MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST A. Osorio	
SITE DESCRIPTION Exelon COL Project	MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)	
BORING NO. B-2282A	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.3 ft (NAVD88)	NORTHING 13,412,971 US ft (NAD83)	EASTING 2,600,758 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 400.0 ft	DRILL MACHINE CME-75	DRILLER: D. Nalls/B. Turner/T. Ellerson	HAMMER (ID) 140 lb. Auto (MEC 11)
DATE STARTED 1/5/08	COMPLETED 1/9/08	CASING DEPTH: 33.0 ft	BITS USED: 4" Drag Bit

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
-200.2					Continued from previous page				
									279.7ft: clay mixed with sand POORLY GRADED SAND (SP), light gray (10YR7/1), very dense, moist, trace fines, carbonate nodules, yellowish brown stains, no HCl reaction *(continued)*
									-209.7 290.0 FAT CLAY (CH), greenish gray (10Y6/1), hard, moist, trace sand, carbonate nodules, yellowish brown nodules and stains, black stains, strong HCl reaction
-218.2	298.5	10	17	21	38	SS-38			
-238.2	318.5	13	16	23	39	SS-39			
									-243.7 324.0 POORLY GRADED SAND (SP), very pale brown (10YR8/2), very dense, moist, fine grained, trace fines, some brownish yellow stains, strong HCl reaction, clay intermixed with sand from 339' to 339.4'

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST A. Osorio	
SITE DESCRIPTION Exelon COL Project	MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)	
BORING NO. B-2282A	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.3 ft (NAVD88)	NORTHING 13,412,971 US ft (NAD83)	EASTING 2,600,758 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 400.0 ft	DRILL MACHINE CME-75	DRILLER: D. Nalls/B. Turner/T. Ellerson	HAMMER (ID) 140 lb. Auto (MEC 11)
DATE STARTED 1/5/08	COMPLETED 1/9/08	CASING DEPTH: 33.0 ft	BITS USED: 4" Drag Bit

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
-256.3					Continued from previous page				
-258.2	338.5	41	32	32	64	SS-40			POORLY GRADED SAND (SP), very pale brown (10YR8/2), very dense, moist, fine grained, trace fines, some brownish yellow stains, strong HCl reaction, clay intermixed with sand from 339' to 339.4' *(continued)*
-278.2	358.5	285/0.5			285/0.5	SS-41			358.5ft: SPT over-driven to collect sample .
									370ft: easier drilling below 370'
-289.7									FAT CLAY (CH), greenish gray (10Y6/1), mottled yellowish brown (10YR5/8), hard, moist, trace sand, carbonate nodules, black stains, strong HCl reaction (370.0)
-298.2	378.5	8	15	20	35	SS-42			

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST A. Osorio	
SITE DESCRIPTION Exelon COL Project	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. B-2282A	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.3 ft (NAVD88)	NORTHING 13,412,971 US ft (NAD83)	EASTING 2,600,758 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 400.0 ft	DRILL MACHINE CME-75	DRILLER: D. Nalls/B. Turner/T. Ellerson	HAMMER (ID) 140 lb. Auto (MEC 11)
DATE STARTED 1/5/08	COMPLETED 1/9/08	CASING DEPTH: 33.0 ft	BITS USED: 4" Drag Bit

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
-312.4					Continued from previous page				
									FAT CLAY (CH), greenish gray (10Y6/1), mottled yellowish brown (10YR5/8), hard, moist, trace sand, carbonate nodules, black stains, strong HCl reaction *(continued)*
-318.2	398.5								
		7	13	23	●36	SS-43			-319.7 400.0
									Boring Terminated at Elevation -319.7 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By [illegible] Date 6-12-08

Checked By KAW Date 7-10-08

SHEET 1 OF 3

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST L. Bisson
SITE DESCRIPTION Exelon COL Project		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. B-2283	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,413,032 US ft (NAD83)	EASTING 2,600,809 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 151.2 ft	DRILL MACHINE CME-550	DRILLER: L. Carter/J. Landeros	HAMMER (ID) 140 lb. Auto (MEC 03)
DATE STARTED 12/5/07	COMPLETED 12/6/07	CASING DEPTH: N/A	BITS USED: 2 15/16" Drag Bit

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
80.4					Ground Surface				80.4 / 0.0
80.4	0.0	2	3	4	7	SS-1			LEAN CLAY (CL), very dark grayish brown (10YR3/2), firm, moist, trace sand, no HCl reaction, trace roots
76.9	3.5	7	8	8	16	SS-2			76.9 / 3.5 FAT CLAY (CH), light brownish gray (10YR6/2), to light gray (2.5Y7/2), very stiff, moist, few sand, strong HCl reaction, trace carbonate nodules
74.4	6.0	3	4	4	8	SS-3			6.0ft: firm
71.9	8.5	5	8	10	18	SS-4			71.9 / 8.5 LEAN CLAY with sand (CL), light brownish gray (10YR6/2), very stiff, moist, little sand, strong HCl reaction, trace carbonate nodules
69.4	11.0	5	7	8	15	SS-5			69.4 / 11.0 FAT CLAY (CH) yellowish brown (10YR5/8), to brownish yellow (10YR6/6), mottled light greenish gray (10Y7/1), stiff, moist, few to trace sand, strong HCl reaction
66.9	13.5	5	8	8	16	SS-6			13.5ft: very stiff
60.7	19.7	3	4	5	9	SS-7			19.7ft: stiff
55.7	24.7	2	5	7	12	SS-8			
50.7	29.7	5	7	11	18	SS-9			29.7ft: light brownish gray (2.5YR6/2), very stiff, some sand, no HCl reaction, increased sand content with depth
45.7	34.7	7	8	10	18	SS-10			34.7ft: greenish gray (10Y6/1), trace black and orange staining
40.7	39.7	7	10	12	22	SS-11			39.7ft: yellowish brown (10YR5/8), to greenish gray (10Y6/1), little sand, weak HCl reaction, trace carbonate nodules
35.7	44.7	7	9	9	18	SS-12			44.7ft: mottled yellowish brown (10YR5/6), strong HCl reaction
30.7	49.7	5	6	7	13	SS-13			49.7ft: stiff, weak to no HCl reaction, trace orange staining
25.7	54.7	9	13	16	29	SS-14			25.7 / 54.7 Sandy FAT CLAY (CH), light olive gray (5Y6/2), very stiff, moist, some sand, strong HCl reaction

