Geological Report Of The Makarwal Area

MOHAMMUD QASIM JAN BANGASH

B.Sc. (HONS). PT.III.

INTRODUCTION

This report was prepared in Dec.1963, after a seven-day field study of the area, mainly along Miranwal Nala. Mr. Farooqui,a junior Gelogist in W.P.I.D.C. guided us at times.

The Makarwal area is on the South-Western extremity of the Surghar-Range. ("Sur"---Pashto word for "Red" and"Ghar"---- for "Mountain"; since the general colour of these mountains is reddish) The Surghar Range is included in the famous Salt Range series of West Pakistan, on the trans-Indus side betwen longitudes 71°—72° E and latitudes 31°—32° N.

The place is in South-West of Kalabagh at a distance of about 32 miles. The area is on the Western extreme of Mianwali District. The top of these mountains is the boundry betwen the Distts. of Kohat and Mianwali. Makarwal exposures are located on the East-scrap slope of the mountain chain of Surghar Range. The place is connected with Kalabagh-Bannu Railway and cemented lorry road which are the side branches of road & railway, separating from main line at Kamar Mashani. The formations at Makarwal have been an Important source of Coal in the Western part of Indo-Pak subcontinent for the last 60 years.

GEOGRAPHY

The highest point along Miranwal Nala is at an altitude of about 3800 feet and the lowest point, about 1305 feet above sea level. The relief is thus considerable.

Topography & Drainage:- The topography is rugged & the shales which usually form high angle slopes are badly eroded. Most of the Lst. & the Iron ore beds form vertical cliffs. Lamshiwall Sst are also cliff forming. Limestones frequently and Shales rarely form ridges between two adjacent nalas. Through the slopes are covered with loose debris of upper rock-beds, the amount of solid rock outcrop is about 60% of the total.

There is no permanent water source.The erosion is active along nalas which are in torrent during rain.These nalas form a dendritic pattern of drainage. Stream capture is very common. The Jurassic limestone & the Belemnite shales are badly eroded and they form walls of gorges.The lower shales very rarely form the beds of the nallas due to deep cutting.

The valley is in the youth stage of erosion because (i) Vertical wall-like cliffs are common. (ii) Gorges & bad lands are found where deepening of valley is much pronounced than the broadening. (iii) The divides between the nalas are wide enough.The ridges of these divides form escarpments.

Vegitation:- The area has extremely hot summers & mild winters. Rainfall is slight. The general structure of the formation provides little posibility of water retention and hence the growth is scarce. The maximum growth is on the top and lower slopes of laki Lst. & along the stream courses especially. The vegation is Xerophytic. Simple grasses, accacia modesta(pully), thorny bushes & thick-leaf small bushes are the growing plants.

STRATIGRAPHY

The stratigraphic succession and the contained fossils are summarised as following.

ERA	AGE	NAME OF BED	THICKNESS	DESCRIPTION OF FOSSILS
C E N O Z O I C	MID. MIOCENE.	Siwalik Sst. Siwalik Congl	Unconformity	
	MIDDLE EOCENE	Laki Lst	More than 1600 Feet	Gastropods see their maximum development in Tertiaries. These include Voluta, Turritella & Cassidaria etc. Foraminifera includes Assilina, Operculina, Miscellania, Nummilites etc. Lamellibranchs include Ostrea Lucina, Aviculopecten etc. Corals include Epitheca, Astrocoenia etc.
		Namal Marl	130 "	
		Patala Sh	402 "	
		Transition Stage	190 "	
	LOWER EOCENE	Ranikot Lst	146-180"	
		Makarwal Stage	150 "	
		Coal Seam	6 4 "	
			Unconformity	
M E S O Z O I C	Lower Cretaceous.	Lumshiwal Sst	340 Feet	Gryphaea, Ostratias, Olcostaphanus, Neocomites, Pleurotomaria, Astrate, Exogyra, Belemnites & some Lamillibranchs.
		Gryphaea Bed	275 "	
		Belemnite "	162-199"	
	Upper Jurassic	Baroach Lst (not fully exposed in main Makarwal area).	Variable 150 to 600 Feet	Lamellibranchs, Gastropods, Corals, Indocephalopods, Belemnites etc.

