

# **PC-II SCHEME**



**GOVERNMENT OF THE PUNJAB  
MINES & MINERALS DEPARTMENT**

**ADP (2021 - 24)**

**POTENTIAL EVALUATION OF COAL, IRON  
ORE, LIMESTONE AND OTHER INDUSTRIAL  
MINERALS IN KOH-E-SULEMAN RANGE,  
DISTRICT D.G.KHAN & RAJANPUR**

**AUGUST, 2021**

## PC-II FORM

<b>1. Name by which survey / feasibility will be identified</b>	<b>POTENTIAL EVALUATION OF COAL, IRON ORE, LIMESTONE AND OTHER INDUSTRIAL MINERALS IN KOH-E-SULEMAN RANGE, DISTRICT D.G.KHAN &amp; RAJANPUR</b>
<b>2. Administrative Authorities responsible for:</b> <b>i) Sponsoring</b>  <b>ii) Execution</b>	<b>i)</b> Mines and Minerals Department. Govt. of the Punjab Lahore.  <b>ii)</b> The Director General, Mines and Minerals, Punjab Lahore, through Director, Resource Mapping (Division).
<b>3. Details of Survey</b>  <b>i) General Description and Justification</b>	<b>Introduction:</b>  The scheme is initiated by the Mines & Minerals Department, Govt. of the Punjab for prospecting and evaluating the potential of economic <b>a.</b> Energy, <b>b.</b> Industrial, <b>c.</b> Metallic Minerals Resources in Districts, Dera Ghazi Khan & Rajan Pur (herein after called scheme area). A brief description of the existence of different minerals on the basis of past geological studies, available information on the exploration, prospecting and mining activities in the above Districts are discussed in the instant PC-II to give an understanding of the importance and need for further exploration & exploitation of these mineral resources in untapped areas. In order to create investment opportunities and promote the potential of mineral resources, a comprehensive scheme is initiated through Annual Development Program (ADP 2021-24). Mainly, the Scope of Work involved would be reconnaissance survey, geological mapping, geophysical surveys, drilling and related exploration techniques including adits, pitting, trenching, etc. using necessary machinery and equipment to achieve the objective of the scheme.
<b>(ii) Background Description &amp; Justification:</b>	According to the available past studies, information, geological descriptions and mineral production from the scheme areas, it is believed that these areas contained energy, industrial and metallic mineral resources. Amongst, the main resources are Coal, Iron Ore, Gypsum, Dolomite, Fuller earth, Bentonite, Silica Sand and limestone etc.  Exploration and mining activities of different minerals is going on by Pvt.

and partially Public Sector through the licenses and leases granted by the Mines & Minerals Department under Punjab Mining Concessions Rules 2002. A topo geological map of Suleman Range falling in Dera Ghazi Khan & Rajan Pur areas are attached as "**Annex-A**". Adjoining to the existing concessions (applied & granted), there are untapped areas which can be explored to establish the existence of similar mineral deposits. Therefore, through this ADP scheme, un-granted accessible areas in the Suleman Range falling in Districts Dera Ghazi Khan and Rajan Pur are proposed to be explored to evaluate the mineral potential so that these can be put to open auction for investment and development of the mineral resources to earn revenue for the Government and business/employment opportunities in general.

**Objective:** The objective is to undertake exploration & exploitation of the mineral resources in untapped far-flung remote hilly terrains and plains of the scheme area, where the private sector is shy enough to come forward for exploration risk. Continuity of the geological and stratigraphic successions of the rocks evident that the mineralization may continue in these similar adjoining areas of which the real economic potential is yet to be established. On evaluation of the mineral resources, potential blocks would be carved out and put to open auction under the Punjab Mining Concession Rules, 2002. This will attract the investors giving a confidence for further resource estimation, mine planning and production.

A brief introduction to the existing geological and mineral description within Suleman Range is given below:-

**Suleman Range:**

This mountainous range is mainly exposed in the South West of Punjab in Dera Ghazi Khan & Rajan Pur Districts, comprising sedimentary sequence of rocks present throughout from where a number of minerals are being commercially extracted through various concessions granted under the Punjab Mining Concession Rules, 2002. However, the continuity of different minerals in the areas other than granted under concessions are yet to be explored.

	<p>The available information on the basis of past geological works and the concessions etc. granted in the scheme area is attached as “<b>Annex-B1</b>”. An exercise by Punjab Economic Research Institute (PERI) has also been under taken to support the background knowledge about the scheme areas. According to PERI, the analysis of mineral reserves in Koh-e-Suleman Range at District Dera Ghazi Khan &amp; Rajanpur and list of the publications, provided which is as such attached at <b>Annexure-B2</b>.</p>
<p><b>4)</b> <b>a) Strategy to handle and carryout the mineral exploration work program</b></p>	<p>There is a need to explore promising mineral bearing areas in a scientific and systematic manner. Mines &amp; Minerals Department as a part of its mandate is striving hard to identify the mineral resources to structure the mineral sector as a vibrant and potential sector to attract the domestic and international investors. The present PC-II is a practical step towards the achievement of this objective.</p> <p><b>(i) Requirements of the Project and planning of the sponsoring agency:</b></p> <p>To handle and carryout the minerals prospecting/ exploration, a systematic and geo-scientific approach is essential which needs an adequate team of geologists, mineral exploration tools, machinery, geological survey equipment, drilling rigs, mineral testing labs and pitting/trenching digging instruments etc. Besides, transport/vehicles, boarding, lodging and routine office commodities both at project sites and headquarter office, Lahore are inevitable. Procurement of all these logistics, require a substantial budget &amp; time consumption and is not in line with the policy of the government to involve spending of huge amounts in <b>billion rupees</b> on the purchase and maintenance of such high cost gadgets, human resource, machinery and equipments. The most cost effective and efficient approach is to outsource the execution of above mentioned exploration and prospecting activities through competitive bidding process.</p> <p>For prospecting and exploration of mineral resources, the technical activities involved can be as under:</p> <ul style="list-style-type: none"> <li>➤ Reconnaissance Survey</li> </ul>

- Geological Survey/Mapping
- Geophysical Survey
- Shallow confirmatory drilling
- Pitting, trenching, adits
- Assays (Lab testing)
- Digitization/Geo-referencing of the entire data using remote sensing images & GIS Analysis.

The present organizational structure of the Directorate General of Mines & Minerals, particularly, the mineral prospecting/ exploration human resource is not well established and facilitated because huge financial resources are involved. Therefore, such specialized nature of exploration/prospecting projects are better to be out sourced. However, all managerial, geological coordination, work plans, data handling and results oriented completion of the ADP scheme would be taken up by the available human resource of Resource Mapping Division attached with this project. The project team (from the Resource Mapping Division, RMD) will be deputed to monitor the scheme execution.

