COMMERCIAL IN CONFIDENCE

55a (up)
55b (down)

- JUN 1982

SK 46 N.E. / 44 / 50

55a (up)
55b (down)

MARKHAM COLLIERY

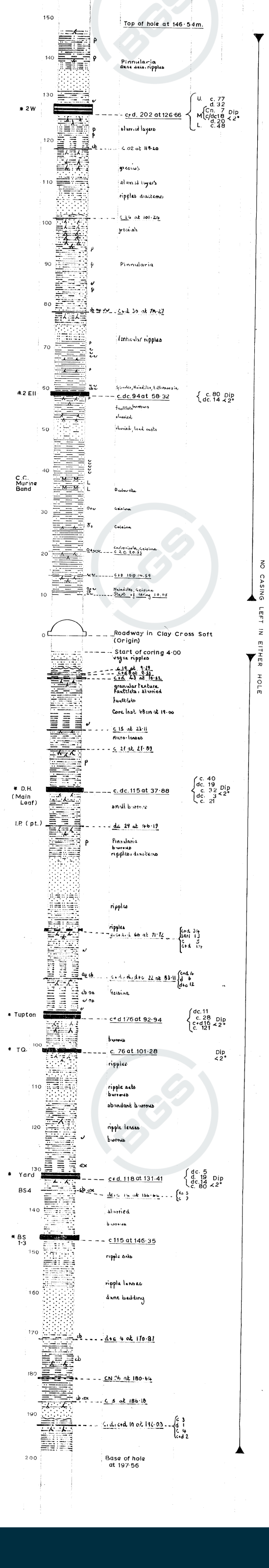
No.16 (up) and No.17 (down) underground boreholes

(from Clay Cross Soft)

445744
368403 } both holes

1980 / 1981

-376·1m. O.D.



Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

Purpose: COAL EXPLORATION

(Nat. Grid, Sheet & Qtr.) B/H REGD. NO.

Exact Site: NATIONAL GRID CO-ORDINATES — SK 46 NE — 55a [redacted] (No.16); 55b [redacted] (No.17)

E445744) Both holes
N368403)

SK 46 NE/44+ 50

Level at which bore commenced relative to O.D. : 376.1 m
(Zero: floor of Clay Cross Soft)

Date of Boring: 1980-81

Borer: NATIONAL COAL BOARD
Cores examined by D.J. Green, N.C.B. Geologist

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
	Top of borehole at			146	54
Siltstone	coarse, vaguely greenish; occasional siltstone medium layers; poorly laminated; rare roots throughout	0	84+	145	70
Siltstone	medium with occasional siltstone coarse layers (strong); common ironstone bands; poorly laminated	0	90	144	80
Siltstone	fine, poorly laminated; common plant debris	0	54	144	26
Siltstone	coarse, unlaminated; rare plant debris	0	61	143	65
Siltstone	medium with occasional siltstone fine and muddy layers, poorly laminated; occasional ironstone bands; rare plant debris	1	50	142	15
Siltstone	fine, poorly laminated; common ironstone nodules; occasional plant debris	0	75	141	40

COMMERCIAL IN CONFIDENCE 2 SK/46/NE/44+50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES --JUN1982

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	silty, laminated; occasional ironstone bands. passage	0	28	141	12
Siltstone	medium, laminated; occasional plant debris	0	61	140	51
Mudstone	silty, laminated; rare ironstone bands; common plant remains including Calamites	0	91	139	60
Mudstone	silty, poporly laminated; common listric surfaces; common plant debris; common roots; occasional Pinnularia Sharp	0	37	139	23
Sandstone	fine and siltstone fine; locally common load and pouch structures; occasional dune sets; common ripples and minor erosion surfaces; common micaceous planty planes	1	81	137	42
Sandstone	medium; common micaceous planty planes above 134.50; common ripples above 134.80	5	14	132	28
Siltstone	medium and sandstone fine; locally vaguely rippled; sub-vertical, calcite-mineralized joint throughout	0	12	132	16
Siltstone	medium, poorly laminated; sub-vertical, unmineralised joint throughout passage	0	10	132	06
Siltstone	fine, poorly laminated; common ironstone bands passage	0	72	131	34
Mudstone	silty, poorly laminated; common thin ironstone bands passage	1	94	129	40
Mudstone	dark, laminated; common ironstone bands; common worm tracks on some bedding planes	0	34	129	06

COMMERCIAL IN CONFIDENCE 3

SK/46/NE / 44 + 50

CORE ANALYSED 129.06 to 126.08

JUN 1982

Mudstone	silty, ironstone bands; non-marine lamellibranchs	0 25	128	81
Mudstone	shaly, carbonaceous; non-marine lamellibranch impressions detached	0 13	128	68
SECOND WATERLOO Upper Leaf	(Coal, bright 15) (Coal, banded 24) fragments (Coal, mostly bright 38)			
	Mudstone, laminated, rootlets 32 cylinders			
Middle Leaf	(Cannel 7) (Coal and dirty coal 18) fragments			
	Seatearth; mudstone, grey 20)			
Lower Leaf	(Coal mostly bright 48)			
	202 cm			
	Dip less than 2°, recovery 75%	2 02	126	66
Seatearth Mudstone	silty, grey, listric	0 18	126	48
Siltstone	fine, grey, with fine sandstone laminae, commoner in basal 0.14; ironstone root-nodules and common roots	0 40	126	08
Sandstone	fine with common siltstone medium laminae (60:40); local slump structures between 125.98 and 126.04; abundant roots	0 30	125	78
Siltstone	fine to medium; poorly laminated; common roots	0 54	125	24
Siltstone	fine to medium, occasional muddy layers, unlaminated; sporadic roots throughout passage	1 39	123	85
Sandstone	medium to fine, (strong), with occasional siltstone laminae; common poorly developed ripples; occasional micaceous planty planes	0 47	123	38
Siltstone	coarse, poorly laminated; common slurried layers; common plant debris including Neuropteris	1 04	122	34