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST L. Bisson	
SITE DESCRIPTION Exelon COL Project	MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)	
BORING NO. B-2283	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,413,032 US ft (NAD83)	EASTING 2,600,809 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 151.2 ft	DRILL MACHINE CME-550	DRILLER: L. Carter/J. Landeros	HAMMER (ID) 140 lb. Auto (MEC 03)
DATE STARTED 12/5/07	COMPLETED 12/6/07	CASING DEPTH: N/A	BITS USED: 2 15/16" Drag Bit

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
24.3					Continued from previous page				
									Sandy FAT CLAY (CH), light olive gray (5Y6/2), very stiff, moist, some sand, strong HCl reaction *(continued)*
20.7	59.7								59.7ft: greenish gray (10Y6/1), few sand, interbedded clayey sand
		8	15	27	42	SS-15A/B			
19.7									POORLY GRADED SAND with clay (SP-SC), gray (2.5Y6/1), dense, wet, fine grained, few fines, trace organic staining
15.7	64.7								
		11	8	8	16	SS-16A/B			
15.2									FAT CLAY (CH), greenish gray (10YR6/1), very stiff, moist, few sand, weak HCl reaction, trace orange and carbonate nodules
10.7	69.7								
		7	7	9	16	SS-17			69.7ft: greenish gray (10Y6/1), mottled strong brown (7.5YR5/8)
5.7	74.7								
		5	9	12	21	SS-18			74.7ft: gray (5Y6/1), little sand
0.7	79.7								
		9	10	14	24	SS-19			79.7ft: greenish gray (10Y6/1)
-4.3	84.7								
		10	14	10	24	SS-20			POORLY GRADED SAND with clay (SP-SC), light yellowish brown (10YR6/4), very firm, wet, fine grained, few fines, no HCl reaction
-9.3	89.7								
		12	13	23	36	SS-21			89.7ft: light gray (2.5Y7/2), dense, strong HCl reaction, few carbonate nodules
-14.3	94.7								
		29	43	41	84	SS-22			94.7ft: very dense
-19.3	99.7								
		50/0.3			50/0.3	SS-23			
-29.3	109.7								
		21	31	38	69	SS-24			

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST L. Bisson	
SITE DESCRIPTION Exelon COL Project	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. B-2283	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,413,032 US ft (NAD83)	EASTING 2,600,809 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 151.2 ft	DRILL MACHINE CME-550	DRILLER: L. Carter/J. Landeros	HAMMER (ID) 140 lb. Auto (MEC 03)
DATE STARTED 12/5/07	COMPLETED 12/6/07	CASING DEPTH: N/A	BITS USED: 2 15/16" Drag Bit

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
-31.8					Continued from previous page				
									POORLY GRADED SAND (SP), pale brown (10YR6/3), very dense, wet, fine to coarse grained, trace fines, strong HCl reaction, trace chert and carbonate nodules *(continued)*
									-36.6 — 117.0
-39.3	119.7								FAT CLAY (CH), light greenish gray (10Y7/1), stiff, moist, trace sand, no HCl reaction, trace carbonate nodules and black staining
		5	7	8	15	SS-25			
-49.3	129.7								
		8	10	16	26	SS-26			129.7ft: gray (5Y6/1), very stiff, some sand, strong HCl reaction, trace orange staining
									-57.6 — 138.0
-59.3	139.7								POORLY GRADED SAND with clay (SP-SC), light yellowish brown (10YR6/4), very dense, wet, fine grained, few fines, strong HCl reaction
		34	26	26	52	SS-27			
-69.3	149.7								-69.3 — 149.7
		6	6	15	21	SS-28			FAT CLAY (CH), greenish gray (10Y6/1), very stiff, moist, trace sand, strong HCl reaction, and interbedded clayey sand lenses, brownish gray (10YR6/2), weak HCl reaction
									-70.8 — 151.2
									Boring Terminated at Elevation -70.8 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By [illegible] Date 6-12-08