Description:-

Baroach Limestone:- Greyish colour thin bedded to laminated limestone. A few beds are light yellow, whitish & pinkish. Fossils are abundant. Many of the individual beds of this Lst have silica contents & blacky arenaceous shaly intercalations. At two places impersistant lignite coal 6 " to 9 " thick are also found. Thin ferruginous layers seperate certain beds of limestone.

Belemnite Beds:- The lower shales are greenish in colour, highly fossiliferous & concretionary. Towards the top these become sandy. These beds are also concretionary & nodular, fractured conchoidally & jointed towards top. Gypsum is fairly well devaloped. The iron contents range from 15% at the base to 32% above. These beds become very sandy towards top. Here glauconitic sand is devaloped to extractable quantity. These shaly sand grade into shale upward.

Gryphaea Beds:- Varigated coloured Sst, mud st, silt st & loose shales are common. The dominent colour is reddish & yellow. The shales are fossiliferous, towards top turning siliceous, and at top form gypseous silt stone. Ferrugineous thin layers also run along bedding plane in these silt stone.

Lumshiwal Sandstone:- These are pinkish Sst. of medium to coarse grain size, laminated to thick bedded. Concretions & solution cavities are often found. Towards top the beds become varigated yellow, red & grey in colour. Here shales are found interbedded with sandstone. The top becomes carbonaceous shales. Cross bedding is the peculiar structure of this Sst.

Coal Seam:- Black lignite coal 6" to 4' in thickness is mined along this horizon at numerous places. Pyrite & Siderite are found in this coal.

Makarwal Stage:- This includes fossiliferous shales, Lst, Siltstone and marl. General colour of this bed is greyish. Some of the beds have concretions. Coaly material is scattered in these beds & there cross sections form an irregular network of dark threads.

Ranikot Limestone:- These are nodular Lst with pale yellow colour. These nodules are in matrix of marl. The Lst is highly fossiliferous.

Transition Stage:- Yellowish to brownish grey colour shales, mudstones and limestones. The lower beds are mostly calcareous, becoming shaly towards top, and grade into shales of light green colour.

Patala Shales:- Green coloured, gypeous, loose shales. Some beds are tinted brown.

Namal Marl:- Marly beds containing limestones, shales and clays.

Laki Limestone:- Whitish limestones, in places yellowish and green due to weathering. These limestones are mostly thin bedded to laminated. At places these become cherty and siliceous. Aphinitic, porcellanous facies present. The Upper portion is nodular and knotty and constitutes the major part of Laki Limestone.

THE GEOLOGIC STRUCTURE OF THE SURGHAR RANGE

The entire Surgarh Rnge is a horse shoe-shaped south-plunging anticline, the axis of which turns from east-west and then to south. The eastern limb of these south-plunging portion forms the exposure at Makarwal.

Besides the primary structure which include the stratification of beds & cross bedding(in Sst), both non-diastrophic & diastrophic structures can be found in the area. Among the non-diastrophic structures the most important are the landslides & gravity faults. This has caused a great problem in B section mines where the control station of trollies is collapsing with the result that accidents occur frequently.

Among the diastrophic structures joints, folds & faults are very common. Almost all the rocks are jointed, especially the shales which have multiple joints & fractures. The folds & faults are abundant & can be marked everywhere. These structures sometimes cover the whole region. Following are some examples:-

(A) Fig.2. There is a syncline-anticline structure of

about 600' dimention, along Miranwala nala in Baroch Lst. The upper limb of it becomes an overfold. The water runs in the syncline whereas the axis of the anticline is almost parallel to nala, being in N-S direction

(B) Fig I. The most important structure of the area is the major o erthrust which caused a fall of 1500'-2000' on eastern side. The top of laki Lst is brought to the level of Baroch Lst. The fault plane is in NS direction.

