RESULTS OF EXPLORATORY DRILLING FROM FEBRUARY 1992 TO JULY 1992, COAL RESOURCE EXPLORATION AND ASSESSMENT PROGRAM (COALREAP), THAR DESERT, LAKHRA SOUTH, INDUS PLAIN, AND ADJACENT AREAS, SINDH PROVINCE, PAKISTAN

Part IIc - Lithologic and geophysical logs for the Meting-Jhimpir extended area

compiled by

John R. SanFilipo[1], Rafiq A. Khan[2], and Abbas Ali Shah[2]

Open-File Report 94-596-C

Prepared jointly by the Geological Survey of Pakistan and the U.S. Geological Survey, under the auspices of the U.S. Agency for International Development

[1]U.S.Geological Survey, 956 National Center, Reston VA 22092

[2]Geological Survey of Pakistan, 42-R, Block-6, PECHS, Karachi

1994

PREFACE

This report was originally one portion of a proprietary administrative report that was prepared by the Geological Survey of Pakistan and the U.S. Geological Survey (USGS) for the U.S. Agency for International Development. As such it received a limited distribution within Pakistan as Geological Survey Project Report (IR)PK-108. Because of it's length, (IR)PK-108 has been divided into five parts for its release to the public by USGS. This part of the report contains only the basic drill-hole data for the Sohnari coal areas adjacent to the active Meting-Jhimpir coal field. The companion volumes that contain the introductory text from (IR)PK-108 and the basic data for the other drilling areas are:

Open-File Report 94-595	Text
Open-File Report 94-596-A	Indus plain area
Open-File Report 94-596-B	Lakhra south area
Open-File Report 94-596-D	Thar Desert area

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DRILLING LOGS AND LITHOLOGIC DESCRIPTIONS

by

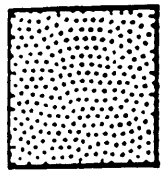
Altaf A. Khan, Zamer M. Khan, Ghulam Sarwar Lashari,
Abdul Rahim Memon, Altaf H. Chandio, and Shafique A. Khan

GEOPHYSICAL LOGS

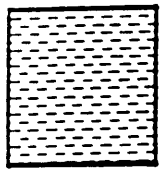
by

Mehtab-ur-Rahman, Nizamani, and Huda

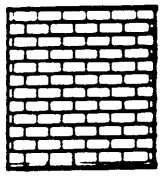
EXPLANATION OF LITHOLOGIC SYMBOLS USED



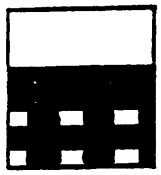
Sandstone



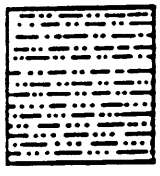
Shale/Claystone



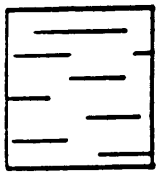
Limestone



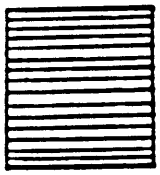
Coal
Dirty coal



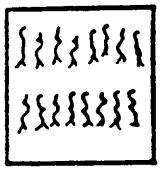
Siltstone



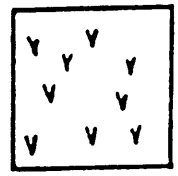
Mudstone



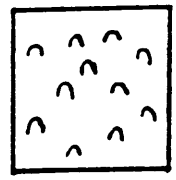
Carbonaceous shale



Underclay

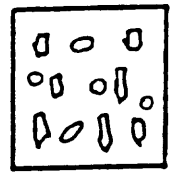


Alluvium

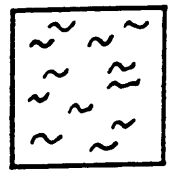


Fossil shell fragments

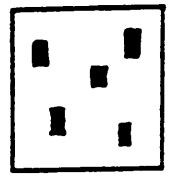
Fossil plant fragments



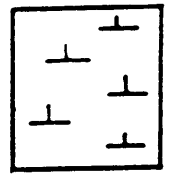
Pebbles / lithic fragments



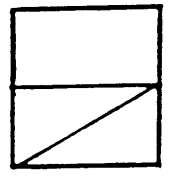
Glauconite



Pyrite



Calcareous



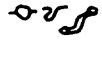
Core loss

Roots

Carbonaceous material

Pelecypods

Siderite



Burrows

Gastropods

Mica

Foraminifera

modified from Thomas and others, 1988

Form 1 of 5

DRILLING RECORD
COAL REAP

Drill hole SO-1

Topo Sheet 40 C/3

Grid ref 856676 m N 2156334 m E

Surface elev. (m) 60.4 (SURVEYED)

Drill rig Acker Wa III C DR-2

Drilling started Date 23rd March/92 Time 07:30 Hrs
Drilling completed Date 19th April/92 14:30 Hrs

Drill Bit
Surface to 2.13 m Tricon Roller Bottom Discharge 5 1/2"
2.13 to 108.38 m HQ Bit 3.75 Step Type Diam mm
_____ to _____ m _____
_____ to _____ m _____
_____ to _____ m _____
_____ to _____ m _____
_____ to _____ m _____

Fluids used QUICK THICK (BENTONITE w/ polymers)

Casing set
Surface to 9.14 m H.W Casing
_____ to _____ m _____
_____ to _____ m _____

Lith logged by ZAMEER MOHAMMAD KHAN
ALTAF ALI KHAN

Geophysical logs:

XAP
GAMMA From 3 m to 108 m through open hole
CALIPER " m " m " " (1)
GGNR " m " m " "
GG FR " m " m " "

TLP
GAMMA 5 m 105 m open hole
NEUTRON " m " m " " (2)

REMARKS:
SHALLOW SOHNARI TEST TO OCCUPY THE RIG BEFORE EID BREAK

HOLE WAS DRILLED A FEW KM SOUTH OF A PIT EXTRACTING SOHNARI CHINA CLAY WHICH APPEARS TO BE UNDERCLAY. THIS CLAY IS APPARENTLY ABSENT AT SO-1, METING LS WAS CONSIDERABLY THICKER AT SO-1 THAN PROJECTED FROM OUTCROP AND BOREHOLE LS-1.

COAL REAP

Drill Hole SO-1

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
-23-92	07.30 Hrs	00.00 M	Drilling started.
"	07.30/08.30	2.13	Non-coring cemented the hole for coring
"	08.30/23.45	62.5½	Drilling continue
-24-92	23.45/06.00	73.00	Head bearing out of order. Stopped drilling to get it repair from Karachi
-12-92			Retrieved the head of the rig and shifted the rig from Bolan camp site to drill hole site centralized the hole. Prepared
TO			
4-17-92			
-16-92	07.30 Hrs	73.00 M	Lowered H.O rods alone with core barrel, but hole was found collapsed.
			Reamed down 9.14 M H.W casing. Then lowered the rods with
			core barrel, washed the hole
			and reached up to 73.00 M
"		73.00 M	Drilling resumed

3 5 15

COAL REAP

Drill Hole SD1

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
04-18-92	14:00/16:30	74.85M	Drilled
04-19-92	06:00/7:25	"	checked oil fuel etc of the rig
"	7:25/14:30	108.38M	Hole completed.

DRILL-HOLE NO. SD-1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
0.00	2.13				1 2			SILTY CLAY / LIMESTONE Moderate yellowish brown 10YR 5/4 to Dark yellowish orange 10YR 6/6. Clay silty, sandy, gypsiferous, with cuttings of limestone.
2.13	0.92 3.05	0.25	27		3		0.66 0.25	CORE LOSS. Probably due to silty clay CLAYSTONE / SILTSTONE Moderate yellowish brown 10YR 5/4. Finely laminated, gypsiferous.
3.05	1.60 4.65	0.88	55		4		0.88 0.72	CLAYSTONE / SILTSTONE. Moderately yellowish brown 10YR 5/4. Finely laminated, gypsum veins from 1 to 2 cm thick, only claystone not calcareous CORE LOSS.
4.65	3.05 7.70	3.05	100		5 6 7		3.05	CLAYSTONE / SILTSTONE. Same as above.
7.70	3.04 10.74	3.04	100		8 9 0 1		2.05 0.99	CLAYSTONE / SILTSTONE Same as above, grades into limestone LIMESTONE. Grayish orange 10YR 7/4 limestone argillaceous, hard, fossiliferous, mostly foraminifera, ostracoda and algae. Dissolution cavities, few gypsum veins 1 to 2 cm thick.

NON-CORING

CORING

DRILL-HOLE NO. SQ-1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1		0.66	LIMESTONE. Same as above.
10.74	3.05	3.05	100		2		1.35	LIMESTONE / CLAYEY / SILTY. Dark yellowish orange 10YR 6/6 limestone argillaceous, fossiliferous, foraws. abundant- weathered glauconite. clayey and silty, grades into shale. 12.55
					3		1.04	SHALE, Moderate brown, Mod. Yellowish brown, Dark yellowish orange, and light olive gray thinly laminated, Gypsiferous
	13.79						0.20	LIMESTONE, White N-9, Hard, compact, fossiliferous, Contains foraws.
13.79					4		0.20	LIMESTONE Same as above
	3.05	3.05	100		5		1.34	LIMESTONE. Pale yellowish orange 10YR 8/6. Argillaceous, fossiliferous, med hard. gypsiferous at places, few weathered glauconite grains, grades into silt-stone.
							0.32	
	16.84				6		1.19	SILTSTONE. Greenish gray 5G 6/1 and light-bluish gray 5B 7/1, fossiliferous, foraws. and bivalves, med hard, grades into limestone.
16.84					7			LIMESTONE. Light-bluish gray 5B 7/1 and Bluish White 5B 9/1, fossiliferous, mostly foraws, asselina and alveolena.
	3.05	3.05	100		8		3.05	LIMESTONE. White N-9 to Bluish white 5B 9/1 Highly fossiliferous, abundant-foraws. asselina and alveolena. Chalky at places. rare pyrite grains.
	19.89				9			
19.89					0			
					1			

DRILL-HOLE NO SO.1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05	3.05	100		1			LIMESTONE_Agrillaceous. White N-9. Bluish white 5B 9/1, highly fossiliferous, mostly foraams, asselina and elvriolina, limestone silty and muddy, few hard bands or nodules of limestone 2 to 10 cm Thick at places.
32.08	32.08				2			
	3.05	2.76	90		3		2.76	LIMESTONE. Same as above
	35.13				4			
					5	X	0.29	CORE LOSS.
35.13	3.05	3.05	100		6			LIMESTONE. Same as above
	38.18				7		3.05	
					8			
35.18	3.05	3.05	100		9			LIMESTONE Same as above
	41.23				0		3.05	
					1			

DRILL-HOLE NO 50-1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
41.23	44.27	3.05	100		1 2 3 4		3.05	LIMESTONE. Same as above.
44.27	47.32	3.05	100		5 6 7		0.63 1.70 0.72	LIMESTONE. Same as above. SILTSTONE. Greenish gray 5GY 6/1, fossiliferous, mega forams about 1 to 2 cm in diametre, rare fine grained glauconitic siltstone calcareous, grades into limestone LIMESTONE. Light-gray N-7 fossiliferous, mostly forams, limestone silty & med hard!
47.32	50.37	3.05	100		8 9 0 1			LIMESTONE. Same as above, with few hard bands or nodules of limestone.

DRILL-HOLE NO SO-1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
50.37	3.05 / 53.42	3.05	100		1 2 3		3.05	LIMESTONE. Very light-gray N-8 Highly fossiliferous, well preserved foram few hard bands of limestone, few solutio cavities filled with calcite, silicified at places, rare black material may be carby shale?
53.42	0.68 / 54.10	0.68	100		4		0.68	LIMESTONE. Light-gray N-7, fossiliferous, mostly foram well preserved, limestone hard and compa silty and clayey near the bottom, grades int shale.
54.10	2.36 / 56.46	2.36	100		5 6		0.40 1.96	SHALE/SILTY Dark gray N-3 to light-gray N-7, Abundant coaly and carby material, shale silty, fossiliferous, fossil shell fragments; plant fossils, rare pyrite grains.
56.46	3.05 / 59.51	3.05	100		7 8 9		3.05	LIMESTONE. Light-gray N-7, Highly fossiliferous, mostly forams, well preserved, few solution cavities, limestone silty.
								LIMESTONE/SILTSTONE/INTERBEDDED Light-gray N-7 to Mod. gray N-5, Limestone highly fossiliferous, well preserved forams, silty, clayey, with about 5 to 12 cm thick band of siltstone. Siltstone, med gray, fossiliferous with abundant coaly and carby material few plant fossils and rare pyrite.
59.51					0 1			

Form 3a 10 5 15

DRILL-HOLE NO 50-1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05	3.05	100		1			LIMESTONE/SHALE/SILTY INTERBEDDED Light-gray N-7 to med gray N-5. fossiliferous, mostly well preserved forams silty, with 20 to 35cm thick bands of shale. Shale, silty, med. gray, with coaly and carby material, rare pyrite grains, lower 1 metre of the unit is bioturbitted.
62.56	62.56				2			
	1.83	1.57	85		3		1.57	LIMESTONE/SILTSTONE INTERBEDDED Limestone same as above, with about 5 to 10cms thick bands to siltstone. Siltstone calcareous & slickensided.
	64.39				4		0.26	CORE LOSS.
64.39							0.40	CORE LOSS
	1.22	0.82	67		5		0.82	LIMESTONE. Med light-gray N-6. fossiliferous, well preserved forams, with coaly and carby material, grades into mudstone calcareous.
	65.61							
65.61					6		1.10	MUDSTONE/SILTY. Light-gray N-7. fossiliferous, disseminated unaltered carby specks and traces, burrows filled with glauconi fossil shell fragments and silty material, rare pyrite grains, bioturbitted, flazer laminations at places.
	3.05	2.95	96		7		1.05	SHALE/SILTY/SANDY Dark gray N-3. Shale, carbonaceous, sandy, silty, abundant fine grained glauconite, few siderite nodules, burrows filled with glauconite grains, fossil shell fragments, with silty matrix. Coaly, carby material abundant, rare pyrite & resin grains root pyritized.
	68.66				8		0.85	
68.66							0.10	
					9		0.95	GLAUCONATIC SANDSTONE Dark greenish gray 5G 4/1, Sandstone med-grained mostly glauconite grains about 50%, cementing materia silty & clayey fossil shell fragments disseminated pyrite grains, few siderite nodules, quartz grains fine & med grained about 20%.
					0			CORE LOSS GLAUCONATIC SANDSTONE fine grained same as above. SHALE/SANDSTONE/FLAZER LAMINATED

