2-HQ The order of samples is as follows: SS-17, R1-HQ, SS-18, R2-HQ Driller's Remark: Very little, if any circulation loss R2:3 minutes 18:15, last run of 2/8/07
	R2-HQ 5 ft 20%	0	NR				
95	95.0						
-52.1			>10			**Limestone** 95.0-95.7' - yellowish gray to light olive gray, (5Y 7/2 to 5Y 5/2), fine grained, weak to medium strong (R2 to R3), strong HCl reaction where pulverized, voids up to 1/16" over 50-70% of surface, strongly competent, fossiliferous (casts, molds up to 10%), trace medium grained black organics with moderate HCl reaction **No Recovery 95.7-99.0'**	Start coring with NQ assembly at 15:50 on 2/9/07 Driller's Remark: Hard drilling over 95.0-96.0' interval Recovery for R3-NQ is only limestone core fragments from 1-1/2"-2-1/2", last core run of 2/9/07, end drilling for 2/9/07 at 16:45 R3:15 minutes
	R3-NQ 4 ft 18%	0	NR				
	99.0						
			>10			**Limestone** 99.0-100.0' - yellowish gray to light olive gray, (5Y 7/2 to 5Y 5/2), moderate HCl reaction, weak to medium strong (R2 to R3), 20-30% voids up to 1/16" over surface, trace dissolution cavities up to 3/16" on surface, fragments up to 3-1/2", mostly fine to coarse gravel-sized fragments, trace organic (black) fragments as medium grained and 1/16"-sized laminations **No Recovery 100.0-104.0'**	Start coring R4-NQ at 09:05 on 2/10/07 Initial recovery from R4-NQ sample barrel is one 1" core fragment, recovery from NQ drill bit and casing is two larger fragments of core and gravel-sized pieces of limestone Driller's Remark: Switch of drill bit to NQ wireline bit Driller's Remark: It was discovered that a conventional NQ drill bit had been in use for the previous runs R4:10 minutes
100							
-57.1	R4-NQ 5 ft 20%	0	NR				
	104.0						
			1	104.5' - Fracture or bedding plane, horizontal, rough, undulating, tight		104.0-105.5' - yellowish gray to light olive gray, mottled slightly darker, (5Y 7/2 to 5Y 5/2), medium grained, strong HCl reaction, weak to medium strong (R2 to R3), highly competent rock, voids up to 1/8" over 25-35% of surface, few increasing with depth, many dissolution cavities up to 3/8"x3/4", oval-shaped, filled cavities with a very pale orange (10YR 8/2) filling, fossiliferous (moderately) molds and casts, trace organics as medium grained black particles **No Recovery 105.5-108.3'**	
105							
-62.1			1	104.85, 105.0' - Mechanical break (2)			
	R5-NQ 5 ft 40%	28	NR	105.5' - Fracture, 30 deg, rough, undulating, dissolution cavities on the surface			Driller's Remark: Soft zone at 107.0' for 1.0-1.5' R5:11 minutes
	109.0		3	108.3' - Fracture, 20 deg, rough, undulating, open, assumed not a mechanical break			
			1	108.45' - Fracture, horizontal, rough, undulating			
110				108.5' - Fracture, 20 deg, rough, undulating			

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ROCK CORE LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