(C) There was another series of faulting in which beds above & below the coal seam (including seam) were disturbed many feet. The combined structure can be called step faulting. Fig 3.

ORIGIN OF FORCES:- Since the Laki limestone is envolved in the disturbances, the forces were hence post-Eocene. All the axes of folds and faults strike in about a N-S direction which indicates that the stresses were from W. and E. directions. The surghar Range is an anticline with axis running E. to W. and then to South, where as the local forces were from E. and W. (as said). The combined effact at Makarwal thus gave birth to a local dome (which is visible from a distance only, in top of Laki limestone).

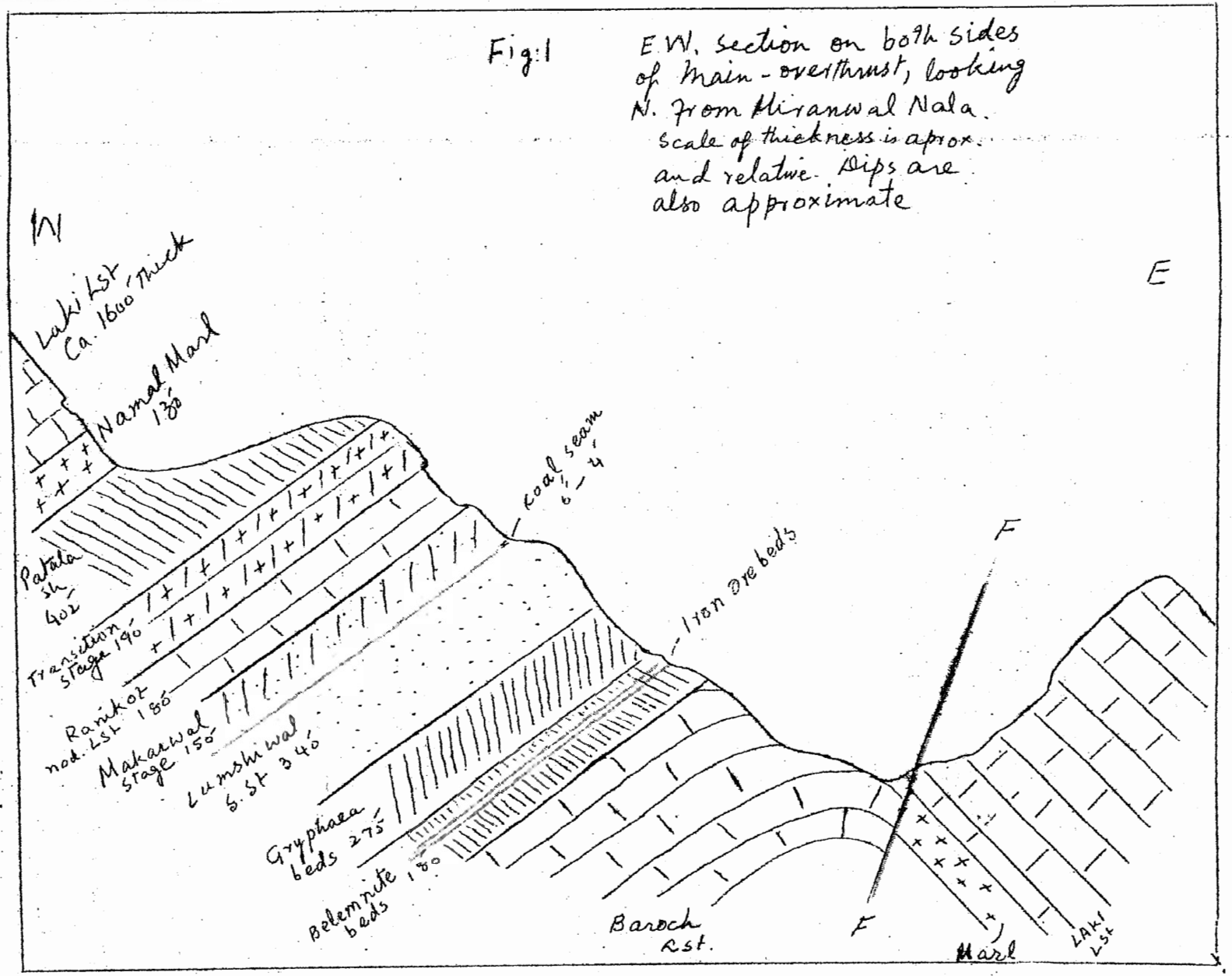
GEOLOGIC HISTORY:-

It is unanimously believed by the geologists that there was a Sea called Tethys, spreading over most of the present lands of W. Pakistan and much beyond it on the Eastern side in the past geologic ages. It was a geosyndinal basin of depoition. Its coastal facies show that there were marine transgressions in earlier Jurassic. The series of resulting deposits are limestones, clays and sand-stones. Baroach limestone is one of such sequence of deposition, with shaly and sandy bands which also mark fluctions of Sea level for short times.

The cross bedding in the Lumshiwal sandstone means that these sands were deposited in shallow water conditions.

Ranikot limestone lies unconformably over Lumshiwal sandst one, which leads to believe that there was a rise in the site of deposition during middle and upper cretaccous, which again sank in Eocene. The lower Eocene coal and the thin coaly layers in Baroach limestones are probably due to either (i) that site of deposition rose, vegetation flourished for something, lagoonal and marshy conditions developed and the beds again sank for further deposition over plant debris, or (ii) during transgressions the sea water spread over an area where the vetation was already present, which sank later and produced coal. The first reason is best because it provides ideal conditions of coal formation.

Fig:1 E.W. section on both sides of Main-overthrust, looking N. from Miranwal Nala. Scale of thickness is aprox. and relative. Dips are also approximate