COMMERCIAL IN CONFIDENCE

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SK/46/NE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with occasional sandstone fine laminae and thin layers (80:20) towards base; common load casts in basal 0.05; occasional plant debris including Calamites and Neuropteris	1	16	121	18
Mudstone	locally slightly silty; poorly laminated; rare ironstone bands; common non-marine lamellibranchs in basal 0.10; very rare plant debris	2	89	118	29
Mudstone	carbonaceous, shaly	0	09	118	20
COAL	bright (cylinder)	0	02	118	18
Seatearth Mudstone	silty, unlaminated, brownish; abundant listric surfaces; abundant roots passage	1	28	116	90
Mudstone	silty, unlaminated, greenish; abundant irregular listric surfaces; occasional ironstone nodules; abundant roots	2	97	113	93
Siltstone	medium, unlaminated, greenish; common roots, becoming less common to base	1	15	112	78
Sandstone	fine to medium, locally vaguely greenish; rare discontinuous micaceous planty planes; rare comminuted plant debris	1	48	111	30
Siltstone	fine and sandstone fine, interlaminated; locally well developed ripples passage	0	20	111	10
Siltstone	fine to medium, poorly laminated	0	50	110	60
Siltstone	medium with common thin sandstone fine laminae (70:30); locally vaguely ripple bedded; occasional comminuted plant debris	0	30	110	30

COMMERCIAL IN CONFIDENCE 5

Sk/46/NE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	medium, poorly laminated; common slurried layers	0	54	109	76
Siltstone	fine, poorly laiminated; common plant debris	2	20	107	56
Siltstone	fine and sandstone fine; occasional micaceous planty planes; rare ripples and minor erosion surfaces	0	86	106	70
Sandstone	medium, generally massive; rare discontinuous micaceous carbonaceous planes	0	62	106	08
Siltstone	fine with common thin sandstone fine laminae (60:40); occasional ripples; rare plant debris	0	23	105	85
Siltstone	fine, poorly laminated, with rare wispy thin sandstone fine laminae near the base; rare plant debris	0	30	105	55
Sandstone	medium, occasional micaceous carbonaceous planes; rare poorly developed ripples; rare plant remains erosional	3	27	102	28
Mudstone	silty, poorly laminated; rare plant debris	0	80	101	48
COAL	bright (fragments)	0	24	101	24
Seatearth Mudstone	silty, unlaminated; abundant irregular listric surfaces; abundant roots	0	48	100	76
Sandstone	fine to medium; occasional micaceous planty planes; occasional poorly developed ripples; occasional roots including Stigmaria	0	81	99	95

BGS ID: 224148 : BGS Reference: SK46NE44
British National Grid (27700) : 445742,368405

SK/46/NE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Seatearth Mudstone	silty, unlaminated, greenish; occasional fine siltstone passages; common roots	1	31	98	64
Siltstone	fine, unlaminated, greenish; common ironstone nodules; abundant roots	0	88	97	76
Siltstone	medium, unlaminated, grey; common ironstone nodules; coalified Stigmaria, abundant roots	0	40	97	36
Mudstone	silty, unlaminated, greenish; occasional irregular listric surfaces; common roots	0	32	97	04
Siltstone	fine to medium, unlaminated, greenish; ironstone nodules; common roots	1	04	96	00
Siltstone	coarse, unlaminated, greenish, abundant roots	0	74	95	26
Siltstone	fine to medium, unlaminated; common roots, occasional root nodules near the base	0	38	94	88
Mudstone	silty, poorly laminated; common irregular listric surfaces; occasional iron-filled roots near base, occasional carbonaceous roots near top; occasional coalified plant remains, common well preserved Neuropteris leaves near top	1	18	93	70
Siltstone	fine to medium, poorly laminated; rare sandstone fine laminae in basal 0.50; occasional iron-rich patches; occasional sub-vertical unmineralised joints; occasional comminuted plant debris; occasional plant remains including Calamites and Pinnularia above 90.80 passage	5	00	88	70
Siltstone	fine to medium with occasional sandstone fine laminae and lenses (80:20); locally vaguely rippled; 45 degree fracture at 88.43	0	65	88	05

Sk/46/NE/44+50

COMMERCIAL IN CONFIDENCE

JUN 1982

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine, locally muddy, laminated passage	0	50	87	55
Mudstone	silty with rare sandy laminae near the base; occasional iron-rich layers; occasional thin wormy ironstone bands; rare small non-marine lamellibranchs; rare plant remains	3	32	84	23
Siltstone	fine with occasional wispy thin sandstone fine laminae (95:5); occasional plant remains including Neuropteris towards the top	0	39	83	84
Siltstone	fine, locally muddy, poorly laminated; rare vague sandy laminae; occasional iron-rich patches	1	04	82	80
Mudstone	silty, poorly laminated	0	95	81	85
Siltstone	fine, unlaminated; common iron-rich patches. short passage	0	85	81	00
Mudstone	slightly silty, laminated passage	1	54	79	46
Mudstone	silty, slightly carbonaceous, laminated, shaly; becoming less carbonaceous towards top; occasional shelly ironstone bands up to 0.05 thick passage	0	74	78	72
Mudstone	highly carbonaceous, shaly, occasional ostracods; common non-marine lamellibranchs in basal 0.05, rare above	0	15	78	57
COAL	and dirt (fragments)	0	30	78	27
Seatearth Mudstone	locally silty, laminated; common listric surfaces, core completely fragmented; locally slightly carbonaceous; occasional rootlets sharp	2	13	76	14

COMMERCIAL IN CONFIDENCE

SK/46/NE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with common thin sandstone fine laminae (70:30); common micaceous carbonaceous planes	0	75	75	39
Sandstone	fine with rare siltstone fine laminae; vaguely ripple bedded; micaceous carbonaceous planes; occasional comminuted plant debris	1	92	73	47
Sandstone	fine and siltstone fine; common lenticular ripples; common micaceous planes; rare sand-filled burrows	1	52	71	95
Siltstone	fine to medium with common thin sandstone fine laminae (70:30); common plant debris	1	37	70	58
Siltstone	muddy, poorly laminated passage	0	58	70	00
Mudstone	silty, laminated, dark; common non-marine lamellibranchs in basal 0.10; scattered non-marine lamellibranch fragments throughout	2	66	67	34
Ironstone	shelly	0	06	67	28
Siltstone	fine, unlaminated; common roots in top 0.10, rare below	1	58	65	70
Siltstone	fine with common sandstone fine laminae and layers (60:40); slump structures at 63.70, 65.40; common rootlets 64.20 to 64.60; common plant fragments including Neuropteris 64.60 to 64.75	3	70	62	00
Siltstone	muddy, laminated passage	0	30	61	70
Mudstone	silty, laminated; abundant non-marine lamellibranchs including Naiadites and Anthracosia	0	90	60	80