Checked By KAW Date 7.10.08

SHEET 1 OF 3

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST J. Moore
SITE DESCRIPTION Exelon COL Project (Victoria Site)		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. B-2284	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,413,061 US ft (NAD83)	EASTING 2,600,948 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 150.0 ft	DRILL MACHINE CME-550-X	DRILLER: R. Landaros/J. Landaros	HAMMER (ID) 140 lb. Auto (MEC 05)
DATE STARTED 11/8/07	COMPLETED 11/8/07	CASING DEPTH: 4.1 ft	BITS USED: 2 15/16" Roller 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
80.4					Ground Surface				
80.4	0.0	2	3	3	6	SS-1			LEAN CLAY (CL), black (10YR2/1), firm, moist, trace fine sand, grass and roots at surface
76.9	3.5	2	3	3	6	SS-2			FAT CLAY (CH), gray (10YR5/1), firm, moist, trace carbonate nodules, weak HCl reaction
74.4	6.0	2	4	3	7	SS-3			
71.9	8.5	2	3	3	6	SS-4			LEAN CLAY (CL), very pale brown (10YR7/3), firm, moist, trace sand, strong HCl reaction
69.4	11.0	3	7	9	16	SS-5			FAT CLAY (CH), light yellowish brown (10YR6/4), mottled gray (10YR6/1), very stiff, moist, trace sand, strong HCl reaction, black streaks
66.9	13.5	4	6	6	12	SS-6			13.5ft: stiff
61.9	18.5	3	3	5	8	SS-7			
56.9	23.5	3	4	4	8	SS-8			23.5ft: very pale brown (10YR7/3), mottled gray, weak to strong HCl reaction, black streaks
51.9	28.5	5	7	7	14	SS-9			
46.9	33.5	6	8	8	16	SS-10			33.5ft: light gray (10YR7/2), very stiff, little sand, no HCl reaction
41.9	38.5	7	9	8	17	SS-11			38.5ft: light gray (10YR7/1), mottled brown (10YR/3)
36.9	43.5	6	8	10	18	SS-12			43.5ft: brownish yellow (10YR6/6), mottled gray (10YR6/1), trace sand, weak to strong HCl reaction
31.9	48.5	6	7	10	17	SS-13			
26.9	53.5	2	4	6	10	SS-14			53.5ft: pale brown (10YR6/3), stiff, weak HCl reaction

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST J. Moore	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. B-2284	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,413,061 US ft (NAD83)	EASTING 2,600,948 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 150.0 ft	DRILL MACHINE CME-550-X	DRILLER: R. Landaros/J. Landaros	HAMMER (ID) 140 lb. Auto (MEC 05)
DATE STARTED 11/8/07	COMPLETED 11/8/07	CASING DEPTH: 4.1 ft	BITS USED: 2 15/16" Roller 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
24.3					Continued from previous page				
21.9	58.5								FAT CLAY (CH), light yellowish brown (10YR6/4), mottled gray (10YR6/1), very stiff, moist, trace sand, strong HCl reaction, black streaks *(continued)*
		4	10	20	30	SS-15			58.5ft: very pale brown (10YR7/3), mottled dark brown (10YR3/3), very stiff, little sand, trace carbonate nodules
16.9	63.5								16.9 — 63.5
		4	16	29	45	SS-16			POORLY GRADED SAND with clay (SP-SC), brown (10YR5/3), dense, moist, few fines, strong HCl reaction
11.9	68.5								11.9 — 68.5
		4	7	6	13	SS-17			FAT CLAY (CH), light brownish gray (10YR6/2), stiff, moist, trace carbonate nodules, black manganese nodules, no HCl reaction on clay
6.9	73.5								73.5ft: light yellowish brown (10YR6/4), hard, little sand, few carbonate nodules, strong HCl reaction
		10	14	19	33	SS-18			
1.9	78.5								
		5	9	10	19	SS-19			78.5ft: light gray (10YR7/2), very stiff, trace carbonate nodules
-3.1	83.5								-3.1 — 83.5
		8	13	13	26	SS-20			POORLY GRADED SAND with clay (SP-SC), pale brown (10YR6/3), very firm, moist, few fines, no HCl reaction
-8.1	88.5								-8.1 — 88.5
		8	22	26	48	SS-21			Clayey SAND (SC), light gray (10YR7/2), dense, moist, little fines, few carbonate nodules
-13.1	93.5								-13.1 — 93.5
		20	30	50/0.3	80/0.8	SS-22			FAT CLAY (CH), very pale brown (10YR8/2), hard, moist, few carbonate gravel-sized nodules, strong HCl reaction Drilled through possible carbonate-cemented layers 94.75' to 95.2, and 97' to 98'
-18.1	98.5								-18.1 — 98.5
		26	50/0.3		76/0.8	SS-23			POORLY GRADED SAND (SP), very pale brown (10YR8/2), very dense, wet, few fines, strong HCl reaction
-28.1	108.5								-28.1 — 108.5
		20	41	34	75	SS-24			POORLY GRADED SAND (SP), dark yellowish brown (10YR4/6), to light gray (10YR7/2), very dense, moist, strong HCl reaction

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST J. Moore	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. B-2284	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,413,061 US ft (NAD83)	EASTING 2,600,948 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 150.0 ft	DRILL MACHINE CME-550-X	DRILLER: R. Landaros/J. Landaros	HAMMER (ID) 140 lb. Auto (MEC 05)
DATE STARTED 11/8/07	COMPLETED 11/8/07	CASING DEPTH: 4.1 ft	BITS USED: 2 15/16" Roller 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
-31.8					Continued from previous page				
									POORLY GRADED SAND (SP), dark yellowish brown (10YR4/6), to light gray (10YR7/2), very dense, moist, strong HCl reaction *(continued)*
-38.1	118.5								-38.1 — 118.5
		5	9	9	18	SS-25			FAT CLAY (CH), light gray (5Y7/2), very stiff, moist, trace carbonate nodules, black organic and iron staining, strong HCl reaction
-48.1	128.5								
		7	9	9	18	SS-26			128.5ft: mottled reddish brown
-58.1	138.5								
		7	14	14	28	SS-27			
-68.1	148.5								
		5	8	9	17	SS-28			148.5ft: mottled light brown
									-69.6 — 150.0
									Boring Terminated at Elevation -69.6 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JDK Date 6-12-08