**(ii) Work Plan Strategy**

The most efficient and fast track route to undertake and complete such projects, the Scope of Work (SOW) under this ADP scheme will be executed through outsourcing by engagement of Consultant and having relevant technical capability and machinery/equipment arrangements to perform the Scope of Work. Procurement of these services would be carried out as per provisions of the relevant rules (PPRA) and procedures in vogue. For administrative and technical controls, a steering committee would be notified by the Government to ensure the executorial management and achievement of the objective of the scheme. Following members for the steering committee are proposed:-

- |       |   |                 |
|-------|---|-----------------|
| (i)   | Secretary, MMD, Punjab,   | <b>Chairman</b> |
| (ii)  | Director General, M&M, Punjab   | Member          |
| (iii) | Director, (RMD)/Project Director  | Member          |
| (iv)  | Deputy Secretary, (Technical)   | Member          |
| (v)   | Director, Inst. of Geology (PU, LHR)<br>or his Rep. not less than BS-19 | Member          |
| (vi)  | Rep./a senior geologist from GSP<br>not less than BS-18.                | Member          |

<p><b>b) Authorization of Payments</b></p>	<p>(vii) Project Coordinator Member (viii) Project Manager Member</p> <p><b>Note:</b> a) Chairman, DG M&amp;M, Project Director, Project Manager/Coordinator and Rep. of GSP will be the mandatory members constituting the quorum of the steering committee.</p> <p>b) Chairman of the Steering Committee would have the authority to opt. any additional expert as member of the committee.</p> <p>The TORs for the Steering Committee are as follows: -</p> <ul style="list-style-type: none"> <li>➤ Steering Committee will steer execution of the overall project components including ongoing results interpretation, progress reviews.</li> <li>➤ To evaluate and certify the executional activities of SOW.</li> <li>➤ Due diligence on any modification in the SOW without compromising the overall objective of the scheme.</li> <li>➤ To approve the interim, draft and final reports etc. as required in the agreements with the Consultant and Contractor.</li> </ul> <p>Whereas, day to day handling, support management and monitoring of executional works will be carried out by the Project Manager, Project Coordinator and its associated team reporting to the Project Director. The entire project activities will be well managed and coordinated through the Project team. All the Project Team will be deputed and arranged from amongst the officers of Resource Mapping Division based at Hqr's office, Lahore.</p> <p>The payments to the Consultant are to be approved by the steering committee as mentioned above. However, the routine monitoring, logistics, transport, fuel, T.A/D.A and others/miscellaneous expenses will be approved by the Project Director from the budgetary provisions provided in the respective heads of the account.</p>
<p><b>5) Scope of Work</b></p>	<p>In order to achieve the objective of the ADP scheme, the roles of the execution agency, Consultant are very important to define at their respective positions.</p> <p>The information and record of the available exploration/prospecting, mining, production etc. of the minerals under different concessions shown on a consolidated GIS based map will be prepared by</p>

the Licensing and GIS Divisions of the Directorate General of Mines & Minerals.

The Resource Mapping Division as per decisions of the Steering Committee would be strategizing the work plans, monitoring the execution, results orientation achievements, payments processing and completion of the scheme.

Whereas, the Consultant will have their respective responsibilities to execute the Scope of Work of the scheme which is summarily described below:-

### **Scope of Work for the Consultant**

- To review the past literature, studies of the scheme areas, geologically evidencing the presence of the economic minerals.
- To review the information provided by the Client to interpret and correlate the possibility of the existence of potential economic mineral resources in the un-granted areas.
- Under take the reconnaissance survey of the scheme area to identify the potential sites to be included for exploration work.
- To propose and present the promising un-granted areas where the required Scope of Work for exploration/prospecting etc. is to be carried out and shall get approval of the same from the Steering Committee.
- Under take the geological mapping at an appropriate scale using GIS, remote sensing and related modern techniques/applications to produce digitized geological maps and cross section of each minerals of the identified areas.
- To conduct in the scheme area appropriate geophysical surveys as and if required to delineate the sub-surface existence of economic mineral presence.
- To identify the economic minerals zones and give locations of the proposed drilling, pitting and trenching sites.
- Identification and ensuring collection of representative samples of each mineral from each site/location/interval for its appropriate handling, preservation and transportation to the lab.
- Preparation of digitized geo-chemical maps in accordance with the lab analysis results and geological controls.
- Prepare economically potential blocks of areas for energy, industrial and metallic minerals.

	<ul style="list-style-type: none"> <li>• Ensure QA/QC measures and safety/environment standards</li> <li>• Facilitate the Client for accessibility to all types of data, both at working sites and office etc.</li> <li>• Facilitate monitoring, supervision and inspections etc. to the officers and staff of the Client as and when required during the execution of the exploration/prospecting works in the scheme area.</li> <li>• Prepare and submit monthly/quarterly progress reports to the Client as per schedule and program.</li> <li>• Prepare and submit reports as deliverables linked with the payment schedule for the approval of the Steering Committee.</li> <li>• Prepare and submit draft final report on each economic mineral in a particular area/block.</li> <li>• Prepare and submit final report on each economic mineral in a particular area/block for approval of the Steering Committee.</li> </ul>												
<b>6) TORs for the Consultant</b>	Detailed Terms of Reference for the Consultant, scope of work, deliverables and Time lines is elaborated in the attached <b>Annex- C.</b>												
<b>7) Implementation period</b>	<table border="1"> <thead> <tr> <th data-bbox="524 1003 799 1058">PERIOD</th> <th data-bbox="799 1003 1406 1058">WORK ACTIVITY</th> </tr> </thead> <tbody> <tr> <td data-bbox="524 1058 799 1163">One (1) month</td> <td data-bbox="799 1058 1406 1163">Advertisement/Processing for hiring of Consultant.</td> </tr> <tr> <td data-bbox="524 1163 799 1268">One (1) month</td> <td data-bbox="799 1163 1406 1268">Selection/Agreement and award of work to the Consultant.</td> </tr> <tr> <td data-bbox="524 1268 799 1730">Two (2) months</td> <td data-bbox="799 1268 1406 1730"> <ul style="list-style-type: none"> <li>• To review the past literature, studies of the scheme areas, geologically evidencing the presence of the economic minerals.</li> <li>• To review the information and record of the exploration/prospecting, mining, production etc. of the minerals under the concessions.</li> <li>• To propose and present the promising areas to carry out the required Scope of Work for exploration/prospecting etc. and get approval of the SOW from the Steering Committee.</li> </ul> </td> </tr> <tr> <td data-bbox="524 1730 799 1835"><b>Twenty months (20)</b></td> <td data-bbox="799 1730 1406 1835">Execution, supervision, report writing etc. as per Scope of Work of the Consultant.</td> </tr> <tr> <td data-bbox="524 1835 799 1873"><b>Total: 24 months</b></td> <td data-bbox="799 1835 1406 1873">Completion of the whole scheme activities.</td> </tr> </tbody> </table>	PERIOD	WORK ACTIVITY	One (1) month	Advertisement/Processing for hiring of Consultant.	One (1) month	Selection/Agreement and award of work to the Consultant.	Two (2) months	<ul style="list-style-type: none"> <li>• To review the past literature, studies of the scheme areas, geologically evidencing the presence of the economic minerals.</li> <li>• To review the information and record of the exploration/prospecting, mining, production etc. of the minerals under the concessions.</li> <li>• To propose and present the promising areas to carry out the required Scope of Work for exploration/prospecting etc. and get approval of the SOW from the Steering Committee.</li> </ul>	<b>Twenty months (20)</b>	Execution, supervision, report writing etc. as per Scope of Work of the Consultant.	<b>Total: 24 months</b>	Completion of the whole scheme activities.
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<p><b>8) Manpower requirement and execution plan</b></p>	<p>To handle the supervisory and monitoring activities on day to day basis by the Client, services of the requisite technical officers would be avail from the Resource Mapping Division and essential supporting staff would be availed from the existing strength of the DGMM office.</p>
	<p><b>Operational Mechanisms:-</b>  The areas under study in this ADP scheme, consist of vast hilly terrains and plains. Therefore, the office of the Deputy Director, Mines &amp; Minerals, Dera Ghazi Khan would be used as the project office. The Deputy Manager (Mineral Data Geo-chemistry), RM Division, Mines &amp; Minerals headquarter office would be notified as Project Manager. However, the expenses and requirements for monitoring, inspections of the field activities, travelling, camping/boarding-lodging, rental 4×4 vehicle(s) etc. will be met from the cost of the scheme. Since, the Steering Committee Members from different tiers of the Mines &amp; Minerals Department would be based at Lahore, therefore, the office of the Director Resource Mapping Division of DGMM office Lahore would be coordinating the implementation of the SOW to update the Government and the high ups from time to time.</p>
<p><b>9) Vehicles/Transport Requirements</b></p>	<p>For monitoring of the field works and project coordination activities on day to day basis by the project related officers and staff etc., the vehicles from the existing offices would be preferably utilized. However, the POL charges will be drawn from the cost of the scheme as there is always shortage of POL routine budgets. However, in case of non-availability the vehicles, the same may also be availed on rental basis with the approval of the Project Director. All project related staff will draw TA/DA from the cost of the scheme. This alternate arrangement is inevitable because most of the times Government vehicles are not adequately available due to other official duties, therefore, the Project activities requiring it's own monitoring to follow the objective, quality and time lines, physical monitoring should not be suffered.</p>
<p><b>10) Year wise estimated cost</b></p>	<p>Keeping in view the budget provisions of the current year and forecasting the expenditures in the years 2022-23 and 2023-24, the year wise</p>