Form 3a 11 / 15

DRILL-HOLE NO 50.1

LAKI FORMATION — SONHARI MEMBER

[illegible] FORMATION

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.04	3.04	100		0–1		1.45	SHALE. Med. dark gray N-4 to dark gray N-3, Slickensided burrows filled with glauconite sand, fossil shell fragments and rasin grains. roots pyritized, disseminated pyrite grains, flazer laminated, glauconite grains fine grained, few siderite nodules, Carby material abundant.
	71.70						0.64	GLAUCONITIC SANDSTONE. Dark greenish gray 5G4/1, fine to med. grained, about 60% glauconite fine grained, and 30% fine to med. grained quartz grains, cementing material silt and clay about 10%. Few clay balls or siderite nodules, 2 to 5 cm thick
71.70	2.72	1.43	53		2–3		1.43	GLAUCONITIC SANDSTONE. Dark greenish gray, 5G4/1, fine to med. grained about 60% glaucanite grains and 30% quartz med. size grains cemented in a matrix of clay & silt about 10%, few siderite nodules near the top of the run, few fine fossil shell fragments, slightly calcareous
	74.42				4		1.29	CORE LOSS
74.42	1.04	1.04	100		5		1.04	GLAUCONITIC SANDSTONE. Same as above.
	75.46							
75.46							0.51	CORE LOSS
	2.44	1.93			6–7		1.93	LIMESTONE. Very light gray N-8. Med. hard, spiritic, marly, rare glauconite grain, few solution cavities, fossiliferous, foram alveolina abundant with few nodular bands of hard limestone few gastropods.
	77.90							
77.90	3.05	3.05	100		8–10			LIMESTONE. Light gray, N-7 arenaceous, fossiliferous, fossil shell fragments, forams; alveolina, [illegible], glauconitic, rare Carby material as specks, med. hard, contains solution cavities at places.
	80.95				1			

DRILL-HOLE NO S01

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
80.95	86.0	3.05	100		1–4			LIMESTONE Light gray N-7 to med light gray, N-6 - arenaceous, highly fossiliferous (bio-spiritic), foram mostly alveolina; glauconite grains abundant, rare unidentified black grains, med hard and compact.
86.0	87.05	3.05	100		4–7			LIMESTONE Same as above.
87.05	90.09	3.04	100		8–0			LIMESTONE Same as above.
90.09					1			LIMESTONE Same as above.

DRILL-HOLE NO Sc 1

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			
	3.05	3.05	100		2			
	93.14				3			
93.14								LIMESTONE
	3.05	3.05	100		4			Same as above.
	96.19				5			
					6			
96.19								LIMESTONE
	3.05	3.05	100		7			Same as above.
	99.24				8			
					9			
99.24								LIMESTONE
	3.04	3.04	100		0			Same as above.
					1			

DRILL-HOLE NO 501

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	101.28				1 2			
101.28	3.05 / 105.33	3.05	100		3 4 5			LIMESTONE Light grey N-7, fossiliferous, abundant forams, alveolina, abundant glauconite grains, few dictyoclina forams. Limestone is hard, compact, arenaceous.
105.33	3.05 / 108.38	3.05	100		6 7 8			LIMESTONE Same as above.
					9 0 1			TOTAL DEPTH 108.38 M. CORE RECOVERY 101.34 M. CUMULATIVE CORE PERCENTAGE — 93.50%

COALREAP
Coal Intercepts

Form 4 of 5
Rev Apr 90

Drill hole SO-1

Collar elevation____________

Bed Name	Description	Depth From	Depth To	Thickness	Info Source	%Dry Ash	Sample No.

NO COAL

(nb: Sohwari test; BARA NOT REACHED)

Form 1 of 5

DRILLING RECORD
COAL REAP

Drill hole Se-2

Topo Sheet 40 C/3

Grid ref 850422 m N 2154581 m E

Surface elev. (m) 56.4 (surveyed)

Drill rig Longyear Forty-four

Drilling started Date 22-3-92 Time 1400
Drilling completed Date 25-3-92 0830

Drill Bit				
	Surface to	6.10	m	TRICONE Roller bit
	6.10 to	142.81	m	Diamond bit HQ
	____ to	____	m	____
	____ to	____	m	____
	____ to	____	m	____
	____ to	____	m	____
	____ to	____	m	____

Fluids used Quick thick bentonite with polymer

Casing set				
	Surface to	6.02	m	HW
	____ to	____	m	____
	____ to	____	m	____

Lith logged by Ghulam Sarwar Lashari
Abdul Rahim Memon

Geophysical logs:

		From		to		through	
JLP	Natural Gamma	00.00	m	154.8	m	Drill pipes	
	Neutron	00.00	m	155.8	m	"	"
XAP	Natural Gamma	00.00	m	153.4	m	"	"
	Gamma Gamma Far	00.00	m	156.9	m	"	"
	Gamma Gamma Near	00.00	m	156.9	m	"	"
JLP	Natural Gamma	00.00	m	156.8	m	Open hole	
	Neutron	00.00	m	159.0	m	=	=

REMARKS:

XAP	Natural Gamma	00.00	m	155.4	m	=	=
	Gamma Gamma Far	00.00	m	158.8	m	=	=
	Gamma Gamma Near	00.00	m	158.8	m	=	=
	Caliper	00.00	m	158.4	m	=	=

REMARKS: "Shallow" Sohwari test hole to occupy rig before Eid break. Hole was drilled a few hundred meters south of a water well that reported coaly material at 30m depth. The Sohwari was considerably deeper in SD-2 than anticipated based on projections from borehole LS-1, and some probably erroneous ostracode correlations made by USGS and GSP paleontologists from the water well and near by coal exploration shafts.

COAL REAP

Drill Hole Sn-2-92

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
22-3-92			Drilling started with $4\frac{7}{8}$ bit
23-3-92	0400	3.05	
	0600	6.08	Cased the hole by H&L casing upto 6.02 m
	1030	8.41	
	1300	11.46	
	1400	14.50	
	1545	17.55	
	1700	20.60	
	1745	23.65	
	1845	26.70	
	1945	29.74	
	2045	32.79	
	2145	35.84	
	2200	38.89	
	2315	41.94	
	2430	44.98	
24-3-92	0145	48.03	
	0300	51.08	
	0415	54.13	
	0530	57.18	
	0600	60.22	

COAL REAP

Drill Hole SA-2-92

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
	0645	63.27	
	0735	66.32	
	0820	69.37	
	0910	72.42	
	1000	75.46	
	1030	78.51	
	1100	81.56	
	1200	84.61	
	1230	87.66	
	1250	90.70	
	1700	93.75	
	1730	96.80	
	1800	99.85	
	1850	102.90	
	1930	105.94	
	2000	108.99	
	2040	112.04	
	2130	115.09	
25-3-92	0220	118.14	
	0245	121.18	
	0315	124.23	

COAL REAP

Drill Hole SO-2-92

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
	0345	127.28	
	0400	130.33	
	0485	133.38	
			Drilling stopped due to the leakage of
			radiator, then make it.
	0445	136.42	
	0500	139.47	
	0515	142.52	
	0530	145.57	
	0545	148.62	
	0600	151.66	
	0700	154.71	
	0800	157.76	
	0830	160.81	Drilling closed on 25-3-92.

DRILL-HOLE NO 50-2-92

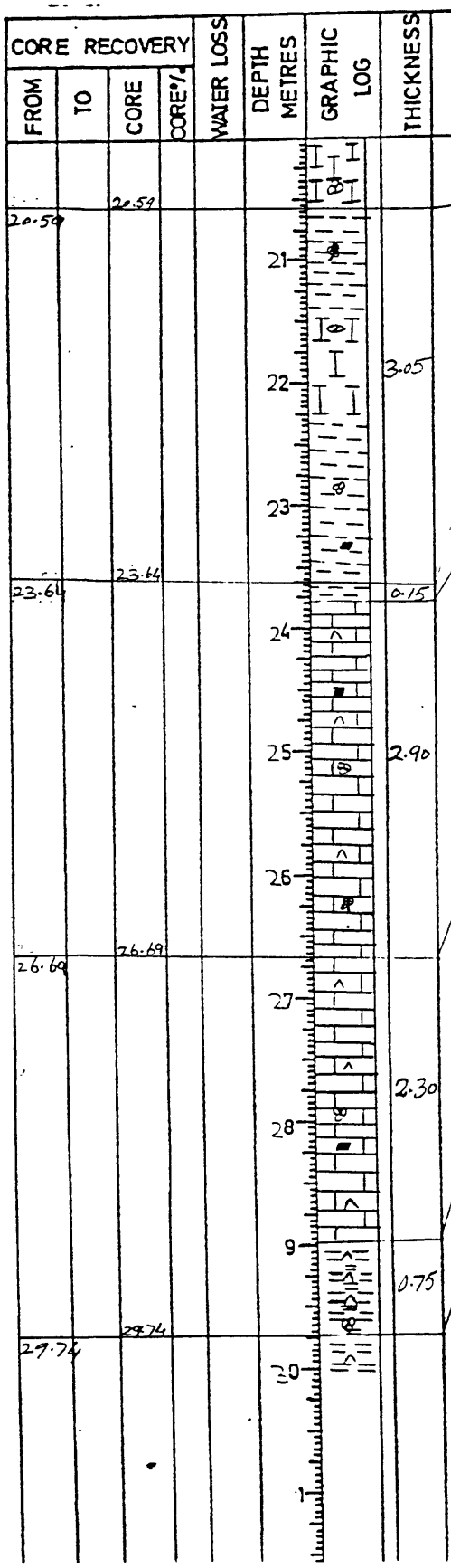
CORE RECOVERY FROM	TO	CORE	CORE%	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	NON CORING				0–1.52		1.52	LIMESTONE (cuttings):- White N9 to yellowish orange 10YR 8/6, silty, chalky, [illegible]
					1.52–3.05		1.53	LIMESTONE (cuttings):- Same as above unit but [illegible]
					3.05–4.57		1.52	LIMESTONE (cuttings):- Same as above unit
					4.57–6.10		1.53	LIMESTONE (cuttings):- Same as above unit.
6.10		7.15			6.10–7.15		1.05	SHALE:- Greenish orange 10YR [illegible], [illegible], soft, silty, gypsum, carby material. [illegible] calcareous towards bottom.
7.15		8.40			7.15–8.40		1.25	LIMESTONE: White to very light gray N8, hard, semicompact, chalky, coaly material, crystalline, calcite veins, calcite crystals, nodular forms, slickenside, silty
8.40					8.40–			LIMESTONE:- Same as above unit

Form 3a 6.8 22

DRILL-HOLE NO SO-2-92

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					11		3.05	
		11.45						
11.45					12			LIMESTONE:- Same as above unit.
					13		3.05	
					14			
		14.50						
14.50					15			LIMESTONE:- Pale yellowish orange, Compact, hard, clayey, silty, Forams, Coaly material, Shell fragments, Medium light gray N6 near bottom.
					16		3.05	
					17			MARL:- very light gray N8, Semi Compact, soft, clayey, Forams, Pyrite, Calcareous, Coaly material.
		17.54						LIMESTONE:- very light gray N8, Compact, hard, Forams, Slickenside, clayey, Coaly material, Shell fragments.
17.54							0.12	
					18		1.00	MARL/SHALE (INTERBEDDED):- Medium dark gray N4 to very light gray N8, Semi Compact, hard, Coaly Carby flakes, Forams, siderite, slickenside, Pyrite, Sandy layers in Shale beds.
					19		1.93	
					20			
					1			

DRILL-HOLE NO. SO-2-92



LITHOLOGIC DESCRIPTION

MARL/SHALE (INTERBEDDED):-
Same as above unit

MARL/SHALE (INTERBEDDED):-
Same as above unit

LIMESTONE:- very light gray N8 to light gray N7, Compact, hard, Fossiliferous, Foraems, chalky, crystalline, Glauconite, Sandy near bottom, Pyrite scattered at places, Coaly and Carby material, Nodules.

LIMESTONE:-
Same as above unit

CARBYSHALE:- Dark gray N3 to olive black 5Y 2/1, Semi-Compact, soft, Coaly and Carby partings, Gypsum, Sandy intedeminated at places, slickenside and Fossils.

CARBYSHALE:-
Same as above unit.

