

1980 DIAMOND DRILL

HOLE LOGS

MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-34

DRILLED FOR: Ranger Oil Limited  
DRILLED BY: Tonto Drilling Ltd.

LOCATION: EB Pit Area

COLLAR ELEVATION: 1701.6 m --  
TOTAL DEPTH: 103.09 m  
CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.  
Focussed Beam (Resistivity) Log: Normal, Expanded.  
Density: Normal, Expanded.  
Caliper.  
Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

	<u>Interval (m)</u>	<u>Thickness (m)</u>
D	12.32-15.52	3.20
C	31.12-35.63	4.51
B	72.59-76.73	4.14
A	90.00-91.34	1.34

0

GATES D SEAM

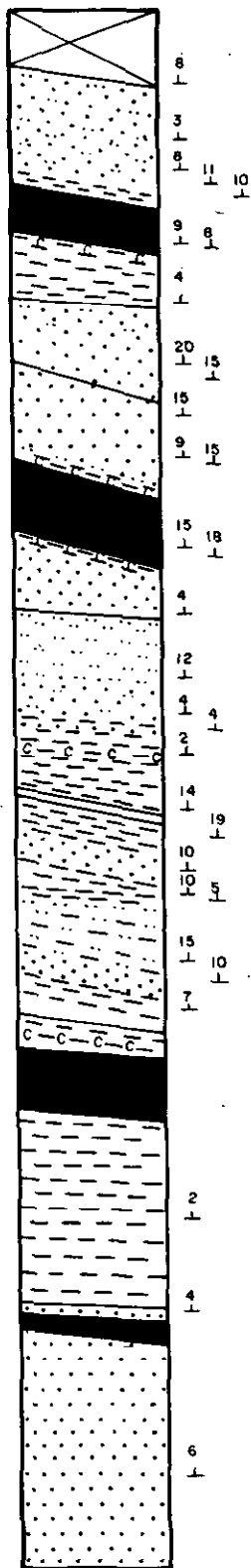
GATES C SEAM

GATES B SEAM

GATES A SEAM

TORRENS MBR.

106.7



Prepared by:  
 ROBERTSON RESEARCH CANADA LIMITED  
 for  
 RANGER OIL (CANADA) LTD.

STRATIGRAPHIC LOG  
 MS 34

DATE: October 1980

Scale 1:500

PAGE 1 of 1

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

R %	INTERVAL	SAMPLE NO.		AIR DRY BASIS						
	(M)	PLY	COMP.	MOIST. %	ASH%	VM.%	F.C. %	S.%	F.S.I.	S.G.
77	1.31	501		1.2	12.5	21.7	64.6	0.53	4	1.38
100	0.20	502			63.6			0.19	NA	2.06
100	1.68	503		2.3	15.5	20.6	61.6	0.43	NA	1.45

DEPTHS

12.32 m

501

CORE LOSS 0.37 m

502

503

15.52 m

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 34 D SEAM

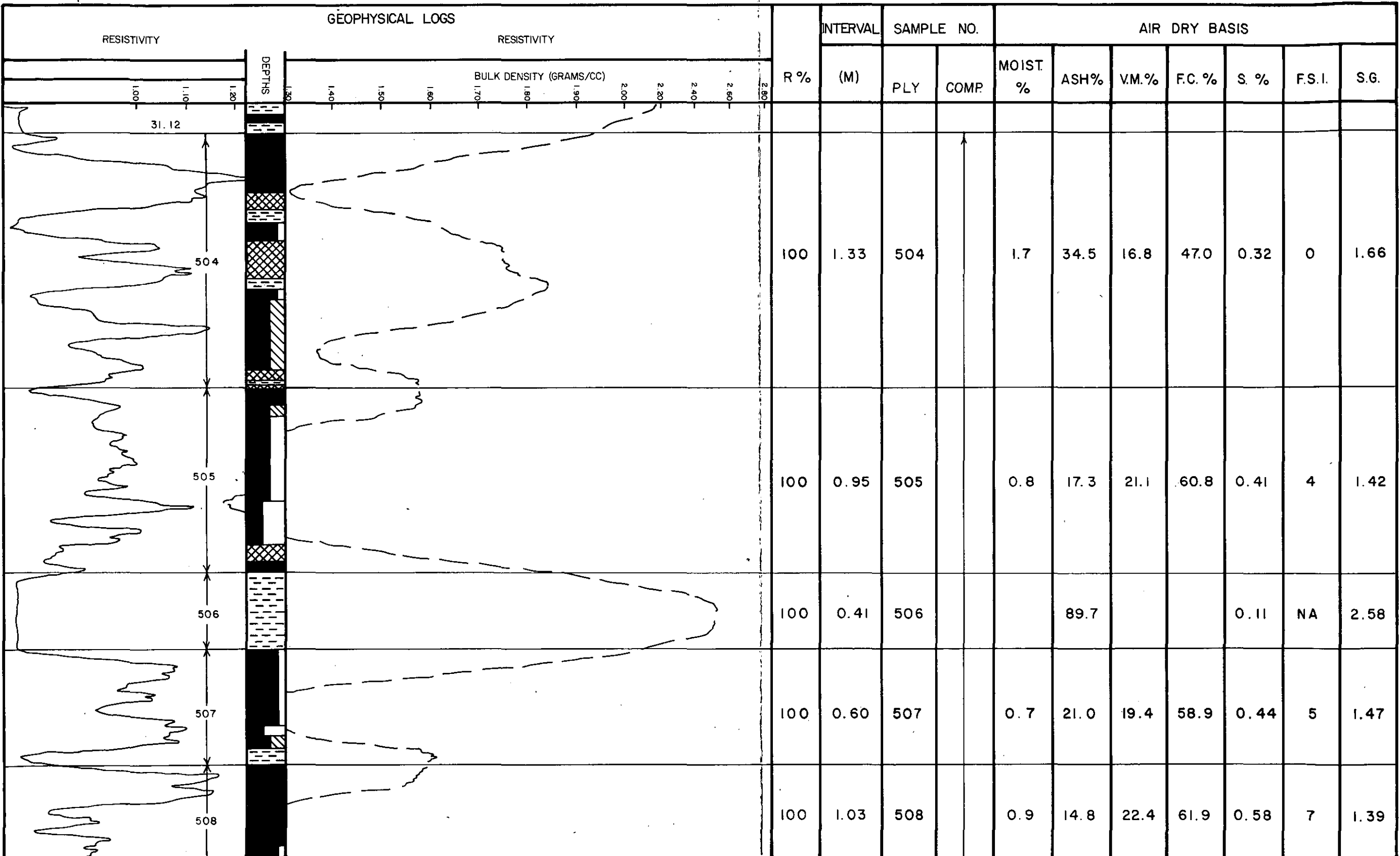
DATE: OCTOBER 1980

SCALE: 1:20

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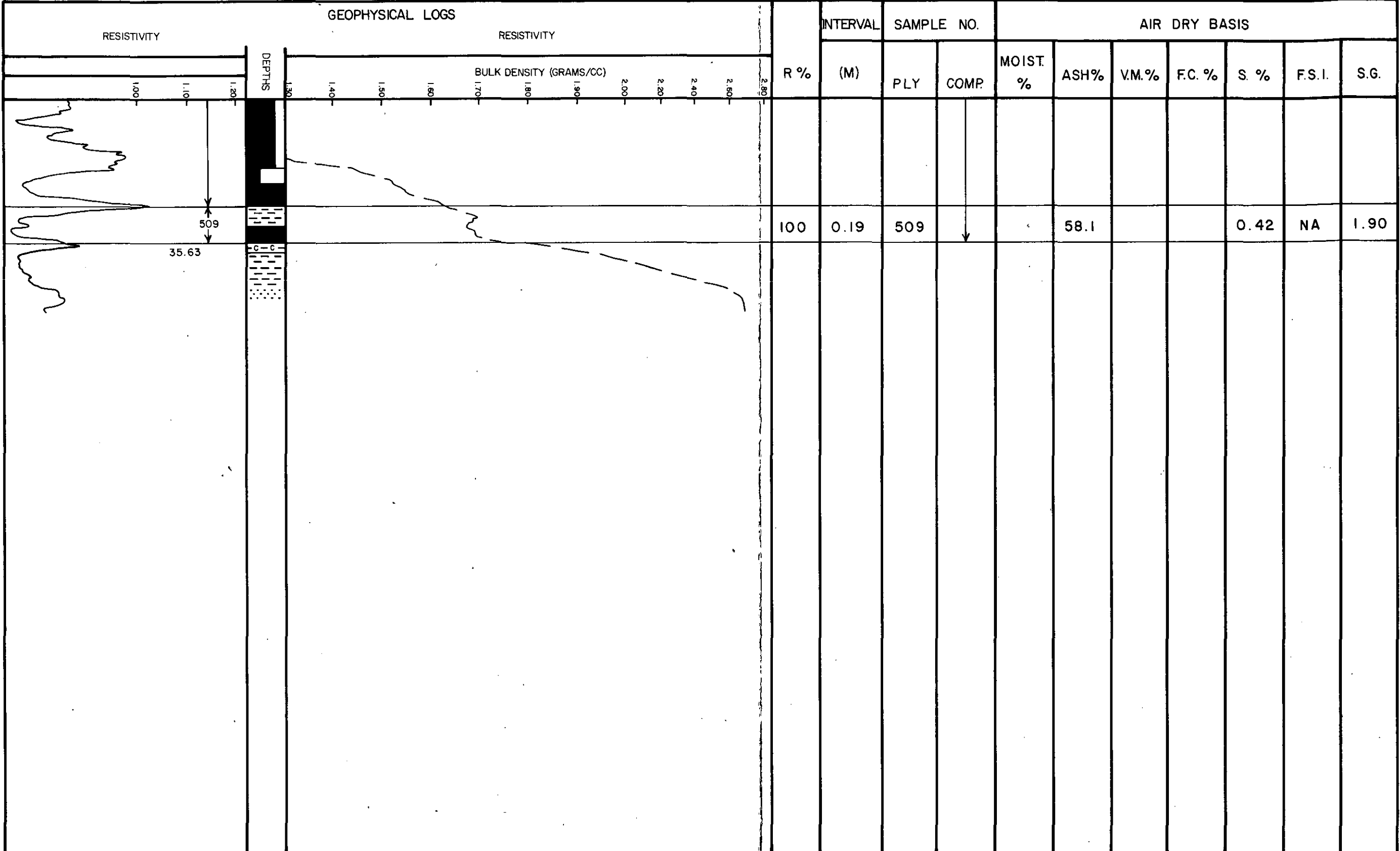
GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 34 C SEAM

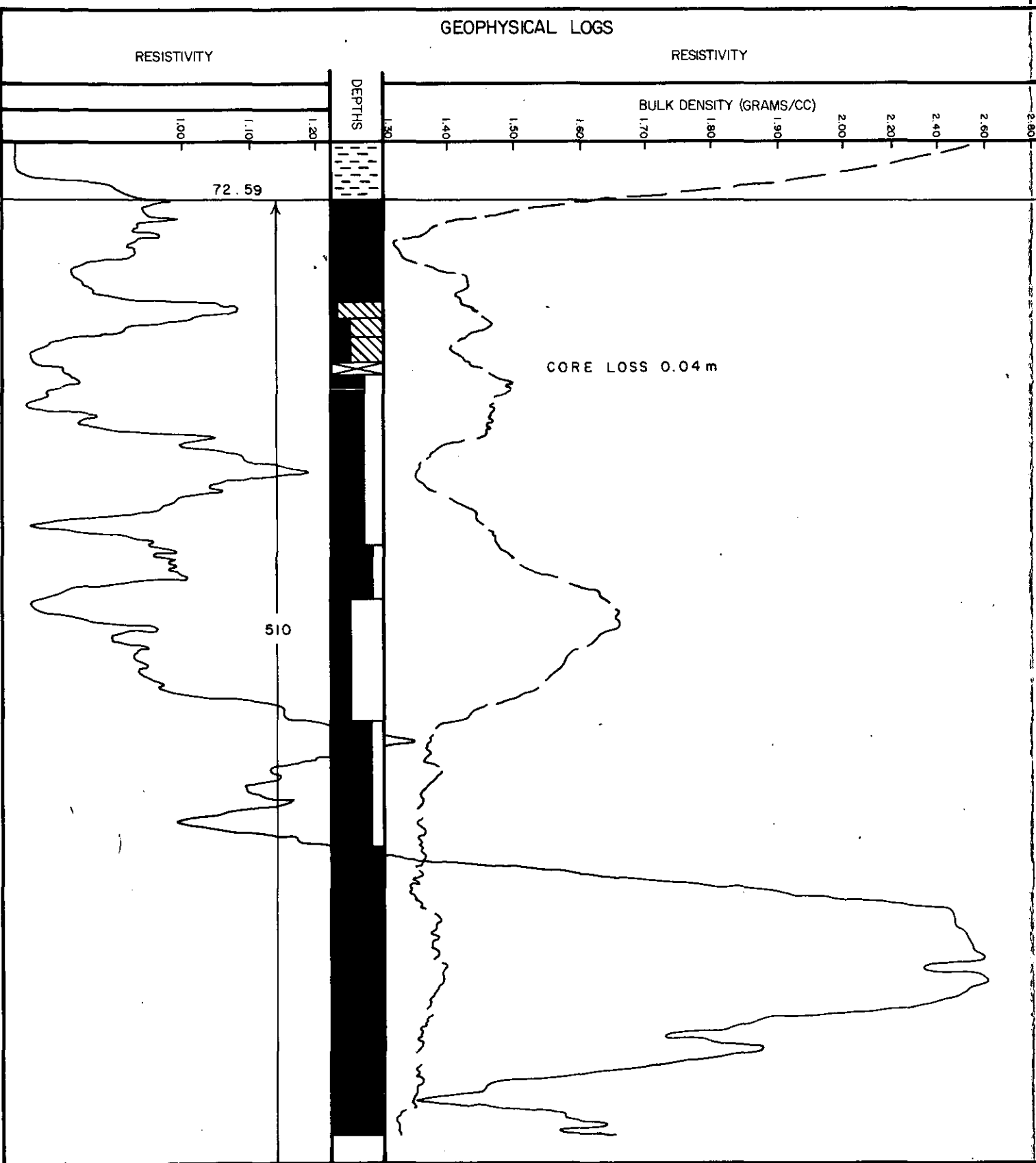


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 ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
 BULK DENSITY - - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 34 C SEAM**

GEOPHYSICAL LOGS

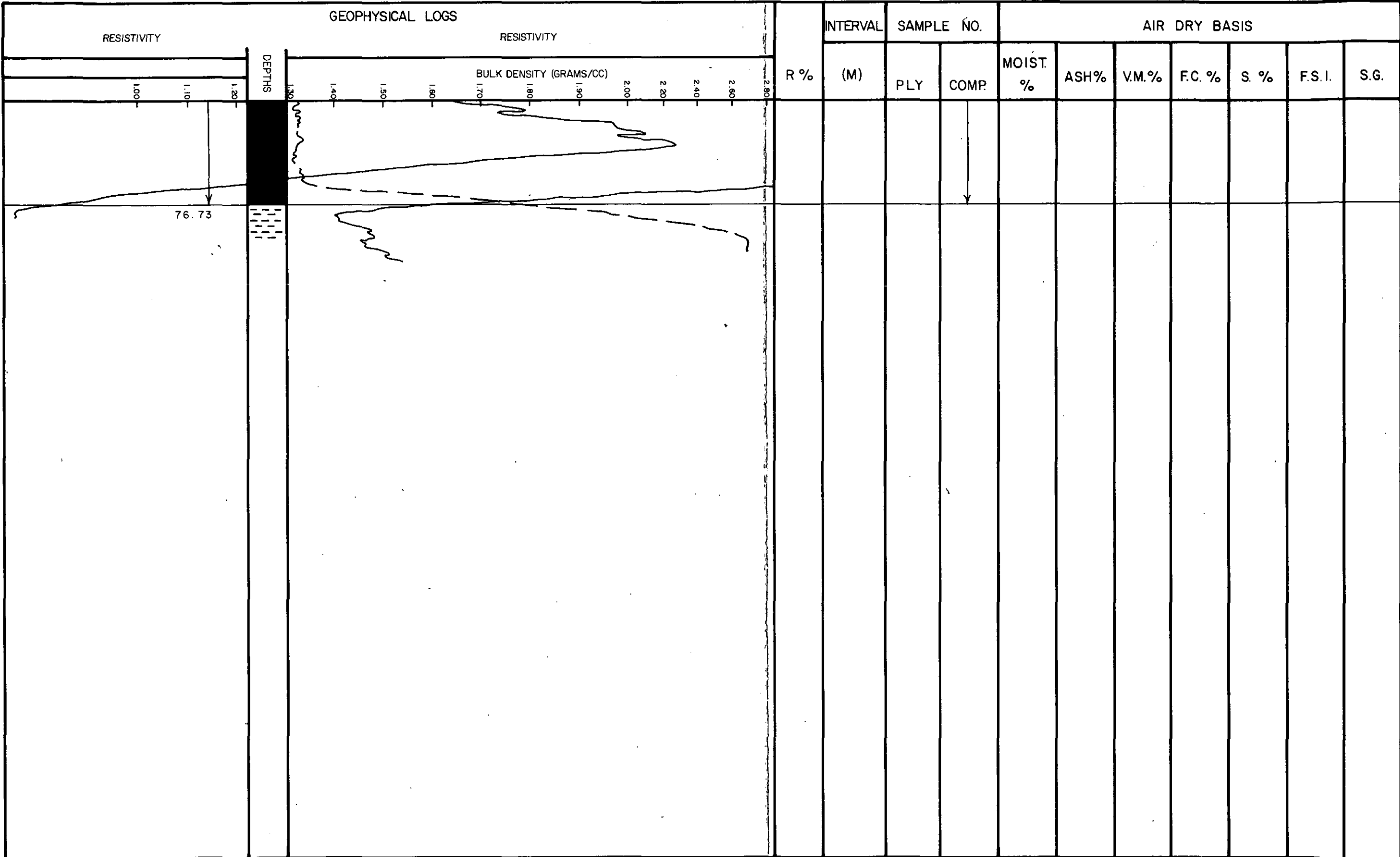


R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
99	4.14	510		1.0	15.3	20.9	62.8	0.40	2	1.43

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 34 B SEAM



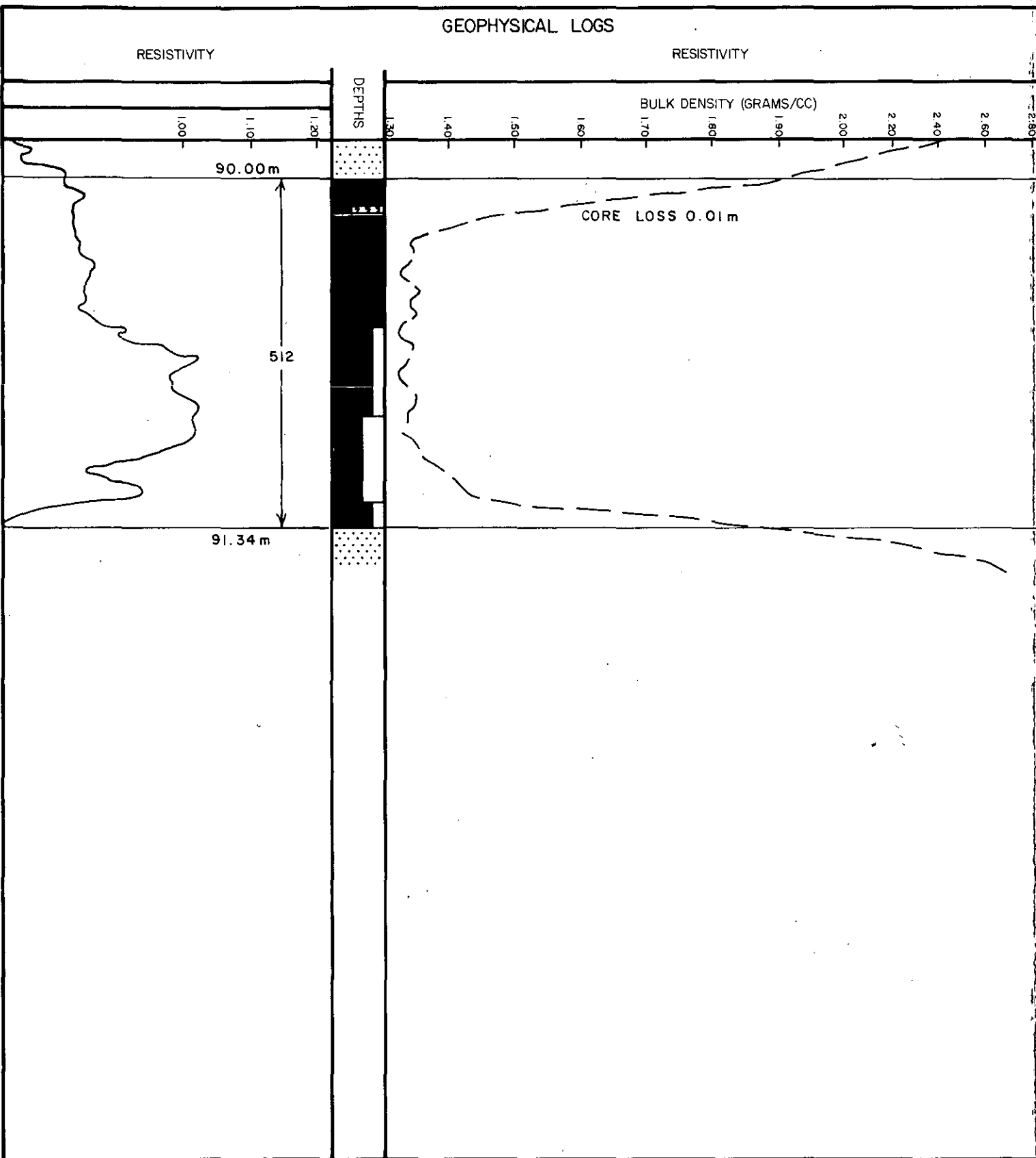
Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED  
 DATE: OCTOBER 1980

RESISTIVITY ———  
 BULK DENSITY - - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
 MS 34 B SEAM**

SCALE: 1:20

GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
99	1.34			1.4	12.6	19.5	66.5	0.55	1.5	1.40

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 34 A SEAM

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 34

SHEET No.: 1

DATE BEGUN:

TOTAL DEPTH: 103.09 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR: 1701.6

COAL LICENSE:

LAT: 6107633.1m

LONG: 602174.9

LOGGED BY: L. Little

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	4.40	8.61	4.21	4.17			Box No. 1	.57
								.73
8							SANDSTONE: fine grained, 25% siltstone crossbedded light grey	.69
						7.9	bedding plane oxidized Box No. 2	.33
								.32
								.72
								.15
3	8.61	10.53	1.92	1.92			SILTSTONE: Dark grey bedding planes oxidized	.57
						11.0		.72
								.60
								.03
8	10.53	11.40	0.87	0.86			SANDSTONE: medium grained, light grey, 10% siltstone crossbedded	.67
								.20
11	11.40	12.32	0.92	0.90			MUDSTONE: black, 10% carbonaceous partings	.47
						12.7		.33
								.07
10	12.32	15.52	3.20	3.15			COAL: bone .13 Gates "D" Seam	.18
							80% .11 oxidized along Box No. 4	.66
						14.0	30% .13 cleats	.13
							80% .44	.45
							Core loss .37 40% .16 soft & sheared	.68
							40% .04	.70
						16.0	Mudstone .20 Box No. 5	.09
							80% .18	
							40% .22 oxidized cleats	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 2

HOLE NO.: MS 34

DATE BEGUN:

TOTAL DEPTH: 103.09 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY: L. Little

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							80% .18	
							40% .12 oxidized cleats	
							80% .17	
							60% .29	
							Mudstone .03	
							80% .40 minor oxidized cleats	
							80% .09 broken	
9	15.52	15.89	0.37	0.37			CARBONACEOUS MUDSTONE: 15% coal, black oxidized joints	.26
8	15.89	19.55	3.66	3.62		17.1	MUDSTONE: dark grey, 30% siltstone moderate crossbedding	.25 .52 .70
							Core Loss 0.78 Box No. 6	.67
							Moderately sharp floor contact	.72 .02
4	19.55	23.50	3.95	3.94		20.1	SANDSTONE: 30 siltstone, light grey, medium grained crossbedded beds .08 to .20	.03 .59 .69
							Minor joints - 10° oxidized Box No. 7	.70 .70
						23.2	Gradational floor contact	.34 .31 .59
20	23.50	24.59	1.09	1.02			SANDSTONE: medium grained, crossbedded light grey Box No. 8	.10 .72
							sharp floor contact	.27

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 3

HOLE NO.: MS 34

DATE BEGUN:

DATE FINISHED:

LAT:

TOTAL DEPTH: 103.09 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY: L. Little

U.T.M.

COAL LICENSE:

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
15	24.59	27.02	2.43	2.35			SANDSTONE: Medium grey, fine grained	.45
						26.2	30% Siltstone	.62
							crossbedded	.69
							Box No. 9	.67
15	27.02	29.82	2.80	2.70			SANDSTONE: medium grained, massive, light grey	.05
								.69
								.71
						29.3		.16
								.53
							joint 12° oxidized	.66
							Box No. 10	
9	29.82	30.51	0.69	.68			SILTSTONE: 20% mudstone, dark grey	.05
							oxidized joints	.64
	30.51	31.12	0.61				MUDSTONE: black - partly carbonaceous	.06
						31.7	15% coal partings to .04 m	.45
							oxidized bedding planes	.10
								.05
15	31.12	35.63	4.51	4.36			COAL: Gates "C" Seam	
							Box No. 11	.05
								.63
							80% .31 <sup>o</sup> Oxidized	.69
							Bone .09	.73
						34.7	Mudstone .07 Oxidized fractures	.71
							60% .09 Oxidized cleats	.18
							Bone .20	.48
							Box No. 12	
							Mudstone .06	.68
							60% .05	.41



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 34

SHEET No.: 4

DATE LOGGED:

TOTAL DEPTH: 103.09 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY: L. Little

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							40% 0.28 sheared	
							Bone .05	
							Mudstone .03	
							Bone .02	
							80% .08	
							40% .06 sheared	
							40% .24	
							50% .20	
							30% .23	
							Bone .09	
							80% .05	
							Mudstone .41	
							70% .36	
							.03	
							20% .06	
							40% .07 sheared	
							Mudstone .08	
							80% .42	
							70% .41 broken & partially soft	
							20% .09	
							80% .11	
							Mudstone .11	
							80% .08	
							Floor	
15	35.63	35.73	0.10	.10			MUDSTONE: carbonaceous roof	.04
	35.73	36.28	0.55	.53			core loss	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 5

HOLE NO.: MS 34

DATE BEGUN:

TOTAL DEPTH: 103.09 m

BEARING:

U.T.M.:

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY: L. Little

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
18	36.28	40.06	3.78	3.60			SANDSTONE: medium grained	.20
							minor oxidized fractures 88	.71
						37.8	bedded with minor crossbedding	.61
							sharp floor contact	.05
							Box No. 13	.64
								.72
								.72
								.13
4	40.06	44.16	4.10	4.09			SILTSTONE: 40% Mudstone	.57
						40.8	dark grey, uniform	Box No. 14 .13
							minor oxidized fractures 12°, 38°	.53
								.68
	44.16	44.21	0.05	0.05			core loss .05	.69
						43.9		.70
							Box No. 15	.47
						44.2		.16
								.15
								.02
12	44.21	46.59	2.38	2.33			SANDSTONE: light grey, 30% siltstone 0.03 + 0.05 m	.48
							crossbedded & moderate bioturbation	.70
								.68
							Box No. 16	.52
4	46.59	47.13	0.54	0.54			MUDSTONE: 30% siltstone, thinly bedded, dark grey	.19
								.35
	47.13	47.67	0.54	0.54		47.5	SANDSTONE: 20% siltstone, crossbedded - medium grained	.07
							gradational floor contact	.47

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 6

HOLE NO.: MS 34

SITE DESIGN:

TOTAL DEPTH: 103.09 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY: L. Little

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
4	47.67	49.07	1.40	1.40			MUDSTONE: black massive	.15
							10% coal partings .02 m	.69
							minor oxidized joints 10°	
							Box No. 17	.56
	49.07	49.40	0.33	0.33			CARBONACEOUS MUDSTONE: 30% coal - core loss	.04
							oxidized joints 10% + bedding	.29
							broken in coal zones	
2	49.40	52.38	2.98	2.98			MUDSTONE: uniform, black, massive	.31
						50.6		.55
								.08
								.65
							Box No. 18	.67
								.72
	52.38	52.98	0.60	0.60			COAL:	.60
							80% .15	
							20% .15	
							80% .07	
							Bone .04	
							80% .10	
							Bone .09	
	52.98	54.97	1.99	1.93			MUDSTONE: black, massive, 20% siltstone	.12
14						53.6	gradational floor contact	.20
							minor joints oxidized 19°	.27
							10% coal partings to 0.10 m	.60
							Box No. 19	.68
19								.12
	54.97	57.09	2.12	2.00			SANDSTONE: fine grained, light grey	.57
						56.7	15% siltstone	.62
							moderately bioturbated	.72
							Box No. 20	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 7

HOLE NO.: MS 34

DATE BEGAN:

DATE FINISHED:

LAT:

TOTAL DEPTH: 103.09 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY: L. Little

U.T.M.:

COAL LICENSE:

CORE SIZE: HQ

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							minor calcite infilled bedding planes	.21
							gradational floor contact	
							minor oxidized joints 10° + 66°	
10	57.09	58.39	1.30	1.23			MUDSTONE: black, massive	.52
							minor polished bedding planes	.62
							minor oxidized joints 5°	.16
10	58.39	58.87	0.48	0.45			MUDSTONE: black, 20% coal partings to .06 - oxidize bedding planes	.48
5	58.87	63.13	4.26	4.24		59.7	SILTSTONE: 30% mudstone, medium grey Box No. 21	.28
							turbated	.34
							oxidized joints 12°	.69
								.70
								.67
						62.8	Box No. 22	.44
								.12
								.71
								.31
15	63.13	64.34	1.21	1.17			SANDSTONE: 40% siltstone, fine grained, medium grey	.40
							crossbedded & turbated	.73
							gradational floor Box No. 23	.08
10	64.34	66.16	1.82	1.76			MUDSTONE: 30% siltstone, thinly bedded	.61
						65.8	dark grey, turbated	.16
							oxidized joints 10°	.54
							gradational floor contact	.51
7	66.16	70.74	4.58	4.55			MUDSTONE: massive uniform	.31
							Box No. 24	.65
								.69
						68.9		.40

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 8

HOLE NO.: MS 34

TOTAL DEPTH: 103.09 m

BEARING:

U.T.M.

DATE BEGUN:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

DATE FINISHED:

LONG.:

LOGGED BY: L. Little

CORE SIZE: HQ

LAT.:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.24
								.68
							Box No. 25	.60
								.62
								.39
8	70.74	72.59	1.85	1.83			MUDSTONE: as above	.30
						71.9	10% coal parting .03 m	.27
								.37
							Box No. 26	.64
								.20
4	72.59	76.73	4.14	4.13			COAL: Gates "B" Seam	.48
							80% .39	.57
						75.0	Dull .06 sheared hard	.68
							30% .08 sheared	.58
							Box No. 27	.58
							Core loss .04	.69
							30% .10 sheared soft	.69
							40% .36 soft	.68
							40% .30 hard	.42
							60% .21 hard oxidized cleats	
							30% .23 oxidized cleats hard banded	
							30% .24	
							70% .48 oxidized cleats hard banded	
							80% 1.65 hard banded	
							Floor	
2	76.73	89.48	12.75	12.74			MUDSTONE: black, massive, uniform	.30
						78.0		.33
							Box No. 28	.33
								.22
								.61
								.66
								.66
							Box No. 29	.62
						81.1		.27





MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-35

DRILLED FOR: Ranger Oil Limited  
DRILLED BY: Tonto Drilling Ltd.

LOCATION: EB Pit Area

COLLAR ELEVATION: 1560.6 m  
TOTAL DEPTH: 120.49 m  
CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.  
Focussed Beam (Resistivity) Log: Normal, Expanded.  
Density: Normal, Expanded.  
Caliper.  
Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

	<u>Interval (m)</u>	<u>Thickness (m)</u>
B	41.80-46.68	4.88
A	61.40-63.05	1.65



0



27  
 30  
 23  
 15  
 22  
 12  
 14  
 18  
 8  
 23  
 19  
 22  
 20  
 25  
 23  
 21  
 19  
 18  
 40  
 30  
 20

GATES B SEAM

GATES A SEAM

TORRENS MBR.

100.00

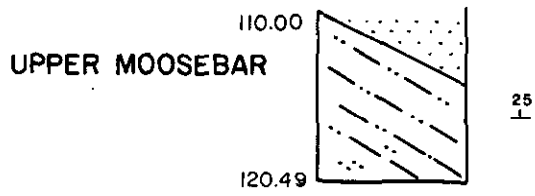
Prepared by:  
 ROBERTSON RESEARCH CANADA LIMITED  
 for  
 RANGER OIL (CANADA) LTD.

STRATIGRAPHIC LOG  
 MS 35

DATE: October 1980

Scale 1:500

PAGE 1 of 2



Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED  
for  
RANGER OIL (CANADA) LTD.

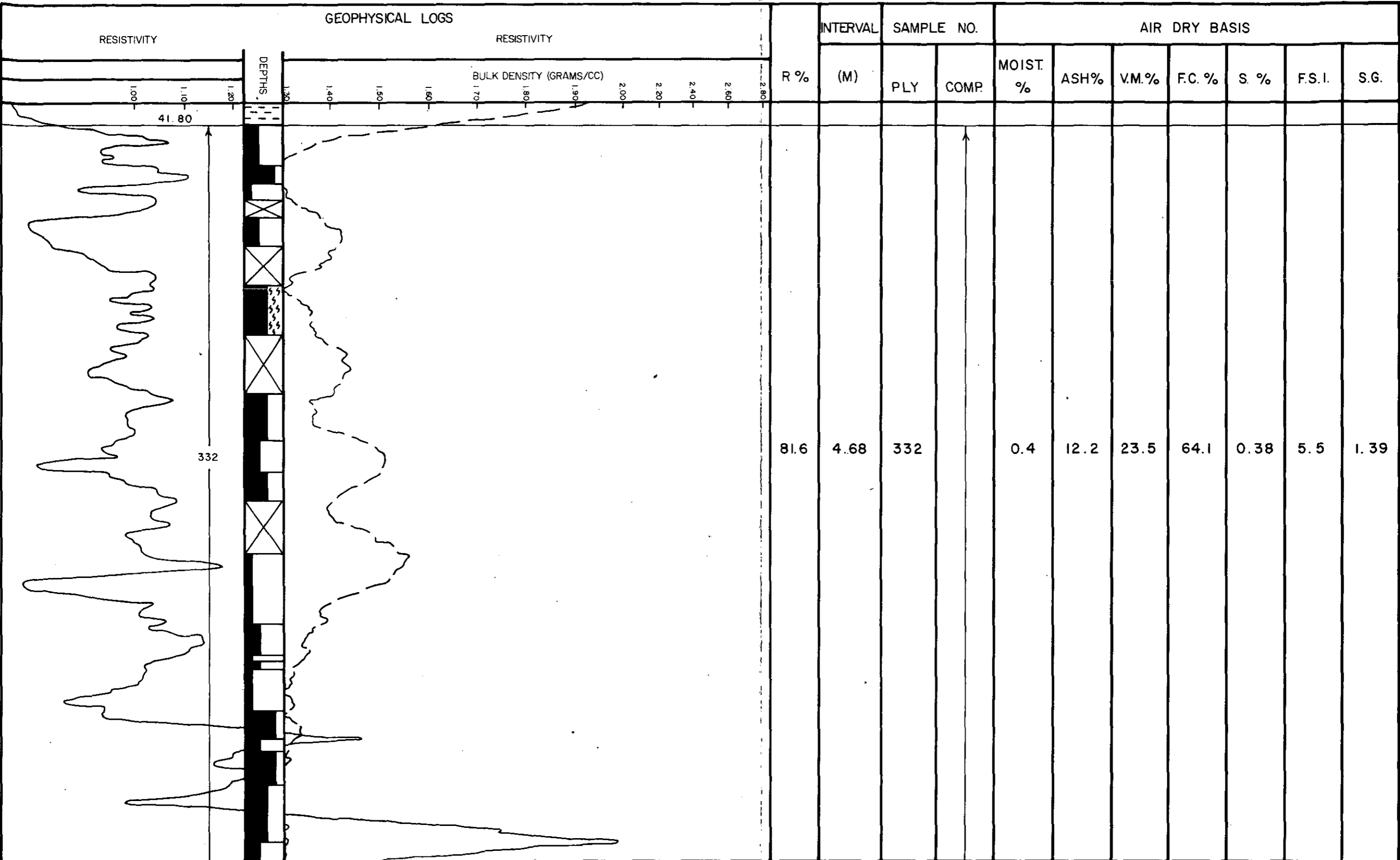
STRATIGRAPHIC LOG  
MS 35

DATE: October 1980

Scale 1:500

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GEOPHYSICAL LOGS



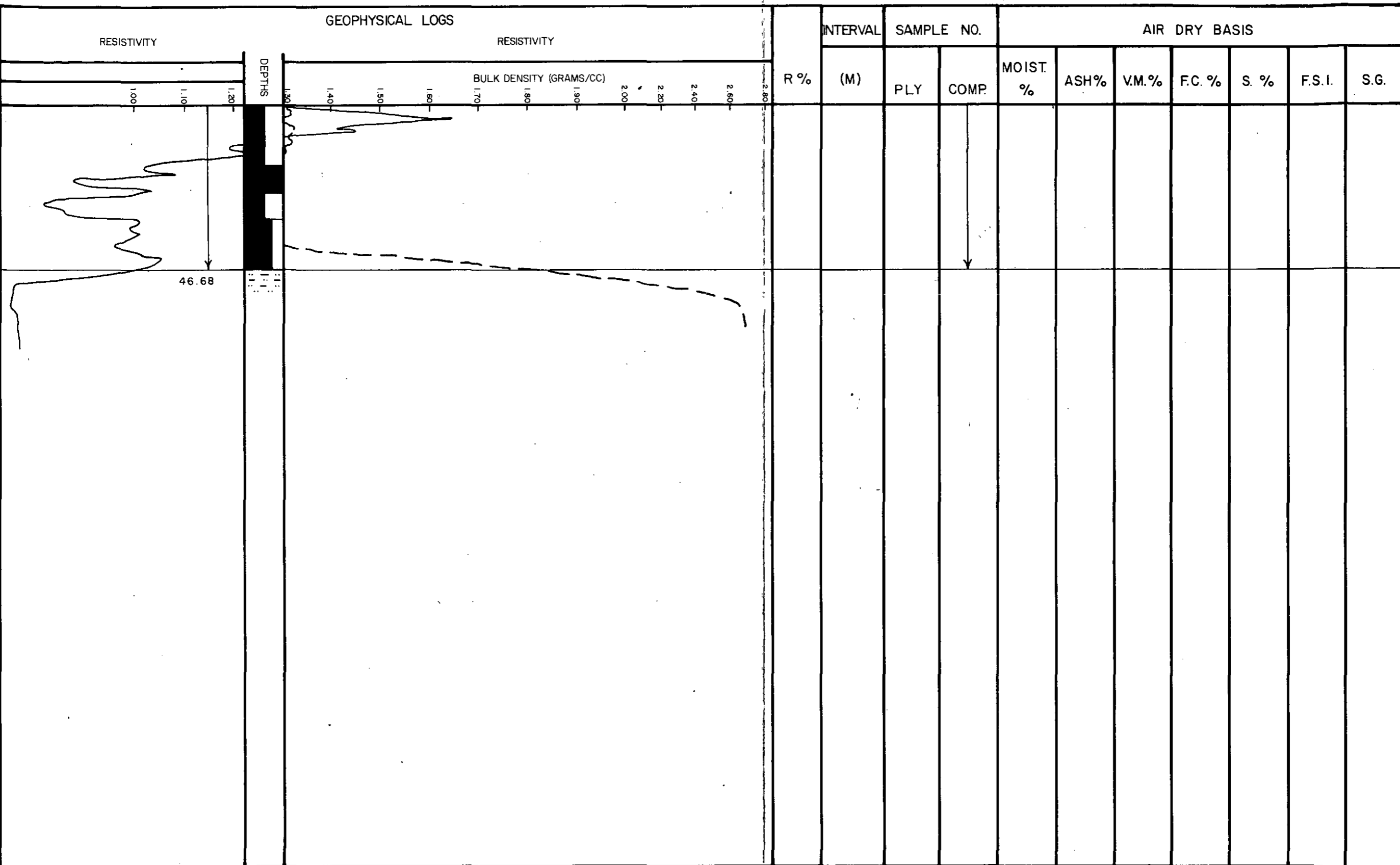
R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
81.6	4.68	332		0.4	12.2	23.5	64.1	0.38	5.5	1.39

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 35 B SEAM**

GEOPHYSICAL LOGS

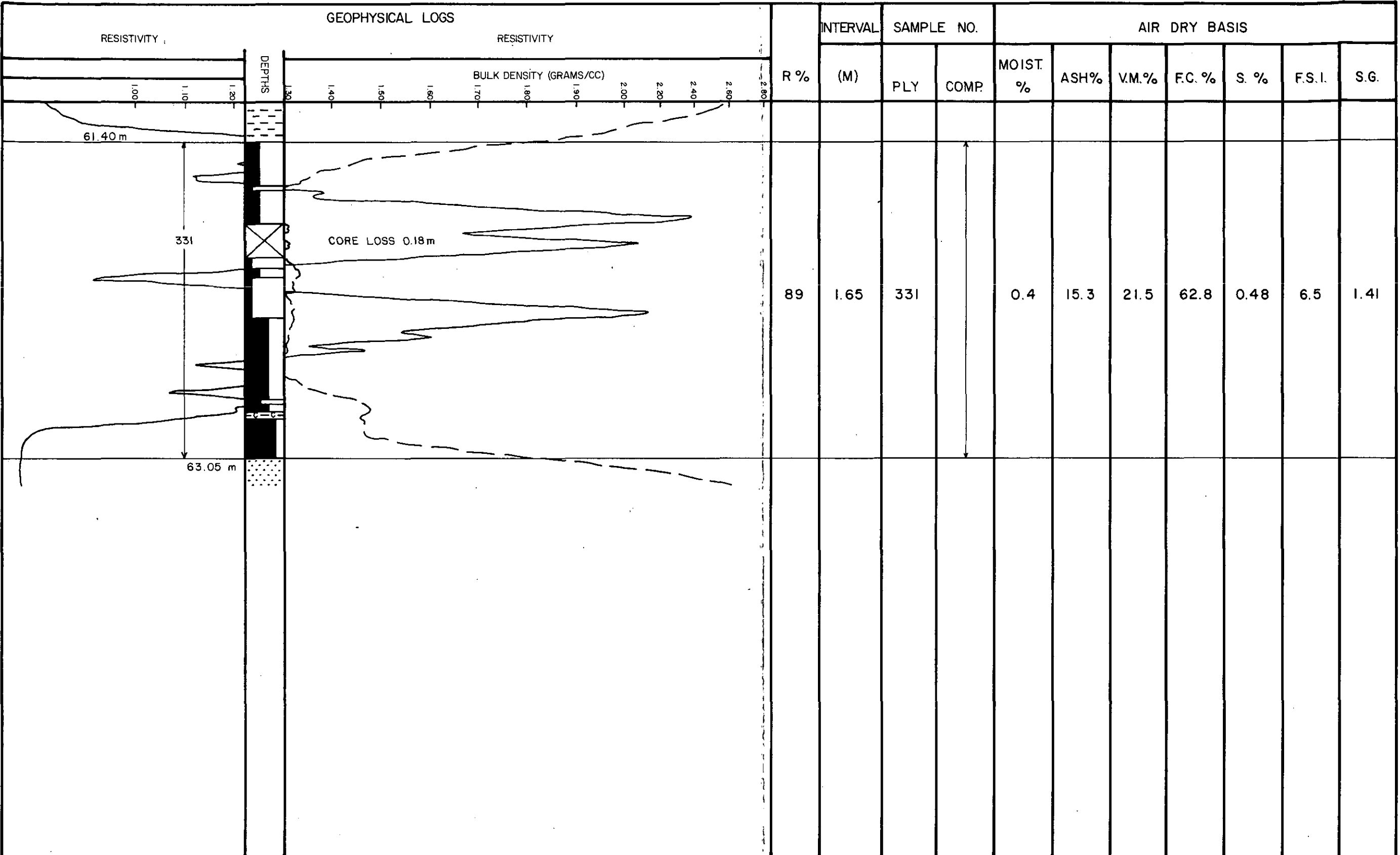


Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 35 B SEAM

GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
89	1.65	331		0.4	15.3	21.5	62.8	0.48	6.5	1.41

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 35 A SEAM**

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 1

HOLE NO.: MS 35

DATE BEGUN:

DATE FINISHED:

LAT.: 6107016.5m

TOTAL DEPTH: 120.49 m

HOLE ANGLE:

LONG.: 601663.3m

BEARING:

ELEV. COLLAR: 1560.6

LOGGED BY: L. Little

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	9.67	10.33	0.66	0.59			MUDSTONE: 15% siltstone dark grey oxidized, broken sharp basal contact	.52 .14
27	10.33	14.39	4.06	3.62			SANDSTONE: very fine, 40% siltstone, 10% mudstone medium grey turbated, cross and ripple bedding, parallel bedding	.43 .41 .20 .47
						11.0	Box No. 2	.63 .64 .70 .34 .24
	14.39	15.42	1.03	.92			MUDSTONE: 10% siltstone dark grey massive, uniform	.66 .37
30	15.42	16.17	0.75	0.65			SANDSTONE: 20% mudstone, 20% siltstone interbedded medium grey	.30 .45
	16.17	16.57	0.40	0.35			MUDSTONE: as above	.20 .20
23	16.57	16.97	0.40	0.35		16.8	COAL: .09 15% .09 dull .13 broken,	.18 .22
							Box No. 4	









DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 5

HOLE NO.: MS 35

DATE REPLAN:

TOTAL DEPTH: 120.49 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY: L. Little

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	37.88	41.80	3.92	3.56		38.4	MUDSTONE: some carbonaceous	.26
							coaly intervals up to 1 cm (<5%)	.18
							dark grey to black Box No. 12	.61
							massive	.54
							broken	.65
							joint plain 9°, 16°	.68
							Box No. 13	.61
						41.9		.27
								.08
23	41.80	46.48	4.68	4.38	332		COAL: 20% .21 Gates "B" Seam	.24
							70% .03	.56
							70% .06	.66
						44.5	Core loss .09 → 15% .09 Box No. 14	.39
							Core loss .20 → 30% .15	.22
							Core loss .30 → 40% .26 sheared & broken	.62
							40% .24	.69
							20% .17	.44
							Core loss .27 → 40% .15	3.80
							Dull .10	
							Dull .27	
							30% .16	
							Dull .03	
							20% .04	
							10% .11	
							10% .11	
							70% .14	
							20% .07	
							60% .17	
							50% .13	
							50% .17	



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 7

HOLE NO.: MS 35

DATE BEGUN:

TOTAL DEPTH: 120.49 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY: L. Little

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
						56.7		.09
								.28
18	56.36	58.27	1.91	1.82			SILTSTONE: 30% mudstone, interbedded intervals	.25
							medium grey	.65
							minor cross bedding, parallel bedding	Box No. 19.70
								.31
40	58.27	61.40	3.13	2.41			MUDSTONE: 20% siltstone	.41
						59.4	dark grey	.64
							jointed, 9° & 12°	.66
							vague bedding	Box No. 20
						61.5	slickensides, more extensive near base	.64
30	61.40	63.05	1.65	1.43	331	62.1	COAL: 20% .22 soft	Gates "A" seam
							Dull .03	.63
							Core loss .18 → 20% .17 soft	Box No. 21
							10% .05	
							30% .05	
							10% .21	
							40% .42	
							20% .03	
							40% .04	
							Carbonaceous mudstone .04	
							70% .20	
20	63.05	112.99	50.28	47.23			SANDSTONE: medium grained	.32
							light grey	.65
							bedded, cross and ripple bedded	.72
						65.2		.50







DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 35

SHEET No.: 11

DATE BEGUN:

TOTAL DEPTH: 120.49 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY: L. Little

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
25	112.99	120.49	7.50	6.80			SANDSTONE: 40% siltstone & mudstone Upper Moosebar FM	.25
							interbedded, variable thickness of intervals (1 to 10 cm)	.71
						114.6	ripples, crossbedding Box No. 40	.40
							worm burrows & bioturbation	.16
								.74
								.69
								.66
							Box No. 41	.69
						117.7		.17
								.49
								.58
								.57
							Box No. 42	.58
								.67
						120.4		.14
							End of Hole 120.49 m	



MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-36

DRILLED FOR: Ranger Oil Limited

DRILLED BY: Tonto Drilling Ltd.

LOCATION: EB Pit Area

COLLAR ELEVATION: 1560.3 m

TOTAL DEPTH: 160.26 m

CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.

Focussed Beam (Resistivity) Log: Normal, Expanded.

Density: Normal, Expanded.

Caliper.

Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

	<u>Interval (m)</u>	<u>Thickness (m)</u>
D	11.61-15.48	3.87
C	30.90-34.94	4.04
B	72.65-78.13	5.48
A	93.09-94.47	1.38

0

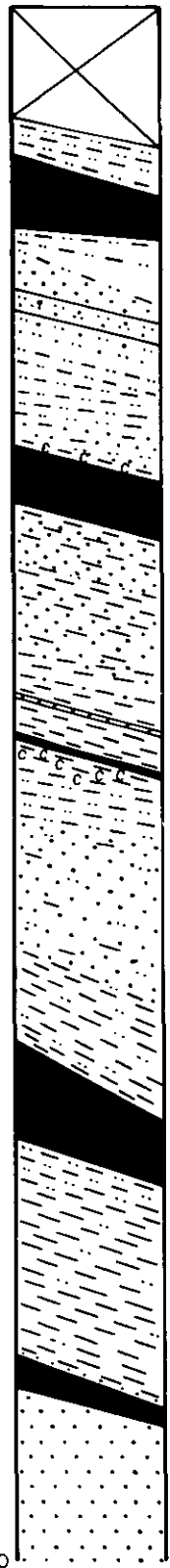
GATES D SEAM

GATES C SEAM

GATES B SEAM

GATES A SEAM

TORRENS MBR.



105.00

Prepared by:  
**ROBERTSON RESEARCH CANADA LIMITED**  
 for  
**RANGER OIL (CANADA) LTD.**

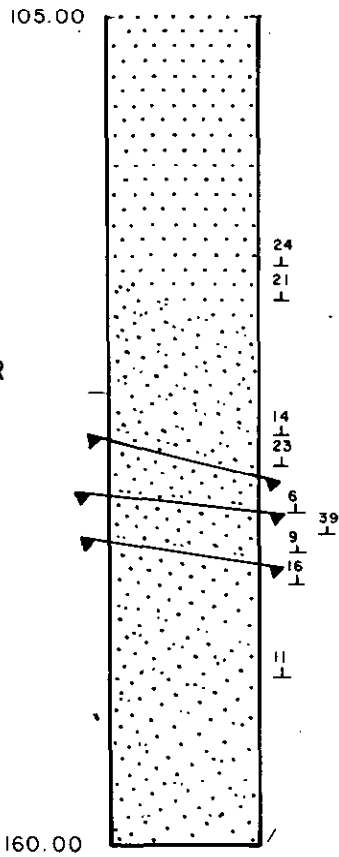
**STRATIGRAPHIC LOG**  
**MS 36**

DATE: October 1980

Scale 1:500

PAGE 1 of 2

UPPER  
MOOSEBAR



Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED  
for  
RANGER OIL (CANADA) LTD.

STRATIGRAPHIC LOG  
MS 36

DATE: October 1980

Scale 1:500

PAGE 2 of 2

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

1.00

1.10

1.20

DEPTHS

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

R %

(M)

PLY

COMP

MOIST.  
%

ASH%

V.M.%

F.C.%

S.%

F.S.I.

S.G.

11.61

341

342

15.48

CORE LOSS 0.41 m

CORE LOSS 0.67 m

46

2.02

341

0.9

35.0

19.5

44.6

0.72

4.5

1.58

100

1.85

342

0.60

17.9

23.5

58.0

0.52

7

1.42

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

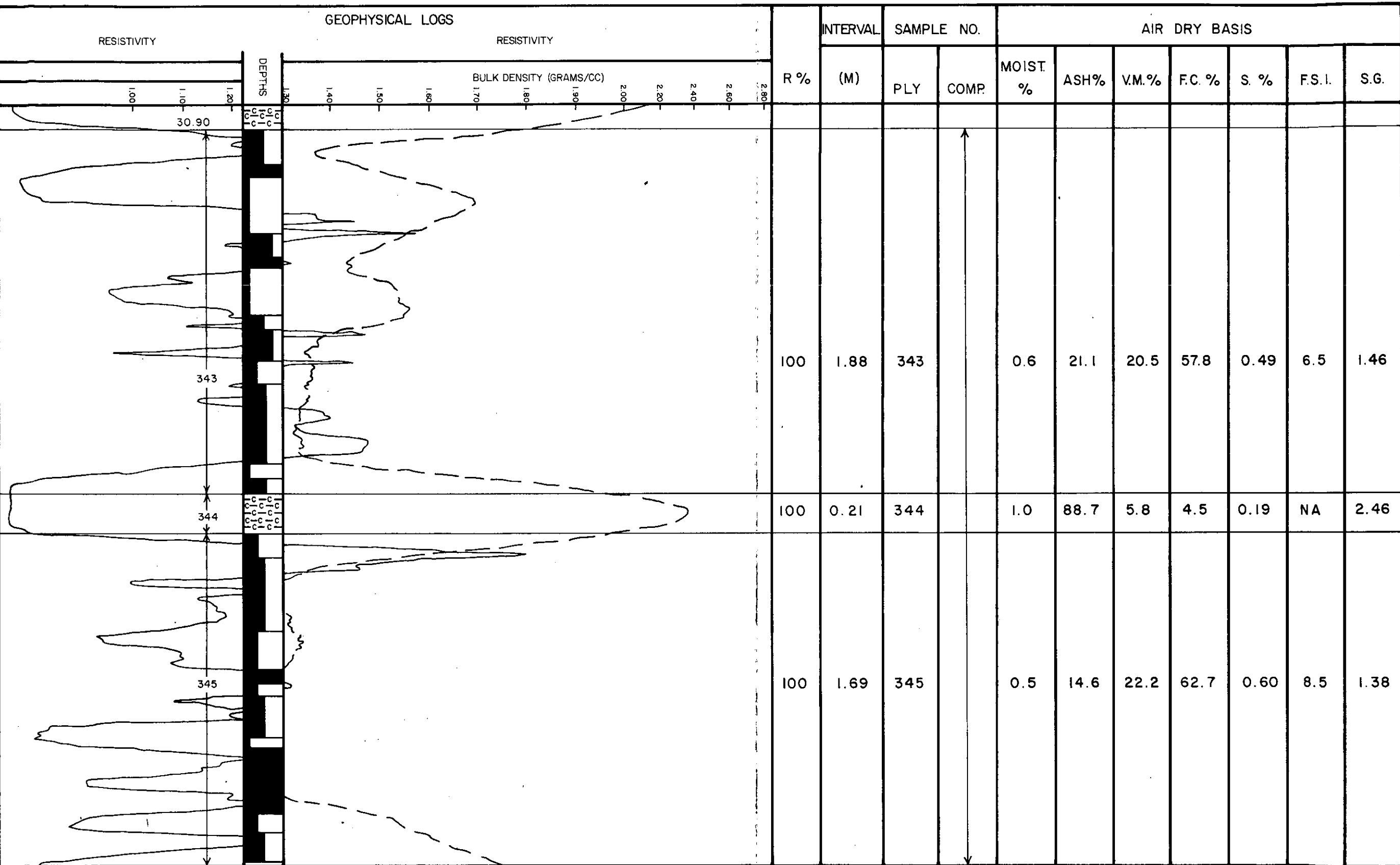
SEAM SECTION AND ANALYTICAL DATA  
MS 36 D SEAM

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 1 of 1

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 36 C SEAM

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

DEPTHS  
1.30  
1.40  
1.50  
1.60  
1.70  
1.80  
1.90  
2.00  
2.20  
2.40  
2.60  
2.80

R %

(M)

PLY

COMP.

MOIST.  
%

ASH%

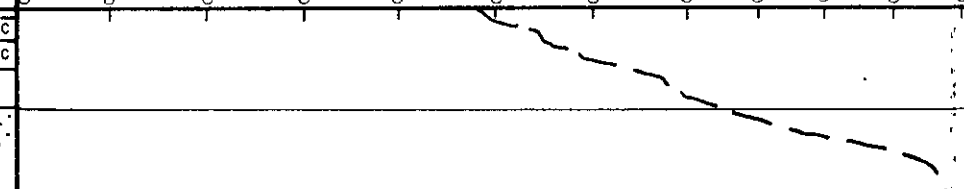
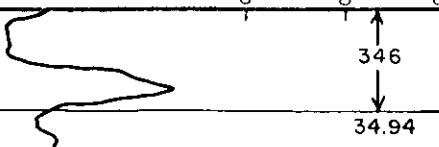
V.M.%

F.C. %

S. %

F.S.I.

S.G.



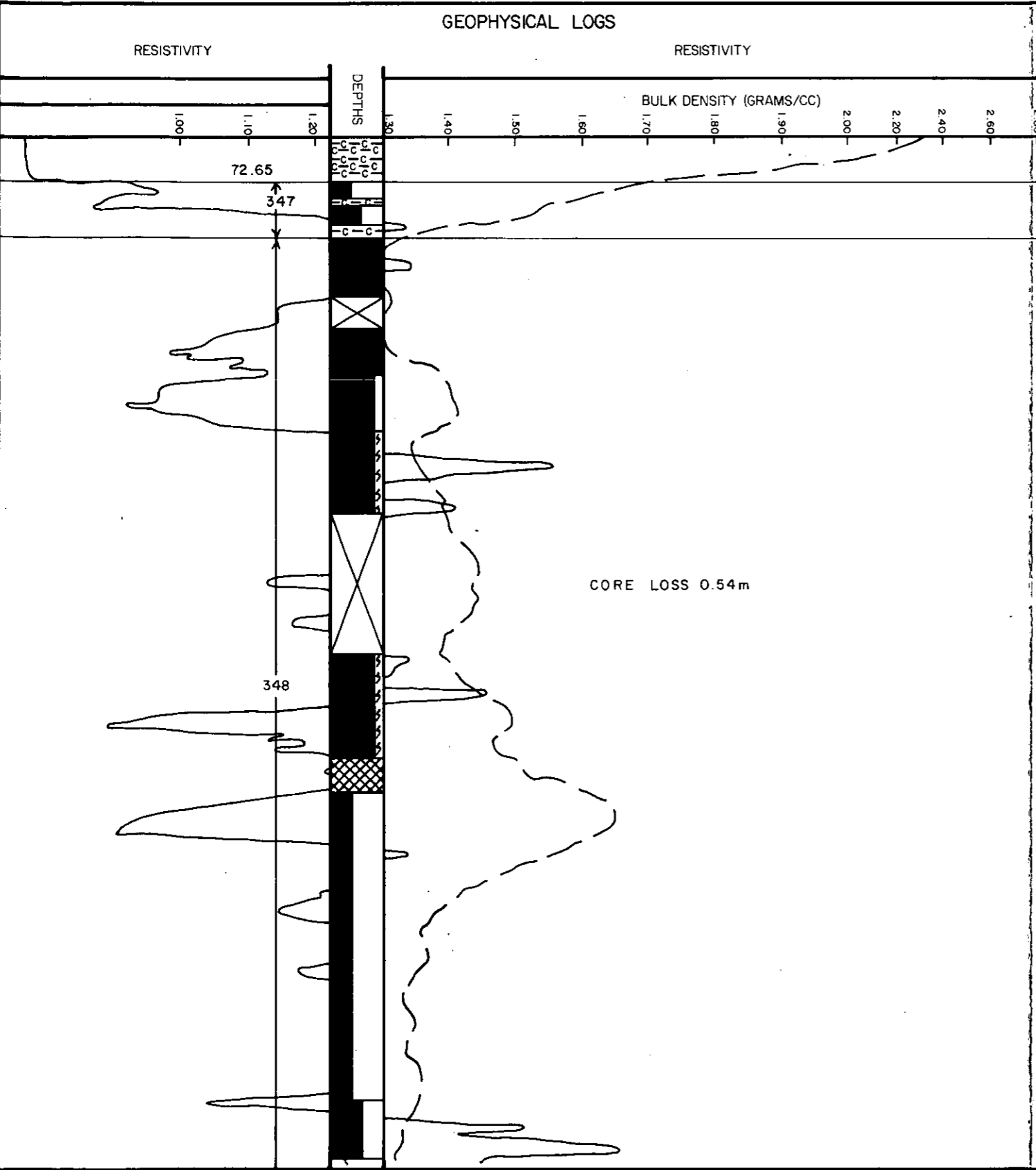
100	0.26	346	↕	0.9	67.0	11.8	20.3	0.58	1	2.03
-----	------	-----	---	-----	------	------	------	------	---	------

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 36 C SEAM

GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP	MOIST. %	ASH%	VM.%	F.C. %	S. %	F.S.I.	S.G.
100	0.22	347		0.6	47.4	16.6	35.4	0.35	3	1.75
90	5.26	348		0.6	11.5	23.1	64.8	0.40	6.5	1.37

Prepared by :  
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RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 36 B SEAM**

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

DEPTHS

BULK DENSITY (GRAMS/CC)

R %

INTERVAL

SAMPLE NO.