SK/46/N E/44
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	carbonaceous, shaly; detached Spirorbis at 60.05; common non-marine lamellibranch fragments including Naiadites	1	01	59	79
	CORE ANALYSED 59.79 TO 58.27				
Mudstone	silty; a few ironstone nodules	0	53	59	26
SECOND ELL	Coal, bright 80) fragments Coal, inferior bright 14) 94 cm				
	Dip less than 2°. Recovery 60% (based on borehole recorder)	0	94	58	32
Seatearth Siltstone	medium, with a few bright coal laminae	0	05	58	27
Siltstone	muddy, poorly laminated, dark; common plant fragments including Lepidodendron	0	07	58	20
Seatearth Siltstone	muddy, unlaminated, abundant rootlets	0	20	58	00
Siltstone	fine, poorly laminated, thin irregular sandstone fine laminae in top 0.30, rootlets above 57.25	1	25	56	75
Siltstone	fine with common thin sandstone fine laminae (70:30); burrows up to 0.08 deep; comminuted plant debris	0	45	56	30
Siltstone	fine, poorly laminated; common faultlets in basal 0.50 passage	0	57	55	73
Siltstone	muddy with irregular thin sandstone fine laminae 55.43 to 55.53	1	92	53	81
Siltstone	fine with sandstone fine (70:30) slurried in parts	0	25	53	56
Siltstone	muddy, laminated, dark; isolated non-marine lamellibranch fragment at 53.40	0	18	53	38

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
				53	38
Seatearth Siltstone	muddy, unlaminated, cheesy texture, ironstone nodules in top 0.10; abundant rootlets	0	73	52	65
Siltstone	fine with common sandstone fine laminae in basal 0.30; rare rootlets	0	37	52	28
Sandstone	fine with thin siltstone laminae; slurried in parts, common load casts throughout; contact inclined at 20 degrees	4	91	47	37
Siltstone	muddy to fine with common thin sandstone fine laminae in top 0.15 passage	0	47	46	90
Mudstone	silty laminated; common shelly ironstone to 43.02 passage	5	75	41	15
Siltstone	muddy, laminated, dark; common non-marine lamellibranchs passage	1	50	39	65
CLAY CROSS MARINE BAND	mudstone, silty, completely fragmented; cone-in-cone, canky ironstone 36.14 to 36.36; Lingula and Dunbarella fragments towards base; isolated Lingula at 37.46 (core from 34.65 to 36.14 broken, part lost)	5	00	34	65
Siltstone	muddy, cheesy texture	0	10	34	55
Siltstone	muddy to fine with common thin sandstone fine laminae, 33.65 to 34.05	1	10	33	45
Mudstone	silty, laminated; wormy	1	91	31	54
Mudstone	silty, dark; common non-marine lamellibranch fragments; common Geisina in basal 0.02	0	25	31	29
Siltstone	muddy to fine; thin sandstone laminae 29.90 to 30.08; poorly laminated; ironstone nodules in top 0.30; plant remains in top 0.30	2	19	29	10

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SK/46/NE 144+ 50

COMMERCIAL CONFIDENCE 11

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	silty, laminated	0	75	28	35
Siltstone	muddy, becoming siltstone fine upwards with rare sandstone fine laminae passage	0	65	27	70
Mudstone	silty, laminated, dark; shelly ironstone 27.00 to 27.12; abundant Geisina in basal 0.01	0	77	26	93
Seatearth Mudstone	silty, dark, unlaminated, listric; abundant rootlets	0	02	26	91
Siltstone	fine with irregular thin sandstone fine laminae; cheesy texture; abundant rootlets	0	46	26	45
Siltstone	fine with common thin sandstone fine laminae; sandstone layer 24.58 to 24.83; common rootlets above 26.25	3	30	23	15
Siltstone	muddy, poorly laminated passage	1	05	22	10
Mudstone	silty, laminated, wormy passage	0	80	21	30
Mudstone	silty, dark, abundant thick shelled non-marine lamellibranchs including Carbonicola; abundant Geisina	0	75	20	55
COAL	(cylinder)	0	02	20	53
Seatearth Siltstone	fine, poorly laminated; common ironstone nodules; common rootlets	0	73	19	80
Siltstone	fine with common thin sandstone fine laminae; sporadic rootlets above 18.50	3	32	16	48
Mudstone	silty, laminated	1	18	15	30

COMMERCIAL IN CONFIDENCE

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SK/46/NE/44+
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

JUN 1982

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	silty, laminated, dark; shelly ironstone band 15.25 to 15.30; abundant thick shelled non-marine lamellibranchs	0	61	14	69
COAL	and dirt (completely fragmented)	0	10	14	59
Seatearth Mudstone	silty, dark, unlaminated, cheesy texture; abundant rootlets (core fragmented)	0	39	14	20
Mudstone	silty, poorly laminated, common rootlets	0	33	13	87
Siltstone	muddy, laminated; common rootlets above 13.20 passage	1	27	12	60
Mudstone	silty, laminated passage	0	65	11	95
Mudstone	carbonaceous, shaly; Geisina at 11.65; common Naiadites fragments at 11.68 passage	0	40	11	55
Mudstone	silty, laminated; abundant non-marine lamellibranchs 10.50 to 10.70	1	50	10.	05
Markham No. 16 (upbore)	Start of coring in upbore: 10.05 m				
ORIGIN	Base of Clay Cross Soft Seam			0	00
Markham No. 17 (downbore)	Start of coring in downbore; 4.00 m			4.	00
Siltstone	fine with common thin sandstone fine laminae 70:30; common ripple sets, occasional minor erosion surfaces; rare comminuted plant debris	0	44	4	44
Siltstone	fine and sandstone fine; interlaminated and interlayered. Ripple bedded throughout, minor erosion surfaces	0	19	4	63

SK/46/NE/44+
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COMMERCIAL IN CONFIDENCE

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA		THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Sandstone	fine to medium with rare siltstone fine laminae; common micaceous planty planes. Local vague ripples		1	25	5	88
Siltstone	fine with common sandstone fine laminae, 70:30; becoming 60:40 towards base. Poorly developed ripples throughout Passage		0	31	6	19
Sandstone	fine with common siltstone fine laminae, 70:30. Common ripple sets; occasional ripple drift, common micaceous planes		0	51	6	70
Siltstone	fine and sandstone fine, complexly interlaminated and interlayered; ripple bedded throughout, occasional minor erosion surfaces. Locally developed minor load structures. Common micaceous planty planes. Rare iron-rich patches Sharp		1	08	7	78
Sandstone	fine to medium; core broken into 1 cm pieces though no sign of bedding sharp, erosional		0	20	7	98
Mudstone	silty, laminated. Common ironstone bands; rare worm tracks; rare plant debris		1	12	9	10
	Detached					
DEEP SOFT (part)	Coal (fragments)	0.19				
	Detached					
	Seatearth, silty mudstone, coal laminae (fragments)	0.16				
	Detached					
	Coal and dirt (fragments)	0.08				
		0.43	0	43	9	53
	Detached					
Seatearth Mudstone	silty, occasional coaly laminae. Abundant roots		0	56	10	09
COAL	and dirt (fragments and broken cylinders)		0	43	10	52