Checked By KAW Date 7-10-08

SHEET 1 OF 3

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST L. Bisson	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)	
BORING NO. B-2285	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,412,683 US ft (NAD83)	EASTING 2,600,322 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 151.2 ft	DRILL MACHINE CME-550	DRILLER: L. Carter/D. Juhan	HAMMER (ID) 140 lb. Auto (MEC 03)
DATE STARTED 11/14/07	COMPLETED 11/15/07	CASING DEPTH: N/A	BITS USED: 2 15/16" Drag Bit

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
80.4					Ground Surface				80.4 — 0.0
80.4	0.0	3	5	6	11	SS-1			FAT CLAY (CH), black (5YR2.5/1), stiff, moist, trace sand, no HCl reaction, organics
76.9	3.5	8	8	8	16	SS-2			76.9 — 3.5; LEAN CLAY with sand (CL), gray (5Y5/1),very stiff, moist, few sand, weak HCl reaction, trace carbonate nodules
74.4	6.0	5	7	8	15	SS-3			6.0ft: greenish gray (10YR6/1), stiff
71.9	8.5	6	9	9	18	SS-4			8.5ft: light greenish gray (10Y7/1), mottled strong brown (7.5YR5/8), very stiff, some sand, strong HCl reaction
69.4	11.0	6	9	11	20	SS-5			11.0ft: few sand
66.9	13.5	5	6	7	13	SS-6			66.9 — 13.5; FAT CLAY (CH) strong brown (7.5YR5/6), mottled greenish gray (10Y6/1), stiff, moist, few sand, strong HCl reaction, trace manganese staining
60.7	19.7	4	4	7	11	SS-7			19.7ft: brownish yellow (10YR6/8), veined with light greenish gray (10Y7/1)
55.7	24.7	4	5	6	11	SS-8			
50.7	29.7	5	6	7	13	SS-9			29.7ft: strong brown (7.5YR5/8)
45.7	34.7	3	5	6	11	SS-10			34.7ft: reddish yellow (7.5YR6/8), veined light greenish gray (10Y7/1), trace sand
40.7	39.7	4	5	8	13	SS-11			39.7ft: yellowish brown (10YR5/8), few sand, weak HCl reaction
35.7	44.7	6	12	13	25	SS-12			44.7ft: greenish gray (10Y6/1), mottled reddish yellow (7.5YR6/8), very stiff, little sand, weak HCl reaction,
30.7	49.7	10	14	14	28	SS-13			31.4 — 49.0; Clayey SAND (SC), light yellowish brown (10YR6/4), mottled brownish yellow (10YR6/8), very firm, moist, little fines, no HCl reaction, trace carbonate nodules
25.7	54.7	4	7	7	14	SS-14			25.7 — 54.7

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST L. Bisson
SITE DESCRIPTION Exelon COL Project (Victoria Site)		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. B-2285	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,412,683 US ft (NAD83)	EASTING 2,600,322 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 151.2 ft	DRILL MACHINE CME-550	DRILLER: L. Carter/D. Juhan	HAMMER (ID) 140 lb. Auto (MEC 03)
DATE STARTED 11/14/07	COMPLETED 11/15/07	CASING DEPTH: N/A	BITS USED: 2 15/16" Drag Bit

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
24.2					Continued from previous page				
									POORLY GRADED SAND with clay (SP-SC), light gray (10YR7/1), firm, moist, fine grained, little fines, no HCl reaction *(continued)*
22.4									58.0
20.7	59.7								FAT CLAY (CH), light olive gray (5Y6/2), very stiff, moist, few sand, no HCl reaction, trace carbonate nodules
		6	11	11	22	SS-15			
15.7	64.7								
		15	16	13	29	SS-16			64.7ft: interbedded poorly graded sand with clay, light brownish gray (2.5Y6/2)
10.7	69.7								
10.7									69.7
		13	25	24	49	SS-17			POORLY GRADED SAND with clay (SP-SC), light brownish gray (10YR6/2), dense, wet, few fines, no HCl reaction
5.6	74.7								
5.1									75.2
		6	12	11	23	SS-18A/B			FAT CLAY (CH), light olive gray (5Y6/2), very stiff, moist, few sand, trace carbonate nodules
0.6	79.7								
		5	7	10	17	SS-19			79.7ft: greenish gray (10Y6/1), no HCl reaction, trace manganese nodules
-4.4	84.7								
		11	13	12	25	SS-20			84.7ft: light gray (5Y7/2), little sand, little subangular gravel
-9.4	89.7								
-9.4									89.7
		9	17	16	33	SS-21			POORLY GRADED SAND with clay (SP-SC), greenish gray (10Y6/1), dense, wet to moist, fine grained, little fines, interbedded with fat clay, few sand, little to no HCl reaction, trace carbonate nodules
-14.4	94.7								
-14.4									94.7
		13	19	21	40	SS-22			POORLY GRADED SAND (SP), strong brown (7.5YR5/8), to light yellowish brown (10YR6/4), dense, wet, trace fines, no HCl reaction
-19.4	99.7								98.0ft: very pale brown (10YR7/3), to brownish yellow (10YR6/8), very dense, trace fines, fine to coarse grained, weak HCl reaction
		26	36	42	78	SS-23			
-22.7									103.0
									FAT CLAY (CH), light greenish gray (10Y7/1), mottled strong brown (7.5YR5/8), very stiff, moist, few sand, trace carbonate nodules
-29.4	109.7								
		6	8	9	17	SS-24			