AIR DRY BASIS

1.00 1.10 1.20

1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.20 2.40 2.60 2.80

(M)

PLY

COMP.

MOIST %

ASH%

V.M.%

F.C.%

S.%

F.S.I.

S.G.

78.13



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 36 B SEAM

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 2 of 2



GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

DEPTHS

1.00

1.10

1.20

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

2.80

R %

(M)

SAMPLE NO.

PLY

COMP.

AIR DRY BASIS

MOIST. %

ASH%

V.M.%

F.C. %

S. %

F.S.I.

S.G.

93.09

349

94.47

CORE LOSS 0.14m

95.6

1.38

349

0.5

13.9

20.8

64.8

0.50

5.5

1.39

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 36 A SEAM



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 36

SHEET No: 2

DATE BEGIN:

TOTAL DEPTH: 160.26 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY:

L. Little

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Recd.
9	17.76	19.00	1.44	1.42			SILTSTONE: interbedded mudstone 40% thinly bedded	.32
							irregular bedding Box No. 4	.68
							medium to dark grey	.44
25	19.00	20.37	1.37	1.24			SANDSTONE: fine grained, medium grey	.21
							turbated, crossbedded	.69
						20.1	mudstone stringers 15%	.42
							joints 72° oxidized	.05
							sharp floor contact	
13	20.37	21.71	1.34	1.31			SILTSTONE: 40% sandstone, fine grained Box No. 5	.12
							turbated, medium grey	.68
							thin mud partings .02	.54
	21.71	21.96	0.25	0.24			COAL: crushed	.13
								.12
	21.96	23.55	1.59	1.55			SANDSTONE: fine grained, 50% siltstone, interbedded	.54
							joints 30° medium grey	.61
						23.2	coaly stringers .005 5% Box No. 6	.15
								.29
38	23.55	28.55	5.00	3.94			SILTSTONE: 40% mudstone, dark grey	.14
							parallel bedding	.67
							joint 9°	.66
							turbated towards floor - sandy lines	.70
							gradational floor contact Box No. 7	.61
						26.2		.66
								.71
							joint 71° and 30°	.70
							Box No. 8	.15

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 3

HOLE NO.: MS 36

DATE BEGUN:

TOTAL DEPTH: 160.26 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG.:

LOGGED BY: L. Little

CORE SIZE:

S.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
6	28.55	29.70	1.15	1.14			SANDSTONE: fine grained, medium grey	.50
						29.3	mudstone 15%	.27
							heavily turbated	.38
							coal stringers .01 5%	
4	29.70	30.14	0.44	0.44			SILTSTONE: 30% mudstone	.44
							joint 30°	
							turbated	
14	30.14	30.90	0.76	0.75			MUDSTONE: carbonaceous	.24
							coal partings to .03 m	.48
	30.90	34.94	4.04	3.92			COAL: .18 40% hard Gates "C" Seam	.17
							.06 80% Box No. 9	.68
						32.3	.29 dull minor pyrite	.58
							.13 60%	.10
							.05 90%	.67
							.25 dull minor pyrite	.61
							.07 40% Box No. 10	.68
							.16 60%	.55
							.12 20% pyrite	
							.12 40%	
							.15 minor pyrite	
							.14 50%	
							.08 dull	
							.08 50%	
							.21 carb mudstone	
							.12 20% pyrite	
							.38 50% minor pyrite	



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No. 5

HOLE NO.: MS 36

DATE BEGUN:

DATE FINISHED:

LAT:

TOTAL DEPTH: 160.26 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY: L. Little

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
22	40.67	44.77	4.10	3.80			SANDSTONE: fine grained grading into medium grained	.47
						41.5	15% mudstone downward	.16
							crossbedded	.42
							medium grey	
							Box No. 13	.72
								.72
								.74
						44.5		.50
								.09
							Box No. 14	.28
9	44.77	47.89	3.12	3.08			MUDSTONE: 30% sandstone, occasional lenses to .10	.38
							dark grey, massive	.67
							carbonaceous intervals 5% to .01	.68
								.70
						47.5	Box No. 15	.21
							sharp floor contact	.44
								.04
16	47.89	48.27	0.38	0.37			SANDSTONE: medium grained, crossbedded	.38
							mudstone 10%	
							medium grey	
							sharp floor contact	
	48.27	49.98	1.71	1.64			MUDSTONE: black, 10% siltstone	.26
							occasional sandstone lenses 5%	.69
							clay lenses .02	.57
							jointed & sheared in places 19° 50' Box No. 16	.19



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 7

HOLE NO.: MS 36

DATE BEGUN:

DATE FINISHED:

LAT:

TOTAL DEPTH: 160.26 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY: L. Little

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
22	65.29	71.86	6.57	6.09			MUDSTONE: 30% siltstone	.25
						65.8	vaguely bedded, uniform Box No. 22	.03
							dark grey	.64
							gradational upper & lower contacts	.72
								.71
						68.9	joint 21°	.69
							Box No. 23	.43
								.17
								.69
								.63
								.62
								.10
							Box No. 24	.68
								.21
29	71.86	72.65	0.78	0.69		71.9	MUDSTONE: carbonaceous, black	.40
							carbonaceous stringers .02 10%	.36
							turbated	
							joint 16°	
29	72.65	78.13	5.48	4.79			COAL: Gates "B" Seam	.28
							.06 30%	.54
							.03 carb mudstone Box No. 25	.50
						75.0	.07 50%	.54
							.06 carb mudstone	.50
							.21 80%	.54
							Core loss .12 → .18 80% broken Box No. 26	.65
							.22 60%	.67
						78.0	.71 60% shear & broken - core loss	.38
							Core loss .54 → .13 bone	.22
							.19 20% calcite infilled cleats	



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No. 8

HOLE NO.: MS 36

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH: 160.26 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY: L. Little

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							.08	
							.91 30%	
							.40 50%	
							.33 60%	
							.09 90%	
							.52 30% minor calcite	
							.47 40% minor calcite	
							.16 70%	
							Sharp floor contact	
18	78.13	81.07	2.84	2.80			SILTSTONE: 40% mudstone	.66
							bedded vaguely Box No. 27	.67
							turbated	.70
							dark grey	.69
						81.1	joint 52° - calcite infilling - slickensided	.11
							gradational floor contact	
	81.07	91.97	10.90	10.37			MUDSTONE: 15% siltstone	.43
							occasional sandy intervals .05 5% Box No. 28	.72
							massive	.74
							dark grey	.73
						84.1	coaly stringers near top .01 5%	.46
							joints 8°, 12°	.19
							Box No. 29	.69
								.72
								.73
								.73
						87.2	Box No. 30	.63
								.68
								.72
								.71
						90.2	Box No. 31	.14

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 36

SHEET No.: 9

DATE BEGAN:

TOTAL DEPTH: 160.26 m.

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY: L. Little

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.53
								.67
								.58
								.10
	91.97	92.44	0.47	0.45			MUDSTONE: uniform, massive, black joints 22° carbonaceous parting minor	.47
21	92.44	93.09	0.65	0.61			SANDSTONE: fine grained 40% siltstone	.03
					93.1		medium grey Box No. 32 bedded, crossbedded, turbated sharp floor contact	.54
	93.09	94.47	1.38	1.31			COAL: Gates "A" Seam	.04
							.22 30%	.66
							.14 20% minor calcite	.62
							.33 10%	
					349	Core loss .06	.07 20%	
							.06 dull	
							.14 30%	
							.07 dull	
							.03 carbonaceous mudstone	
							.07 dull	
							.13 40%	
							.06 70%	
							Sharp floor contact	
15	94.47	123.94	29.47	28.47			SANDSTONE: medium grained Torrens Member	.70
							medium crossbedded & uniform Box No. 33	.70
					96.2		light grey	.33
							rare mudstone parting .001	.35











MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-37

DRILLED FOR: Ranger Oil Limited  
DRILLED BY: Tonto Drilling Ltd.

LOCATION: EB Pit Area

COLLAR ELEVATION: 1716.1 m

TOTAL DEPTH: 158.8 m

CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.

Focussed Beam (Resistivity) Log: Normal, Expanded.

Density: Normal, Expanded.

Caliper.

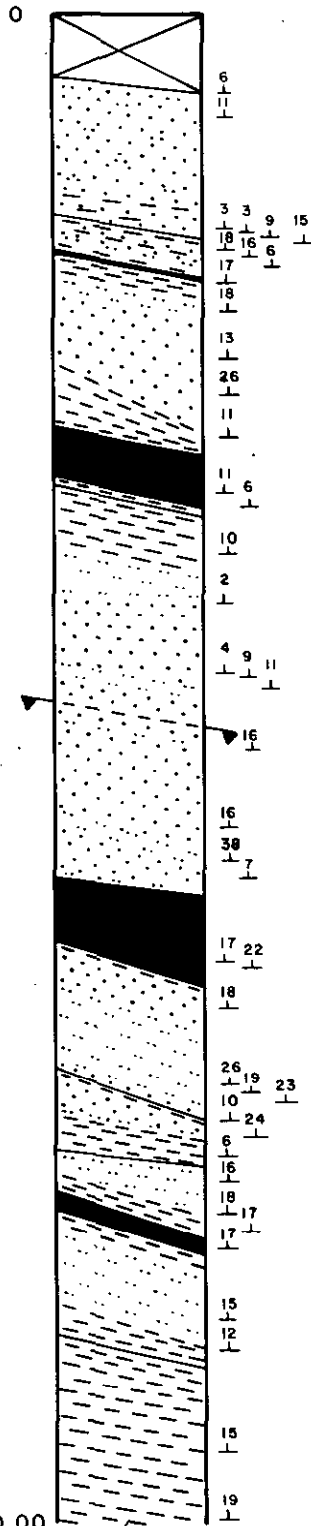
Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

	<u>Interval (m)</u>	<u>Thickness (m)</u>
D	28.51-31.96	3.45
C	58.06-63.11	5.05
B	101.45-107.06	5.61
A	122.54-123.78	1.24





GATES D SEAM

GATES C SEAM

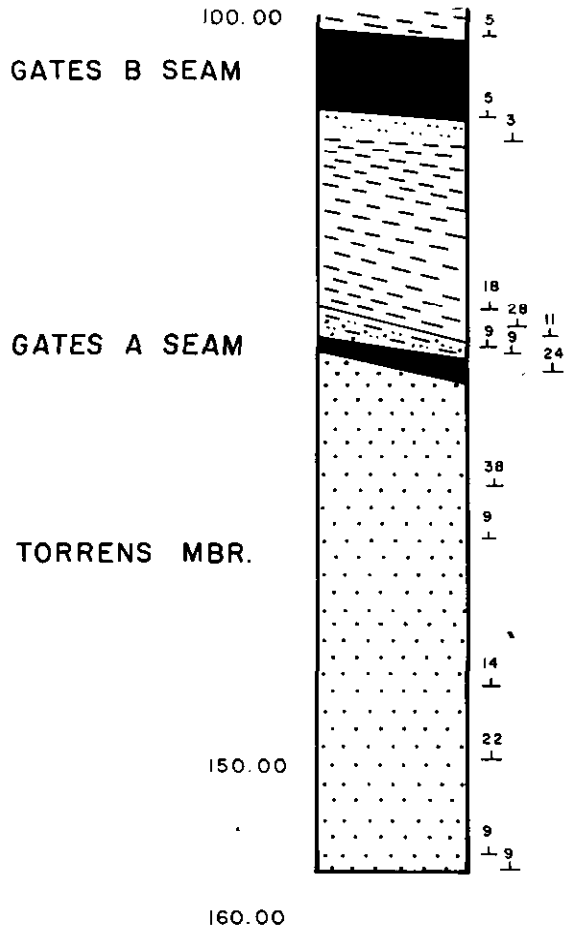
Prepared by  
 ROBERTSON RESEARCH CANADA LIMITED  
 for  
 RANGER OIL (CANADA) LTD.

STRATIGRAPHIC LOG  
 MS 37

DATE: October 1980

Scale 1:500

PAGE 1 of 2



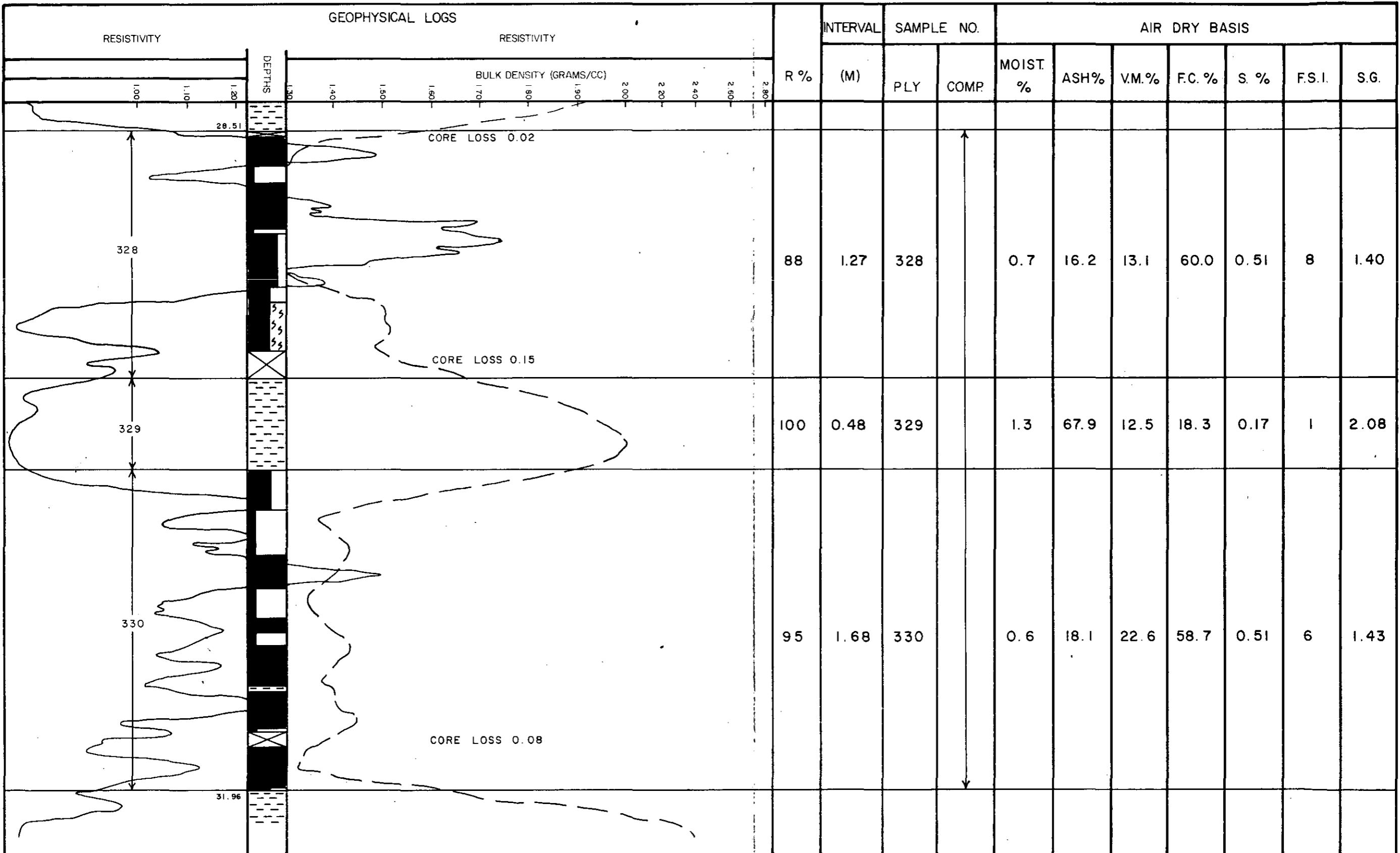
Prepared by:  
 ROBERTSON RESEARCH CANADA LIMITED  
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STRATIGRAPHIC LOG  
 MS 37

DATE: October 1980

Scale 1:500

PAGE 2 of 2

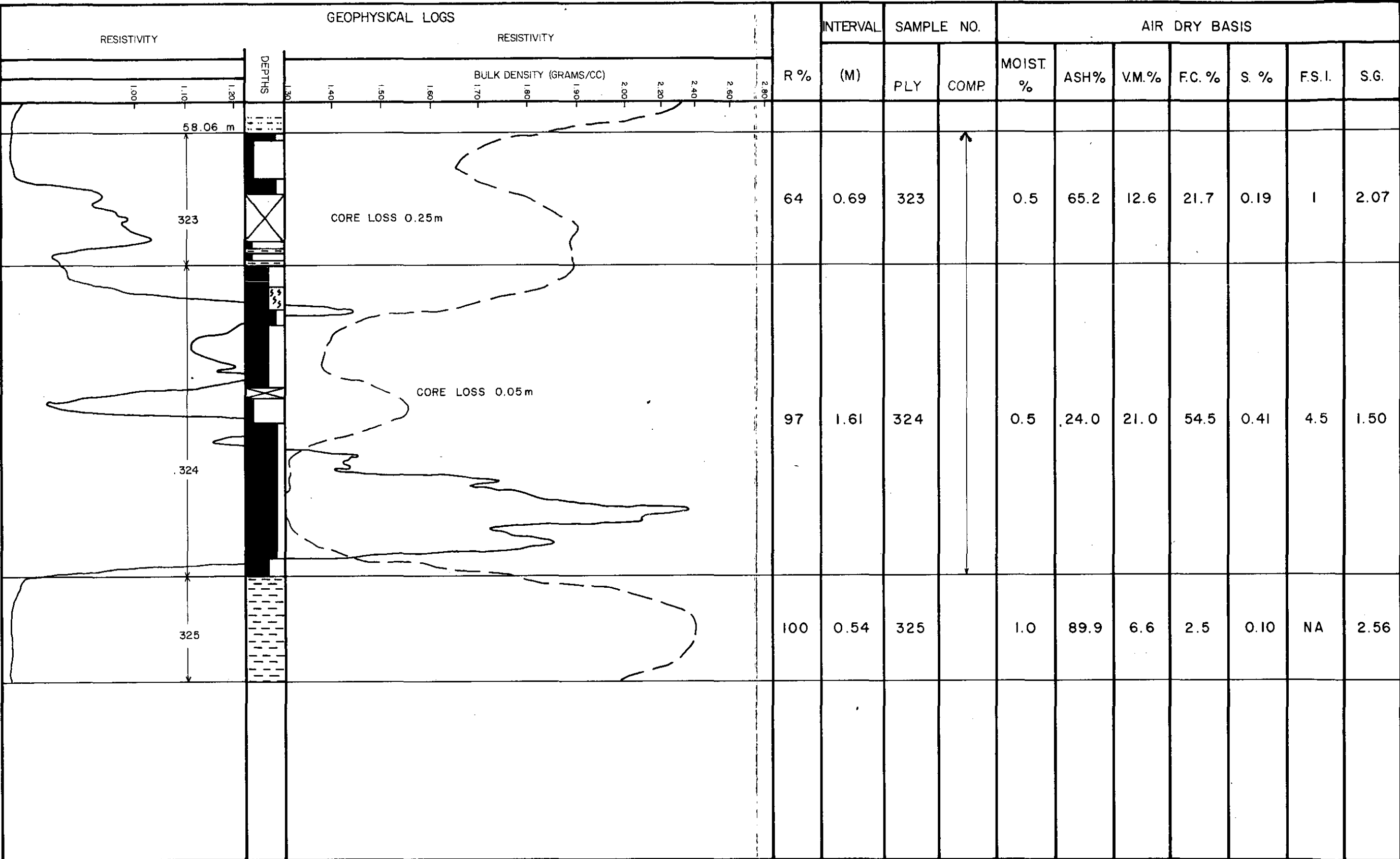


Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED  
 DATE: OCTOBER 1980

RESISTIVITY ———  
 BULK DENSITY - - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
 MS 37 D SEAM**

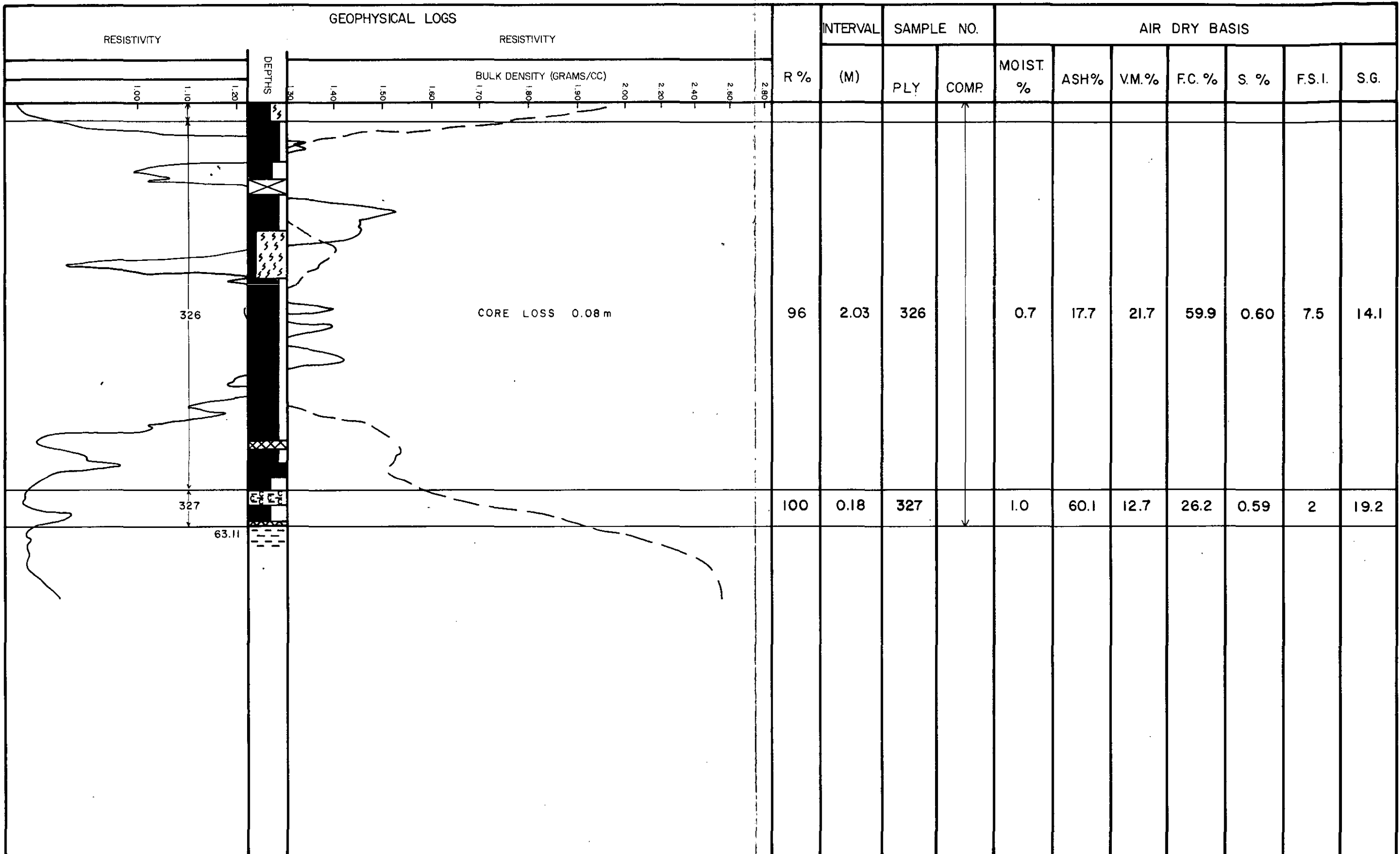
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Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

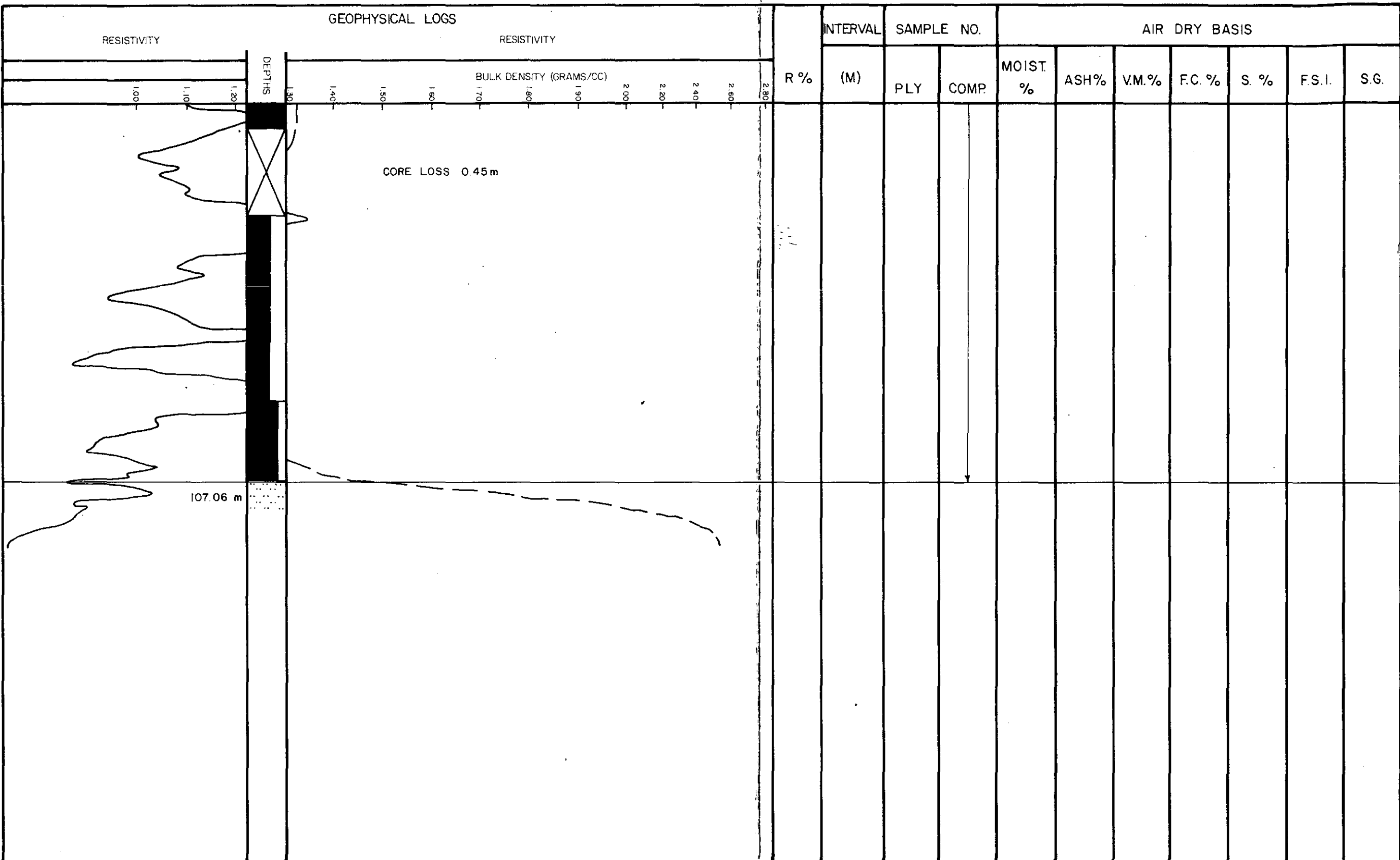
**SEAM SECTION AND ANALYTICAL DATA**  
**MS 37 C SEAM**



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
MS 37 C SEAM



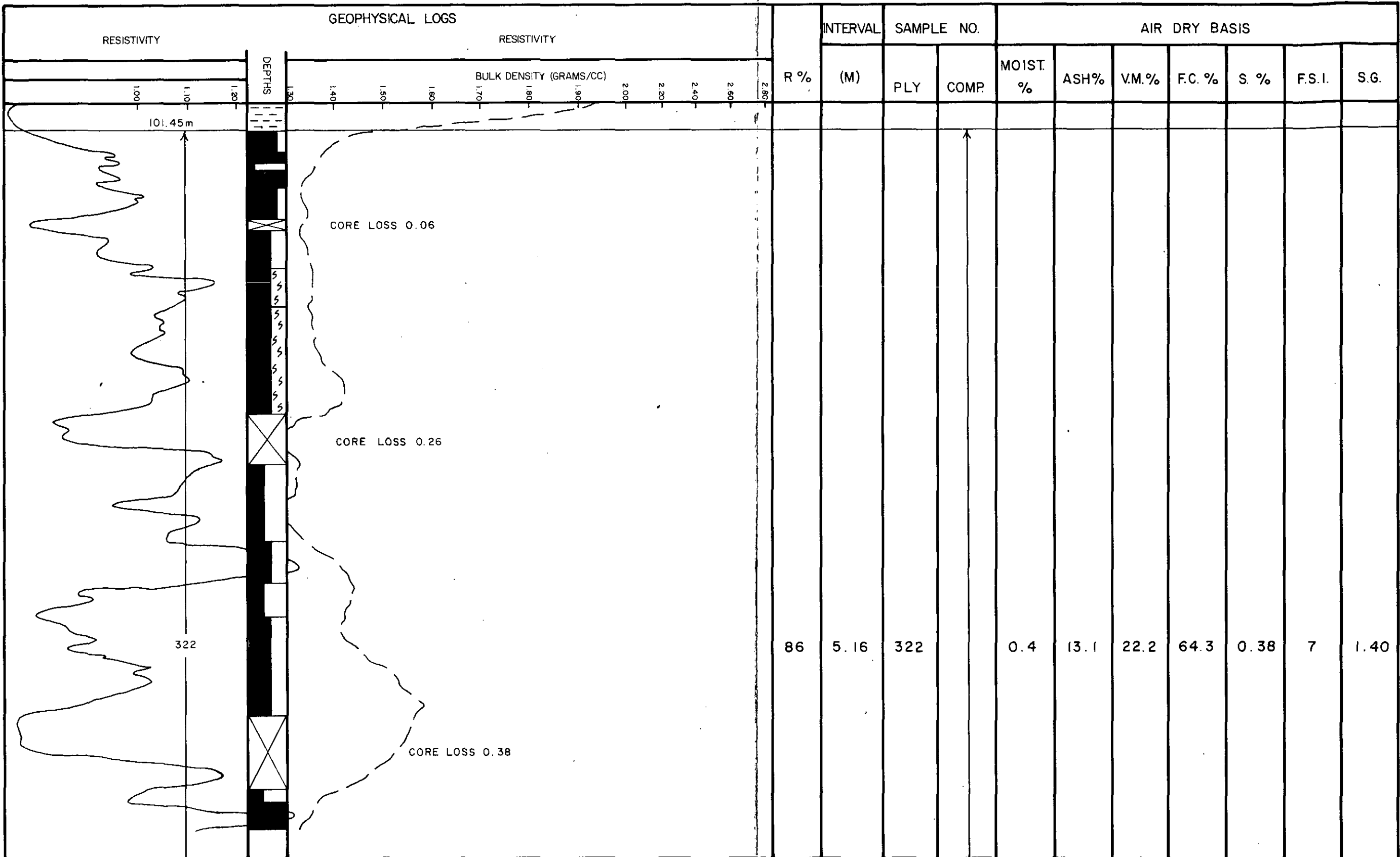
Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED

DATE: OCTOBER 1980

RESISTIVITY ———  
 BULK DENSITY ———  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
 MS 37 B SEAM

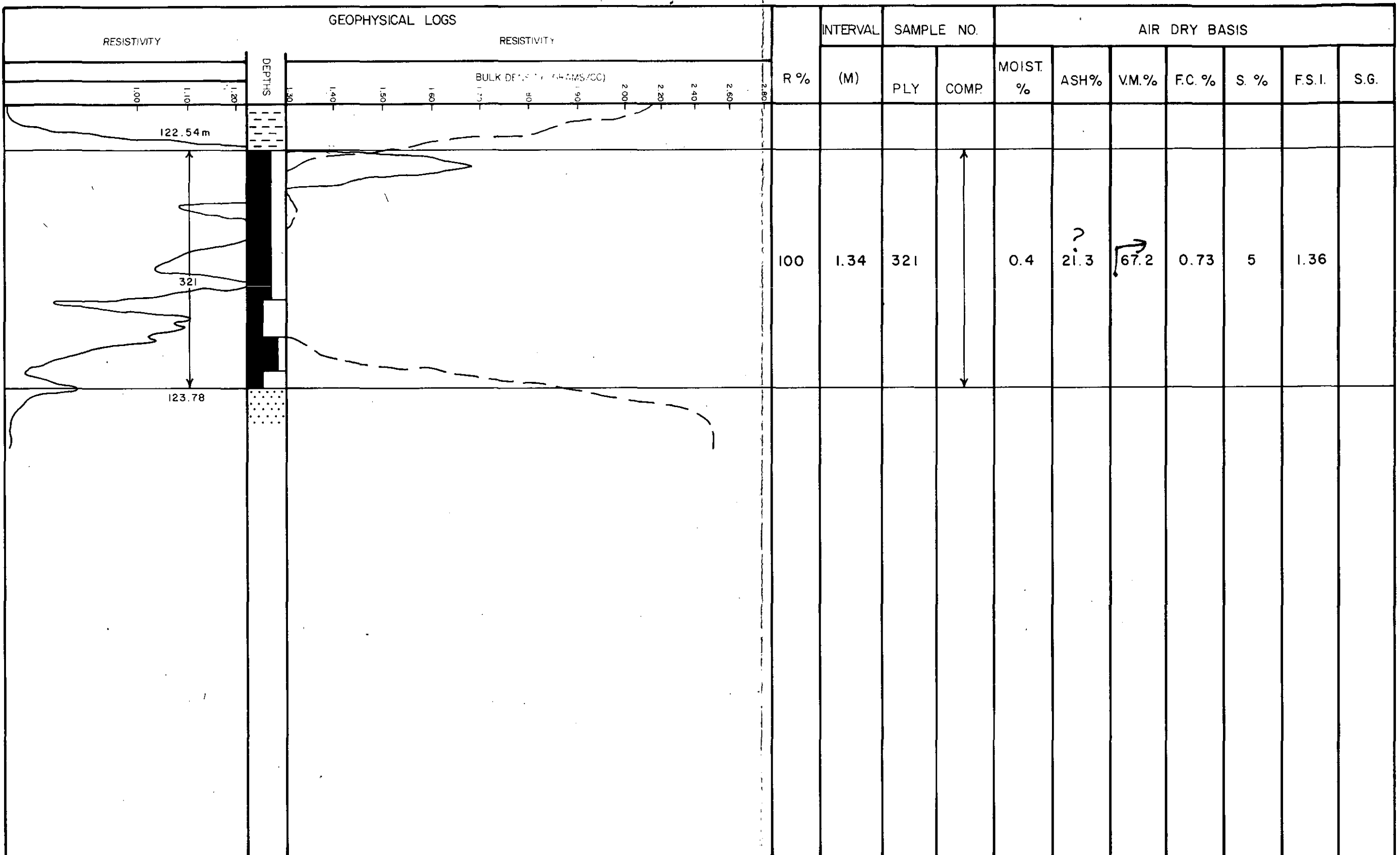
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Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 37 B SEAM**



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 37 A SEAM**



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 1

HOLE NO.: MS 37

DATE BEGUN:

DATE FINISHED:

LAT: 6108034.0m

TOTAL DEPTH: 158.8m

HOLE ANGLE:

LONG: 602156.5m

BEARING:

ELEV. COLLAR: 1716.1m

LOGGED BY: L.Little

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	0	4.90	4.90	4.87			Box No. 1	.60
6	4.90	7.10	2.20	2.19			SANDSTONE: fine grained, 30% siltstone, dark grey thinly bedded 2-4 cm, oxidation along bed planes & joints	.50 .50
							core badly broken	.61
							Joints 10°	.54
						8.23		.37
							Box No. 2	.16
	7.10	13.92	6.82	6.69			SANDSTONE: medium grained, 20% siltstone	.24
							minor crossbedding, light grey	.68
							beds 4-8 cm	.52
11							oxidation along joints	.68
							joints 9 + 24°	.47
							Box No. 3	.52
								.68
						11.3		.47
								.12
								.66
							Box No. 4	.67
								.71
								.40
	13.92	14.47	0.55	0.55			SANDSTONE: medium grained, 40% mudstone 5	.25
3						14.3	beds 5 cm, light grey & dark grey mudstone, crossbedded,	.30

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 2

HOLE NO.: MS 37  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT.:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

S.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
3	14.47	14.67	0.20	0.20			SANDSTONE: medium grained, light grey 10% mudstone	.20
							sharp floor contact	
9	14.67	14.81	0.14	0.14			MUDSTONE: dark grey, fissile	.14
							Box No. 5	
2	14.81	15.39	0.58	0.58			SANDSTONE: medium grained, massive joints 29° oxidized	.58
	15.39	15.52	0.13	0.13			MUDSTONE: dark grey	.11
15							sharp floor contact	.02
	15.52	15.83	0.31	0.30			SANDSTONE: medium grained, massive, light grey joint 18° oxidized	.31
	15.83	16.37	0.54	0.51			SANDSTONE: fine to medium grained, 40% siltstone minor bioturbation	.34
18								.20
	16.37	16.43	0.06	0.06			CONGLOMERATE: Coarse grained sandstone	.06
							sharp floor contact	
9	16.43	16.50	0.07	0.07			SILTSTONE: medium grey, 30% sandstone	.07
	16.50	16.75	0.25	0.25	16.5		CARBONACEOUS MUDSTONE	.25
	16.75	17.07	0.32	0.32			Coal bone sheared .12 mudstone .12	.05
							bone .03 bone .05	.27





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 5

HOLE NO.: MS 37  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT.:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	32.56	32.62	0.06	0.06			COAL: 80%	.06
6	33.24	36.21	3.59	3.57			MUDSTONE: dark grey, 40% siltstone, thinly bedded	.48
							Core loss 0.62	.73
							Box No. 12	.72
						35.4		.35
								.27
								.42
10	36.21	39.35	3.14	3.09			SILTSTONE: 20% medium grained sandstone lenses	.30
							medium grey	.70
							minor crossbedding and bioturbation	
							joint 26°, minor oxidation	
							Box No. 13	.69
						38.4		.64
								.72
								.09
2	39.35	43.98	4.63	4.63			SANDSTONE: 10% siltstone, light grey	.57
							medium grained, minor crossbedding	
							minor joints 65° + 29°, calcite infilled	
							and minor oxidation	
							Box No. 14	.69
						41.5		.69
								.24
								.38
								.72
							Box No. 15	.72
								.62
4	43.98	44.01	0.03	0.03			CARBONACEOUS SANDSTONE: Minor Sandstone	.03

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 6

HOLE NO.: MS 37

DATE BEGUN:

TOTAL DEPTH:

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
9	44.01	45.23	1.22	1.20			SILTSTONE: 20% sandstone, medium grey	.04
							minor crossbedding and bioturbation	.52
						44.5	joints 34° + 61°, calcite infilled	.11
								.55
11	45.23	46.59	1.36	1.34			SANDSTONE: medium grained, 30% siltstone	.14
							calcite infilled joints 78° Box No. 16	.68
								.54
	46.59	46.74	0.15	0.15			MUDSTONE: calcite and oxidized - fault zone	.15
	46.74	47.16	0.42	0.41			SANDSTONE: medium grained, light grey	.42
							calcite infilling along joints 29°	
							floor contact sharp & oxidized 51°	
	47.16	47.45	0.29	0.28			SILTSTONE: 10% sandstone, dark grey	.26
							bioturbated	.03
	47.45	48.61	1.16	1.14		47.5	SANDSTONE: 30% siltstone, medium grained	.08
							light grey	.49
							Box No. 17	.59
	48.61	54.34	5.73	5.45			SANDSTONE: 15% siltstone	
							crossbedded	.12
							joints light oxidized & calcite 14°+28°	.71
							light grey	.34
18							medium grained	.39
							minor joints, polished	.60

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 7

HOLE NO.: MS 37  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT.:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							Box No. 18	.68
								.71
						50.6		.69
								.68
						53.6	Box No. 19	.11
								.56
								.14
16	54.34	55.82	1.48	1.42			SILTSTONE: 30% sandstone, dark grey	.55
							core broken, possible fault zone	.25
							oxidation along joints 05°	.68
	55.82	56.26	0.44	0.42			SANDSTONE: 10% siltstone, medium grained	.24
							oxidation along joint 05°	.20
38	56.26	57.85	1.59	1.25		56.7	SANDSTONE: medium grained, thinly bedded Box No. 20	.44
							20% siltstone, minor calcite infilling	.23
							along bedding, joints 78° + 12° calcite	.68
							infilled	.24
7	57.85	58.06	0.21	0.21		60.3	SILTSTONE: 30% mudstone, dark grey	.21
	58.06	63.11	5.05	5.01			COAL: 60% .03 Gates "C" Seam	
							Dull .20	.13
							60% .08 soft	.68
							Core Loss .25 Dull .04	
							Mudstone .02	
							Dull .04	
							Mudstone .03	
							40% .11	
							40% .12 sheared	
							60% .08	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.:

8

HOLE NO.: MS 37

DATE RECORDED:

DATE FINISHED:

LAT.:

TOTAL DEPTH:

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.:

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							Core loss.05_40% .32 soft	
						59.7	Dull .13 Box No. 21	.45
							60% .06 minor calcite	.19
							.65	.67
							40% .09 soft	.71
							Mudstone .54	.69
							40% .10 soft sheared Box No. 22	.69
						62.8	50% .21	.06
							Core loss.08_40% .09 broken	.40
							60% .19	
							Dull .26 soft sheared	
							60% .84	
							Bone .04	
							60% .02	
							60% .06	
							80% .07	
							40% .07 soft	
							Carb. Mudstone .08	
17							40% .08	
							Bone .02	
							Floor	
17	63.11	63.33	0.22	0.21			MUDSTONE: dark grey, massive	.18
								.04
22	63.33	66.03	2.70	2.50			SANDSTONE: fine grained, 30% siltstone, thin bedded	.68
							bioturbated	.68
							minor calcite along joints 46° + 35°	
							gradational floor contact Box No. 23	
								.73
						65.8		.20



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 9

HOLE NO.: MS 37

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH:

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.03
								.38
18	66.03	70.89	4.86	4.62			SILTSTONE: massive, bioturbated	.06
							medium grey	.71
							minor calcite along joints & bedding planes	.72
							joints 71°	.69
						68.9	Box No. 24	.30
							gradation floor contact	.34
								.71
								.68
							Box No. 25	.65
26	70.89	71.40	0.51	0.46			SANDSTONE: medium grained, light grey	.51
							massive	
							sharp floor contact	
19	71.40	72.31	0.91	0.86			MUDSTONE: black, massive	.20
						71.9		.03
								.56
								.12
23	72.31	73.60	1.29	1.19			SANDSTONE: fine grained, light grey, moderate	.57
							crossbedding, 20% siltstone	.72
							Box No. 26	
							joint 24° oxidized	
10	73.60	73.98	0.38	0.37			SILTSTONE: medium grey, 30% sandstone	.38
24	73.98	75.78	1.80	1.64			MUDSTONE: 20% coal parting, black	.33
						75.0	dark grey, massive	.23
							minor calcite along bedding planes	.33
							sharp floor contact	.66
							Box No. 27	.25

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 10

HOLE NO.: MS 37  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT.:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
6	75.78	77.26	1.48	1.47			SILTSTONE: dark grey, massive	.37
								.70
								.41
16	77.26	77.53	0.27	0.26		78.0	SANDSTONE: medium grained, 20% siltstone	.27
	77.53	78.05	0.52	0.50			SILTSTONE: 30% mudstone, uniform gradational floor contact	.52
	78.05	79.41	1.36	1.31			MUDSTONE: massive, black joints 66° curved	.22
							Box No. 28	.66
							Core loss .04	.48
18	79.41	80.87	1.46	1.39			COAL: 40% .16 soft	
							Mudstone .07	.10
							Core loss .52 60% .04	.55
						81.1	Mudstone .08	.19
							Bone .06	.06
							20% .05	
							40% .10 soft	
							20% .15	
							Mudstone .09	
							40% .04	
							.06	
							Floor	
17	80.74	81.78	1.04	0.99			MUDSTONE: massive, black joints 06°, minor	.26
							Box No. 29	.61
							coal lenses, gradational floor contact	.17
17	81.78	86.55	4.77	4.56			SILTSTONE: dark grey, 20% sandstone	.52
						84.1	bioturbated, minor clay lenses to .04	.63





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 13

HOLE NO.: MS 37

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH:

HOLE ANGLE:

LONG.:

SEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							Box No. 40	.70
								.68
								.74
								.70
								.69
						114.6	Box No. 41	.45
								.17
								.71
								.72
								.73
						117.7	Box No. 42	.66
								.72
								.68
								.70
							Box No. 43	.59
18	119.98	121.09	1.11	1.06			MUDSTONE: uniform, massive, black	.10
						120.7	bed planes polished & curved	.32
								.26
							Core loss .32	.11
28	121.09	121.25	0.16	0.14			COAL	.16
							60% .11 banded	
							40% .05 soft sheared	
35	121.25	121.41	0.16	0.13			MUDSTONE: uniform, massive, black	.16
	121.41	121.54	0.13	0.11			CARBONACEOUS MUDSTONE: 20% coal, black	.13
11	121.54	122.16	0.62	0.61			SANDSTONE: 30% siltstone	.07
							moderate crossbedding	.55
							medium grey	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 14

HOLE NO.: MS 37

DATE BEGUN:

DATE FINISHED:

LAT:

TOTAL DEPTH:

HOLE ANGLE:

LONG:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.:

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
9	122.16	122.54	0.38	0.38		122.4	MUDSTONE: uniform, black polished bedding planes Box No. 44	.16 .22
9	122.54	123.78	1.24	1.22			COAL Gates "A" Seam	.45
						123.7	40% .78 hard	.65
							20% .20	.14
							60% .12	
							.05	
							30% .09	
24	123.78	131.67	7.89	7.21			SANDSTONE: coarse grained, light grey massive, uniform	.51 .71
							Box No. 45	.70
							Torrens Member	.69
						126.8		.19
								.42
								.71
							Box No. 46	.69
								.70
						129.8		.56
								.13
								.71
							Box No. 47	.66
								.51
38	131.67	132.26	0.59	0.46			SANDSTONE: as above broken core, possible fault zone	.18
						132.9		.17
								.24
	132.26	132.58	0.32				SANDSTONE: as above	.22
							gradational floor contact Box No. 48	.10







MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-38

DRILLED FOR: Ranger Oil Limited  
DRILLED BY: Tonto Drilling Ltd.

LOCATION: EB Pit Area

COLLAR ELEVATION: 1558.5 m  
TOTAL DEPTH: 137.92 m  
CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.  
Focussed Beam (Resistivity) Log: Normal, Expanded.  
Density: Normal, Expanded.  
Caliper.  
Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

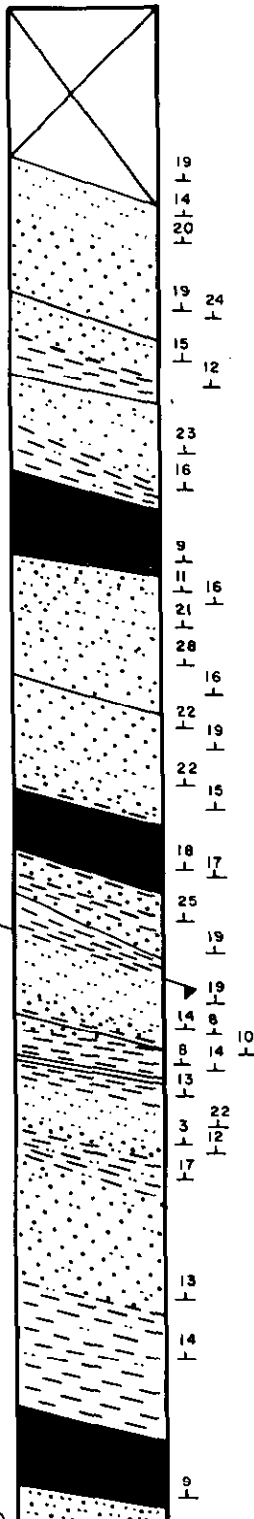
	<u>Interval (m)</u>	<u>Thickness (m)</u>
D	32.08-36.88	4.80
C	53.16-57.06	3.90
B	93.57-98.37	4.80
A	111.80-113.20	1.40

GATES D SEAM

GATES C SEAM

GATES B SEAM

100.00



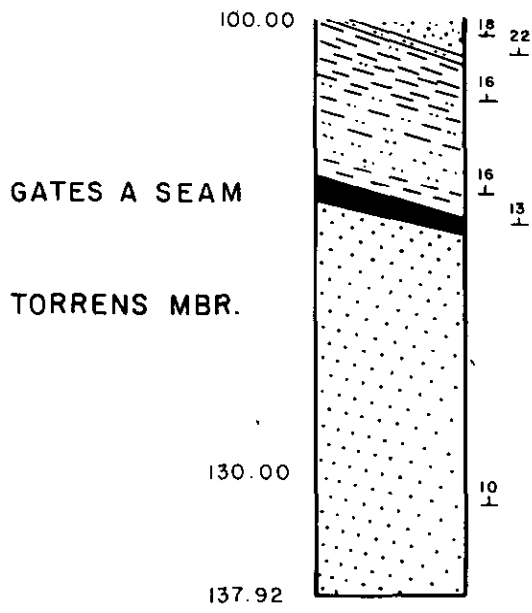
Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED  
for  
RANGER OIL (CANADA) LTD.

DATE: October 1980

STRATIGRAPHIC LOG  
MS 38

Scale 1:500

PAGE 1 of 2



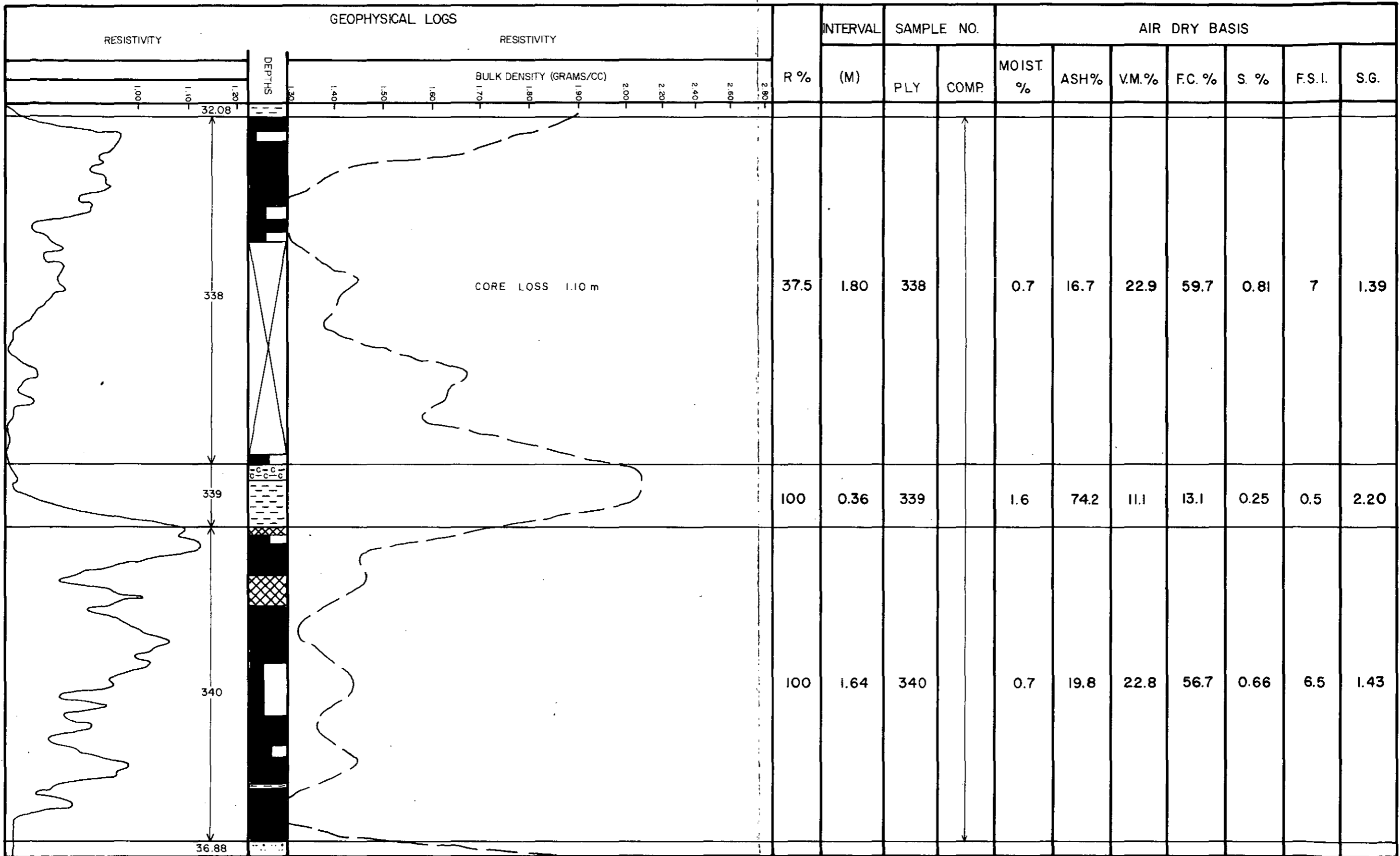
Prepared by:  
 ROBERTSON RESEARCH CANADA LIMITED  
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STRATIGRAPHIC LOG  
 MS 38

DATE: October 1980

Scale 1:500

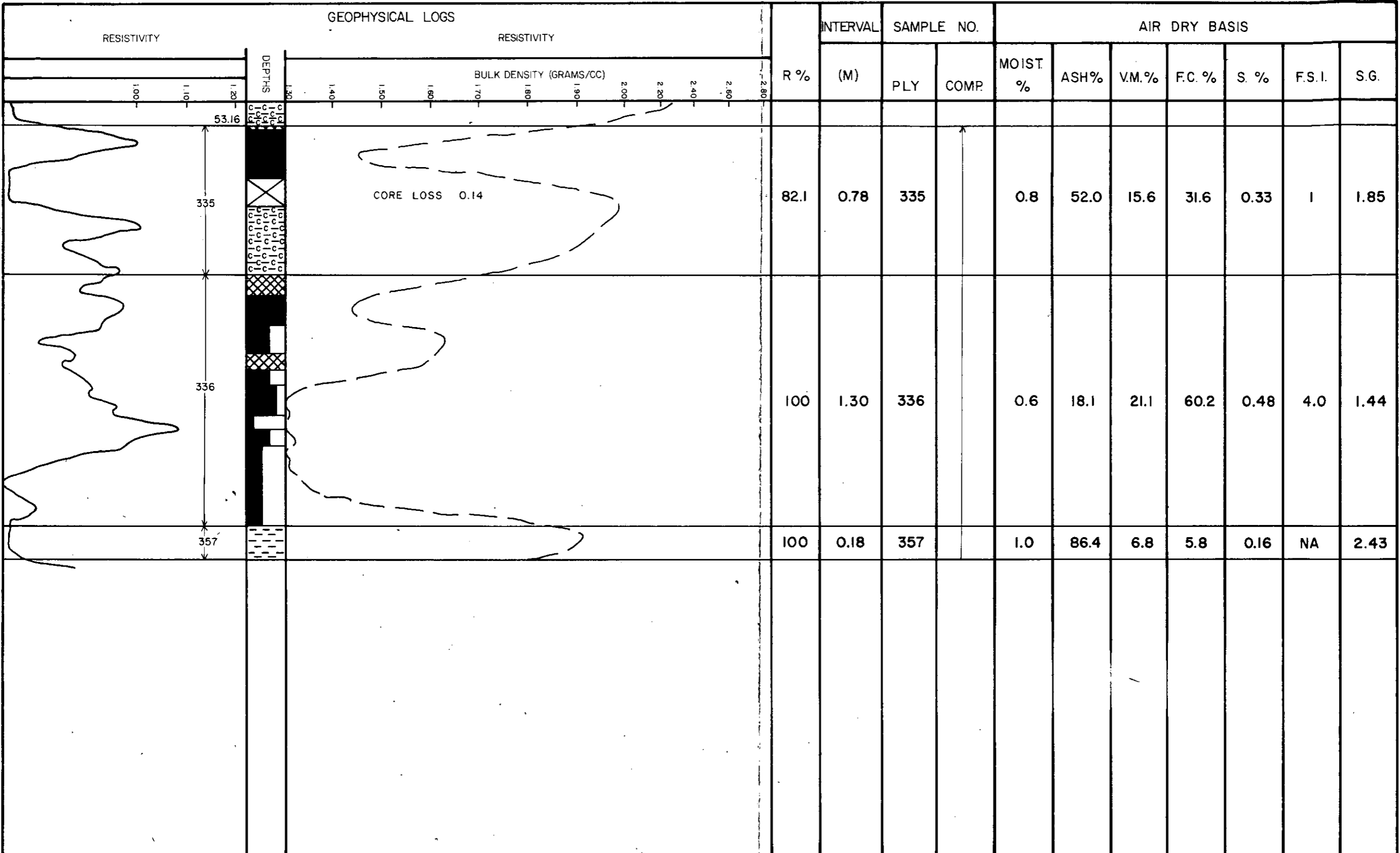
PAGE 2 of 2



Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
 BULK DENSITY - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
 MS 38 D SEAM**



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

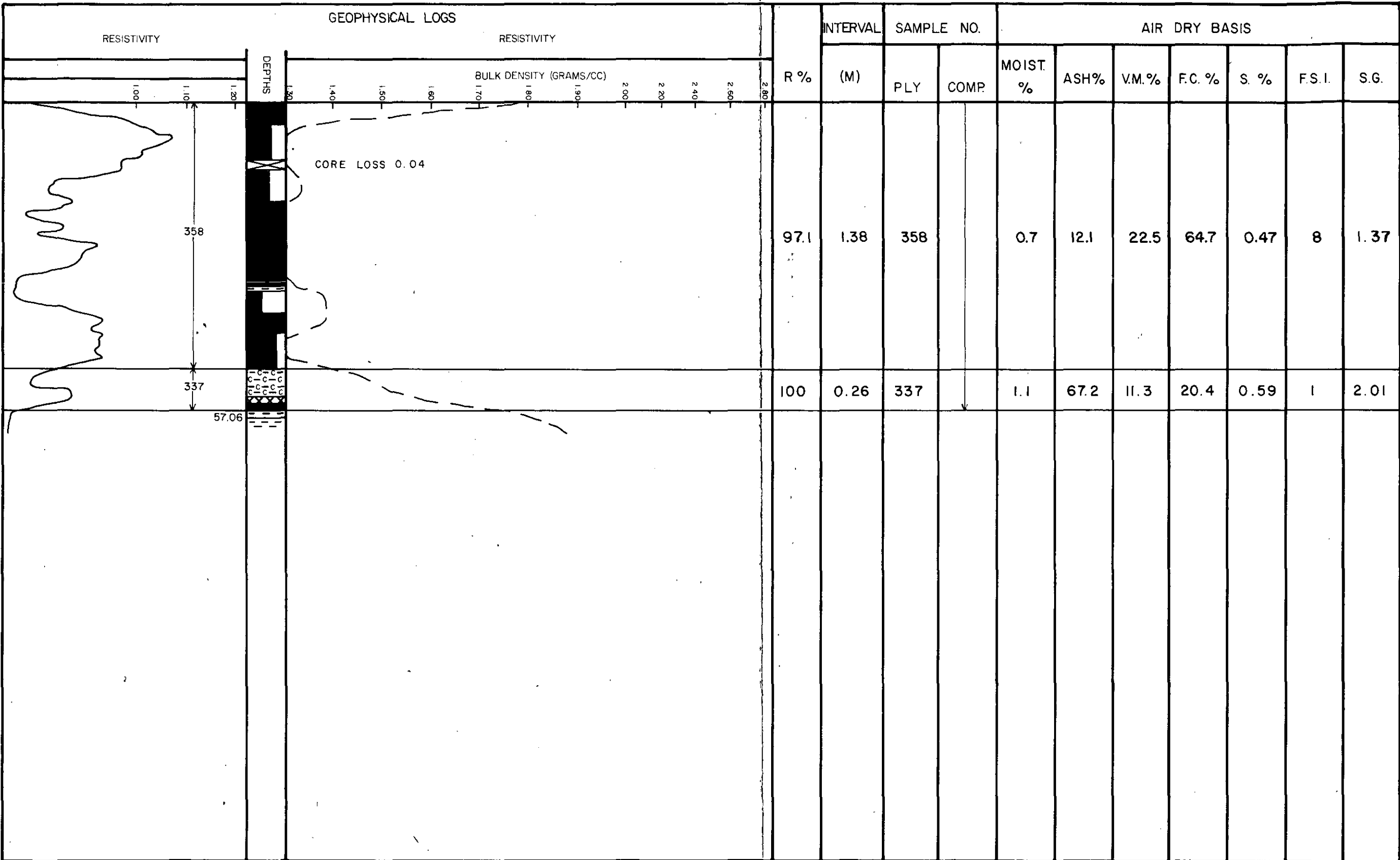
RESISTIVITY ———  
BULK DENSITY - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 38 C SEAM**

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 1 of 2



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
97.1	1.38	358		0.7	12.1	22.5	64.7	0.47	8	1.37
100	0.26	337		1.1	67.2	11.3	20.4	0.59	1	2.01

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 38 C SEAM**

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 2 of 2

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

DEPTH

R %

(M)

PLY

COMP.