Form 3a 8.8 22

DRILL-HOLE NO SO-2-92

CORE RECOVERY FROM	CORE RECOVERY TO	CORE RECOVERY CORE	CORE RECOVERY CORE%	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					31		0.40	MARL:- Light grey N-7, Semi Compact, calcareous, coaly carby flakes, Fossiliferous (Forams).
							1.00	LIMESTONE:- Light grey N-7, Compact, hard, Forams, marly at top and bottom, Coaly carby traces, Pyrite.
					32		0.63	MARL:- Light grey N-7, Semi Compact, calcareous, coaly carby traces, Forams, lime stone 0.10 m band near bottom.
		32.78					0.20	
32.78							0.38	CARBYSHALE:- Olive black 5Y 2/1 to dark grey, Semi Compact, Coaly carby material and flakes.
					33			LIMESTONE:- Same as above
					34		3.05	MARL:- Light grey N-7, Compact, hard, soft, Forams, Coaly carby flakes, Pyrite at places and chalky.
					35			
35.83		35.83						MARL:- Same as above unit
					36			
					37		3.05	MARL:- Same as above unit
					38			
38.88		38.88						
					39			
					40			

Form 3a 9822

DRILL-HOLE NO. 80-2-92

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					41		3.05	LIMESTONE:- Light grey N7, Semi Compact, hard, Fossiliferous, marly near top and bottom, crystalline, Forams, Coaly carby traces
41.93		41.93			42		0.63	MARL/LIMESTONE(INTERBEDDED):- Medium grey N5 to light grey N7, Compact, hard, fossils, calcareous, Coaly carby traces, slickenside and forams.
					43		1.10	
					44		0.90	MARL:- Medium grey N5, Semi Compact, soft, sandy traces, Fossils, Forams, slicken side, calcareous, Coaly carby material.
							0.42	LIMESTONE:- light grey N7, Semi Compact, hard, Fossils, Forams, Marly in upper half.
44.98		44.98			45		1.15	MARL:- Medium grey N5, Semi Compact, Hard band of lime stone about 0.10m at top, Forams, slicken side, clay intermix in lower half, calcareous.
					6		0.50	SHALE:- Medium grey N5, Semi compact, Soft, Sand interlayered & intermixed, Coaly Carby material, slicken side, Calcareous at places.
					47		1.10	MARL:- light grey N7, Compact, hard, Forams, shell fragments, Coaly Carby traces at places, Clayey near bottom, Sandy streaks.
							0.15	MARL:- Medium grey N5, Semi Compact, Calcareous, Clayey, Forams, Shell fragments
48.02		48.02			48		0.14	Core loss at bottom
					49		3.05	MARL - Medium dark grey N4 to medium grey N5, Semi Compact, Calcareous, Coaly carby traces, Forams, Coaly material, slicken side, Sandy streaks, calcite veins at places, Sandy at bottom.
					50			
					1			

DRILL-HOLE NO 50-2-92

CORE RECOVERY FROM	TO	CORE	CORE%	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
		51.07			51			MARL:- Same as above unit
51.07							0.45	FOSSIL HASH:- Light gray N7, Hard, Compact, Full of foraams, calcareous material as matrix, Coaly carby traces are.
							0.28	
					52			CARBYCLAYSTONE:- Grayish black N2 to olive black 5Y2/1, Semi Compact, Fissile, Coaly carby material, siderite, sandy layers, slicken side, vertical burrows, Coaly carby traces, Resin, calcareous material through out the unit
					53		2.32	
		54.12			54			MARL:- Medium dark gray N4 to medium gray N5, Semi-Compact to Compact, calcareous material through out the unit, Slicken side, Coaly carby flakes, Siderite, Fossils in lower half
54.12					55		3.05	
					56			MARL:- light gray N7, Compact, hard, Foraams, Shell fragments, Crystalline, Slicken side, Pyrite, Coaly carby traces at places, Sandy near bottom.
		57.17			57			
57.17								LIMESTONE:- light gray N7, Compact, hard, Foraams, Shell fragments, crystalline, Slicken side, Pyrite and Coaly carby traces at places, Sandy near bottom
					58		2.45	
					59			
							0.60	
					60			

Form 3a 11.8 22

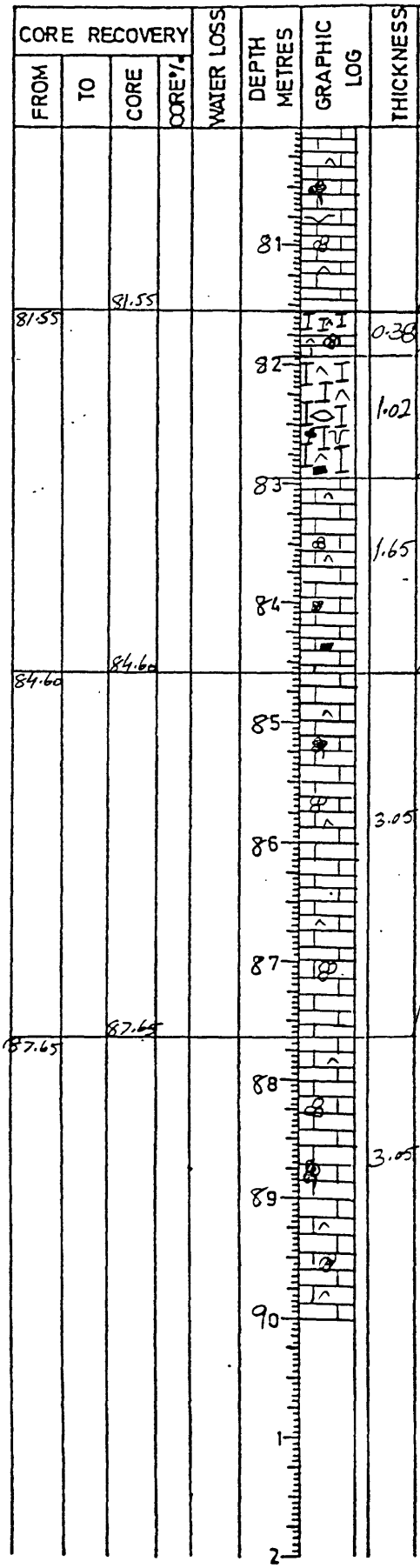
DRILL-HOLE NO Co-2-92

CORE RECOVERY FROM	TO	CORE	CORE%	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
		60.22						
60.22							0.29	LIMESTONE:- Same as above unit
							0.50	MARL:- Medium gray N5, Semi Compact, Calcareous, Slicken side, Fossils, Coaly carby material, Pyrite Clayey.
					62		2.15	
					63			CLAYSTONE:- olive black 5Y 2/1 to Medium dark gray N4, Semi Compact, Fossils (Forams), vertical burrows, Slicken side, Siderite, Calcareous at places Coaly and carby traces, Pyrite, glauconite towards bottom, more clayey in lower half, burrows filled with pyrite, Resin
		63.26					0.16	
63.26								Core loss at bottom
					64		2.20	CLAYSTONE:- Same as above unit
					65			
							0.60	MARLYCLAYSTONE:- Medium dark gray N4 to olive black 5Y 2/1, Semi-Compact to Compact, Fossils, Forams, Calcareous, Coaly Carby streaks, Glauconite, slicken side.
					66		0.25	
		66.31						MARL:- Dark greenish gray 5GY 4/1, hard, Compact, Fossil, Forams, Glauconite, Coaly carby traces.
66.31								
					67		1.45	MARL:- Same as above unit
					68		0.60	FOSSIL ASH:- Dark gray N3, greenish black 5GY 2/1, Semi Compact, Coaly carby streaks, Full of forams Glauconite as matrix, Clayey throughout the unit
							0.70	
					69			
		69.36					0.30	CLAYSTONE:- Dark gray N5 to olive gray 5Y 4/1, Semi Compact, Coaly carby material, Siderite, Sandy streaks, Calcareous, Sand as interlaminated.
69.36								Core loss at Bottom
								CLAYSTONE:- Same as above unit

DRILL-HOLE NO. SO-2-92

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					71		1.10	LIMESTONE:- Light Gray N7, Hard, Compact, Fossiliferous, Forams, crystalline, Coaly Corby flakes at places, Pyrite at places.
							1.00	SILTYSANDSTONE:- Medium light gray, Semi Compact, soft, Calcareous, Coaly streakes, Fossils, glauconite, clayey near bottom.
							0.25	
					72		0.60	CLAYSTONE:- olive black 5Y 2/1 to dark gray N5, Semi Compact, Coaly Corby material, Sandy layers, Glauconite, Forams.
		72.41						
72.41							0.53	CLAYSTONE:- Same as above unit but slicken side.
					73		0.64	LIMESTONE:- very light gray N8 & White N9, very hard, crystalline, Forams, Resin, Pyrite, Glauconite, Siderite at places.
					74			LIMESTONE/MARL (INTERBEDDED):- light gray N7, Compact, hard, Forams, Siderite at top, Calcareous, Silty, Coaly Corby traces, Pyrite
					75			Core loss at Bottom
							0.38	
75.46		75.46						LIMESTONE:- White N9 to very light gray N8, Compact, chalky, Fossiliferous, Forams crystalline at places, Pyritic, Siderite, marly.
					76		3.05	
					77			LIMESTONE:- very light gray N8 to medium dark gray N4, Compact, hard, Fossiliferous, Forams, Crystalline, Coaly Corby material, Rare glauconite in lower half and silty at bottom
					78			
78.50		78.50						
					79		2.38	
					80			
					1			
					2			

DRILL-HOLE NO 80-2-92



LITHOLOGIC DESCRIPTION

MARL/LIMESTONE (INTERBEDDED):-
Light grey N7, Semi Compact to Compact, Foraminiferous, Forams, marly, calcite crystals.

MARL:-
Medium grey N5, Semi Compact, soft, Sandy, silty, Foraminiferous, siderite, Calcareous, slickenside, Coaly carby traces, pyrite disseminated, burrows

LIMESTONE:-
Very light grey N8 to light grey N7, Compact, hard, Foraminiferous (Forams), Calcite crystals, Coaly carby traces, pyrite, silty.

LIMESTONE:-
Same as above unit but mostly crystalline and no pyrite

LIMESTONE:-
light grey N7, Compact, hard, Foraminiferous, silty crystalline near top, Forams, chalky in lower half

DRILL-HOLE NO

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								LIMESTONE:- Same as above unit but more chalky in crystalline.
		90.70						
90.70					91			
					92		3.05	LIMESTONE:- Very light gray. N8, Semi Compact to Compact chalky, Fossiliferous, Foams, Calcite crystals in crystalline portion after 0.70 m and near bottom
		93.75			93			
93.75					94			LIMESTONE:- Same as above unit
					95		3.05	
					96			
		96.80						
96.80					97			
					98		3.05	
					19			
		99.85			100			
					1			
					2			

Form 3a 15 822

DRILL-HOLE NO SD-2-92

CORE RECOVERY FROM	CORE RECOVERY TO	CORE RECOVERY CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
				101		2.82	LIMESTONE:- Same as above unit
							Core loss at bottom
				102			LIMESTONE:- Same as above but slicken side
		102.99				0.73	
102.92				103			LIMESTONE:- Same as above unit
				104		3.05	
				105			
		105.95					
105.95				106			Core loss at bottom
				107		3.00	
				108		0.04	
		108.99					
108.99				9			
				110			

DRILL-HOLE NO

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					111		3.04	LIMESTONE:- Same as above unit
		112.03			112			LIMESTONE:- Same as above unit
112.03					113		3.05	LIMESTONE:- White N9 to very light gray N8, very hard, Compact, Fossiliferous, Forams, chalky, crystalline, scattered small calcite grains, slickenside, calcite crystals.
					114			
		115.08			115			
115.08					116		3.05	LIMESTONE:- Same as above unit
					117			
		118.13			118			MARL:- light olive gray 5Y 6/1, Semi Compact, Fossils (Forams), Clayey, calcareous, Shell fragments.
118.13							1.43	LIMESTONE:- very light gray N8, very hard, Slickenside, crystalline, calcite crystals, marly, Forams
					119			
							0.28	
							0.08	MARL:- light olive gray 5Y 6/1, Semi Compact, Fossils, Forams, Slickenside, coarse shell fragments
					120		0.13	

DRILL-HOLE NO SO-2-92

CORE RECOVERY: FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	THICKNESS	LITHOLOGIC DESCRIPTION
		121.18			121	1.13	LIMESTONE:- Very light gray N8, very hard, slickenside, crystalline, calcite crystals, Fossils, Forams, marly
121.18					122, 123	2.95	LIMESTONE:- Same as above unit.
		124.22			124	0.04	Core loss at bottom
124.22					125, 126	2.75	LIMESTONE:- Very light gray N8, very hard, Compact, Full of fossils, Forams, crystalline, slicken side, marly bands at 0.02 m, 0.67 m and 1.07 m, Calcite crystals, chalky near bottom.
		127.27			127	0.30	Core loss at bottom
127.27						0.30	SILTSTONE:- Medium light gray N6, Semi Compact, Forams, calcareous, Sandy, Glauconite.
					128	1.14	LIMESTONE/SILTSTONE (INTERBEDDED):- Very light gray N8, very hard, Compact, Forams, calcite crystals, glauconite, siltstone, Calcareous.
					129	0.35	SILTSTONE:- Medium light gray N6, Semi Compact, Forams, calcareous, sandy, pyrite grains scattered, glauconite
						0.50	LIMESTONE:- Very light gray N8 to light gray N7, Compact, hard, Forams, Shell fragments, calcite crystals, Sandy, Silty, glauconite, Pyrite scattered
					130, 1	0.50	CLAYSTONE:- Olive gray 5Y4/1, Medium hard, Medium Compact, effervescence produced due to action of HCl, coaly and carbonaceous traces and flakes, Fossils, slicken sided.