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST L. Bisson
SITE DESCRIPTION Exelon COL Project (Victoria Site)		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. B-2285	DRILL METHOD: Mud Rotary	SAMPLE METHODS: SPT	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,412,683 US ft (NAD83)	EASTING 2,600,322 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 151.2 ft	DRILL MACHINE CME-550	DRILLER: L. Carter/D. Juhan	HAMMER (ID) 140 lb. Auto (MEC 03)
DATE STARTED 11/14/07	COMPLETED 11/15/07	CASING DEPTH: N/A	BITS USED: 2 15/16" Drag Bit

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
-31.9					Continued from previous page				
									FAT CLAY (CH), light greenish gray (10Y7/1), mottled strong brown (7.5YR5/8), very stiff, moist, few sand, trace carbonate nodules *(continued)*
-39.4	119.7	6	7	9	16	SS-25			
-49.4	129.7	9	13	13	26	SS-26			
									-54.7 135.0 POORLY GRADED SAND with clay (SP-SC), light brownish gray (10YR6/2), dense, wet, few fines, no HCl reaction
-59.4	139.7	6	13	24	37	SS-27			
									-65.7 146.0 POORLY GRADED SAND (SP), light gray (10YR7/2), very dense, weak HCl reaction
-69.4	149.7	17	34	46	80	SS-28			
									-70.9 151.2 Boring Terminated at Elevation -70.9 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

Test Pits Logs

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JDX Date 6-12-08

Checked By KAW Date 6.12.08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST M. Harvey	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. TP-2101	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,412,437 US ft (NAD83)	EASTING 2,599,756 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/17/08	COMPLETED 1/17/08	CASING DEPTH: N/A	BITS USED: N/A

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
80.4					Ground Surface				80.4 — 0.0
									Black Topsoil, grass at surface
									78.4 — 2.0
									Sandy FAT CLAY (CH), dark gray (5Y4/1), moist, some sand, no HCl reaction
									75.4 — 5.0
						J1			FAT CLAY with sand (CH), gray (2.5Y5/1), moist, no HCl reaction, carbonate nodules
72.4	8.0					B1A/ B1B/J2 J3			8.0ft: light gray (2.5Y7/2), weak HCl reaction
									70.4 — 10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
5.0ft: J1
8.0ft: Bulk (B1A/B1B)/J2
10.0ft: J3
Boring Terminated at Elevation 70.4 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JDZ Date 6-12-08

Checked By KAW Date 6-12-08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST M. Harvey	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. TP-2102	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 80.4 ft (NAVD88)	NORTHING 13,412,124 US ft (NAD83)	EASTING 2,599,819 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/18/08	COMPLETED 1/18/08	CASING DEPTH: N/A	BITS USED: N/A

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
80.4					Ground Surface				80.4 0.0
						J1			FAT CLAY with sand (CH), very dark gray (10YR4/1 and 10YR3/1), moist, organics, no HCl reaction
						J2			
						J3			5.5ft: gray (2.5Y5/1), carbonate nodules
72.4	8.0					B1A/ B1B/J4			8.0ft: light gray (2.5Y7/2), weak HCl reaction
						J5			70.4 10.0ft: strong HCl reaction 10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
1.0ft: J1
3.0ft: J2
5.5ft: J3
8.0ft: Bulk (B1A/B1B)/J4
10.0ft: J5
Boring Terminated at Elevation 70.4 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JPX Date 6-12-08

Checked By KAW Date 6-12-08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST M. Harvey
SITE DESCRIPTION Exelon COL Project (Victoria Site)		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. TP-2103	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 79.7 ft (NAVD88)	NORTHING 13,411,951 US ft (NAD83)	EASTING 2,600,104 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/18/08	COMPLETED 1/18/08	CASING DEPTH: N/A	BITS USED: N/A

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	
79.7					Ground Surface				79.7	0.0
						J1			0.0ft: FAT CLAY with sand (CH), very dark gray (2.5Y3/1), moist, little sand, organics, no HCl reaction	
						J2			75.7 3.0ft: carbonate nodules, strong HCl reaction	4.0
						J3			Sandy FAT CLAY (CH), gray (5Y6/1), moist, some sand, weak HCl reaction, carbonate nodules	
71.7	8.0					B1A/ B1B/J4 J5			71.7 LEAN CLAY with sand (CL), light gray (2.5Y7/2), moist, weak HCl reaction, carbonate nodules amount increases with depth	8.0
									69.7	10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
1.0ft: J1
3.0ft: J2
5.0ft: J3
8.0ft: Bulk (B1A/B1B)/J4
10.0ft: J5
Boring Terminated at Elevation 69.7 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By [illegible] Date 6-12-08

Checked By KAW Date 6.12.08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST M. Harvey	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777		GROUND WATER (ft)
BORING NO. TP-2104	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 80.2 ft (NAVD88)	NORTHING 13,412,451 US ft (NAD83)	EASTING 2,600,288 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/17/08	COMPLETED 1/17/08	CASING DEPTH: N/A	BITS USED: N/A