MOIST. %

ASH%

V.M.%

F.C. %

S. %

F.S.I.

S.G.

1.00

1.10

1.20

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

2.80

93.57m

334

CORELOSS 0.11

CORE LOSS 0.12

95.2

4.80

334

0.5

12.9

22.2

64.4

0.44

5.5

1.40

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

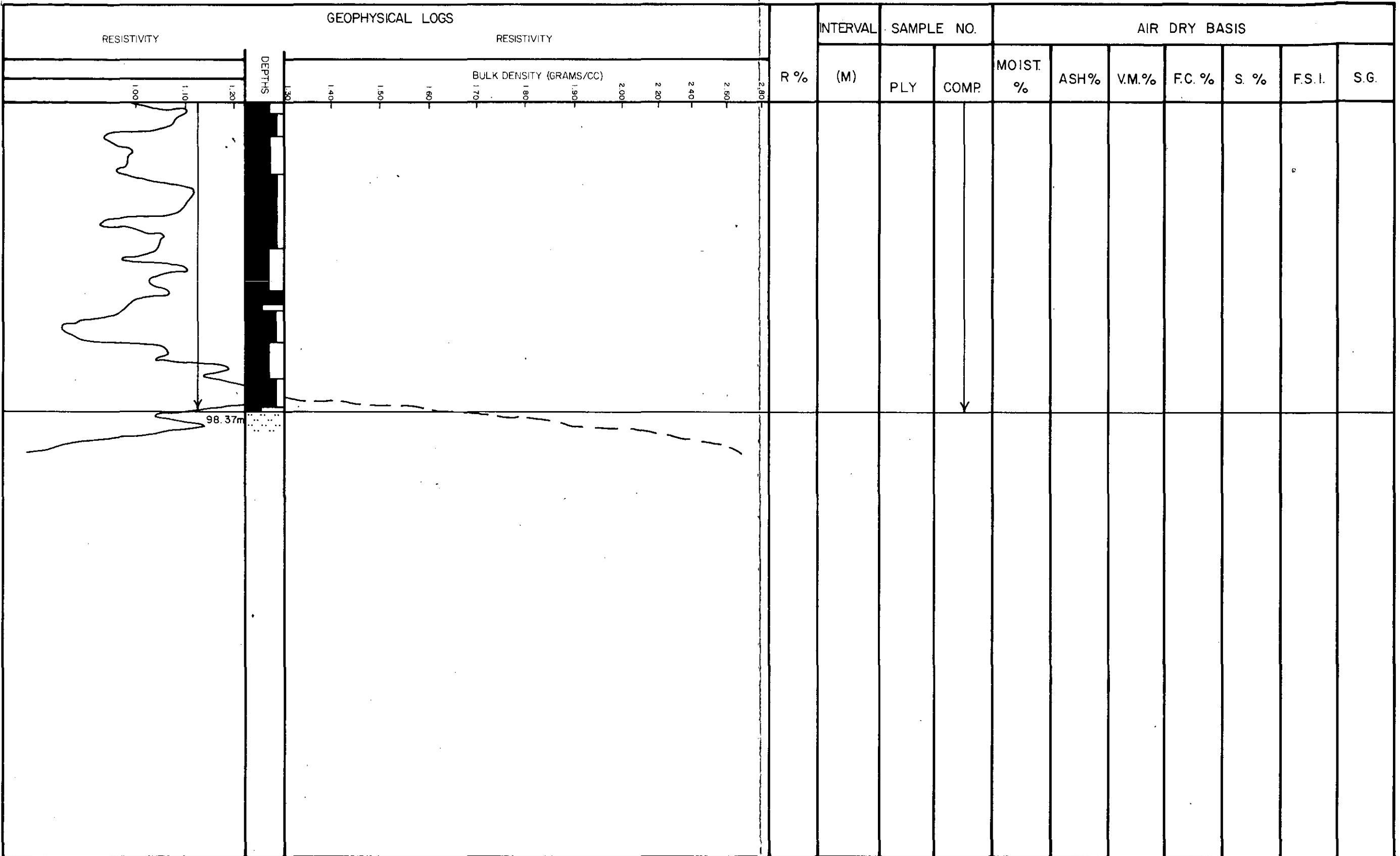
RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 38 B SEAM

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 1 of 2



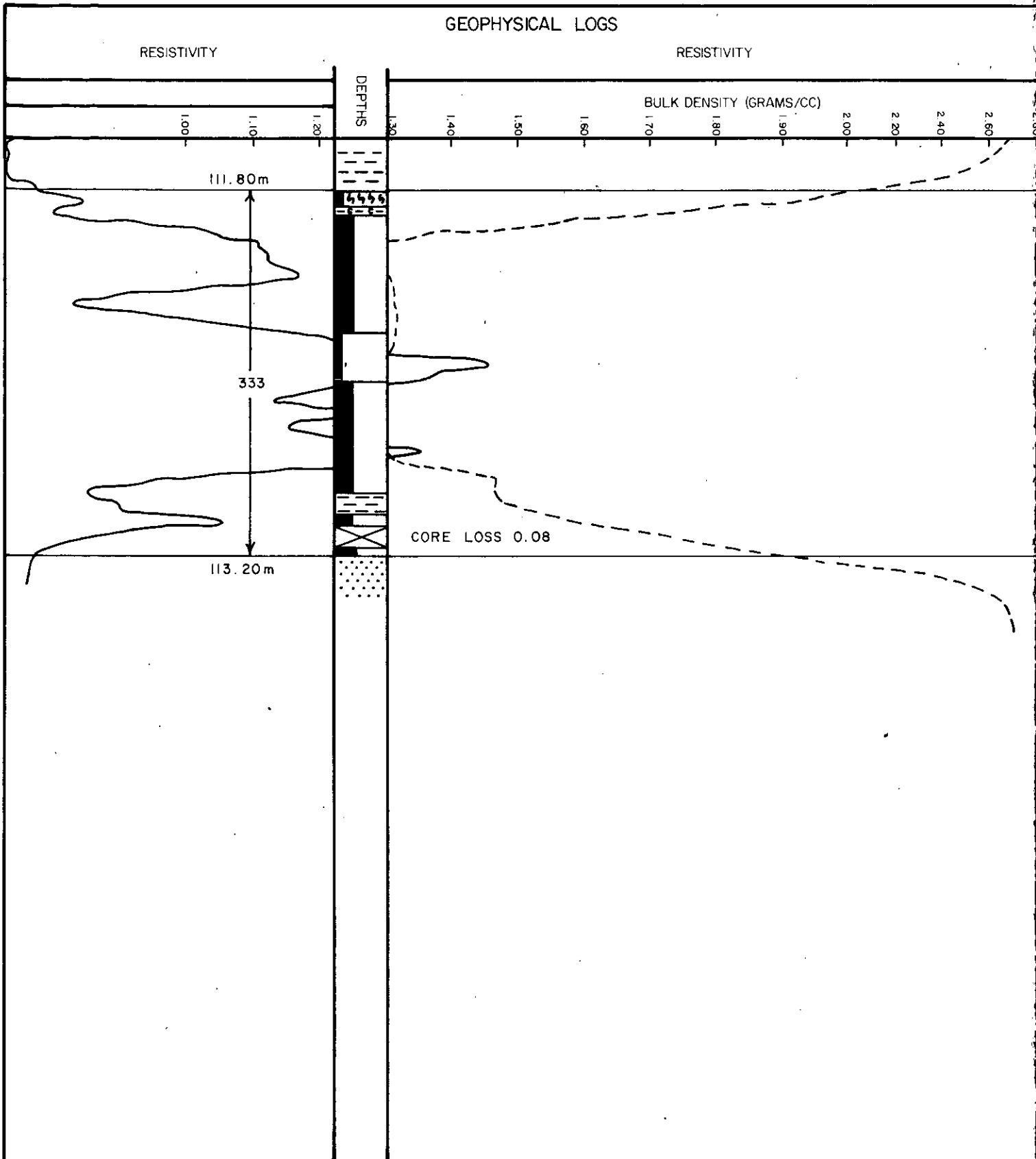
Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
 BULK DENSITY ———  
 R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
 MS 38 B SEAM**



GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP	MOIST %	ASH%	VM.%	F.C. %	S. %	F.S.I.	S.G.
94.3	1.40	333		0.4	20.7	18.5	60.4	0.48	5	1.46

Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED

DATE: OCTOBER 1980

RESISTIVITY ———  
 BULK DENSITY - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 38 A SEAM**

SCALE 1:20



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 2

HOLE NO.: MS 38

DATE BEGUN:

TOTAL DEPTH: 137.92 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
15	23.48	25.26	1.78	1.72			MUDSTONE: 20% carbonaceous partings to 0.08 m	.44
							black Box No. 6	.59
							sharp floor contact	.67
								.08
12	25.26	29.53	4.27	4.18		26.2	SANDSTONE: fine grained, 30% siltstone	.57
							turbated, beds to .04 m	.71
							gradational floor contact	.73
								.73
								.72
						29.3		.14
								.51
							Box No. 8	.16
23	29.53	31.79	2.26	2.08			MUDSTONE: 30% siltstone	.52
							dark grey	.69
							minor sandstone lenses to .08 m	.69
						32.3		.36
	31.79	32.08	1.29	1.19			MUDSTONE: black, massive, uniform	.25
							Box No. 9	.73
						33.5		.09
								.12
16	32.08	36.88	3.80	3.65			COAL: pyrite disseminated throughout	.25
							80% .07 hard Gates "D" Seam	.58
						35.4	Dull .06	.14
							80% .33 hard	.50
							20% .08 Box No. 10	.71
						37.4	80% .06	.49
							20% .05 core broken	
							Core loss 1.10	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 3

HOLE NO.: MS 38

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH: 137.92 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							40% .05	
							Carb. mudstone .09	
							mudstone .18	
							mudstone .06	
							bone .04	
							40% .05	
							80% .16	
							bone .16	
							80% .30	
							20% .28	
							80% .15	
							40% .07	
							80% .13	
							mudstone .03	
							80% .27	
							Sharp floor contact	
9	36.88	37.57	0.69	0.68			SILTSTONE: 40% sandstone, dark grey	.12
								.62
								.10
11	37.57	38.26	0.69	0.68		38.4	SANDSTONE: fine grained 20% siltstone turbated and crossbedded	.19
							gradational floor contact Box No. 11	.29
								.21
	38.26	39.33	1.07	1.05			SILTSTONE: 10% sandstone, dark grey	.51
							gradational contact	.56
							turbated	
16	39.33	40.96	1.63	1.57			SANDSTONE: 30% siltstone, fine grained moderately crossbedded	.14
						41.5	light grey	.72
								.62
							Box No. 12	.15

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 4

HOLE NO.: MS 38

DATE BEGUN:

TOTAL DEPTH: 137.92 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
21	40.96	43.66	2.70	2.52			SILTSTONE: 20% sandstone	.57
							turbated	.72
								.72
								.69
28	43.66	45.27	1.61	1.42			SANDSTONE: fine grained, light grey	.02
						44.5	crossbedded Box No. 13	.26
							sharp floor contact	.40
								.68
								.25
16	45.27	47.44	2.17	2.09			SANDSTONE: fine grained, 20% siltstone	.41
							light grey	.62
						47.5	Box No. 14	.59
								.04
								.51
22	47.44	49.10	1.66	1.54			SANDSTONE: fine grained	.17
							10% siltstone	.70
							light grey Box No. 15	.74
								.05
19	49.10	50.82	1.72	1.63			SILTSTONE: 10% sandstone, medium grey	.61
						50.6	turbated	.19
								.70
	50.82	51.12	0.30	0.28			core loss .30	.22
22	51.12	52.20	1.08	1.00			SANDSTONE: 40% siltstone, medium grey	.46
							moderately turbated Box No. 16	.57
	52.20	52.89	0.69	0.64			core loss .69	.05
15	52.89	53.16	0.27	0.26		53.6	CARBONACEOUS MUDSTONE: black, 20% coal partings	.27
	53.16	57.06	3.90	3.77			COAL: Gates "C" Seam	.30
						54.4	bone .02	.40
							80% .25	.21

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 5

HOLE NO.: MS 38

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH: 137.92 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.:

COAL LICENSE:

CORE SIZE:

S.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							carb. mudstone .37	.73
							bone .03	
							bone .07 minor calcite	
							80% .15	
							40% .15 minor calcite	
							bone .09 Box No. 17	.62
						56.7	40% .08	.57
							60% .15	.63
							dull .08	.26
							40% .08	
							30% .42 minor calcite	
							mudstone .18	
							80% .11	
							40% .36 minor calcite	
							core loss .04 80% .24	
							80% .20	
							mudstone .02	
							20% .12 soft,	
							80% .10	
							60% .19 soft,	
							carb. mudstone .15	
							bone .04	
							100% .02	
							carb. mudstone .05	
							floor gradational contact	
18	57.06	57.38	0.32	0.30			MUDSTONE: black, uniform	
							gradational floor contact	.32
17	57.38	58.59	1.21	1.16			SANDSTONE: medium grained, light grey	.09
							10% siltstone Box No. 18	.71
							gradational floor contact	.41

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 6

HOLE NO.: MS 38

DATE BEGUN:

DATE FINISHED:

LAT:

TOTAL DEPTH: 137.92 m

HOLE ANGLE:

LONG:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	58.59	59.69	1.10	1.05			MUDSTONE: 10% coal partings, black, uniform	.32
						59.7	minor turbation	.06
							gradational floor contact	.57
								.15
	59.69	60.43	0.74	0.71			SANDSTONE: fine grained, light grey	.52
							uniform, sharp floor contact Box No. 19	.22
25	60.43	62.33	1.90	1.72			MUDSTONE: black, uniform	
	62.33	62.51	0.18	0.16			Core loss 0.18	
							fault floor contact, minor calcite 78° polished	.47
								.71
						62.8		.21
								.43
								.08
19	62.51	65.91	3.40	3.21			SILTSTONE: 15% fine sandstone, dark grey	.61
							moderate turbation Box No. 20	.70
							gradational floor contact	.70
						65.8		.59
								.72
							Box No. 21	.08
19	65.91	66.46	0.55	0.52			SANDSTONE: medium grained, 10% siltstone lenses	.55
							sharp floor contact, light grey	
	66.46	67.46	1.00	0.95			MUDSTONE: 20% carbonaceous partings, black	.49
							sharp floor contact	.51
14	67.46	67.98	0.52	0.49			SANDSTONE: 30% siltstone, crossbedded	.22
							light grey	.30
							gradational floor contact	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 7

HOLE NO.: MS 38

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH: 137.92 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.:

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
8	67.98	69.25	1.27	1.26		68.9	MUDSTONE: uniform, black	.07
								.28
							Box No. 22	.69
								.23
10	69.25	69.80	0.55	0.54			MUDSTONE: carbonaceous, hard, black	.41
								.14
8	69.80	70.25	0.45	0.45			COAL: 70% .31	.45
							40% .14 soft & broken	
14	70.25	71.79	1.54	1.49			MUDSTONE: massive, uniform, black	.08
							10% coal parting to .04 m	.67
						71.9	gradational floor contact Box No. 23	.06
								.61
								.12
13	71.79	74.03	2.24	2.18			SILTSTONE: 20% fine sand	.54
							gradational floor contact	.73
								.62
						75.0	Box No. 24	.35
22	74.03	75.00	0.97	0.90			SANDSTONE: fine grained, 20% siltstone	.31
							crossbedded	.66
3	75.00	75.68	0.68	0.68			MUDSTONE: 10% carbonaceous partings to .10 m	.68
							black	
12	75.68	77.23	1.55	1.52			MUDSTONE: 30% siltstone, interbedded	.66
							minor fine sand lenses .09 m Box No. 25	.57
							gradational floor contact	.32



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 38

SHEET No.: 8

DATE BEGUN:  
DATE FINISHED:  
LAT:

TOTAL DEPTH: 137.92 m  
HOLE ANGLE:  
LONG:

BEARING:  
ELEV. COLLAR:  
LOGGED BY:

U.T.M.  
COAL LICENSE:  
CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
17	77.23	84.83	7.60	7.27			SANDSTONE: fine grained, 20% siltstone	.36
							moderate crossbedding	.69
							light grey	.63
	84.83	85.21	0.38	0.36			core loss 0.38 m	.68
						81.1	Box No. 26	.35
								.26
								.66
							gradational floor contact	.60
							Box No. 27	.68
								.65
						84.1		.73
							Box No. 28	.69
								.62
13	85.21	88.20	2.99	2.91			MUDSTONE: 20% siltstone, dark grey	.07
	88.20	89.29	1.09	1.06		87.1	core loss 1.09, uniform	.32
								.26
								.62
							Box No. 29	.71
								.64
								.37
14	89.29	93.57	4.28	4.15			MUDSTONE: black, uniform	.25
						90.2		.14
								.41
							Box No. 30	.66
								.67
								.55
								.54
						93.3	Box No. 31	.28
							Gates "B" Seam	.60



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 10

HOLE NO.: MS 38

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH: 137.92 m

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
	100.96	101.02	0.06	0.06			COAL: stringer, driller loss circulation	.06
	101.02	101.27	0.25	0.25			core loss 0.25, fault - if so little evidence	
18	101.27	101.37	0.10	0.10			SILTSTONE: as above, dark grey	.10
							sharp floor contact	
							minor polished fracture 42°	
	101.37	105.00	3.63	3.45			MUDSTONE: 20% siltstone, uniform	.14
						102.4	dark grey	.32
								.28
								.67
							Box No. 35	.52
22								.71
						105.5		.67
								.15
								.17
	105.00	108.06	3.06	2.84			SILTSTONE: 40% mudstone	.44
							dark grey Box No. 36	.69
16							massive, somewhat bedded	.68
							occasional shaly breaks	.65
						108.5	slickensided	.46
							Box No. 37	.14
	108.06	110.48	2.42	2.33			SILTSTONE: bedded	.43
							frequent shale lenses	.66
							medium to dark grey	.67
								.66
	110.48	111.80	1.32	1.27		111.6	MUDSTONE: minor coal partings (.01-.1 m) Box No. 38	.59
							dark grey	.51
							slickensided	.22





MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-39

DRILLED FOR: Ranger Oil Limited

DRILLED BY: Tonto Drilling Ltd.

LOCATION: Mt. Spieker - Syncline Area

COLLAR ELEVATION: 1831.2 m

TOTAL DEPTH: 449.8 m

CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.

Focussed Beam (Resistivity) Log: Normal, Expanded.

Density: Normal, Expanded.

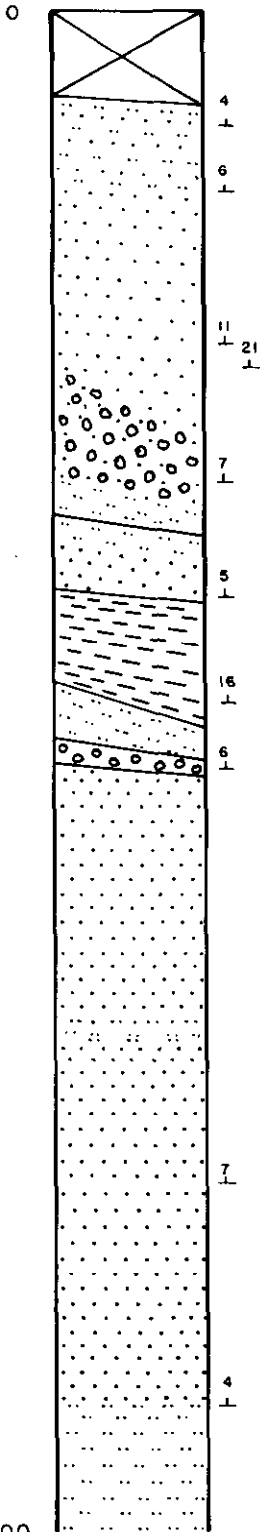
Caliper.

Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

	<u>Interval (m)</u>	<u>Thickness (m)</u>
1	440.50-444.65	4.15
2	265.21-269.35	4.14
3	258.01-260.44	2.43
4	251.70-254.93	3.23



Prepared by:  
 ROBERTSON RESEARCH CANADA LIMITED  
 for  
 RANGER OIL (CANADA) LTD.

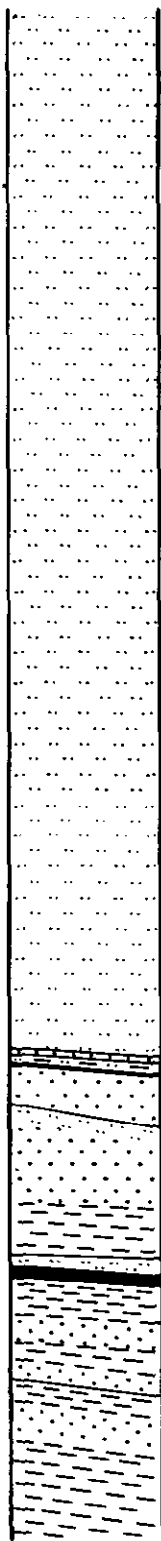
STRATIGRAPHIC LOG  
 MS 39

DATE: October 1980

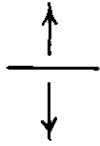
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PAGE 1 of 5

100.00



2  
1 5  
1 1



HULLCROSS

GATES

2

4

6

200.00

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STRATIGRAPHIC LOG  
MS 39

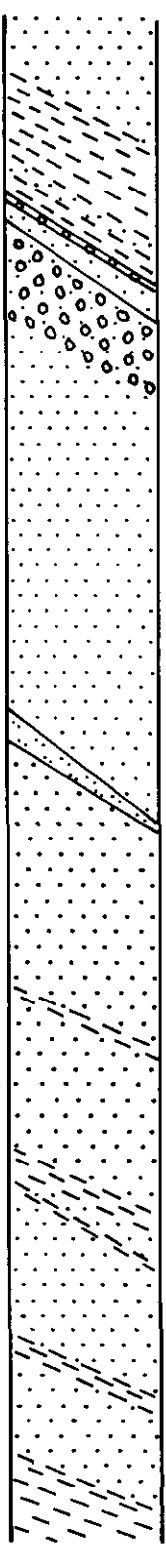
DATE: October 1980

Scale 1:500

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300.00



27



31



32 34



28



36



32



37



31



24



31



24



36



23



← fold axis

400.00

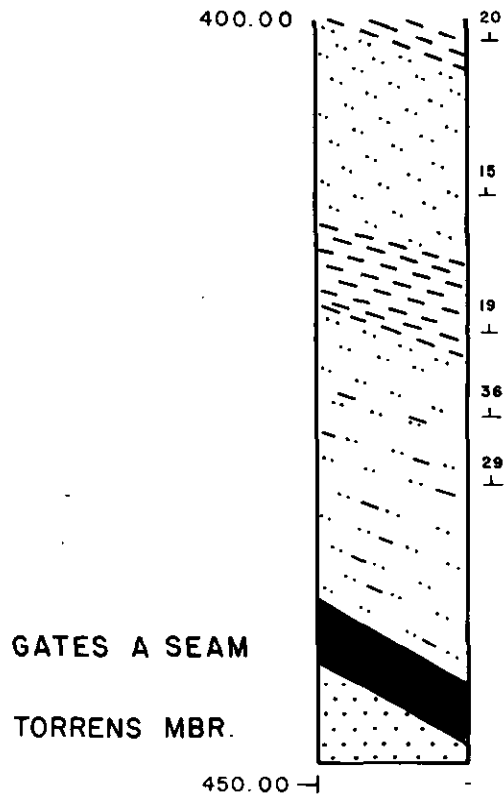
Prepared by:  
**ROBERTSON RESEARCH CANADA LIMITED**  
for  
**RANGER OIL (CANADA) LTD.**

**STRATIGRAPHIC LOG  
MS 39**

DATE: **October 1980**

Scale **1:500**

PAGE **4** of **5**



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 for  
 RANGER OIL (CANADA) LTD.

STRATIGRAPHIC LOG  
 MS 39

DATE: October 1980

Scale 1:500

PAGE 5 of 5

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

DEPTHS

R %

(M)

PLY

COMP.

MOIST. %

ASH%

V.M.%

F.C. %

S. %

F.S.I.

S.G.

1.00 1.10 1.20

1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00 2.20 2.40 2.60 2.80

251.70

212

213

214

215

216

217

218

254.93

CORE LOSS 0.12 m

100

1.07

212

0.5

8.8

26.0

64.7

0.46

6

1.36

100

0.30

213

1.0

47.2

18.2

33.6

0.50

3

1.75

56

0.27

214

1.4

84.3

8.7

5.6

0.09

0

2.43

100

0.45

215

0.6

47.1

18.4

33.9

0.22

1.5

1.78

100

0.27

216

0.4

15.6

26.0

58.0

0.42

7

1.41

100

0.48

217

0.5

25.6

22.0

51.9

0.42

3

1.52

100

0.37

218

0.4

14.3

26.7

58.6

0.52

8.5

1.39

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 39 4 SEAM

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 1 of 1

GEOPHYSICAL LOGS

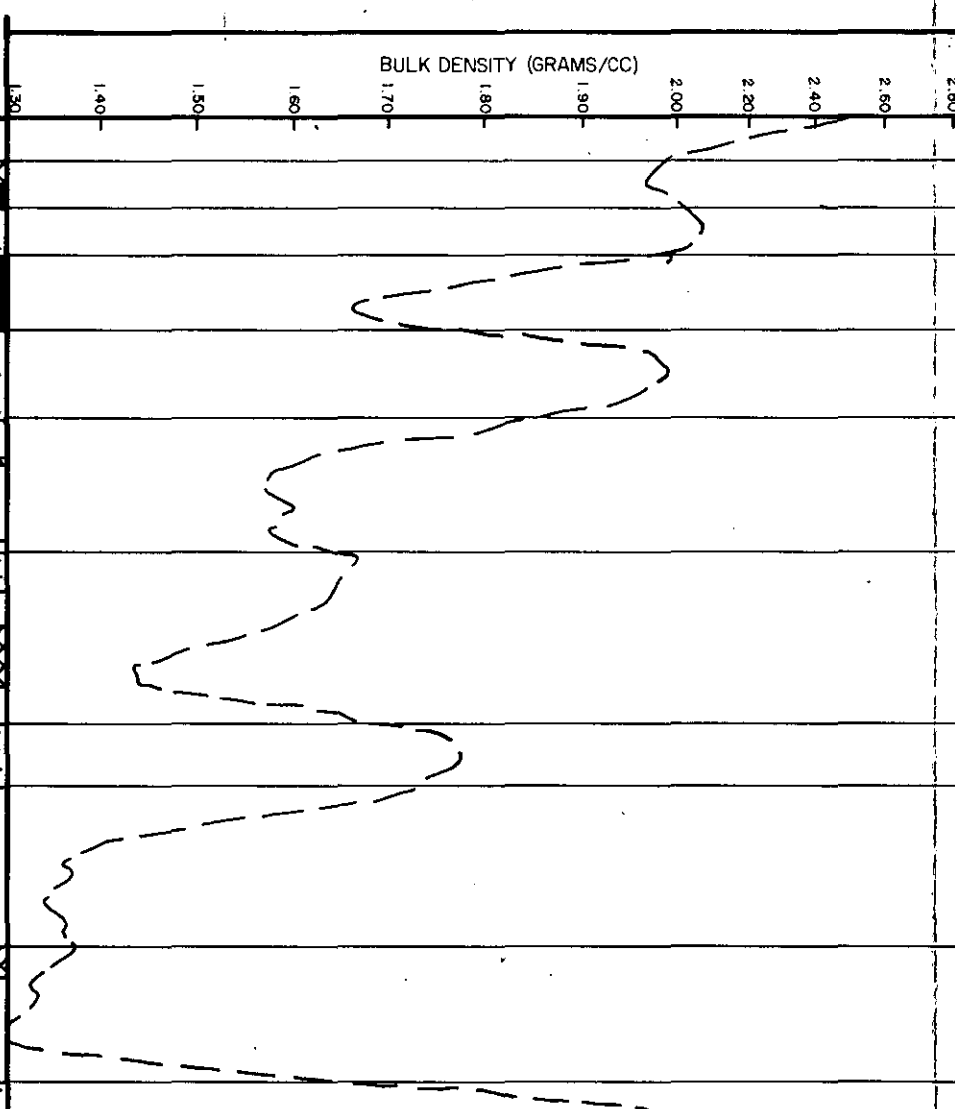
RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

DEPTHS

1.00  
1.10  
1.20  
258.01m  
219  
220  
221  
222  
223  
224  
225  
226  
227  
260.44 m



R %	INTERVAL	SAMPLE NO.		AIR DRY BASIS						
	(M)	PLY	COMP	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
100	0.12	219		0.8	43.7	19.7	35.8	0.79	4	1.67
100	0.13	220		1.2	86.3	9.5	3.0	0.11	0	2.55
100	0.19	221		0.6	18.3	25.4	55.7	0.64	7	1.43
100	0.24	222		1.1	77.2	9.5	12.2	0.16	0.5	2.45
100	0.35	223		0.5	28.4	20.9	50.2	0.59	3	1.55
100	0.45	224		0.5	29.0	21.0	49.5	0.28	2	1.57
100	0.17	225		0.8	59.4	14.9	24.9	0.15	1	1.97
100	0.42	226		0.4	11.7	24.6	63.3	0.30	4.5	1.39
100	0.36	227		0.3	7.8	26.3	65.6	0.46	6.5	1.34

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 39 3 SEAM

GEOPHYSICAL LOGS

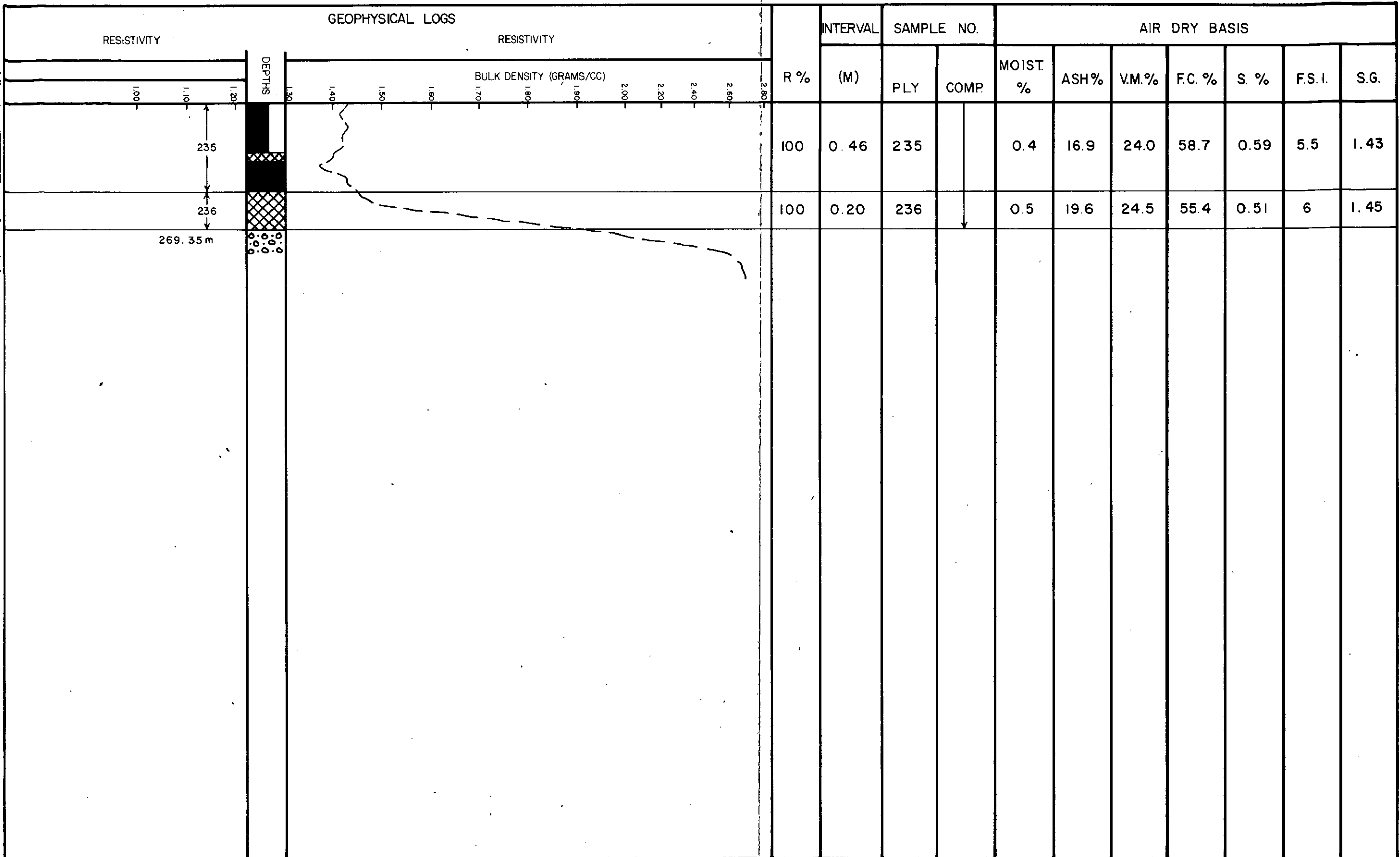
RESISTIVITY	DEPTHS	RESISTIVITY	BULK DENSITY (GRAMS/CC)	R %	INTERVAL	SAMPLE NO.		AIR DRY BASIS									
					(M)	PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.			
	265.21 m																
	228			100	0.50	228			0.4	6.2	26.2	67.2	0.49	6	1.34		
	229			100	0.29	229			1.0	76.1	9.2	13.7	0.14	0.5	2.24		
	230			100	0.52	230			0.5	8.1	27.2	64.2	0.53	8.5	1.34		
	231			100	0.38	231			1.0	76.8	9.1	13.1	0.15	0.5	2.25		
	232			50	0.74	232			0.7	19.6	25.1	54.6	0.55	8.0	1.44		
	233			100	0.12	233			1.1	69.3	11.1	18.5	0.19	0.5	2.15		
	234			82	0.93	234			0.5	19.3	24.6	55.6	0.88	7.0	1.44		

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 39 2 SEAM

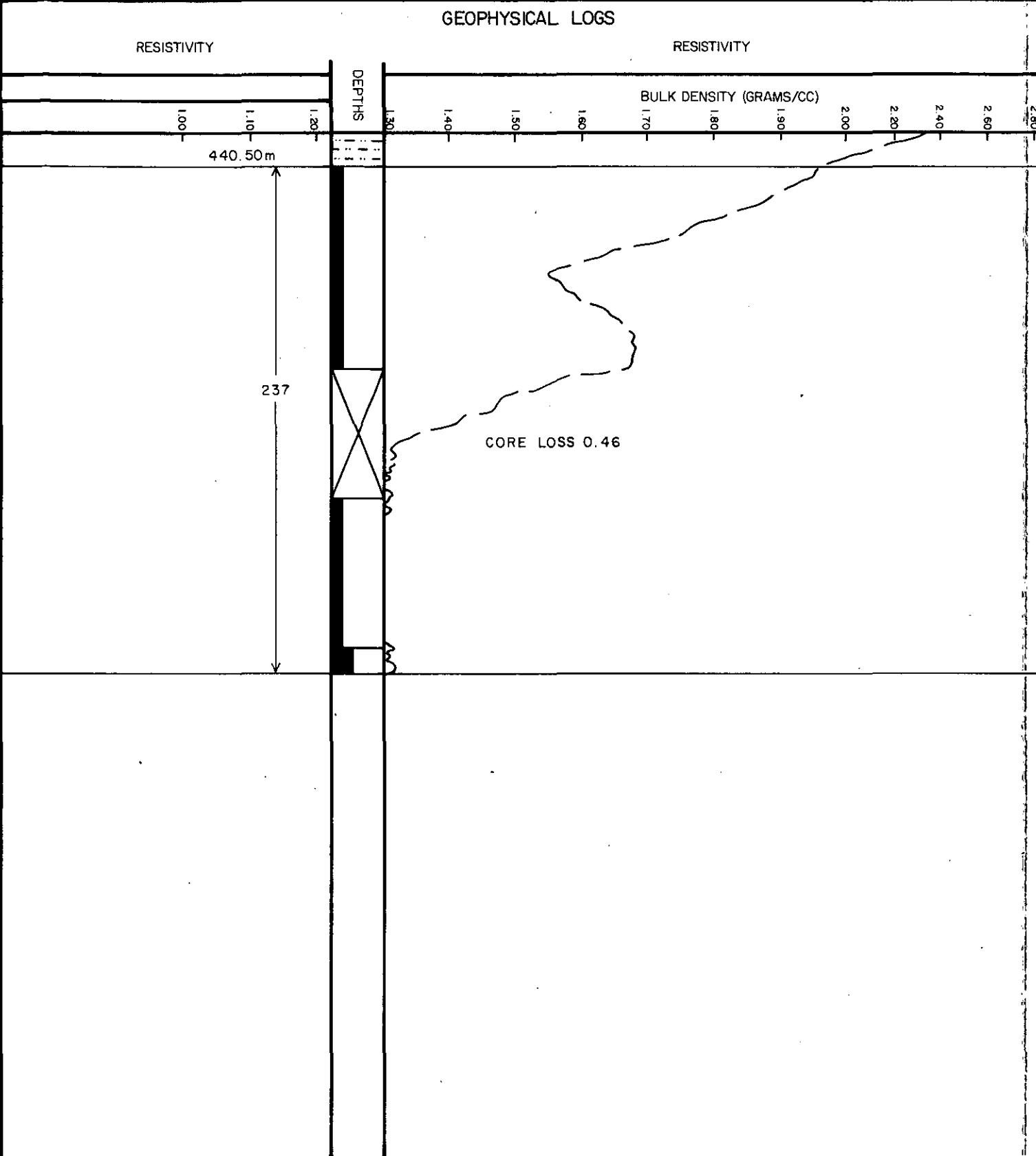
GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 39 2 SEAM**



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
74	1.95	237		0.4	19.0	21.4	59.2	0.66	6	1.42

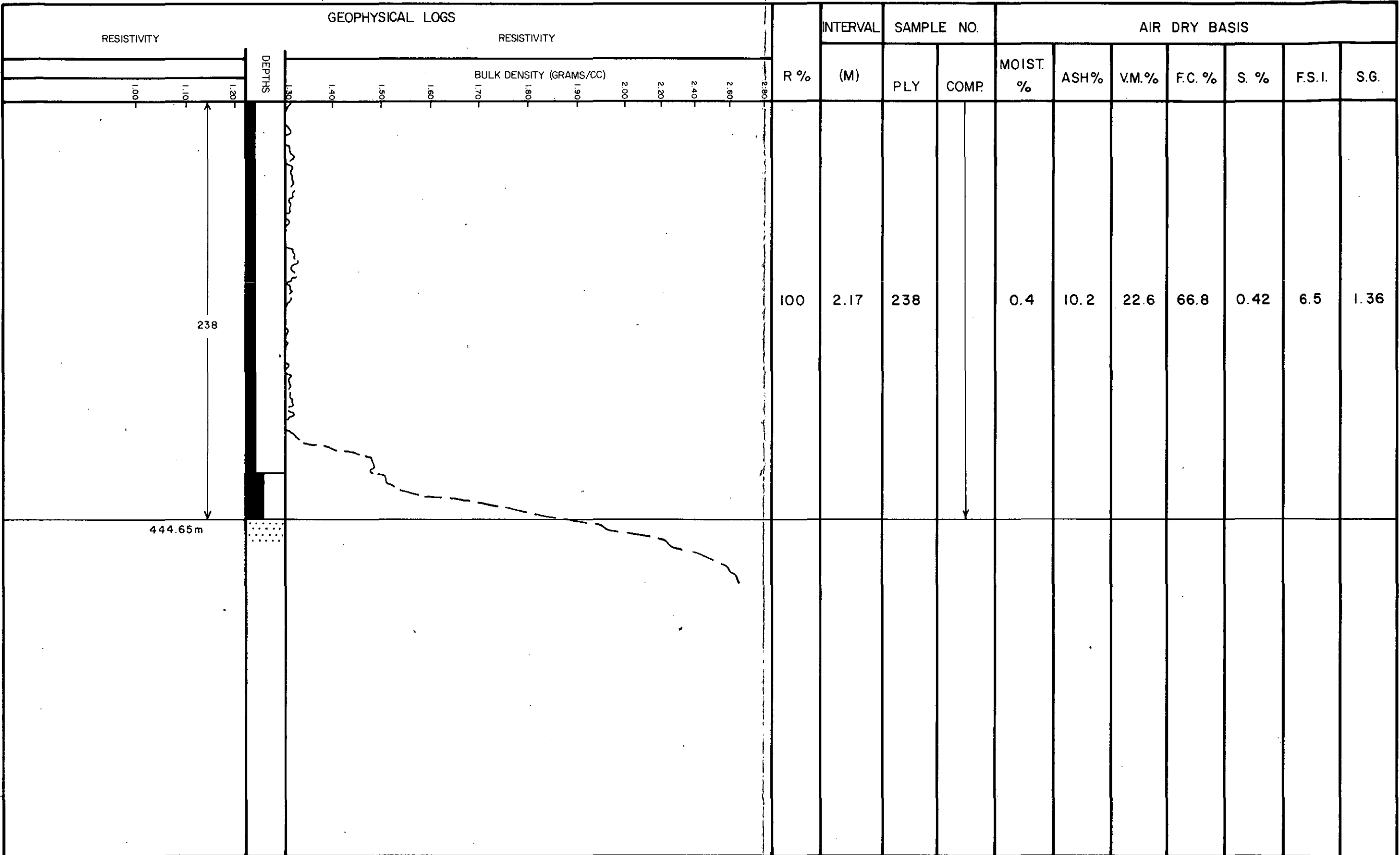
Prepared by :  
**ROBERTSON RESEARCH CANADA LIMITED**  
 DATE: OCTOBER 1980

RESISTIVITY ———  
 BULK DENSITY - - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 39 | SEAM**

SCALE: 1:20

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 39 | SEAM





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 2

HOLE NO.: MS 39

DATE BEGAN:

DATE FINISHED:

LAT:

TOTAL DEPTH:

HOLE ANGLE:

LONG:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

E.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.74
11								.71
						23.2	Box No. 8	.47
								.17
								.52
21	23.58	26.29	2.71	2.53			SANDSTONE: coarse grained, bedded	.15
							salt and pepper texture	.74
							gradational floor contact	.74
							Box No. 9	.69
						26.2		.12
								.27
	26.29	30.09	3.80	3.55			CONGLOMERATE: 20% coarse grained sandstone	.23
							chert pebble	.72
							sharp floor contact	.70
							Box No. 10	.68
						29.3		.43
								.19
								.73
								.12
	30.09	30.96	0.87	0.81			SANDSTONE: medium grained	.58
							light grey Box No. 11	.29
							broken up, weathered, soft	
							gradational floor contact, joints 56°	
7	30.96	33.80	2.84	2.82			SILTSTONE: medium grey	.33
						32.3	30% sandstone	.57
							minor crossbedding	.61
							sharp floor contact	.71







## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 6

HOLE NO.: MS 39

DATE BEGUN:

TOTAL DEPTH:

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.67
							Box No. 28	.72
								.70
								.71
						78.0		.23
								.41
							Box No. 29	.60
								.67
								.60
								.72
7							minor joints at 35° Box No. 30	.57
								.70
								.56
								.74
							Box No. 31	.65
								.72
								.69
								.74
						87.2	Box No. 32	.71
								.64
								.71
								.69
							Box No. 33	.71
								.41
						90.2		.10
								.64
								.66
							Box No. 34	.27
4	91.76	168.18	76.42	76.23			SILTSTONE: 30% sandstone, fine grained	.34
						92.7	dark grey	.54



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 39  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

SHEET No.: 8

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.68
						111.6	Box No. 41	.22
								.36
								.72
								.73
								.75
						114.6	Box No. 42	.61
								.66
								.72
								.75
							Box No. 43	.72
						117.7	10 cm, light grey, clay with mudclusts	.32
								.29
								.72
								.70
							Box No. 44	.74
								.74
						120.7		.06
								.53
								.76
							Box No. 45	.69
								.71
						123.7		.44
								.21
								.73
							Box No. 46	.70
								.73
						126.8		.65
								.68
							Box No. 47	.74





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 10

HOLE NO.: MS 39

DATE BEGUN:

DATE FINISHED:

LAT:

TOTAL DEPTH:

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.:

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Recd.
								.70
								.73
							Box No. 54	.74
						148.1		.35
								.33
								.73
								.73
							Box No. 55	.74
						151.2		.64
							.25 m soft, broken clay lense	.72
							turbated	.72
							Box No. 56	.74
								.69
						154.2	joint, s.s., 34°	.06
								.64
							joint, s.s., 49°	.58
							Box No. 57	.70
								.69
						157.3		.47
								.20
								.69
							Box No. 58	.70
							12 cm clay band, with mud clusts	.69
								.69
						160.3		.18
								.43
							Box No. 59	.75
								.72
								.67
						163.4		.52

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 11

HOLE NO.: MS 39  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
								.12
							Box No. 60	.72
								.72
								.70
								.69
						166.4	Box No. 61	.10
								.55
								.68
								.69
	168.18	168.72	0.54	0.54			SANDSTONE: medium grained	.20
							medium grey	.34
							bedded	
2							conglomerate base	
							pyrite matrix, 2 cm	
							sharp contact	
							FLOOR OF HULCROSS F.M.	
	168.72	168.90	0.18	0.18			SILTSTONE: dark grey	.18
							pyrite organic replacement	
	168.90	169.06	0.16	0.16			MUDSTONE: 20% carbonaceous	.16
							black	Box No. 62
5	169.06	169.43	0.37	0.37		169.5	COAL: hard, banded	.28
							60% bright	.09
							sharp floor contact	
	169.43	169.52	0.09	0.09			MUDSTONE: black	.09
							uniform	



## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No: 13

HOLE NO.: MS 39  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT.:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				re. Rec.
	181.25	181.49	0.24	0.24		181.7	COAL: 80% bright hard	.10 .14
4	181.49	182.33	0.84	0.84			SILTSTONE: 30% mudstone dark grey minor turbation	.37 .47
	182.33	183.20	0.87	0.87			COAL: .16 80% bright .06 dull .16 80% bright Box No. 67 .14 30% bright .12 80% bright .18 20% bright .05 bone	.22 .65
	183.20	185.49	2.29	2.28		184.7	MUDSTONE: black uniform 5% coal partings, 1 cm. Box No. 68	.75 .50 .20 .73 .11
	185.49	186.98	1.49	1.49			SANDSTONE: fine grained 20% siltstone turbated gradational floor	.57 .68 .24
	186.98	188.67	1.69	1.69		187.8	MUDSTONE: 30% siltstone 5% carbonaceous partings, 1 cm dark grey Box No. 69 turbated gradational floor	.49 .68 .52

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 14

HOLE NO.: MS 39  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
6	188.67	189.98	1.31	1.30			SANDSTONE: medium grained	.18
							light grey	.68
							20% siltstone	.45
							minor turbation	
							sharp floor contact	
	189.98	191.42	1.44	1.43			MUDSTONE: 20% siltstone	.22
						190.8	dark grey	.32
							uniform	.26
							Box No. 70	.64
	191.42	194.08	2.66	2.65			SANDSTONE: light grey	.72
							medium grained	.73
						193.9	30% siltstone lenses	.69
							uniform	.52
							Box No. 71	
							minor turbation	
	194.08	199.75	5.67	5.64			MUDSTONE: 30% siltstone	.20
							turbated	.72
							10% sandstone lenses	.72
								.70
						196.9	Box No. 72	.20
								.44
								.71
								.74
								.74
							Box No. 73	.50
	199.75	202.18	2.43	2.42			MUDSTONE: 30% siltstone	
						199.9	shell fragments, pelecypods marker	.03

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 15

HOLE NO.: MS 39

DATE RUN:

DATE FINISHED:

LAT:

TOTAL DEPTH:

HOLE ANGLE:

LONG:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

S.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							sharp floor contact	.19
							(sampled)	.72
								.74
								.75
1	202.18	205.12	2.94	2.94		203.0	SANDSTONE: medium grained light grey uniform	.59 .70 .74
							sharp floor	.62
							Box No. 75	.29
	205.12	205.54	0.42	0.42			MUDSTONE: black uniform 20% siltstone	.42
							sharp floor contact	
	205.54	212.24	6.70	6.70		206.0	SANDSTONE: light grey 15% siltstone lenses, 1 cm	.25 .37
								.75
								.72
							Box No. 76	.73
						209.1		.52
								.17
								.74
								.63
							Box No. 77	.72
								.72
10							sharp floor contact	.33

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 16

HOLE NO.: MS 39

DATE RUN:

TOTAL DEPTH:

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
2	212.24	223.37	11.13	11.12			SILTSTONE: dark grey	.34
							40% fine grained sandstone lenses .13 m	.73
							minor turbation Box No. 78	.72
							moderate crossbedding	.72
						215.2		.30
								.34
								.74
							Box No. 79	.72
								.70
						218.2		.53
								.11
								.71
							Box No. 80	.68
								.70
								.72
						221.3		.17
								.47
							Box No. 81	.75
								.74
							gradational floor contact	.24
2	223.37	228.37	5.00	5.00			SILTSTONE: 20% fine grained sandstone lenses, .05	.50
						224.3	dark grey	.31
								.33
							Box No. 82	.75
								.75
								.75
						227.4		.40
								.19
							Box No. 83	.68





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 18

HOLE NO.: MS 39  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.T.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
4	239.15	248.11	8.96	8.94			MUDSTONE: 30% siltstone	.15
							uniform	.71
							10% sandstone lenses	.73
								.71
							Box No. 88	.74
						242.6		.05
								.65
								.73
								.73
							Box No. 89	.70
						245.7		.20
								.47
								.70
								.72
							Box No. 90	.70
							floor fractured and polished	.27
	248.11	248.16	0.16	0.16		248.7	COAL: extremely broken	.16
	248.16	251.70	3.43	3.42			MUDSTONE: turbated	.09
							black	.66
							uniform	.74
							Box No. 91	.69
								.73
						251.8		.14
								.38
	251.70	254.93	3.25	3.24			COAL: Gates "4" Seam	.10
							1.07 80%	.69
							.05 bone	.66
							Box No. 92	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 19

HOLE NO.: MS 39

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH:

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.:

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							.12 20%	.73
						254.8	.13 bone	.47
							.19 mudstone	.17
							core loss 0.12	.32
							.23 bone	
							.13 60%	
							1.09 mudstone	
							.27 60%	
							.32 bone	
							.05 40%	
							.11 bone	
							.05 40%	
							.32 60%	
8	254.93	258.01	3.08	3.05			MUDSTONE: 20% siltstone	.38
							10% fine sandstone Box No. 93	.75
							dark grey	.73
						257.9		.72
								.49
	258.01	260.44	2.43	2.41			COAL: Gates "3" Seam	.23
							.06 bone Box No. 94	.64
							.06 80%	.67
							.13 mudstone	.69
							.19 80%	.20
							.24 mudstone	
							.10 40%	
							.02 bone	
							.20 20%	
							.03 40%	
							.10 mudstone	
							.09 60%	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 20

HOLE NO.: MS 39  
 DATE DECLIN:  
 DATE FINISHED:  
 LAT:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG.:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							.16 bone	
							.10 60%	
							.17 mudstone	
							.42 50%	
							.08 bone	
							.28 60%	
15	260.44	265.21	4.77	4.61		260.9	MUDSTONE: 20% siltstone black minor turbation dinko leaves	.11 .37 .71 .66 .71
						264.0		.51
							floor is massive mudstone, 10% carbonaceous .33 m	.15
							sharp floor contact	.71
								.69
								.15
	265.21	269.35	4.14	4.00			COAL: Core loss .08 Gates "2" Seam	
							.33 80%	.42
							.09 dull	.60
						267.0	.08 bone	.18
							.21 mudstone	.36
							.11 60%	.62
							.04 bone	.52
							.37 40%	.70
							.02 mudstone	.13
							.36	
							core loss .37	
							.25 70%	





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 23

HOLE NO.: MS 39

DATE BEGUN:

TOTAL DEPTH:

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							sharp floor contact	Box No. 107 .55
22	293.96	296.76	2.80	2.60			MUDSTONE: 30% siltstone bedded	.17 .70 .68 .71
						297.5		Box No. 108 .10 .44
24	296.76	306.09	9.33	8.52			SANDSTONE: fine grained turbated 25% siltstone medium grey	.11 .69 .63 .70
						300.5	10% mudstone lenses to .15 m carbonaceous	Box No. 109 .55 .11 .72 .67 .66
								Box No. 110 .70
						303.6		.12 .46 .62 .70
								Box No. 111 .70
						306.6		.51 .11 .57
							calcite joints at 44°	
27	306.09	311.80	5.71	5.09			MUDSTONE: black uniform	.10 .52









## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 27

HOLE NO.: MS 39  
 DATE BEGUN:  
 DATE FINISHED:  
 LAT:

TOTAL DEPTH:  
 HOLE ANGLE:  
 LONG:

BEARING:  
 ELEV. COLLAR:  
 LOGGED BY:

U.T.M.  
 COAL LICENSE:  
 CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
31	350.53	364.78	14.25	12.21		352.3	SANDSTONE: medium grained light grey	.55 .69
							10% conglomerate lenses	.72
							joints at 71°, 36° calcite Box No. 129	.71
								.70
						355.4		.19
								.44
								.72
							Box No. 130	.68
								.72
						358.4		.60
								.08
								.68
							Box No. 131	.72
								.68
								.63
						361.5		.38
								.24
							Box No. 132	.68
								.68
								.65
								.72
						364.5	sharp floor contact Box No. 133	.12
								.54
								.73
	364.78	366.28	1.50	1.29			MUDSTONE: 30% siltstone turbated	.60 .70
						367.3	dark grey Box No. 134	.20
							10% sand lenses	
							minor pyrite	

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 28

HOLE NO.: MS 39

DATE BEGUN:

TOTAL DEPTH:

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY	
	From	To	Thick.	True				wt. Rec.	
24	366.28	372.81	6.53	5.97			SANDSTONE: fine grained	.42	
							20% siltstone	.66	
							moderately turbated and crossbedded	.66	
							minor pyrite	.65	
								.63	
						370.3	gradational floor contact	Box No. 135	.65
								.71	
								.72	
								.69	
								Box No. 136	.69
31	372.81	376.40	3.59	3.08		373.7	SANDSTONE: fine grained	.56	
							15% siltstone	.08	
							minor turbation	.67	
							sharp floor contact	.64	
								Box No. 137	.69
								.68	
								.27	
24	376.40	377.68	1.28	1.17		376.7	MUDSTONE: 20% siltstone	.07	
							bedded	.29	
								.70	
							gradational floor contact	Box No. 138	.22
	377.68	378.82	1.14	1.04			SANDSTONE: fine grained	.46	
							15% siltstone, turbated	.68	
							jointed at 24°		
36	378.82	379.86	1.04	.84		379.8	MUDSTONE: 30% siltstone	.13	
							turbated	.47	





## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 31

HOLE NO.: MS 39

DATE BEGUN:

DATE FINISHED:

LAT.:

TOTAL DEPTH:

HOLE ANGLE:

LONG.:

BEARING:

ELEV. COLLAR:

LOGGED BY:

U.T.M.

COAL LICENSE:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							Box No. 149	.70
							calcite fault zone 52°	.71
						410.3		.70
								.59
							Box No. 150	.72
15								.70
								.69
								.27
						413.3		.37
							Box No. 151	.68
								.70
	414.50	420.55	6.05	5.84			MUDSTONE: 15% siltstone, massive, black	.70
						416.4	joints calcite 64°	.05
							polished 10°	.63
							minor pyrite	.70
							Box No. 152	.58
						419.4		.66
								.26
								.32
							Box No. 153	.52
							gradational floor	.64
						420.9		.57
								.05
								.47
19	420.55	423.53	2.98	2.82			SILTSTONE: 30% sandstone	.26
						422.5	turbated	.54
							Box No. 154	.05
							minor joints 70° quartz, calcite	.69

DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 32

HOLE NO.: MS 39

DATE BEGUN: TOTAL DEPTH:

DATE FINISHED: HOLE ANGLE:

LAT: LONG:

BEARING:

U.T.M.

ELEV. COLLAR:

COAL LICENSE:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							gradational floor contact	.71
								.73
	423.53	440.53	17.00	16.07		425.5	SILTSTONE: 30% mudstone bedded	Box No. 155 .66 .70
36						427.3		.67 .38
							gradational to 50% mudstone	.15
								Box No. 156 .72 .72
								.74
29						430.4		Box No. 157 .12 .48 .72
								.66
								.72
						433.4		Box No. 158 .55 .10
								.73
								.70
								.71
								Box No. 159 .70
						436.5		.23 .43
								.74
								.66
								Box No. 160 .71
						439.5		.30 .26





MT. SPIEKER COAL PROJECT

DIAMOND DRILL HOLE NO. MS-40

DRILLED FOR: Ranger Oil Limited  
DRILLED BY: Tonto Drilling Ltd.  
  
LOCATION: EB Pit Area

COLLAR ELEVATION: 1679.3 m  
TOTAL DEPTH: 74.8 m  
CORE SIZE: HQ

GEOPHYSICAL LOGS

Natural Gamma Ray - Neutron.  
Focussed Beam (Resistivity) Log: Normal, Expanded.  
Density: Normal, Expanded.  
Caliper.  
Directional Survey.

LOGGED BY: L. Little

SEAM INTERSECTIONS

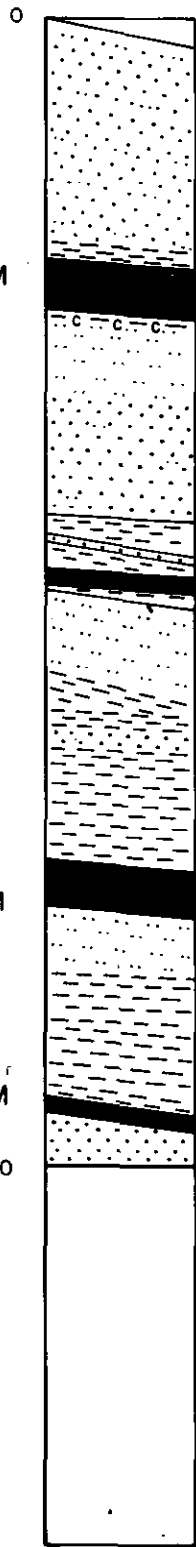
	<u>Interval (m)</u>	<u>Thickness (m)</u>
C	16.15-19.69	3.54
B	55.31-58.47	3.16
A	71.00-72.00	1.00

GATES C SEAM

GATES B SEAM

GATES A SEAM

75.0



Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED  
for  
RANGER OIL (CANADA) LTD.