DRILL-HOLE NO. 80-2-92

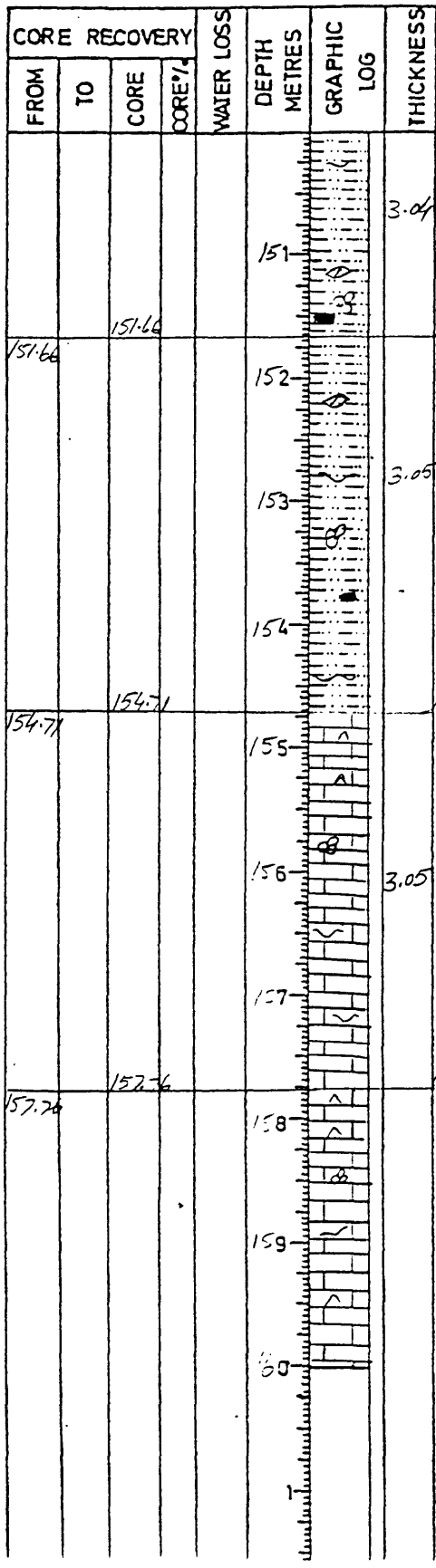
CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
		130.32					0.26	CARBY SHALE:- Grayish black N2 to brownish black 5YR 2/1, Semi Compact, Coaly Carby material and flakes, Forams and pyrite.
130.32					131		1.65	SILTY LIMESTONE:- Greenish gray 5GY 6/1 to light gray N7, Semi-Compact, hard, Fossil, Forams, siderite, Pyrite disseminated, Glauconite, silty and Sandy
					132		1.40	SILTSTONE:- Dark greenish 5G 4/1, semi compact to Compact, Glauconite, Pyritic, slickensided, Fossils, Forams, Calcareous
		133.37			133			
133.37					134		2.15	SILTY SANDSTONE:- Dark greenish gray 5GY 4/1, Semi Compact, soft, Coaly Carby streaks and flakes at top, Fine Coarse grained, Pyrite, Glauconitic, Burrows, very fine grained.
					135			
							0.60	CLAYSTONE/SANDSTONE (INTERMIXED):- Medium dark gray N4, Compact, hard, Slickenside, burrows filled with Coaly carby flakes, pyrite, Glauconite, Coarse grained patches
		136.42			136		0.30	Core loss at bottom
136.42					137		3.05	CLAYSTONE:- Medium dark gray N4, Compact, hard, Slickenside throughout the unit, siderite bands, Glauconite, Coaly carby traces, Pyrite filled in Siderite band at one place, medium Sand patches near top, Sandy.
					138			
		139.47			139			
139.47					140			

Form 3a 19.8.22

DRILL-HOLE NO SO-2-92

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					141		2.80	SILTSTONE:- Dark greenish gray 5GY3/1 to Dark gray N3, compact, very thin band 0.60m, Glauconite, Slickenside, Pyrite, Coaly carby material, Resin and small burrows.
					142			Core loss at bottom
	142.52	142.52					0.25	SILTSTONE:- Same as above unit
142.52					143		0.70	CLAYSTONE:- Olive gray 5Y4/1, Semi Compact, Fissile, Slickenside, Glauconite, Pyrite, Fossils, Silty at places
					144		2.35	SILTSTONE:- Dark greenish gray 5gy4/1, Semi Compact to Compact, Fossils, Glauconitic, Pyrite at places, Fissures at places slickenside, sideri... at places, Calcite veins
					145			
	145.57	145.57						
145.57					146		3.05	SILTSTONE:- Same as above unit
					147			
					148			
	148.62	148.62						
148.62					149			
					150			

DRILL-HOLE NO 30-2-92



LITHOLOGIC DESCRIPTION

SILTSTONE:-

Same as above unit

SILTSTONE:-

Same as above unit but hard, Calcareous bands at 0.10 m at top, 0.30 m at 152.06 and 0.25 m at 154.46 depths.

LIMESTONE:-

Very light gray N8 to light gray N7, Compact, very hard, Fossils, Forams, clayey, Slickenside, crystalline and Glauconite

Form 3a 21822

DRILL-HOLE NO. SO-2-92

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	160.81						3.05	LIMESTONE:- Same as above unit
								160.81 TD

COALREAP
Coal Intercepts

Form 4 of 5
Rev Apr 90

Drill hole SO-2 Collar elevation

Bed Name	Description	Depth From	Depth To	Thickness	Info Source	%Dry Ash	Sample No.
	NO COAL						
	(NO SOHNARI test; BARE NOT Reached)						

DRILLING RECORD
COAL REAP

Drill hole SO-3

Topo Sheet 35 P/13

Grid ref 805516 mN 2136513 mE

Surface elev. (m) 29.3 (surveyed)

Drill rig Acker - INA III C DR-2

Drilling started Date 18th MAY 92 Time 10 AM
Drilling completed Date 26th MAY 92 8.30 AM

Drill Bit	Surface	to 2.87	m	TRICON ROLLER BOTTOM DISCHARGE 5½
	2.87	to 124.15	m	HQ BIT 3.75 STEEL TYPE DIAMOND
		to	m	
		to	m	
		to	m	
		to	m	
		to	m	

Fluids used BENTONITE (KWIK THIK)

Casing set	Surface	to 18.28	m	H.W. CASING
		to	m	
		to	m	

Lith logged by M/S ALTAF ALI KHAN AND ZAMEER M. KHAN

Geophysical logs:

		From		to		through
XAP	GAMMA	3	m	116	m	RODS
XAP	GGNR	3	m	119	m	"
XAP	GGFR	3	m	119	m	"
JLP	GAMMA		m	118	m	"
JLP	NEUTRON		m	120	m	"
JLP	GAMMA	3	m	119	m	OPEN HOLE
JLP	NEUTRON	8		121		" "

REMARKS:

XAP	GAMMA	4	to	116	"	"
XAP	CALIPER	4	to	119	"	"
XAP	GGNR	4	to	120	"	"
XAP	GGFR	4	to	120	"	"

SHALLOW SOHNARI TEST DRILLED BECAUSE NORTH LAKHRA HOLES HAD TO BE ABANDONED DUE TO SECURITY THREATS AND ACKER WAS UNABLE TO REACH THAR DESERT LOCATIONS

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COAL REAP

Drill Hole SO-3

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
05-18-92	10Hrs	00.00	Drilling Started.
"	10-13.00	2.87	Did Non-coring
"	13-14.00	6.32	Did coring
05-19-92	12.15-13.15	7.80	Pulled out c/B. lowered 4 3/4 R/Bit. Re drilled from 2.4-6.32 found chotting, pulled out c/B and lowered H.W casing along with casing diamond shoe upto 2.13 M, hole collapsed due to loose gravels. ~~Redrilled from 2.13 to 6.32 m~~ and 5.18 M to 9.80 M
05-20-92	07.30	13.15	found water loss upto 90% Reamed down casing to prevent the water loss and Rods sticking
05-21-92	10-10.45	15.24	Drilling continue.
05-21-92	10.45-12.15	"	Reamed down casing upto 18.28 M
"	12.15/19.75	23.03	Drilled.
05-22-92	06.00/18.15	47.42	Drilled
05-23-92	06.00/17.55	65.70	Drilled
05-24-92	06.00/18.45	90.09	Drilled
05-25-92	06.00/18.30	123.62	Drilled

COAL REAP

Drill Hole SO-3

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
05-26-92	06:00/08:30	124.15	Drilling Stopped. Hole Completed
"	14:00/18:00	"	Carried out Geophysical logging.

DRILL-HOLE NO 50-3

NON-CORRING → CORING

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	THICKNESS	LITHOLOGIC DESCRIPTION
0.00	1.00				1.0	ALLUVIUM Grayish orange 10YR 7/4, Clay, Silt & Sand Surficial cover.
1.00	1.44	1.44	100%		1.44	LIMESTONE CUTTINGS Very Pale Orange, 10YR 8/2, Cuttings of hard limestone, fossiliferous.
2.44	2.44 / 0.43 / 2.87	0.43	100%		0.43	LIMESTONE CUTTINGS: Same as above.
2.87	1.88 / 4.75	1.88	100%		1.88	LIMESTONE Very Pale orange, 10YR 8/2, very hard and compact, nodular, fossiliferous, mostly forams weathered, Solution cavities abundant, rare ferruginous material, calcitised, fine grained, Crypto-crystalline.
4.75	1.57 / 6.32	1.57	100%		1.57	LIMESTONE Same as above.
6.32	2.14	1.50	70%		1.50	LIMESTONE. Same as above.
	8.46				0.64	CORE LOSS
8.46	1.34	0.80	59%		0.54	CORE LOSS
	9.80				0.77	SHALE Dark yellowish orange 10YR 6/6 to Grayish orange 10YR 7/4, silty, Sandy, flaky, calcareous, soft, weathered, 10 to 15 cm thick limestone unit in the middle part. Limestone is hard fossiliferous with Solution cavities, marly at the bottom.
9.80	1.04 / 10.84	1.04	100%		1.04	LIMESTONE Pale yellowish orange, 10YR 8/6, hard, compact, fossiliferous, mostly forams, weathered, argillaceous, rare tiny black grains, probably of iron, calcitic

DRILL-HOLE NO SC-3

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
10.84	12.31	1.58	60%		1		1.58	SHALE Light brown 5Y 6/4, silty, flaky, non-calcareous at the TOP 0.2 cm thick limestone unit.
12.31	13.15				2		0.73	CORE LOSS
13.15	15.21	1.51	100%		3		0.70	SHALE Same as above. 0.5 cm thick limestone unit at the TOP
							1.51	LIMESTONE Dark yellowish orange 10YR 6/6, hard, compact, fossiliferous, mostly forams, white, red clasts ferruginous.
15.21	18.29	3.05	49%		4			CORE LOSS
		1.52			5		1.1	SHALE Same as above shale unit
					6		0.32	LIMESTONE Dark yellowish orange 10YR 6/6. Hard, compact, mostly forams, ferruginous argillaceous.
							0.40	
							1.36	SHALE Pale yellowish brown 10YR 6/2 [illegible] non-calcareous black staining at places.
					7		0.07	LIMESTONE Dark yellowish orange [illegible] Med. hard, fossiliferous, mostly forams, clastic [illegible]
18.29	19.99	1.70	100%		8		1.70	LIMESTONE Pale yellowish orange [illegible] Hard, orange 10YR 6/6 [illegible] hard, highly fossiliferous forams, mostly [illegible], [illegible] slightly clastic.
					9			
					0			

METTIS LIMESTONE MEMBER — METTING SHALE MEMBER

DRILL-HOLE NO 80-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
19.99	3.01	3.04	100 %		1 2 3		3.04	LIMESTONE Same as above
23.03	26.08	3.05	100 %		4 5 6		3.05	LIMESTONE. Very pale orange 10YR 8/2 to Pale yellowish orange 10YR 8/6, hard, highly fossiliferous rich in fossils, weathered, clastic
26.08	28.23	2.15	88 %		7 8		2.15	CORE LOSS. LIMESTONE. Same as above.
28.23	30.10	1.75	100 %		9 0 1		1.75	LIMESTONE Same as above, abundant skeletal, solution cavities.

DRILL-HOLE NO S-0-3

METING LIMESTONE MEMBER

SONHARI MEMBER

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
30.27	1.91 / 32.18	1.91	100 %		0–2		1.91	LIMESTONE. very pale orange 10YR 8/2. weathered to pale yellowish orange 10YR 8/6 to dark yellowish orange 10YR 8/6, hard, abundant forams, rich in Alviolina, highly weathered, rare black grains, solution cavities.
32.18	3.05 / 35.23	3.05	100 %		2–3		1.05	LIMESTONE. Same as above grades into shale
					3–5		2.0	SHALE. Dark gray N-3 to grayish black. N-2. Carby specks, burrows filled with fine sand, glauconite coarse grained, Fossil shell fragments, Forams, rare resin in shale, disseminated pyrite grains. very thin sand laminations i.e. highly glauconitic. Shale sandy silty [illegible] and grades into siltstone 0.08 m thick siltstone at the bottom.
35.23	3.04 / 38.27	2.66	87 %		5–6		0.64	SILTSTONE. Light bluish gray 5B7/1. Med hard, fossiliferous. Forams, glauconitic, disseminated pyrite. grades into calcarenite.
					6		0.50	CALCARINITE. Light bluish gray 5B7/1. hard compact, fossiliferous: Alviolina forams, Fossil shell fragments, glauconite clastic, grades into sandstone
					6–7.5		1.52	SHALE / SANDSTONE LAMINATIONS. Shale, dark gray N-2, pyrite grains, and patches abundant carby material, resin rare, burrows filled with fine clean sand and fossil shell fragments, Forams, few siderite nodules, non calcareous. Sandstone fine grained, glauconitic well sorted, Flazer laminations at places
38.27	3.05 / 41.32	1.80	59 %		8		0.38	CORE LOSS
					8–10		1.80	SHALE / SANDSTONE INTERLAMINATED. Same as above
					10–11		1.25	CORE LOSS.