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
80.2					Ground Surface				80.2 — 0.0
						J1			LEAN CLAY with sand (CH), very dark gray (10YR3/1), moist, organics, no HCl reaction
						J2			3.0ft: dark grayish brown (2.5Y4/2), carbonate nodules
						J3			4.5ft: grayish brown (2.5Y5/2), trace organics
72.2	8.0					B1A/B1B/J4			7.5ft: light gray (2.5Y7/2), strong HCl reaction
									70.2 — 9.0ft: mottled brownish yellow (10YR6/8) — 10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
1.0ft: J1
3.0ft: J2
5.0ft: J3
8.0ft: Bulk (B1A/B1B)/J4
Boring Terminated at Elevation 70.2 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JDK Date 6-12-08

Checked By KAW Date 6-12-08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST M. Harvey/A. Shaw	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)	
BORING NO. TP-2201	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 79.9 ft (NAVD88)	NORTHING 13,413,199 US ft (NAD83)	EASTING 2,600,399 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/17/08	COMPLETED 1/17/08	CASING DEPTH: N/A	BITS USED: N/A

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	
79.9					Ground Surface				79.9	0.0
									Topsoil 78.4	1.5
						J1			LEAN CLAY with sand (CL), gray green, moist, little sand	
74.9	5.0					B1A/ B1B/ B1J				
									8.0ft: gray green, increased HCl reaction with depth	
									69.9 10.0ft: strong HCl reaction	10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
2.0ft: J1
5.0ft: B1J
5.0 to 10.0ft: Bulk (B1A/B1B)
Boring Terminated at Elevation 69.9 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JMc Date 6-12-08

Checked By KAW Date 6-12-08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST M. Harvey
SITE DESCRIPTION Exelon COL Project (Victoria Site)		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. TP-2202	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 80.6 ft (NAVD88)	NORTHING 13,412,890 US ft (NAD83)	EASTING 2,600,464 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/17/08	COMPLETED 1/17/08	CASING DEPTH: N/A	BITS USED: N/A

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
80.6					Ground Surface				80.6 0.0
75.6	5.0					J1 BJ1 B1A/B1B J2			FAT CLAY with sand (CH), brownish gray, moist 5.0ft: light brownish gray, weak HCl reaction 70.6 10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
5.0ft: J1
5.0-10.0ft: BJ1
8.0ft: Bulk (B1A/ B1B)
10.0ft: J2
Boring Terminated at Elevation 70.6 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By JDK Date 6-12-08

Checked By KAW Date 6-12-08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352		COUNTY Victoria	GEOLOGIST M. Harvey
SITE DESCRIPTION Exelon COL Project (Victoria Site)		MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)
BORING NO. TP-2203	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 80.3 ft (NAVD88)	NORTHING 13,412,718 US ft (NAD83)	EASTING 2,600,741 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/18/08	COMPLETED 1/18/08	CASING DEPTH: N/A	BITS USED: N/A

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
80.3					Ground Surface				80.3 — 0.0
						J1			Sandy FAT CLAY (CH), very dark gray (10YR3/1), moist, some sand, no HCl reaction
									77.5 — 2.8
						J2			LEAN CLAY with sand (CL), light gray (2.5Y7/1), moist, no HCl reaction
						J3			
72.3	8.0					B1A/B1B/J4			7.5ft: light gray (2.5Y7/1), moist, carbonate nodules, weak HCl reaction 9.5ft: light gray (2.5Y7/2), mottled yellow (10YR7/6), moist, carbonate nodules, strong HCl reaction
						J5			70.3 — 10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
1.0ft: J1
3.0ft: J2
5.0ft: J3
8.0ft: Bulk (B1A/B1B)/J4
10.0ft: J5
Boring Terminated at Elevation 70.3 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

MACTEC

GEOTECHNICAL BORING LOG

Prepared By [illegible] Date 6-12-08

Checked By KAW Date 6-12-08

SHEET 1 OF 1

BECHTEL PROJECT NO.: 25352	COUNTY Victoria	GEOLOGIST M. Harvey/A. Shaw	
SITE DESCRIPTION Exelon COL Project (Victoria Site)	MACTEC PROJECT NO.: 6468-07-1777	GROUND WATER (ft)	
BORING NO. TP-2204	DRILL METHOD: Back Hoe	SAMPLE METHODS: Hand	0 HR. ND
GROUND SURFACE ELEV. 80.8 ft (NAVD88)	NORTHING 13,413,216 US ft (NAD83)	EASTING 2,600,932 US ft (NAD83)	24 HR. ND
TOTAL DEPTH 10.0 ft	DRILL MACHINE John Deere	DRILLER: D. Rhodes	HAMMER (ID) NA
DATE STARTED 1/17/08	COMPLETED 1/17/08	CASING DEPTH: N/A	BITS USED: N/A

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
80.8					Ground Surface				80.8 0.0
						J1			LEAN CLAY with sand (CL), very dark grayish brown (2.5Y3/2), moist
75.8	5.0					B1A/ B1B/B1J			4.0ft: dark gray (2.5Y4/1), no HCl reaction, carbonate nodules
						J2			70.8 10.0ft: light gray (2.5Y7/2), weak HCl reaction 10.0

Note: Bulk samples are composites of soil collected from the approximate sample-depth(s) listed below:
1.0ft: J1
5.0-10.0ft: Bulk (B1A/ B1B)/B1J
10.0ft: J2
Boring Terminated at Elevation 70.8 ft