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Seatearth Mudstone	silty, occasional coaly laminae; common roots	1	22	11	74
Siltstone	fine to medium, unlaminated, granular texture. Occasional roots	0	79	12	53
Ironstone		0	12	12	65
Siltstone	fine to medium, poorly laminated, becoming muddy towards base. Occasional iron-rich patches; 0.11 ironstone band at base. Rare plant debris	0	83	13	48
Mudstone	silty, poorly laminated. Rare plant debris	0	13	13	61
Siltstone	medium, locally siltstone fine. Slurried texture near top. Poorly laminated; occasional faultlets. Occasional plant remains	0	54	14	15
Siltstone	fine, unlaminated with occasional siltstone medium passages. Slurried texture in basal 0.20. Common faultlets. Common plant remains including Neuropteris; common comminuted plant debris	0	43	14	58
Mudstone	laminated	0	06	14	64
Siltstone	fine, locally muddy, unlaminated; abundant faultlets. Common ironstone bands. Single Naiadites at 15.97. Occasional plant debris	2	29	16	93
Siltstone	medium with common sandstone fine laminae, 70:30. Occasional ironstone patches. Occasional faultlets. Sub-vertical unmineralised joint in basal 0.20 Occasional plant debris	0	40	17	33

SK/46/NE/447
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine, locally muddy, unlaminated	0	72	18	05
Siltstone	coarse, poorly laminated	0	48	18	53
CORE LOST		0	47	19	00
Mudstone	laminated, becoming slightly carbonaceous in basal 0.10. Core completely fragmented. Occasional ironstone bands; rare non-marine lamellibranch fragments. Rare guilielmites. Common worm tracks on some bedding planes	3	96	22	96
COAL	(fragments)	0	15	23	11
Seatearth Mudstone	core completely fragmented	0	29	23	40
Siltstone	coarse, unlaminated; abundant roots	0	25	23	65
Sandstone	fine with rare wispy thin siltstone fine laminae, becoming more common towards base. Common micaceous carbonaceous planes. Common sand-filled roots passage	0	35	24	00
Siltstone	fine to medium with rare sandstone fine laminae. Occasional iron-rich patches. Common comminuted plant debris	0	40	24	40
Mudstone	silty, poorly laminated; common ironstone bands. Occasional roots	0	25	24	65
Siltstone	fine with occasional wispy sandstone fine microlenses, 90:10; occasional ironstone bands. Common comminuted plant debris. Rare roots in top 0.10 Passage	0	60	25	25

SK/46/NE/44 + 50

COMMERCIAL IN CONFIDENCE

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine, laminated; occasional thin ironstone bands. Occasional plant fragments passage	0	35	25	60
Mudstone	silty, laminated sharp	0	29	25	89
Sandstone	fine with rare siltstone fine laminae; vaguely ripple bedded. Common micaceous planty planes. Common comminuted plant debris	0	09	25	98
Mudstone	silty, laminated, core fragmented. Occasional ironstone bands. Occasional worm tracks; abundant burrows in top 0.05 Detached	1	64	27	62
DEEP HARD (Upper Leaf)	Coal (fragments) Detached	0	27	27	89
Seatearth Siltstone	fine to muddy, grey; common ironstone nodules; common roots	0	51	28	40
Siltstone	fine to medium, unlaminated; common ironstone bands and nodules, becoming rare below 29.20; common roots	1	30	29	70
Siltstone	medium with occasional sandstone fine laminae. Occasional iron-rich patches. Rare roots, rare plant debris	0	20	29	90
Siltstone	fine with common thin sandstone fine laminae and layers, variously inclined. Common plant debris	2	20	32	10
Mudstone	silty, laminated. Common worm tracks on some bedding planes	0	90	33	00
Siltstone	fine, locally muddy, laminated; iron-rich layers in basal 0.10	0	37	33	37

SK/46/NE/44+
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	laminated. Occasional plant debris	0	09	33	46
Siltstone	fine, poorly laminated, occasional medium siltstone passages. Occasional iron-rich layers. Rare plant debris	0	44	33	90
Mudstone	silty, laminated, fining downwards. Occasional ironstone bands. Common worm tracks. passage	1	10	35	00
Mudstone	laminated; core fragmented. Rare plant remains	0	48	35	48
Siltstone	fine, poorly laminated. Occasional iron-rich layers. Rare plant remains including Lepidostrobus. Vague worm tracks, locally common small burrows	0	94	36	42
	CORE ANALYSED, 36.42 to 38.04				
Mudstone	silty, light grey	0	31	36	73
DEEP HARD (Main Leaf)	Coal, mostly bright 40) Coal, inferior bright, pyritic 19) cyl- Coal, bright 32) inders Coal, inferior bright, pyritic 3) Coal, mostly bright 21) 115 cm Dip less than 2° Recovery 100%	1	15	37	88
Seatearth Mudstone	light grey	0	16	38	04
Mudstone	silty, grey, common roots	0	26	38	30
Siltstone	coarse, unlaminated. Common roots	0	15	38	45

SK/40/NE/44 50 +

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with common thin sandstone fine laminae, 70:30. Common roots	0	57	39	02
Seatearth					
Sandstone	fine with occasional root-disturbed siltstone fine laminae. Common micaceous planty planes. Common iron-rich patches. Occasional roots	0	78	39	80
Siltstone	fine with common thin sandstone fine laminae, 70:30. Common small load and pouch structures. Occasional roots	0	15	39	95
Siltstone	fine with rare sandstone fine laminae and lenses. Occasional roots. Occasional plant remains	0	10	40	05
Siltstone	fine, poorly laminated. Occasional roots passage	0	35	40	40
Mudstone	laminated; occasional ironstone bands	0	20	40	60
Siltstone	fine with common, variously inclined sandstone fine laminae and layers, 60:40. Ripple-bedded throughout. Common micaceous planty planes. Common sand-filled burrows	0	60	41	20
Siltstone	fine with occasional muddy passages; 0.18 slurried layer at 41.47. Common plant debris. Occasional small burrows. passage	2	30	43	50
Mudstone	silty, poorly laminated passage	0	30	43	80
Siltstone	fine, poorly laminated. Occasional iron-rich layers. Common worm tracks	0	67	44	47
Mudstone	laminated; common ironstone bands Detached	1	43	45	90