DRILL-HOLE NO. CO-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE RECOVERY CORE	CORE RECOVERY CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1		0.15	CORE LOSS
41.32	3.05	2.90	95 %		2		2.90	SANDSTONE. Med dark gray N-4 to grayish black N-2 soft- to med hard, fine grained silty, muddy and clayey, fossil shell fragments, burrows filled with clean sand, abundant disseminated pyrite grains and patches, highly carbonaceous, carby streaks, rare glauconite, clay nodules, non calcareous
44.37	41.37				3			
	1.73	0.93	53 %		4		0.93	SANDSTONE. Same as above.
46.10	46.10				5		0.80	CORE LOSS
	1.32	1.32	100 %		6		1.32	SHALE/CLAY/SANDSTONE LAMINATIONS. Shale grayish black, N-2 to dark gray N-5 carbonaceous, rare resin, burrows filled with glauconite and fine sand, disseminated pyrite, slickensided at places clay in very pale orange (or 10 R 8/2. Sandstone fine grained, well sorted glauconitic.
47.42	47.42				7			
	3.05	3.05	100 %		8		3.05	SHALE. Dark gray N-3, carbonaceous material and specks, disseminated pyrite grains and patches, burrows filled by clean quartz sand, thin clay bands at places slickensided at places, shale sandy & silty.
	50.47				9			
					0			
					1			

DRILL-HOLE NO 50-3

HILLIA BED — SONHARI MEMBER
LAKHRA FORMATION

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
50.47	3.05	2.40	78 %		1		1.30	SHALE. Same as above.
							0.26	LIMESTONE / CALCARINITE. Light-greenish gray 5G 8/1 to light-bluish gray 5B 7/1, hard compact, fossiliferous, forams and bivalves broken shell fragments, highly glauconitic, clastic fine grained.
	53.52				2			SANDSTON / SHALE. INTERLAMINATIONS Dark greenish gray, 5GY 4/1, fine grained, fossiliferous, fossil shell fragments, disseminated pyrite grains, glauconitic, flaser lamination of shale, rare siderite nodules. shale dark gray N-3, med compact.
53.52					3		1.49	
	56.56	3.04	100 %		4			SHALE / SANDSTONE FLAZER LAMINATIONS Shale olive black, 5Y 2/1, sandy silty, fossiliferous, bivalves, fossil shell fragments, flaky, disseminated pyrite grains, rare resin, carby specks. Sand stone fine grained, glauconitic, well sorted, fossiliferous, grades into siltstone.
					5		3.04	
					6			
56.56					7		0.25	CORE LOSS.
	59.61	2.90	91 %		8		0.16	SILTSTONE Med: light-gray N-6, fossiliferous, fossil shell fragments, glauconitic.
					9		2.64	LIMESTONE. Light-bluish gray 5B 7/1, fine grained, hard, fossiliferous, forams, & bivalves, disseminated pyrite grains, glauconitic, few calcite veins. clastic downward. A band of about 0.5 M shale in the upper part and 0.12 M thick Siltstone, fossiliferous and glauconitic unit at the bottom.
59.61					0		0.75	LIMESTONE. Same as above 0.6 M thick siltstone unit at the top.
					1			

DRILL-HOLE NO 50-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					0			
	3.05	1.48	48%		1		0.56	SANDSTONE/SHALE INTERLAMINATIONS Med. light-gray N-6, fine grained, well sorted, glauconitic, shale black 5YR 2/1, silty, carbonaceous specks, pyrite grains disseminated. Few resin grains, rare siderite nodules.
	62.66				2		1.57	SANDSTONE, Med. dark gray N-4, coarse grained, ha... calcareous, argillaceous, carbonaceous, glauconitic moderately sorted, rounded to subrounded.
62.66							0.05	CORE LOSS.
					3		0.40	SHALE. Brownish black 5YR 2/1, sandy, silty, carbonaceous disseminated pyrite. Few plant fossils.
	3.05	0.45	14%		4		2.60	COAL. Grayish black N-2 to black N-1, light in weight, brittle, bedded. rare pyrite and resin. Few partings of highly carbonaceous shale.
	65.71				5			CORE LOSS.
65.71					6			CORE LOSS.
	3.04	1.04	34%		7		2.0	SANDSTONE. Med. light-gray N-6 fine to coarse grain soft, sub-angular to sub-rounded grain quartz grains up to 90%, moderately sorted
	68.75				8		1.04	
68.75					9		3.05	SHALE/SANDSTONE INTERLAMINATED Shale, brownish gray 5YR 4/1, silty, sandy fine grained, well sorted, glauconitic disseminated pyrite grains, burrows fill...
					0			
					1			

DRILL-HOLE NO 50-3

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05	3.05	100 %		1			with clean sand.. Shale contains carbonaceous material, fossil shell fragments, Cross bedding near bottom of the piece.
	71.80							
71.80	3.05	3.05	100 %		2 3 4		3.05	SHALE / SANDSTONE INTERLAMINATED.. Shale, brownish black 5YR 2/1, to brownish gray 5YR 4/1, Carbonaceous, carby specks & traces, silty, sandy, burrows filled with glauconitic sand Sandstone fine grained, well sorted, glauconitic with minute shell fragments, siderite nodules 4 cm to 6 cm thick, Shale non calcareous fossiliferous, few small bivalves. shells. Cross laminated at places
	74.85							
74.85	1.73	1.73	100 %		5 6		1.73	SHALE / SANDSTONE INTERLAMINATED. Same as above.
	76.58							
76.58	1.32	1.32	100 %		7		1.32	SHALE. Brownish black 5YR 2/1, to brownish gray 5YR 4/1, Silty, rare carby, rare marcasite, disseminated fossil shell fragments, siderite nodules 2-5 cm. Non-calcareous.
	77.90							
77.90	3.05	3.05	100 %		8 9 0		3.05	SHALE. Same as above. Only size of siderite nodules increased 1 to 2 cm. contains abundant fossil shell fragments, bivalves rare marcasite.
	80.95				1			

DRILL-HOLE NO 50-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
80.95	84.0	3.05	100%		1 2 3 4		3.05	SHALE. Same as above.
84.0	87.04	3.04	100%		4 5 6 7		3.04	SHALE. Same as above.
87.04	90.09	3.05	100%		7 8 9 10		3.05	SHALE. Same as above

DRILL-HOLE NO SO-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
90.09	93.14	3.05	100%		1 2 3		3.05	SHALE. Same as above
93.14	96.19	3.05	100		4 5 6		3.05	SHALE. Same as above
96.19	99.23	3.05	100		7 8 9		0.46	SHALE. Same as above
							2.59	SILTSTONE. Dark greenish gray 5G 4/1. Med hard and compact, fossiliferous, fossil shell fragments of bivalve, highly glauconitic. Low half unit is highly fossiliferous and glauconitic. Inferred fossil impression observed in the core.
99.23					0 1			SILTSTONE/SHALE SILTY Dark greenish gray 5G 4/1, highly glauconitic

DRILL-HOLE NO 50-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05	3.05	100		1		3.05	and fossiliferous, contain forams and fossil shell fragments in the middle of the unit. Carby specks + traces. Disseminated pyrite and marcasite grains.
	102.28				2			
102.28	3.05	3.05	100		3		1.65	SILTSTONE. Olive gray 5Y4/1 and Greenish gray 5G6/1 Med hard and compact, carby specks + traces, highly glauconitic, fossiliferous, fossil shell fragments, disseminated pyrite grains. Siltstone grades into limestone.
	105.33				4			
					5		1.20	LIMESTONE. Med. bluish gray 5B5/1, and light gray N-7 Hard, compact, fossiliferous, forams, fossil shell fragments, few discocyclina and alveolina fossils. The upper 50cm core is highly glauconitic.
105.33	3.05	3.05	100		6		3.05	LIMESTONE. Light-gray N-7, hard, compact, highly fossiliferous, mostly forams, glauconitic foram chambers contains glauconite grain
	108.38				7			
					8			LIMESTONE. Light-gray N-7. hard, compact, highly fossiliferous may be fossil Hash, rest is same as above unit, grades into shale.
108.38	3.05	3.05	100		9		1.60	SHALE. Olive gray 5Y4/1 Mod hard and compact, very fossiliferous fossil shell fragments, abundant clay or siderite nodules. Very calcareous disseminated pyrite + marcasite grains. Shale silty + sandy
	111.43				0			
					1		1.45	

DRILL-HOLE NO S-0-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			
111.43					2		1.70	SHALE SILTY. Same as above.
	114.47	3.04	100		3			LIMESTONE. Med. bluish gray 5B 5/1 to light-gray N-7 upper 80cm of the unit is highly fossiliferous. Way-be fossil Hash. The rest unit is same as above.
114.47					4		1.34	
	117.52	3.05	100		5		3.05	LIMESTONE. Med bluish gray 5B 5/1 to light-gray N-7 Med hard, compact. highly fossiliferous. Fossil shell fragments, mostly forams. Forams contains glauconite in the chambers. Limestone grades into shale.
117.52					6			
	120.57	3.05	100		7			LIMESTONE. Same as above
					8		2.80	SHALE :- Dark gray N-4 to Olive gray 5Y 4/1 Med hard, compact, rare fossiliferous Fossil shell fragments, few siderite nodules, non calcareous, rare glauconite grains disseminated pyrite & marcasite grains shale silty and sandy.
					9			
					0		0.25	
					1			

DRILL-HOLE NO SO-3

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
120.57	123.62	3.05	100				3.05	SHALE Same as above.
123.62	124.15	0.53	100				0.53	SHALE. Same as above.

Total depth = 124.15 metres.
Total core recovery = 109.20 m
Cumulative Percentage = 87.96 %

COAL SAMPLE DATA

SAMPLE NO. SO-3-1 NO. OF BAGS 1 OF 1

COLLECTOR M/S ALTAF ALI KHAN ZAMEER M. KHAN COAL FIELD LAKHRA SOUTH

LATITUDE _____ LONGITUDE _____

PROVINCE SINDH DISTRICT THATTA

DRILL HOLE SO-3 DATE SAMPLED 05-23-92

FORMATION LAKHRA (HILIA BED) AGE PALEOCENE

COAL SEAM _____ ESTIMATED RANK LIGNITE

TOTAL SEAM THICKNESS _____ in THICKNESS SAMPLED _____ in

0.40 m 0.40 m

DEPTH TO TOP OF COAL _____ ft SURFACE ELEVATION _____ ft@MSL

62.71 m _____ m

ROOF ROCK SHALE FLOOR ROCK SAND (Loose)

SAMPLE TYPE Drill core
(channel, channel/upper bench, grab, drillcore, etc.)

COMMENTS:

Coal with parting

Form 1 of 5

DRILLING RECORD
COAL REAP

Drill hole S04

Topo Sheet 4100'6

Grid ref 875422 mN 217 0344 mE

Surface elev. (m) 28.7 (surveyed)

Drill rig ACKER

Drilling started Date 4-5-92 Time 1PM
Drilling completed Date 16-5-92 6PM

Drill Bit				
	Surface	to 9.14	m	TRICONE ROLLER BIT
	9.14	to 123.54	m	DIAMOND BIT HQ
		to	m	
		to	m	
		to	m	
		to	m	
		to	m	

Fluids used KWIK THIK BENTONITE

Casing set				
	Surface	to 9.14	m	
		to	m	
		to	m	

Lith logged by ALTAF ALI KHAN
ALTAF HUSSAIN CHANDIO
SHAFIQUE AHMAD KHAN

Geophysical logs:

		From		to		through	
XAP	GAMMA	SURFACE	m	120	m	OPEN HOLE	
	CALIPER	"	m	120	m	OPEN HOLE	
	EGNR	"	m	"	m	"	
	GGFR	"	m	"	m	"	
JLP	GAMMA	"	m	"	m	"	
	NEUTRON	"	m	"	m	"	

REMARKS:
"SHALLOW" SOHNARI TEST DRILLED WHILE WAITING FOR ARMY CLEARANCE TO DRILL CS-4. HOLE SPUDDED ABOOT 35m higher IN SECTION THAN Anticipated DUE TO UNMAPPED FAULTS

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COAL REAP

Drill Hole SO-4

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
4-5-92	13/-		Drilling started with 4 3/4 Rotary bit
	13/- 16/-		Drilled from 00 to 9.14 m
5-5-92			Lowered HW casing upto 9.14 m
			Shifted drilling equipment to drill set
9-5-92	8/30 - 16/		Drilled from 9.14 to 25.48 m
10-5-92	10/45 - 17/15		Drilled from 25.48 to 36.88 m
11-5-92	09/- 11/30		Maintenance of Machine
	11/30 - 18/15		Drilled from 36.88 to 44.37 m
12-5-92	09/30 - 17/30		Drilled from 44.37 to 65.71 m
13-5-92	8/30 - 9/-		Checked rod & lowered rods
	9/- 17/30		Drilled from 65.71 to 93.14 m
14-5-92	08/30 - 9/-		Checked machine
	9/- 18/-		Drilled from 93.14 to 111.43 m
	18/- 18/30		Pulled out rods
15-5-92			Maintenance of Rig
16-5-92	09/- 11/45		Lowered the rods & core barrel
	11/45 - 18/-		Drilled from 111.43 to 123.54 m
17-5-92			Geophysical logging

DRILL-HOLE NO 50-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
00.00	1.52				1		1.52	Alluvium. Contains Clay, Sand and Silt; micaceous yellowish gray 5Y 7/2 to grayish yellow 5Y 8/4
1.52	4.57				2 3 4		3.05	Alluvium. Unconsolidated Sand Silt, few hard Cuttings Slightly gravelly, few black grains.
4.57	6.09	NON — CORING			5 6		1.52	Alluvium same as above Qtz grains
6.09	7.62				7		1.53	Alluvium Same as above unit
7.62	9.14				8 9		1.52	Alluvium, Unconsolidated Sand silt and gravel. yellowish gray 5Y 7/2 to grayish yellow 5Y 8/4,
9.14		CORING			10 1 2		.75 0.10	LIMESTONE:- grayish orange 10YR 7/4 to pale yellowish orange 10YR hard and Compact, fresh fossils, sandy in the middle few weathered patches, Calcitic, Forams, more fossiliferous toward base of the unit, dolomitic in the upper part. SHALE: With Gypsum bands Dark yellowish orange 10YR 6/6, Shale is slightly Silty, ferruginous, flaky.