DATE: October 1980

Scale 1:500

STRATIGRAPHIC LOG  
MS 40

PAGE 1 of 1

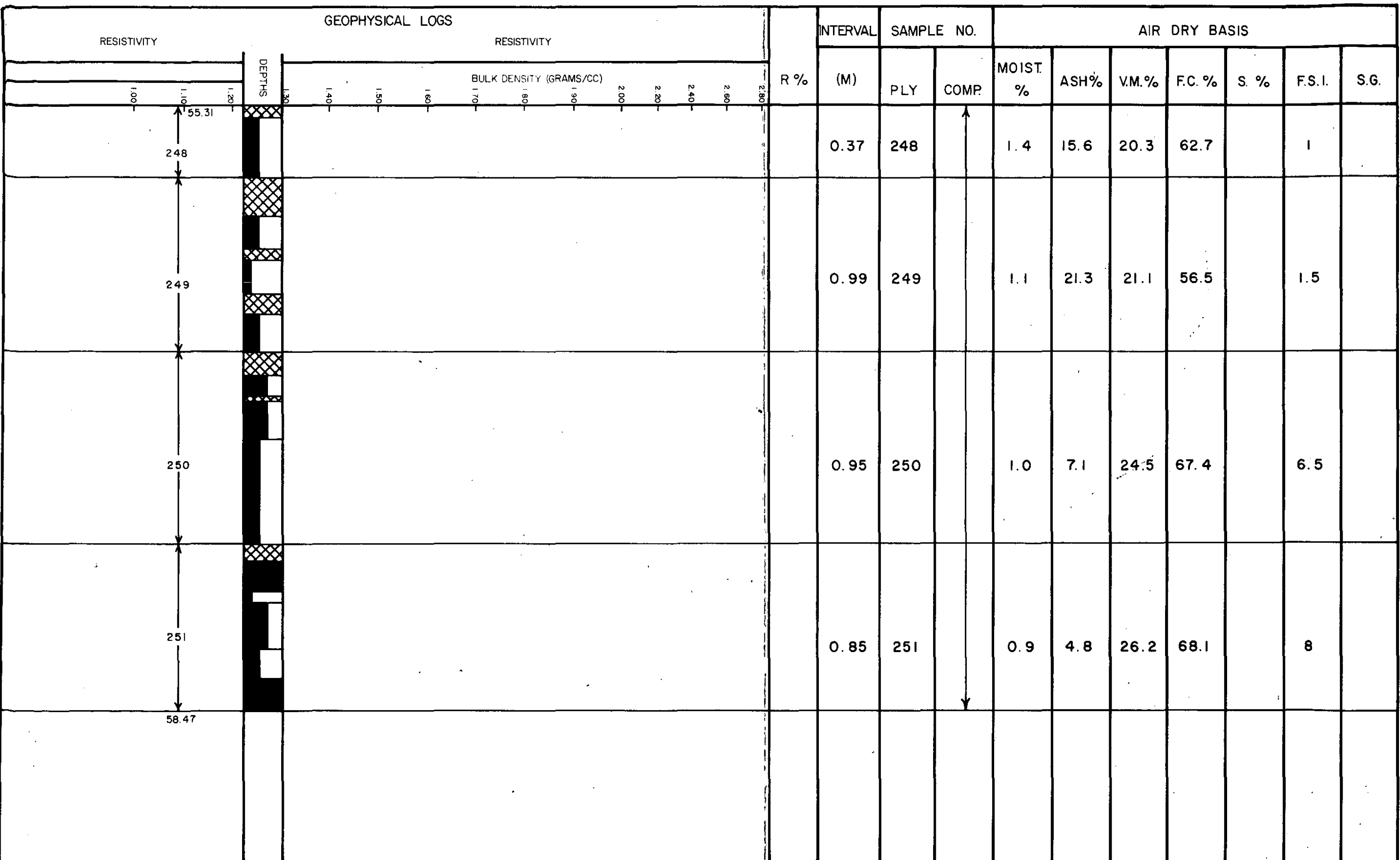
RESISTIVITY		GEOPHYSICAL LOGS										RESISTIVITY	INTERVAL	SAMPLE NO.		AIR DRY BASIS								
		BULK DENSITY (GRAMS/CC)										R %	(M)	PLY	COMP.	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.		
1.00	1.0	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.20	2.40	2.60	2.80		0.26	239	↑	0.7	7.9	25.8	65.6		7	
	16.15m	239													0.50	240		0.8	57.2	14.5	27.5		1	
		240													0.24	241		0.7	14.8	22.6	61.1		3.5	
		241													0.15	242		0.8	57.3	15.7	26.2		1	
		242													0.73	243		0.7	21.6	22.7	55.0		4.5	
		243													0.26	244		1.2	90.4	6.3	2.1		NA	
		244													0.33	245		0.7	11.1	23.8	64.4		6.5	
		245													0.7	246		1.2	69.8	9.5	19.5		0.5	
		246													1.02	247		0.8	14.2	23.7	61.3		8.5	
	19.69m	247																						

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 40 C SEAM**

GEOPHYSICAL LOGS



Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 40 B SEAM

GEOPHYSICAL LOGS

RESISTIVITY	DEPTHS	RESISTIVITY										R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS							
		1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.20	2.40	2.60			2.80	PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
1.00	71.00													0.46	252		0.8	8.4	22.8	68		7.5	
252														0.54	253		0.9	18.6	20.8	59.7		6	
253																							
72.00																							

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 40 A SEAM**

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.:

1

HOLE NO.: MS 40

DATE BEGUN:

TOTAL DEPTH: 74.80 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR: 1679.3 m

COAL LICENSE:

LAT: 6107446.8 m

LONG: 601901.3 m

LOGGED BY: L. Little

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
							Box No. 1	.53
								.63
11	1.06	14.83	13.76	13.51			SANDSTONE: medium grained, med grey	.67
							30% siltstone	.69
							moderate crossbedding & minor turbation	
							minor oxidized joints at 15°	.71
						4.87	Box No. 2	.58
								.08
								.70
								.69
							Box No. 3	.73
								.73
						7.92		.23
								.45
								.72
							Box No. 4	.73
								.71
						10.97		.45
								.23
								.67
							Box No. 5	.69
							gradational floor contact	.73
								.72
						14.02		.08
							oxidized joints at 15°	.61
4	14.83	16.15	1.32	1.32			MUDSTONE: black, massive, 5% carbonaceous	.68
							partings	.64

## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

SHEET No.: 2

HOLE NO.: MS 40

DATE BEGUN:

TOTAL DEPTH: 74.80 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT.:

LONG.:

LOGGED BY:

CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Sec.
4	16.15	19.69	3.54	3.53			COAL: .26 80% bright Gates "C" Seam	.67
						17.06	.08 carb mudstone	.48
							.26 mudstone minor pyrite	.06
							.06 bone Box No. 7	.56
							.10 mudstone	.61
							.24 20% minor pyrite	.62
							.15 mudstone	.54
							.57 20%	
							.06 60%	
							.04 bone	
							.06 80%	.11
							.21 mudstone	
							.05 bone	
							.33 40%	
							.07 mudstone	
							.34 70%	
							.19 40%	
							.20 80%	
							.12 20%	
							.15 40%	
	19.69	19.76	.07	.07			MUDSTONE: carbonaceous	.07
							black	
4	19.76	25.45	5.69	5.68			SILTSTONE: 20% sandstone, minor crossbedding	.11
							minor turbation Box No. 8	.19
						20.12	medium grey	.43
								.66
								.68
								.72
							Box No. 9	.58







## DIAMOND DRILL CORE LOG

ROBERTSON RESEARCH (N.A.) LTD.

HOLE NO.: MS 40

SHEET No.: 5

DATE BEGUN:

TOTAL DEPTH: 74.80 m

BEARING:

U.T.M.

DATE FINISHED:

HOLE ANGLE:

ELEV. COLLAR:

COAL LICENSE:

LAT:

LONG:

LOGGED BY:

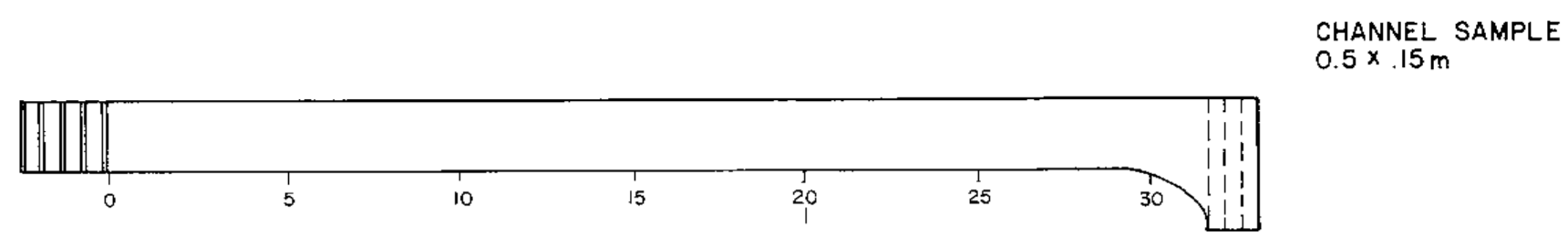
CORE SIZE:

B.C.A.	UNIT		UNIT THICKNESS		SAMPLE NUMBER	MARKER	DESCRIPTION	RECOVERY
	From	To	Thick.	True				m. Rec.
2	46.47	47.79	1.32	1.32		47.55	SANDSTONE: medium grained.	.66
							light grey Box No. 18	.66
							moderate crossbedding	
							sharp floor	
2	47.79	54.11	6.32	6.32			MUDSTONE: 30% siltstone	.01
							uniform	.64
							dark grey	.63
								.66
						50.60	Box No. 19	.47
								.06
								.66
								.66
								.72
							Box No. 20	.58
						53.64		.30
								.23
								.70
4	54.11	55.31	1.20	1.20			MUDSTONE: uniform, 15% carbonaceous partings to 10 cm	.70
							Box No. 21	.50
4	55.31	58.47	3.16	3.15			COAL: .06 bone Gates "B" Seam	.11
						56.69	.31 40%	.46
							.20 bone	.10
							.17 30%	.68
							.05 bone	.67
							.26 20% Box No. 22	.66
							.09 bone	.48
							.22 40%	

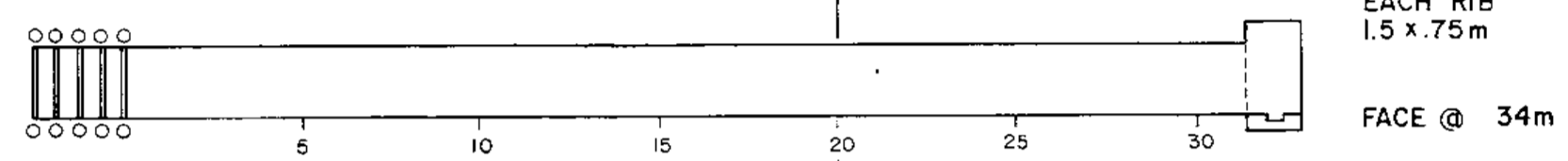




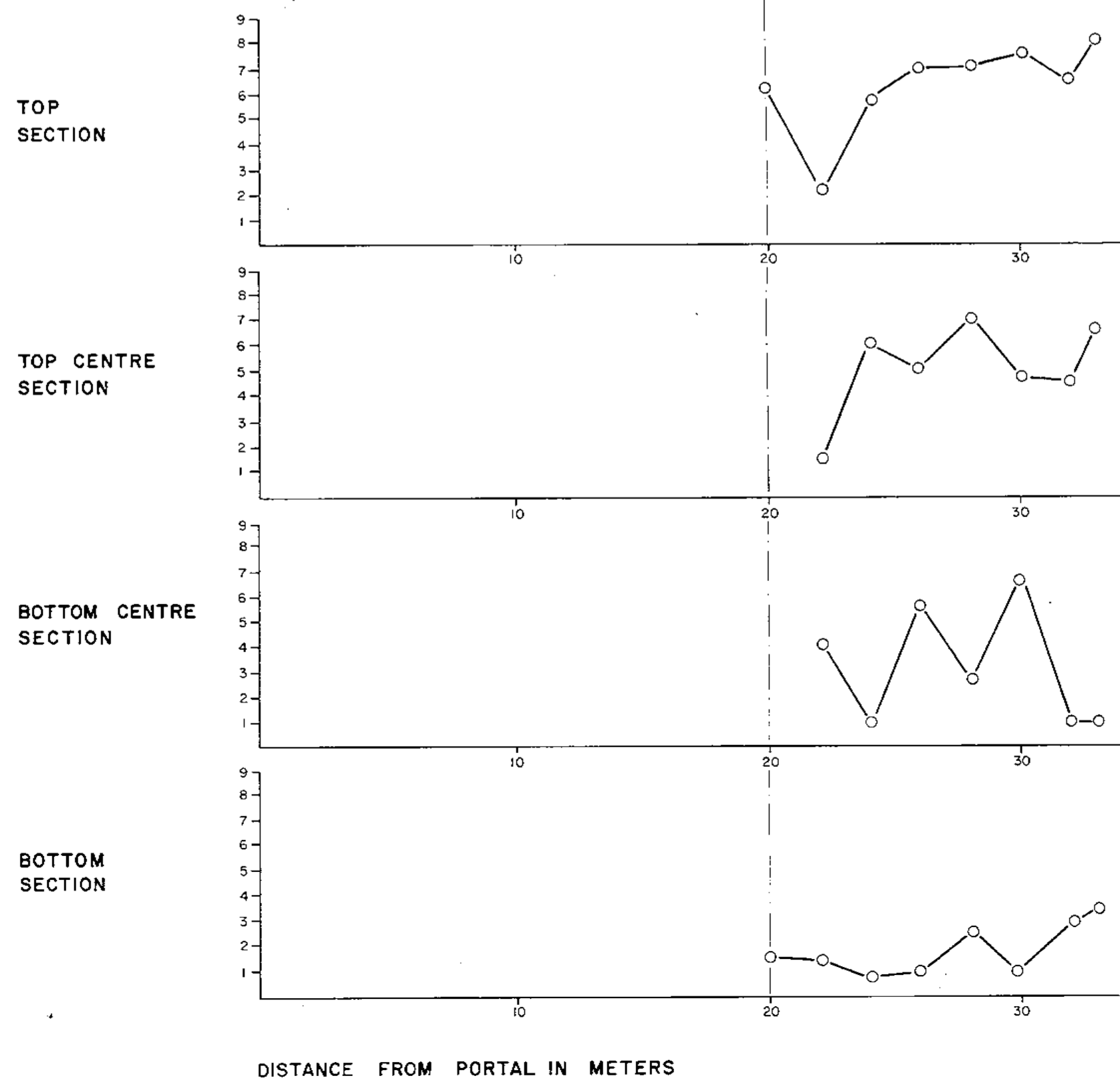




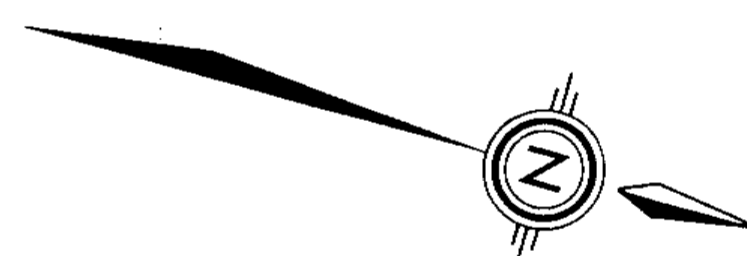
SECTION  
1:200



PLAN  
1:200



DISTANCE FROM PORTAL IN METERS



SECTION AT CHANNEL SAMPLE

SAMPLE INTERVAL	M	RAW COAL AS REC'D				FSI SAMPLE INTERVAL
		ASH %	FSI %	VOL %	S %	
6	0.64	13.1	7	63.5	0.40	TOP
5	0.69	27.7	6.5	20.3	0.49	TOP CENTRE
4	0.42	40.5	5	18.2	0.29	BOTTOM CENTRE
3	0.42	23.4	3.5	21.3	0.32	BOTTOM
2	0.60	18.3	3.5	22.8	0.34	
1	0.76	28.6	4.5	22.4	0.38	

TOTAL THICKNESS 3.53 m

COAL CLASSIFICATION LEGEND  
(% BRIGHT BANDS)

- DULL 0-20 %
- DULL BANDED 20-40 %
- DULL & BRIGHT 40-60 %
- BRIGHT BANDED 60-80 %
- BRIGHT 80-100 %

558

PR. Mt Spieker 80(3)A

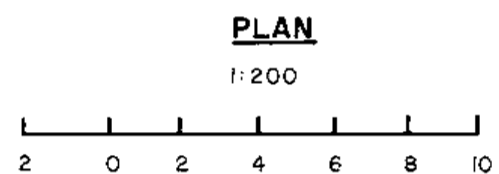
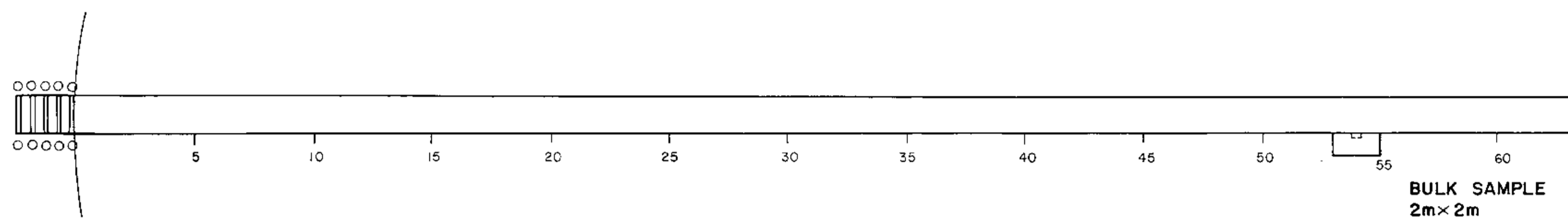
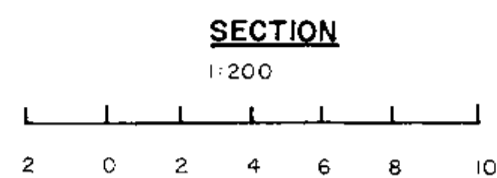
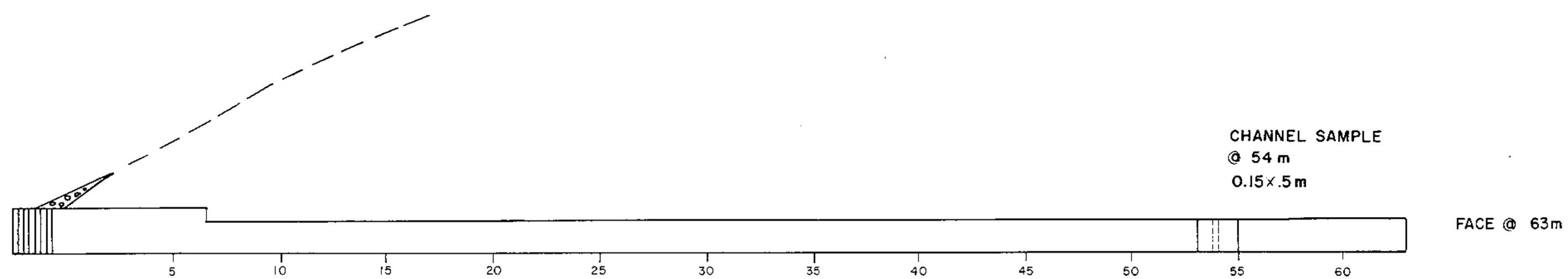
**RANGER OIL (CANADA) LTD.**

PREPARED BY ROBERTSON RESEARCH (NORTH AMERICA) LIMITED - TO ACCOMPANY REPORT NO C10-1-1

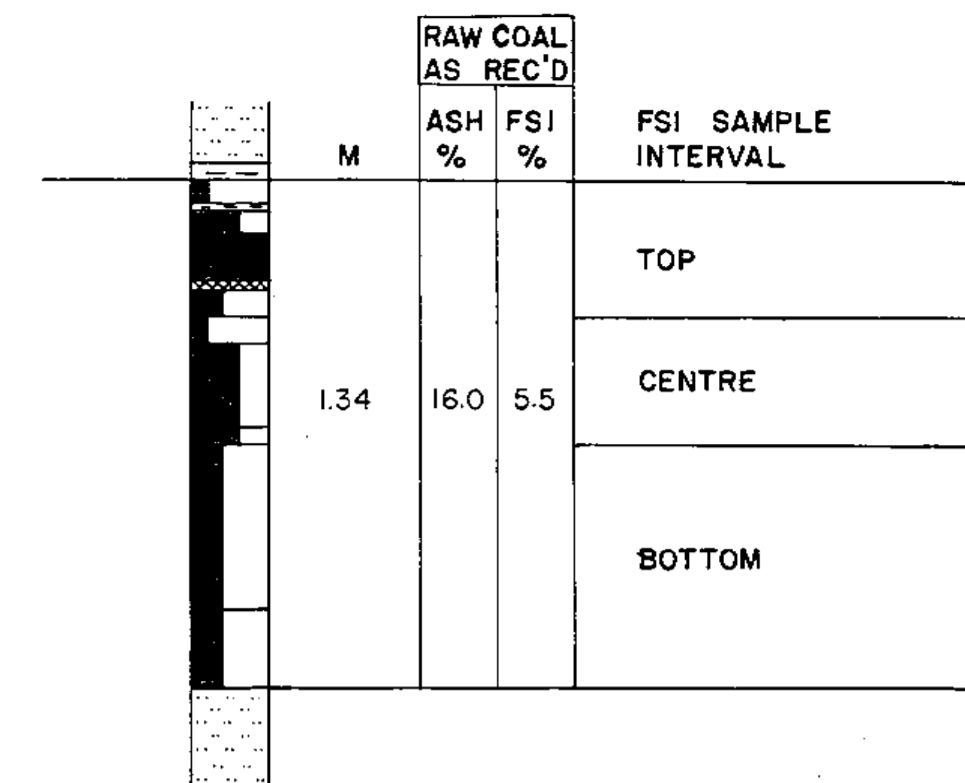
**MT. SPIEKER PROJECT**

D SEAM ADIT DI SECTIONS & PLANS

DRAWN BY: N. Le GUYDER      DATE: OCTOBER 1980

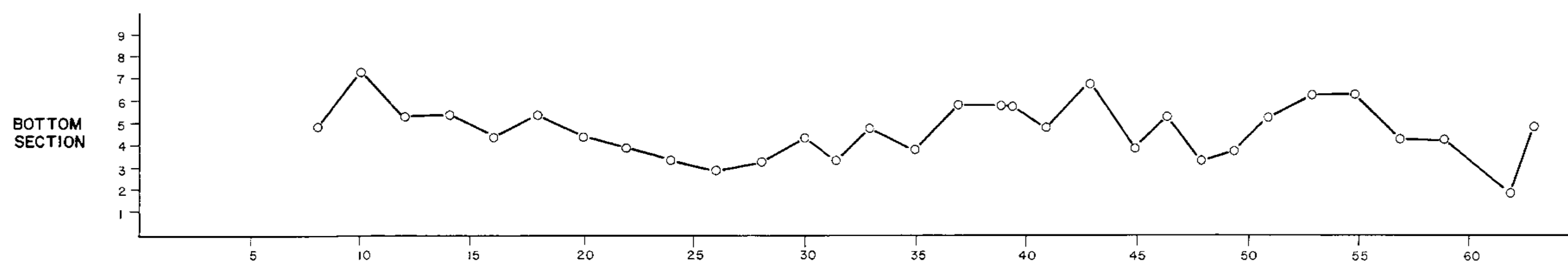
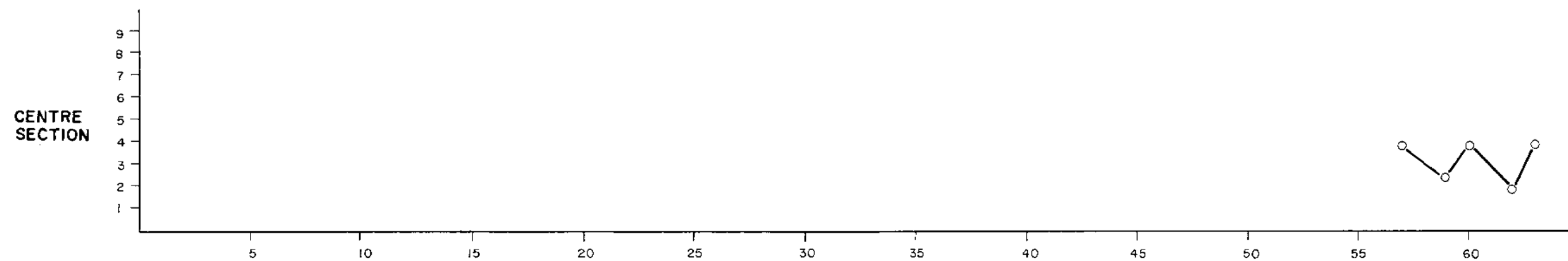
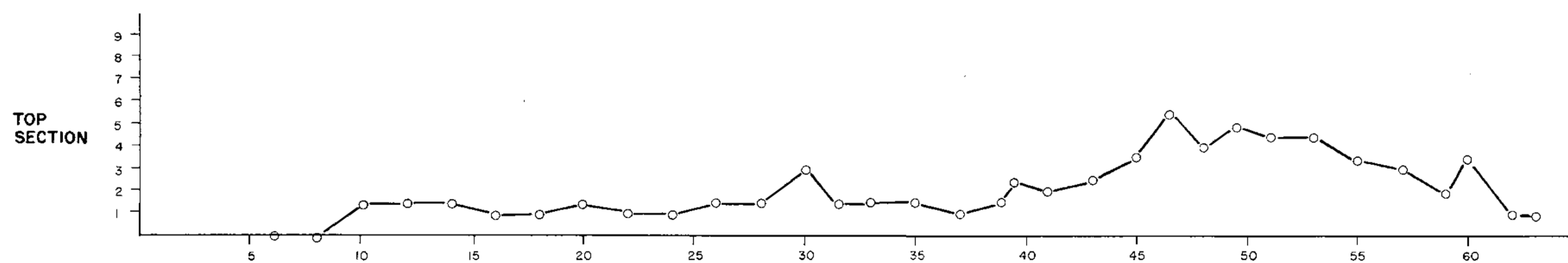
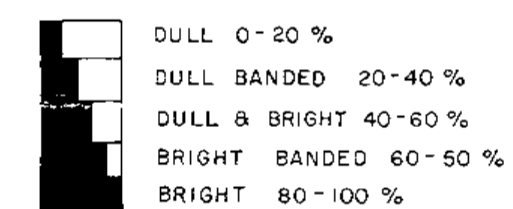


SECTION AT CHANNEL SAMPLE



TOTAL THICKNESS 1.34 m

**COAL CLASSIFICATION LEGEND**  
(% BRIGHT BANDS)

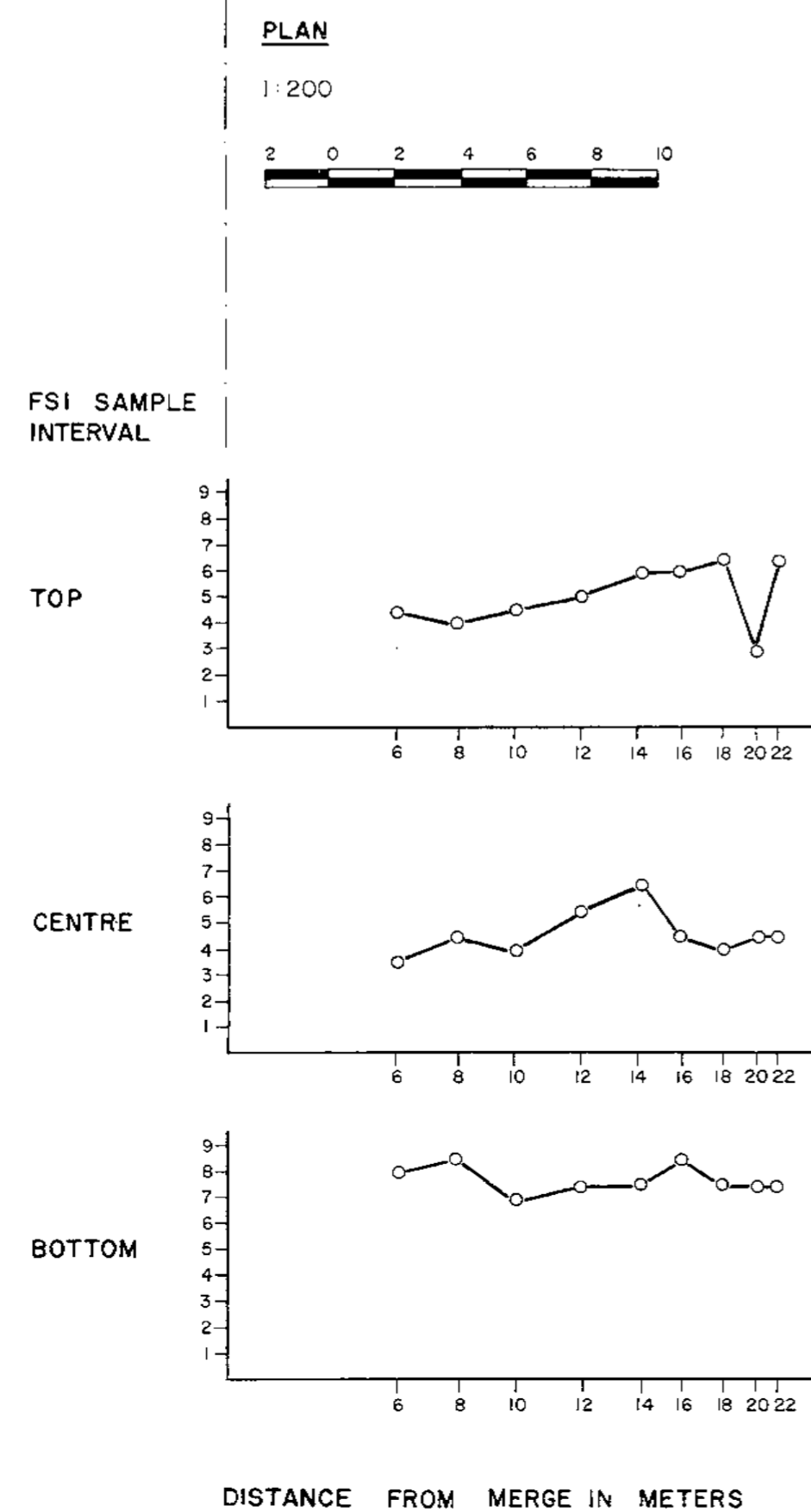
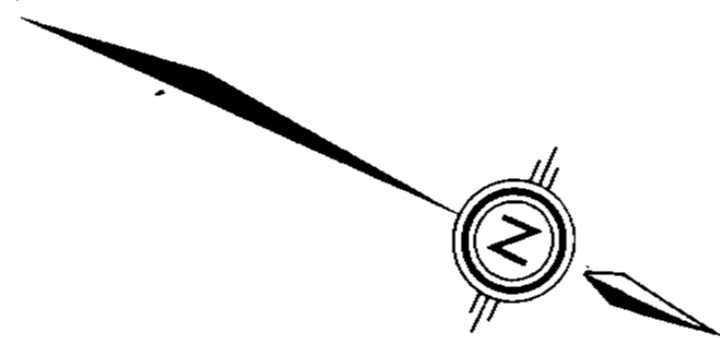
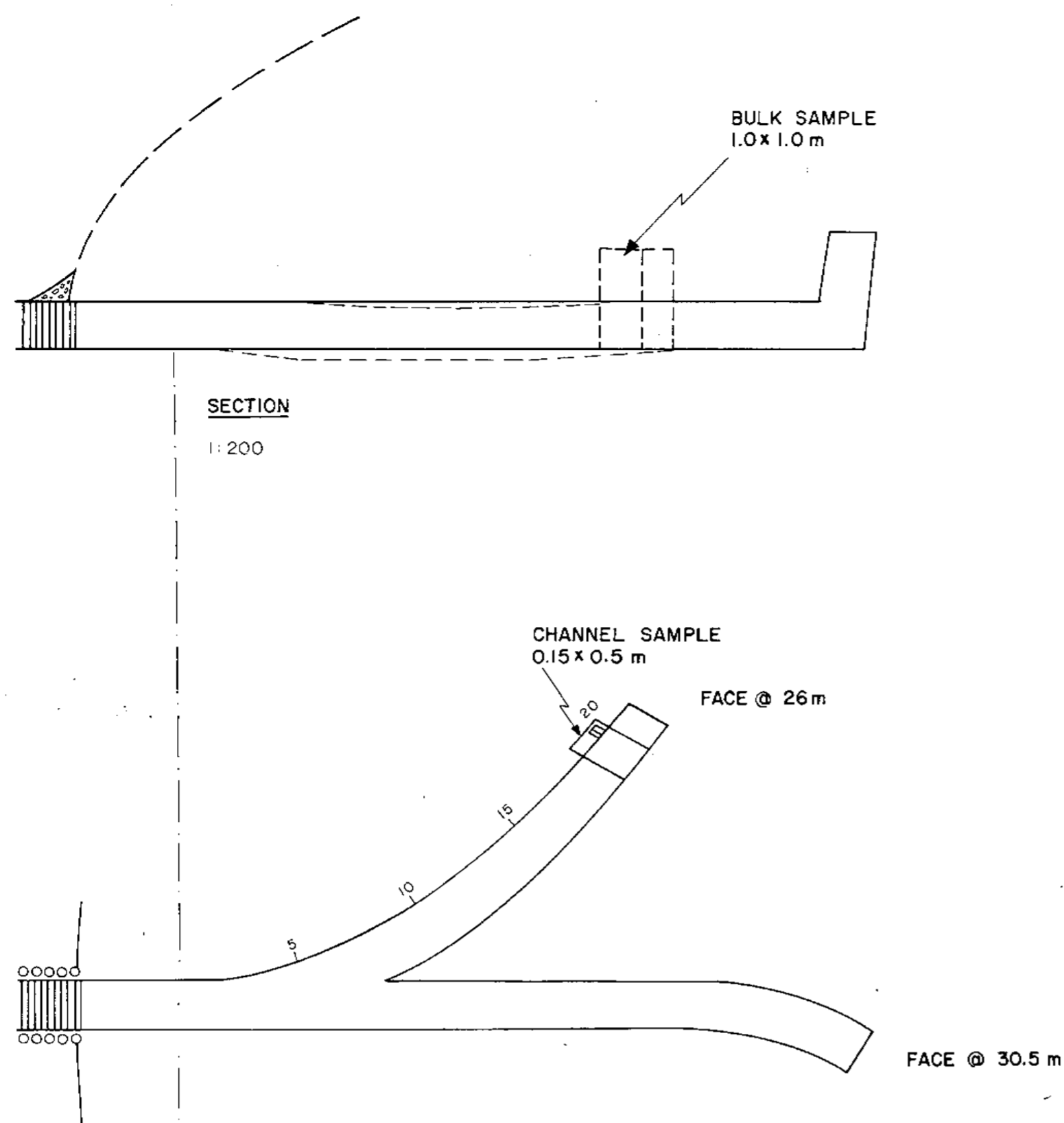


558

PR. Mt. Spieker 90:31A

<b>RANGER OIL (CANADA) LTD.</b>	
PREPARED BY ROBERTSON RESEARCH (NORTH AMERICA) LIMITED - TO ACCOMPANY REPORT NO. 110-1-11	
<b>MT. SPIEKER PROJECT</b>	
<b>A SEAM ADIT AI SECTIONS &amp; PLANS</b>	
DRAWN BY: N. Le GUYDER	DATE: DECEMBER 1980





SECTION AT CHANNEL SAMPLE

SAMPLE No.	M	RAW COAL AS REC'D				FSI SAMPLE INTERVAL
		ASH %	FSI %	VOL %	S %	
1	0.68	16.5	6.5	23.0	0.37	
2	0.62	31.3	19.1	3	0.43	
3	0.65	21.7	2.5	19.3	0.39	
4	0.64	11.4	4.5	23.3	0.44	TOP
5	0.48	9.3	6.5	24.6	0.49	
6	0.47	6.9	7.5	24.9	0.49	CENTRE
7	0.82	9.0	8.5	24.8	0.53	BOTTOM

TOTAL THICKNESS - 4.35 m

COAL CLASSIFICATION LEGEND

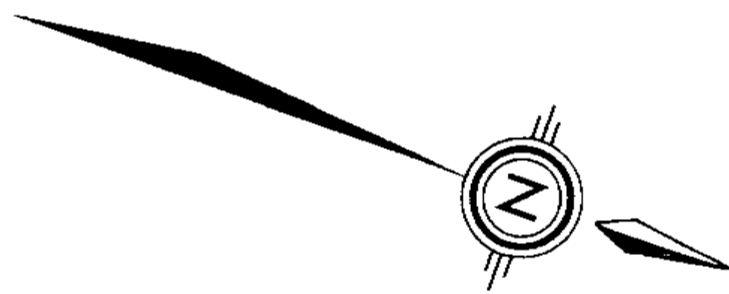
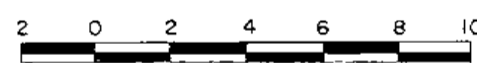
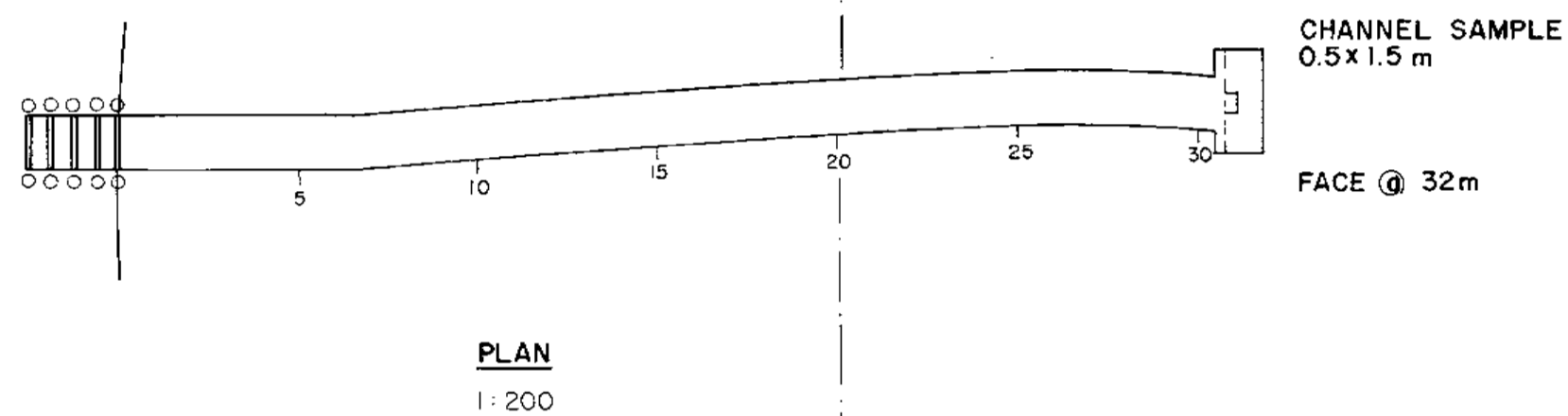
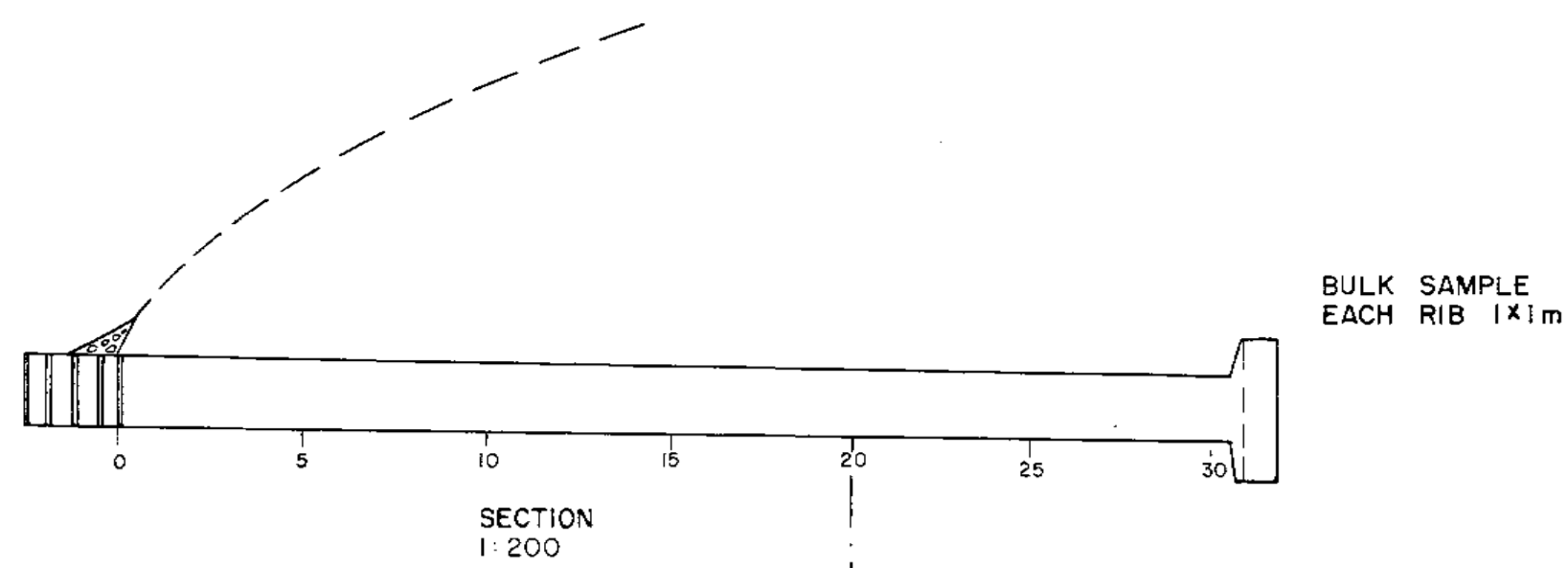
% BRIGHT BANDS)

	DULL 0-20 %
	DULL BANDED 20-40 %
	DULL & BRIGHT 40-60 %
	BRIGHT BANDED 60-80 %
	BRIGHT 80-100 %

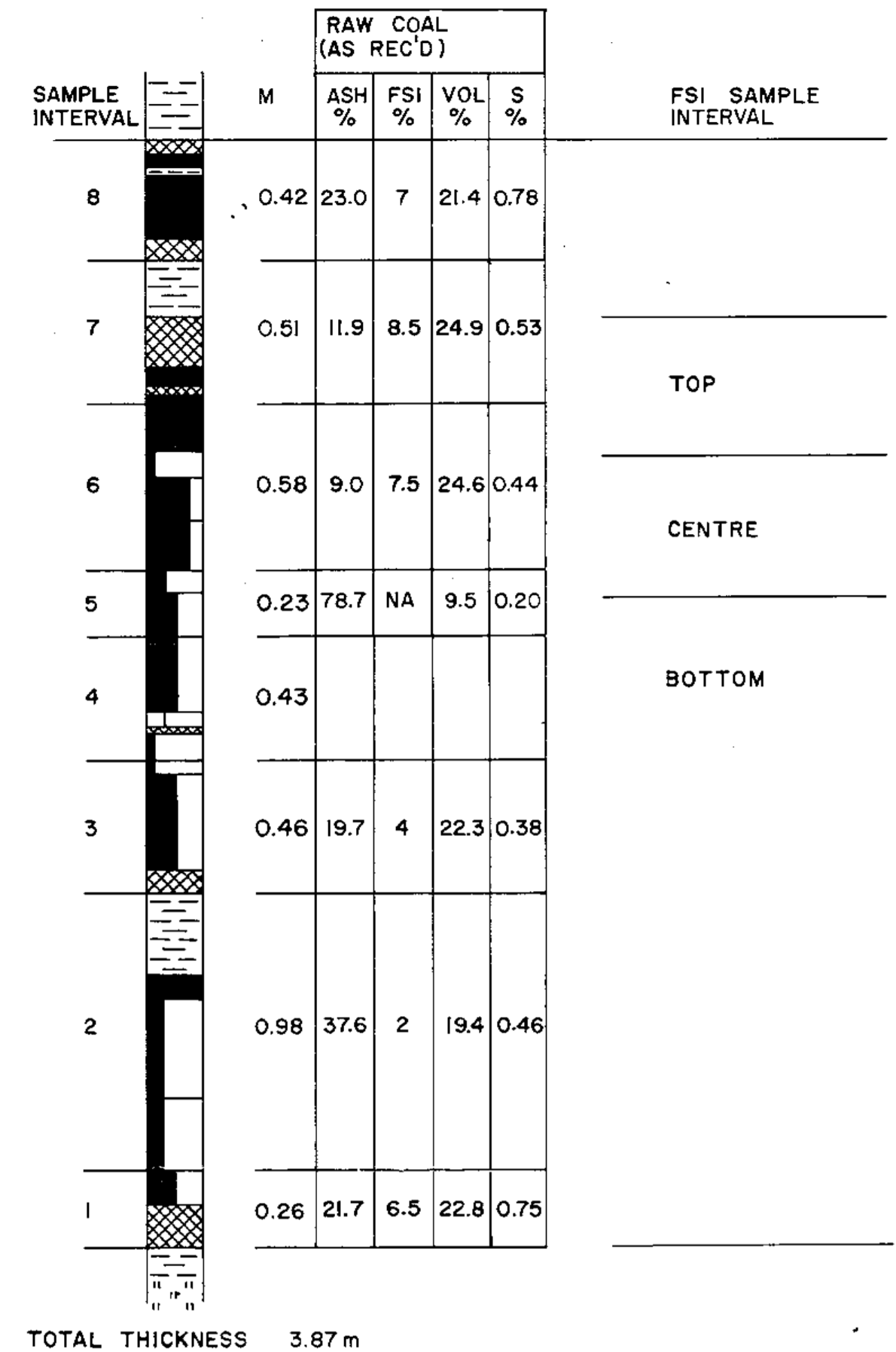
558

PR-Mt Spieker 803A

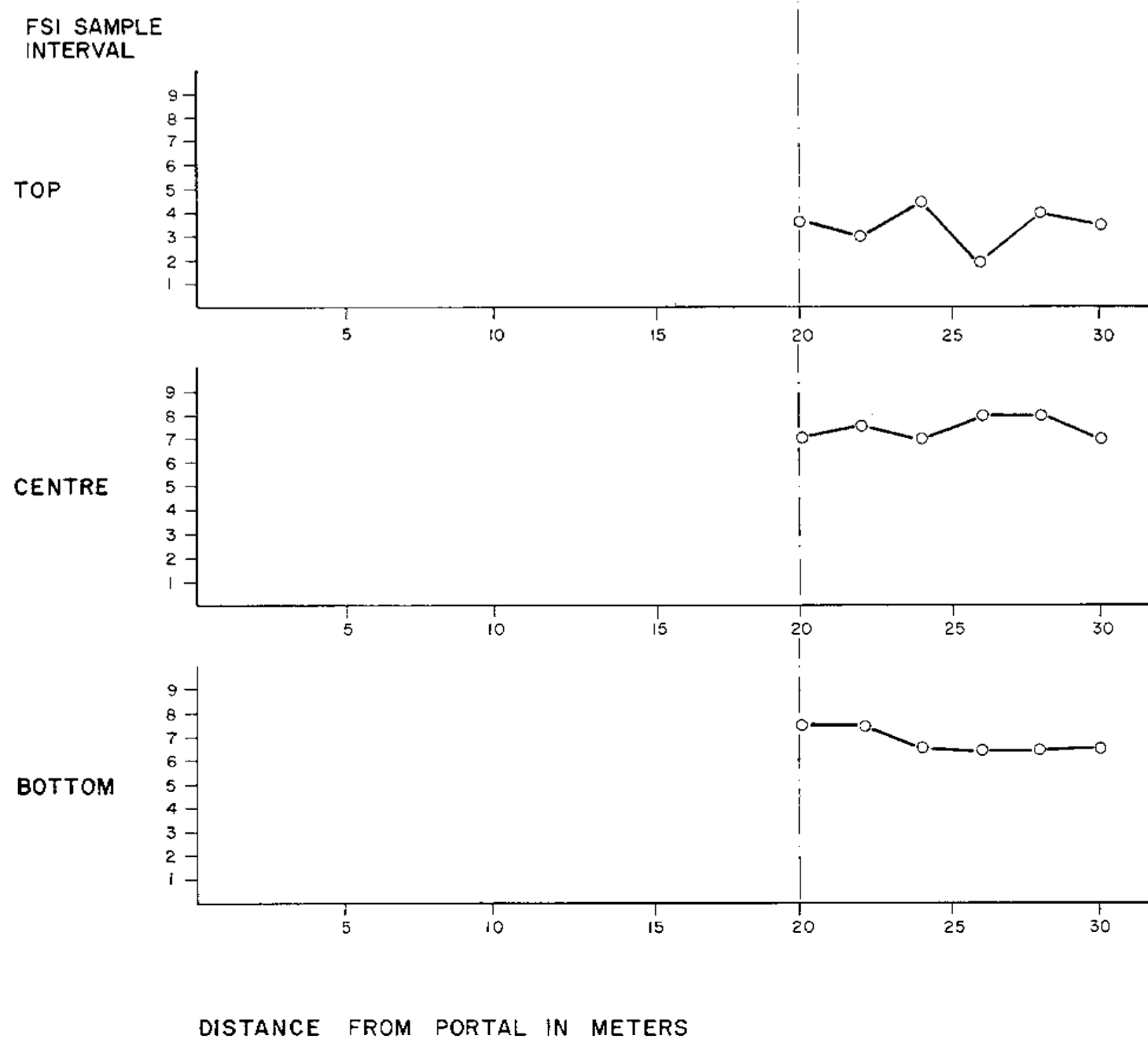
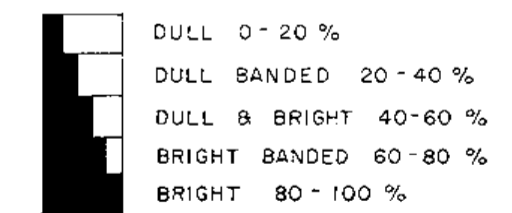
<b>RANGER OIL (CANADA) LTD.</b>	
PREPARED BY ROBERT JON RESEARCH (NORTH AMERICA) LIMITED - TO ACCOMPANY REPORT NO C10-1-1	
<b>MT. SPIEKER PROJECT</b>	
<b>B SEAM ADIT B3 SECTIONS &amp; PLAN</b>	
DRAWN BY: N. Le GUYDER	DATE: OCTOBER 1980



SECTION AT CHANNEL SAMPLE



COAL CLASSIFICATION LEGEND  
(% BRIGHT BANDS)



558

PR Mt. Spieker 80(3)A

**RANGER OIL (CANADA) LTD.**

PREPARED BY ROBERTSON RESEARCH (NORTH AMERICA) LIMITED -  
TO ACCOMPANY REPORT NO C10-1-1

**MT. SPIEKER PROJECT**

**C SEAM ADIT C2  
SECTIONS & PLAN**

DRAWN BY: N. Le GUYDER      DATE: OCTOBER 1980

MT. SPIEKER PROJECT

APPENDIX C

COAL QUALITY ANALYTICAL RESULTS

~~CONFIDENTIAL~~  
GEOLOGICAL BRANCH  
ASSESSMENT REPORT

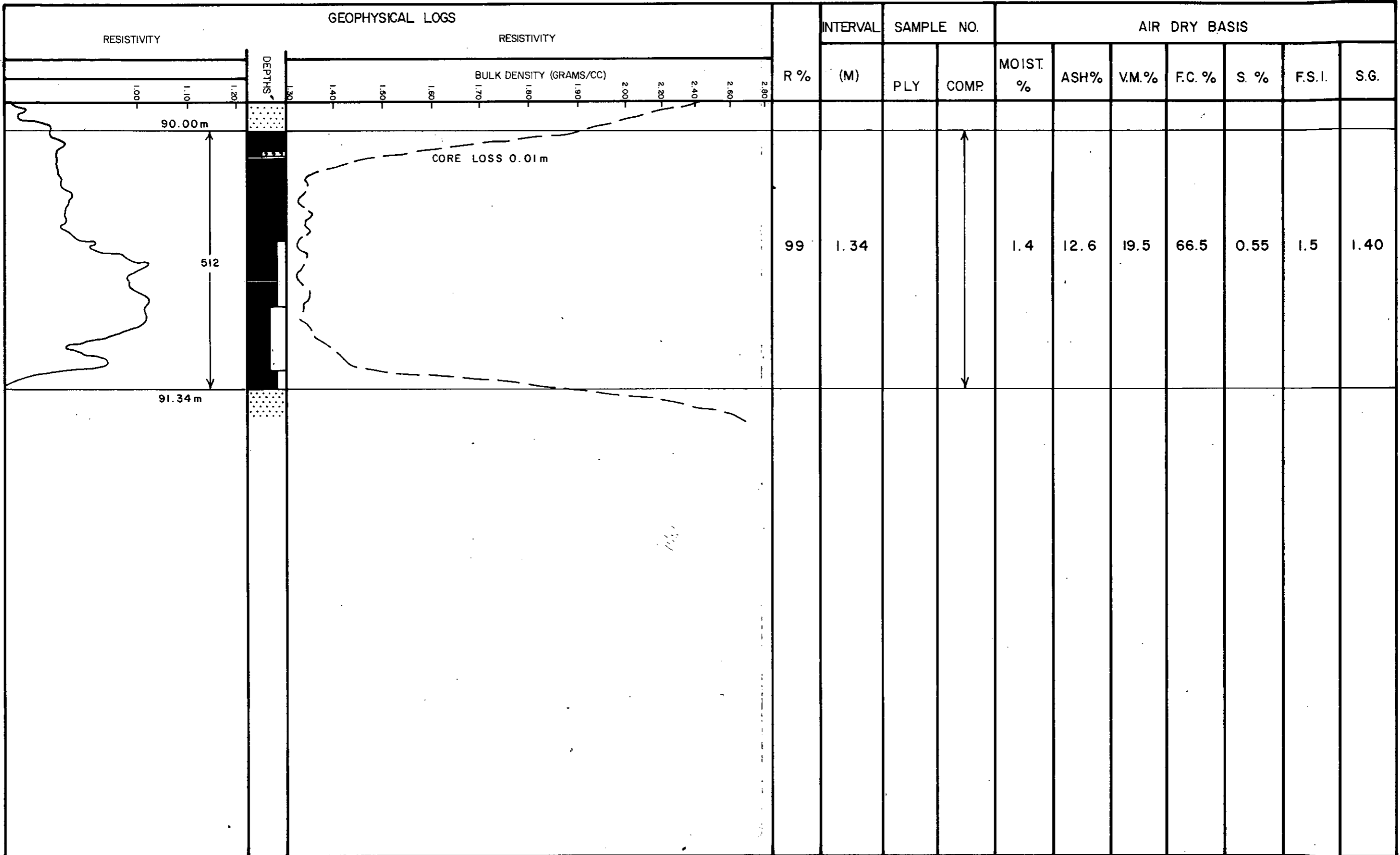
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Prepared For: Ranger Oil Limited,  
#2600, 330 - 5th Avenue S.W.,  
Calgary, Alberta.  
T2P 0L4

Prepared By: Robertson Research Canada Limited

Report No.: RRC/80/3014

December 19, 1980



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 34 A SEAM**

CLIENT : BRANCO OIL LIMITED

PROJECT: MS 34 CORE SAMPLE, SEAM A COMP.

LAB NO.: 5682

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.6	1.4	12.6	19.5	66.5	0.55	1.40	1 1/2	77	a.d.b.
	3.0	12.4	19.2	65.4	0.54	-	-	-	a.r.b.
		12.8	19.8	67.4	0.56	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM X 0.5 MM	88.6	88.6
0.5MM x 0	11.4	100.0

SINK-FLOAT ANALYSIS, a.d.b.:

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	8.7	2.3	0.56	2	8.7	2.3
1.30 - 1.40	67.3	6.7	0.46	1 1/2	76.0	6.2
1.40 - 1.50	13.5	16.0	0.39	1/2	89.5	7.7
1.50 - 1.60	4.3	27.4	0.47	1/2	93.8	8.6
1.60 - 1.70	2.2	40.0	0.37	1/2	96.0	9.3
1.70 - 1.80	1.0	48.5	0.36	1/2	97.0	9.7
1.80 - 2.00	1.2	59.0	0.23	N.A.	98.2	10.3
+2.00 -	1.8	73.6	0.15	N.A.	100.0	11.4

FROTH FLOTATION TEST, adb: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	35.5	7.9	1	35.5	7.9
STAGE II	6.7	15.6	1	42.2	9.1
TAILINGS	57.8	19.9	1	100.0	15.4

F.F. PARAMETERS: PULP DENSITY=10%  
 REAGENT =4:1=Kerosene:MIBC  
 DOSAGE =0.5 lb/T.D.S.  
 CONDITIONING=60 seconds  
 FROTHS (I & II) =60 seconds each

CLIENT : RANGER OIL LIMITED

PROJECT: MS 34 CORE SAMPLES , SEAM A

LAB NO.: 5682

ANALYSIS OF CLEAN COAL COMPOSITE % YIELD = 84.1

MOIST%	ASH%	VM %	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
1.3	7.8	20.5	70.4	0.52		1	1.36	82	a.d.b.
	7.9	20.8	71.3	0.53		-	-	-	d.b.

DILATATION TEST				
S.T. (°C)	MDT (°C)	M.C. %	M.D. %	G. NUMBER
455	-	3	-	-

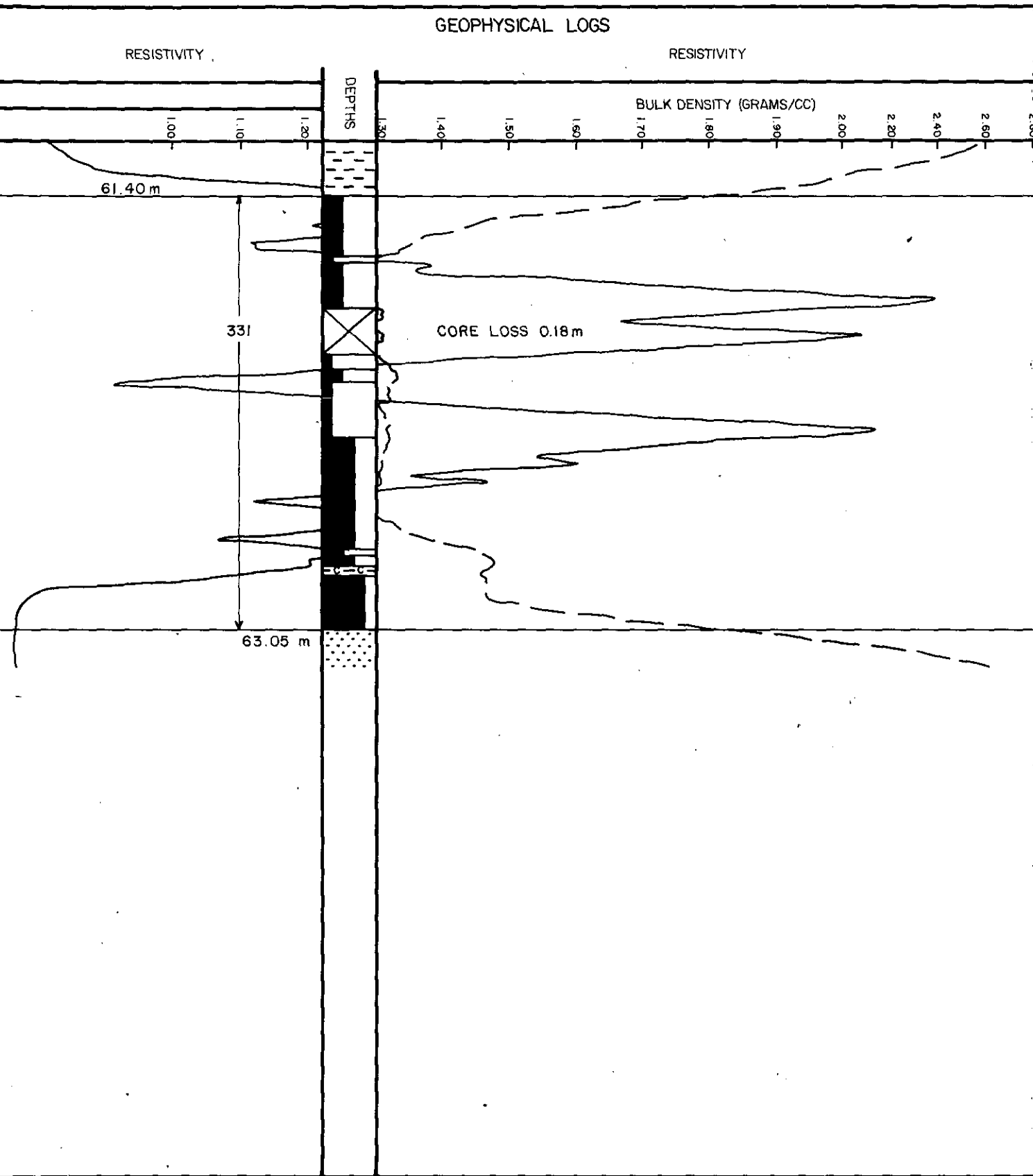
@489°

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	NON	
MAXIMUM	AGGLOME-	
FINAL	RATING	
RANGE =		

Sample for petrographic analysis prepared.