estimated costs are as follows:-

<u>FISCAL YEAR</u>	<u>ESTIMATED COST</u> (Rs. in Millions)
2021-22	25.00
2022-23	125.00
2023-24	30.00
<b>TOTAL COST</b>	<b>180.00</b>

Summary of the breakup of cost estimates are given at **Annex-D**. Consultant's man months and breakup of it's work and services along with unit costs where existed is given at **Annex-E**. Activity wise details are given at **Annex-F**. Deliverables and timelines are given at **Annex-G**.

**11) Financial Plan**

Source of funding includes domestic source. No foreign component is included in the cost. Main expenditures, incurred under the scheme would be met out of the allocated budget. Entire allocated amount shall be utilized under the sub heads of revenue and as provided under the law.

Following would be the main expenditure centers:-

- Major amount (Rs.174.20 million) is proposed to be incurred for the payments to others for services to be rendered. (Services i.e., Consultancy, Geo-Physical & Geological Surveys, Pitting, Trenching & Drilling, Lab Testing/Assays, report writing. Rented vehicles where required by the Officers/Staff of the Executing Agency and for the far flung hilly terrains where routine transport/vehicle may not be useful).
- A minor amount of Rs.5.80 million is proposed to be incurred on advertisement (in case), Purchase of IT Equipment (Two Laptops, One Color Printer and One Scanner), POL, TA/DA and others expenses for the effective and close monitoring of the project activities by the executing agency and to achieve the objective of the ADP scheme.

**12) Expected outcomes of the survey study and details of the Project likely to be submitted after the survey.**

Exploration/prospecting of the scheme areas would result in evaluating the economic potential and probable mineral resources in the Dera Ghazi Khan & Rajan Pur Districts. Economically viable blocks will be carved out over the areas where the mineral prospects are evaluated and would be offered to the intending investors through competitive bidding process for the grant of mining leases under the Punjab Mining

Concession Rules, 2002. Through this bidding process, a handsome revenue may be generated for the Government Exchequer along with regular receipt of royalty on the produced and dispatched minerals. On the other hand numerous employment opportunities in the far flung neglected areas of South Punjab creating economic activity of production of mineral resources will be created to feed and meet the domestic mineral based industries. There are also bright prospects of the export of raw minerals, ores and valuable mineral products through the CPEC road/route adjoining to the South Punjab. Hence, the scheme would be a contribution to develop the mineral wealth in the South Punjab and an overall growth of GDP.



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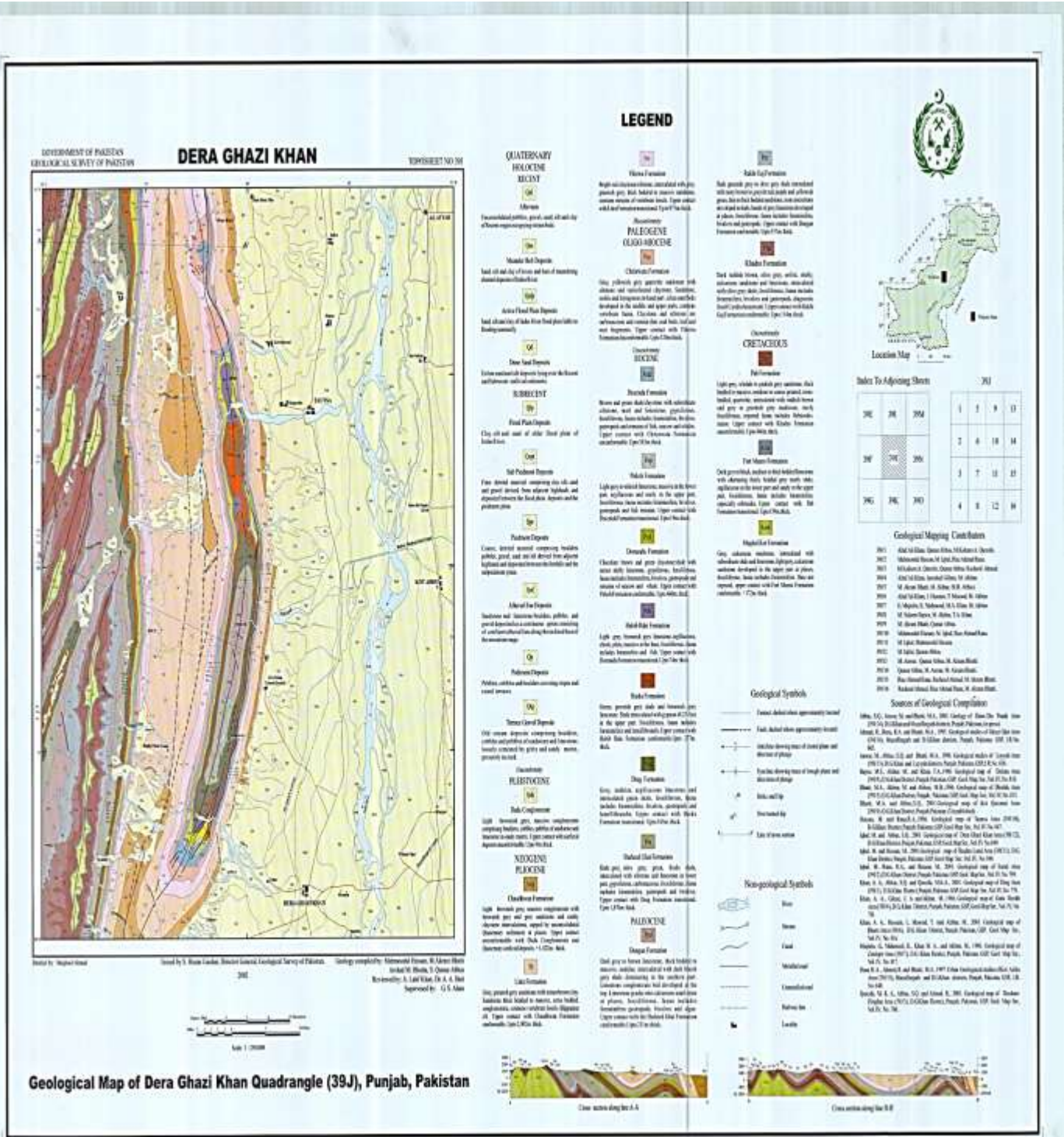