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CORING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, HQ/NQ tools, HW casing ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
-67.1			>10	109.15' - Fracture, horizontal, smooth, undulating, open 1/2"		**Limestone**	
	R6-NQ 5 ft 82%	56	>10	110.0-110.3' - Fracture zone, vertical and horizontal, tight 110.55' - Fracture, <5 deg, rough, undulating, tight		109.0-113.1' - Same as 104.0-109.0' except many dissolution cavities 1/8"x3/8", 15% voids <1/16" over surface, light olive color (5Y 5/2) transitions to dusky yellow gray (5Y 6/4) mottled with light olive gray (5Y 5/2)	Driller's Remark: Loose drilling at 111.0'
			1	111.0-111.4' - Fracture zone, rock fragments 111.9' - Fracture, 20 deg, black stain, tight			
			NR	112.85' - Fracture, 10 deg, smooth, undulating, no infill, black staining		**No Recovery 113.1-114.0'**	R6:4 minutes
	114.0						
			3			**Limestone**	
115				114.5' - Mechanical break, horizontal, smooth, undulating, tight		114.0-119.0' - mottled pale yellowish orange and light olive gray, (10YR 8/6 and 5Y 5/2), fine to medium grained, moderate HCl reaction, weak to medium strong (R2 to R3), strongly cemented, 40-50% voids up to 1/16" over rock surface, poorly fossiliferous (casts), <1% fine to medium grained black particles	
-72.1			>10	114.6' - Fracture, <5 deg, smooth, undulating, black staining, open 1/2"			
	R7-NQ 5 ft 100%	30	3	114.8' - Fracture, 40 deg, rough, undulating, no staining, open, top of fractured zone at 114.8-115.7'			
			4	116.0' - Mechanical break, horizontal, rough, undulating, tight 116.2' - Fracture, vertical, rough, undulating, black staining, open			
			1	116.55' - Fracture, <5 deg, rough, undulating, stains over 1/4"			R7:6 minutes
	119.0						
			1	116.8' - Mechanical break, horizontal, smooth, planar, open 1/8"		119.0-121.4' - mottled pale yellowish orange and medium gray and light olive gray, (10YR 8/6 and N5 and 5Y 5/2), fine to medium grained, weak to medium strong (R2 to R3), strong HCl reaction on light colored areas, moderate HCl reaction on darker colored areas, strongly competent, 20-30% voids 1/16"x1/16", 5-10% dissolution cavities 1/8"x1/16", poorly to moderately fossiliferous, casts, 1" section at top is moderate olive brown (5Y 4/4) and moderately to highly fossiliferous (casts)	
120				117.0, 117.25, 117.45' - Mechanical break (3)			
-77.1				117.85' - Fracture, 70 deg, rough, undulating			
			>10	118.1' - Fracture, horizontal, smooth, undulating, open 118.2' - Fracture, <5 deg, rough, undulating, open 3/8"			
	R8-NQ 5 ft 48%	20		118.6-118.7' - Fracture zone or mechanical break			Driller's Remark: 121.0-122.5' soft
			NR	119.1' - Mechanical break, along bedding plane from drilling 119.5, 119.6' - Fracture (2), horizontal, rough, undulating, open			Driller's Remark: Slightly harder drilling at 122.5'
				119.9' - Fracture, horizontal, rough, planar, open			R8:6 minutes Driller's Remark: 123.5' slipped down
	124.0					**No Recovery 121.4-124.0'**	Started R9-NQ at 14:27
			>10	120.05-121.0' - Fracture zone, rough, undulating, open		**Limestone**	
125				124.0-124.6' - Fracture zone		124.0-124.6' - yellowish gray, (5Y 7/2), medium grained, strong HCl reaction, very weak (R1), weakly to moderately competent, voids (<1/16") over 75% of surface, 40% fine to medium grained black (N1) particles	
-82.1			1	124.6' - Mechanical break, horizontal 125.1' - Fracture, <5 deg, rough, undulating, open			Driller's Remark: Soft at 124.0-127.0'
	R9-NQ 5 ft 48%	31	3	126.15' - Bedding plane, rough, stepped, open 1/4"		124.6-126.4' - light olive brown and moderate olive brown, (5Y 5/6 and 5Y 4/4), fine grained, moderate HCl reaction, weak to medium strong (R2 to R3), moderately to highly fossiliferous (many casts, trace molds), white crystal as partial infill in cavities (with mild to moderate HCl reaction)	
			NR	126.25' - Fracture, horizontal, rough, undulating, open 1/4" 126.4' - Fracture, horizontal, rough, undulating, open			R9:3 minutes
	129.0						
			>10	129.0-130.8' - Fracture zone		**No Recovery 126.4-129.0'**	
130							

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ROCK CORE LOG

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ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