C.C. Make-up \_\_\_\_\_ 9.5 MM x 0.5 M Float @ \_\_\_\_\_ S.G.  
combined with 0.5 MM froth for \_\_\_\_\_ seconds.

GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
89	1.65	331		0.4	15.3	21.5	62.8	0.48	6.5	1.41

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 35 A SEAM**

## HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
2.6	0.4	15.3	21.5	62.8	0.48	1.41	6 1/2	77	a.d.b.
	3.0	14.9	20.9	61.2	0.47	-	-	-	a.r.b.
		15.4	21.6	63.0	0.48	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	76.1	76.1
0.5 MM X 0	23.9	100.0

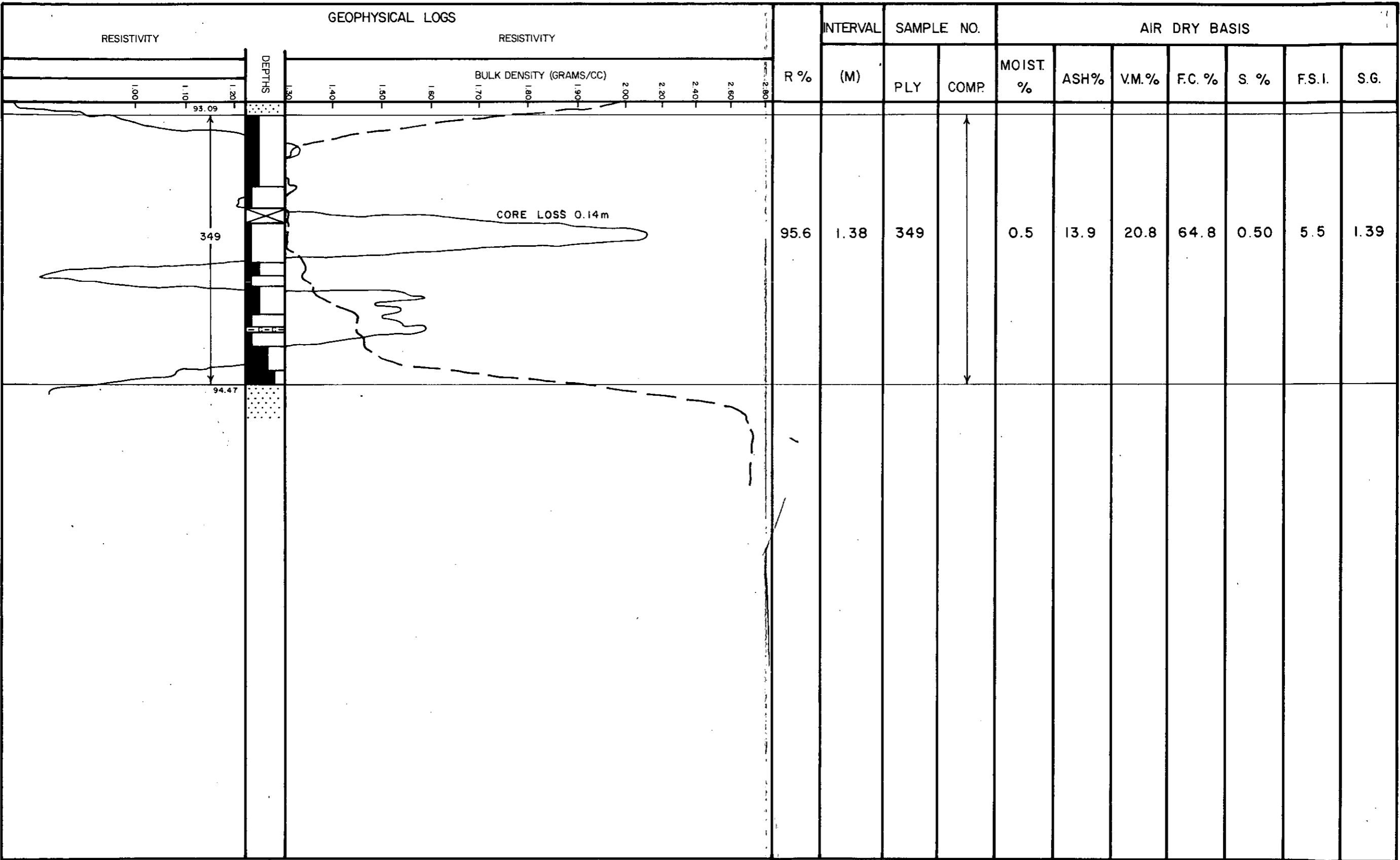
SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	34.1	3.7	0.53	9	34.1	3.7
1.30 - 1.40	36.6	7.9	0.45	5	70.7	5.9
1.40 - 1.50	10.7	15.3	0.41	1 1/2	81.4	7.1
1.50 - 1.60	1.9	24.0	0.37	1 1/2	83.3	7.5
1.60 - 1.70	1.7	33.3	0.29	1	85.0	8.0
1.70 - 1.80	2.2	42.2	0.22	1	87.2	8.9
1.80 - 2.00	3.9	49.1	0.13	1/2	91.1	10.6
+2.00	8.9	79.2	0.11	N.A.	100.0	16.7

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE I	52.3	6.5	0.48	9	52.3	6.5
STAGE II	11.9	9.7	0.50	8 1/2	64.2	7.1
TAILINGS	35.8	17.5	0.50	7	100.0	10.8

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each





Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 36 A SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: MS 36 Core Sample

SEAM A COMP.

LAB NO.: 6186

## HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.8	0.5	13.9	20.8	64.8	0.50	1.39	5 1/2	83	a.d.b.
	1.3	13.8	20.6	64.3	0.50	-	-	-	a.r.b.
		14.0	20.9	65.1	0.50	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	85.2	85.2
0.5 MM X 0	14.8	100.0

## SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	34.1	4.6	0.48	8 1/2	34.1	4.6
1.30 - 1.40	42.1	8.3	0.43	3	76.2	6.6
1.40 - 1.50	10.2	16.1	0.44	2	86.4	7.8
1.50 - 1.60	3.6	22.9	0.44	1 1/2	90.0	8.4
1.60 - 1.70	1.7	31.5	0.47	1	91.7	8.8
1.70 - 1.80	0.6	50.8	0.43	1	92.3	9.1
1.80 - 2.00	1.3	60.0	0.30	1	93.6	9.8
+2.00	6.4	81.7	0.14	N.A.	100.0	14.4

## FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE I	69.2	6.8	0.49	8 1/2	69.2	6.8
STAGE II	16.4	9.8	0.49	7 1/2	85.6	7.4
TAILINGS	14.4	24.2	0.37	4 1/2	100.0	9.8

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(I & II) = 60 seconds each

Birtley Coal  
& Minerals Testing

A DIVISION OF GREAT WESTERN INDUSTRIES LTD

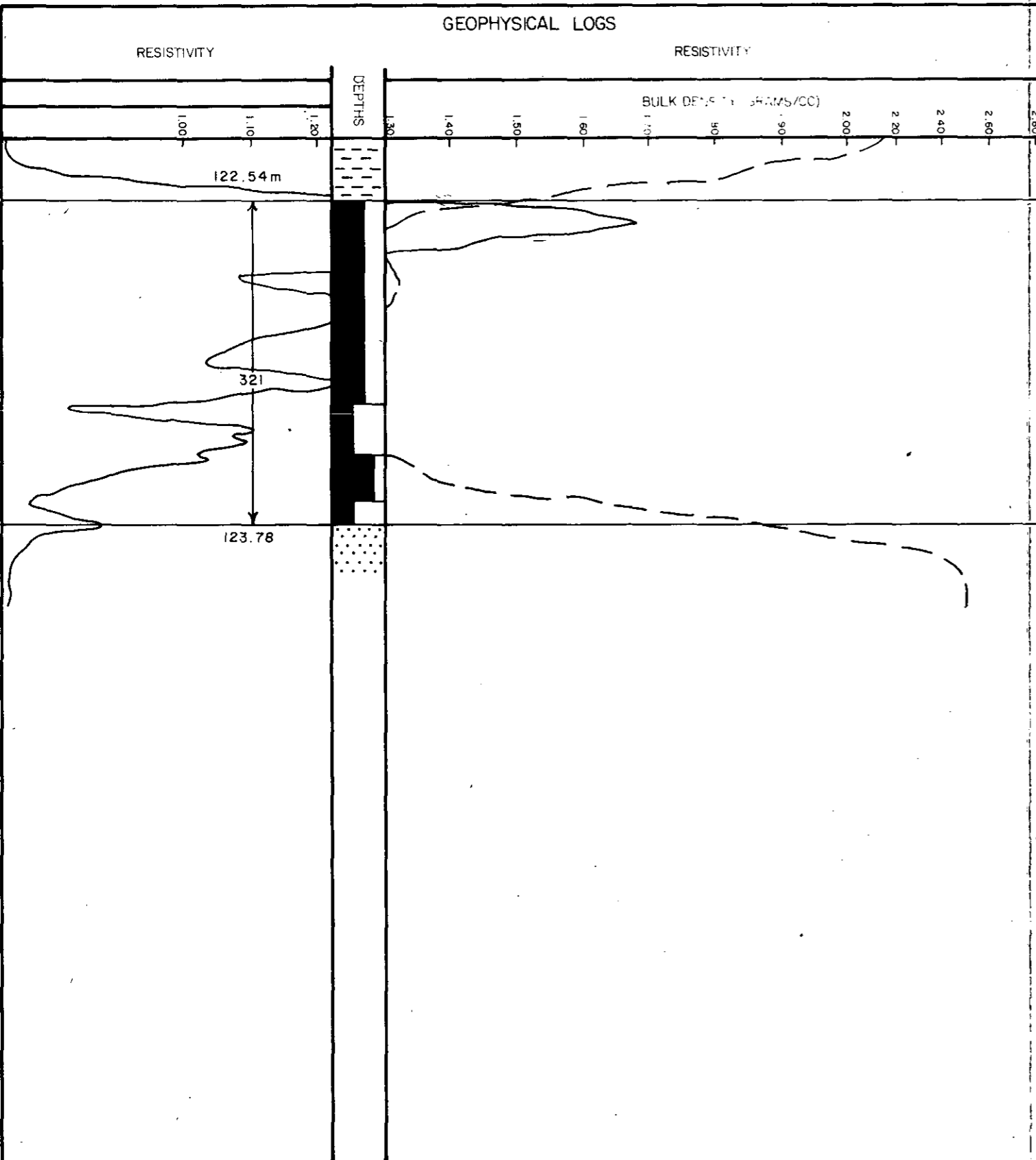
GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

DEPTHS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
100	1.34	321		0.4	21.3	67.2	0.73	5	1.36	

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 37 A SEAM

CLIENT : RANGER OIL LIMITED

PROJECT: MS 37 Core Sample

SEAM     A     COMP.     (    

LAB NO.: 6187

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.5	0.4	11.1	21.3	67.2	0.73	1.36	5	80	a.d.b.
	0.9	11.0	21.2	66.9	0.73	-	-	-	a.r.b.
		11.1	21.4	67.5	0.73	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	84.4	84.4
0.5 MM X 0	15.6	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	23.2	3.0	0.57	9	23.2	3.0
1.30 - 1.40	54.1	7.6	0.45	3 1/2	77.3	6.2
1.40 - 1.50	13.3	17.4	0.54	1 1/2	90.6	7.9
1.50 - 1.60	3.7	26.5	0.54	1	94.3	8.6
1.60 - 1.70	1.2	37.4	0.65	1	95.5	9.0
1.70 - 1.80	0.7	48.8	0.95	1	96.2	9.2
1.80 - 2.00	1.4	56.6	1.06	1	97.6	9.9
+2.00	2.4	71.0	2.14	N.A.	100.0	11.4

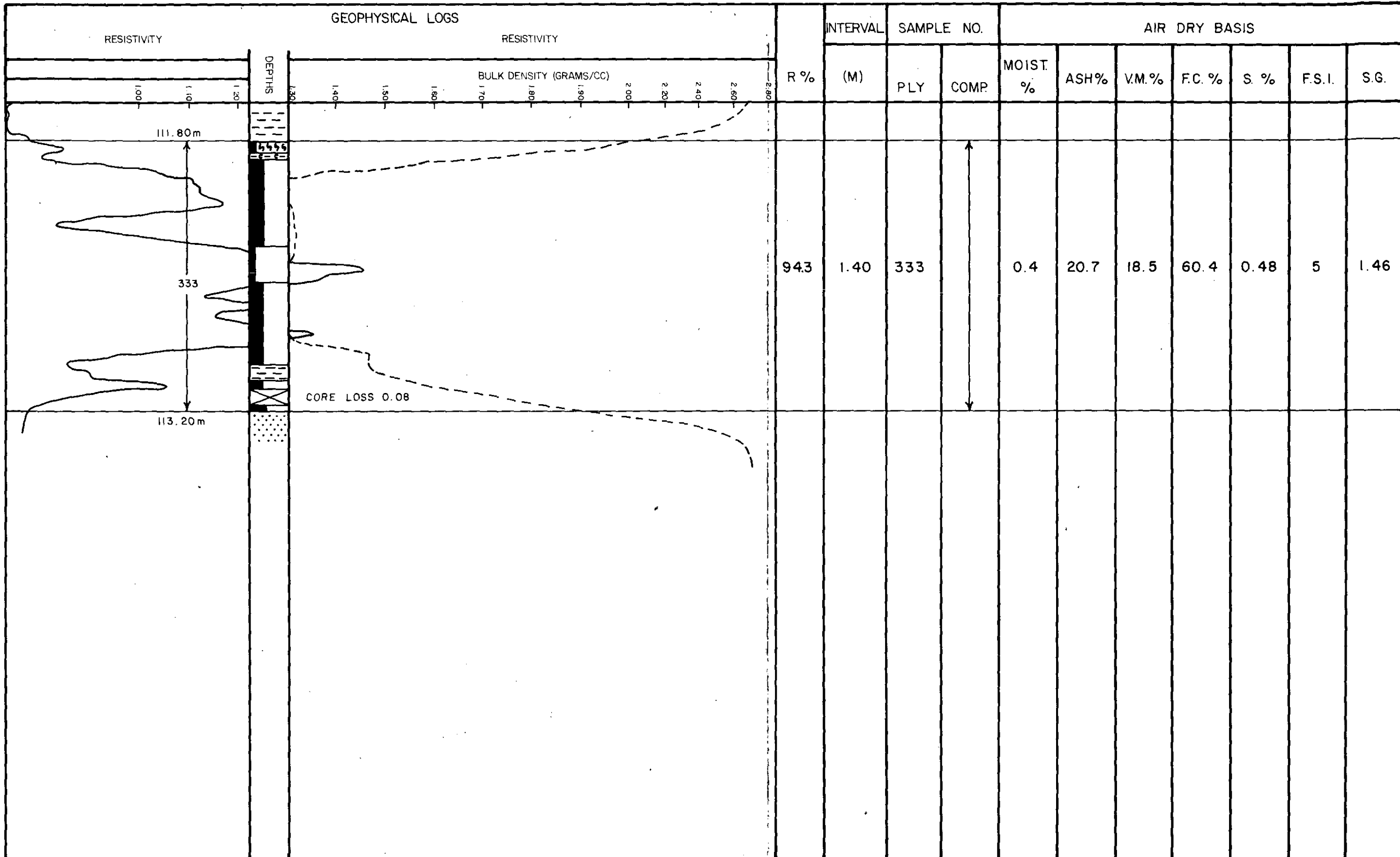
FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	65.1	6.1	0.59	9	65.1	6.1
STAGE 11	13.5	8.4	0.55	8	78.6	6.5
TAILINGS	21.4	16.2	0.61	5 1/2	100.0	8.6

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 38 A SEAM

CLIENT : RANGER OIL LIMITED

PROJECT: MS 38 Core Sample

SEAM A COMP.

LAB NO.: 6193

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
3.4	0.4	20.7	18.5	60.4	0.48	1.46	5	82	a.d.b.
	3.8	20.0	17.9	58.3	0.46	-	-	-	a.r.b.
		20.8	18.6	60.6	0.48	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	82.7	82.7
0.5 MM X 0	17.3	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	29.5	3.8	0.49	9	29.5	3.8
1.30 - 1.40	36.9	8.0	0.41	3	66.4	6.1
1.40 - 1.50	10.0	13.9	0.41	1 1/2	76.4	7.2
1.50 - 1.60	2.4	22.6	0.34	1	78.8	7.6
1.60 - 1.70	1.5	33.1	0.33	1	80.3	8.1
1.70 - 1.80	0.8	45.7	0.33	1	81.1	8.5
1.80 - 2.00	1.1	58.7	0.24	1	82.2	9.1
+2.00	17.8	83.7	0.08	N.A.	100.0	22.4

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE I	57.6	7.3	0.56	9	57.6	7.3
STAGE II	12.0	12.1	0.40	7 1/2	69.6	8.1
TAILINGS	30.4	24.5	0.44	6 1/2	100.0	13.1

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

DEPTH

R %

(M)

PLY

COMP

MOIST %

ASH%

V.M.%

F.C.%

S.%

F.S.I.

S.G.

1.00

1.10

1.20

71.00

252

253

72.00

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

2.80

0.46

252

0.8

8.4

22.8

68

7.5

0.54

253

0.9

18.6

20.8

59.7

6

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 40 A SEAM

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 1 of 1

CLIENT : RANGER OIL LIMITED

PROJECT: MS 40 CORE SAMPLE , SEAM A COMP.

LAB NO.: 5817

Analysis of Clean Coal Composite . % Yield = 86.8

MOIST.%	ASH%	VM%	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
0.5	8.2	22.9	68.4	0.48	.03	6	1.34	75	a.d.b.
	8.2	23.0	68.8	0.48		-	-	-	d.b.

DILATATION TEST				
S.T.(°C)	MDT(°C)	M.C. %	M.D.%	G. NO.
374	473	23	45	1.039

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	419
MAXIMUM	609	470
FINAL	0	508
RANGE =		89

Sample for Petrographic analysis prepared.

C.C. MAKE-UP \_\_\_\_\_ 9.5 MM x 0.5 M FLOAT @ 1.50 S.G.  
combined with 0.5 MM froth for 120 seconds



CLIENT : RANGER OIL LIMITED

PROJECT: MS 40 CORE SAMPLE , SEAM A COMP.

LAB NO. : 5817

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
2.0	0.5	14.0	22.4	63.1	0.48	1.39	6	74	a.d.b.
	2.5	13.7	22.0	61.8	0.47	-	-	-	a.r.b.
		14.1	22.5	63.4	0.48	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM X 0.5 MM	87.9	87.9
0.5MM x 0	12.1	100.0

SINK - FLOAT ANALYSIS, adb: 9.5MMx0.5MM					
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
-1.30	17.1	3.1	9	17.1	3.1
1.30 -1.40	60.0	8.1	7	77.1	7.0
1.40 -1.50	11.1	16.6	1 1/2	88.2	8.2
1.50 -1.60	2.1	25.3	1	90.3	8.6
1.60 -1.70	1.0	36.6	1	91.3	8.9
1.70 -1.80	1.3	41.0	1	92.6	9.4
1.80 -2.00	16.	55.6	1	94.2	10.1
+ 2.00	5.8	78.2	1/2	100.0	14.1

FROTH FLOTATION TEST, adb: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	63.7	7.0	8	63.7	7.0
STAGE II	13.0	9.2	7 1/2	76.7	7.4
TAILINGS	23.3	20.2	6	100.0	10.4

F.F. PARAMETERS: PULP DENSITY=10%

REAGENT =4:1=Kerosene:MIBC

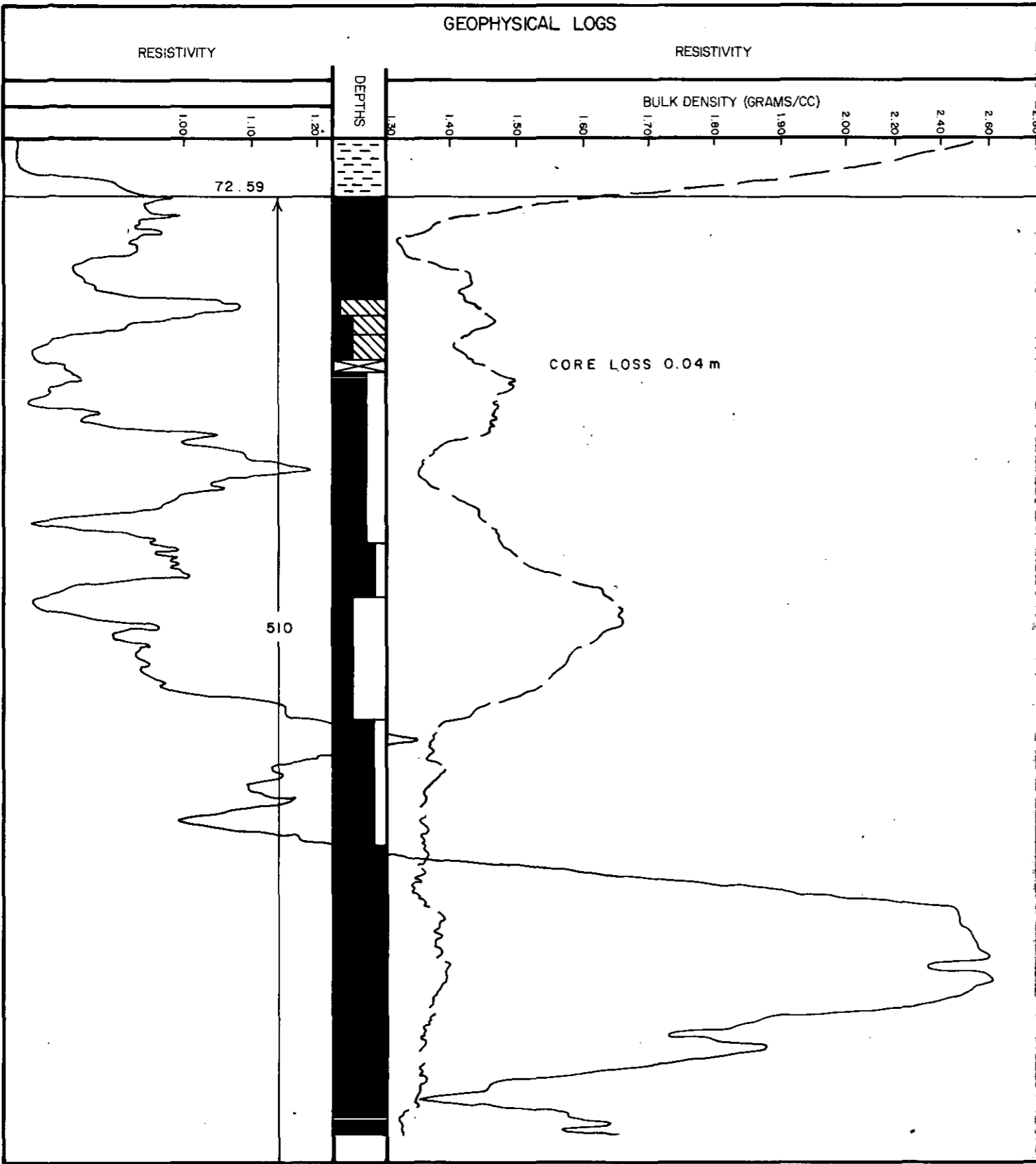
DOSAGE : =0.5 lb/T.D.S.

CONDITIONING=60 seconds

FROTHS (I & II) =60 seconds each

Birtley Coal  
& Minerals Testing

GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
99	4.14	510		1.0	15.3	20.9	62.8	0.40	2	1.43

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 34 B SEAM**



CLIENT : BANGOR OIL LIMITED

PROJECT: MS 34 CORE SAMPLE, SEAM B COMP.

LAB NO.: 5683

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGT	CALC. BASIS
1.2	1.0	15.3	20.9	62.8	0.40	1.43	2	79	a.d.b.
	2.2	15.1	20.6	62.1	0.40	-	-	-	a.r.b.
		15.5	21.1	63.4	0.40	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM X 0.5 MM	82.8	82.8
0.5MM x 0	17.2	100.0

SINK-FLOAT ANALYSIS, a.d.b.:

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	10.6	3.2	0.39	8 1/2	10.6	3.2
1.30 - 1.40	52.9	6.1	0.32	1 1/2	63.5	5.6
1.40 - 1.50	13.9	16.9	0.32	1	77.4	7.6
1.50 - 1.60	9.6	24.6	0.24	1	87.0	9.5
1.60 - 1.70	4.4	30.4	0.27	1	91.4	10.5
1.70 - 1.80	2.4	39.2	0.23	1	93.8	11.3
1.80 - 2.00	3.3	53.5	0.16	1	97.1	12.7
+2.00 -	2.9	75.9	0.09	1/2	100.0	14.5

FROTH FLOTATION TEST, adb: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	56.0	8.9	5	56.0	8.9
STAGE II	13.8	15.0	2 1/2	69.8	10.1
TAILINGS	30.2	31.2	1	100.0	16.5

F.F. PARAMETERS: PULP DENSITY=10%

REAGENT =4:1=Kerosene:MIBC

DOSAGE =0.5 lb/T.D.S.

CONDITIONING=60 seconds

FROTHS (I & II) =60 seconds each

CLIENT ; RANGER OIL LIM (

PROJECT: MS 34 CORE SAMPLES , SEAM B

LAB NO. : 5683

ANALYSIS OF CLEAN COAL COMPOSITE % YIELD = 76.1

MOIST%	ASH%	VM %	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
0.9	8.0	22.3	68.8	0.40		2	1.36	81	a.d.b.
	8.1	22.5	69.4	0.40		-	-	-	d.b.

DILATATION TEST				
S.T. (°C)	MDT(°C)	M.C. %	M.D.%	G. NUMBER
422	-	10	-	-

@479°

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	455
MAXIMUM	1	475
FINAL	0	492
RANGE =		37

Sample for petrographic analysis prepared.

C.C. Make-up 9.5 MM x 0.5 M Float @ 1.50 S.G.  
combined with 0.5 MM froth for 120 seconds.

CLIENT : RANGER OIL LIMITED

PROJECT: MS 34 CORE SAMPLES , SEAM B

LAB NO.: 5683

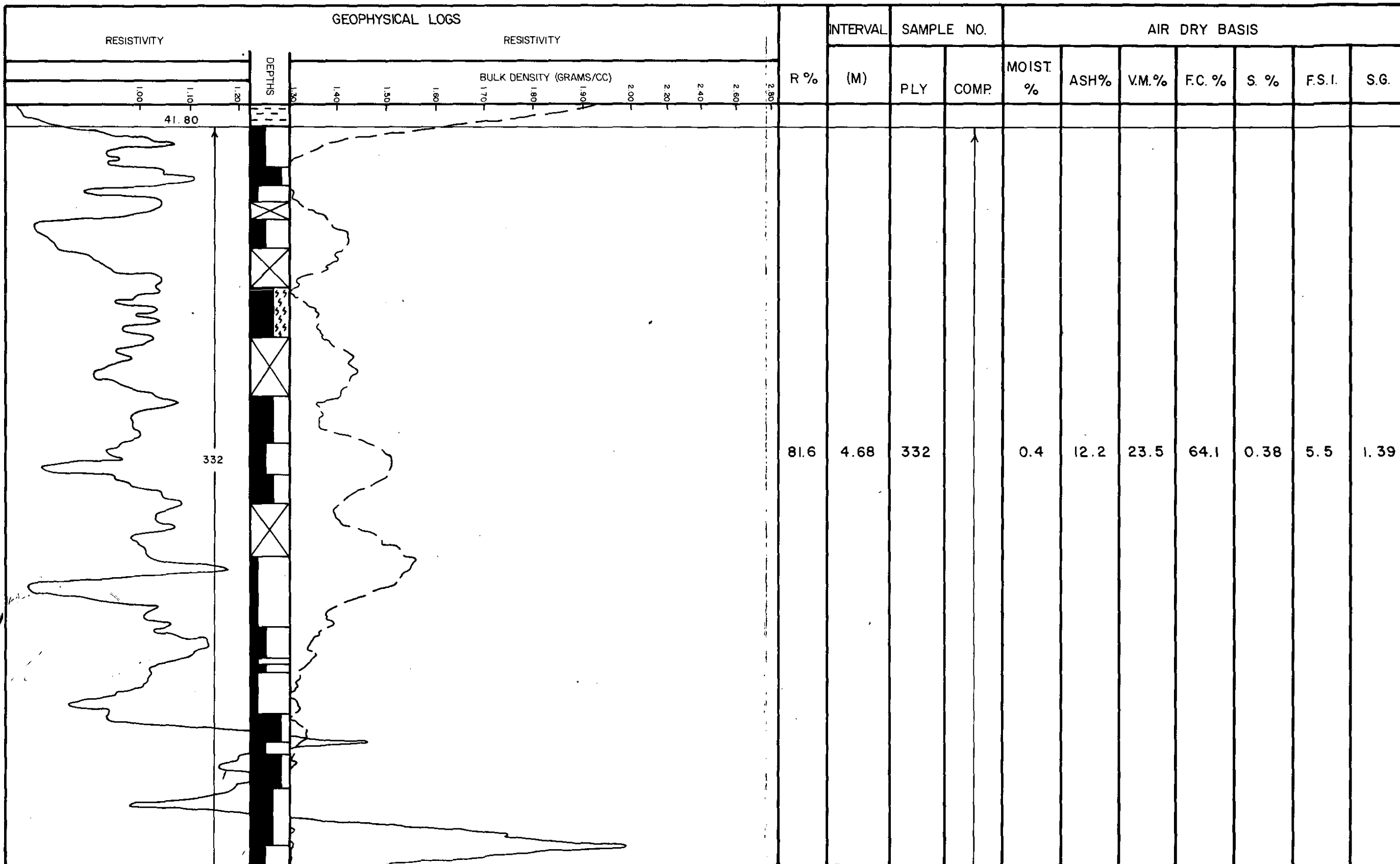
ANALYSIS OF CLEAN COAL COMPOSITE % YIELD = 64.1

MOIST%	ASH%	VM %	FC%	S%		F.S.I.			CALC. BASIS
0.9	7.7	22.2	69.2	0.39		3			a.d.b.
	7.8	22.4	69.8	0.39		-			d.b.

DILATATION TEST				
S.T. (°C)	MDT (°C)	M.C. %	M.D. %	G. NUMBER
425	-	11	-	-

@500°

C.C. Make-up \_\_\_\_\_ 9.5 MM X 0.5 M Floats @ 1.50 S.G.

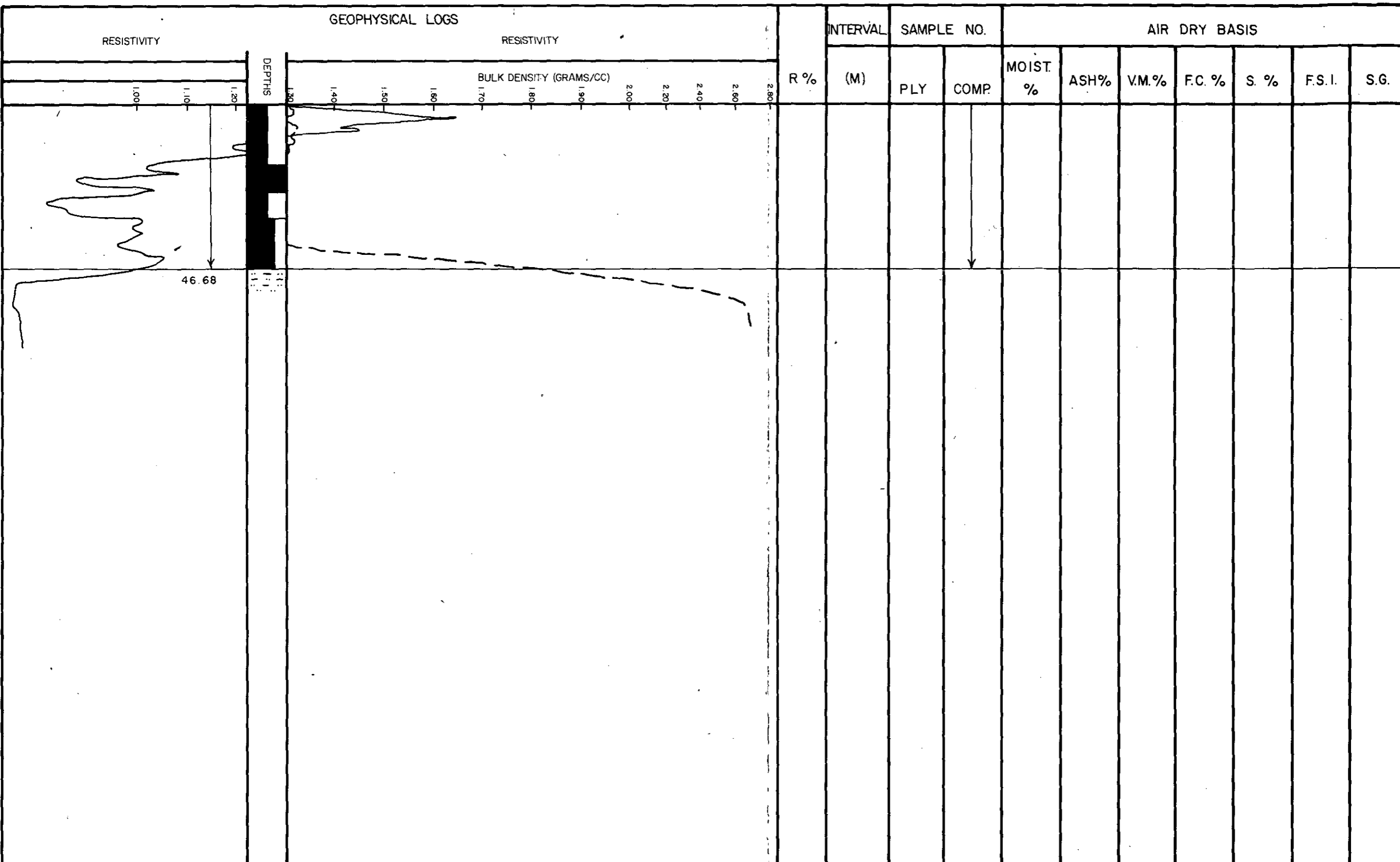


Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 35 B SEAM**

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 35 B SEAM



CLIENT : RANGER OIL LIMITED

PROJECT: MS 35 Core Samples

SEAM      B      COMP.

LAB NO.: 6181

## HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGT	CALC. BASIS
1.0	0.4	12.2	23.3	64.1	0.38	1.39	5 1/2	78	a.d.b.
	1.4	12.1	23.1	63.4	0.38	-	-	-	a.r.b.
		12.2	23.4	64.4	0.38	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	86.2	86.2
0.5 MM X 0	13.8	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	38.8	3.6	0.44	8 1/2	38.8	3.6
1.30 - 1.40	26.5	7.8	0.31	3	65.3	5.3
1.40 - 1.50	15.3	15.9	0.28	1 1/2	80.6	7.3
1.50 - 1.60	8.5	23.4	0.21	1	89.1	8.9
1.60 - 1.70	3.9	29.3	0.10	1	93.0	9.7
1.70 - 1.80	2.4	35.1	0.12	1	95.4	10.3
1.80 - 2.00	3.1	42.2	0.09	1/2	98.5	11.3
+2.00	1.5	59.8	0.08	N.A.	100.0	12.1

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	49.2	7.2	0.38	9	49.2	7.2
STAGE 11	9.9	9.9	0.34	8 1/2	59.1	7.7
TAILINGS	40.9	13.2	0.34	7	100.0	9.9

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

DEPTHS

R %

(M)

PLY

COMP.

MOIST. %

ASH%

V.M.%

F.C. %

S. %

F.S.I.

S.G.

1.00

1.10

1.20

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

2.80

72.65

347

348

CORE LOSS 0.54m

100

0.22

347

0.6

47.4

16.6

35.4

0.35

3

1.75

90

5.26

348

0.6

11.5

23.1

64.8

0.40

6.5

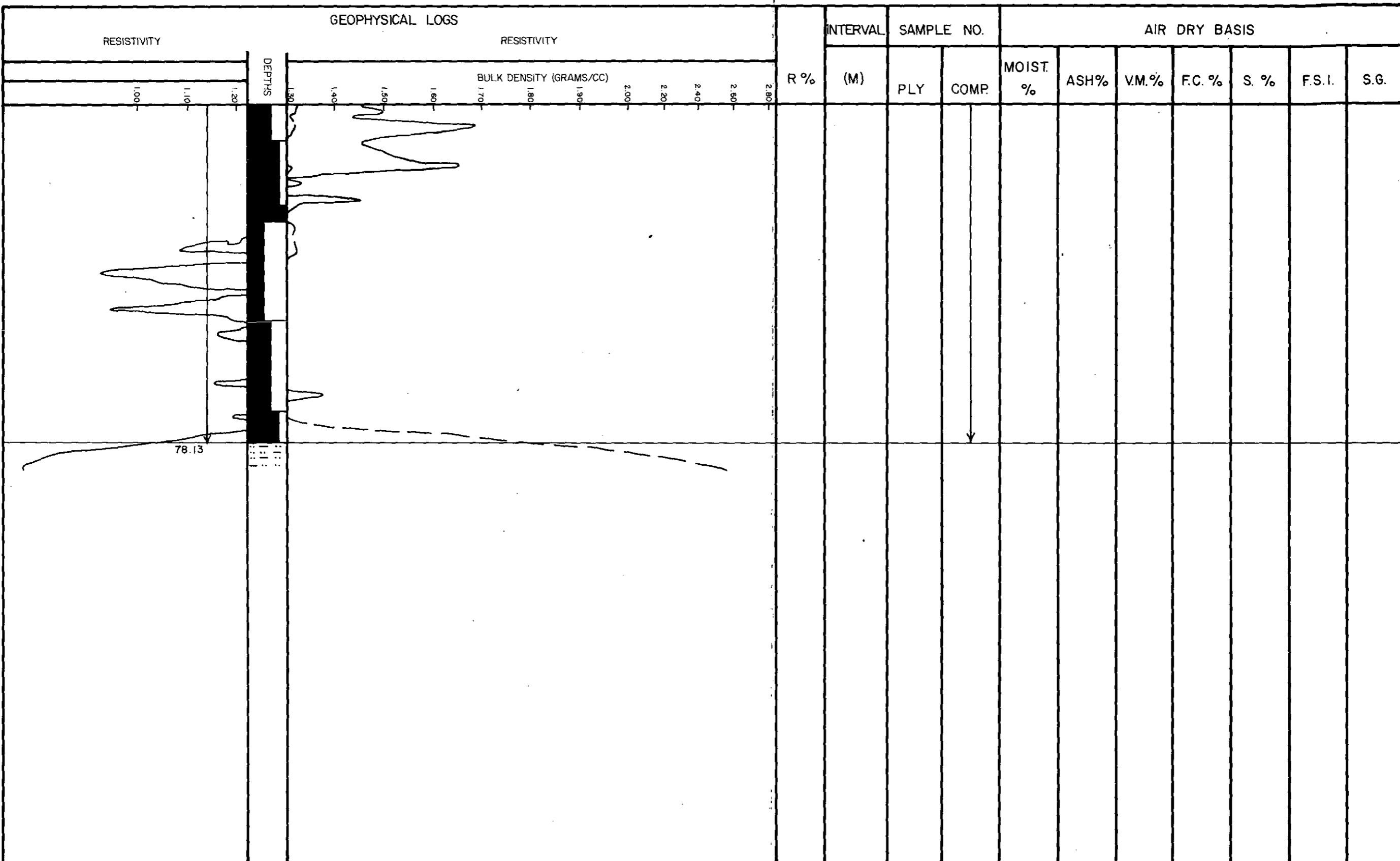
1.37

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 36 B SEAM

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 36 B SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: MS 36 Core Sample

SEAM B COMP.

LAB NO.: 6185

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.2	0.6	12.6	22.3	64.5	0.35	1.38	6 1/2	84	a.d.b.
	1.8	12.4	22.0	63.8	0.35	-	-	-	a.r.b.
		12.7	22.4	64.9	0.35	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	80.7	80.7
0.5 MM X 0	19.3	100.0

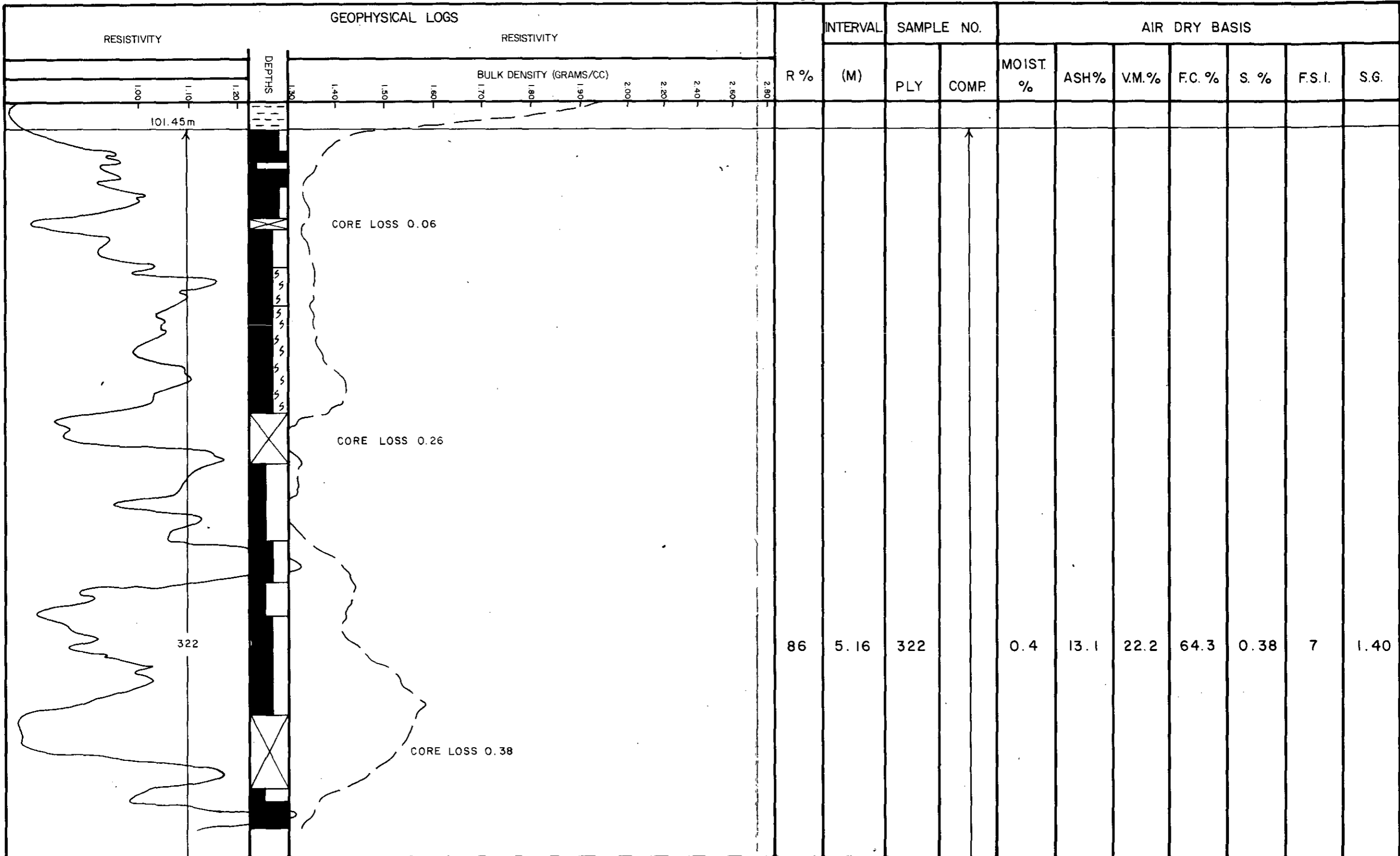
SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	30.2	3.5	0.35	9	30.2	3.5
1.30 - 1.40	38.8	5.9	0.30	7	69.0	4.8
1.40 - 1.50	12.8	15.2	0.27	1 1/2	81.8	6.5
1.50 - 1.60	6.7	23.3	0.22	1	88.5	7.7
1.60 - 1.70	3.4	31.8	0.22	1	91.9	8.6
1.70 - 1.80	1.8	37.5	0.14	1	93.7	9.2
1.80 - 2.00	1.9	45.9	0.08	1/2	95.6	9.9
+2.00	4.4	77.4	0.08	N.A.	100.0	12.9

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	75.9	7.3	0.32	8 1/2	75.9	7.3
STAGE 11	9.8	14.9	0.31	6 1/2	85.7	8.2
TAILINGS	14.3	31.5	0.30	2 1/2	100.0	11.5

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1-Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

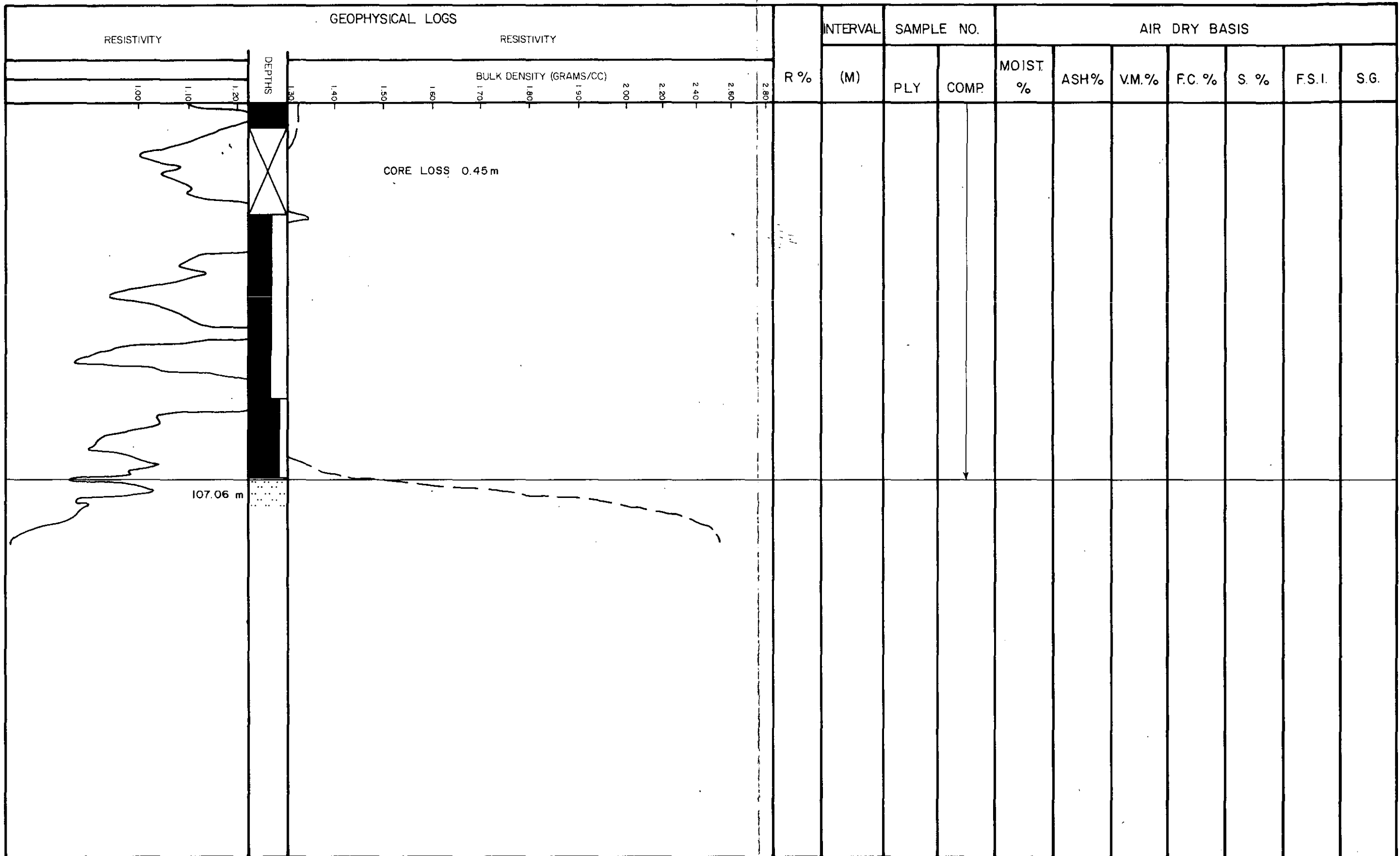
Birtley Coal & Minerals Testing



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 37 B SEAM**



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 37 B SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: MS 37 Core Sample

SEAM        B        COMP.

LAB NO.: 6188

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CAT.C. BASIS
0.6	0.4	13.1	22.2	64.3	0.38	1.40	7	90	a.d.b.
	1.0	13.0	22.1	63.9	0.38	-	-	-	a.r.b.
		13.2	22.3	64.5	0.38	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	81.5	81.5
0.5 MM X 0	18.5	100.0

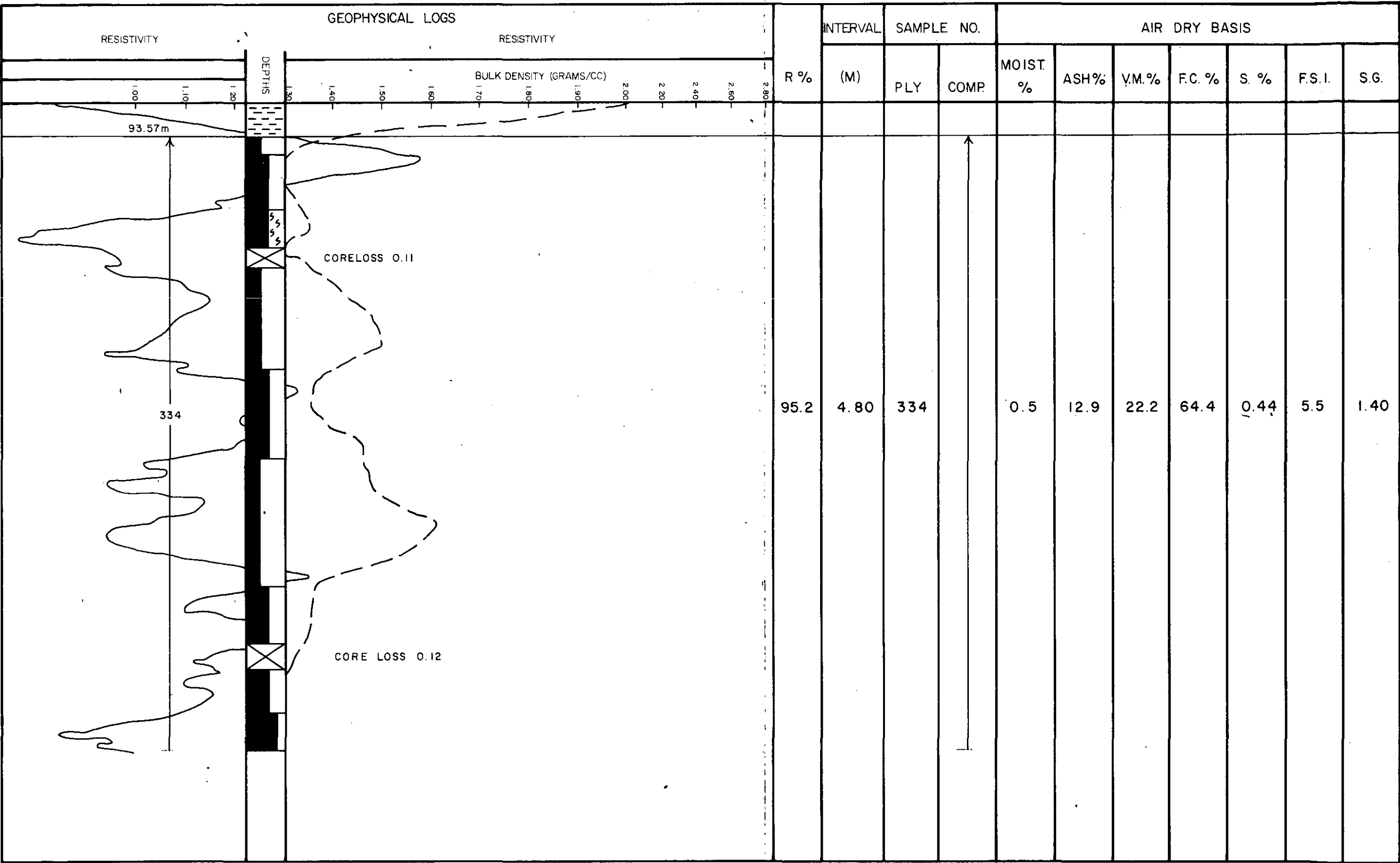
SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	32.4	3.0	0.45	9	32.4	3.0
1.30 - 1.40	34.8	7.5	0.45	4 1/2	67.2	5.3
1.40 - 1.50	11.0	16.8	0.40	1 1/2	78.2	6.9
1.50 - 1.60	10.7	24.5	0.31	1	88.9	9.1
1.60 - 1.70	4.9	29.4	0.27	1	93.8	10.1
1.70 - 1.80	2.6	35.0	0.21	1/2	96.4	10.8
1.80 - 2.00	1.6	45.3	0.12	1/2	98.0	11.4
+2.00	2.0	72.7	0.10	N.A.	100.0	12.6

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	62.1	7.3	0.41	9	62.1	7.3
STAGE 11	16.0	11.3	0.31	8	78.1	8.1
TAILINGS	21.9	20.8	0.33	3 1/2	100.0	10.9

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 38 B SEAM**



GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

DEPTHS

INTERVAL

SAMPLE NO.

AIR DRY BASIS

R %

(M)

PLY

COMP

MOIST %

ASH%

VM.%

FC. %

S. %

F.S.I.

S.G.

1.00

1.10

1.20

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

2.80

98.37m

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 38 B SEAM

DATE: OCTOBER 1980

SCALE: 1:20

PAGE 2 of 2

CLIENT : RANGER OIL LIMITED

PROJECT: MS 38 Core Sample

SEAM        B        COMP. (

LAB NO.: 6194

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.9	0.5	12.9	22.2	64.4	0.44	1.40	5 1/2	83	a.d.b.
	1.4	12.8	22.0	63.8	0.44	-	-	-	a.r.b.
		13.0	22.3	64.7	0.44	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	84.7	84.7
0.5 MM X 0	15.3	100.0

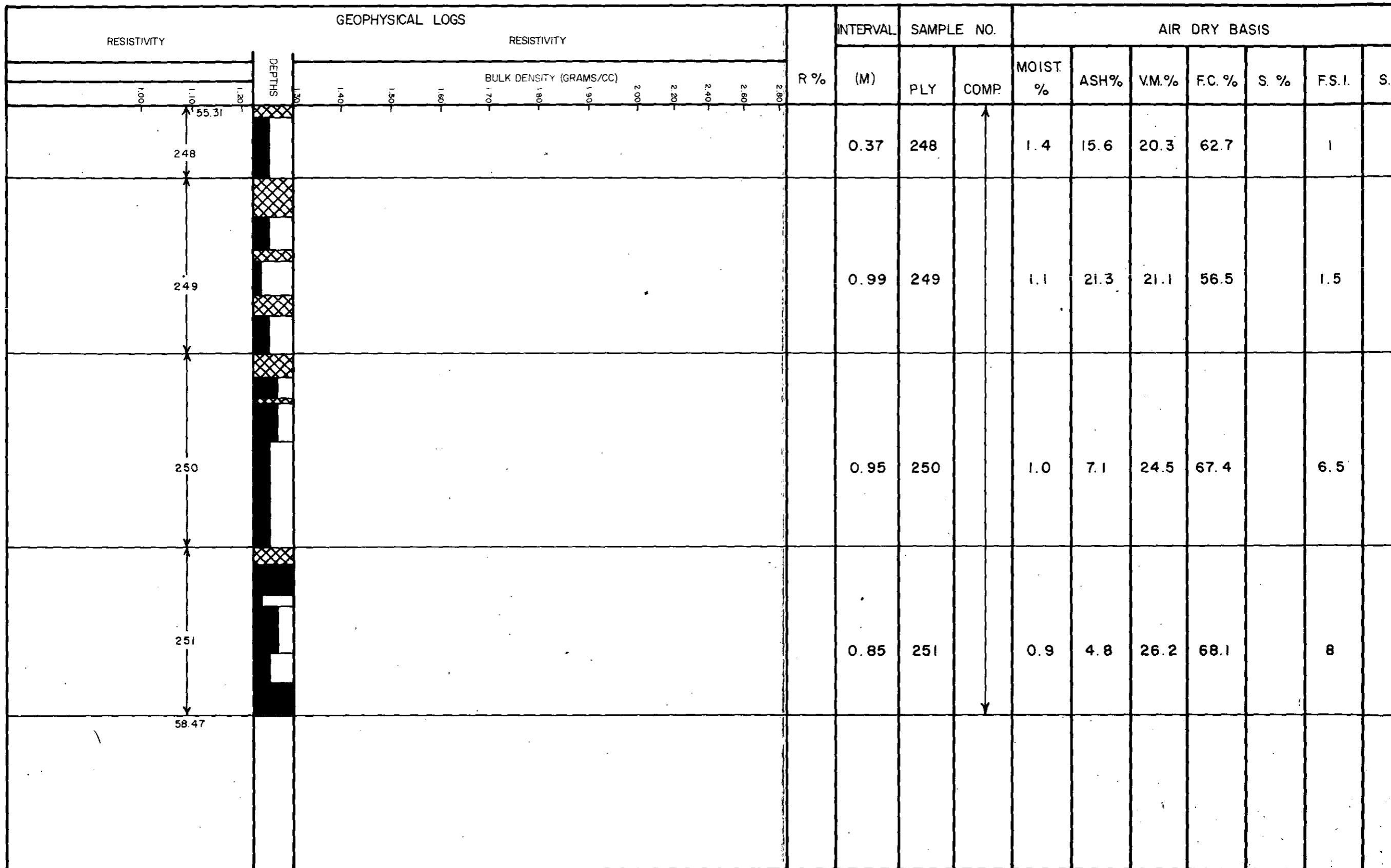
SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	39.2	3.5	0.46	9	39.2	3.5
1.30 - 1.40	26.2	7.9	0.38	3 1/2	65.4	5.3
1.40 - 1.50	15.2	17.2	0.33	2	80.6	7.5
1.50 - 1.60	9.1	26.0	0.28	1	89.7	9.4
1.60 - 1.70	4.2	32.1	0.21	1	93.9	10.4
1.70 - 1.80	2.4	39.1	0.16	1	96.3	11.1
1.80 - 2.00	1.7	48.1	0.09	1	98.0	11.8
+2.00	2.0	74.0	0.07	N.A.	100.0	13.0

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1.	72.4	7.7	0.33	8 1/2	72.4	7.7
STAGE 11	12.4	12.5	0.35	7 1/2	84.8	8.4
TAILINGS	15.2	26.0	0.31	3 1/2	100.0	11.1

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1-Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 40 B SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: BS 40 CORE SAMPLE , SEAM B COMP.