EXELON COL BORE EXELON-2.GPJ EXELON COL.GDT 6/12/08

STANDARD PENETRATION TEST ENERGY REPORTS

March 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 3/14/08

Subject: **Report of SPT Energy – MACTEC Raleigh CME 55LC Track Hammer Serial No. MEC-02 Automatic Hammer**
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777

Kyle Miller and Steve Kiser, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on December 4 and 18, 2007, during drilling of Borings B-2180 and B-2301, respectively, at the referenced site. The testing was performed from approximately 10:15 to 11:10 AM under sunny skies and a temperature of about 60 degrees Fahrenheit on December 4, and from approximately 4:30 PM to 5:25 PM under cloudy skies and a temperature of about 70 degrees Fahrenheit on December 18. The borings were drilled with personnel and equipment from the Raleigh office of MACTEC. The drilling equipment consisted of a CME 55LC model track-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods (December 4) and NW-J-sized drilling rods (December 18) and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. David White. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. P5953 and P5992) and strain gages (Serial Nos. AW #75/1 and AW#75/2 on December 4; Serial Nos. NW#146/1 and NW146/2 on December 19). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert used on December 4 had a cross-sectional area of approximately 1.19 square inches and an outside diameter of approximately 1.75 inches at the gage location. The drill rods included in the drill rod string on December 4 were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 1.75 and 1.375 inches, respectively. The instrumented rod insert used on December 19 had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string on December 19 were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the

23 Pages Total

closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN EXE 315.

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The range of average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method is shown in Table 1 below for each rod size tested. The corresponding energy transfer ratio of the SPT hammer system is also shown.

Table 1: Average Energy Transfer Range for the Depth Intervals Tested

Rod Size	Range of Average Energy Transferred, Per Individual Sample (foot-pounds)	Range of Average Energy Transfer Ratio (ETR)
AW-J	293 to 301	84% to 86%
NW-J	284 to 292	81% to 83%

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) is shown in Table 2 below for each rod size tested.

Table 2: Overall Energy Testing Results for Each Rod Size

Rod Size	Overall Average Energy Transferred (foot-pounds)	Range of Overall Average Energy Transfer Ratio (ETR)
AW-J	297.3	84.9%
NW-J	288.8	82.5%

Attachments: Page 4 Table 3 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN EXE 19 – 1 Page
Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 23 PDIPLOT Output – 16 Pages

TABLE 3
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Exelon Victoria COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777

Hammer Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Rod Size	Date Tested	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
MEC-02 (CME 55LC Track)	MACTEC Raleigh	David White	B-2180	AW-J	12/4/2007	83.5 - 85.0	6 - 11 - 12	29	294	84.0%
						88.5 - 90.0	12 - 16 - 26	54	293	83.7%
						93.5 - 95.0	21 - 24 - 26	71	301	86.0%
						98.5 - 98.7	50 / 0.2'	99	298	85.1%
							Average for AW-J Rods:		**297.3**	**84.9%**
			B-2301	NW-J	12/18/2007	18.5 - 20.0	6 - 6 - 9	21	284	81.1%
						23.5 - 25.0	5 - 5 - 8	18	288	82.3%
						28.5 - 30.0	9 - 12 - 15	36	292	83.4%
							Average for NW-J Rods:		**288.8**	**82.5%**
							Average for Rig:		**295.4**	**84.4%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.
EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).
[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).
The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By: SK Date: 3-14-08	Checked By: KAW Date: 3/14/08
STEVE KISER	

Work Instruction No. 19
Exelon COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1777

Issued To:	Stephen E. Kiser, Kyle B. Miller	**Rev. No.**	0
Issued By:	Kathryn A. White	**Date:**	8-19-07
Valid From:	8-19-07	**To:**	8-19-08

Task Description: Perform SPT Hammer Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision), Bechtel Engineering Specification 25352-102-3PS-CY00-00001, Rev 000, and ASTM D 4633-05. Copies of the Work Plan and Bechtel Engineering Specification are provided in the Site Office. A copy of ASTM procedure are attached.

Specific Instructions (note attachments where necessary): Energy measurement will be performed in accordance with ASTM D 4633-05 at borings and depths selected by Bechtel. For drill rigs using both AW and NW drill rods, energy measurements must be made for both rod types as indicated in assignment sheet provided by Site Coordinator prior to start of work. Prepare and submit an energy measurement report containing information described in Section 8 of ASTM D 4633-05.

Special Instructions (note attachments where necessary): If changed conditions are encountered contact Project Manager and Project Principal Engineer immediately.

Report Format: Standard MACTEC forms provided by Project Manager and Project Principal Engineer.

Specific Quality Assurance Procedures Applicable: MACTEC QA Manual, QAPD, HASP and QAP-25-1; current revisions apply.