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**SECRETARY**  
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**APPROVED BY:**

# ANNEXURE-A

## TOPO GEOLOGICAL MAP OF DERA GHAZI KHAN AREA SHOWING THE EXISTENCE AND EXPOSURE OF SULEMAN RANGE



## ANNEXURE-B1

### **AVAILABLE INFORMATION ABOUT THE MINERAL RESOURCES IN DERA GHAZI KHAN & RAJAN PUR AREAS**

In the South Western part of the Punjab Province, a sedimentary sequence of **Suleman Range** is exposed in Dera Ghazi Khan & Rajan Pur Districts, from where certain industrial minerals are being commercially extracted. The potential of coal and iron ore in this Range is yet to be established; besides other important industrial minerals like gypsum, dolomite, limestone, Fuller earth, silica sand, fireclay, barite etc.

**1. Coal:** Previous work undertaken by the Geological Survey of Pakistan (GPS) indicates presence of coal / carbonaceous shales in the Domanda Formation and Drazinda Formation of Eocene age, in DG Khan district. Indication of coal has also been reported from the Chiterwata Formation, of Oligocene age, in the same district of DG Khan. Coal seam in a mine near Rakhi Munh Hills was studied by the Geological Survey of Pakistan and a coal seam of 0.33 to 0.41 meters thick was touched. Similarly another coal seam of 0.2 to 0.3 meters thick has also been reported in the same Domanda Formation near the localities of Kahhan BMP Post, Zain BMP post and Mahoi Nallah areas. Presence of coal seam having thickness of 0.76 meter has also been reported by GSP in the Chiterwata Formation of Oligocene age near the Khador, BMP post. However presence of carbonaceous shales are also reported in the Drazinda Shales of Eocene age near village Haftgarh.

Following is the summary of coal occurrences in D.G. Khan & Rajan Pur.

#### COAL OCCURRENCES IN THE D.G.KHAN & RAJAN PUR DISTRICTS

Sr. No.	Location	Coordinates		Sheet No.	Seam Thickness & Trend	Associated Rock formation	Remarks
		Latitudes "DD"	Longitude "DD"				
1.	RakhiMunh Mine (3km from D.G.Khan-Fort Munro Road)	29°57'55" N	70°7'12"	39 k/1	0.33 to 0.41 m Trend N20W/55 SE	Coal bed in 41.6m below Pirkhoh Limestone in Domada formation of Eocene age. Eastern limb of Fort Munro Anticline	At the depth of 37 meters. Production of 100 ton was made from the mine.

2.	Kahhan BMP post area	29°49'06"N 29°45'10"N 29°44'56"N	70°03'07" 70°02'40" 70°02'38"	39 k/1	(i) 0.30 m Trend N15w/575E (ii) Thin Carbonaceous Mudstone layer (iii) Thin coaly zone 2.5m	-do-	—
3.	Mahori Area	30°32'51"N	70°31'13"	39J/10	0.3m	Domada formation ZindaPir	—
4.	Zain BMP. Post Area (Chowkiwal Bhart Road)	30°34'52"	70°30'17"	39J/6	0.2-0.3 m Trend N 10 W/ 43 SE	-do-	—
5.	Haft Garh D.G.Khan – Taunsa Road	30°25'00"N	70°31'14"	39J/11	60cm layer of coal flakes in Papery Shales	Middle Part of Drazinda Formation	—
6.	Khandor BMP Approachable from SakhiSerwar	30°13'55"	70°12'47"	39J/4	0.67m Trend NS/40E	Chitterwatta Formation Of Oligocene Age	

The Geological Survey of Pakistan had therefore recommended further exploration activities in the Suleman Range under the above said significant results.

## 2. Iron Ore

Economic deposits of iron ore with sedimentary nature have been reported in the RakhiMunh Hills, district D.G. Khan. Iron ore deposits of Rakhi Munh are relatively of low grade and found along the linear belt near Fort Manroo which is stretching along north south direction having length of about 25 km, district DG Khan. The ore body mainly consists of limonite, siderite and chemosite etc.

### **RAKHIMUNH, DG KHAN IRON ORE DEPOSITS**

These deposits are located two kilometers west of RakhiMunh Hills, which is about 53 kilometers west of D.G. Khan. These deposits are of Eocene-Oligocene age.

The iron occurs as banded iron ore and is exposed in the foothills of the Rakhi Munh area. The overlying beds are ferruginous shales. The Rakhi Munh iron ore deposits

constitute a single sedimentary iron ore bed commonly called Rakhi MunhIron Ore Bed which marks the unconformable boundary between the Eocene and Oligocene strata dipping at 60<sup>0</sup> to 70<sup>0</sup> and almost vertical at places. The iron ore bed is traceable persistently, with varying thickness and grade, for a stretch of 25 kms from Choti Nai area in the south to Shadan Nala Valley in the north. Thickness of the bed varies from 30 to 65 cms. On the northern and southern extremes and upto 1.85 meters in the middle part forming a lenticular pattern.

The constituent minerals include limonite, goethite and siderite. Average grade is 32-34% Fe<sub>2</sub>O<sub>3</sub>. Estimated resources are 268.3 million tons.

<b>CHEMICAL COMPOSITION</b>	
Iron (Fe)	37.5 %
Silica (SiO <sub>2</sub> )	13.9 %
Alumina (Al <sub>2</sub> O)	07.4 %
Calcium & Magnesium Oxides (CaO + MgO)	06.6 %
Manganese (Mn)	01.8

### **3. Fuller Earth.**

Fuller earth is a non-plastic clay or clay like material, usually high in magnesia that has adequate decolorizing and purifying properties. It can be used as decolorizing/bleaching agent. It is mainly used in oil industry and in foundries. The districts of D.G. Khan & Rajan Pur in the Punjab Province is the prominent area where extensive deposits have been known to occur. It is formed along the flood plains of ancient river channels. The Paleocene Eocene Rocks which had been deposited with coal in Punjab contained Fuller earth in the adjoining areas. With activation of this clay, it may be used for purification of vegetable oil and ghee industry. It is also being used in making insecticide. It is also an excellent binding agent for different minerals in foundries and steel industries. An exploration study can be carried out to quantify the potential and continuity of Fuller earth deposits in the Suleman Range, South Punjab.