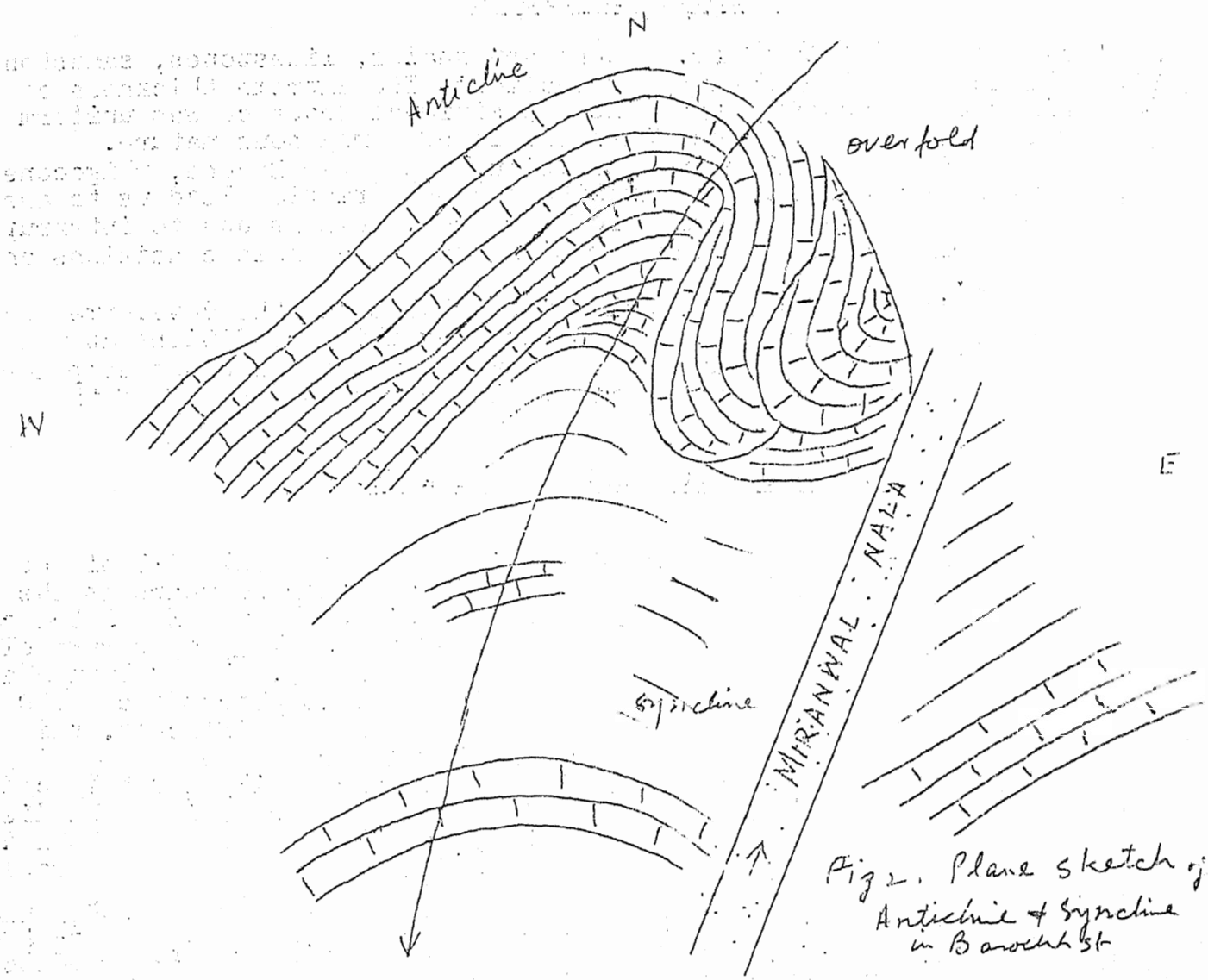


Fig 2. Plane sketch of Anticline & Syncline in Baroch St

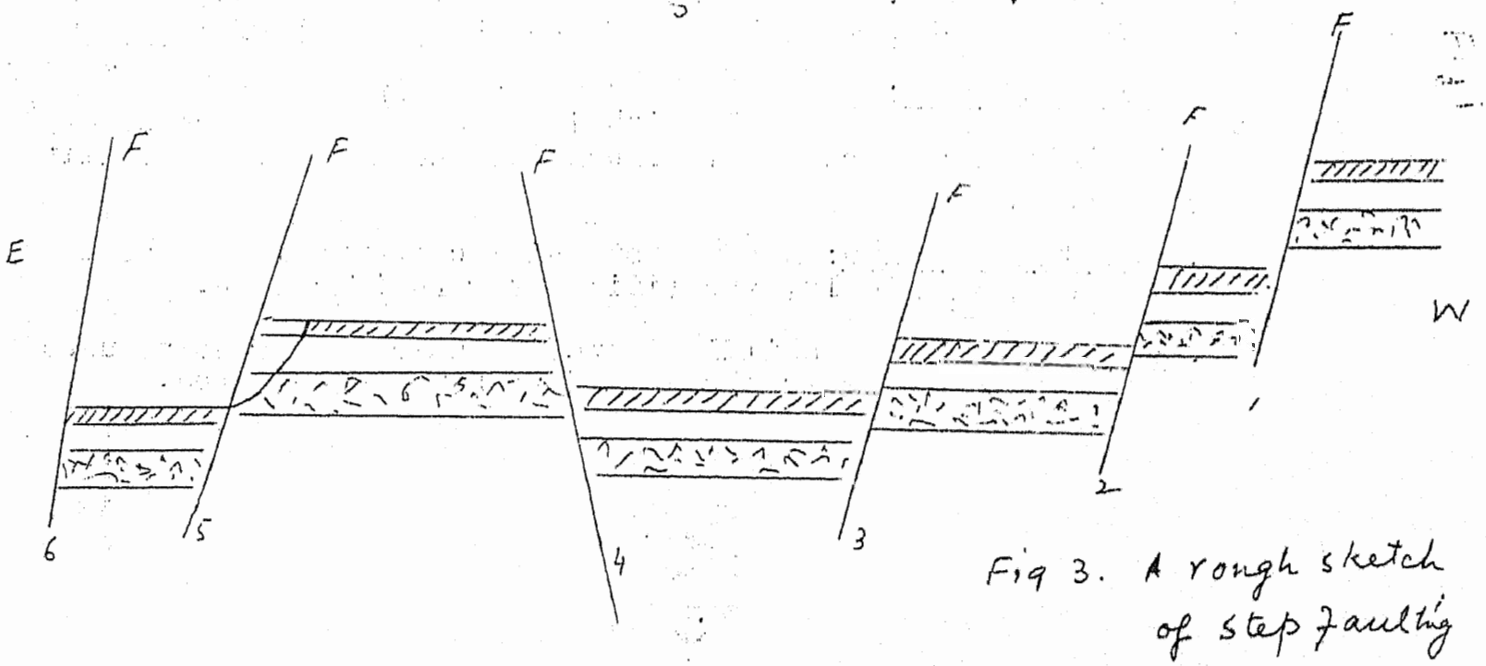


Fig 3. A rough sketch of step faulting

GEOLOGICAL HISTORY

The rest of the beds of Lr. Eocene are shales, limestones, sandstones ltstones which indicate marine fluctuations. The extreme thickness of e Laki Limestones suggests that the depositional sequence was uniform r a long time since since the limestone is of homogenous nature.

There is again a big gap in deposition, the Upper Eocene, Oligocene & wer Miocene being absent. The Siwalik Boulder formation lead us to ass- e that these were brought from a local source. This is due to interrup- ons in the normal cycle of river erosion due to unstable conditions and ense orogeny.

The glauconitic sandstones, Belemnites shales and the development of gnitic coal beds lead to assume that the prevailing conditions at the ne of deposition were warm and humid, however the sea was not deep here. obably thearea constituted the part of the continental shelf of the thys.

ECONOMIC IMPORTANCE OF THE AREA.

A. COAL: Coal has been mined since 1902 and only 1/3 of the coal reserves is left, which can be mined for an other 20 years at the esent rate of production. SAMSON MINE is the biggest mine of all the coal nes of Makarwal Coal Fields. The thickness of the coal seam is variable. places it varies from 6 -4' (six inches to four feet). The faulting has used a considerable displacement of the coal bed. At places about 600' of ck is tunneled in order to reach the coal bed. Though difficult, this ll be inevitable one day when the present levels are worked out. This is ust because Pakistan does not have accessible and easily workable coal posits of enormous magnitude, though huge resources are said to be dis- vered but at greater depths. Among such types of deposits the GONDWANA al of high bituminous quality found in East Pakistan is of considerable portance.

The coal is Lignitic with low heating value. It is highly ban- d and fractured. Contains considerable amount of moisture and has a heat- g value of 8300 B.Th.Units. This coal is used to make Producer Gas and to se Steam. It is of no use for coking purposes because of pyrite contents.

B. IRON ORE BEDS: These are not yet developed into ores. The 46' ck beds are sandy in the lower part with 15% iron contents where as the er beds are 32% rich iron ore beds. Glauconite and a little Greenalite the imputities.

C. GLAUCONITIC SAND: Due to Potassium contents it can be used (i) Fertilizers (ii) Chemicals, and (iii) Water Purification.

D. LIMESTONES: Good building material which can also be used cement industry since gypsum is also found at hand in the area.

****
****
*****
***
*