LAB NO.: 5818

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.1	0.6	12.9	23.7	62.8	0.37	1.39	4 1/2	77	a.d.b.
	1.7	12.8	23.4	62.1	0.37	-	-	-	a.r.b.
		13.0	23.8	63.2	0.37	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM X 0.5 MM	88.2	88.2
0.5MM x 0	11.8	100.0

SINK - FLOAT ANALYSIS, adb: 9.5MMx0.5MM					
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
-1.30	26.0	2.7	9	26.0	2.7
1.30 -1.40	42.4	5.8	5 1/2	68.4	4.6
1.40 -1.50	11.0	16.7	1 1/2	79.4	6.3
1.50 -1.60	7.5	23.8	1 1/2	86.9	7.8
1.60 -1.70	4.5	28.2	1	91.4	8.8
1.70 -1.80	4.2	32.6	1	95.6	9.9
1.80 -2.00	1.4	42.4	1/2	97.0	10.3
+ 2.00	3.0	82.5	N.A.	100.0	12.5

FROTH FLOTATION TEST, adb: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	66.9	6.7	8 1/2	66.9	6.7
STAGE II	12.0	12.4	7	78.9	7.6
TAILINGS	21.1	28.4	2	100.0	12.0

F.F. PARAMETERS: PULP DENSITY=10%

REAGENT =4:1=Kerosene:MIBC

DOSAGE =0.5 lb/T.D.S.

CONDITIONING=60 seconds

FROTHS (I & II) =60 seconds each

CLIENT : RANGER OIL LIMITED

PROJECT: MS 40 CORE SAMPLE , SEAM B COMP.

LAB NO.: 5818

Analysis of Clean Coal Composite . % Yield = 79.3

MOIST.%	ASH%	VM%	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
0.6	6.6	23.0	69.8	0.37	.09	7 1/2	1.33	78	a.d.b.
	6.6	23.1	70.3	0.37		-	-	-	d.b.

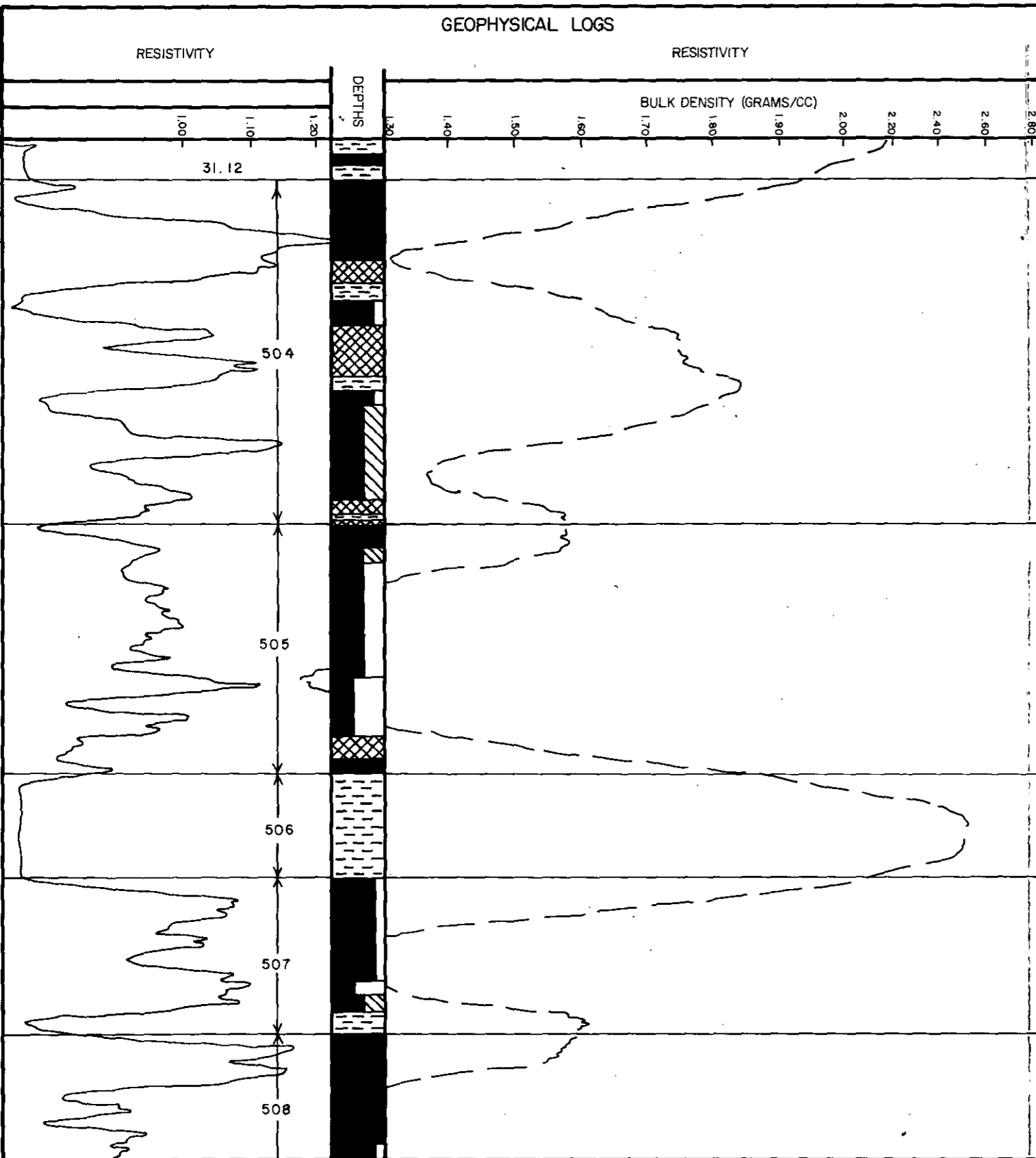
DILATATION TEST				
S.T.(°C)	MDT(°C)	M.C. %	M.D.%	G. NO.
395	473	22	50	1.036

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	433
MAXIMUM	218	471
FINAL	0	504
RANGE =		71

Sample for Petrographic analysis prepared.

C.C. MAKE-UP \_\_\_\_\_ 9.5 MM x 0.5 M FLOAT @ 1.50 S.G.  
combined with 0.5 MM froth for 120 seconds

GEOPHYSICAL LOGS



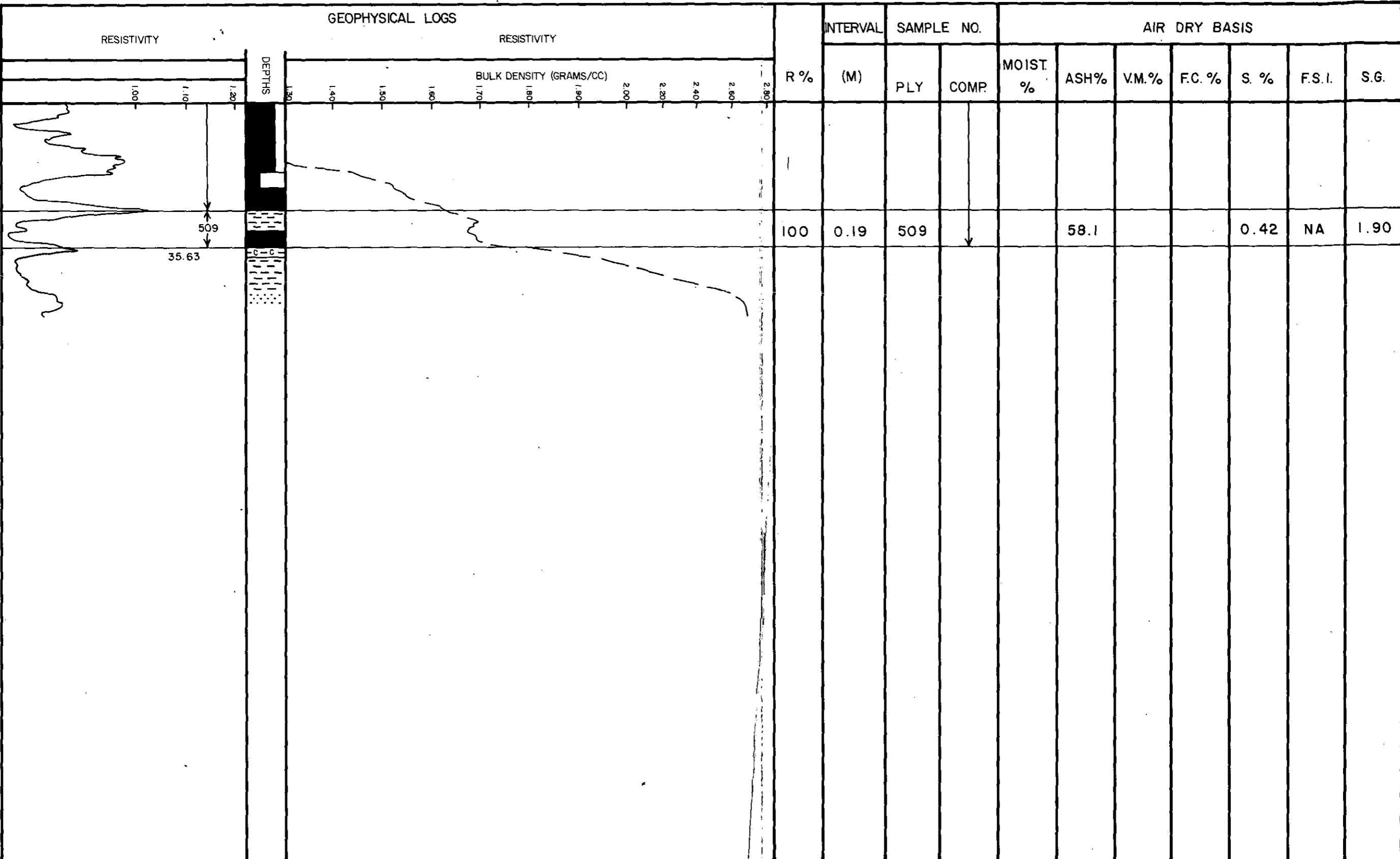
R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP.	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
100	1.33	504		1.7	34.5	16.8	47.0	0.32	0	1.66
100	0.95	505		0.8	17.3	21.1	60.8	0.41	4	1.42
100	0.41	506			89.7			0.11	NA	2.58
100	0.60	507		0.7	21.0	19.4	58.9	0.44	5	1.47
100	1.03	508		0.9	14.8	22.4	61.9	0.58	7	1.39

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 34 C SEAM**

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 34 C SEAM

CLIENT : BAWGER OIL LIMITED

PROJECT: BS 34 CORE SAMPLE, SEAM C COMP.

LAB NO.: 5694

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.3	1.1	30.4	18.2	50.3	0.44	1.55	1 1/2	75	a.d.b.
	2.4	30.0	18.0	49.6	0.43	-	-	-	a.r.b.
		30.7	18.4	50.9	0.44	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM X 0.5 MM	82.0	82.0
0.5MM x 0	18.0	100.0

SINK-FLOAT ANALYSIS, a.d.b.:

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	21.4	3.0	0.55	9	21.4	3.0
1.30 - 1.40	23.1	7.0	0.58	1 1/2	44.5	5.1
1.40 - 1.50	12.2	15.3	0.54	1	56.7	7.3
1.50 - 1.60	4.8	24.3	0.47	1/2	61.5	8.6
1.60 - 1.70	2.7	36.4	0.44	1/2	64.2	9.8
1.70 - 1.80	3.7	44.1	0.39	1/2	68.9	11.5
1.80 - 2.00	8.0	53.4	0.31	N.A.	75.9	16.0
+2.00 -	24.1	83.5	0.13	N.A.	100.0	32.3

FROTH FLOTATION TEST, a.d.b.: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	48.7	8.0	7 1/2	48.7	8.0
STAGE II	9.7	18.1	2 1/2	58.4	9.7
TAILINGS	41.6	33.5	1	100.0	19.6

F.F. PARAMETERS: PULP DENSITY=10%

REAGENT =4:1=Kerosene:MIBC

DOSAGE =0.5 lb/T.D.S.

CONDITIONING=60 seconds

FROTHS (I & II) =60 seconds each



CLIENT : RANGER OIL LIMITED

PROJECT: HS 34 CORE SAMPLES , SEAM C

LAB NO.: 5694

ANALYSIS OF CLEAN COAL COMPOSITE % YIELD = 46.5

MOIST%	ASH%	VM %	FC%	S%		F.S.I.			CALC. BASIS
1.0	7.3	22.5	69.2	0.55		3			a.d.b.
	7.4	22.7	69.9	0.56		-			d.b.

DILATATION TEST				
S.T. (°C)	MDT (°C)	M.C. %	M.D. %	G. NUMBER
425	-	25	-	-

@494°

C.C. Make-up \_\_\_\_\_ 9.5 MM X 0.5 M Floats @ 1.50 S.G.

CLIENT : RANGER OIL LIMB

PROJECT: MS 34 CORE SAMPLES , SEAM C Composite

LAB NO.: 5694

ANALYSIS OF CLEAN COAL COMPOSITE % YIELD = 57.0

MOIST%	ASH%	VM %	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
1.0	7.6	22.4	69.0	0.60		.4	1.34	83	a.d.b.
	7.7	22.6	69.7	0.61		-	-	-	d.b.

DILATATION TEST				
S.T. (°C)	MDT (°C)	M.C. %	M.D.%	G. NUMBER
410	-	17	-	-

@491°

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	448
MAXIMUM	7	482
FINAL	0	500
RANGE =		52

Sample for petrographic analysis prepared.

C.C. Make-up \_\_\_\_\_ 9.5 MM x 0.5 M Float @ 1.50 S.G. combined with 0.5 MM froth for 120 seconds.

CLIENT: RANGER OIL

PROJECT: MS 34 CORE SAMPLES, SEAM C COMPOSITE

LAB NO.: 5694

FROTH TEST: Raw Coal Crushed to -28Mesh

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE WT%	ASH%
STAGE I	45.5	10.4	5 1/2	45.5	10.4
STAGE II	6.7	29.4	1 1/2	52.2	12.8
TAILS	47.8	49.9	1/2	100.0	30.6

PARAMETERS: 10% Pulp Density  
1 minute conditioning  
0.50 lb/T.D.S. of 4:1=Kerosene:MIBC  
Stage I & II = 1st & 2nd min. froths

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

INTERVAL

SAMPLE NO.

AIR DRY BASIS

DEPTHS

BULK DENSITY (GRAMS/CC)

R %

(M)

PLY

COMP.

MOIST.  
%

ASH%

V.M.%

F.C.%

S.%

F.S.I.

S.G.

1.00

1.10

1.20

30.90

343

344

345



100

1.88

343

0.6

21.1

20.5

57.8

0.49

6.5

1.46

100

0.21

344

1.0

88.7

5.8

4.5

0.19

NA

2.46

100

1.69

345

0.5

14.6

22.2

62.7

0.60

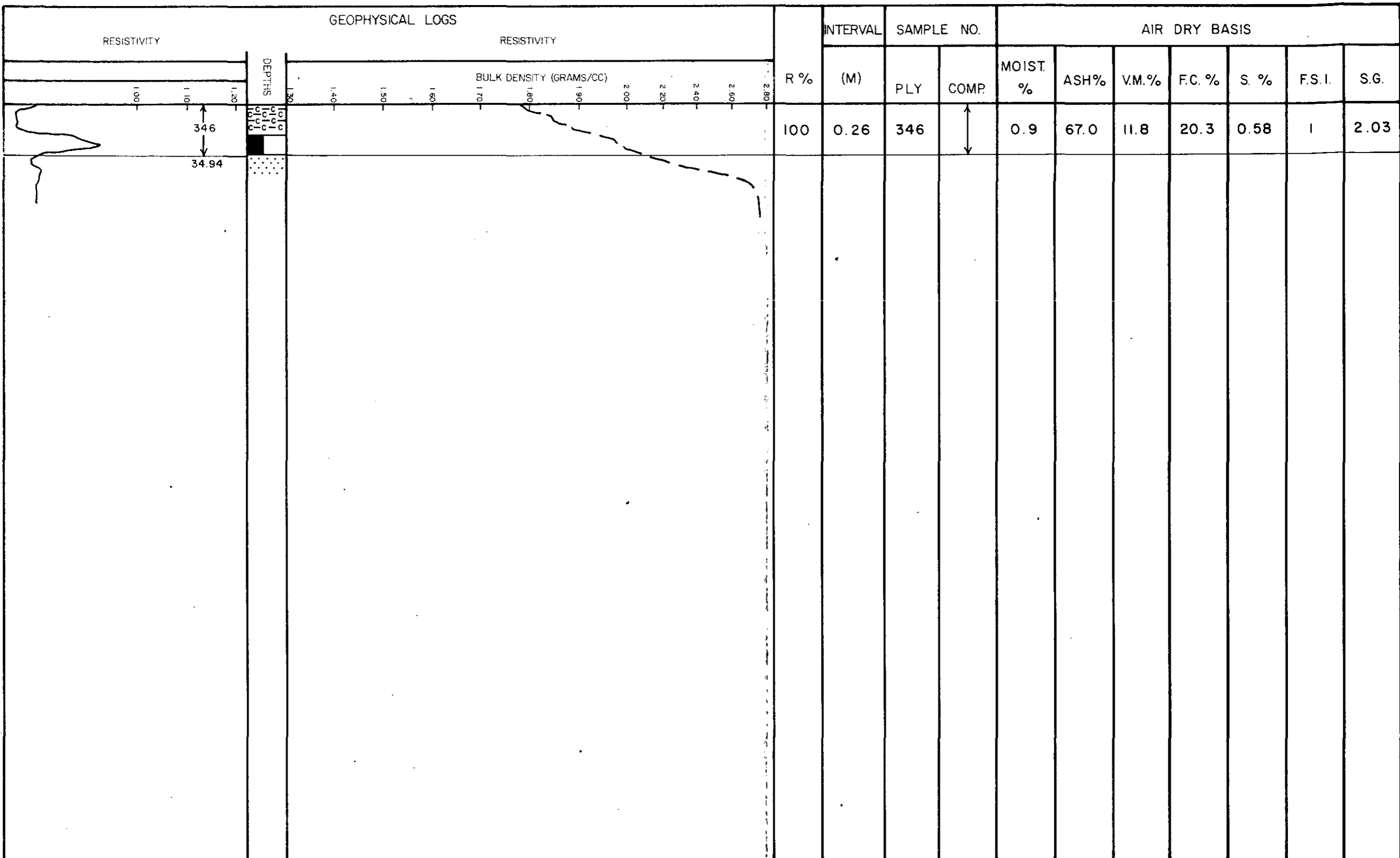
8.5

1.38

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 36 C SEAM



Prepared by :  
**ROBERTSON RESEARCH CANADA LIMITED**

RESISTIVITY ———  
 BULK DENSITY - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 36 C SEAM**

DATE: OCTOBER 1980 SCALE: 1:20 PAGE 2 of 2

CLIENT : RANGER OIL LIMITED

PROJECT: NS 36 Core Sample

SEAM        C        COMP.

LAB NO.: 6212

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.1	0.7	23.8	20.3	56.0	0.47	1.46	7	78	a.d.b.
	1.8	23.5	20.1	54.6	0.46	-	-	-	a.r.b.
		23.2	20.4	56.4	0.47	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	86.0	86.0
0.5 MM X 0	14.0	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	30.9	3.2	0.64	9	30.9	3.2
1.30 - 1.40	24.7	8.9	0.57	4 1/2	55.6	5.7
1.40 - 1.50	10.7	17.4	0.47	2	66.3	7.6
1.50 - 1.60	4.6	29.2	0.57	1 1/2	70.9	9.0
1.60 - 1.70	3.1	39.2	0.56	1 1/2	74.0	10.3
1.70 - 1.80	4.1	47.1	0.47	1	78.1	12.2
1.80 - 2.00	8.8	55.3	0.40	1/2	86.9	16.6
+2.00	13.1	84.8	0.18	N.A.	100.0	25.5

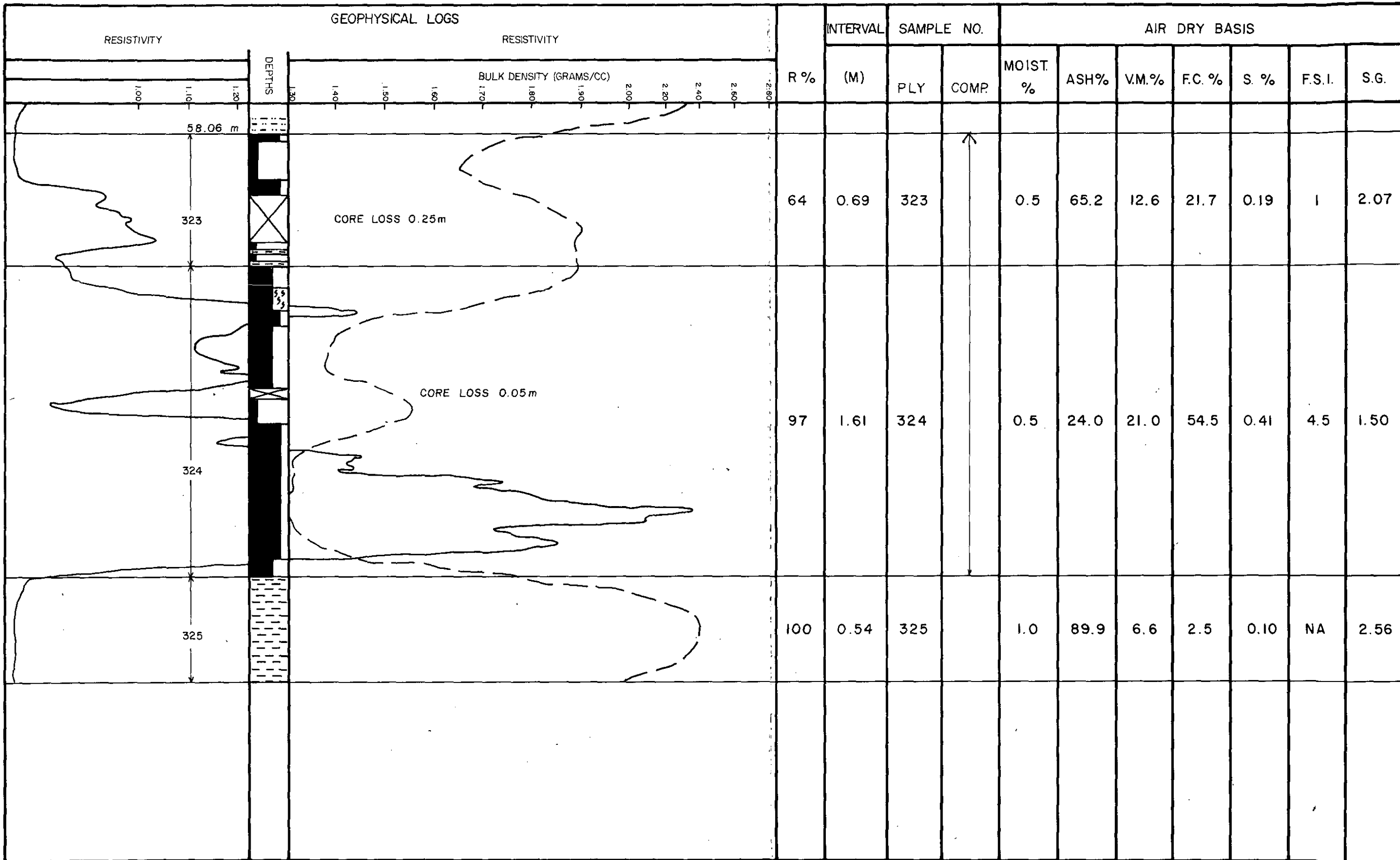
FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	82.3	9.9	0.59	9	82.3	9.9
STAGE 11	3.7	27.4	0.59	N.S.S.	86.0	10.7
TAILINGS	14.0	57.2	0.65	1	100.0	17.2

N.S.S. - Not Sufficient Sample

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

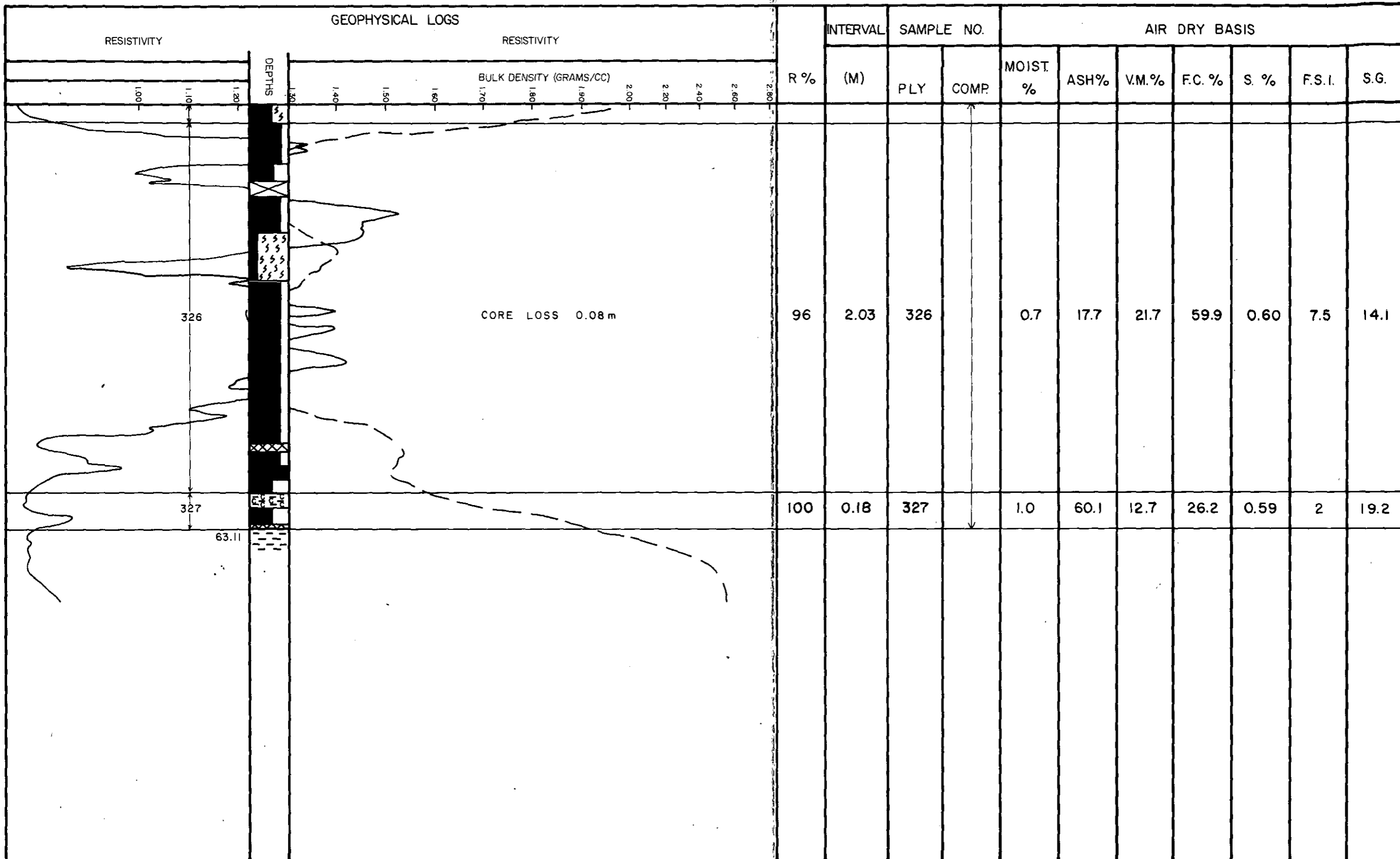
Birtley Coal  
& Minerals Testing



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 37 C SEAM**



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 37 C SEAM**



CLIENT : RANGER OIL LIMITED

PROJECT: MS 37 Core Sample

SEAM     C     COMP. #2

LAB NO.: 6190

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.9	0.6	20.4	21.2	57.8	0.57	1.41	7 1/2	83	a.d.b.
	1.5	20.2	21.0	57.3	0.56	-	-	-	a.r.b.
		20.5	21.3	58.2	0.57	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	80.0	80.0
0.5 MM X 0	20.0	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	42.9	2.8	0.63	9	42.9	2.8
1.30 - 1.40	15.6	9.1	0.53	7 1/2	58.5	4.5
1.40 - 1.50	12.7	17.3	0.52	2 1/2	71.2	6.8
1.50 - 1.60	6.2	27.8	0.52	2	77.4	8.5
1.60 - 1.70	3.5	39.7	0.69	1 1/2	80.9	9.8
1.70 - 1.80	2.2	50.7	0.66	1 1/2	83.1	10.9
1.80 - 2.00	4.5	59.5	0.48	1	87.6	13.4
+2.00	12.4	79.8	0.28	N.A.	100.0	21.6

FROTH FLOTATION TEST, adb:0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	79.9	7.7	0.68	9	79.9	7.7
STAGE 11	5.9	19.8	0.59	7	85.8	8.5
TAILINGS	14.2	35.2	0.63	3	100.0	12.3

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal & Minerals Testing

A DIVISION OF GREAT WESTERN INDUSTRIES LTD

## HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.6	0.5	32.7	18.5	48.3	0.27	1.58	3	80	a.d.b.
	1.1	32.5	18.4	48.0	0.27	-	-	-	a.r.b.
		32.9	18.6	48.5	0.27	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	80.4	80.4
0.5 MM X 0	19.6	100.0

## SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	13.5	4.9	0.41	9	13.5	4.9
1.30 - 1.40	17.4	8.5	0.47	5	30.9	6.9
1.40 - 1.50	18.0	14.6	0.35	2	48.9	9.8
1.50 - 1.60	5.0	21.1	0.38	1 1/2	53.9	10.8
1.60 - 1.70	2.2	31.3	0.31	1	56.1	11.6
1.70 - 1.80	3.3	42.3	0.25	1	59.4	13.3
1.80 - 2.00	11.7	55.4	0.22	1	71.1	20.2
+2.00	28.9	71.9	0.16	N.A.	100.0	35.2

## FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	72.8	15.3	0.40	8	72.8	15.3
STAGE 11	6.7	33.1	0.33	1 1/2	79.5	16.8
TAILINGS	20.5	51.9	0.34	1	100.0	24.0

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:l=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

INTERVAL

SAMPLE NO.

AIR DRY BASIS

1.00

1.10

1.20

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

R %

(M)

PLY

COMP

MOIST.  
%

ASH%

V.M.%

F.C.%

S.%

F.S.I.

S.G.

DEPTHS

53.16

335

336

357

CORE LOSS 0.14

82.1

0.78

335

0.8

52.0

15.6

31.6

0.33

1

1.85

100

1.30

336

0.6

18.1

21.1

60.2

0.48

4.0

1.44

100

0.18

357

1.0

86.4

6.8

5.8

0.16

NA

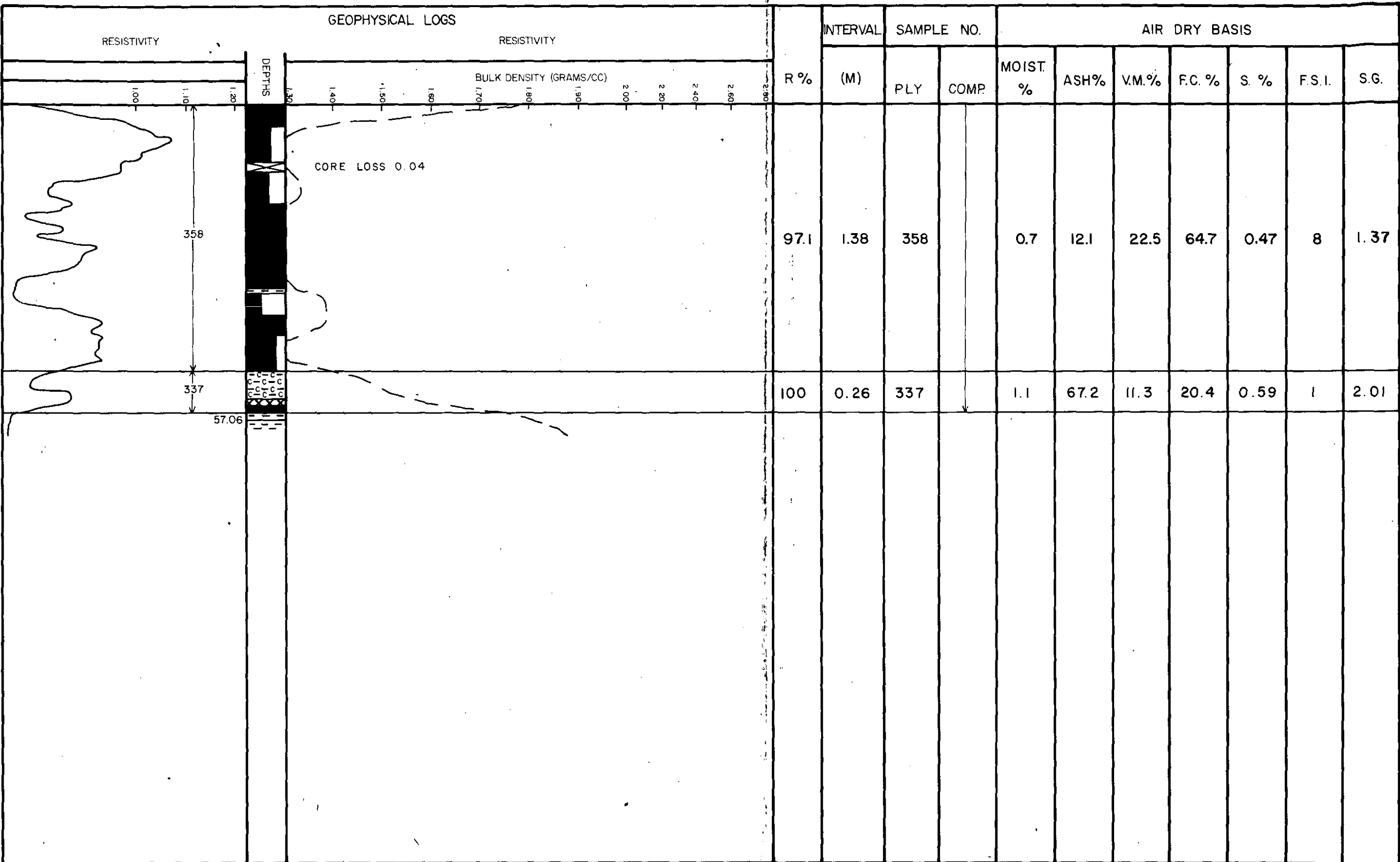
2.43

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 38 C SEAM

GEOPHYSICAL LOGS



RESISTIVITY	RESISTIVITY	BULK DENSITY (GRAMS/CC)	R %	INTERVAL	SAMPLE NO.		AIR DRY BASIS						
				(M)	PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
			97.1	1.38	358		0.7	12.1	22.5	64.7	0.47	8	1.37
			100	0.26	337		1.1	67.2	11.3	20.4	0.59	1	2.01

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 38 C SEAM**

## HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.7	0.8	28.4	19.3	51.5	0.42	1.53	4 1/2	72	a.d.b.
	1.5	28.2	19.2	51.1	0.42	-	-	-	a.r.b.
		28.6	19.5	51.9	0.42	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	83.5	83.5
0.5 MM X 0	16.5	100.0

## SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	26.5	3.3	0.58	9	26.5	3.3
1.30 - 1.40	23.5	8.3	0.49	5	50.0	5.7
1.40 - 1.50	12.6	15.5	0.41	3	62.6	7.6
1.50 - 1.60	3.7	24.7	0.37	1	66.3	8.6
1.60 - 1.70	2.3	33.9	0.37	1	68.6	9.4
1.70 - 1.80	2.5	43.4	0.35	1	71.1	10.6
1.80 - 2.00	6.6	54.2	0.18	1	77.7	14.3
+2.00	22.3	80.7	0.18	N.A.	100.0	29.1

## FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	70.0	11.8	0.42	8	70.0	11.8
STAGE 11	7.3	29.7	0.47	3 1/2	77.3	13.5
TAILINGS	22.7	55.6	0.33	1	100.0	23.0

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MJBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

GEOPHYSICAL LOGS

RESISTIVITY	DEPTHS	RESISTIVITY						R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS													
		1.00	1.10	1.20	1.30	1.40	1.50			1.60	1.70	1.80	1.90	2.00	2.20	2.40	2.60	2.80	PLY	COMP.	MOIST. %	ASH%	V.M.%	F.C. %	S. %
	16.15m								0.26	239		0.7	7.9	25.8	65.6			7							
									0.50	240		0.8	57.2	14.5	27.5			1							
									0.24	241		0.7	14.8	22.6	61.1			3.5							
									0.15	242		0.8	57.3	15.7	26.2			1							
									0.73	243		0.7	21.6	22.7	55.0			4.5							
									0.26	244		1.2	90.4	6.3	2.1			NA							
									0.33	245		0.7	11.1	23.8	64.4			6.5							
									0.7	246		1.2	69.8	9.5	19.5			0.5							
									1.02	247		0.8	14.2	23.7	61.3			8.5							
	19.69m																								

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY — — —  
R% = RECOVERY — TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 40 C SEAM

CLIENT : RANGER OIL LIMITED

PROJECT: MS 40 CORE SAMPLE , SEAM C COMP.

LAB NO. : 5819

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.9	0.7	29.7	20.9	48.7	0.54	1.58	6	67	a.d.b.
	1.6	29.4	20.7	48.3	0.54	-	-	-	a.r.b.
		29.9	21.0	49.1	0.54	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM X 0.5 MM	92.0	92.0
0.5MM x 0	8.0	100.0

SINK - FLOAT ANALYSIS, adb: 9.5MMx0.5MM					
S.G. FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
-1.30	19.5	2.9	9	19.5	2.9
1.30 -1.40	25.4	7.2	6 1/2	44.9	4.7
1.40 -1.50	13.7	15.8	3	58.6	7.3
1.50 -1.60	6.1	26.9	2 1/2	64.7	9.1
1.60 -1.70	3.7	37.2	1	68.4	10.7
1.70 -1.80	3.4	45.5	1	71.8	12.3
1.80 -2.00	6.6	56.3	1	78.4	16.0
+ 2.00	21.6	82.7	N.A.	100.0	30.4

FROTH FLOTATION TEST, adb: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	66.4	9.6	8	66.4	9.6
STAGE II	9.0	21.1	7 1/2	75.4	11.0
TAILINGS	24.6	46.0	2	100.0	19.6

F.F. PARAMETERS: PULP DENSITY=10%

REAGENT =4:1=Kerosene:MIBC

DOSAGE =0.5 lb/T.D.S.

CONDITIONING=60 seconds

FROTHS (I & II) =60 seconds each

CLIENT : RANGER OIL LIMITED

PROJECT: MS 40 CORE SAMPLE , SEAM C COMP.

LAB NO. : 5819

Analysis of Clean Coal Composite . % Yield = 59.9

MOIST.%	ASH%	VM%	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
0.7	8.1	24.3	66.9	0.54	.09	7 1/2	1.35	71	a.d.b.
	8.2	24.5	67.3	0.54		-	-	-	d.b.

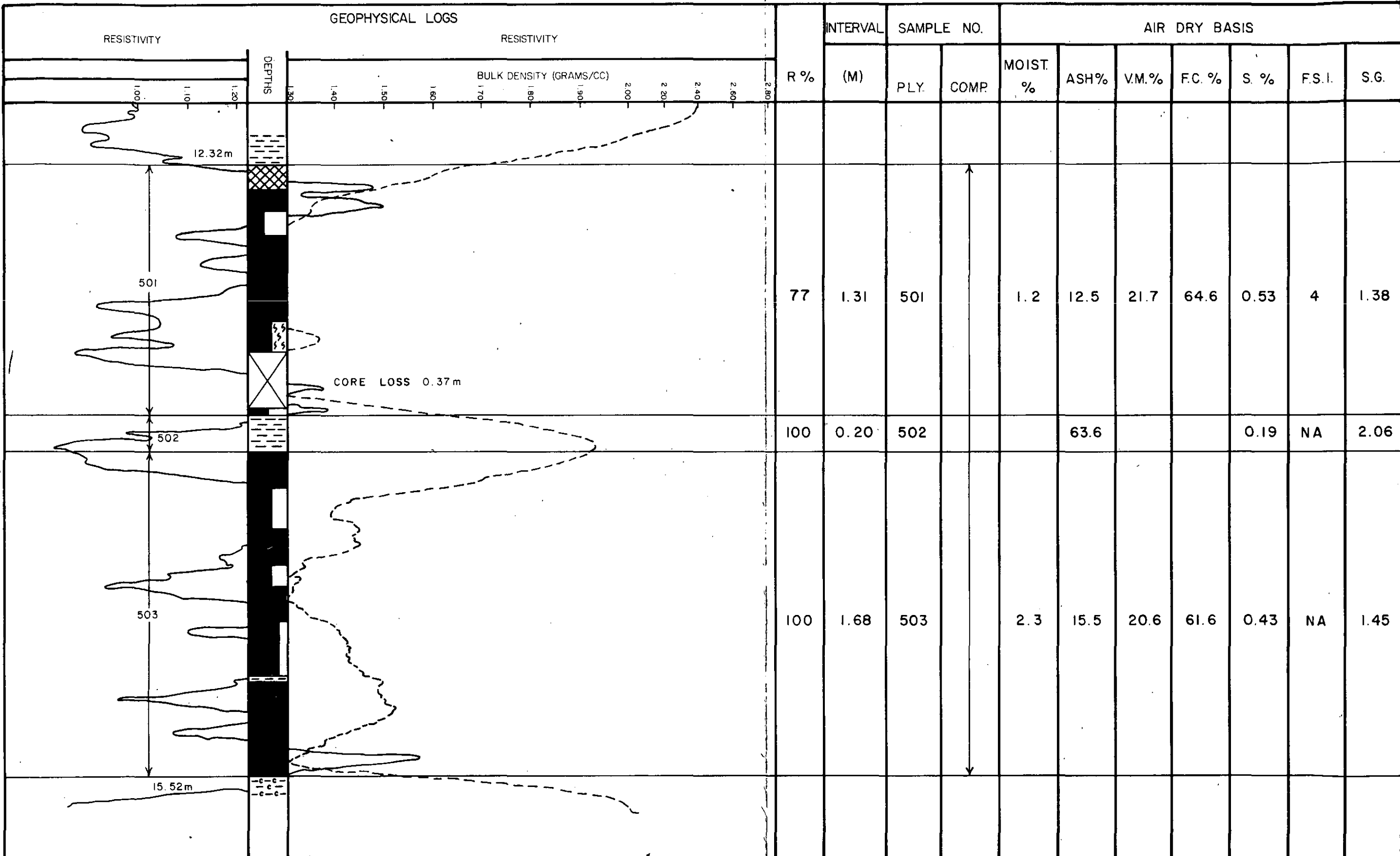
DILATATION TEST				
S.T.(°C)	MDT(°C)	M.C. %	M.D.%	G. NO.
386	470	23	90	1.062

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	420
MAXIMUM	601	462
FINAL	0	501
RANGE =		81

Sample for Petrographic analysis prepared.

C.C. MAKE-UP \_\_\_\_\_ 9.5 MM x 0.5 M FLOAT @ 1.50 S.G.  
combined with 0.5 MM froth for 120 seconds





R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY.	COMP.	MOIST. %	ASH%	VM.%	F.C. %	S. %	F.S.I.	S.G.
77	1.31	501		1.2	12.5	21.7	64.6	0.53	4	1.38
100	0.20	502			63.6			0.19	NA	2.06
100	1.68	503		2.3	15.5	20.6	61.6	0.43	NA	1.45

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 34 D SEAM**

CLIENT : RANGER OIL LIM(C)

PROJECT: MS 34 CORE SAMPLES , SEAM D

LAB NO. : 5695

ANALYSIS OF CLEAN COAL COMPOSITE % YIELD = 68.6

MOIST%	ASH%	VM %	FC%	S%	P%	F.S.I.	S.G.	H.G.I.	CALC. BASIS
1.3	8.1	22.9	67.7	0.43		1-1/2	1.36	81	a.d.b.
	8.2	23.2	68.6	0.44		-	-	-	d.b.

DILATATION TEST				
S.T.(°C)	MDT(°C)	M.C. %	M.D.%	G. NUMBER
461	-	2	-	-

@493°

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	463
MAXIMUM	1	471
FINAL	0	498
RANGE =		35

Sample for petrographic analysis prepared.

C.C. Make-up \_\_\_\_\_ 9.5 MM x 0.5 M Float @ 1.50 S.G.

combined with 0.5 MM froth for 120 seconds.

CLIENT : RANGER OIL LIMITED

PROJECT: MS 34 CORE SAMPLE, SEAM D COMP.

LAB NO.: 5695

HEAD RAW ANALYSIS

ADM %	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.2	2.4	16.5	20.9	60.2	0.37	1.47	1	79	a.d.b.
	3.6	16.3	20.6	59.5	0.37	-	-	-	a.r.b.
		16.9	21.4	61.7	0.38	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to 9.5MM

SIZE FRACTION	WT%	CUM. WT%
9.5MM x 0.5 MM	86.3	86.3
0.5MM x 0	13.7	100.0

SINK-FLOAT ANALYSIS, a.d.b.:

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	16.2	3.5	0.55	5 1/2	16.2	3.5
1.30 - 1.40	37.1	5.4	0.47	1/2	53.3	4.8
1.40 - 1.50	20.5	15.2	0.34	1/2	73.8	7.7
1.50 - 1.60	12.9	24.4	0.34	1/2	86.7	10.2
1.60 - 1.70	3.6	33.7	0.36	1/2	90.3	11.1
1.70 - 1.80	1.3	40.0	0.32	N.A.	91.6	11.5
1.80 - 2.00	1.5	52.9	0.24	N.A.	93.1	12.2
+2.00 -	6.9	75.0	0.14	N.A.	100.0	16.5

FROTH FLOTATION TEST, adb: 0.5MM x 0

PRODUCT	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
STAGE I	26.5	10.0	1 1/2	26.5	10.0
STAGE II	9.0	18.2	1	35.5	12.1
TAILINGS	64.5	22.6	1	100.0	18.9

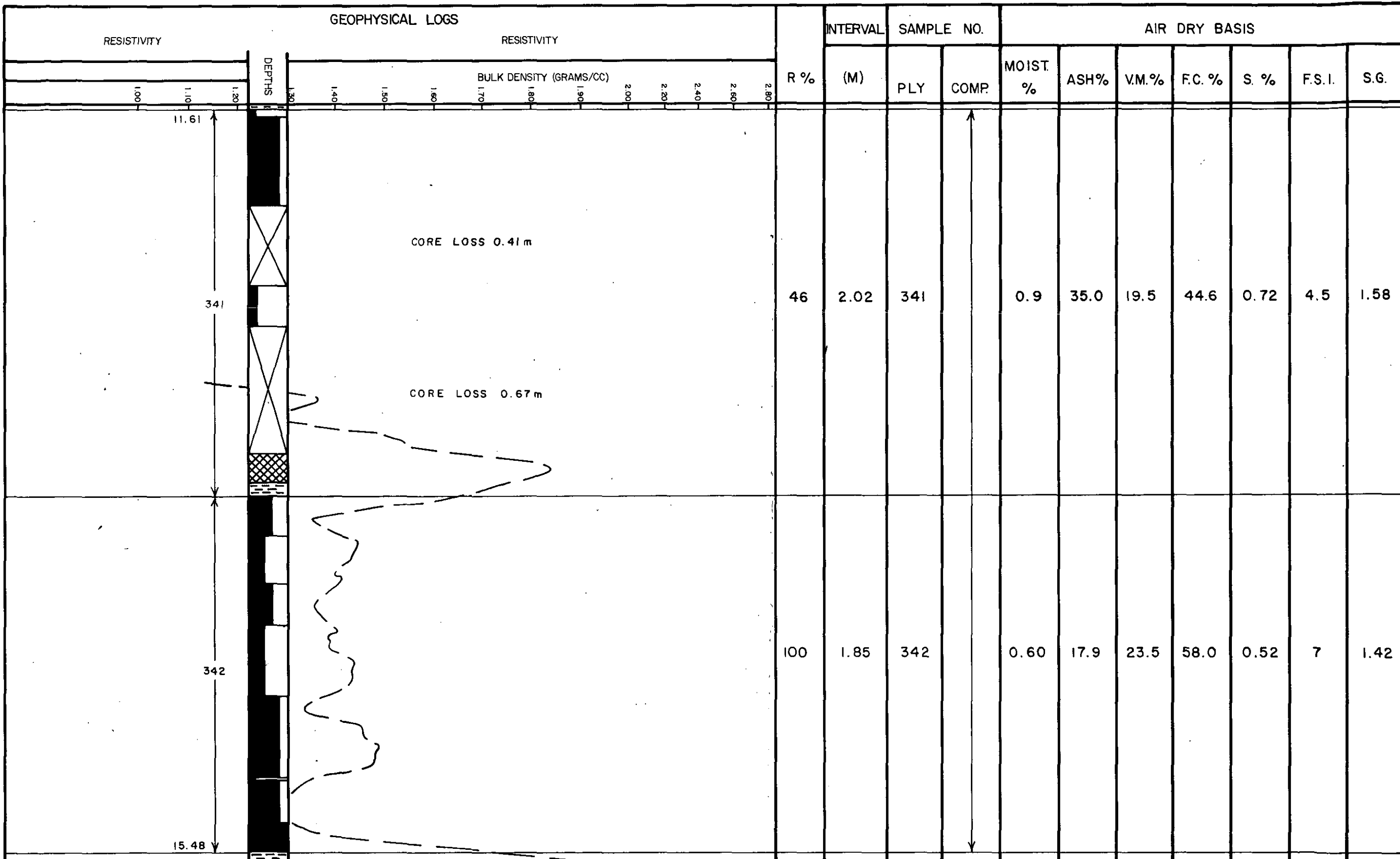
F.F. PARAMETERS: PULP DENSITY=10%

REAGENT =4:1=Kerosene:MIBC

DOSAGE =0.5 lb/T.D.S.

CONDITIONING=60 seconds

FROTHS (I & II) =60 seconds each



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 36 D SEAM**

## HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.9	0.9	27.5	20.9	50.7	0.49	1.51	5	75	a.d.b.
	2.8	27.0	20.5	49.7	0.48	-	-	-	a.r.b.
		27.7	21.1	51.2	0.49	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

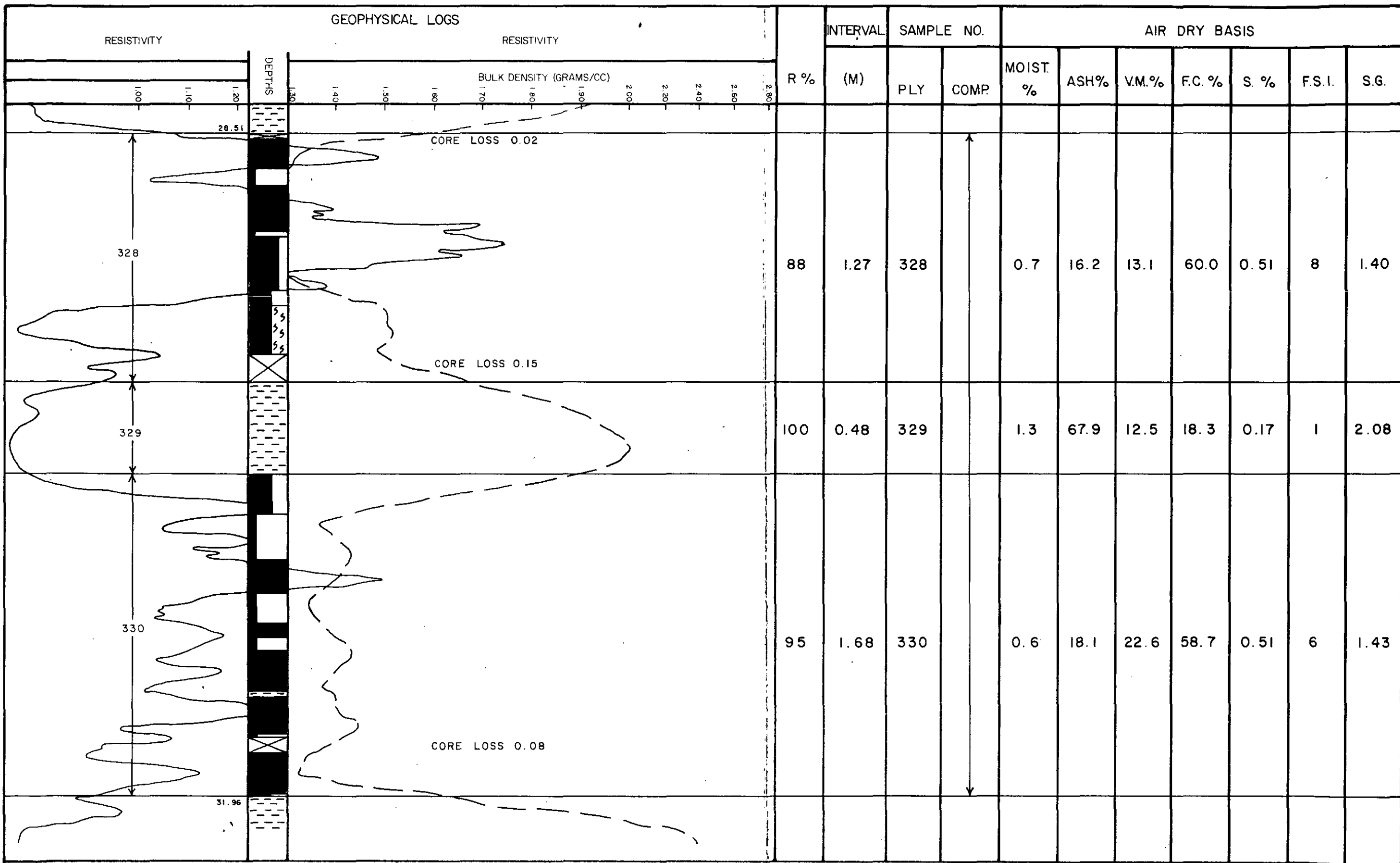
SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	86.1	86.1
0.5 MM X 0	13.9	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM							
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	
- 1.30	28.6	4.1	0.60	9	28.6	4.1	
1.30 - 1.40	14.0	10.3	0.57	7	42.6	6.1	
1.40 - 1.50	14.0	18.5	0.57	3	56.6	9.2	
1.50 - 1.60	10.7	26.7	0.53	1 1/2	67.3	12.0	
1.60 - 1.70	4.7	34.4	0.54	1	72.0	13.4	
1.70 - 1.80	4.4	42.9	0.34	1	76.4	15.1	
1.80 - 2.00	5.1	54.1	0.33	1/2	81.5	17.6	
+2.00	18.5	80.3	0.16	N.A.	100.0	29.2	

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	63.0	11.1	0.65	9	63.0	11.1
STAGE 11	8.9	25.4	0.84	5	71.9	12.9
TAILINGS	28.1	44.5	0.86	1 1/2	100.0	21.8

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 37 D SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: MS 37 Core Sample

SEAM        D        COMP.

LAB NO.: 6213

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.6	0.7	24.6	21.0	53.7	0.44	1.49	7	75	a.d.b.
	2.3	24.2	20.7	52.8	0.43	-	-	-	a.r.b.
		24.8	21.1	54.1	0.44	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	79.9	79.9
0.5 MM X 0	20.1	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	27.7	3.4	0.49	9	27.7	3.4
1.30 - 1.40	24.4	12.2	0.43	6 1/2	52.1	7.5
1.40 - 1.50	11.1	19.1	0.43	3 1/2	63.2	9.6
1.50 - 1.60	11.8	27.1	0.34	1	75.0	12.3
1.60 - 1.70	4.6	35.8	0.29	1	79.6	13.7
1.70 - 1.80	1.5	42.0	0.16	1	81.1	14.2
1.80 - 2.00	2.6	51.9	0.10	1/2	83.7	15.4
+2.00	16.3	79.5	0.12	N.A.	100.0	25.8

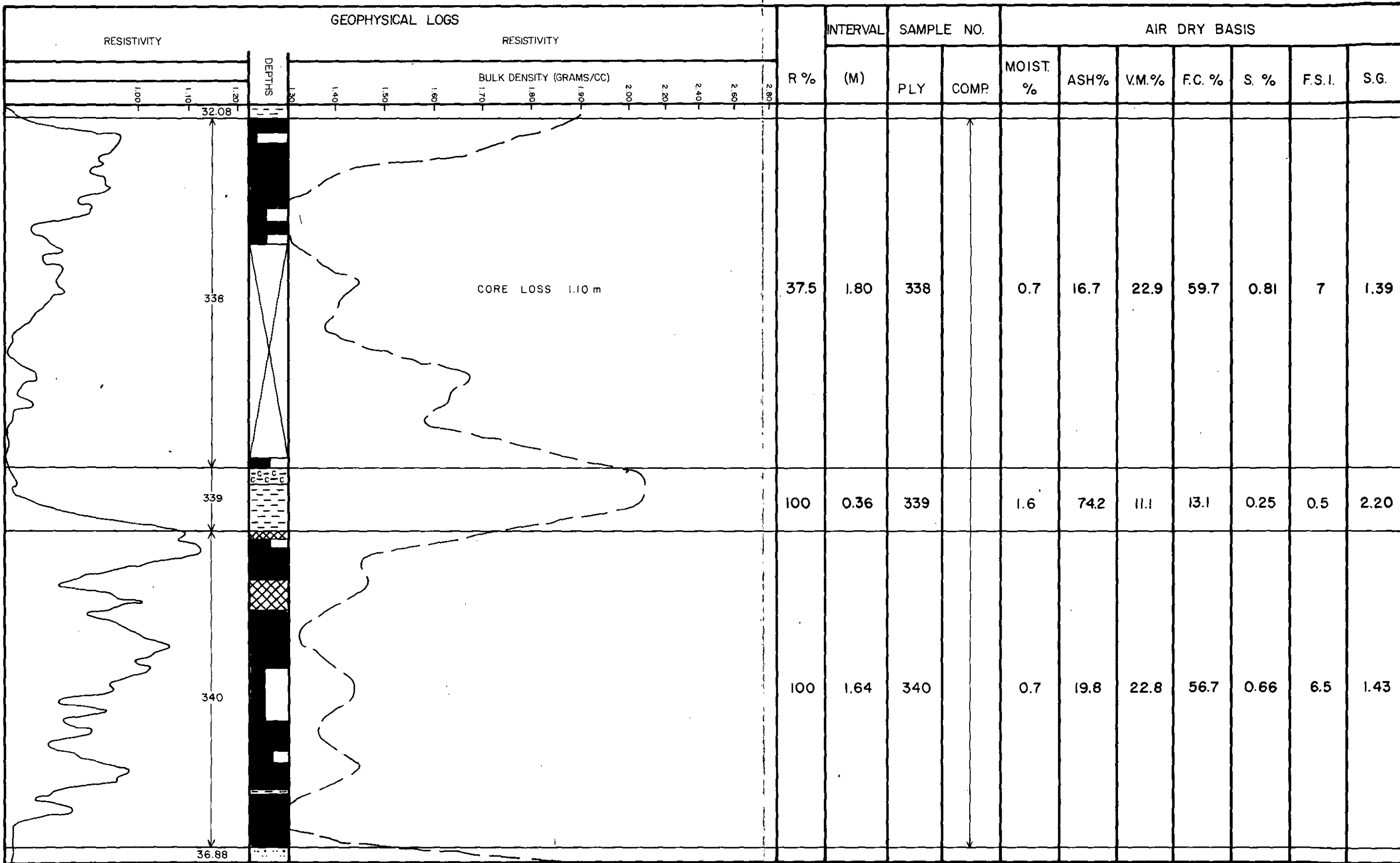
FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	66.6	10.5	0.43	9	66.6	10.5
STAGE 11	9.8	20.1	0.42	6 1/2	76.4	11.7
TAILINGS	23.6	40.8	0.39	3	100.0	18.6

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

GEOPHYSICAL LOGS



Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 38 D SEAM



CLIENT : RANGER OIL LIMITED

PROJECT: MS 38 Core Sample

SEAM     D     COMP.