SK/46/NE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES -- JUN 1982

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
1ST PIPER (Part)	Coal, dirty (fragments) Detached	0	29	46	19
Seatearth Mudstone	Core fragmented	0	91	47	10
Siltstone	fine, grey; common ironstone nodules Common roots	0	44	47	54
Mudstone	Core fragmented	0	57	48	11
Siltstone	fine with occasional muddy layers. Occasional ironstone nodules. Occasional roots. Common Neuropteris leaves below 48.50	0	59	48	70
Siltstone	fine, poorly laminated; rare ironstone nodules. Abundant plant remains including Mariopteris; Calamites; Neuropteris and Pinnularia	2	66	51	36
Siltstone	medium, poorly laminated. Abundant burrows in top 0.10; rare plant debris passage	0	84	52	20
Siltstone	medium with common thin sandstone fine laminae, 70:30; occasional ripples and minor erosion surfaces, common micaceous planty planes passage	1	55	53	75
Sandstone	fine with common siltstone fine laminae, 70:30. Common ripples and minor erosion surfaces. Common micaceous planty planes	1	37	55	12
Siltstone	fine with common thin sandstone fine laminae, 60:40. Common ripples. Common micaceous planty planes	0	28	55	40

COMMERCIAL IN CONFIDENCE

SK/46/NE/44
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

- JUN 1982

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Sandstone	fine with common siltstone fine laminae. Vaguely ripple bedded. Common micaceous planty planes	0	50	55	90
Sandstone	medium, generally massive, rare discontinuous micaceous planty planes showing vague dune bedding; conglomerate between 61.75 and 61.82. Occasional thin fine siltstone layers. Common sub-vertical mineralised joints sharp	6	87	62	77
Siltstone	fine and sandstone fine, interlayered. Common ripples and minor erosion surfaces	0	81	63	58
Sandstone	medium, massive. Common sub-vertical unmineralised joints	1	05	64	63
Siltstone	fine and sandstone fine; interlayered; common mineralised joints. Common ripples, common micaceous planty planes passage	1	57	66	20
Siltstone	fine, poorly laminated, common listric surfaces. Common sub-vertical joints. Rare horizons with thin sandstone fine laminae. Rare plant debris. passage	2	90	69	10
Siltstone	medium, poorly laminated	1	10	70	20
Sandstone	fine with common siltstone fine laminae, 70:30. Occasional ripples. Detached	0	86	71	06
COAL	and dirt (broken cylinders)	0	34	71	40
Seatearth Mudstone	unlaminated; grey; rare coal streaks Detached	0	13	71	53

SK/46/NE 44 + 50

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
COAL AND DIRT	Coal, bright 0.05 (cylinder) Coal and dirt 0.14 (broken cylinders 0.19 and fragments) Detached	0	19	71	72
Seatearth Mudstone	unlaminated, grey; abundant listric surfaces; abundant roots	0	29	72	01
Siltstone	fine, poorly laminated; abundant roots	0	57	72	58
Siltstone	fine, poorly laminated; rare ironstone nodules; rare roots; common plant debris	0	42	73	00
Mudstone	silty, poorly laminated, common listric surfaces; common roots	0	82	73	82
Seatearth Mudstone	grey, common coal streaks, abundant roots	0	17	73	99
Siltstone	medium, grey; occasional ironstone nodules, common roots	0	45	74	44
Sandstone	fine with common siltstone fine laminae, 60:40. Occasional ironstone nodules. Common roots in top 0.05; rare below. passage	0	21	74	65
Siltstone	fine, unlaminated; rare plant remains	1	06	75	71
Siltstone	fine with common sandstone fine laminae, 70:30. Common vague ripples. Common micaceous planty planes Sharp	0	35	76	06
Mudstone	silty, laminated; rare non-marine lamellibranchs	0	14	76	20

SK/46/NE/44 + 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine, poorly laminated; rare plant debris	0	60		
	passage			76	80
Mudstone	silty, poorly laminated; rare plant debris	0	19		
				76	99
Siltstone	fine, poorly laminated; occasional muddy passages; common small burrows	1	99		
				78	98
Mudstone	very weak, core completely fragmented; occasional ironstone bands	3	65		
				82	63
Mudstone	carbonaceous, shaly. Common ostracods. Rare plant remains including Lepidodendron and Neuropteris	0	26		
	Attached			82	89
COAL	and dirt (cylinder)	0	04		
	Attached			82	93
Mudstone	carbonaceous, shaly. Locally common ostracods. Locally common fish scales.	0	06		
	Detached			82	99
Mudstone	and Coal. Abundant plant fragments (cylinder)	0	12		
	Detached			83	11
Seatearth Mudstone	silty, unlaminated, grey, occasional irregular listric surfaces, abundant roots	0	31		
				83	42
Siltstone	fine, muddy, unlaminated, grey; occasional ironstone bands; common roots	0	36		
				83	78
Mudstone	silty with local muddy siltstone passages; core completely fragmented; common roots, becoming rare towards base	1	34		
	sharp			85	12
Sandstone	medium; common micaceous planty planes; rare roots	0	31		
				85	43

SK46 INE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	laminated, fissile, core locally completely fragmented; occasional ironstone bands up to 0.04 thick; locally common worm tracks	0	77		
	sharp			86	20
Mudstone	highly carbonaceous, shaly; core completely fragmented in top 0.22; common ostracods including Geisina	0	40		
				86	60
CORE LOST		0	60		
				87	20
Mudstone	carbonaceous, poorly laminated in top 0.30, becoming shaly below; locally very weak. Locally common non-marine lamellibranchs, some with mineralised shells. Locally common ostracods including Geisina; occasional ironstone bands up to 0.04 thick	2	91		
	passage			90	11
Mudstone	laminated, very weak, occasional ironstone bands; occasional non-marine lamellibranchs near top	0	96		
				91	07
	CORE ANALYSED 91.07 TO 93.07				
Mudstone	shaly with non-marine lamellibranch fragments	0	11		
				91	18
TUPTON	Coal, inferior bright — 11 part fragmented				
	Coal, mostly bright — 28)				
	Mudstone, grey — 3)				
	Coal, bright — 10) cylinders				
	Mudstone, dark grey — 3)				
	Coal, bright — 96)				
	Coal, bright — 3 fragments				
	Core lost, assumed coal — 22				
	176 cm				
	Pull-out at 92.68. Dip less than 2°				
	Recovery 85% (Based on borehole recorder)	1	76		
				92	94
Seatearth Mudstone	silty, light grey; ironstone nodules	0	13		
				93	07

COMMERCIAL IN CONFIDENCE

Sk/46/NE/44+50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES -- JUN 1982