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					11		0.60	LIMESTONE :- Same as above unit of Lst Slickensided, argillaceous, fossiliferous.
							0.20	
	3.05	3.05	100				0.35	SILTSTONE Dark yellowish orange, 10YR 6/6, Calcareous semi hard Compact, ferruginous patches, Slightly Sandy.
							0.35	
	12.19				12		0.70	LIMESTONE :- grayish orange 10YR 7/4, hard, compact Arenaceous, Spritic, Calcareous, Probably dolomitic.
12.19							0.20	
	1.69	1.69	100				.52	SILTSTONE/SHALE Dark yellowish orange 10YR 6/6, Semi hard and Compact, Subordinate shale, ferruginous patches at places, Calcitic Calcareous, fossiliferous Rare shell fragments 11.49
	13.88				13		0.97	
13.88							0.24	LIMESTONE :- Dark yellowish orange 10YR 6/6, hard and Compact, Shale bands upto 10cm thick towards lower part of the unit, Sandy, Weathered, dolomitic probably? Shale bands are semi compact, variegated color, silty Slickenside at base and are Calcareous, The lower part 0.12m lime stone have different color, light gray N7 to light bluish gray 5B7/1, glauconitic, rare foram Arenaceous. 12.19
					14		0.20	
	3.05	3.05	60				1.10	
	16.93				15			
16.93					16			LIMESTONE :- Light gray N7 to dark yellowish orange 10YR 6/6, hard and Compact, Same as above unit. 12.37
					17			SHALE/SILTSTONE Dark yellowish orange 10YR 6/6 to medium light-gray N6, semi hard and Compact, fossiliferous, foram Pectin bivalves, broken shell fragments, glauconitic Gastropoda at one place, gypsum band at the middle 0.01m thick Sandy, Slickenside in the middle Calcareous, ferruginous patches at top - 12.91
					18			LIMESTONE :- very light gray N8 on fresh surface to white N9 hard and Compact, Silty, Sandy, ferruginous traces at places (Weathered), Rare fossils. 12.91 & 13.88 & 13.88 - 14.12
					19			SILTSTONE :- light-gray N7 to W light-gray N8, hard and Compact, Sandy, oxidized along the fractures, rare fossils and foraams, rare glauconite, grades into shale, few black minerals Scattered throughout the unit. (0.20) 14.32
					20			(1.10) SHALE, Carby - Dark gray N3, medium dark gray N4, semi hard, Semi Compact, fissile, Cavities filled with silt and fine sand and glauconite, Pyritic, Pyrite in the sharp veins and patches, Coaly Carby traces, fossils, foraams, broken shell fragments, grades into siltstone/fossiliferous, Slickenside at base LIMESTONE :- Very light gray N8 to light-gray N7 hard and Compact, effervescence with the shale bands thick upto 0.12m calcitized, Silty throughout the unit, Pyritic at contact with above unit, Micritic, fossiliferous, foraams. 15.42
					1			
					2			

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			
					2			
					3			
					4			
					5			15.42 LIMESTONE Very light gray N8 to light gray N7, hard, compact, silty, fossiliferous, fibrous. Pyritic near top. Shale bands upto 0.12m. Micritic 16.93
					6		1.51	LIMESTONE:- Same as above unit of Lst Towards lower end 0.05m thick shale contains well preserved forams, Pyritic, Silty, unit grades into marly lst. 18.83
16.93	16.93				17			MARLY LST: Light-gray N7, Semihard to soft at places have pyrite, effervescences, forams, fossil rare slickenside at top. 19.81
	2.88	2.88	100		18		1.90	
					19		0.98	LIMESTONE,
19.81	19.81				20			CONTINUES
					1			
					2			

DRILL-HOLE NO 304

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								19-81
							1.00	LIMESTONE :- SAME AS ABOVE Marly Calcitic, fossiliferous, Cavities filled with Secondary Calcite and rare pyrite, marly towards bottom. 20.81
	2.61	2.61	100		21		1.61	MARLY Limestone :- same as above unit- 22.42
22.42	22.42				22			LIMESTONE :- White N9, hard and compact, forams rare shell fragments, rare pyrite, Calcitized, Cavities filled with Secondary Calcite, Towards lower portion Coaly Carby traces and slightly silty.
	3.05	3.05	100		23		1.98	CARBYSHALE :- Grayish black N2, to dark gray N3, Semihard to compact, Coaly Carby material, Coaly flakes pyrite disseminated, forams, fossil shell fragments abundant towards lower portion, more silty towards bottom, glauconitic, slickenside at one place.
					24			
					25		0.28	SILTSTONE / SANDSTONE :- (Very fine grained) Light-bluish gray 5B7/1, hard and Compact- highly glauconitic, slightly sandy, forams, fossil shell fragments, one band of 0.20 of Sstone/shale- Containing burrows and pyrite, fine grained glauconite, Calcareous.
25.47	25.47						0.79	
		0.33	50				0.33	
26.13	26.13				26		0.33	
							0.20	
							.80	CORE LOSS
	3.05	3.05	100		27			SILTSTONE :- Light bluish gray 5B7/1, highly glauconitic (fine grained), Calcareous Pyritic, Semi hard and Compact, burrows filled with fine silt- and fine glauconite, Clayey.
					28		1.20	SILTSTONE :- Same as above.
							0.85	LIMESTONE :- Light-greenish gray 5G 8/1, hard and compact, very fine grained glauconite scattered fossiliferous, forams rare shell fragments, Calcitic at places, may be termed Calcalonite, burrows filled with fine glauconite sand, slightly Pyritic at few places.
29.18	29.18				29		0.40	
							1.25	SILTSTONE :- light greenish gray 5G 8/1, Semi Compact to hard slickenside at top and towards bottom, forams fossil shell fragments, fine grained glauconite scattered, slightly pyritic at few places, Clayey, Sandy, more pyritic towards bottom of the unit, burrows filled with Pyrite at few places, calcareous.
					30			LIMESTONE :- Light greenish gray 5G 8/1, Hard compact heavy, forams, fossils, Slickenside in upper half, Shale band in upper half, may be termed as calcarenite, fine-grained glauconite pyrite disseminated.
					1			0.40 See next Page
					2			

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05	3.05	100		31		1.25	(0.41) LIMESTONE :- light greenish gray 5G 8/1, hard and compact, fine grained glauconite, scattered rare foraams and shell fragments Pyrite rare. May be termed as calcarenite
	32.23				32		1.40	SANDSTONE (glauconitic) Medium bluish gray 5B 5/1, semihard to hard slickenside at the middle, abundant glauconite, broken shell fragments, Pyrite throughout the unit scattered, foraams - matrix silty, Calcareous, burrows filled with shell fragments and glauconite towards lower portion of the unit - more sandy towards bottom -
32.23	3.05	3.05	100		33		1.46	LIMESTONE :- Light bluish gray 5B 7/1, hard and compact, highly glauconitic, Pyrite at few places burrows filled with glauconite, Rooted, Sandy, badly replaced by Pyrite and glauconite, more sandy towards bottom, Calcareous.
	35.28				34		0.85	LIMESTONE :- Light bluish gray 5B 7/1, hard and compact, Calcitic, abundant glauconite, scattered foraams, Pyrite in shale bands, Sandy, maybe termed as Sandy Lst - Grades into siltstone. 33.69
35.28	1.60	1.60	100		35			SILTSTONE :- Light gray N-7, hard and compact, foraams, broken shell fragments, resin at places. slightly glauconitic at top, highly glauconitic towards bottom. Calcareous. Slickenside at one place May be termed as Calcarenite. 34.51
	36.88				36		0.74	SHALE, Med dark gray N4, Burrows filled with fine silt glauconite & pyrite. foraams, shell fragments. Pyritic siderite nodules, pyritized roots. foraams and shell fragments abundant abundant at base. 35.28
36.88	1.39	1.39	100		37		1.60	SHALE, Dark gray N3, Semihard, Pyritic, rare shell fragments, silty, slightly calcareous, Roots pyritized, weathered patches at places. Burrows filled with silt. Rare coaly : carby traces In the lower part calcareous 36.88
	38.27				38		1.39	
38.27	3.04	2.85	94		39			SHALE, Same as above, burrows filled with glauconite shell fragments and pyrite. Shale contains shell fragments at places, Calcareous 39.27
					40		1.44	CORE LOSS 0.19 38.46
	41.31				41		1.41	SHALE, Same as above, shell fragments abundant at places alongwith glauconite, carby traces Sharp contact with limestone 39.90
					2			LIMESTONE, light gray N7, hard, compact, fossiliferous. foraams silty, Pyrite rare patches. Slightly glauconitic in the middle, highly glauconitic and sandy towards bottom. Grades into sandstone 41.31

..Form 3a ..

DRILL-HOLE NO 50-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			41.31
								SANDSTONE, Med. light gray N7, hard, compact, calcareous glauconitic, Forams, shell fragments, Scattered pyrite, Resin, slickenside, Very fine grained
41.31							2.14	
	3.05	2.95	97		2			
					3			SHALE, Med. dark gray N4, Med hard, Fossiliferous-Forams and shell fragments. Rooted, Disseminated pyrite. Burrows filled with fine sand and silt. Slightly calcareous. Sandy, silty Carby traces, glauconite grains in burrows. Slickenside in the lower part. Very thin fine grained sand laminations.
							0.81	43.45
	4436				4			44.26
4436							0.10	CORE LOSS 0.10
					5		0.85	44.36
								SHALE. Same as above, Siderotic nodules rare, Sandstone thin, very fine grained sand laminations. Gradational contact with limestone
	3.05	3.05	100		6		2.20	45.21
								LIMESTONE, Very light gray N8 to white N9, very hard and compact Pyrite traces, cavities filled with glauconite grains. Sec. calcite. Disseminated pyrite grains towards top. more clayey with more pyrite and fossil shell fragments and forams.
	4741				7			47.41
47.41							0.64	LIMESTONE, Same as above, Lower portion of the unit is med light gray N6, marly, nodular.
					8			48.05
	3.05	3.05	100		9		2.41	LIMESTONE, Very light gray N8, hard, compact, fossiliferous, full of forams, slightly silty and clayey
	5046				0			50.46
					1			
					2			

DRILL-HOLE NO 50-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								50.46
5046							1.00	LIMESTONE, light gray N7, hard, compact, argillaceous, full of foraams. Rare pyrite on the lower portion. Weathered patches rare
								51.46
	3.05	3.05	100		1		1.17	SILTSTONE, light gray N7, compact, highly fossiliferous. foraams, rare mega fossils. calcitic clastic calcareous
								52.63
							0.88	LIMESTONE, Same as above limestone unit
								53.51
								LIMESTONE, Very light gray N8, hard, Compact, heavy fossiliferous, foraams, calcitized, weathered patches, micritic.
5351					2		3.05	
								56.56
								LIMESTONE Very light gray N8, hard, compact, foraams fossiliferous. The lower portion 0.24m is clayey shaly, containing fossil shell fragments, carby traces, silty, slickenside.
	5656							57.48
5656					3		0.92	SILTSTONE/CALCARENITE Light gray N7, Med light gray N6, Med hard, compact, abundant large foraams, Carby traces rare. Slickensided at top Clastic, calcareous.
								58.34
							0.86	LIMESTONE, Yellowish gray 5Y 7/1, hard, compact, full of foraams, and very fine shell fragments. Silty.
	3.05	3.05	100		4			59.61
							1.27	LIMESTONE Yellowish gray 5Y 7/1, hard, compact, foraams, marly, shaly, fine shell fragments. Small weathered patches.
								— — — — — — — — CONTINUES.
	5961							
5961					5			

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05	3.05	100		1 2		3.05	LIMESTONE.
	6266							62.66
								LIMESTONE Same as above, Secondary calcite veins Cavities and burrows also filled with calcite. Fossiliferous, rich in forams
6266	3.04	3.04	100		3 4 5		2.10	64.76
	65.70						0.94	MARLY LIMESTONE, Very light gray N8 to yellowish gray 5Y 8/1, Forams, cavities filled with calcite, elastic fractured in the lower part
								65.70
65.70	3.05	3.05	100		6 7 8		3.05	LIMESTONE, Light gray N7, to very light gray N8, Very hard and compact, Fossils and forams. Slightly silty throughout the unit. Cavities filled with secondary calcite. Thin calcite veins. Marly at places
	68.75							68.75
68.75	3.05	3.05	100		9 0 1		3.05	LIMESTONE Same as above
	7180				2			71.80

DRILL-HOLE NO 50-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								71.80
								LIMESTONE, Same as above, coaly flakes at places. Foraams Mega fossels, marly at places, fractures. Pyrite at places, slightly silty.
71.80	74.85	3.05	100		2–3		3.05	74.85
								MARLY LIMESTONE, Very light gray N8 to light gray N7, hard, compact fossiliferous, foraams, argilldeceous. Shell fragments Pyrite replaced by ferruginous material. Weathered patches. Rare sederitic nodules slickensided in the middle
74.85	77.89	3.04	100		5–7		1.90	76.75
								CALCAREOUS SHALE, Med light gray N6, Semi hard, abundant larger foraams: Disseminated pyrite crystal broken shell fragments. Changes into Marly limestone in the basal part
							1.14	77.89
								LIMESTONE, Pinkish gray 5YR 8/1. to very light gray N8 hard, compact, marly, full of foraams broken shell fragments
77.89	80.94	3.05	100		8–0		1.27	79.16
								MARLY LIMESTONE – CALCAREOUS SHALE Med dark gray N4 Med hard, abundant foraams. Weathered small patches
							1.05	80.21
								LIMESTONE, White N9. hard, compact, fossiliferous. slickenside in the middle. Slightly clastic.
							0.73	80.94
					2			