#### **4. Gypsum**

Gypsum, known to mankind since its earliest days, is the most common calcium sulphate mineral ( $\text{Ca}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ ). Its composition ranges upto 75% calcium sulfate and 21% water. It is mainly used as a raw material for Cement, some fertilizer and plaster of Paris etc. Extensive work is required for evaluation of its proved deposits and determining the process of its value addition. The Suleman Range have been bestowed with the extensive deposits of Gypsum in the province of Punjab.

In view of the above, it will be appropriate to undertake reconnaissance, Geophysical exploration if necessary and prospection activities for these minerals under the instant scheme corresponding to the Suleman Range falling in Districts Dera Ghazi Khan & Rajan Pur.

#### **5. Limestone**

The term limestone includes those rocks which contain more than 50% mineral calcite ( $\text{CaCO}_3$ ) and dolomite ( $\text{CaMgCO}_3$ )<sub>2</sub>. Limestone deposits are extensively formed on continental shelves as detrital, biogenic or chemical precipitates.

Limestone is extensively used as concrete aggregates and gravel after crushing. It is also the basic raw material for Portland cements. Limestone is also used as the fluxing agent, soil conditioner, source of lime, chemical raw material and as dimension stone. Variegated, in exhaustible deposits of limestone are found in Suleman Range, most of which are being used in different projects. Detailed study for evaluation and value addition products is required.

#### **6. Silica Sand/Glass Sand.**

Quartz Sand, free of impurities, is used as silica sand or glass sand. Areas falling in the D.G. Khan & Rajan Pur Districts comprise of different qualities of Silica Sand. Coarse grained silica sand is used as abrasive material and in the manufacture of glass and some chemicals. It is also used in re-factory and metallurgical applications. The foundry requirements are met with molding sand (rounded grains) found in various parts of the Punjab Province, particularly in the Suleman Range. Locally produced glass/Silica Sand is used for making sheet glass and bottles. Extensive work is required to determine its potential deposits.

#### **7. Any Other Mineral.**

Any other economic minerals are included in this PC-II as is to be explored during execution of the Scope of Work.



### **ANALYSIS OF MINERAL RESERVES IN KOH-E-SULEMAN AT DISTRICTS D. G. KHAN AND RAJANPUR BY PERI, P&D BOARD, GOVERNMENT OF THE PUNJAB**

*(Source: Policy Paper Unveiling the Mineral Reserves in Punjab: A case of Attock, D.G.Khan, and Rajanpur by Punjab Economic Research Institute, PERI 2020-02)*

This part provides content analysis, based on previous studies to confirm the existence of coal, barite, iron ore, gypsum, fuller earth, and limestone in the Koh-e-Suleman at Districts of D. G. Khan and Rajanpur. The results of the content analysis and available literature provided evidence of the existence of the above mentioned potential mineral deposits in the Districts of D. G. Khan and Rajanpur as depicted in table 4. However, the available literature does not support the existence of Barite in the region of the Southern Punjab.

To support the content analysis, a more thematic approach is used to provide the arguments in favor of the existence of potential mineral deposits in these regions. (Shah, 2018) studied and explicated the strategies for mineral sector development in Pakistan. In this exploratory study, several secondary sources like the GSP and the Small and Medium Development Authority (SMEDA) were reviewed.

The study explicitly suggested the existence of gypsum in several areas of the Punjab. It was added that gypsum reserves can be found in the regions of D. G. Khan, Mianwali, Rohri, Kohat, Sibi, and Quetta. This study also discussed the existence of other potential minerals like coal and iron ore, yet, it remained silent on the exact placement of minerals near the Districts of D. G. Khan and Rajanpur.

Similarly, Alyani and Malkani (2018) conducted a study that highlighted the existence of iron ore and limestone in the districts of D. G. Khan and Rajanpur and provided the preliminary status of the formations. Furthermore, it confirmed the existence of limestone, mudstone, sandstone, red muds at Fort Munro, and Rakhi Gaj while shale, rubbly limestone, gypsum, and others at Sakhi Sarwar in the D. G. Khan. Additionally, it claimed the presence of economic mineral commodities including fuller earth and other cement raw materials in these formations.

According to a study by Mahmood *et al.* (2017), minerals in varied geographical formations were found in the Southern Punjab and the Northern Punjab. In this study, several prospecting tools like lithology, structure, paleobiogeography, revised stratigraphy, geodynamics/ tectonics, geological history, and paleontology were used to observe the presence of minerals in these areas. Several coal formations including fireclay, iron ore (Rakhi Munh), silica sand, shale, fuller earth, limestone, gypsum (2 billion tons in the Rajanpur and 9 billion tons in the D. G. Khan), and cement raw materials were found in the Districts of D. G. Khan and Rajanpur alongside celestite deposits, heavy mineral placer deposits, and bentonite in the Suleman fold belt.

Similarly, in another study conducted by Malkani *et al.* (2016), several geographic formations were observed to ensure and update the status of minerals in Pakistan. For this study, several field visits were conducted to make new discoveries along with the consultation with the previous work done. Furthermore, preliminary prospecting tools were used to determine the existence of these minerals in these regions. The results suggested the presence of fuller earth, iron ore, fire clay, silica sand, and cement raw material (Shale, gypsum, and limestone) in the areas of Rajanpur and D. G. Khan.

In another study by Malkani and Shah (2014), the formation of Chamalang coal fields was discussed. Additionally, preliminary prospecting techniques like stratigraphy and general geology techniques were used to ensure the existence of several minerals in these formations. The study suggested that the presence of coal, limestone, gypsum, sandstone, marl, and shale in Chamalang coal fields (Middle Indus Suleman range).

Gondal, Ahsan, and Javid (2008) also studied Sakhi Sarwar and Rajanpur aggregates by using geotechnical and petro-graphical techniques. The results of the study confirmed the presence of limestone, sandstone, and gypsum at Sakhi Sarwar, Girdu, Pitok Nullah, Zungi Nullah, Khalgari, and Kaha Nullahs in the Southern Punjab.

Hassan, Bhatti, Bhutta, and Abbas (2001) argued that several mineral resources like gypsum, fuller's earth, barite, iron ore, coal, and limestone etc. can be found in several regions and formations of D. G. Khan. This report highlights the existence of these mineral deposits in the areas like Zinda Pir, Safed Koh, Taunsa, Vidor, Rakhi Munh, Rodho, Sanghar, Dalana, Rakhi Gaj, Baghal Chur, Dagar, Nangar Nai, and Fort Munro etc.

According to findings, several gypsum reserves were identified along with the potential reserves. Moreover, samples from the Dungan formation and the Ghazij shale provided evidence of the existence of limestone and coal in the region as well. It was also submitted that with the average dip depth of 50 feet in eastern and western flanks of Zinda Pir and in Rakhi Munh, the gypsum reserve estimates can make up to 27, 12, and 27 million tons respectively. Finally, the authors recommended an open-pit technique for mining. Even though this study is quite comprehensive, however, it was conducted in 1970 while using obsolete methods. This feasibility report and reserve estimation figures are questionable due to the use of outdated approaches and a long-time lag.

In another study by Shah (2002), lithostratigraphic units of the Sulaiman and Kirthar were identified along with the existence of potential minerals. This study classified these regions in different formations which were classified as per the era, period, epoch, and age of the formation. This study identified the presence of celestite, limestone (of various colors, and type), claystone, siltstone, sandstone, shales, coal, marl, and gypsum in these formations. So, to have a better idea about the reserve estimates in the region, it would be imperative to conduct such a study, while using the latest technology available in the region.