CORING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, HQ/NQ tools, HW casing ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
-87.1			>10			**Limestone** 129.0-132.7' - Same as 124.6-126.4'	Consistent medium drilling
	R10-NQ 5 ft 74%	26	0	130.8' - Fracture, horizontal, rough, undulating, tight 131.0' - Fracture, 60 deg, rough, undulating, tight			
			0	131.65' - Fracture, 40 deg, rough, undulating, tight			R10:4 minutes
			NR	132.3' - Fracture, <5 deg, rough, undulating, open, fractured from 132.3-132.7'		**No Recovery 132.72-134.0'**	
	134.0						
			1	134.1' - Fracture, <5 deg, rough, undulating, open 1-1/2"		**Limestone** 134.0-137.3' - Same as 124.6-126.4' except 25% oblong-shaped dissolution cavities (up to 1/4"x1/8"), stronger rock at 135.0-135.5' and 136.3-137.3'	
135 -92.1			>10	135.0' - Fracture, horizontal, rough, undulating, open			
	R11-NQ 5 ft 66%	30	>10	135.0-135.4' - Mechanical break 136.15' - Fracture, <5 deg, rough, undulating, top of fractured zone 136.15-136.8',			
			0	mechanical breaks to 1-1/2" fragments 136.8' - Mechanical break, horizontal		**No Recovery 137.3-139.0'**	Driller's Remark: Soft at 137.0-138.0'
			NR	136.9' - Mechanical break 137.05' - Fracture, vertical, slickensided, stepped			R11:4 minutes
	139.0			137.3' - Fracture, <5 deg, rough, undulating, open			
			>10	139.25' - Bedding plane, horizontal, rough, planar, open 1/8", top of fractured zone of		**Limestone** 139.0-139.9' - dusky yellow to light olive gray, (5Y 6/4 to 5Y 5/2), fine grained, mild to moderate HCl reaction, medium strong (R3), trace bedding, voids <1/16" over 10-15% surface on stronger intervals, up to 45% on more friable intervals, 10-15% black possible organics	
140 -97.1			1	more friable material, 139.25-139.9'			Driller's Remark: Very soft from 141.5-143.5'
	R12-NQ 5 ft 30%	0		mechanical breaks 139.25, 139.9' - Mechanical break (2) 140.1' - Fracture, 50 deg, smooth, undulating 140.3' - Fracture, <5 deg, rough, undulating			
			NR			139.9-140.5' - very pale orange mottled medium gray, (10YR 8/2 mottled N5), very fine grained, strong HCl reaction, weak to medium strong (R2 to R3), bioturbated, moderately to highly fossiliferous (mostly casts, many molds) up to 1-3/8"	R12:3 minutes
	144.0					**No Recovery 140.5-144.0'**	Start R13-NQ at 16:09, ended at 16:14
			3	144.4' - Fracture, 10 deg, rough, undulating, open		**Limestone**	
145 -102.1			>10	144.6, 144.9' - Fracture (2), <5 deg, rough, undulating, open		144.0-146.2' - Same as 139.9-140.5' except less mottling, highly bioturbated, trace very fine to fine organic particles in bioturbated zones	Driller's Remark: 146.5-147.5' were alternating soft to medium drilling
	R13-NQ 5 ft 86%	40	4	145.2, 145.4' - Fracture (2), horizontal, rough, undulating, open 1/4" 145.6' - Fracture, <5 deg, grayish brown (5YR 3/2) stain, tight, 1/8"		146.2-148.3' - yellowish gray, (5Y 7/2), very fine grained, strong HCl reaction, weak to medium strong (R2 to R3), laminated light olive gray (5Y 5/2), bioturbated zone at 147.2' (1/2" thick) with voids <1/16"	
			2	145.75-146.2' - Fracture zone, limestone gravel up to 1"x1/2" 146.2' - Mechanical break, tight			Driller's Remark: Hard at 147.5'
			2	146.4' - Bedding plane, horizontal, smooth, undulating, organic infill, tight			R13:5 minutes
	149.0		NR	146.65, 146.8' - Mechanical break (2)		**No Recovery 148.3-149.0'**	
			>10	147.1, 147.35' - Fracture (2), horizontal, smooth, planar, open 1/2"		**Limestone** 149.0-149.5' - Same as 146.2-148.3'	
150							

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ROCK CORE LOG

PROJECT : Progress Energy Florida - COLA Investigation, Levy County Site LOCATION : 1722723.7 N, 457915.1 E (NAD83)

ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

CORING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, HQ/NQ tools, HW casing ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION — DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	SYMBOLIC LOG	LITHOLOGY — ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	COMMENTS — SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.
-107.1			3	148.3' - Fracture, horizontal, rough, undulating, open		**Limestone**	Measured depth of water at 1.7' below ground surface on 2/11/07 at 08:30
	R14-NQ 5 ft 86%	37	5	149.0-149.35' - Fracture zone, limestone gravel-sized fragments to 3/4"x1" 149.35' - Fracture, horizontal, rough, undulating, open		149.5-151.9' - light olive brown to light olive gray, (5Y 5/6 to 5Y 5/2), fine grained, moderate HCl reaction, weak to medium strong (R2 to R3), poorly fossiliferous (casts), trace voids up to 1/8"	
			0	149.5' - Fracture, horizontal, rough, undulating, open 3/16"		151.9-153.3' - Same as 146.2-148.3'	
			1	149.75' - Fracture, horizontal, rough, undulating, tight			R14:7 minutes
	154.0		NR	149.9' - Fracture, horizontal, rough, undulating, open, top of fracture zone		**No Recovery 153.3-154.0'**	
			1	149.9-150.2' - Fracture zone, rock fragments to 1"x 1"		**Limestone**	
155 -112.1			1	150.2' - Fracture, horizontal, rough, undulating, tight to open 1/8"		154.0-157.2' - moderate yellow to dusky yellow, (5Y 7/6 to 5Y 6/4), fine to medium grained, strong HCl reaction, weak to medium strong (R2 to R3), ripple laminated in light olive gray (5Y 5/2), alternating parallel intervals of bioturbation, voids up to 1/16" over 5-10% of surface	
	R15-NQ 5 ft 76%	18	1	150.3, 150.35, 150.72, 151.0, 151.25, 151.6, 151.75, 151.9' - Fractures (8), horizontal, rough, undulating, tight			
			2	153.3' - Fracture, horizontal, rough, undulating		157.2-157.8' - olive gray, (5Y 3/2), medium grained, moderate HCl reaction, weak to medium strong (R2 to R3), voids <1/16" on 50-70% of surface, trace dusky yellow (5Y 6/4) discoloration	
			NR	154.5' - Fracture, horizontal, rough, planar, tight 154.6-155.1' - Fracture zone 155.5' - Fracture, 80 deg, slickensided, stepped, brown staining, tight			R15:5 minutes
	159.0			156.85, 157.0, 157.6' - Fractures (3), horizontal, rough, undulating, open		**No Recovery 157.8-159.0'**	
			2	159.4, 159.5' - Fractures (2), rough, undulating, open 1/8"		**Limestone**	
160 -117.1			1			159.0-162.5' - dusky yellow to moderate olive brown, (5Y 6/4 to 5Y 4/4), fine to medium grained, moderate to strong HCl reaction, weak to medium strong (R2 to R3), voids (<1/16") over 30-40% of surface, dissolution cavities up to 3/8"x3/4" on 5% of surface, white mineral infill, some cavities	
	R16-NQ 5 ft 92%	56	7	160.9, 161.0, 161.1' - Bedding plane (3), <5 deg, rough, undulating, tight			
			5	161.2, 161.3' - Fracture or mechanical break (2), horizontal, rough, undulating, tight 161.5, 161.6, 161.7, 162.0, 162.1, 162.2' - Bedding plane (4), horizontal, rough, planar, tight			
			0	162.6' - Bedding plane, horizontal, rough, undulating		162.5-163.6' - very pale orange and mottled medium light gray, (10YR 8/2 and N6), strong HCl reaction, weak to medium strong (R2 to R3), highly fossiliferous (very small <1/16" molds/casts)	R16: No run time recorded
	164.0		NR	162.7, 163.0' - Mechanical break (2)		**No Recovery 163.6-164.0'**	
165 -122.1	R17-HQ 2 ft 0%	0	NR	163.45' - Fracture, horizontal, rough, undulating, tight, open 1/8"		**No Recovery 164.0-166.0'**	Driller's Remark: Driller switch to HQ core assembly and used a 2.0' stake on core run
	166.0						R17:1 minute
			2			**Limestone**	
			>10	166.65' - Bedding plane, horizontal, rough, undulating, open		166.0-166.9' - moderate olive brown and light olive gray, (5Y 4/4 and 5Y 6/1), fine grained, strong HCl reaction, strong (R4), 30-40% medium grained medium gray (N5) particles, poorly fossiliferous (few casts), laminations at 166.0'	
	R18-HQ 5 ft 70%	16	>10	166.9' - Bedding plane, horizontal, smooth, planar, open 166.9-171.0' - Mechanical break, horizontal, smooth, planar, highly competent limestone intervals, related to drilling			
			>10				
170							

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ROCK CORE LOG

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ELEVATION : 42.9 ft (NAVD88) DRILLING CONTRACTOR : Universal Engineering Sciences, Orlando, FL; Driller: D. Patten

CORING METHOD AND EQUIPMENT : CME 550X S/N 340253, mud rotary, HQ/NQ tools, HW casing ORIENTATION : Vertical

WATER LEVELS : 1.7 ft bgs on 2/11/07 START : 2/7/2007 END : 2/12/2007 LOGGER : T. Stewart, C. Sump