DRILL-HOLE NO 50-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								80.74
80.74	3.05	3.05	100		1 2 3		3.05	LIMESTONE, White N9, hard, compact, full of forams, broken shell fragments. Rare carby traces Clastic, Slightly silty. Rare pyrite Biospiritic oolitic, Silty marly band towards lower position.
	83.99							83.99
83.99	3.05	3.05	100		4 5 6		3.05	LIMESTONE, Same as above. fractured, slickenside, Cavities filled with calcite
	87.04							87.04
87.04					7		0.25	SHALE, Medium dark gray N4, Semihard, Semi compact. Calcareous, Coaly carby traces Shell fragments, forams, Mega fossels. Coaly flakes at places
								87.29
87.04	3.04	3.04	100		8 9		2.79	LIMESTONE, Same as above limestone unit. Clayey bands at few places. Carby thin laminations Dense, Wood imprints Coalified
	90.08							90.08
					0 1 2			

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								10.08
9008	3.05 / 9313	2.95	97		1 2 3		2.56	LIMESTONE, Clayey, light gray N7, hard and compact, forams thin shell fragments. Contains few calcareous shale bands upto 0.15m thick, full of forams shell fragments. Pyrite. Cavities at places. 92.64
							0.39	SHALE, Dark gray to grayesh black N_2. Semi hard semi compact. Coaly carby material, Burrows filled with fine shell fragments and silt. Carby at top. Calcareous towards lower portion A hard band of limestone at bottom 93.03
93.13								CORE LOSS 0.10 93.13.
	3.05 / 9618	3.05	100		4 5 6		3.05	LIMESTONE, Medium light gray N6, light gray N7, hard and compact Fossiliferous, full of forams Dissemninated pyrite, Few blue grains Fractured at places, silty at places. Shell fragments at places. 96.18
96.18								LIMESTONE, Med light gray N6, light gray N7, hard and compact, clayey, full of forams, shell fragments. Pyrite patches, more pyrite towards lower half, also in cavities Glauconite in lower position. Grades into siltstone. 98.51
	3.05 / 9923	3.05	100		7 8 9		2.33 0.72	SILTSTONE, Med light gray N6, hard, compact, calcareous slightly sandy, shell fragments, forams. Dessemninated pyrite, Glauconite with medium grained sand at places, Abundant pyrite in the middle. More sandy towards base. 99.23
9923								CORE LOSS 0.15 99.38
					0 1 2		1.80	SANDSTONE, Dark greenish gray, 5G 4/1, Med gray N5. Semi hard to compact. Muddy, clayey at base. Very fine to med grained, at places glauconitic pyrite scattered throughout, Rare shell fragment and rare forams at places. 101.18

SONHARI ——— METING L.ST

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								101.18
	10228				1			SHALE Med dark gray N4, Semi hard to compact, Massive Pyritic, burrows filled with fine silt and glauconite grains. Muddy at places; Rare shell fragments throughout unit slightly calcareous. 102.28
10228					2		1.25	SHALE, Same as above, rooted, slightly calcareous. abundant med. grained glauconite at the base of the unit 103.53
	10441	2.13	100		3		0.88	LIMESTONE, Med light gray N6, light gray N7, hard compact, full of forams, shell fragments, glauconite at top. Silty and clayey throughout the unit, calcitic at places 101.41
10441					4			SHALE, Med grey N5, Semi hard to compact, massive, silty, Coarse grained glauconite at top. Few siderectic nodules near top, Shell fragments forams, and pyrite scattered. Burrows filled with fine shell fragments, glauconite and pyrite. Thin, very fine sand lamination with glauconite in the middle of the unit. Sticky slickenside at base, Non calcareous 106.43
	10708	2.67	96		5		2.02	SHALE, Med dark gray N4 to dark gray N3, Semi hard to compact Coaly carby traces, Pyritized plant material at places. Sticky, Pyrite filled in burrows, Few siderite nodules Non calcareous. 106.78
		2.57			6		0.55	
					7		0.10	CORE LOSS 0.10 107.08
10708							0.23	CORE LOSS 0.23 107.31
	10941	2.33	90		8		0.60	SHALE Med gray N5, Semihard, compact, fissile, sticky, Very fine carby traces 107.91
		2.10			9		1.12	SHALE, light bluish gray 5B 7/1, Semihard, massive Contains shell fragments, Rooted, slickenside at places, burrows filled with pyrite and fine shell fragments. Sticky, more silty towards base. More pyritic at the bottom. Coaly and carby streak. 109.03
10941							0.38	MUDSTONE, Med dark gray N4 to Med gray N5, Semihard compact. Slickenside at top. Coaly carby material replaced by pyrite. Abundant pyritized, coalified plant material 109.41
	2.01	1.41	70		0		0.60	
					1			CORE Loss 0.60
					2			110.01

..Form 3a...

DRILL-HOLE NO 50-4

LAKHRA FORMATION ——→ SONHARI

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								110.01
	11142				1		1.41	CLAYSTONE-SANDSTONE INTERLAMINATED Med dark gray N4, Semi hard Semi compact, fine to med grained: Pyrite throughout the unit Sand percentage increases in the middle Burrows filled with pyrite. Fine coaly carby traces. Few coaly laminations. Very fine grained in the lower portion. Few coaly carby streaks at base. Pyritized plant material Resin at places. Muddy at base
11142								111.42
	3.05	3.05	100		2			LIMESTONE-FOSSIL HASH Abundant forams, shell fragments, fossils, throughout the unit. Carby traces in top 5 cms silty, Pyrite at places, Glauconite. Semi hard and medium compact
					3		3.05	
	11447				4			
11447								114.47
					5		1.77	LIMESTONE Same as above, hard bands at places
	3.04	2.67	88		6			116.24 CLAYSTONE Silty, Med dark gray N4. Semi hard and compact massive, burrows filled with shell fragments and rarely glauconite, at places pyrite in burrows. Blackness towards lower portion Few scattered shell fragments. Non calcareous
					7		0.90	
	11751						0.37	117.14 CORE LOSS.
								117.51
11751					8			CLAYSTONE, Same as above, muddy and few calcareous silty bands in the middle upto 0.23m thick containing abundant shell fragments, abundant forams, Pyrite at places. Rare glauconite grains. Fractured towards base.
	2.98	2.98	100		9		2.98	
	12049				0			
								120.49
					1			
					2			

DRILL-HOLE NO SO-4

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								120.49
120.49	3.05	3.05	100		1		0.67	SHALE, Med dark gray N4, Semi hard, compact, Massive sandy and silty, burrows at places, Rare shell fragments, Pyrite Grades into siltstone 121.16
					2		1.38	SILTSTONE Clayey, Sandy, Shell fragments throughout the unit. Very fine grained sand and fine grained glauconite. Few well preserved foraams. Few siderotic bands. 0.10 m thick at base 122.54
	123.54				3		1.00	SANDSTONE light gray N7, Semi hard and compact, clayey silty, fossil shell fragments at top. Pyritic Burrows filled with pyrite. Noncalcareous. 123.54
					4			
					5			
					6			
					7			
					8			
					9			
					0			
					1			
					2			

TOTAL DEPTH 123.54 m
16th MAY, 92

COALREAP
Coal Intercepts

Form 4 of 5
Rev Apr 90

Drill hole SO-4 Collar elevation

Bed Name	Description	Depth From	Depth To	Thickness	Info Source	%Dry Ash	Sample No.
			NIL				
		NO	COAL				

DRILLING RECORD
COAL REAP

Drill hole SO-5

Topo Sheet 35 P/14

Grid ref 781534 m N 2122510 mE

Surface elev. (m) 34.5 (Surveyed)

Drill rig Acker - Wa III C DR-2

Drilling started Date 29-05-92 Time 10 Hrs
Drilling completed Date 03-06-92 16 Hrs

Drill Bit
Surface to 1.70 m TRICON ROLLER BOTTOM DISCHARGE 5 1/2"
1.70 to 132.76 m HQ BIT 3.75 STEP TYPE DIAMOND
_____ to _____ m _____
_____ to _____ m _____
_____ to _____ m _____
_____ to _____ m _____
_____ to _____ m _____

Fluids used BENTONITE (KWIK THIK)

Casing set
Surface to 9.75 m H.W Casing
_____ to _____ m _____
_____ to _____ m _____

Lith logged by M/S ZAMEER MOHAMMAD KHAN AND ALTAF ALI KHAN

Geophysical logs:

		From		to		through
JLP	GAMMA	4	m	126	m	RODS
	NEUTRON	4	m	128	m	"
XAP	GAMMA	4	m	124	m	"
	GGNR	4	m	128	m	"
	GGFR	4	m	128	m	"
JLP	GAMMA	3	m	91	m	OPEN HOLE
	NEUTRON	3		94		"

REMARKS:

XAP	GAMMA	15	62	"
	CALIPER	15	64	"
	GGNR	18	65	"
	GGFR	18	65	"

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COAL REAP

Drill Hole S.O.5

DRILLING LOG

DATE	TIME	DEPTH	REMARKS
29-5-92	08.45	00.00 m	Drilling started
"	11.0/11.45	6.09 "	Pulled out rods, enlarged the hole with $3\frac{7}{8}$" Roller bit to lower the H.W casing upto 20'. Reamed the casing upto 20'
"	17.0/19.00	7.79 "	Drilled
30-5-92	7.45/17.30	45.89 "	Drilled
31-5-92	06.00/0800	"	Lowered rods, washed hole redrilled from 44.19 to 45.89 m
"	09.00/11.00	49.86 "	Casing had slipped 6' from the ramp Jointed 3.05 casing reamed upto 9.75. Paked the casing and started drilling.
"	12.30/18.15	68.15 "	Drilled
1-6-92	8.25/14.35	94.97 "	Drilled
2-6-92	09.00/18.30	114.43 "	Drilled
3-6-92	08.40/16.00	132.76	Drilled. drilling completed TD 132.76M

DRILL-HOLE NO S0-5

CORING

NON-CORING

METING LS MEMBER — METING SHALE AND METING LIMESTONE MEMBER

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
0.00	1.70	1.70	100%		1		1.70	CLAY, SILT, SAND AND LIMESTONE CUTTINGS Clay, silt & sand are superficial deposits. Limestone is very pale orange, 10YR 8/2 fossiliferous, mostly forams, marly and weathered.
1.70	3.05	2.30	75%		2 3		2.30	LIMESTONE very pale orange 10YR 8/2 weathers to pale yellowish orange 10YR 8/6 & Dark yellowish orange, 10YR 6/6, fossiliferous, mostly forams, hard weathered ferruginous, clastic, calcite veins, solution cavities also filled by secondary calcite, brown colors.
	4.75				4		0.75	CORE LOSS
4.75	7.80	3.05	100%		5 6 7		3.05	SHALE Moderate yellowish brown, 10YR 5/4, flaky, sandy, silty, ferruginous, fossiliferous, non-calcareous, weathers soft.
7.80					8		0.75	SHALE same as above.
	10.85	3.05	100%		9 0 1		2.30	LIMESTONE Medium light gray, N6, hard, fossiliferous, forams, calcitised, ferruginous and dolomitic patches, pyritic at places, nodular, clastic towards bottom, 10 cm thick carbonaceous shale, black, in the middle part.

Form 3a 4 of 17

DRILL-HOLE NO 505

SONHARI MEMBER — METING. LS MEMBER

FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
10.85					1			LIMESTONE Same as above.
	3.05	3.05	100%		2		1.46	SHALE Dark gray N3, fossiliferous, forams & bivalves, fossil shell fragments, sandy, silty, highly glauconitic, Pyrite in patches and disseminated grains, rare sand, burrows filled with glauconitic sand and fossil shell fragments. Carby specks in the lower part.
	13.90				3		1.59	
13.90					4		.95	SHALE Same as above. Includes very thin fine grained glauconitic sand interCalations.
	3.05	3.05	100%		5		2.10	MARLSTONE Dark gray N6, highly fossiliferous, rich in forams and broken shells, fine to coarse glauconite grains, matrix Calcareous, muddy, highly glauconitic towards bottom where slightly Carby as patches.
	16.95				6			
16.95					7			SHALE Med. gray N5, silty, Carby Traces, Poor in fossils, siderite nodules in the upper part, glauconitic sand as fine Caminations, fossiliferous, Non-Calcareous.
	3.05	3.05	100%		8		1.97	
	20.00				9			MARLSTONE Same as above.
20.00					0		1.08	
					1			

DRILL-HOLE NO 505

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
20.00	23.04	3.04	100%		1 2 3			SHALE/SILTY/SANDY Dark gray N3 to olive black 5Y 2/1, silty, sandy pyrite patches and disseminated grains, carby traces, rare siderite nodules, rare resin. upper 1 meter is more sandy & silty, may be termed as siltstone.
23.04	26.08	3.05	100%		4 5 6		0.55 1.74 0.75	SHALE Same as above slickensided at places SILTSTONE/SANDSTONE Greenish gray 5GY 6/1, very fine grained, highly glauconitic, disseminated pyrite, shaly/muddy, highly fossiliferous, broken shell fragments. 25.33 SHALE Dark gray N3, sandy, silty, fossiliferous, forams are fossil shell fragments, carby traces, pyrite disseminated, siderite nodules at the bottom. 25.08
26.08	29.13	3.05	100%		7 8 9		1.25 1.80 3.01	SHALE Same as above, more siderite nodules SANDSTONE/MUDSTONE Greenish gray 5GY 6/1, fine to coarse grained, mainly quartz grains & glauconite grains, sub-ordinate shaly/muddy, fossiliferous, forams and fossil shell fragments, angular to sub-angular grains. SHALE Grayish black N3, pyritic, carbonaceous, siderite nodules, sandy, silty, slickensided at places, burrows filled with lighter, rare resin. The shale contain very fine sandstone laminations in the lower part.