### **LIST OF PUBLICATIONS**

<b>Sr. No.</b>	<b>Authors</b>	<b>Name of Publication</b>
<b>1</b>	Shah (2018)	Strategy for Mineral Sector Development in Pakistan
<b>2</b>	Alyani and Malkani (2018)	Lithostratigraphy, Economic and Vertebrate Significance of Fort Munro Anticlinorium, Dera Ghazi Khan (D. G. Khan) Rajanpur Districts of Punjab and Dera Bugti And Barkhan Districts of Balochistan, Pakistan
<b>3</b>	Mahmood et al. (2017)	Mineral Resources of North and South Punjab, Pakistan
<b>4</b>	Malkani et al. (2016)	Mineral Resources of Pakistan-An Update
<b>5</b>	Malkani and Shah (2014)	Chamalang Coal Resources and Their Depositional Environments, Balochistan, Pakistan
<b>6</b>	Gondal et al. (2008)	Evaluation of Shaki Sarwar And Rajan Pur Aggregates for Construction in Southern Punjab Province, Pakistan
<b>7</b>	Hussain (2003)	Mineral Sector: Vision and Strategy
<b>8</b>	Hassan et al. (2001)	Geology and Mineral Resource of D. G. Khan and Rajanpur Areas, Eastern Sulaiman Range, Punjab, Pakistan
<b>9</b>	Shah (2002)	Lithostratigraphic Units of the Sulaiman and Kirthar Provinces, Lower Indus Basin, Pakistan
<b>10</b>	Hussain and Mustafa (1970)	Gypsum Deposits of Dera Ghazi Khan District, Punjab Province.

**TERMS OF REFERENCE (TORs) FOR THE CONSULTANT  
REGARDING PROJECT, TITLED AS:-**

**POTENTIAL EVALUATION OF COAL, IRON ORE, LIMESTONE  
AND OTHER INDUSTRIAL MINERALS IN KOH-E-SULEMAN  
RANGE, DISTRICT D.G.KHAN & RAJANPUR**

**1) BACKGROUND AND OBJECTIVE**

Mines & Minerals Department, Govt. of the Punjab has one of the mandates to explore and evaluate the mineral resources of the province. It has recently, undertook detailed exploration program for coal in the Salt Range/Trans Indus Range and Iron ore in Chiniot - Rajoa and adjoining areas at International Standards through renowned International Consulting and Consultant firms.

Suleman Range falling in Districts Dera Ghazi Khan & Rajan Pur have a variety of Industrial, metallic and energy minerals including Gypsum, Dolomite, Fuller Earth, Silica Sand, Limestone, Iron ore and Coal, besides other minerals of economic potential. Different minerals and areas are already granted to the private and public sector entities for exploration and mining, but the pace of development of these important mineral commodities is not according to the real potential of the minerals. There are areas which are still untapped and the private sector is shy enough to invest in it. As a result of that, the mineral production growth is very slow.

As part of the mandate of the Mines & Minerals Department, Government of the Punjab is desirous to evaluate the hidden mineral potential of those areas which have not so far been granted under the mineral concessions so that after determination of these mineral bearing areas, they may be presented for grant of concessions through competitive bidding process and bring investment and economic opportunities in the remote and far flung areas of districts Dera Ghazi Khan & Rajan Pur for its prosperity and mineral sector contribution towards the overall economic growth.

A detailed background of the mineral deposits information based on the past regional geological studies and the Mines & Minerals activities through concessions is described at **Annexure-B1 & B2.**

In order to meet the vision of the Government, Directorate General, of Mines & Minerals Punjab (hereinafter called as the “**Client**”) has planned to undertake a Mineral Resource Potential Evaluation of industrial, metallic and energy minerals in Dera Ghazi Khan & Rajan Pur Areas (herein

after called as **Scheme Area**) through an Annual Development Program (ADP Scheme-2021-2023). For this purpose, the services of a "Consultant cum Contractor Firm" (here in after called the **Consultant cum Contractor**) are to be hired.

2) **OBJECTIVE OF THE CONSULTANCY**

The objective of the Consultancy is to explore Energy, Industrial and Metallic Minerals and to identify the economic potential mineral bearing areas in host formations of the scheme area as per Scope of Work.

3) **SCOPE, DUTIES AND RESPONSIBILITIES OF THE CONSULTANT**

The Scope of work (SOW) for the Consultant would include but not limited to the following: -

**General Terms**

The Consultant shall exercise all reasonable care to protect the interests of the Client; ensure timely supervision, execution and control of the works. In addition the Consultant would also be responsible to avoid occurrences of disorders of prospecting and exploration activities during the execution of the scope of works; guarantee a timely implementation and efficient use of financial resources.

The Consultant shall also maintain a continuous presence of its relevant experts and staff on the sites of works for smooth execution of the project activities. The Consultant will complete the job and submission of the reports etc. within a period of two years from the date of award of Contractor.

**Technical Terms**

The Consultant would be responsible to execute the Services & Works following the Scope of Work indicated in this PC-II, ADP scheme and details given below:-

- i) Availing and getting at its own cost and expenses of the relevant past geological reports/studies/maps, data etc. reported/indicated by different private/public sector organizations on the occurrence, deposition and presence of the minerals

in the areas under study of Districts Dera Ghazi Khan & Rajan Pur (referred to as the Past Literature) for review and evaluation of the Client.

- ii)** The Exploration/Mineral Potential Evaluation Program should include but not limited to the following:
  - The preliminary reconnaissance survey of Suleman Range areas fall in Districts DG.Khan and Rajan Pur.
  - The details of site surveys required (geological, geophysical surveys etc. and as may be others).
  - Submission of detailed geological and geophysical maps showing the probable location of the promising mineral sites of the project area.
  - The proposed Pitting / trenching / adits and sampling program (as may be required) along with location maps and coordinates, prepared and submitted to the Client.
  - The proposed drilling program, borehole locations with coordinates shown on the maps submitted to the Client and after approval, drilling will be executed.
  - Requirement of the types of sample analysis for different minerals and areas.
  - Any value added work to be proposed by the Consultant to meet the objective of the ADP scheme, submitted to the Client.
- iii)** Submission to the Client, the details/list/ references of the past literature consulted by the Consultant.
- iv)** Preparation and submission to the Client an inception report as an outcome of the review of the past literature and recommendations for the prospecting/exploration program in the identified/promising areas of Punjab with justification.
- v)** Participate in the meetings, record minutes and follow up the implementation of the instructions issued by the Client from time to time during performance / execution of the Scope of Work
- vi)** Undertake reconnaissance/geological surveys of the promising areas for proposing prospection and exploration program of Minerals throughout the project area.
- vii)** Present the proposed exploration program before the Steering Committee with the help of necessary descriptions, maps, illustrations, diagrams and analysis reports etc. The formation of the Steering Committee would be notified by the competent authority.
- viii)** Preparation of final program including the recommendations of the Steering Committee for its approval.
- ix)** Framing of the SOW in a clear sequential manner including QA/QC measures.