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	medium, unlaminated, grey; abundant roots becoming common below 94.50; occasional root nodules below 94.70	1	83	94	90
Siltstone	medium with occasional root-disturbed sandstone fine laminae 80:20, becoming 70:30 below 95.40; common root nodules; common roots sharp	1	14	96	04
Siltstone	medium, slurried texture	0	30	96	34
Siltstone	medium with rare sandstone fine wisps and micro-lenses; strong; rare root nodules; locally abundant small burrows towards base; rare plant debris passage	2	01	98	35
Siltstone	fine to medium with common sandstone fine laminae and lenses, 70:30; occasional micaceous planty planes; occasional minor erosion surfaces; occasional small load casts; common comminuted plant debris sharp	0	87	99	22
Mudstone	laminated, fissile, weak; occasional ironstone nodules; locally common worm tracks	0	52	99	74
Siltstone	fine with common sandstone fine laminae, 80:20 sharp	0	08	99	82
Mudstone	laminated, shaly, weak; occasional ironstone bands; locally common worm tracks	0	42	100	24
	CORE ANALYSED 100.24 to 101.40				
Mudstone	light grey	0	28	100	52
THREEQUARTER	Coal, bright 72 cylinders Coal, bright 4 fragments 76 cm				
	Dip less than 2°, Recovery (based on borehole recorder) 99%.	0	76	101	28

SK/46/NE/44+

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Seatearth Mudstone	silty, grey	0	10	101	38
Siltstone	fine, grey	0	02	101	40
Siltstone	fine with common root-disturbed sandstone fine laminae, 60:40; abundant roots	0	14	101	54
Sandstone	fine with occasional discontinuous micaceous planty planes; common roots	0	28	101	82
Siltstone	medium with common sandstone fine laminae and layers, 70:30; common roots	0	33	102	15
Mudstone	with occasional ironstone bands. Core completely fragmented; occasional roots	0	60	102	75
Siltstone	fine, unlaminated; common roots sharp	0	41	103	16
Sandstone	fine to medium with rare siltstone fine laminae; locally vaguely ripple bedded, well developed ripple sets in basal 0.20; common micaceous planty planes; occasional iron-rich patches; rare roots in top 0.50 sharp	1	68	104	84
Siltstone	fine to medium with rare wispy thin sandstone fine laminae in top 0.30; common worm tracks and small burrows; single non-marine lamellibranch at 105.63	1	04	105	88
Siltstone	fine and sandstone fine; variously interlayered and interlaminated; occasional ripples; rare minor erosion surfaces; common micaceous planty planes	0	36	106	24

SK/46/NE/44 + 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Sandstone	fine with rare siltstone fine laminae; occasional iron-rich patches; occasional large load-and-pouch structures	0	86	107	10
Siltstone	medium with occasional sandstone fine laminae, 90:10; common minor load structures and isolated sandstone pouches in top 0.50	1	40	108	50
Sandstone	fine and siltstone fine, interlayered and interlaminated; locally developed ripples with ripple sets, occasional minor erosion surfaces; common micaceous planty planes; occasional large load-and-pouch structures	1	70	110	20
Sandstone	fine with rare siltstone fine laminae; occasional discontinuous micaceous planty planes; vague ripple bedding throughout; occasional sand-filled burrows passage	2	60	112	80
Siltstone	fine with common sandstone fine laminae; 60:40, becoming 80:20 below 113.10; locally ripple-bedded; occasional sand-filled burrows; common micaceous planes passage	0	40	113	20
Siltstone	fine with rare sandstone fine laminae and isolated lenses; occasional sandstone dominant layers up to 0.03 thick; occasional sand-filled burrows; common comminuted plant debris in sand-dominant layers; single non-marine lamellibranch at 113.25. passage	0	80	114	00
Siltstone	fine to medium, poorly laminated; occasional plant debris; abundant burrows throughout. passage	0	80	114	80
Siltstone	fine, muddy, laminated; occasional thin ironstone bands, rare plant debris, common burrows	0	26	115	06

SK/46/NE/44+

COMMERCIAL IN CONFIDENCE

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- - JUN 1982

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with rare sandstone fine laminae and isolated lenses; occasional iron-rich patches; common sand-filled burrows sharp	0	26	115	32
Mudstone	silty, laminated; core completely fragmented below 117.00; occasional thin ironstone bands; common worm tracks on some bedding planes; locally common small burrows sharp	2	23	117	55
Siltstone	medium and sandstone fine, interlaminated and interlayered; strong; common micaceous planty planes; rare roots	0	45	118	00
Siltstone	fine, poorly laminated with rare sandstone fine wisps near the base; rare root nodules; rare roots	0	67	118	67
Sandstone	fine with rare siltstone fine laminae; common iron-rich layers; common micaceous planes; locally poorly developed ripples; common sand-filled burrows towards the base short passage	0	68	119	35
Siltstone	fine with common sandstone fine laminae and ripple marked lenses, 80:20; occasional iron-rich patches sharp	0	27	119	62
Sandstone	fine with occasional siltstone fine laminae and layers, 90:10; occasional small load structures; sub-vertical mineralised joint throughout	0	45	120	07
Siltstone	medium to fine, laminated; common burrows in top 0.05	0	83	120	90

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Sandstone	fine with occasional siltstone fine laminae and layers 90:10; occasional discontinuous micaceous planty planes. Inclined, erosional contact	0	52	121	42
Siltstone	medium to coarse with occasional sandstone fine pouches and layers 90:10; strong. sharp	0	54	121	96
Mudstone	silty, laminated; occasional thin ironstone bands, rare comminuted plant debris; locally common small burrows; single non-marine lamellibranch at 122.08 passage	0	34	122	30
Siltstone	fine, poorly laminated; occasional iron-rich patches; occasional small burrows near the base	1	35	123	65
Siltstone	medium with rare sandstone fine laminae and lenses; common burrows	0	22	123	87
Siltstone	coarse with occasional irregular sandstone fine laminae, strong	0	25	124	12
Siltstone	fine, locally muddy, poorly laminated; occasional ironstone bands; 45 degree polished break at 125.43; rare plant remains including Calamites	2	26	126	38
Mudstone	silty, laminated, occasional ironstone bands; locally common worm tracks	1	54	127	92
Mudstone	laminated, weak, core completely fragmented in parts	0	53	128	45
Mudstone	dark, slightly carbonaceous, shaly; rare fish remains including scales	0	11	128	56