LAB NO.: 6197

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.7	0.7	21.9	22.0	55.4	0.55	1.44	6 1/2	71	a.d.b.
	1.4	21.7	21.8	55.1	0.55	-	-	-	a.r.b.
		22.1	22.2	55.7	0.55	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	90.3	90.3
0.5 MM X 0	9.7	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

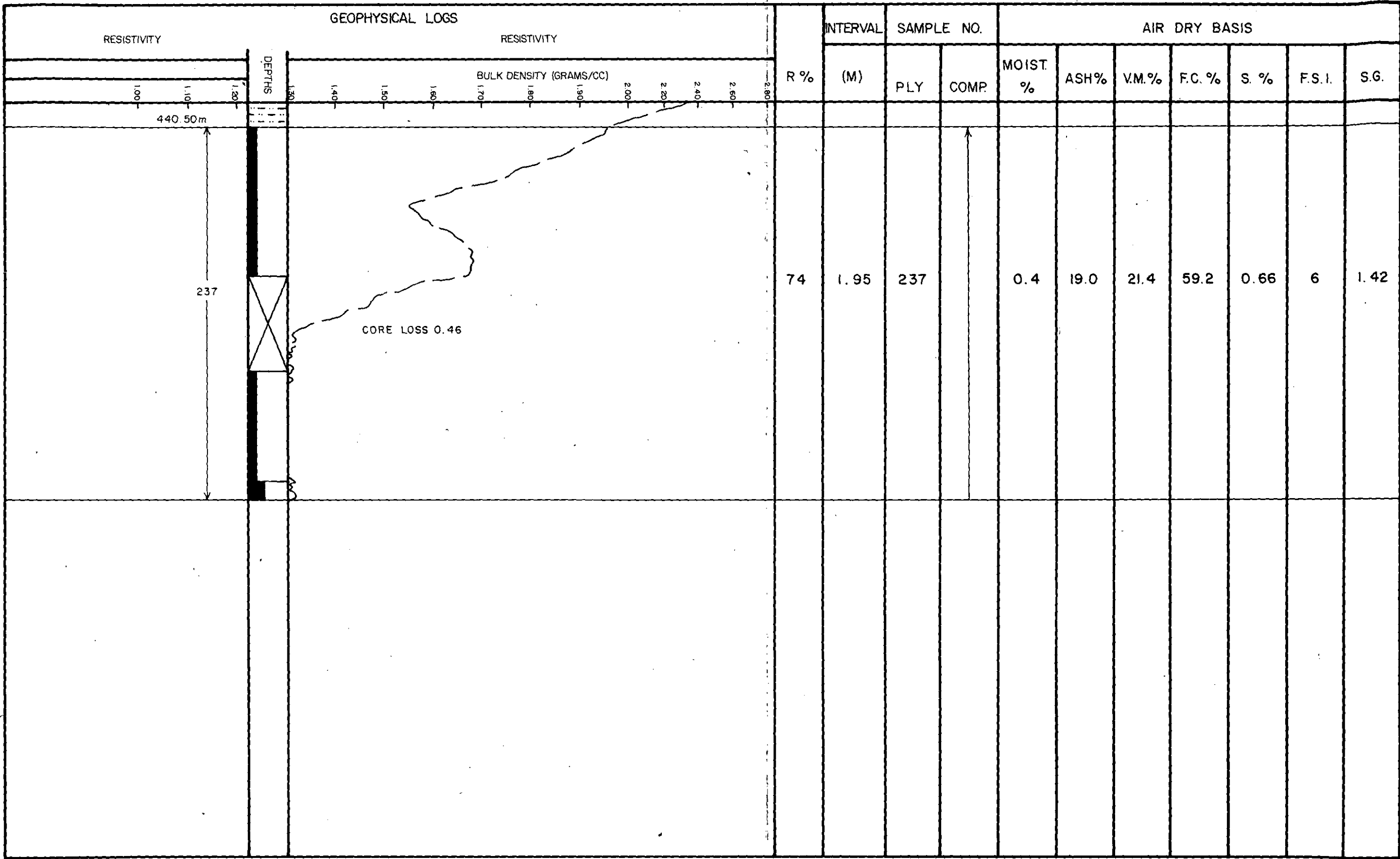
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	33.4	3.9	0.52	9	33.4	3.9
1.30 - 1.40	19.7	9.3	0.52	7 1/2	53.1	5.9
1.40 - 1.50	11.7	19.0	0.51	3	64.8	8.3
1.50 - 1.60	15.2	27.8	0.43	1 1/2	80.0	12.0
1.60 - 1.70	4.7	35.8	0.40	1 1/2	84.7	13.3
1.70 - 1.80	1.8	46.1	0.40	1	86.5	14.0
1.80 - 2.00	2.4	57.1	0.39	1	88.9	15.1
+2.00	11.1	80.9	0.22	N.A.	100.0	22.4

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	81.3	10.3	0.65	9	81.3	10.3
STAGE 11	4.5	31.5	0.85	5	85.8	11.4
TAILINGS	14.2	51.7	1.45	1 1/2	100.0	17.1

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

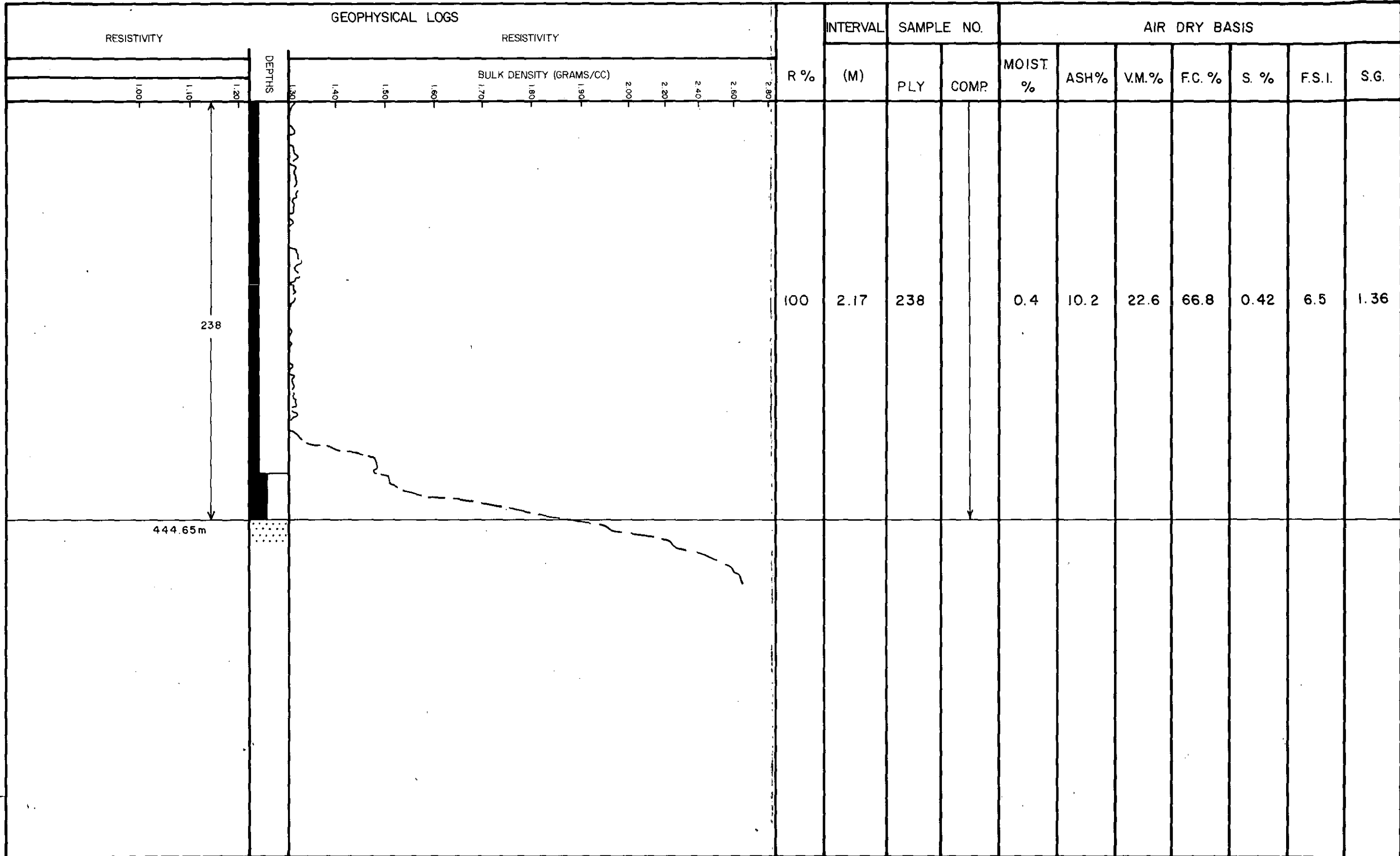


Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY — TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 39 | SEAM**

GEOPHYSICAL LOGS



R %	INTERVAL (M)	SAMPLE NO.		AIR DRY BASIS						
		PLY	COMP	MOIST %	ASH%	V.M.%	F.C. %	S. %	F.S.I.	S.G.
100	2.17	238		0.4	10.2	22.6	66.8	0.42	6.5	1.36

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 39 | SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: MS 39 Core Sample

SEAM 1 COMP.

LAB NO.: 6198

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.0	0.6	27.7	22.2	49.5	0.53	1.54	4 1/2	76	a.d.b.
	1.6	27.4	22.0	49.0	0.52	-	-	-	a.r.b.
		27.9	22.3	49.8	0.53	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	88.5	88.5
0.5 MM X 0	11.5	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

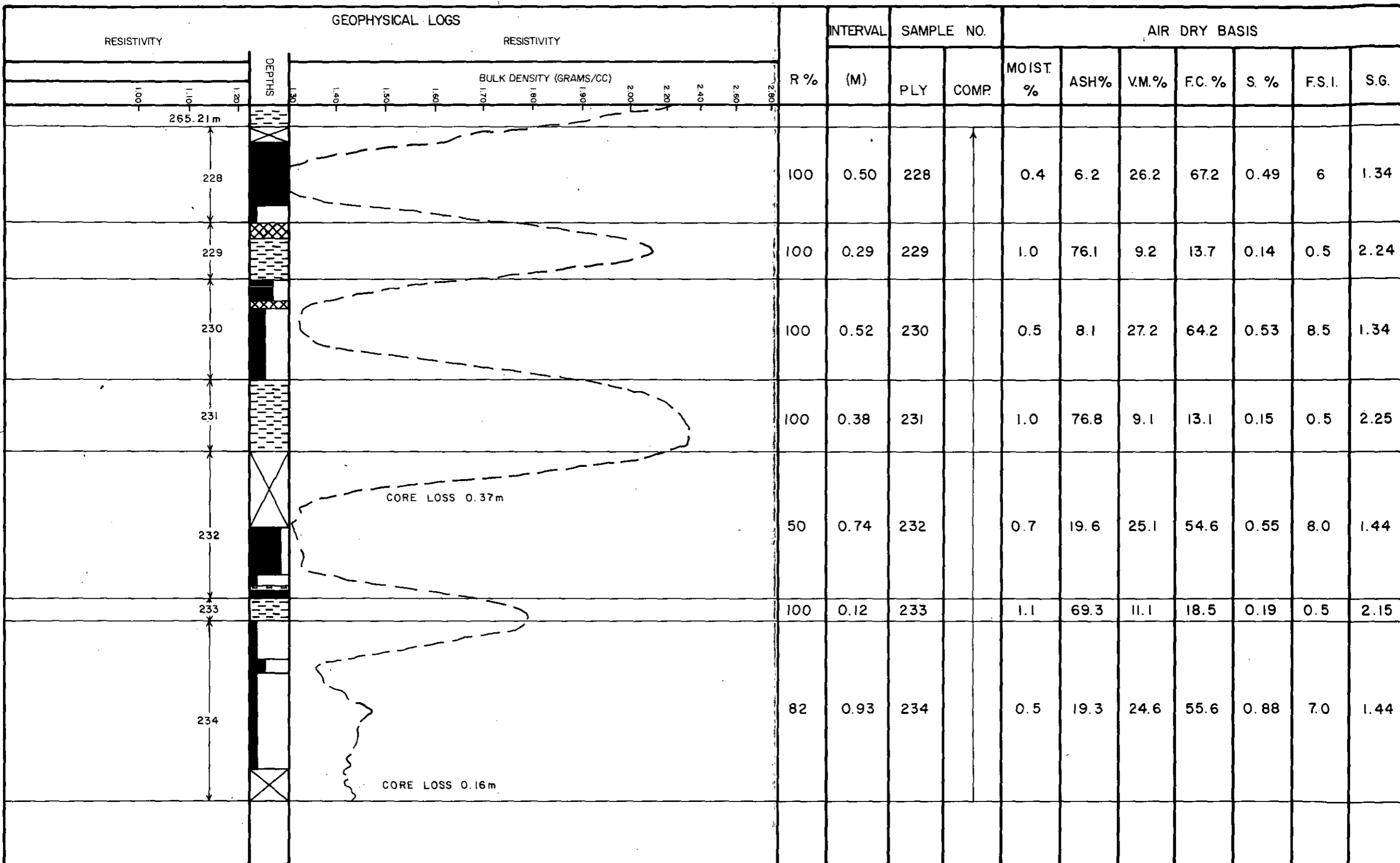
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	26.7	3.7	0.51	9	26.7	3.7
1.30 - 1.40	17.9	9.5	0.59	7	44.6	6.0
1.40 - 1.50	13.1	17.1	0.49	4	57.7	8.5
1.50 - 1.60	6.8	25.4	0.42	2	64.5	10.3
1.60 - 1.70	5.4	33.2	0.35	1 1/2	69.9	12.1
1.70 - 1.80	5.2	42.4	0.24	1	75.1	14.2
1.80 - 2.00	5.0	50.8	0.24	1	80.1	16.5
+2.00	19.9	81.2	0.20	N.A.	100.0	29.4

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	71.0	10.4	0.54	8	71.0	10.4
STAGE 11	12.2	17.5	0.47	6 1/2	83.2	11.4
TAILINGS	16.8	46.2	0.39	2 1/2	100.0	17.3

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing



Prepared by :  
 ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
 BULK DENSITY - - - -  
 R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 39 2 SEAM**

GEOPHYSICAL LOGS

RESISTIVITY

RESISTIVITY

BULK DENSITY (GRAMS/CC)

DEPTHS

1.00

1.10

1.20

235

236

269.35 m

1.30

1.40

1.50

1.60

1.70

1.80

1.90

2.00

2.20

2.40

2.60

2.80

INTERVAL

SAMPLE NO.

AIR DRY BASIS

R %

(M)

PLY

COMP

MOIST %

ASH%

V.M.%

F.C.%

S.%

F.S.I.

S.G.

100

0.46

235

0.4

16.9

24.0

58.7

0.59

5.5

1.43

100

0.20

236

0.5

19.6

24.5

55.4

0.51

6

1.45

Prepared by :  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY ———  
R% = RECOVERY - TOTAL SEAM

SEAM SECTION AND ANALYTICAL DATA  
MS 39 2 SEAM

CLIENT : RANGER OIL LIMITED

PROJECT: MS 39 Core Sample

SEAM 2 COMP.

LAB NO.: 6215

HEAD RAW ANALYSIS

ADN%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.0	0.8	28.3	20.7	50.2	0.37	1.54	3 1/2	70	a.d.b.
	1.8	28.0	20.5	49.7	0.37	-	-	-	a.r.b.
		28.5	20.9	50.6	0.37	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	79.8	79.8
0.5 MM X 0	20.2	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

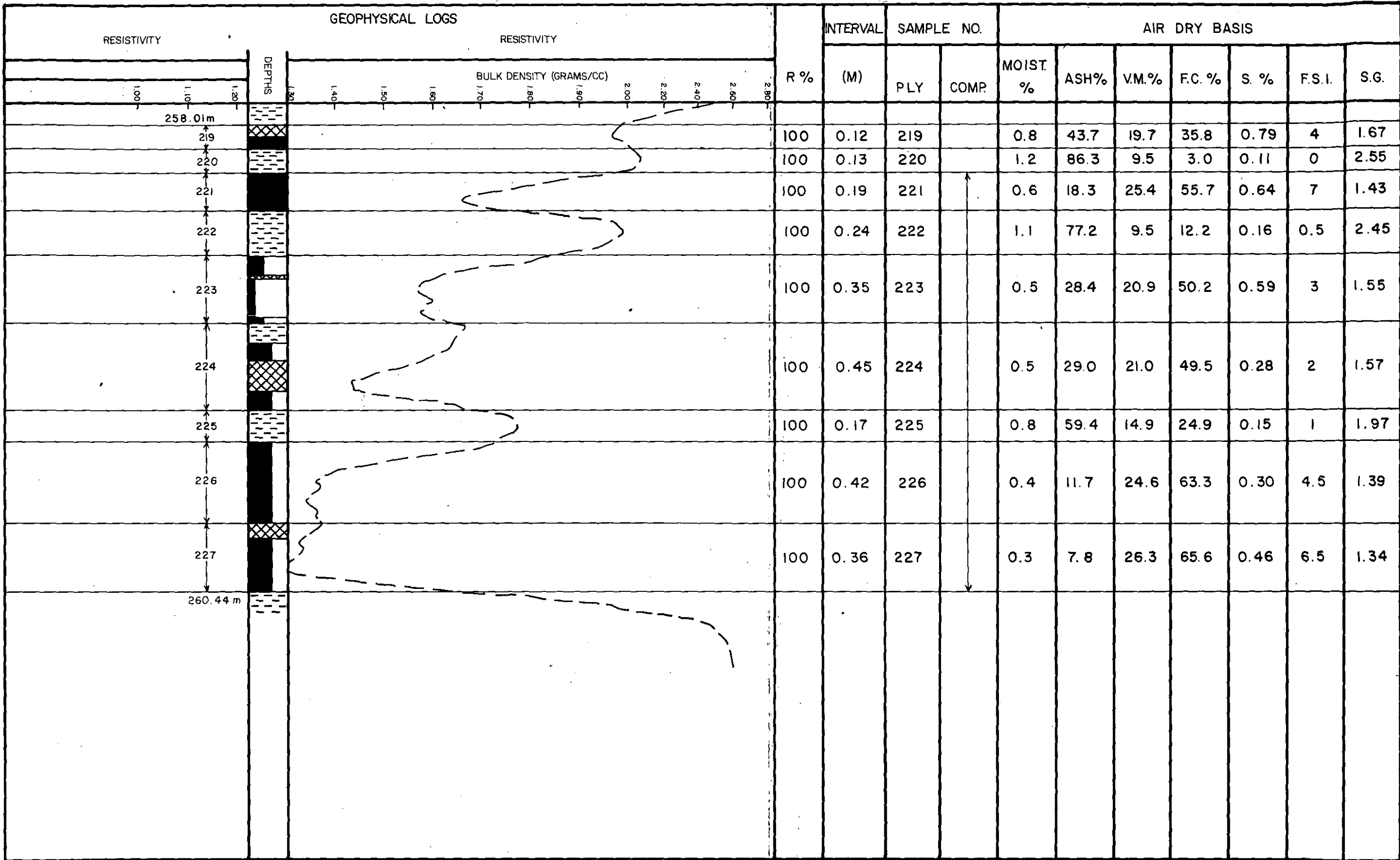
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	14.1	3.1	0.50	9	14.1	3.1
1.30 - 1.40	24.8	8.2	0.43	4	38.9	6.4
1.40 - 1.50	17.3	15.8	0.42	2 1/2	56.2	9.3
1.50 - 1.60	5.6	25.4	0.39	1 1/2	61.8	10.7
1.60 - 1.70	8.9	36.3	0.37	1	70.7	13.9
1.70 - 1.80	3.6	41.8	0.31	1	74.3	15.3
1.80 - 2.00	3.8	53.6	0.35	1/2	78.1	17.2
+2.00	21.9	81.2	0.16	N.A.	100.0	31.2

FROTH FLOTATION TEST, adb:0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	82.6	12.7	0.39	6 1/2	82.6	12.7
STAGE 11	4.7	27.1	0.38	3	87.3	13.5
TAILINGS	12.7	55.6	0.32	1	100.0	18.8

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal & Minerals Testing



Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA  
MS 39 3 SEAM**



CLIENT : RANGER OIL LIMITED

PROJECT: MS 59 Core Sample

SEAM 3 COMP.

LAB NO.: 6216

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
0.9	0.7	26.0	22.7	50.6	0.55	1.50	6 1/2	71	a.d.b.
	1.6	25.8	22.5	50.1	0.55	-	-	-	a.r.b.
		26.1	22.9	51.0	0.55	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	78.9	78.9
0.5 MM X 0	21.1	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

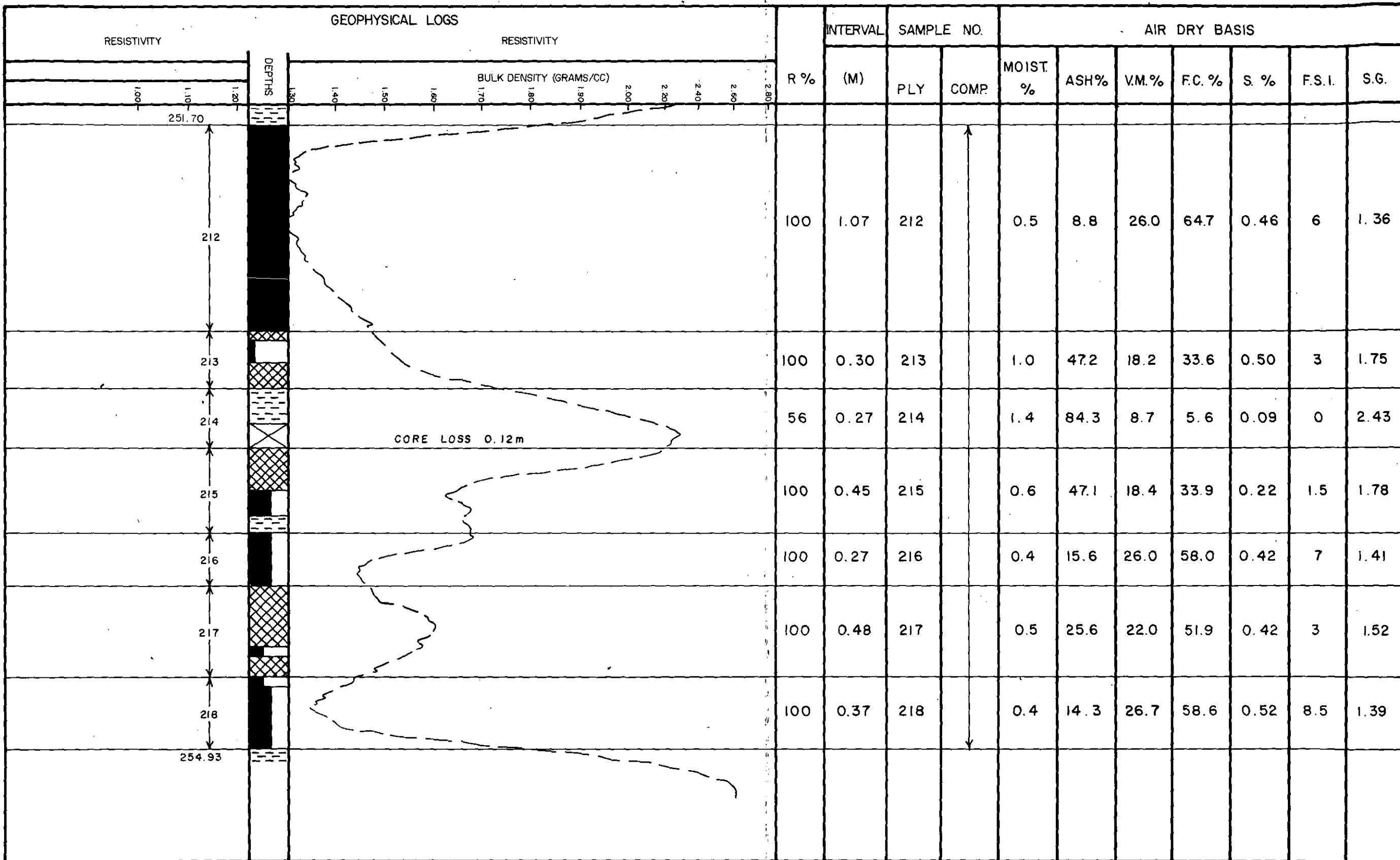
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	24.1	2.8	0.65	9	24.1	2.8
1.30 - 1.40	27.4	8.2	0.65	7 1/2	51.5	5.7
1.40 - 1.50	11.7	17.4	0.73	4 1/2	63.2	7.8
1.50 - 1.60	6.4	27.1	0.67	2 1/2	69.6	9.6
1.60 - 1.70	5.2	35.7	0.76	1 1/2	74.8	11.4
1.70 - 1.80	2.7	41.5	0.65	1	77.5	12.5
1.80 - 2.00	3.2	50.5	0.24	1	80.7	14.0
+2.00	19.3	81.7	0.12	N.A.	100.0	27.1

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	78.8	10.5	0.72	8 1/2	78.8	10.5
STAGE 11	6.0	25.7	0.63	5	84.8	11.6
TAILINGS	15.2	50.8	0.45	1	100.0	17.5

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing



Prepared by:  
ROBERTSON RESEARCH CANADA LIMITED

RESISTIVITY ———  
BULK DENSITY - - -  
R% = RECOVERY - TOTAL SEAM

**SEAM SECTION AND ANALYTICAL DATA**  
**MS 39 4 SEAM**

CLIENT : RANGER OIL LIMITED

PROJECT: MS 39 Core Sample

SEAM     A     COMP.     (    

LAB NO.: 6199

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
1.4	0.4	14.0	21.7	63.9	0.49	1.39	6	76	a.d.b.
	1.8	13.8	21.4	63.0	0.48	-	-	-	a.r.b.
		14.1	21.8	64.1	0.49	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	89.4	89.4
0.5 MM X 0	10.6	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	19.0	3.0	0.57	9	19.0	3.0
1.30 - 1.40	62.0	6.8	0.47	5	81.0	5.9
1.40 - 1.50	4.9	16.6	0.57	4	85.9	6.5
1.50 - 1.60	1.7	26.6	0.67	2 1/2	87.6	6.9
1.60 - 1.70	2.0	38.3	1.36	1 1/2	89.6	7.6
1.70 - 1.80	1.5	48.7	1.78	1	91.1	8.3
1.80 - 2.00	2.1	59.2	1.69	1	93.2	9.4
+2.00	6.8	77.9	0.86	N.A.	100.0	14.1

FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	76.1	7.4	0.51	9	76.1	7.4
STAGE 11	4.2	27.0	0.61	N.S.S.	80.3	8.4
TAILINGS	19.7	40.0	0.69	3 1/2	100.0	14.6

N.S.S. - Not Sufficient Sample

F.F. PARAMETERS: Pulp Density = 6%  
 Reagent = 4:1-Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

CLIENT : RANGER OIL LIMITED

PROJECT: D SEAM CHANNEL SAMPLES

LAB NO.	SAMPLE I.D.	A.D.M%	MOIST%	ASH%	VOL%	FC%	S%	BTU/LB	F.S.I.	S.G.	CAIC. BASIS
6093	.76M #1	10.7	1.1	28.6	22.4	47.9	0.38	10648	4 1/2	1.52	a.d.b.
				28.9	22.6	48.5	0.38	10766	-	-	d.b.
6094	.59M #2	4.8	0.9	18.3	22.8	58.0	0.34	12288	3 1/2	1.45	a.d.b.
				18.5	23.0	58.5	0.34	12400	-	-	d.b.
6095	.48M #3	5.1	0.9	23.4	21.3	54.4	0.32	11575	3 1/2	1.50	a.d.b.
				23.6	21.5	54.9	0.32	11680	-	-	d.b.
6096	.44M #4	5.9	1.7	40.5	18.2	39.6	0.29	8513	3	1.66	a.d.b.
				41.2	18.5	40.3	0.30	8660	-	-	d.b.
6097	.68M #5	7.3	1.3	27.7	20.3	50.7	0.49	10739	6 1/2	1.52	a.d.b.
				28.1	20.6	51.3	0.50	10880	-	-	d.b.
6098	.65M #6	4.9	1.0	13.1	22.4	63.5	0.40	13241	7	1.38	a.d.b.
				13.2	22.6	64.2	0.40	13375	-	-	d.b.

CLIENT : RANGER OIL LIMITED

PROJECT: CHANNEL SAMPLE, SEAM D COMPOSITE

Sept. 29/80

LAB NO.: 6142

HEAD RAW ANALYSIS

ADM%	MOIST.%	ASH%	VOL%	FC%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
6.7	1.0	24.5	20.7	53.8	0.38	1.48	6 1/2	75	a.d.b.
	7.6	22.9	19.3	50.2	0.35	-	-	-	a.r.b.
		24.7	20.9	54.4	0.38	-	-	-	d.b.

SIZE ANALYSIS ,a.d.b.: Sample crushed to -9.5MM

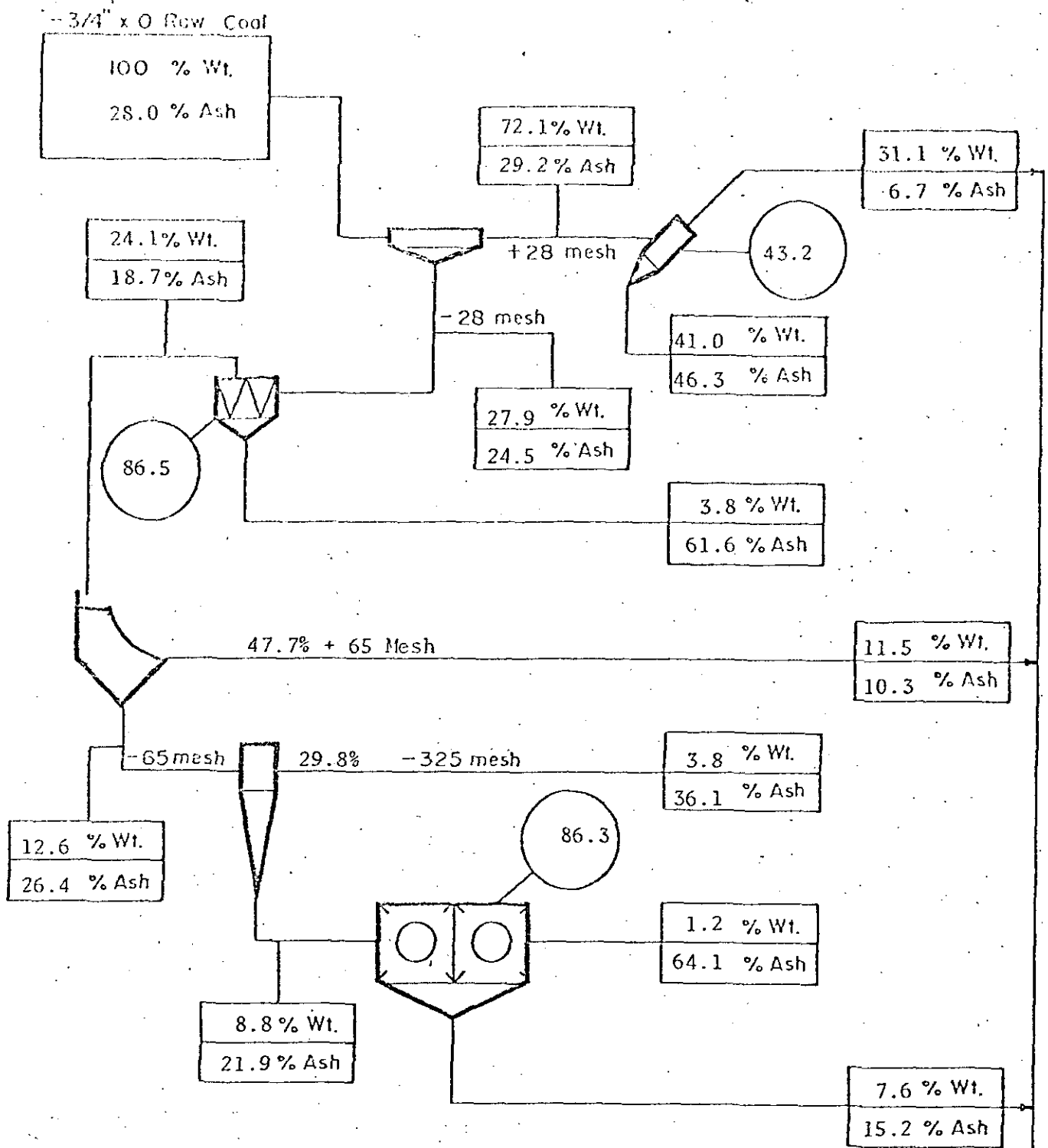
SIZE FRACTION	CUM.	
	WT%	WT %
9.5 MM X 0.5MM	80.8	80.8
0.5 MM X 0	19.2	100.0

SINK - FLOAT ANALYSIS, a.d.b.: 9.5MMx0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	27.6	4.1	0.53	9	27.6	4.1
1.30 - 1.40	18.2	9.8	0.51	7 1/2	45.8	6.4
1.40 - 1.50	13.6	19.1	0.33	3 1/2	59.4	9.3
1.50 - 1.60	14.7	27.9	0.31	1	74.1	13.0
1.60 - 1.70	6.9	35.4	0.32	1	81.0	14.9
1.70 - 1.80	2.1	43.6	0.29	1	83.1	15.6
1.80 - 2.00	3.0	56.5	0.33	1	86.1	17.0
+ 2.00	13.9	78.6	0.19	N.A.	100.0	25.6

FROTH FLOTATION TEST, a.d.b.: 0.5MMx0						
PRODUCT	WT%	ASH%	S%	FSI	CUMULATIVE	
					WT%	ASH%
STAGE 1	48.8	8.7	0.47	8 1/2	48.8	8.5
STAGE 11	14.3	16.8	0.55	8 1/2	63.1	10.5
TAILINGS	36.9	32.4	0.61	5 1/2	100.0	18.6

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/T.D.S.  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal & Minerals Testing



TOTAL CLEAN COAL	50.2% WT
	8.8% ASH

**LEGEND:**

○ CIRCUIT YIELD %

Wt. WEIGHT %

Ash ASH CONTENT (AIR DRIED)

**BIRTLY BIRTLEY COAL & MINERALS TESTING**

Title PLANT BALANCE FLOW SHEET  
 RANGER OIL - MR. SPIEKER PROPERTY  
 "D" SEAM BULK SAMPLE  
 LAB NO. 6316

Date NOV./80

Drawn

SUMMARY - BULK WASHING DATA \*

Bulk Sample "D" SEAM Lab. No. 6316  
 Date Received Oct/80 Date Washed Nov. 10, 1980

(a) RAW COAL

Delivered Weight 12.053 MT Washed Weight 8.546 MT  
 ADM % 4.9 ASH% 28.0 F.S.I. 4 1/2

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 72.1 % by weight

S.G. of Medium 1.25 Calculated Yield 43.2 %

Sample	ASH %	F.S.I.
Feed	29.2	4 1/2
Clean Coal	6.7	8 1/2
Reject	46.3	1

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 27.9 % by weight

V.F.C. #1 6 cm. #2 5 cm. Calculated Yield 86.5 %

Sample	ASH %	F.S.I.
Feed	24.5	7 1/2
Overflow	18.7	7 1/2
Underflow	61.6	1
S.B.O.	10.3	8
S.B.U.	26.4	4 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 12.6 %by Weight.

4:1 =Kerosene: M.I.B.C. Calculated Yield 86.3 %

Sample	ASH %	F.S.I.
T.C.O.	36.1	1/2
Feed (T.C.U.)	21.9	7 1/2
Concentrate	15.2	8
Tailings	64.1	N.A.

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 12.5 ASH% 8 FSI

\* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal  
& Minerals Testing

SUMMARY - BULK WASHING DATA (Cont.)

BULK SAMPLE "D" SEAM LAB NO. 6316

(F) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 50.2 %

ADM	PROXIMATE				S%	BTU/LB	FSI	HGI	S.G.	CALC. BASIS
	RM%	ASH%	VM %	FC %						
8.4	0.4	8.7	25.9	65.0	0.51	14108	8 1/2	77	1.34	adb
		8.7	26.0	65.3	0.51	14165	-	-	-	db

DILATATION TEST				
ST(°C)	MDT(°C)	MC %	MD %	G
380	467	27	114	1.068

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	435
MAXIMUM	444	475
FINAL	0	513
RANGE		78



SUMMARY BULK WASHING DATA (Cont)

BULK SAMPLE "D" SEAM

LAB NO. 6316

ULTIMATE ANALYSIS

H2O %	C%	H%	N%	S%	ASH%	0% by diff.
0.37				0.51	8.68	

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING				
REDUCING				

MINERAL ANALYSIS OF ASH										
SiO2	Al2O3	TiO2	Fe2O3	CaO	MgO	Na2O	K2O	P2O5	SO3	Undet.

BULK SAMPLE

"D" SEAM

LAB NO.

6316

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLs	M.T.	BBLs	M.T.
Nov. 12, 1980	-	-	23	3.999

BULK WASHING DATA

BULK SAMPLE "D" SEAM LAB NO. 6316

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa.

MAGNETITE MEDIUM maintained @ 1.25 S.G.

1. FEED(3/4 x 28 Mesh) 6.161 M.T. 29.2 ASH% 4 1/2 FSI

2. CLEAN COAL 2.565 M.T. 6.7 ASH% 8 1/2 FSI

3. REJECT 3.596 M.T. 46.3 ASH% 1 FSI

4. YIELD CLEAN COAL (Weighted) =  $\frac{2.565}{6.161} = 41.6\%$

5. YIELD CLEAN COAL (Calculated) =  $\frac{46.3 - 29.2}{46.3 - 6.7} = 43.2\%$



BULK WASHING DATA

BULK SAMPLE "D" SEAM LAB NO. 6316

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble  
impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20<sup>o</sup> - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 36.1 ASH% 1/2 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 21.9 ASH% 7 1/2 FSI

3. Concentrate 15.2 ASH% 8 FSI

4. Tailings 64.1 ASH% N.A. FSI

5. Yield Concentrate  $\frac{64.1 - 21.9}{64.1 - 15.2} = \underline{86.3} \%$

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM       D       BULK SAMPLE

LAB NO. :       6317      

HEAD RAW ANALYSIS

A.D.M.	MOIST%	ASH%	VOL%	F.C.%	S%	F.S.I.	CALC. BASIS
4.9	0.8	28.0	20.3	50.9	0.40	4 1/2	a.d.b.
	5.7	26.6	19.3	48.4	0.38	-	a.r.b.
		28.2	20.5	51.3	0.40	-	d.b.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
100 mm x 38mm	10.9	44.9	1 1/2	10.9	44.9
38 x 25.4	5.8	37.9	1 1/2	16.7	42.5
25.4 x 12.7	9.4	34.6	3	26.1	39.6
12.7 x 6.35	11.6	32.9	3	37.7	37.6
6.35 x 3.2	10.9	26.3	4 1/2	48.6	35.0
3.2 x 0.5	29.9	20.9	7 1/2	78.5	29.7
0.5 x 0.25	11.3	20.1	7	89.8	28.5
0.25 x 0.149	2.7	20.8	6 1/2	92.5	28.2
0.149 x 0.074	5.0	23.6	4 1/2	97.5	28.0
0.074 x 0.044	1.1	27.1	3 1/2	98.6	28.0
0.044 x 0	1.4	30.6	1	100.0	28.0

WT% + 100 mm =       1.9       -crushed to pass 100 mm

-approximately 40% rock

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     D     BULK SAMPLE

LAB NO.:     6317    

FLOAT-SINK ANALYSIS, a.d.b.: 100mm x38mm (WT%= 10.9 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.30	1.9	4.6	0.52	9	1.9	4.6	0.52
1.30 - 1.35	9.7	8.4	0.42	6	11.6	7.8	0.44
1.35 - 1.40	8.6	12.7	0.39	5	20.2	9.9	0.42
1.40 - 1.45	7.0	17.2	0.35	4 1/2	27.2	11.8	0.40
1.45 - 1.50	7.9	22.4	0.33	2	35.1	14.2	0.38
1.50 - 1.55	9.8	26.9	0.28	1	44.9	16.9	0.36
1.55 - 1.60	5.2	29.5	0.28	1	50.1	18.2	0.35
1.60 - 1.70	3.2	33.6	0.25	1	53.3	19.2	0.35
1.70 - 1.80	1.0	44.8	0.26	1	54.3	19.6	0.34
1.80 - 1.90	2.8	57.5	0.29	1	57.1	21.5	0.34
1.90 - 2.00	3.8	61.1	0.20	1/2	60.9	24.0	0.33
S @ 2.00	39.1	77.5	0.09	N.A.	100.0	44.9	0.24

Birtley Coal  
& Minerals Testing

A DIVISION OF GREAT WESTERN STEEL INDUSTRIES LTD

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM  D  BULK SAMPLE

LAB NO. :  6317

FLOAT-SINK ANALYSIS, a.d.b. :  38mm x6.35mm (WT%= 26.8 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ -- 1.30	9.6	5.2	0.50	7 1/2	9.6	5.2	0.50
1.30 - 1.35	14.0	9.8	0.42	5 1/2	23.6	7.9	0.45
1.35 - 1.40	7.5	13.5	0.40	4	31.1	9.3	0.44
1.40 - 1.45	8.2	17.4	0.30	3	39.3	11.0	0.41
1.45 - 1.50	7.7	22.3	0.26	2	47.0	12.8	0.39
1.50 - 1.55	8.8	26.2	0.33	1	55.8	14.9	0.38
1.55 - 1.60	7.5	30.2	0.31	1	63.3	16.7	0.37
1.60 - 1.70	6.5	35.1	0.23	1	69.8	18.5	0.36
1.70 - 1.80	2.3	42.1	0.27	1	72.1	19.2	0.35
1.80 - 1.90	2.3	52.5	0.32	1	74.4	20.2	0.35
1.90 - 2.00	2.9	60.7	0.26	1/2	77.3	21.8	0.35
S @ 2.00	22.7	78.2	0.12	N.A.	100.0	34.6	0.30



CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     D     BULK SAMPLE

LAB NO.:     6317    

FLOAT-SINK ANALYSIS, a.d.b. : 6.35mmx0.5mm (WT%= 40.8 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.30	40.0	4.4	0.49	8 1/2	40.0	4.4	0.49
1.30 - 1.35	11.2	9.2	0.44	6	51.2	5.5	0.48
1.35 - 1.40	8.8	13.5	0.43	4 1/2	60.0	6.6	0.47
1.40 - 1.45	4.5	17.9	0.40	2 1/2	64.5	7.4	0.47
1.45 - 1.50	5.2	22.1	0.38	2	69.7	8.5	0.46
1.50 - 1.55	4.3	26.5	0.36	1	74.0	9.6	0.45
1.55 - 1.60	3.6	30.7	0.34	1	77.6	10.5	0.45
1.60 - 1.70	4.7	36.7	0.32	1	82.3	12.0	0.44
1.70 - 1.80	2.5	45.5	0.31	1	84.8	13.0	0.44
1.80 - 1.90	2.1	52.5	0.29	1/2	86.9	14.0	0.43
1.90 - 2.00	1.5	59.7	0.24	1/2	88.4	14.7	0.43
S @ 2.00	11.6	78.5	0.11	N.A.	100.0	22.1	0.39

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     D     BULK SAMPLE

LAB NO. :     6317    

FLOAT-SINK ANALYSIS, a.d.b. : 0.5mm x149     (WT%= 14.0 )      
MICRONS

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.30	30.0	4.5	0.50	9	30.0	4.5	0.50
1.30 - 1.35	20.3	7.3	0.49	7 1/2	50.3	5.6	0.50
1.35 - 1.40	12.8	11.1	0.49	6 1/2	63.1	6.7	0.49
1.40 - 1.45	6.0	16.8	0.44	4	69.1	7.6	0.49
1.45 - 1.50	5.3	20.8	0.44	2	74.4	8.6	0.49
1.50 - 1.55	3.8	26.0	0.42	1	78.2	9.4	0.48
1.55 - 1.60	3.1	30.3	0.42	1	81.3	10.2	0.48
1.60 - 1.70	4.1	36.8	0.41	1	85.4	11.5	0.48
1.70 - 1.80	2.3	45.4	0.42	1	87.7	12.4	0.48
1.80 - 1.90	1.7	53.7	0.41	1/2	89.4	13.2	0.47
1.90 - 2.00	1.3	59.8	0.37	1/2	90.7	13.8	0.47
Se 2.00	9.3	77.3	0.60	N.A.	100.0	19.7	0.48

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM  D  BULK SAMPLE

LAB NO.  6317

FROTH FLOTATION TEST: a.d.b.: 0.5mmx0 (WT%=21.5 )

PRODUCT	PRODUCT ANALYSIS			CUMULATIVE	
	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	56.7	12.2	8	56.7	12.2
STAGE 11	9.3	22.4	4 1/2	66.0	13.6
TAILINGS	34.0	38.3	2 1/2	100.0	22.0

FROTH FLOTATION TEST: a.d.b.: 149 Micronsx0 (WT%=7.5 )

PRODUCT	PRODUCT ANALYSIS			CUMULATIVE	
	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	57.7	15.1	5 1/2	57.7	15.1
STAGE 11	10.5	26.0	3	68.2	16.8
TAILINGS	31.8	42.7	1 1/2	100.0	25.0

FLOTATION PARAMETERS: Pulp Density = 10% Weight/Weight  
Reagent = 4:1=Kerosene:MIBC  
Dosage = 0.5 lb/Ton  
Conditioning = 1 minute  
Stage 1 = 1st minute froth  
Stage 11 = 2nd minute froth

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM D BULK SAMPLE

ANALYSIS OF MIDDLINGS

LAB NO.: 6442

MIDDLINGS = COMPOSITE 1.40-1.80 S.G. FRACTION - 100 mm x 6.35mm  
CRUSHED TO PASS 6.35 mm.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
6.35mm x 0.5mm	88.8	27.4	0.29	-	88.0	27.4	0.29
0.5 mm x 0	11.2	21.2	0.40	4	100.0	26.7	0.30

SINK - FLOAT ANALYSIS, a.d.b.: 6.35mm x 0.5mm

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
Floats @ 1.40	9.9	10.0	0.41	6 1/2	9.9	10.0	0.41
Sinks @ 1.40	90.1	29.3	0.28	1	100.0	27.4	0.29

N.B. - Analyses of 6.35 x 0.5 size fraction are calculated from sink-float data.



CLIENT : RANGER OIL LIMITED.

PROJECT: CHANNEL SAMPLE

SEAM     C     COMP.     

LAB NO.: 6211.

HEAD RAW ANALYSIS

ADM%	MOIST%	ASH%	VOL%	F.C.%	S%	S.G.	F.S.I.	HGI	CALC. BASIS
4.4	0.7	23.6	21.4	54.3	0.51	1.46	6 1/2	72	a.d.b.
		23.8	21.6	54.6	0.51	-	-	-	d.b.

SIZE ANALYSIS, a.d.b.: Sample crushed to-9.5MM

SIZE FRACTION	WT%	CUM
		WT%
9.5 MM X 0.5MM	86.2	86.2
0.5 MM X 0	13.8	100.0

SINK - FLOAT ANALYSIS, adb: 9.5 MM X 0.5MM						
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
- 1.30	32.4	3.4	0.55	9	32.4	3.4
1.30 - 1.40	18.8	9.8	0.55	5	51.2	5.8
1.40 - 1.50	14.9	17.8	0.47	1 1/2	66.1	8.5
1.50 - 1.60	5.6	29.1	0.57	1 1/2	71.7	10.1
1.60 - 1.70	5.1	39.8	0.51	1	76.8	12.1
1.70 - 1.80	3.7	47.2	0.39	1	80.5	13.7
1.80 - 2.00	6.0	58.7	0.32	1/2	86.5	16.8
+2.00	13.5	81.9	0.32	N.A.	100.0	25.6

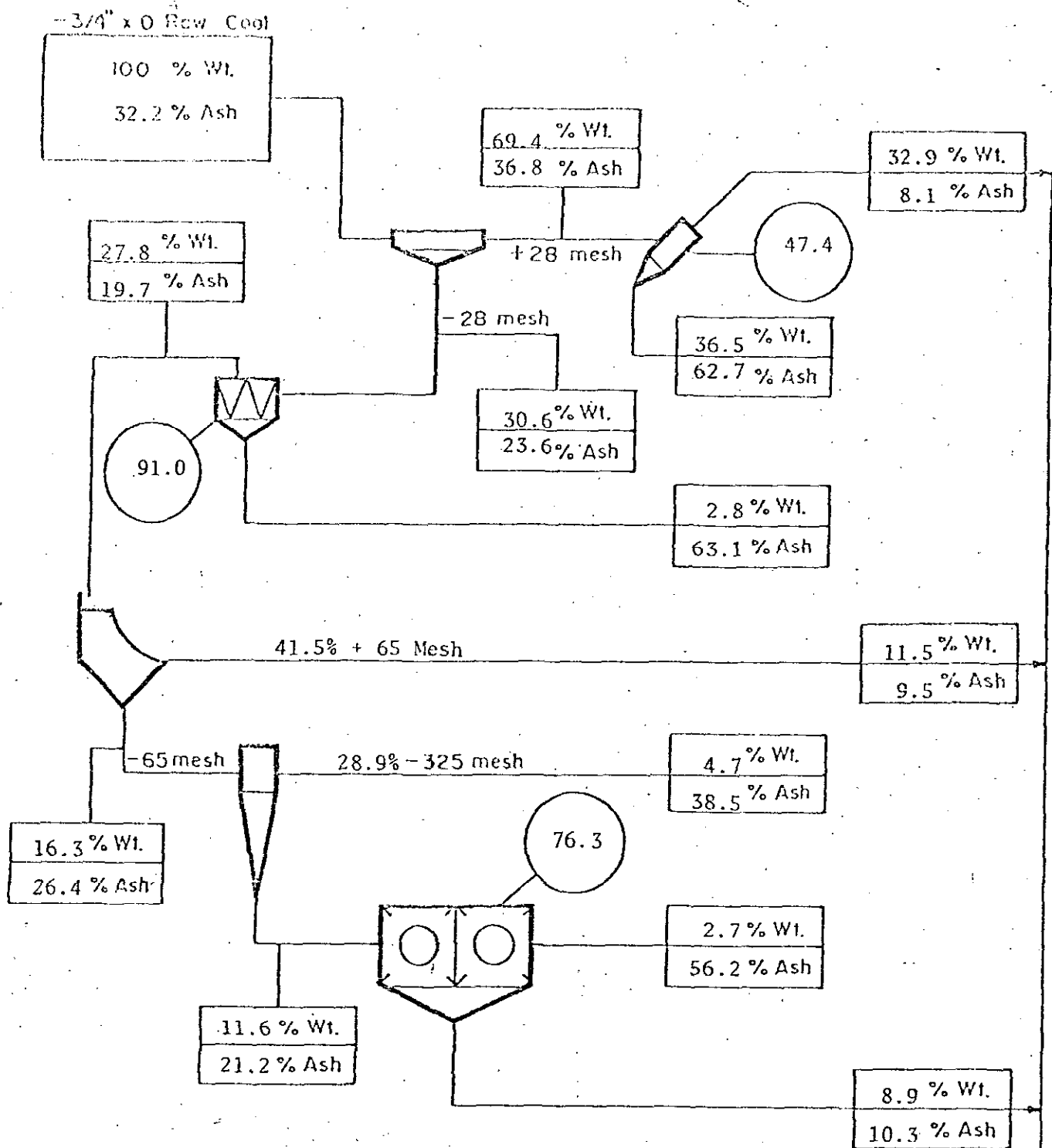
FROTH FLOTATION TEST, adb: 0.5MMx0

PRODUCT	WT%	ASH%	S%	F.S.I.	CUMULATIVE	
					WT%	ASH%
STAGE 1	79.9	8.0	0.59	9	79.9	8.0
STAGE 11	3.9	18.7	0.72	8	83.8	8.5
TAILINGS	16.2	41.2	1.06	3	100.0	13.8

F.F. PARAMETERS: Pulp Density = 10%  
 Reagent = 4:1=Kerosene:MIBC  
 Dosage = 0.5 lb/TDS  
 Conditioning = 60 seconds  
 Froths(1 & 11) = 60 seconds each

Birtley Coal  
& Minerals Testing

A DIVISION OF GREAT WEST STEEL INDUSTRIES LTD



**LEGEND:**

○ *CIRCUIT YIELD %*

Wt. *WEIGHT %*

Ash *ASH CONTENT (AIR DRIED)*

TOTAL CLEAN COAL	53.3% WT
	8.8% ASH

**BIRTLÉ BIRTLEY COAL & MINERALS TESTING**

Title PLANT BALANCE FLOW SHEET  
 RANGER OIL -MT SPIEKER PROPERTY  
 "C" SEAM BULK SAMPLE  
 LAB NO. 6318

Date  
 NOV. /80

Drawn

SUMMARY - BULK WASHING DATA \*

Bulk Sample "C" SEAM Lab. No. 6318  
 Date Received Oct./80 Date Washed Nov. 1/80

(a) RAW COAL

Delivered Weight 12.746 MT Washed Weight 9.048 MT  
 ADM % 5.5 ASH% 32.2 F.S.I. 4

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 69.4 % by weight

S.G. of Medium 1.30 Calculated Yield 47.4 %

Sample	ASH %	F.S.I.
Feed	36.8	3 1/2
Clean Coal	8.1	7 1/2
Reject	62.7	1/2

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 30.6 % by weight

V.F.C. #1 5 cm. #2 5 cm. Calculated Yield 91.0 %

Sample	ASH %	F.S.I.
Feed	23.6	5
Overflow	19.7	6 1/2
Underflow	63.1	1/2
S.B.O.	9.5	8
S.B.U.	26.4	3 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 16.3 %by Weight

4:1 =Kerosene: M.I.B.C. Calculated Yield 76.3 %

Sample	ASH %	F.S.I.
T.C.O.	38.5	1
Feed (T.C.U.)	21.2	7
Concentrate	10.3	8
Tailings	56.2	1/2

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 10.0 ASH% 8 FSI

\* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal  
& Minerals Testing



SUMMARY - BULK WASHING DATA (Cont.)

BULK SAMPLE "C" SEAM LAB NO. 6318

(F) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 53.3 %

ADM	PROXIMATE				S%	BTU/LB	F.S.I	H.G.I	S.G.	CALC. BASIS
	RM%	ASH%	VM%	FC%						
8.4	0.9	8.9	24.1	66.1	0.60	14027	7 1/2	77	1.35	a.d.b.
		9.0	24.3	66.7	0.61	14154	-	-	-	d.b.

DILATATION TEST				
ST.(°C)	MDT(°C)	MC %	MD %	G
384	473	23	82	1.062

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	436
MAXIMUM	335	474
FINAL	0	509
RANGE		73

BULK SAMPLE "C" SEAM LAB NO. 6318

ULTIMATE ANALYSIS

H2O %	C%	H%	N%	S%	ASH%	O% by diff.
0.87				0.60	8.86	

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I.D.T.	S.T.	H.T.	F.T.
OXIDIZING	2350	2540	2620	2660
REDUCING	2280	2470	2550	2640

MINERAL ANALYSIS OF ASH

SiO2	Al2O3	TiO2	Fe2O3	CaO	MgO	Na2O	K2O	P2O5	SO3	Undet.

BULK SAMPLE "C" SEAM LAB NO. 6318

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
Nov. 3, 1980	-	-	28	4.513

BULK WASHING DATA

BULK SAMPLE "C" SEAM LAB NO. 6318

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa.

MAGNETITE MEDIUM maintained @ 1.30 S.G.

1. FEED(3/4 x 28 Mesh) 6.278 M.T. 36.8 ASH% 3 1/2 FSI
2. CLEAN COAL 2.861 M.T. 8.1 ASH% 7 1/2 FSI
3. REJECT 3.417 M.T. 62.7 ASH% 1/2 FSI
4. YIELD CLEAN COAL (Weighted) =  $\frac{2.861}{6.278} = 45.6 \%$
5. YIELD CLEAN COAL (Calculated) =  $\frac{62.7 - 36.8}{62.7 - 8.1} = 47.4 \%$

BULK WASHING DATA

BULK SAMPLE

"C" SEAM

LAB NO. 6318

WATER-ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM Operating @ 138 KPa

Vortex Finder Clearance set @ 5 c.m.

Secondary Cyclone: 4" DSM Operating @ 35 KPa

Vortex Finder Clearance Set @ 5 c.m.