- x) Specify the equipment, tools, machinery, drilling rigs etc. required for the execution of the SOW.
- xi) Preparation of a comprehensive monitoring program for the supervision of the execution of the SOW mentioning the human resource, transport and other logistics including (boarding / lodging etc.)
- xii) Preparation of a Comprehensive periodic, interim, midterm, draft final and final report etc. of the respective areas and minerals elaborated by necessary analytical comments with a view to attract the domestic and foreign investors including the industrial and commercial aspects.
- xiii) The Consultant will also give training exposure to the nominated staff/officers of the Clients department on ongoing all executional works at sites.
- xiv) The Consultant will provide the Client, 20 both hard and soft copies for all documentary reports, Maps, Assays, Lithologs, Geophysical data etc.

### **Financial Terms**

- i) The Consultant will claim payment on the basis of "part work done" part payment.
- ii) 10% of each bill submitted by the Consultant will be retained and paid at the time of final payment.
- iii) The settlement of final bill will be made upon the acceptance of Final Report.
- iv) The Client will make the payment to the Consultant in Pak Rupees subject to deduction of all types of Government taxes.
- v) Expenditures incurred on mobilization of all kinds of machinery, equipment and instruments etc. for the job will be borne by the Consultant itself.
- vi) The skilled/unskilled personnel's deployed by the Consultant will be paid by the Consultant itself.

#### **4) ARBITRATION**

In case the Consultant is aggrieved by any decision of the Client it can approach, the Secretary, Mines & Minerals Department, Government of the Punjab, who will act as sole arbitrator.

#### **5) ROLE OF CLIENT AGENCY**

Client agency will monitor all the project activities running in field and lab as well. Client will evaluate the proposals; reports presented by the Consultant and process the

approvals of deliverables after thorough deliberations and directions from the steering committee.

## **6) TIME DURATION FOR PROPOSED CONSULTANCY**

Subject ADP Scheme is formulated for twenty four (24) months and Consultant work is spanned over the period of twenty two (22) months including all desk studies, field surveys and sample collections, lab testing and final report submission.

Detailed man month is provided in **Annexure-E** for further explanation.

## **7) INDICATIVE MINERALS/AREAS OF STUDIES**

The SOW to be executed by the Consultant in Districts Dera Ghazi Khan & Rajan Pur may include but not limited to the following minerals and areas. These areas are just indicative on the basis of existing information with the Client, therefore, other areas containing potential economic minerals will also be considered included in the Scope of Work and Project area.

The Consultant would be responsible and expected to identify additional promising areas as per his own studies/evaluation. Selection of areas for exploration program would therefore, be finalized by the steering committee of the scheme.

### **(A) COAL**

#### **a. Suleman Range**

- Rakhi Munh (D.G.Khan - Fort Munro Road, Wadoor Nala to Quetta Road).
- Kahhan BMP area (Tibbi Lundan to Chhachar Nala).
- Mahoi area (Barthi Road to Zinda Pir Nala).
- Zain BMP area (Chowkiwal Bharthi Road).
- Haft Garh, D.G.Khan – Taunsa Road.
- Khandor BMP Approachable from Sakhi Sarwar.

### **(B) IRON ORE**

A comprehensive geological study and drilling in the Rakhi Mounh Hills (Wadoor Nala to Quetta Road) to substantiate the worth and potential of iron ore deposits is required.



### (C). INDUSTRIAL MINERALS

The Industrial Minerals in Suleman Range and their possibility may include; Gypsum, Fireclay, Laterite, Bentonite, Barite, Flourite, Bauxite, Silica Sand, Limestone, Commercial Marble, Dolomite, Fuller Earth and Iron ore etc. The indicate areas can be Wadoor Nala to Quetta Road, Tibbi Lundan to Chhachar Nala, Barthi Road to Zinda Pir Nala, Chowkiwal Bhart Road, D.G.Khan – Taunsa Road and Sakhi Sarwar.

#### 8) CHANGE IN SCOPE OF WORK.

For any change in the Scope of Work of the Consultant and the corresponding revision of the costs, the matter will be referred to the "Steering Committee" of the scheme. Steering Committee would have the power to include/exclude and examine the changes for improvement in the scope of work along with revision of cost if any and prepare final recommendations to proceed further for approval by the competent forum. The Steering Committee will be notified by the Secretary, Mines & Minerals Department, Government of the Punjab, Lahore.

#### 9) ARRANGEMENT OF THE CORE TEAM

Core team of the Consultant would comprise of the following experts.

<b>Sr. No.</b>	<b>Position</b>	<b>Qualification</b>	<b>Expertise</b>
<b>1.</b>	<b>Team Leader:</b>	Ph.D. or M.Phil in Geology/Earth Sciences.	Having at least fifteen (15) years of relevant experience and expertise in execution, supervision or Consultant obligations for geological, geophysical and drilling works including exposed, un-exposed, minerals and reporting.
<b>2.</b>	<b>Senior Geologist (Exploration):</b>	M.Sc. Geology or equivalent degree	Having at least ten (10) years of relevant experience and expertise in execution, supervision or Consultant obligations for geological, drilling works including exposed, un-exposed, minerals and reporting.
<b>3.</b>	<b>Geophysicist:</b>	M.Sc. Geo-Physics or Geology degree with specialization in Geo-Physics	Having at least ten (10) years of relevant experience and expertise in applications of geophysical surveys, data interpretation and reporting.

4.	<b>Geologist(Drilling/Logging/trenching/pitting/Adits)</b>	M.Sc. Geology or equivalent degree	Having at least five (05) years of drilling/logging /trenching/pitting/Adits execution and supervision experience and expertise.
5.	<b>Geologist (Mineralogy – Petrology/Economic Geology):</b>	M.Sc. geology with specialization in mineralogy Petrology or Economic Geology.	Having at least five (05) years of relevant experience and expertise in mineralogy / petrography/mineral sampling analytical works / economic geology.
6.	<b>Geologist (GIS/Computer):</b>	Masters or equivalent degree in Geology with expertise in GIS or Computer Geology Applications	Having at least five (05) years of relevant experience and expertise in GIS or computer geology applications

Additional technical personal and support staff required to efficiently manage, monitor and supervise of the execution of the SOW would also be hired / arranged by the Consultant.

## 10) **DELIVERABLES**

The Consultant would be responsible to submit the following deliverables to the Client:-

### (i) **Certificate of Mobilization of the resources of the Consultant**

The Consultant will submit a certificate of mobilization of its resources reporting and elaborating deployment of its required man power, machinery and equipment necessary office setups, transport arrangement etc. as per approved proposal of the Consultant for the satisfaction/certification of the Client.

### (ii) **Inception Report**

The Inception Report should include a complete understanding of the objectives of the scheme based on Past Literature review and preliminary reconnaissance survey of the scheme area along with work plan strategy and schedules along with comprehensive monitoring plan to execute and supervise the SOW for the approval of Steering Committee.

### (iii) **Submission of Geological and Geophysical Reports and Drilling Plan**

This report will describe the detailed stratigraphic succession in the scheme area along with geological map, geophysical data map and drilling plan along with location of boreholes and probable depths. Based on the geological and geophysical interpretation, the economic mineral deposits/horizons will be described in detail.

**(iv) Submissions of Interim/Periodic Drilling Data and Assays Reports**

These reports will have to be submitted on quarterly basis, presenting the progress made in the drilling of boreholes, lithological logs, geophysical logs (where applicable) samples analysis/lab results, interpretation and further recommendations after evaluation of the entire work of each periodic period progress.