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	laminated, core completely fragmented	0	19	128	75
Mudstone	carbonaceous, shaly	0	04	128	79
Mudstone	laminated, dark; occasional thin ironstone bands	1	34	130	13
	CORE ANALYSED 130.13 TO 131.91				
Mudstone	grey	0	10	130	23
YARD	Coal, inferior bright 5 cylinders Mudstone, grey, listric 14 fragments Mudstone, dark grey 5) Coal, inferior bright and dull 14) cylinders Coal, bright 51) Core lost, assumed coal 29) 118 cm				
	Dip less then 2°. Recovery (based on borehole recorder) 75%. Pull-out at 130.68	1	18	131	41
Seatearth Siltstone	fine, light grey; a few ironstone lenses	0	50	131	91
Siltstone	fine, unlaminated, grey; occasional ironstone nodules; abundant roots	0	29	132	20
Siltstone	medium, unlaminated; common roots becoming rare to base; occasional root nodules. passage	0	50	132	70
Siltstone	fine, poorly laminated; common comminuted plant debris; rare roots passage	0	40	133	10
Siltstone	fine, muddy, laminated; rare roots and root nodules in top 0.10; 0.04 ironstone at base	1	18	134	28

SK/46/NE/44
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Section of: MARKHAM NOS. 16 (UP) 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Mudstone	dark, laminated; common worm tracks	0	18	134	46
Mudstone	carbonaceous, poorly laminated; occasional fish remains including spines and scales. detached, fitting	0	04	134	50
BLACKSHALE 4TH LEAF	Coal, dirty 5 cylinder Coal, bright 9 cylinder 14 detached, inclined	0	14	134	64
Seatearth Mudstone	silty, unlaminated; common inclined listric surfaces; common roots	0	05	134	69
Siltstone	fine, iron-rich; abundant roots	0	20	134	89
CORE LOST		0	35	135	24
Mudstone	laminated, very weak; occasional ironstone bands; common worm tracks sharp	0	65	135	89
Siltstone	fine, locally muddy, poorly laminated; occasional ironstone bands; rare roots in top 0.20; locally vaguely wormy. passage	1	11	137	00
Siltstone	medium, unlaminated, barren	0	60	137	60
Siltstone	fine, locally muddy, poorly laminated; barren	1	50	139	10
Siltstone	medium, poorly laminated; occasional slurried layers; barren passage	1	20	140	30
Siltstone	fine, poorly laminated with occasional siltstone medium passages, very rare comminuted plant debris	2	60	142	90

sk/46/NE/44+ 50

COMMERCIAL IN CONFIDENCE

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

--JUN 1982

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with common thin sandstone fine laminae, 80:20 becoming 90:10 towards the base; occasional iron-rich layers; rare minor erosion surfaces; 0.04 ironstone band at base; common small sand-filled burrows	0	76	143	66
Mudstone	silty, laminated, very weak	0	11	143	77
Siltstone	fine, muddy, laminated; occasional ironstone bands up to 0.08 thick sharp	1	18	144	95
Mudstone	laminated, very weak; common worm tracks	0	17	145	12
	CORE ANALYSED 145.12 TO 146.67				
Mudstone	shaly	0	08	145	20
BLACKSHALE LEAVES 1 to 3	Coal, bright 39 cylinders Coal, bright 7 fragments Coal, bright 14 cylinders Coal, bright 9 fragments Coal, bright; with 50° dip slickensided breaks) 46 cylinders 115 cms				
	Dip less than 2°. Recovery (based on borehole recorder) 90%. Pull-out at 145.88	1	15	146	35
Seatearth Mudstone	dark grey	0	01	146	36
Siltstone	fine, light grey	0	31	146	67
Mudstone	silty, very weak, unlaminated, grey; abundant roots	0	07	146	74
Siltstone	medium to coarse, strong; unlaminated, grey; abundant roots	0	22	146	96
Siltstone	fine to medium, unlaminated, grey; abundant roots including Stigmaria becoming common towards base; occasional root nodules below 147.25	0	54	147	50

SK/46/NE/44
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	medium, unlaminated, with rare, diffuse siltstone coarse layers, strong; occasional roots in top 0.25; 0.04 septarian ironstone at base	1	04	148	54
Siltstone	fine with occasional siltstone medium passages, unlaminated; rare plant remains including Neuropteris sharp	1	17	149	71
Sandstone	fine with occasional irregular siltstone fine laminae, 90:10. Common large load-and-pouch structures	0	42	150	13
Siltstone	medium, unlaminated; barren	0	19	150	32
Sandstone	fine with common discontinuous micaceous planty planes; ripple bedded throughout with well developed ripple sets; occasional minor erosion surfaces inclined	0	25	150	57
Siltstone	fine with rare sandstone fine laminae and disconnected lenses	0	38	150	95
Sandstone	fine with rare highly disturbed siltstone fine laminae; complex load-and-pouch structures throughout	0	46	151	41
Siltstone	medium with occasional complex, isolated siltstone and sandstone pouches	0	28	151	69
Sandstone	fine with rare siltstone fine laminae; highly contorted bedding; common large load structures	0	12	151	81
Siltstone	fine to medium, laminated; common micaceous bedding planes	0	73	152	54

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with common sandstone fine laminae and layers 70:30 becoming 60:40 towards base; locally well developed ripples; locally common ripple lenses below 156.00; common small scale load-and-pouch structures; common micaceous planty planes; rare minor erosion surfaces; mineralised joint between 155.34 and 155.58 Inclined, sharp	5	56	158	10
Sandstone	medium, generally massive; occasional siltstone fine laminae in top 0.50; occasional iron-rich layers showing vague dune bedding; sub-vertical mineralised joint in top 0.70; rare burrows towards base sharp	11	64	169	74
Siltstone	and sandstone interlaminated and inter-layered; common vague ripples; abundant plant debris; occasional sand-filled burrows sharp	0	50	170	24
Mudstone	slightly silty, poorly laminated ; dark; slightly carbonaceous, occasional plant debris	0	33	170	57
Mudstone	carbonaceous, shaly, cleated; locally abundant coalified plant debris	0	26	170	83
COAL	and dirt	0	04	170	87
Mudstone	dark, slightly carbonaceous, poorly laminated; common irregular listric surfaces; abundant plant debris in top 0.04	0	36	171	23
Mudstone	carbonaceous, laminated; common guilielmites in top 0.10; rare Naiadites fragments; rare coalified plant fragments sharp; inclined	0	27	171.50	
Sandstone	fine with rare siltstone fine laminae, vague ripple bedding	0	05	171	55