DRILL-HOLE NO 505

CORE RECOVERY FROM	TO	CORE	CORE%	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.05 / 32.18	[illegible]	[illegible]		1–2			SHALE
32.18	3.05 / 35.23	3.05	100%		2–5		3.05	SHALE Olive black 5Y 2/1, Sandy, Silty, Pyrite disseminated, root Pyritised, Carby traces, burrows filled with glauconitic sand, siderite nodules, Non-Calcareous
35.23	3.04	3.04	100		5–7		1.68	SHALE Grayish black, Sandy, Silty, sand is glauconitic, rare disseminated Pyrite grains, burrows filled with glauconitic sand. Non-Calcareous
	38.27				7–8		1.36	SANDSTONE Greenish black 5GY 2/1, fine grained, almost equigranular, well sorted, rounded to sub-rounded grains, highly glauconitic, shelly/muddy, fossiliferous towards base, fossils and fossil shell fragments
38.27	3.05 / 41.32	1.95	[illegible]		8–10		1.95	SHALE olive black 5Y 2/1, Sandy, Silty, disseminated Pyrite, burrows filled with glauconitic sand, rare fossil shell fragments, siderite nodules, Carby slickensided at places, fossiliferous bivalves. burrows also filled with fossils, fossil shell fragments and fine quartz sand. 0.15 m thick unit at the bottom is coarse sandstone, glauconitic, pyritic, poorly sorted, non calcareous
					10–11		1.10	CORE LOSS

Form 3a 7.8 17

DRILL-HOLE NO 505

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			CORE LOSS
41.32	42.35 1.53	0.30	19.1 %		2		1.23	SANDSTONE Medium dark grained N4, soft and loose, fine and coarse grained, fine sand is glauconitic coarse sand is mostly Quartz grains, subrounded to rounded. Poor sorting, matrix silty, bioturbated, disseminated Pyrite grains and specks. Non-calcareous, flazer bedding with Shale.
							0.30	
42.35	3.04 45.89	3.04	100 %		3 4 5		3.04	SANDSTONE AND SHALE Sandstone, med. light gray N5, Shale, brownish gray 5YR 4/1. Flazer bedding, bioturbated. Sandstone, fine grained, glauconitic, silty, matrix Calcareous. Shale, Pyritic, with Carby traces. Rare Clay balls.
45.89	1.53 47.42	1.53	100 %		6 7		1.53	SHALE Olive gray 5Y4/1, Sandy & Silty in the upper part, flaky, Pyrite specks and disseminated Pyrite grains, root pyritised, rare Siderite nodules, Non-Calcareous, Silicified in the middle.
47.42	2.44 49.86	2.44	100 %		8 9		2.44	SHALE Medium gray. N5, Sandy, Silty, Carby traces of ferruginous material, rare Siderite nodules, rare Siderite nodules. Silicified at places, Poorly fossiliferous, fossil shell fragments, Non-Calcareous.
49.86					0 1		0.34	CORE LOSS SHALE Same as above. Abundant Siderite nodules

Form 3a 8817

DRILL-HOLE NO. 505

SONHARI MEMB.

HILIA BEDS

CORE RECOVERY: FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	3.04	2.70			1–2		1.00	SILTSTONE Greenish gray 5GY 6/1, highly glauconitic and fossiliferous, mostly forams, med. hard and compact, pyritic, grades into limestone.
52.90	52.90				2–3		0.70	LIMESTONE/CALCARINITE Light greenish gray 5GY 8/1, hard, clastic, fossiliferous, mostly forams, lower 20 cm is mudstone/foram hash
					3		0.70	SILTSTONE Dark greenish gray 5GY 4/1, highly glauconitic, burrows filled with fossils and fossil shell fragments, med. hard, slickensided at places, flazer bedding of siltstone & shale.
	3.05	3.05	100%		4		0.85	MUDSTONE/FORAM HASH Light greenish gray 5GY 8/1, hard, highly fossiliferous, mostly forams, glauconitic.
	55.95				5		1.50	SILTSTONE Same as above siltstone unit. Lower 15 cm is sandstone.
55.95					6		0.73	CORE LOSS
62.00	3.05 / 62.00	~~3.05~~ 2.32	~~100%~~		7–8		2.52	SANDSTONE AND SHALE (FLAZER BEDDING) Dark greenish gray 5GY 4/1, sandstone is fine grained, well sorted, equigranular, highly glauconitic, few siderite nodules, 5 cm is mudstone, ~~fossil~~ [illegible] at 57.23 m depth.
62.00	3.05	[illegible]	[illegible]		9–10		2.07	MUDSTONE Greenish gray 5GY 6/1, highly fossiliferous at places, mostly forams, fossil shell fragments, glauconitic, few siderite nodules, weak pyritised, shaly in the middle.

DRILL-HOLE NO S05

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			
	6205				2		0.98	SHALE olive gray 5Y 4/1 to dark greenish gray 5GY 4/1, silty, sandy, fossiliferous, burrows filled with fossil shell fragments, few siderite nodules, silicified at places.
6205								SHALE Same as above.
	3.05	3.05	100%		3		1.77	MUDSTONE greenish gray 5GY 6/1, highly fossiliferous mostly forams, fossil shell fragments, glauconitic, siderite nodules at places.
					4		0.72	SHALE Same as above shale unit.
	6510				5		0.56	
6510								SHALE AND MUDSTONE Same as above
	3.05	3.05	100%		6		2.30	LIMESTONE light bluish gray 5B 7/1, hard, compact, fossiliferous, fossil shell fragments, forams gastropods, glauconitic, pyrite disseminated grains.
	6815				7			
					8		0.75	
6815								LIMESTONE very light gray N9, micritic, hard & compact re-crystalline, disseminated pyrite grains in the upper part, slightly glauconitic, fine calcite veins, fossiliferous, gastropods, forams, Alveolina, Discocyclina?
	3.04	3.04	100%		9			
	7119				0			
					1			

LAKHRA FORMATION — HILIA BEDS

DRILL-HOLE NO 505

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
71.19	73.94	2.40	87%		2		1.25	LIMESTONE Same as above. SHALE Dark gray N3, sandy, silty, fossiliferous, burrows filled with glauconitic sand, fossils & fossil shell fragments, disseminated Pyrite, Carby traces, rare siderite nodules.
					3		1.15	
							0.35	CORE LOSS.
73.94	74.85	0.56	61%		4		0.35	CORE LOSS
							0.56	SANDSTONE AND SHALE (FLAZER BEDDING) Dark gray N3, Sandstone, med. to Coarse grained, matrix silty & muddy, moderately sorted, sub-angular & sub-rounded, soft, disseminated Pyrite grains, few siderite nodules.
74.85	77.90	3.05	100%		5		3.05	SANDSTONE AND SHALE (FLAZER BEDDING) Dark gray N3, disseminated Pyrite grains and Patches, Carby Specks, few siderite nodules, root Pyritised, fossil shell fragments, Sand is fine. to med. grained, glauconitic The grain size fining upward.
					6			
					7			
77.90	80.95	1.85	61%		8		1.20	CORE LOSS
					9			
					0		1.85	SANDSTONE Light gray N7, Soft, med. grained, rounded to sub-rounded, matrix silty, non-calcareous, glauconitic, rare fossil shell fragments, Sandstone bedded with carbonaceous shale.
					1			

DRILL-HOLE NO 505

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
80.05	83.10	3.05	100		1–4			SANDSTONE AND SHALE Medium gray N5, med. hard, fine grained, glauconitic, rare fossil shell fragments, disseminated pyrite grains, slickensided at places, few siderite nodules, the shale is silty & sandy.
84.04	87.04	2.46	80		4–7		0.58 2.46	CORE LOSS SANDSTONE AND SHALE Same as above.
87.04	90.09	3.05	100		7–10		3.05	SHALE Med. dark gray N3, fossiliferous, Echinoids, gastropods, slickensided at many places, siderite nodules at places, fossil shell fragments.
90.09	92.53	2.44	100		10–11		2.44	SHALE Same as above.

DRILL-HOLE NO 50.5

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			
	92.53				2			
92.53	2.74	2.74	100 %		3		2.74	SHALE Same as above.
	95.27				4			
95.27	0.92	0.92	100 %		5		0.92	MUDSTONE Med. gray N5, rich in forams, fossil shell fragments, silty & sandy.
	96.19				6			
96.19	0.91	0.61	67.9 %		7		0.70	CORE LOSS
	97.10						0.61	MUDSTONE Same as above.
97.10	3.05	3.05	100 %		8		2.50	LIMESTONE/CALCARENITE Med. light gray N6, hard, compact, fossiliferous, forams, micro calcite veins, weathered glauconite clastic in the upper part.
					9			SHALE Dark gray N3, sandy, silty, fossiliferous, fossil shell fragments, rare glauconite in sandy & silty material. Non-calcareous, disseminated Pyrite.
	100.15				0		0.55	
100.15	1.75	1.75	100 %		1		1.75	SHALE Same as above do Cm thick limestone band in the middle, glauconitic, light gray N7.

DRILL-HOLE NO 505

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
	101.90		100					
101.90	3.05	3.05	100		2 3 4		3.05	SHALE Med. dark gray N3, sandy, silty, foram, bivalves, fossil shell fragments. carbonaceous material, burrows filled with pyrite, thin laminations with fine glauconitic sand, rare siderite nodules. Thin secondary calcite veins. Shale is slightly calcareous.
104.95	104.95							
104.95	2.74	2.74	100		5 6 7		2.10	SHALE same as above. SILTSTONE Dark greenish gray 5GY 4/1, fossiliferous, glauconite grains, fossil shell fragments, grades into mudstone.
107.69	107.69						1.14	
107.69	2.04	2.04	100		8 9		2.04	MUDSTONE Greenish gray 5G 6/1 to dark gray N3, silty, sandy, fossiliferous, bivalves, fossil shell fragment, disseminated glauconite grains.
109.73	109.73							
109.73	1.70	1.70	100		0 1		0.70	MUDSTONE Same as above. LIMESTONE (ARGILLACEOUS) Light greenish gray 5GY 8/1 to dark greenish gray 5GY 4/1, argillaceous

DRILL-HOLE NO S.05

CORE RECOVERY FROM	TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
								fossiliferous, rich in foram, disseminated Pyrite grains, rare glauconite grains.
	111.43		100 %				1.0	
111.43	3.04	3.04	1.0		2 3 4			LIMESTONE Same as above.
	114.47							
114.47	3.05	3.05	100 %		5 6		0.80	LIMESTONE Same as above.
	117.52						2.25	SHALE Grayish black, N2, Carbonaceous material, silty, sandy, disseminated Pyrite grains, with fine sand are glauconite grains, fossil shell fragments, bivalves, abundant siderite nodules.
117.52	0.85 118.37	0.85	100 %		8		0.85	SHALE Same as above.
118.37	2.20	2.20	100		9 0		2.20	LIMESTONE/CALCARENITE Light gray N7, fair glauconite grains, disseminated Pyrite grains, fossiliferous, mostly foram, fossil shell fragments, hard in the middle, argillaceous at the top and basal part—— 2.05 Recovered ?
120.57								SHALE

DRILL-HOLE NO SO-5

CORE RECOVERY FROM	CORE RECOVERY TO	CORE RECOVERY CORE	CORE RECOVERY CORE%	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			SHALE olive black 5Y 2/1, sandy, silty, abundant siderite nodules, disseminated pyrite grains and patches, marcasite, fossil shell fragments, sandy at the top. The sand grains are dark and glauconitic, soft, fossiliferous, bivalves, slickensided in the lower part.
	123.62	3.05	100		2		3.01	
123.62					3			
	126.67	3.05	100		4		1.92	SHALE Same as above.
126.67					5			
					6		1.13	LIMESTONE same as above limestone unit.
	129.71	3.04	100		7		1.10	SANDSTONE Med.-dark gray N4, fair grained, equigranular, well sorted, highly glauconitic, fossil shell fragments in the end of the unit.
					8		1.44	SHALE Med.-dark gray N4 to dark gray N3, pyrite, marcasite abundant carbonaceous material, abundant siderite nodules, slickensided in the lower part.
129.71					9			
	132.76	3.05	100		0			SHALE Grayish black N2, fossiliferous, fossil shell fragments, siderite nodules at places, pyrite & marcasite grains, slickensided at places, 30 cm. near
					1			

DRILL-HOLE NO 505

CORE RECOVERY FROM	CORE RECOVERY TO	CORE	CORE %	WATER LOSS	DEPTH METRES	GRAPHIC LOG	THICKNESS	LITHOLOGIC DESCRIPTION
					1			Light bottom is mudstone, highly fossiliferous, mostly foram, glauconitic, disseminated pyrite grains.
	132.76				2		3.05	
					3			TOTAL DEPTH = 132.76 M.
					4			CORE RECOVERY = 127.08 M.
					5			CUMULATIVE CORE PERCENTAGE = 95.7 %.
					6			
					7			
					8			
					9			
					0			
					1			

17817

COALREAP
Coal Intercepts

Form 4 of 5
Rev Apr 90

Drill hole SO-5 Collar elevation

Bed Name	Description	Depth From	Depth To	Thickness	Info Source	%Dry Ash	Sample No.
	NO COAL						