DEPTH BELOW SURFACE AND ELEVATION (ft)	CORE RUN, LENGTH, AND RECOVERY (%)	DISCONTINUITIES: R Q D (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DESCRIPTION (DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS)	SYMBOLIC LOG	LITHOLOGY (ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS)	COMMENTS (SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.)
-127.1			NR			**Limestone** 166.9-169.5' - moderate olive brown, (5Y 4/4), medium to coarse grained, strong HCl reaction, weak (R2), 5-10% powder white mineral infill in voids and cavities, 166.9-167.2' and 167.6-168.0' is olive gray (5Y 6/1), fine matrix, microlaminated **No Recovery 169.5-171.0'** **Limestone** 171.0-171.9' - yellowish gray, (5Y 7/2), medium to coarse grained, strong HCl reaction, weak to medium strong (R2 to R3), 10-20% dissolution cavities up to 9/16"x3/8", up to 35% medium gray (N5) coarse-sized grains, poorly fossiliferous (trace casts), sharp contact 171.9-176.0' - yellowish gray, (5Y 7/2), fine to medium grained, moderate HCl reaction, weak to medium strong (R2 to R3), very poorly fossiliferous (trace casts), fine bedding laminations (1/16"x3/16") visible on fresh broken face 176.0-180.8' - Same as 171.9-176.0' except rippled laminations are visible over 179.0-180.5'	R18: No run time recorded
	171.0						
	R19-HQ 5 ft 100%	56	1	171.7' - Mechanical break, horizontal, undulating, 1/4" x 5/16" relief, fossil molds exposed on surface			
			3	172.2' - Fracture, horizontal, smooth, undulating			
			2	172.4' - Fracture or mechanical break, <5 deg			
			2	172.5, 172.9, 173.6' - Bedding plane (3), horizontal, rough, undulating, open 3/16"			
175							
-132.1			2	174.1' - Mechanical break or fracture, 70 deg, rough, undulating			R19:8 minutes
	176.0			175.1' - Mechanical break, horizontal, rough, undulating, irregular			
			2	175.3' - Mechanical break, horizontal, rough, undulating			
			4	175.4' - Bedding plane, horizontal, rough, undulating, open 1/8"x3/16"			
	R20-HQ 5 ft 96%	32	1	176.4-176.6' - Fracture, horizontal, rough, clay/gravel interbed, clay infill			
			7	177.0, 177.1' - Fractures (2), horizontal, rough, undulating, clay infill			
180				177.8' - Fracture or mechanical break, 70 deg, rough, undulating, closely spaced fracture			
-137.1			5	178.6' - Fracture, 45 deg, rough, undulating			R20: No run time recorded
	181.0		NR	179.0' - Mechanical break, horizontal, rough, undulating			
			4	179.2, 179.3, 179.35' - Bedding plane (3), horizontal, rough, planar to undulating		**No Recovery 180.8-181.0'** **Limestone** 181.0-185.0' - Same as 171.9-176.0'	
			3	179.6' - Mechanical break, 10-15 deg, clean, tight			
	R21-HQ 5 ft 90%	48	0	179.7, 179.85' - Fracture (2), horizontal, rough, planar, dark brown staining			
			6	180.0' - Mechanical break, 0-5 deg, undulating, clean			
185				180.1, 180.3' - Bedding plane (2), horizontal, rough, brown staining			
-142.1			5	180.6, 180.7' - Fractures (2), horizontal, rough, undulating, slight staining, no infill			R21: No run time recorded
	186.0		NR	181.2' - Fracture, fragmented limestone			
				181.5, 181.6, 181.7' - Fracture (3), fragmented limestone, horizontal planar breaks		**Limestone** 185.3-185.5' - dark brown, fossiliferous surface, voids on >60% of surface, molds and casts **No Recovery 185.5-186.0'** Bottom of Boring at 186.0 ft bgs on 2/12/2007	
				182.0' - Bedding plane, horizontal, rough, planar, slight brown staining on fracture			
				182.5' - Fracture, rough, horizontal partings, cavity-rich limestone breaks (fragmented)			
				182.7' - Fracture, rough, irregular break			
				184.0' - Bedding plane, horizontal, smooth			
				184.05, 184.45, 184.50, 184.6' - Bedding plane (4), horizontal, smooth			
				184.95, 185.0, 185.05, 185.1' - Bedding plane (4), horizontal, smooth, fine spaced (3/8"x7/8")			

CH2MHILL

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ROCK CORE LOG

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				185.3' - discontinuity with much more void/fossil-rich limestone, dark brown/yellow color 185.5' - end of run			