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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine and sandstone fine; ripple bedded throughout with well developed ripple sets; occasional minor erosion surfaces; common micaceous planty planes.	0	21	171	76
Siltstone	fine with occasional siltstone - with - sandstone layers; load structures within sandy layers	0	20	171	96
Siltstone	fine and sandstone fine, interlaminated and interlayered; common ripples through-out; common small sand-filled burrows.	0	39	172	35
Siltstone	fine with rare sandstone fine micro-lenses; occasional ironstone patches; sub-vertical mineralised joint below 172.80 rare plant debris	1	12	173	47
Sandstone	medium with common micaceous planty planes; vague ripple bedding.	0	13	173	60
Siltstone	fine with occasional sandstone fine laminae and lenses 90:10; occasional iron-rich patches	0	70	174	30
Siltstone	fine, laminated; occasional ironstone bands	0	55	174	85
Mudstone	laminated, common worm tracks	0	55	175	40
Mudstone	highly carbonaceous, shaly; barren	0	68	176	08
Seatearth					
Siltstone	medium with occasional highly disturbed sandstone fine laminae, 80:20, abundant roots	0	57	176	65
Siltstone	fine to medium, poorly laminated; common roots becoming rare to base; occasional root nodules; 0.05 "oolitic" ironstone band at base	1	26	177	91

SK/46/NE/447
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Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine to muddy, laminated; occasional ironstone patches; occasional plant debris including Calamites	0	47	178	38
Mudstone	laminated; core completely fragmented; 0.08 ironstone at base sharp	0	52	178	90
Mudstone	silty, laminated; core completely fragmented	0	60	179	50
Mudstone	dark, laminated; core completely fragmented	0	78	180	28
CANNEL		0	36	180	64
Mudstone	laminated; occasional ironstone bands; core completely fragmented	0	76	181	40
Siltstone	fine, laminated; common ironstone bands	0	50	181	90
Siltstone	fine with common sandstone fine laminae and lenses, 80:20 becoming 70:30 in basal 0.20; local ripple bedding; rare minor erosion surfaces; rare sand-filled burrows; rare plant debris	0	88	182	78
Siltstone	fine with rare wispy thin sandstone fine laminae and disconnected lenses passage	2	02	184	80
Mudstone	silty laminated;	0	32	185	12
Siltstone	fine laminated; occasional ironstone bands	0	61	185	73
Mudstone	dark, laminated	0	26	185	99
Mudstone	highly carbonaceous, sub-canneloid; rare fish scales	0	14	186	13

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COMMERCIAL IN CONFIDENCE

--JUN 1982

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
COAL	bright (fusain in top 0.01)	0	05	186	18
Seatearth Mudstone	core completely fragmented	0	02	186	20
Sandstone	fine with rare highly disturbed siltstone fine laminae; abundant roots; occasional root nodules	1	09	187	29
Siltstone	fine to medium, poorly laminated; common roots and occasional root nodules sharp	0	35	187	64
Sandstone	fine with rare, locally highly disturbed siltstone fine laminae and thin layers; common micaceous planty planes; occasional large load-and-pouch structures; vague ripples below 88.40; rare roots in top 0.10 Sharp, slightly erosional	2	80	190	44
Siltstone	fine to medium with occasional sandstone fine laminae, 80:20; occasional small load structures; locally common small burrows passage	0	36	190	80
Siltstone	medium, poorly laminated	1	02	191	82
Mudstone	laminated	0	16	191	98
COAL AND DIRT	Coal, bright 3 Mudstone 1 Coal 4 Coal and dirt 2	0	10	192	08
Seatearth Mudstone	core completely fragmented	0	12	192	20

SK/46/NE/44+ 50

Section of: MARKHAM NOS. 16 (UP) AND 17 (DOWN) UNDERGROUND BOREHOLES

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m	THICKNESS cm	DEPTH m	DEPTH cm
Siltstone	fine with common highly disturbed sandstone fine laminae 70:30; common roots	0	25	192	45
Sandstone	fine with rare siltstone fine laminae; bedding highly disturbed by large load structures and occasional roots	0	38	192	83
Siltstone	fine with occasional sandstone fine laminae; 90:10 becoming 80:20 below 193.30; vague ripple bedding, rare minor erosion surfaces; common diffuse ironstone bands; rare roots; common comminuted plant debris in basal 0.30	1	22	194	05
Siltstone	medium, poorly laminated, occasional diffuse ironstone bands; rare thin sandstone fine layers below 195.00 showing minor load and pouch structures; occasional faultlets; rare worm tracks and burrows	3	51+	197	56

Base of borehole at 197.56

NORTH DERBYSHIRE AREA
NATIONAL COAL BOARD

SK/46/NE/44+

SURVEY DEPARTMENT

BOREHOLE DATA AND HISTORY

BOREHOLE NAME: MARKHAM N°16 UNDERGROUND UP-BORE

Approximate Location: 2,635 METRES S 7°W OF BOLSOVER COLLIERY

National Grid Reference: E. 445744 N 368403.

6 inch sheet: SK 46 N E.

Level of Origin: 376 metres BELOW O.D.

Date of Drilling: Commenced 23 - 11 - 1980
Finished 16 - 4 - 1981.

Contractor's Name: N.C.B.

Name of Boremaster: DRILLER IN CHARGE B. WARD

Depth (m)	Diameter of Core (mm)	Diameter of Hole (mm)
0 to 10.05m	OPEN HOLE	88.90
10.05m to 146.54	NQU CORE	69.90

Drilling Difficulties: AT 5/1/81 HAD DRILLED 90 METRES, AFTER THAT HAD REPEATED TROUBLE WITH PRESSURE SETTING VALVES, URETHANE WASHERS ON CORE BARREL HEAD & OVERSHOT BUT GREATEST DIFFICULTIES WITH SEAT EARTH BELOW 2ND WATERLOO SEAM, THIS AREA CAVED REPEATEDLY CAUSING DRILLERS TO WITHDRAW RODS SEVERAL TIMES.

Method of Sealing Off Borehole: PUMPED 1150 KILOGRAMS SHALLOW OIL WELL CEMENT. API Class B MIXED WITH 615 LITRES OF FIRE MAIN WATER UP THE BOREHOLE UNTIL A PRESSURE OF OVER 200 lbs/□" WAS RECORDED - HOLE CHECKED SINCE - CEMENT SOLID AT BASE OF UP-BORE.

Purpose fulfilled by Borehole: OBTAINED CORE OF 2ND WATERLOO SEAM & 2ND ELL, PROVED THICKNESS OF SANDSTONE CHANNEL ABOVE 2ND WATERLOO ROOF & INTERVAL BETWEEN ROOF OF SEAM & SANDSTONE CHANNEL.

Official Responsible for above Report:

A. F. BOWNER

for. Area Chief Surveyor & Minerals Manager