Hold Points or Witness Points:

- Calibration information is submitted to Bechtel
- Deviations from QAPD/HASP/Work Plan

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)

Project Manager: _____ Date: _____

Project Principal Engineer: _____ Date: _____

Site Manager/Coordinator: _____ Date: 8-20-07

Pages: 8 **DCN:** EXE

1/8

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Exelon 2 (Victoria) COL Site	MAKE:	CME
LOCATION:	Victoria, Texas	MODEL:	55 LC
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-02
DATE:	12/4/2007	HAMMER TYPE:	Auto
WEATHER:	Sunny 60°F	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	AW-J
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-2180		
DEPTH DRILLED:	83.5' to 100'		
TIME DRIVEN:	10:15 AM - 11:15 AM		
RIG OPERATOR:	David White		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.19 in²		
ACCEL. SERIAL NOS.:	5953; 5992		
STRAIN SERIAL NOS.:	75AW-1; 75AW-2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)
83.5	6-11-12										
88.5	12-16-26										
93.5	21-24-26										
98.5	50/0.18										

REMARKS:

NONE	NONE	NONE

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RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Exelon 2 (Victoria) COL Site	MAKE:	CME
LOCATION:	Victoria, Texas	MODEL:	55LC TRACK
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-02
DATE:	12-18-07	HAMMER TYPE:	AUTOMATIC
WEATHER:	CLOUDY 70°	ROPE CONDITION:	N/A
INSPECTOR:	~~Kyle Miller~~ STEVE KISER	ROD SIZE:	NW-J
DRILLING COMPANY:	MACTEC RALEIGH	NO. OF SHEAVES:	N/A

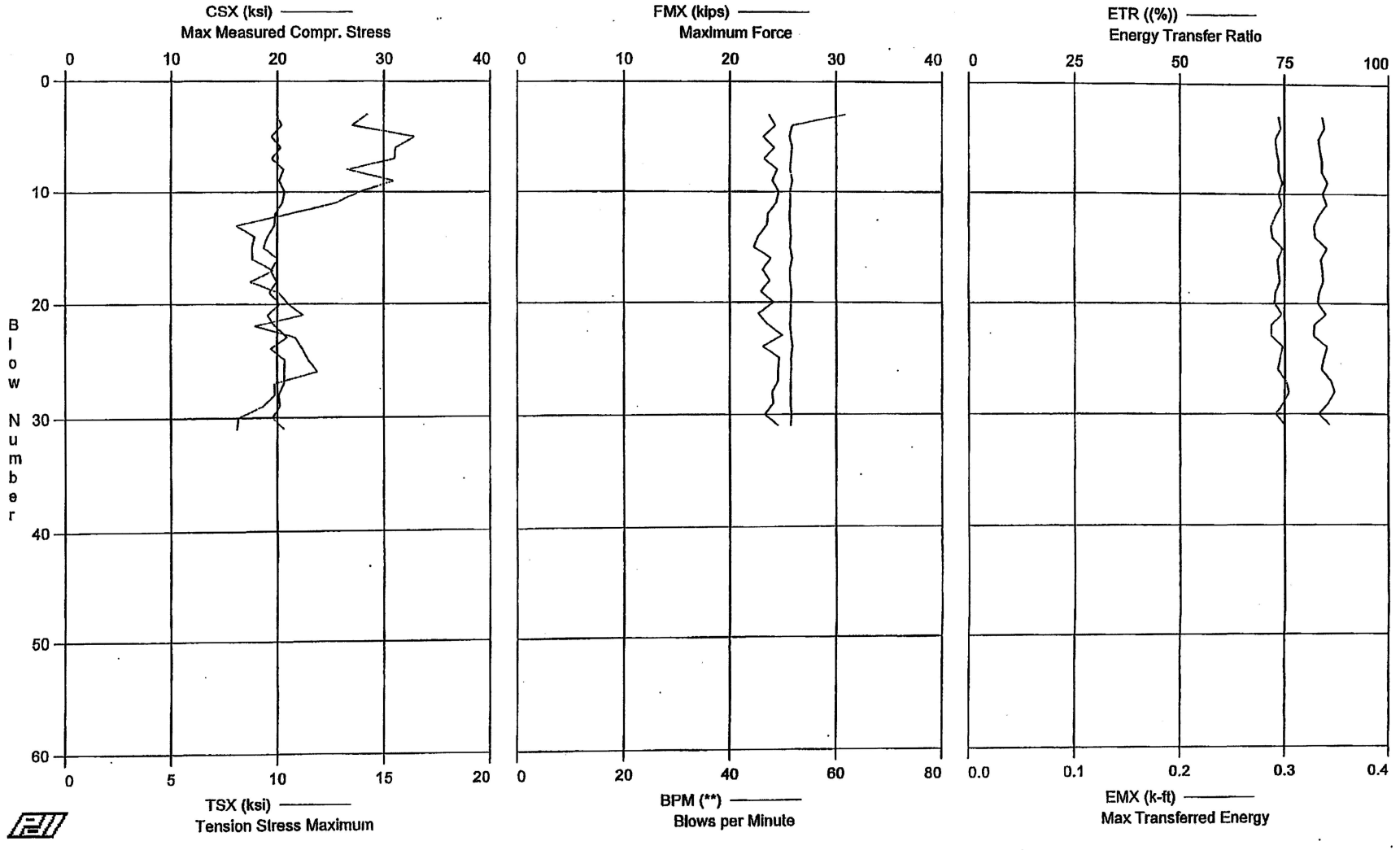
BORING DATA			
BORING NUMBER:	B-2301		
DEPTH DRILLED:	100' PLANNED		
TIME DRIVEN:	VARIOUS		
RIG OPERATOR:	DAVID WHITE		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	146 NW # 1/2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)
18.5/20'	6-6-9										
23.5/25'	5-5-8										
28.5/30'	9-12-15										

REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 28-Feb-2008

Test date: 4-Dec-2007

EXCELON VICTORIA COL PROJECT - BORING B-2180; 83.5' - 85' SAMPLE