Sieve Bend : 65 Mesh

1. Feed ( 28Mesh x 0 ) 23.6 ASH% 5 F.S.I.

2. Primary Cyclone Overflow 19.7 ASH% 6 1/2 F.S.I.

3. Secondary Cyclone Underflow 63.1 ASH% 1/2 F.S.I.

4. Sieve Bend Overflow (S.B.O.) 9.5 ASH% 8 F.S.I.

5. Sieve Bend Underflow(S.B.U.) 26.4 ASH% 3 1/2 F.S.I.

6. Yield (W.O. Cyclone)  $\frac{63.1 - 23.6}{63.1 - 19.7} = \underline{91.0} \%$

7. WT% 28M x 65M in Primary Cyclone Overflow = 41.5 %

8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed) = 37.8 %

BULK WASHING DATA

BULK SAMPLE "C" SEAM LAB NO. 6318

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble  
impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20<sup>0</sup> - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 38.5 ASH% 1 FSI

2. Flotation Feed(Thickening Cyclone Underflow) 21.2 ASH% 7 FSI

3. Concentrate 10.3 ASH% 8 FSI

4. Tailings 56.2 ASH% 1/2 FSI

5. Yield Concentrate  $\frac{56.2 - 21.2}{56.2 - 10.3} = \frac{35.0}{45.9} = 76.3$  %

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM C BULK SAMPLE

LAB NO.: 6319

HEAD RAW ANALYSIS

A.D.M.	MOIST%	ASH%	VOL%	F.C.%	S%	F.S.I.	CALC. BASIS
5.5	0.8	32.2	19.0	48.0	0.47	4	a.d.b.
	6.3	30.4	18.0	45.3	0.44	-	a.r.b.
		32.5	19.2	48.3	0.47	-	d.b.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
100 mm x 38mm	7.9	73.6	N.A.	7.9	73.6
38 x 25.4	4.4	55.0	1	12.3	66.9
25.4 x 12.7	9.8	43.2	1	22.1	56.4
12.7 x 6.35	12.6	39.5	2	34.7	50.3
6.35 x 3.2	11.6	33.6	2 1/2	46.3	46.1
3.2 x 0.5	30.4	21.0	6	76.7	36.1
0.5 x 0.25	11.3	16.3	8	88.0	33.6
0.25 x 0.149	2.6	17.8	7 1/2	90.6	33.1
0.149 x 0.074	5.8	22.8	4 1/2	96.4	32.5
0.074 x 0.044	2.9	28.5	2 1/2	99.3	32.4
0.044 x 0	0.7	31.1	1	100.0	32.4

WT% + 100 mm = 3.2 -crushed to pass 100 mm  
 - all rock

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     C     BULK SAMPLE

LAB NO. :     6319    

FLOAT-SINK ANALYSIS, a.d.b. : 100mmx38mm (WT%= 7.9 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.30	2.3	3.7	0.55	8	2.3	3.7	0.55
1.30 - 1.35	2.1	8.2	0.55	5 1/2	4.4	5.8	0.55
1.35 - 1.40	2.8	12.5	0.46	2	7.2	8.4	0.52
1.40 - 1.45	1.9	16.3	0.44	1 1/2	9.1	10.1	0.50
1.45 - 1.50	1.8	20.9	0.54	1 1/2	10.9	11.9	0.51
1.50 - 1.55	2.2	24.7	0.41	1	13.1	14.0	0.49
1.55 - 1.60	1.7	29.8	0.48	1	14.8	15.8	0.49
1.60 - 1.70	2.2	40.8	0.49	1	17.0	19.1	0.49
1.70 - 1.80	2.7	47.8	0.41	1	19.7	23.0	0.48
1.80 - 1.90	1.6	53.3	0.42	1	21.3	25.3	0.47
1.90 - 2.00	2.0	61.2	0.30	1	23.3	28.4	0.46
S @ 2.00	76.7	87.4	0.10	N.A.	100.0	73.6	0.18



CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM C BULK SAMPLE

LAB NO.: 6319

FLOAT-SINK ANALYSIS, a.d.b.: 38mmX6, 35mm (WT%= 26.8 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.30	7.0	3.9	0.54	8	7.0	3.9	0.54
1.30 - 1.35	10.1	8.9	0.52	5	17.1	6.9	0.53
1.35 - 1.40	11.7	14.3	0.46	2	28.8	9.9	0.50
1.40 - 1.45	6.3	17.5	0.46	1 1/2	35.1	11.2	0.49
1.45 - 1.50	7.0	21.4	0.52	1 1/2	42.1	12.9	0.50
1.50 - 1.55	4.2	28.8	0.54	1 1/2	46.3	14.4	0.50
1.55 - 1.60	3.5	32.7	0.54	1	49.8	15.7	0.50
1.60 - 1.70	7.1	41.2	0.59	1	56.9	18.8	0.51
1.70 - 1.80	4.3	47.2	0.57	1	61.2	20.8	0.52
1.80 - 1.90	4.2	53.7	0.43	1	65.4	23.0	0.51
1.90 - 2.00	4.7	61.8	0.31	1/2	70.1	25.6	0.50
S @ 2.00	29.9	85.2	0.14	N.A.	100.0	43.4	0.39

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM C BULK SAMPLE

LAB NO. : 6319

FLOAT-SINK ANALYSIS, a.d.b. : 6.35mmx0.5mm(WT%= 42.0 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.30	37.6	3.4	0.60	9	37.6	3.4	0.60
1.30 - 1.35	12.4	7.7	0.53	7	50.0	4.5	0.58
1.35 - 1.40	5.8	11.4	0.51	4	55.8	5.2	0.58
1.40 - 1.45	9.0	15.3	0.47	1 1/2	64.8	6.6	0.56
1.45 - 1.50	4.4	20.6	0.49	1	69.2	7.5	0.56
1.50 - 1.55	2.7	26.6	0.60	1	71.9	8.2	0.56
1.55 - 1.60	2.0	31.7	0.61	1	73.9	8.8	0.56
1.60 - 1.70	3.9	39.3	0.61	1	77.8	10.4	0.56
1.70 - 1.80	3.2	46.6	0.56	1	81.0	11.8	0.56
1.80 - 1.90	2.9	54.5	0.49	1	83.9	13.3	0.56
1.90 - 2.00	2.6	61.3	0.42	1/2	86.5	14.7	0.55
S @ 2.00	13.5	82.8	0.21	NA	100.0	23.9	0.51

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     C     BULK SAMPLE

LAB NO. :     6319    

FLOAT-SINK ANALYSIS, a.d.b. : 0.5mmx149 (WT%= 13.9 )  
microns

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.30	42.3	3.6	0.60	9	42.3	3.6	0.60
1.30 - 1.35	19.2	6.8	0.57	8 1/2	61.5	4.6	0.59
1.35 - 1.40	10.3	10.7	0.53	5	71.8	5.5	0.58
1.40 - 1.45	6.6	15.3	0.52	2 1/2	78.4	6.3	0.58
1.45 - 1.50	3.8	20.1	0.56	1 1/2	82.2	6.9	0.58
1.50 - 1.55	2.2	25.7	0.59	1 1/2	84.4	7.4	0.58
1.55 - 1.60	1.4	30.9	0.63	1	85.8	7.8	0.58
1.60 - 1.70	2.3	37.4	0.65	1	88.1	8.6	0.58
1.70 - 1.80	1.5	46.2	0.66	1	89.6	9.2	0.58
1.80 - 1.90	1.3	52.3	0.62	1	90.0	9.8	0.58
1.90 - 2.00	1.1	59.9	0.54	1/2	92.0	10.4	0.58
S @ 2.00	8.0	82.1	0.74	N.A.	100.0	16.2	0.59

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     C     BULK SAMPLE

LAB NO.     6319    

FROTH FLOTATION TEST: a.d.b.: 0.5mmx0 (WT%= 23.3 )

PRODUCT ANALYSIS				CUMULATIVE	
PRODUCT	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	32.6	12.0	8	32.6	12.0
STAGE 11	10.1	15.6	7 1/2	42.7	12.9
TAILINGS	57.3	24.0	6 1/2	100.0	19.2

FROTH FLOTATION TEST: a.d.b.: 149 Micronsx0 (WT%= 9.4 )

PRODUCT ANALYSIS				CUMULATIVE	
PRODUCT	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	40.3	16.7	6	40.3	16.7
STAGE 11	13.4	23.9	3 1/2	53.7	18.5
TAILINGS	46.3	32.2	3	100.0	24.8

FLOTATION PARAMETERS: Pulp Density = 10% Weight/Weight  
Reagent = 4:1=Kerosene:MIBC  
Dosage = 0.5 lb/Ton  
Conditioning = 1 minute  
Stage 1 = 1st minute froth  
Stage 11 = 2nd minute froth

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM C BULK SAMPLE

ANALYSIS OF MIDDINGS

LAB NO.: 6443

MIDDINGS = COMPOSITE 1.40-1.80 S.G. FRACTION - 100 mm x 6.35mm  
CRUSHED TO PASS 6.35 mm.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
6.35mm x 0.5mm	89.9	31.7	0.48	-	89.9	31.7	0.48
0.5 mm x 0	10.1	22.2	0.60	4	100.0	30.7	0.49

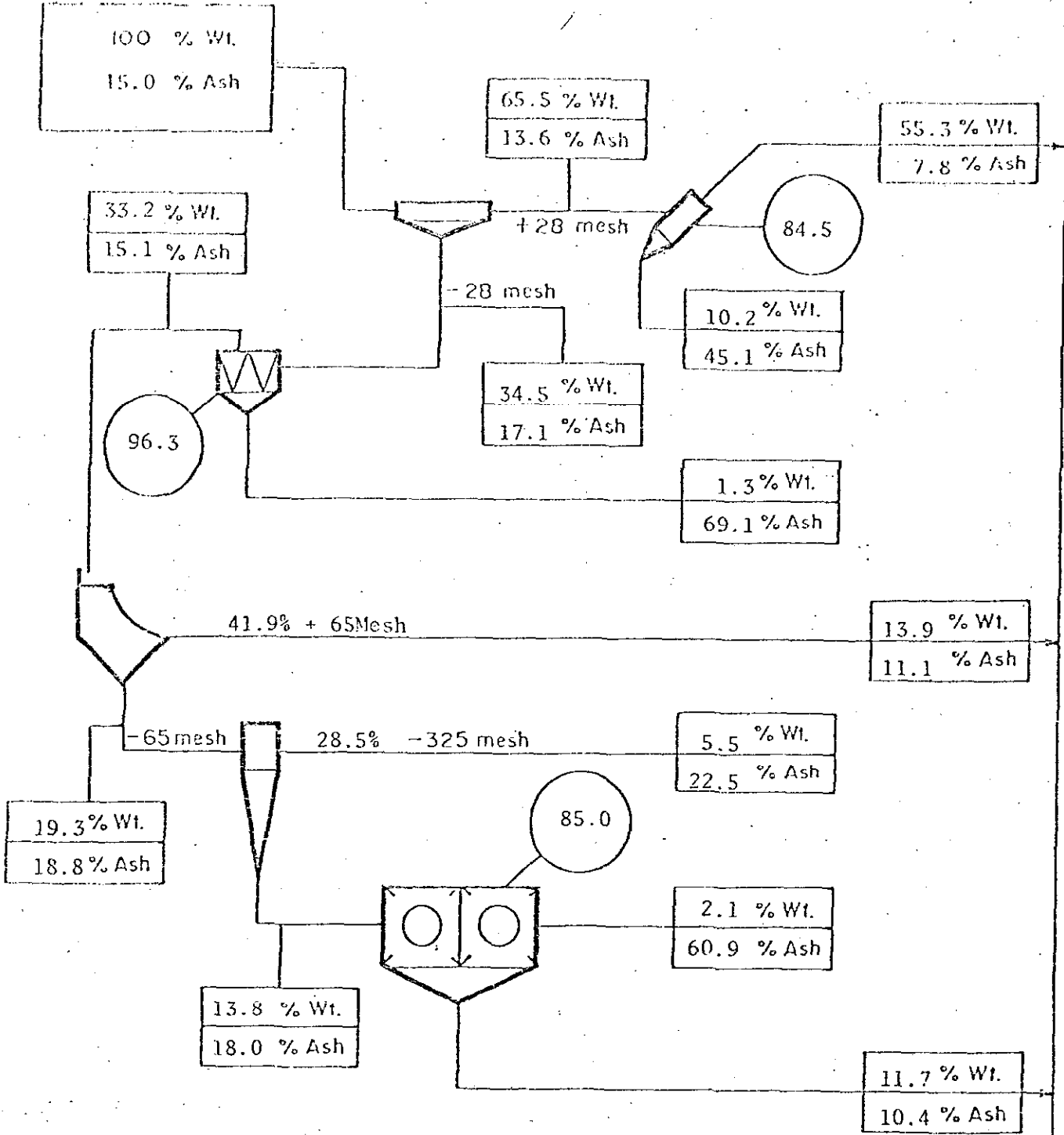
SINK - FLOAT ANALYSIS, a.d.b.: 6.35mm x 0.5mm

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
Floats @ 1.40	6.5	10.6	0.53	6 1/2	6.5	10.6	0.53
Sinks @ 1.40	93.5	33.2	0.48	1	100.0	31.7	0.48

N.B. - Analyses of 6.35 x 0.5 size fraction are calculated from sink-float data.

LAB NO.	SAMPLE		A. D. M. %	MOIST%	ASH%	VOL%	F. C. %	S%	S. G.	F. S. J.	CALC.
	I. D.										BASIS
6204	# 1		2.7	0.7	16.4	22.8	60.1	0.37	1.43	6 1/2	adb
							16.5	23.0	60.5	0.37	-
6205	# 2		3.9	1.4	30.9	18.8	48.9	0.42	1.57	3	adb
							31.3	19.1	49.6	0.43	-
6206	# 3		4.2	0.7	21.5	19.2	58.6	0.39	1.50	2 1/2	adb
							21.7	19.3	59.0	0.39	-
6207	# 4		2.3	1.0	11.3	23.1	64.6	0.44	1.41	4 1/2	adb
							11.4	23.3	65.3	0.44	-
6208	# 5		4.8	0.7	9.2	24.4	65.7	0.49	1.37	6 1/2	adb
							9.3	24.6	66.1	0.49	-
6209	# 6		2.0	1.0	6.8	24.7	67.5	0.49	1.34	7 1/2	adb
							6.9	24.9	68.2	0.49	-
6210	# 7		5.6	0.7	8.9	24.6	65.8	0.53	1.36	8 1/2	adb
							9.0	24.8	66.2	0.53	-

-3/4" x 0 Row Cool



LEGEND:



CIRCUIT YIELD %



Wt. WEIGHT %

Ash ASH CONTENT (AIR DRIED)

TOTAL CLEAN COAL	80.9% WT
	8.7% ASH



**BIRTLLEY COAL & MINERALS TESTING**

Title PLANT BALANCE FLOW SHEET  
RANGER OIL - MT. SHIEKER PROPERTY  
"B" SEAM BULK SAMPLE  
LAB NO. 6320

Date  
Nov./80  
Drawn

SUMMARY - BULK WASHING DATA \*

Bulk Sample "B" SEAM Lab. No. 6320  
 Date Received Oct/80 Date Washed Oct. 30, 1980

(a) RAW COAL

Delivered Weight 7.997 MT Washed Weight 5.853 MT  
 ADM % 3.7 ASH% 15.0 F.S.I. 6

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 65.5 % by weight

S.G. of Medium 1.33 Calculated Yield 84.5 %

Sample	ASH %	F.S.I.
Feed	13.6	5
Clean Coal	7.8	6
Reject	45.1	1

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 34.5 % by weight

V.F.C. #1 1.5cm. #2 5.0 cm. Calculated Yield 96.3 %

Sample	ASH %	F.S.I.
Feed	17.1	7
Overflow	15.1	7
Underflow	69.1	1/2
S.B.O.	11.1	7 1/2
S.B.U.	18.8	6 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 19.3 %by Weight.

4:1 =Kerosene: M.I.B.C. Calculated Yield 85.0 %

Sample	ASH %	F.S.I.
I.C.O.	22.5	1
Feed (I.C.U.)	18.0	7
Concentrate	10.4	8
Tailings	60.9	1/2

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 11.0 ASH% 7 1/2 FSI

\* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal  
& Minerals Testing



SUMMARY - BULK WASHING DATA (Cont.)

BULK SAMPLE \_\_\_\_\_ "B" SEAM \_\_\_\_\_ LAB NO. \_\_\_\_\_ 6320

(f) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 80.9 %

ADM	PROXIMATE				S%	BTU/LB	FSI	HGI	SG	CALC. BASIS
	RM%	ASH%	VM %	FC %						
5.3	0.7	8.6	22.9	67.8	0.40	14080	6 1/2	78	1.35	adb
		8.7	23.1	68.2	0.40	14179	-	-	-	db

DILATATION TEST				
ST (°C)	MDT (°C)	MC %	MD %	G
377	467	22	43	1.035

GIESELER FLUIDITY TEST		
	DDPM	TEMP (°C)
START	1	418
MAXIMUM	422	471
FINAL	0	511
RANGE		93

SUMMARY-BULK WASHING DATA (Cont.)

BULK SAMPLE "B" SEAM LAB NO. 6320

ULTIMATE ANALYSIS

H2O %	C%	H%	N%	S%	ASH%	0% by diff.
0.71				0.40	8.63	

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I. D. T.	S. T.	H. T.	F. T.
OXIDIZING	2290	2360	2440	2580
REDUCING	2250	2320	2390	2510

MINERAL ANALYSIS OF ASH

SiO2	Al2O3	TiO2	Fe2O3	CaO	MgO	Na2O	K2O	P2O5	SO3	Undet.

BULK SAMPLE

"B" SEAM

LAB NO.

6320

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLs	M.T.	BBLs	M.T.
Nov. 3, 1980	-	-	27	4.509

BULK WASHING DATA

BULK SAMPLE "B" SEAM LAB NO. 6320

HEAVY MEDIUM CIRCUIT

CYCLONE: 1 1/4" DSM operating @ 52 KPa.

MAGNETITE MEDIUM maintained @ 1.33 S.G.

1. FEED(3/4 x 28 Mesh) 3.832 M.T. 13.6 ASH% 5 FSI

2. CLEAN COAL 3.190 M.T. 7.8 ASH% 6 FSI

3. REJECT 0.642 M.T. 45.1 ASH% 1 FSI

4. YIELD CLEAN COAL (Weighted) =  $\frac{3.190}{3.832} = 83.2$  %

5. YIELD CLEAN COAL (Calculated) =  $\frac{45.1 - 13.6}{45.1 - 7.8} = 84.5$  %

BULK WASHING DATA

BULK SAMPLE \_\_\_\_\_ "B" SEAM \_\_\_\_\_ LAB NO. 6320 \_\_\_\_\_

WATER-ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM Operating @ 138 KPa  
Vortex Finder Clearance set @ 1.5 c.m.  
Secondary Cyclone: 4" DSM Operating @ 35 KPa  
Vortex Finder Clearance Set @ 5.0 c.m.

Sieve Bend : 65 Mesh

1. Feed ( 28M x 0 )	<u>17.1</u>	ASH%	<u>7</u>	F.S.I.
2. Primary Cyclone Overflow	<u>15.1</u>	ASH%	<u>7</u>	F.S.I.
3. Secondary Cyclone Underflow	<u>69.1</u>	ASH%	<u>1/2</u>	F.S.I.
4. Sieve Bend Overflow (S.B.O.)	<u>11.1</u>	ASH%	<u>7 1/2</u>	F.S.I.
5. Sieve Bend Underflow(S.B.U.)	<u>18.8</u>	ASH%	<u>6 1/2</u>	F.S.I.
6. Yield (W.O. Cyclone)	$\frac{69.1 - 17.1}{69.1 - 15.1}$	=	<u>96.3</u>	%
7. WT% 28M x 65M in Primary Cyclone Overflow		=	<u>41.9</u>	%
8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed)		=	<u>40.3</u>	%

BULK WASHING DATA

BULK SAMPLE "B" SEAM LAB NO. 6320

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble  
impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20° - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 22.5 ASH% 1 FSI
2. Flotation Feed(Thickening Cyclone Underflow) 18.0 ASH% 7 FSI
3. Concentrate. 10.4 ASH% 8 FSI
4. Tailings 60.9 ASH% 1/2 FSI
5. Yield Concentrate  $\frac{60.9 - 18.0}{60.9 - 10.4} = \frac{42.9}{50.9} = 85.0$  %

RANGER OIL - MT. SPIEKER PROPERTY

ANALYSIS OF CHANNEL SAMPLES

COMBINED PLY ANALYSIS

ADIT No. \_\_\_\_\_

Ply Numbers Combined

Seam B

Samples #1 to #7 inclusive

Date Analyzed Nov. 17, 1980

Lab. No. 6508

Head Sample Analysis

Total Weight      Kg.

Proximate Analysis (Air-dried)				Miscellaneous Analysis (A.D.)			
Moist. %	Ash %	V.M. %	F.C. %	Total S%	F.S.I.	S.G.	H.G.I.
0.8	15.4	21.9	61.9	0.40	6 1/2	1.40	83

Float-Sink Analysis (9.5mm x 0.5mm):

Weight 78.3 %

Specific Gravity Fraction	Fraction Analysis				Cumulative		
	Weight %	Ash %	S %	F.S.I.	Wt.%	Ash %	S %
F @ 1.30	40.4	3.5	0.35	9	40.4	3.5	0.35
1.30 - 1.40	27.2	8.9	0.31	3	67.6	5.7	0.33
1.40 - 1.50	12.0	18.4	0.39	1 1/2	79.6	7.6	0.34
1.50 - 1.60	6.6	25.9	0.57	1 1/2	86.2	9.0	0.36
1.60 - 1.70	3.4	31.3	0.57	1 1/2	89.6	9.8	0.37
1.70 - 1.80	2.2	37.1	0.41	1	91.8	10.5	0.37
1.80 - 2.00	1.9	48.0	0.33	1/2	93.7	11.3	0.37
S @ 2.00	6.3	78.4	0.33	N.A.	100.0	15.5	0.37
Total	100.0	15.5	0.37	-	-	-	-

Flotation Test (0.5mm x 0)

Weight 21.7 %

Product	Wt.%	Ash % (A.D.)	Total S%	F.S.I.
Froth I	79.1	8.1	0.52	8
II	9.0	23.2	0.74	3 1/2
Tails	11.9	50.8	1.06	2
Total	100.0	14.5	0.60	-

Conditioning Time: 1 Minute  
 Reagent: 4:1 Diesel Fuel: M.I.B.C.  
 Dosage: 0.5 lb/ton  
 Pulp Density: 10% Weight/Weight  
 Frothing Time: 2 Minutes

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     B     BULK SAMPLE

LAB NO. :     6321    

HEAD RAW ANALYSIS

A.D.M.	MOIST%	ASH%	VOL%	F.C.%	S%	F.S.I.	CALC. BASIS
3.7	0.6	15.0	21.9	62.5	0.36	6	a.d.b.
	4.3	14.4	21.1	60.2	0.35	-	a.r.b.
		15.1	22.0	62.9	0.36	-	d.b.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
100 mm x 38mm	10.1	19.1	3	10.1	19.1
38 x 25.4	4.2	17.4	3	14.3	18.6
25.4 x 12.7	8.7	15.3	3 1/2	23.0	17.4
12.7 x 6.35	11.0	14.2	4	34.0	16.3
6.35 x 3.2	11.9	12.8	4 1/2	45.9	15.4
3.2 x 0.5	29.6	12.9	6	75.5	14.4
0.5 x 0.25	11.5	14.9	7	87.0	14.5
0.25 x 0.149	3.0	16.1	7 1/2	90.0	14.5
0.149 x 0.074	6.0	17.9	5	96.0	14.8
0.074 x 0.044	3.3	21.0	5	99.3	15.0
0.044 x 0	0.7	22.2	1 1/2	100.0	15.0

WT% + 100 mm = \_\_\_\_\_ -crushed to pass 100 mm



CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM       B       BULK SAMPLE

LAB NO. :       6321      

FLOAT-SINK ANALYSIS, a.d.b. : 100mmx38mm (WT%= 10.1 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.25	nil	-	-	-	-	-	-
1.25 - 1.30	13.8	4.4	0.31	7 1/2	13.8	4.4	0.31
1.30 - 1.35	26.6	7.4	0.36	5	40.4	6.4	0.34
1.35 - 1.40	12.4	11.6	0.36	3	52.8	6.6	0.35
1.40 - 1.45	8.4	17.0	0.36	2 1/2	61.2	8.9	0.35
1.45 - 1.50	9.8	19.7	0.39	1 1/2	71.0	10.4	0.35
1.50 - 1.55	4.0	23.8	0.44	1 1/2	75.0	11.1	0.36
1.55 - 1.60	4.4	25.0	0.29	1	79.4	11.9	0.36
1.60 - 1.65	2.8	28.0	0.27	1	82.2	12.4	0.35
1.65 - 1.70	4.0	29.9	0.23	1	86.2	13.2	0.35
1.70 - 1.80	4.7	32.1	0.21	1	90.9	14.2	0.34
1.80 - 1.90	1.6	45.7	0.20	1	92.5	14.8	0.34
1.90 - 2.00	1.5	54.3	0.14	1	94.0	15.4	0.33
S@ 2.00	6.0	77.7	0.10	N.A.	100.0	19.1	0.32

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM        <sup>B</sup> BULK SAMPLE

LAB NO. :       6321      

FLOAT-SINK ANALYSIS, a.d.b. : 38mmx25.4mm (WT%=4.2 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F <sub>0</sub> - 1.25	nil	-	-	-	-	-	-
1.25 - 1.30	5.9	3.6	0.35	7 1/2	5.9	3.6	0.35
1.30 - 1.35	38.2	6.5	0.33	5 1/2	44.1	6.1	0.33
1.35 - 1.40	12.6	11.7	0.37	2 1/2	56.7	7.4	0.34
1.40 - 1.45	8.2	16.4	0.39	1 1/2	64.9	8.5	0.35
1.45 - 1.50	9.4	20.2	0.38	1 1/2	74.3	10.0	0.35
1.50 - 1.55	4.4	23.8	0.57	1 1/2	78.7	10.8	0.36
1.55 - 1.60	5.0	25.4	0.41	1 1/2	83.7	11.6	0.37
1.60 - 1.65	3.2	30.1	0.43	1 1/2	86.9	12.3	0.37
1.65 - 1.70	3.4	32.4	0.26	1	90.3	13.1	0.36
1.70 - 1.80	2.9	39.0	0.20	1	93.2	13.9	0.36
1.80 - 1.90	1.9	49.4	0.21	1	95.1	14.6	0.36
1.90 - 2.00	1.1	58.6	0.17	1	96.2	15.1	0.35
S <sub>e</sub> 2.00	3.8	76.0	0.11	N.A.	100.0	17.4	0.35

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     B     BULK SAMPLE

LAB NO. :     6321    

FLOAT-SINK ANALYSIS, a.d.b. : 25.4mmx12.7mm (WT%= 8.7 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.25	nil	-	-	-	-	-	-
1.25 - 1.30	8.9	3.6	0.35	8	8.9	3.6	0.35
1.30 - 1.35	45.6	6.7	0.32	4 1/2	54.5	6.2	0.32
1.35 - 1.40	8.3	12.3	0.35	2	62.8	7.0	0.33
1.40 - 1.45	10.5	16.2	0.37	2	73.3	8.3	0.33
1.45 - 1.50	8.8	20.9	0.43	1	82.1	9.7	0.34
1.50 - 1.55	3.4	24.0	0.40	1	85.5	10.2	0.35
1.55 - 1.60	3.6	28.1	0.55	1	89.1	11.0	0.35
1.60 - 1.65	2.0	30.5	0.50	1	91.1	11.4	0.36
1.65 - 1.70	1.8	32.6	0.28	1	92.9	11.8	0.36
1.70 - 1.80	1.5	37.4	0.38	1	94.4	12.2	0.36
1.80 - 1.90	1.1	47.9	0.28	1	95.5	12.6	0.36
1.90 - 2.00	0.9	60.2	0.23	1	96.4	13.1	0.35
S @ 2.00	3.6	76.1	0.18	N.A.	100.0	15.3	0.35

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     B     BULK SAMPLE

LAB NO. :     6321    

FLOAT-SINK ANALYSIS, a.d.b. : 12.7mmx6.35mm (WT%= 11.0 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.25	0.7	2.2	0.47	9	0.7	2.2	0.47
1.25 - 1.30	31.0	4.0	0.32	8	31.7	4.0	0.32
1.30 - 1.35	27.7	7.4	0.30	3	59.4	5.6	0.31
1.35 - 1.40	7.8	12.2	0.34	2	67.2	6.3	0.32
1.40 - 1.45	8.8	15.9	0.34	1 1/2	76.0	7.4	0.32
1.45 - 1.50	7.2	20.4	0.49	1	83.2	8.6	0.33
1.50 - 1.55	3.3	25.0	0.35	1	86.5	9.2	0.33
1.55 - 1.60	3.1	27.9	0.37	1	89.6	9.8	0.34
1.60 - 1.65	1.8	31.0	0.56	1	91.4	10.3	0.34
1.65 - 1.70	1.3	33.2	0.47	1	92.7	10.6	0.34
1.70 - 1.80	1.8	38.6	0.28	1	94.5	11.1	0.34
1.80 - 1.90	1.2	46.1	0.21	1	95.7	11.5	0.34
1.90 - 2.00	0.9	58.8	0.19	1/2	96.6	12.0	0.34
Se 2.00	3.4	76.7	0.18	N.A.	100.0	14.2	0.33

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     B     BULK SAMPLE

LAB NO. :     6321    

FLOAT-SINK ANALYSIS, a.d.b. : 6.35mm x 3.2mm (WT%=11.9)

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.25	5.6	2.2	0.42	9	5.6	2.2	0.42
1.25 - 1.50	34.3	3.9	0.30	8	39.9	3.7	0.32
1.30 - 1.35	24.9	7.3	0.27	3	64.8	5.1	0.30
1.35 - 1.40	9.0	12.7	0.30	1 1/2	73.8	6.0	0.30
1.40 - 1.45	6.2	16.9	0.30	1	80.0	6.8	0.30
1.45 - 1.50	6.3	20.9	0.34	1	86.3	7.9	0.30
1.50 - 1.55	3.3	25.8	0.40	1	89.6	8.5	0.31
1.55 - 1.60	1.8	29.9	0.40	1	91.4	8.9	0.31
1.60 - 1.65	1.1	32.7	0.38	1	92.5	9.2	0.31
1.65 - 1.70	0.9	36.3	0.38	1	93.4	9.5	0.31
1.70 - 1.80	1.2	40.4	0.34	1	94.6	9.9	0.31
1.80 - 1.90	0.9	47.4	0.32	1	95.5	10.2	0.31
1.90 - 2.00	0.6	57.0	0.25	1/2	96.1	10.5	0.31
Se 2.00	3.9	78.4	0.40	N.A.	100.0	13.2	0.31

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     B     BDLK SAMPLE

LAB NO. :     6321    

FLOAT-SINK ANALYSIS, a.d.b. :     3.2mmx0.5mm     (WT% =     29.6    )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.25	11.3	2.0	0.40	9	11.3	2.0	0.40
1.25 - 1.30	38.9	3.5	0.33	8	50.2	3.2	0.35
1.30 - 1.35	17.3	7.1	0.27	3	67.5	4.2	0.33
1.35 - 1.40	9.2	11.8	0.30	1 1/2	76.7	5.1	0.32
1.40 - 1.45	4.7	16.2	0.30	1	81.4	5.7	0.32
1.45 - 1.50	4.9	20.1	0.34	1	86.3	6.5	0.32
1.50 - 1.55	2.4	25.7	0.41	1	88.7	7.1	0.33
1.55 - 1.60	1.6	29.1	0.46	1	90.3	7.5	0.33
1.60 - 1.65	1.1	33.1	0.44	1	91.4	7.8	0.33
1.65 - 1.70	0.7	35.9	0.47	1	92.1	8.0	0.33
1.70 - 1.80	1.1	40.6	0.46	1	93.2	8.4	0.33
1.80 - 1.90	0.8	47.3	0.49	1	94.0	8.7	0.33
1.90 - 2.00	0.6	54.4	0.49	1/2	94.6	9.0	0.33
Se @ 2.00	5.4	79.2	0.55	N.A.	100.0	12.8	0.35

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM       B       BULK SAMPLE

LAB NO. :       6321      

FLOAT-SINK ANALYSIS, a.d.b. : 0.5mmx149 (WT% = 14.5)  
microns

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.25	9.2	2.4	0.39	9	9.2	2.4	0.39
1.25 - 1.30	36.8	3.6	0.37	8 1/2	46.0	3.4	0.37
1.30 - 1.35	19.1	6.7	0.34	6 1/2	65.1	4.3	0.36
1.35 - 1.40	11.1	11.1	0.33	2	76.2	5.3	0.36
1.40 - 1.45	3.7	16.1	0.37	1	79.9	5.8	0.36
1.45 - 1.50	4.4	19.8	0.41	1	84.3	6.6	0.36
1.50 - 1.55	2.4	25.5	0.52	1	86.7	7.1	0.37
1.55 - 1.60	1.1	30.2	0.61	1	87.8	7.4	0.37
1.60 - 1.65	1.2	34.4	0.68	1	89.0	7.7	0.37
1.65 - 1.70	0.6	37.8	0.71	1	89.6	7.9	0.38
1.70 - 1.80	1.2	43.2	0.80	1	90.8	8.4	0.38
1.80 - 1.90	0.9	50.6	0.88	1	91.7	8.8	0.39
1.90 - 2.00	0.8	58.4	0.91	1/2	92.5	9.2	0.39
S@ 2.00	7.5	78.4	1.24	N.A.	100.0	14.4	0.45

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     B     BULK SAMPLE

LAB NO.     6321    

FROTH FLOTATION TEST: a.d.b.: 0.5mmx0 (WT%= 24.5 )

PRODUCT ANALYSIS				CUMULATIVE	
PRODUCT	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	72.8	9.1	8	72.8	9.1
STAGE 11	8.9	20.8	4 1/2	81.7	10.4
TAILINGS	18.3	43.2	1	100.0	16.4

FROTH FLOTATION TEST: a.d.b.: 149 Micronsx0 (WT%= 10.0 )

PRODUCT ANALYSIS				CUMULATIVE	
PRODUCT	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	80.4	11.0	6 1/2	80.4	11.0
STAGE 11	6.6	28.4	1 1/2	87.0	12.3
TAILINGS	13.0	60.2	N.A.	100.0	18.5

FLOTATION PARAMETERS: Pulp Density = 10% Weight/Weight  
Reagent = 4:1=Kerosene:MIBC  
Dosage = 0.5 lb/Ton  
Conditioning = 1 minute  
Stage 1 = 1st minute froth  
Stage 11 = 2nd minute froth



CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM . . . B BULK SAMPLE

ANALYSIS OF MIDDLINGS

LAB NO. : 6444

MIDDLINGS = COMPOSITE 1.40-1.80 S.G. FRACTION - 100 mm x 6.35mm  
CRUSHED TO PASS 6.35 mm.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
6.35mm x 0.5mm	88.4	22.7	0.35	-	88.4	22.7	0.35
0.5 mm x 0	11.6	19.7	0.42	3 1/2	100.0	22.4	0.36

SINK - FLOAT ANALYSIS, a.d.b. : 6.35mm x 0.5mm

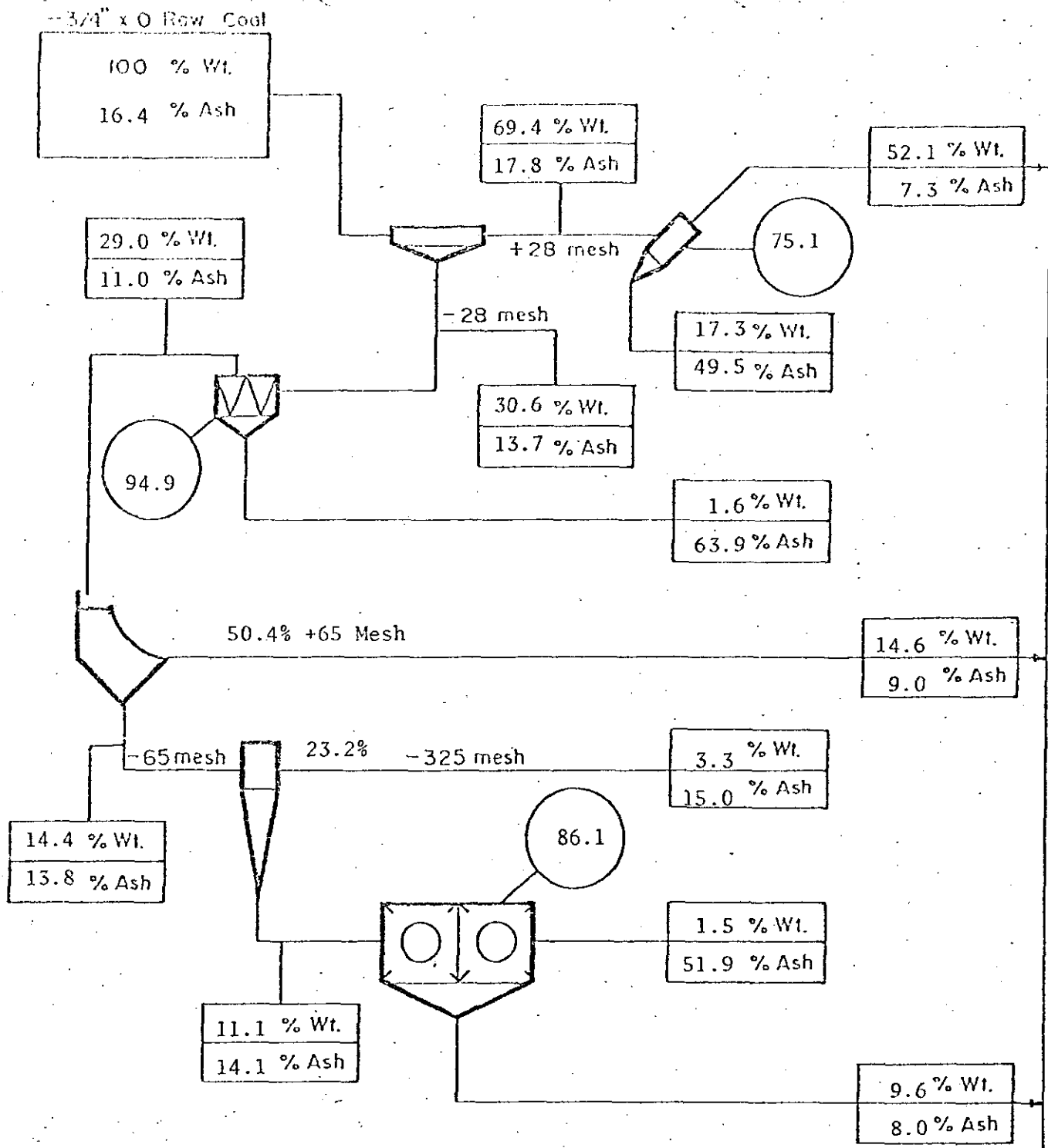
S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
Floats @ 1.40	18.4	9.2	0.29	5	18.4	9.2	0.29
Sinks @ 1.40	81.6	25.8	0.36	1	100.0	22.7	0.35

N.B. - Analyses of 6.35 x 0.5 size fraction are calculated from sink-float data.

CLIENT :  
PROJECT :

RANGER OIL LIMITED  
CHANNEL SAMPLES "A" SEAM

LAB. NO.	SAMPLE I.D.	MOIST%	ASH%	VOL%	F.C.%	S%		F.S.I.	S.G.	CALC. BASIS
6242	59M	0.6	25.6	19.6	54.2	0.40		4	1.51	adb
	0.260		25.8	19.7	54.5	0.40		-	-	db
6245	60M	0.6	13.7	21.4	64.3	0.48		7	1.39	adb
	.200BC		13.8	21.5	64.7	0.48		-	-	db
6244	60M	0.8	11.7	21.5	66.0	0.57		5 1/2	1.37	adb
	.52 BC		11.8	21.7	66.5	0.57		-	-	db
6245	62M	0.9	18.7	20.3	60.1	0.47		5	1.44	adb
	.39T		18.9	20.5	60.6	0.47		-	-	db
6246	62M	0.6	18.3	20.3	60.8	0.49		5 1/2	1.43	adb
	.41C		18.4	20.4	61.2	0.49		-	-	db
6247	62M	0.7	13.7	21.1	64.5	0.49		4 1/2	1.40	adb
	.49B		13.8	21.2	65.0	0.49		-	-	db
6248	63M	0.7	13.9	21.0	64.4	0.49		7	1.39	adb
	.37T		14.0	21.1	64.9	0.49		-	-	db
6249	63M	0.8	11.4	21.9	65.9	0.48		6 1/2	1.37	adb
	.57T		11.5	22.1	66.4	0.38		-	-	db



**LEGEND:**

○ CIRCUIT YIELD %

Wt. WEIGHT %

Ash ASH CONTENT (AIR DRIED)

TOTAL CLEAN COAL	76.3% WT
	7.7% ASH



**BIRTLEY COAL & MINERALS TESTING**

Title PLANT BALANCE FLOW SHEET  
 Ranger Oil - Mt. Spieker Property  
 "A" SEAM BULK SAMPLE  
 LAB NO. 6322

Date Oct./80

Drawn

REPORT - BULK WASHING DATA \*

Bulk Sample "A" SEAM Lab. No. 6522

Date Received Oct. /80 Date Washed Oct. 29/80

(a) RAW COAL

Delivered Weight 4.343 MT Washed Weight 2.158 MT  
 ADM % 5.3 ASH% 16.4 F.S.I. 6 1/2

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 69.4 % by weight

S.G. of Medium 1.27 Calculated Yield 75.1 %

Sample	ASH %	F.S.I.
Feed	17.8	6
Clean Coal	7.3	7 1/2
Reject	49.5	1

(c) WATER -ONLY CYCLONE CIRCUIT :28M x0 = 30.6 % by weight

V.F.C. #1 1 cm. #2 5 cm. Calculated Yield 94.9 %

Sample	ASH %	F.S.I.
Feed	13.7	8
Overflow	11.0	8 1/2
Underflow	63.9	1
S.B.O.	9.0	8 1/2
S.B.U.	13.8	8

(d) FROTH FLOTATION CIRCUIT: 65M x0 14.4 %by Weight.

4:1 =Kerosene: M.I.B.C. Calculated Yield 86.1 %

Sample	ASH %	F.S.I.
T.C.O.	15.0	3 1/2
Feed (T.C.U.)	14.1	8 1/2
Concentrate	8.0	9
Tailings	51.9	1 1/2

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 8.8 ASH% 8 1/2 FSI

\* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

**Birtley Coal  
& Minerals Testing**

SUMMARY - BULK WASHING DATA (Cont.)

BULK SAMPLE "A" SEAM LAB NO. 6322

(F) CLEAN COAL: H.M.C.C. + FILTER CAKE Calculated Yield 76.3 %

ADM	PROXIMATE				S%	BTU/ LB	FSI	HGI	S.G.	CALC. BASIS
	RM%	ASH%	VM %	FC %						
5.1	0.5	7.7	22.8	69.0	0.54	14362	71/2	80	1.35	adb
		7.7	22.9	69.4	0.54	14434	-	-	-	db

DILATATION TEST				
ST(°C)	MDT(°C)	MC %	MD %	G
386	470	24	48	1.034

GIESELER FLUIDITY TEST		
	DDPM	TEMP(°C)
START	1	430
MAXIMUM	286	474
FINAL	0	512
RANGE		82

SUMMARY ( BULK WASHING DATA (Cont.) (

BULK SAMPLE "A" SEAM LAB NO. 6322

ULTIMATE ANALYSIS

H2O %	C%	H%	N%	S%	ASH%	0% by diff.
0.48				0.54	7.71	

ASH FUSION TEMPERATURES (°F)				
ATMOSPHERE	I. D. T.	S. T.	H. T.	F. T.
OXIDIZING	2350	2480	2550	2610
REDUCING	2290	2450	2530	2590

MINERAL ANALYSIS OF ASH

2	Al2O3	TiO2	Fe2O3	CaO	HgO	Na2O.	K2O	P2O5	SO3	Undet.

BULK SAMPLE "A" SEAM LAB NO. 6322

SUMMARY BULK WASHING DATA (Cont.)

CLEAN COAL INVENTORY

DATE	SHIPPED		IN STOCK	
	BBLS	M.T.	BBLS	M.T.
Oct. 31, 1980	-	-	9	1.559

BULK WASHING DATA

BULK SAMPLE "A" SEAM LAB NO. 6322

HEAVY MEDIUM CIRCUIT

CYCLONE: 14" DSM operating @ 52 KPa.

MAGNETITE MEDIUM maintained @ 1.27 S.G.

1. FEED(3/4 x 28 Mesh) 1.497 M.T. 17.8 ASH% 6 FSI

2. CLEAN COAL 1.116 M.T. 7.3 ASH% 7 1/2 FSI

3. REJECT 0.381 M.T. 49.5 ASH% 1 FSI

4. YIELD CLEAN COAL (Weighted) =  $\frac{1.116}{1.497} = 74.5\%$

5. YIELD CLEAN COAL (Calculated) =  $\frac{49.5 - 17.8}{49.5 - 7.3} = 75.1\%$



BULK WASHING DATA

BULK SAMPLE "A" SEAM LAB NO. 6322

WATER-ONLY CYCLONE CIRCUIT

Primary Cyclone: 6" DSM Operating @ 138 KPa  
Vortex Finder Clearance set @ 1 c.m.  
Secondary Cyclone: 4" DSM Operating @ 35 KPa  
Vortex Finder Clearance Set @ 5 c.m.

Sieve Bend : 65 Mesh

1. Feed ( 28Mesh x 0 )	<u>13.7</u>	ASH%	<u>8</u>	F.S.I.
2. Primary Cyclone Overflow	<u>11.0</u>	ASH%	<u>8 1/2</u>	F.S.I.
3. Secondary Cyclone Underflow	<u>63.9</u>	ASH%	<u>1</u>	F.S.I.
4. Sieve Bend Overflow (S.B.O.)	<u>9.0</u>	ASH%	<u>8 1/2</u>	F.S.I.
5. Sieve Bend Underflow(S.B.U.)	<u>13.8</u>	ASH%	<u>8</u>	F.S.I.
6. Yield (W.O. Cyclone)	$\frac{63.9 - 13.7}{63.9 - 11.0}$	=	<u>94.9</u>	%
7. WT% 28M x 65M in Primary Cyclone Overflow		=	<u>50.4</u>	%
8. Estimated Yield of 28M x 65M (S.B.O., as % of 28M x 0 Feed)		=	<u>47.8</u>	%

BULK WASHING DATA

BULK SAMPLE \_\_\_\_\_ "A" SEAM LAB NO. 6322

FROTH FLOTATION CIRCUIT

Flotation Cell: two(2) Birtley -Humboldt Multi-Wobble  
impellers in series.

Reagent : 4:1 = Kerosene:M.I.B.C.

Thickening Cyclone : 20<sup>o</sup> - 8" cyclone Hayl-Patterson

1. Thickening Cyclone Overflow (T.C.O. -325M) 15.0 ASH% 3 1/2 FSI
2. Flotation Feed(Thickening Cyclone Underflow) 14.1 ASH% 8 1/2 FSI
3. Concentrate 8.0 ASH% 9 FSI
4. Tailings 51.9 ASH% 1 1/2 FSI
5. Yield Concentrate  $\frac{51.9 - 14.1}{51.9 - 8.0} = \underline{86.1} \%$

RANGER OIL - MT. SPIEKER PROPERTY

ANALYSIS OF CHANNEL SAMPLES

COMBINED PLY ANALYSIS

ADIT No. \_\_\_\_\_  
 Seam     A    

Ply Numbers Combined  
 All eight (8) individual  
 samples combined.

Date Analyzed Nov. 17, 1980  
 Lab. No.     6509    

Head Sample Analysis

Total Weight     ----Kg.    

Proximate Analysis (Air-dried)				Miscellaneous Analysis (A.D.)			
Moist. %	Ash %	V.M. %	F.C. %	Total S%	F.S.I.	S.G.	H.G.I.
0.7	15.7	20.5	63.1	0.53	5 1/2	1.40	78

Float-Sink Analysis (9.5mm x 0.5mm):

Weight 81.9 %

Specific Gravity Fraction	Fraction Analysis				Cumulative		
	Weight %	Ash %	S %	F.S.I.	Wt. %	Ash %	S %
F @ 1.30	21.2	3.7	0.54	9	21.2	3.7	0.54
1.30 - 1.40	51.7	8.9	0.48	2	72.9	7.4	0.50
1.40 - 1.50	11.6	18.5	0.46	1 1/2	84.5	8.9	0.49
1.50 - 1.60	2.6	28.5	0.48	1	87.1	9.5	0.49
1.60 - 1.70	1.2	30.1	0.50	1	88.3	9.8	0.49
1.70 - 1.80	1.0	44.4	0.40	1	89.3	10.2	0.49
1.80 - 2.00	1.4	57.8	0.28	1	90.7	10.9	0.49
S @ 2.00	9.3	71.3	0.11	N.A.	100.0	16.5	0.45
Total	100.0	16.5	0.45	-	-	-	-

Flotation Test (0.5mm x 0)

Weight 18.1 %

Product	Wt. %	Ash % (A.D.)	Total S%	F.S.I.
Froth <u>1</u>	82.2	8.0	0.72	8 1/2
<u>11</u>	6.8	19.4	0.88	3 1/2
Tails	11.0	51.2	1.17	2
Total	100.0	13.5	0.78	-

Conditioning Time: 1 Minute  
 Reagent: 4:1 Diesel Fuel: M.I.B.C.  
 Dosage: 0.5 lb/ton  
 Pulp Density: 10% Weight/Weight  
 Frothing Time: 2 Minutes

CLIENT : RANGER OIL LIMITED

PROJECT: SEAM A BULK SAMPLE

LAB NO.: 6323 - Preliminary Washability Test

Raw Coal crushed to minus 3/4"

SIZE ANALYSIS

SIZE FRACTION	WT%	CUM WT%
3/4" x 28M	76.2	76.2
28M x 0	23.8	100.0

SINK-FLOAT ANALYSIS: 3/4" x 28M					
SG FRACTION	WT%	ASH%	FSI	CUMULATIVE	
				WT%	ASH%
F@ 1.55	87.2	12.5	7 1/2	87.2	12.5
S@ 1.55	12.8	68.9	1	100.0	19.7

FROTH FLOTATION TEST: 28M x 0					
PRODUCT	WT%	ASH%	FSI	CUMULATIVE	
				WT%	ASH%
STAGE 1	83.1	7.4	9	83.1	7.4
STAGE 11	5.2	17.5	7	88.3	8.0
TAILINGS	11.7	43.0	2	100.0	12.1

F.F. PARAMETERS: - Pulp Density = 10%  
Reagent = 4:1=Kerosene:MIBC  
Dosage = 0.50 lb/Ton  
Conditioning Time = one minute  
Stage 1 = 1st minute froth  
Stage 11 = 2nd minute froth

Bulk sample homogenized. Raw- 3 barrels extracted and crushed to -3/4" and cored and quartered to required amount for test work.

Birtley Coal  
& Minerals Testing

A DIVISION OF GREAT WESTERN STEEL INDUSTRIES LTD

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     A     BULK SAMPLE

LAB NO.:     6323    

HEAD RAW ANALYSIS

A.D.M.	MOIST%	ASH%	VOL%	F.C.%	S%	F.S.I.	CALC. BASIS
5.3	0.6	16.4	20.5	62.5	0.50	6 1/2	a.d.b.
	5.9	15.5	19.4	59.2	0.47	-	a.r.b.
		16.5	20.6	62.9	0.50	-	d.b.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	F.S.I.	CUMULATIVE	
				WT%	ASH%
100 mm x 38mm	9.5	22.9	3	9.5	22.9
38 x 25.4	4.1	23.3	3	13.6	23.0
25.4 x 12.7	11.6	21.0	3	25.2	22.1
12.7 x 6.35	13.2	18.8	3 1/2	38.4	21.0
6.35 x 3.2	11.6	18.3	4	50.0	20.3
3.2 x 0.5	30.2	12.7	8	80.2	17.5
0.5 x 0.25	10.1	11.7	8	90.3	16.8
0.25 x 0.149	2.3	12.3	8	92.6	16.7
0.149 x 0.074	3.9	13.4	8	96.5	16.6
0.074 x 0.044	2.6	16.7	7	99.1	16.6
0.044 x 0	0.9	18.0	5	100.0	16.6

WT% + 100 mm =     2.1     -crushed to pass 100 mm  
-mostly coal

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     A     BULK SAMPLE

LAB NO. :     6323    

FLOAT-SINK ANALYSIS, a.d.b. : 100mm x38mm (WT%= 9.5 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.25	nil	-	-	-	-	-	-
1.25 - 1.30	0.8	2.8	0.54	9	0.8	2.8	0.54
1.30 - 1.35	45.9	6.9	0.48	5	46.7	6.8	0.48
1.35 - 1.40	26.5	11.2	0.52	2 1/2	73.2	8.4	0.50
1.40 - 1.45	5.0	15.7	0.46	2	78.2	8.9	0.49
1.45 - 1.50	1.4	20.0	0.52	1	79.6	9.1	0.49
1.50 - 1.55	0.2	24.2	0.46	1	79.8	9.1	0.49
1.55 - 1.60	0.2	27.7	0.47	1	80.0	9.2	0.49
1.60 - 1.65	0.1	32.7	0.42	1	80.1	9.2	0.49
1.65 - 1.70	0.1	37.4	0.49	1	80.2	9.2	0.49
1.70 - 1.80	0.5	52.6	0.33	1	80.7	9.5	0.49
1.80 - 1.90	0.6	60.6	0.33	1	81.3	9.9	0.49
1.90 - 2.00	1.4	64.9	0.27	1/2	82.7	10.8	0.49
S@ 2.00	17.3	80.8	0.18	N.A.	100.0	22.9	0.43

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     A     BULK SAMPLE

LAB NO.:     6323    

FLOAT-SINK ANALYSIS, a.d.b. : 38 mm x 25.4mm (WT% = 4.1 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.25	nil	-	-	-	-	-	-
1.25 - 1.30	0.8	3.5	0.54	9	0.8	3.5	0.54
1.30 - 1.35	41.0	6.6	0.52	5	41.8	6.5	0.52
1.35 - 1.40	26.4	11.3	0.50	2 1/2	68.2	8.4	0.51
1.40 - 1.45	8.5	16.2	0.48	2	76.7	9.2	0.51
1.45 - 1.50	1.8	21.6	0.42	1 1/2	78.5	9.5	0.51
1.50 - 1.55	0.7	27.3	0.44	1 1/2	79.2	9.7	0.51
1.55 - 1.60	0.7	29.9	0.46	1 1/2	79.9	9.9	0.51
1.60 - 1.65	0.4	36.3	0.42	1 1/2	80.3	10.0	0.51
1.65 - 1.70	0.2	45.8	0.38	1 1/2	80.5	10.1	0.51
1.70 - 1.80	0.7	52.4	0.34	1	81.2	10.5	0.50
1.80 - 1.90	0.6	58.8	0.23	1	81.8	10.8	0.50
1.90 - 2.00	1.4	63.6	0.29	1	83.2	11.7	0.50
Se 2.00	16.8	80.9	0.17	N.A.	100.0	23.3	0.44

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     A     BULK SAMPLE

LAB NO.:     6323    

FLOAT-SINK ANALYSIS, a.d.b. : 25.4mmx12.7mm (WT%= 11.6 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.25	nil	-	-	-	-	-	-
1.25 - 1.30	0.6	3.1	0.63	9	0.6	3.1	0.63
1.30 - 1.35	39.2	6.5	0.53	4 1/2	39.8	6.4	0.53
1.35 - 1.40	27.3	11.2	0.47	2 1/2	67.1	8.4	0.51
1.40 - 1.45	10.0	16.7	0.46	2	77.1	9.5	0.50
1.45 - 1.50	4.4	22.1	0.48	1 1/2	81.5	10.1	0.50
1.50 - 1.55	1.8	28.6	0.44	1 1/2	83.3	10.5	0.50
1.55 - 1.60	0.7	34.2	0.44	1 1/2	84.0	10.7	0.50
1.60 - 1.65	0.5	37.6	0.36	1 1/2	84.5	10.9	0.50
1.65 - 1.70	0.4	43.2	0.36	1 1/2	84.9	11.1	0.50
1.70 - 1.80	0.7	50.3	0.32	1 1/2	85.6	11.4	0.49
1.80 - 1.90	0.9	57.2	0.23	1	86.5	11.8	0.49
1.90 - 2.00	1.2	66.4	0.19	1	87.7	12.6	0.49
S@ 2.00	12.3	80.7	0.12	N.A.	100.0	21.0	0.44



CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     A     BULK SAMPLE

LAB NO.:     6317    

FLOAT-SINK ANALYSIS, a.d.b.: 6.35mmx3.2mm (WT%= 11.6 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.25	0.6	3.0	0.54	9	0.6	3.0	0.54
1.25 - 1.30	6.5	3.2	0.54	9	7.1	3.2	0.54
1.30 - 1.35	39.6	6.2	0.61	4 1/2	46.7	5.7	0.60
1.35 - 1.40	17.9	11.1	0.48	3	64.6	7.2	0.57
1.40 - 1.45	12.9	16.4	0.52	2	77.5	8.8	0.56
1.45 - 1.50	5.9	21.6	0.57	1	83.4	9.7	0.56
1.50 - 1.55	2.7	27.4	0.46	1	86.1	10.2	0.56
1.55 - 1.60	1.6	32.2	0.46	1	87.7	10.6	0.55
1.60 - 1.65	1.0	38.5	0.44	1	88.7	10.9	0.55
1.65 - 1.70	0.7	43.1	0.41	1	89.4	11.2	0.55
1.70 - 1.80	0.8	49.0	0.36	1	90.2	11.5	0.55
1.80 - 1.90	0.8	56.2	0.27	1	91.0	11.9	0.55
1.90 - 2.00	0.9	60.0	0.29	1	91.9	12.4	0.55
S @ 2.00	8.1	81.2	0.11	N.A.	100.0	18.0	0.51

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM   A   BULK SAMPLE

LAB NO. :   6317  

FLOAT-SINK ANALYSIS, a.d.b. :   12.7mmx6.35mm   (WT%=   13.2  )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
F@ - 1.25	0.2	3.2	0.58	9	0.2	3.2	0.58
1.25 - 1.30	3.9	3.8	0.56	9	4.1	3.8	0.56
1.30 - 1.35	42.3	6.7	0.49	5	46.4	6.4	0.50
1.35 - 1.40	21.5	12.2	0.46	2 1/2	67.9	8.3	0.48
1.40 - 1.45	11.2	17.1	0.48	2	79.1	9.5	0.48
1.45 - 1.50	4.7	23.1	0.46	1 1/2	83.8	10.3	0.48
1.50 - 1.55	2.2	27.8	0.46	1 1/2	86.0	10.7	0.48
1.55 - 1.60	1.2	31.9	0.45	1	87.2	11.0	0.48
1.60 - 1.65	0.9	38.0	0.42	1	88.1	11.3	0.48
1.65 - 1.70	0.4	43.4	0.39	1	88.5	11.4	0.48
1.70 - 1.80	0.8	49.3	0.35	1	89.3	11.8	0.48
1.80 - 1.90	0.7	57.0	0.21	1	90.0	12.1	0.48
1.90 - 2.00	0.9	63.4	0.27	1	90.0	12.6	0.48
S@ 2.00	9.1	80.0	0.16	N.A.	100.0	18.8	0.45

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM     A     BULK SAMPLE

LAB NO. :     6323    

FLOAT-SINK ANALYSIS, a.d.b. : 3.2mmx0.5mm (WT%= 30.2 )

S.G. FRACTION	FRACTION ANALYSIS				CUMULATIVE		
	WT%	ASH%	S%	F.S.I.	WT%	ASH%	S%
Fe - 1.25	6.0	2.0	0.54	9	6.0	2.0	0.54
1.25 - 1.30	38.3	3.4	0.54	9	44.3	3.2	0.54
1.30 - 1.35	24.5	7.4	0.54	4 1/2	68.8	4.7	0.54
1.35 - 1.40	8.2	11.6	0.48	3	77.0	5.4	0.53
1.40 - 1.45	7.2	15.9	0.56	2	84.2	6.3	0.54
1.45 - 1.50	4.2	21.3	0.52	1	88.4	7.0	0.54
1.50 - 1.55	2.0	26.4	0.52	1	90.4	7.5	0.53
1.55 - 1.60	1.1	31.0	0.56	1	91.5	7.8	0.54
1.60 - 1.65	0.9	35.5	0.57	1	92.4	8.0	0.54
1.65 - 1.70	0.6	40.7	0.56	1	93.0	8.2	0.54
1.70 - 1.80	0.8	46.0	0.53	1	93.8	8.6	0.54
1.80 - 1.90	0.7	53.3	0.49	1	94.5	8.9	0.54
1.90 - 2.00	0.6	61.0	0.21	1	95.1	9.2	0.53
Se 2.00	4.9	80.6	0.38	N.A.	100.0	12.7	0.53



CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM   A   BULK SAMPLE

LAB NO.   6323  

FROTH FLOTATION TEST:a.d.b.: 0.5mmx0 (WT%=   19.8  )

PRODUCT ANALYSIS				CUMULATIVE	
PRODUCT	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	84.3	7.4	8 1/2	84.3	7.4
STAGE 11	5.8	20.9	4 1/2	90.1	8.3
TAILINGS	9.9	52.7	1	100.0	12.7

FROTH FLOTATION TEST: a.d.b.: 149 Micronsx0 (WT%=   7.4  )

PRODUCT ANALYSIS				CUMULATIVE	
PRODUCT	WT%	ASH%	FSI	WT%	ASH%
STAGE 1	85.6	8.6	8	85.6	8.6
STAGE 11	6.3	24.9	3	91.9	9.7
TAILINGS	8.1	66.3	N.A.	100.0	14.3

FLOTATION PARAMETERS: Pulp Density = 10% Weight/Weight  
Reagent = 4:1=Kerosene:MIBC  
Dosage = 0.5 lb/Ton  
Conditioning = 1 minute  
Stage 1 = 1st minute froth  
Stage 11 = 2nd minute froth

CLIENT : RANGER OIL - MT. SPIEKER PROPERTY

PROJECT: SEAM A BULK SAMPLE

ANALYSIS OF MIDDLINGS

LAB NO.: 6445

MIDDLINGS = COMPOSITE 1.40-1.80 S.G. FRACTION - 100 mm x 6.35mm  
CRUSHED TO PASS 6.35 mm.

SIZE AND RAW ANALYSIS, a.d.b.

SIZE FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
6.35mm x 0.5mm	88.4	23.5	0.40	-	88.4	23.5	0.40
0.5 mm x 0	11.6	13.8	0.57	7 1/2	100.0	22.4	0.42

SINK - FLOAT ANALYSIS, a.d.b.: 6.35mm x 0.5mm

S.G. FRACTION	WT%	ASH%	S%	F.S.I.	CUMULATIVE		
					WT%	ASH%	S%
Floats @ 1.40	23.3	12.0	0.45	4 1/2	23.3	12.0	0.45
Sinks @ 1.40	76.7	27.0	0.39	1	100.0	23.5	0.40

N.B. - Analyses of 6.35 x 0.5 size fraction are calculated from sink-float data.

Birtley Coal  
& Minerals Testing

A DIVISION OF GREAT WESTERN INDUSTRIES LTD

SUMMARY - BULK WASHING DATA \*

Bulk Sample "B" SEAM Lab. No. 6320

Date Received Oct/80 Date Washed Oct. 30, 1980

(a) RAW COAL

Delivered Weight 7.997 MT Washed Weight 5.853 MT  
 ADM % 3.7 ASH% 15.0 F.S.I. 6

(b) HEAVY MEDIA CIRCUIT: 3/4" x 28 Mesh = 65.5 % by weight

S.G. of Medium 1.33 Calculated Yield 84.5 %

Sample	ASH %	F.S.I.
Feed	13.6	5
Clean Coal	7.8	6
Reject	45.1	1

(c) WATER - ONLY CYCLONE CIRCUIT :28M x0 = 34.5 % by weight

V.F.C. #1 1.5 cm. #2 5.0 cm. Calculated Yield 96.3 %

Sample	ASH %	F.S.I.
Feed	17.1	7
Overflow	15.1	7
Underflow	69.1	1/2
S.B.O.	11.1	7 1/2
S.B.U.	18.8	6 1/2

(d) FROTH FLOTATION CIRCUIT: 65M x0 19.3 %by Weight.

4:1 =Kerosene: M.I.B.C. Calculated Yield 85.0 %

Sample	ASH %	F.S.I.
T.C.O.	22.5	1
Feed (T.C.U.)	18.0	7
Concentrate	10.4	8
Tailings	60.9	1/2

(e) FILTER CAKE: S.B.O. + CONCENTRATE = 11.0 ASH% 7 1/2 FSI

\* All weights and analysis are on an Air Dried Basis unless otherwise indicated.

Birtley Coal  
& Minerals Testing