**(v) Draft Final Report**

This draft final report should include the Comprehensive Reports for different areas and minerals elaborated by necessary analytical comments by carving out mineral bearing blocks/zones economically viable for grant of mineral concessions keeping in view the industrial and commercial aspects for the perusal and approval of the Steering Committee.

**(vi) Final Report**

This final report should include the Comprehensive Reports for different areas and minerals elaborated by necessary analytical comments by carving out mineral bearing blocks/zones economically viable (in acres) for grant of mineral concessions keeping in view the industrial and commercial aspects for the perusal and approval of the Steering Committee.

**(vii) Professional Liability of the Consultant cum Contract as per Punjab Procurement Rules, 2014**

Professional liability of the Consultant will lie in form of its professional's man months including all office and field services and also in form of services availed in field and laboratory as well. All liabilities will be paid in the light of Punjab Procurement Rules, 2014.

**11) PAYMENT SCHEDULE FOR CONSULTANT**

The Consultant will be paid according to the "Part Work Done Part Payment principle". Percentage payment will be linked with the quantum of work and time involved in a particular deliverable as mentioned above. The payments will be approved by the "Steering Committee" on the receipts of the deliverables and satisfaction of the Steering Committee.

Whereas, the payment schedule and details will be further elaborated in the agreement to be executed between the Consultant and the Client in the light of directions of Steering Committee.

## Annexure-D

### SUMMARY OF THE COST ESTIMATES OF POTENTIAL EVALUATION OF COAL, IRON ORE, LIMESTONE AND OTHER INDUSTRIAL MINERALS IN KOH-E-SULEMAN RANGE, DISTRICT D.G.KHAN & RAJANPUR

OBJECT CODE	PARTICULARS	PERIOD OF UTILIZATION Rs in million			
		2021-22 (FY)	2022-23 (FY)	2023-24 (FY)	Total (Rs)
A03919	Payments to others for service rendered.				
	(i) Consultant Services,	21.00	119.00	29.20	169.20
	(ii) Costs/services to be rendered from others to monitor the project (Monitoring and Logistics)	1.30	3.10	0.60	5.00
	<b>Sub Total</b>	<b>22.30</b>	<b>122.10</b>	<b>29.80</b>	<b>174.20</b>
A03907	Advertisement	0.10	0.10	0.00	0.20
A03901	Stationery	0.25	0.25	0.00	0.50
A03805	TA/DA	0.60	1.30	0.10	2.00
A03807	POL Charges	0.40	1.00	0.10	1.50
A03970	Others	0.25	0.25	0.00	0.50
A09203	IT Equipment	1.10	0.00	0.00	1.10
	<b>GRAND TOTAL (A)</b>	<b>25.00</b>	<b>125.00</b>	<b>30.00</b>	<b>180.00</b>

## Annexure-E

### POTENTIAL EVALUATION OF COAL, IRON ORE, LIMESTONE AND OTHER INDUSTRIAL MINERALS IN KOH-E-SULEMAN RANGE, DISTRICT D.G.KHAN & RAJANPUR

#### (A) Breakup of the Man Months Input/Payment to the Core Team of the Consultant

Sr. No.	Consultant's core team and Management/Admin		Duration (months)			Rate/month (PKR in million)	Cost (PKR in million)
			Literature review and Exploration program	Execution of the Consultant(s) works	Total (4+5)		
1	Core Team		4	5	6	7	8
	2	3					
	Members	Nos.					
I	Team Leader	1	2	18	20	0.8	16
II	Senior Geologist(Exploration)	1	1	17	18	0.4	7.2
III	Geo-physicist	1	1	6	7	0.4	2.8
IV	Geologist (Sampling/Drilling /Logging)	2	-	12	12	0.15	1.8
V	Geologist (Min-pet)	2	1	12	13	0.15	1.95
VI	Geologist (GIS/Computer)	1	1	6	7	0.15	1.05
<b>TOTAL</b>							<b>30.80</b>

**Note:**

- Monthly salary for the Core Team has been proposed after keeping in view the following factors:-
- a. Boarding & Lodging Charges of each member of the core team have to be paid by themselves.
  - b. Attachment of Associated staff (technical and helper) as per need on activities to action basis.
  - c. Technical Support (IT & Communication gadgets).
  - d. To meet the security charges for working in remote areas of D.G.Khan and Rajan Pur

**(B) Breakup of the Technical Activities as per SOW**

<b>Sr. No.</b>	<b>Activity</b>	<b>Lump Sum Cost (PKR in Million)</b>
2.	Management/Admin/Logistics etc.	10.00
3.	Reconnaissance, Data Compilation and Field Work	03.00
4.	Geological Mapping, Geophysical Survey, GIS/Digitization applications	16.50
5.	Pitting, Trenching, Aditting, representative sampling and handling etc.	15.00
6.	Sample analysis,	13.00
7.	Shallow confirmatory drilling	78.75
8.	Data compilation, reporting	2.15
	<b>TOTAL</b>	<b>138.40</b>
	<b>GRANT TOTAL OF TABLE OF A+B (30.80+138.40)</b>	<b>169.20</b>

### (C) Cost Justification for the Technical Activities

Sr. No.	Justification	Lump Sum Cost (PKR in Million)
2.	Management/Admin/Logistics etc. are kept as lump sum	10.00
3.	Reconnaissance survey, Data compilation and Field work will involve traveling of team of three (3) geo-scientific experts along with supporting staff and necessary equipments, their boarding lodging for 2-3weeks and reporting.	03.00
4.	Geological Mapping, Geophysical Survey & GIS/Digitization applications For geological mapping Rs.5.00 million For GIS analysis and map digitization Rs.1.50 million For geophysical survey Rs.10.00 million Approximately Point of Observations (POBs) = 500 (Gravity, Magnetic & IP as may be required) Unit cost for per point of observation in Rs. = 20,000	16.50
5.	Pitting, Trenching, Aditting, representative sampling and handling etc.	15.00
6.	Sample analysis. Approximately No. of samples to be analyzed = 1,000 (Including drilling logs) Per sample cost in Rs. XRD, XRF = 13,000 [(The XRD & XRF (Rs.6000 for each) for analysis is estimated as information received from Geo-Sciences Lab, GSP and remaining Rs.1000 included for sample preparation & transportation charges.)].	13.00
7.	Shallow confirmatory drilling. Approximately No. of boreholes (BHs) = 35-40 Approximately meter-age can be drilled = 3500-4000 (Each BH depth may be varied from 70-120 meter) Estimated drilling rate in Rs. = 20000-25000 per meter	78.75
8.	Data compilation, reporting Report writing, printing, binding, scanning, geological map preparation, map digitization's/grid referencing, development of soft versions, lab data presentations, approximately 15 hard & soft copies of final report will be submitted.	2.15
	<b>Total</b>	<b>138.40</b>
	<b>Grant Total (30.80+138.40)</b>	<b>169.20</b>

**Note:** The above costs and calculation are guesstimates. Actual payments will be made on the basis of lowest bid received and expenditures thereof.

## ACTIVITY WISE DETAILS

Sr. No.	PLANNED ACTIVITIES	DURATION								
		2021-22 (FY)				2022-23 (FY)				2023-24 (FY)
		Oct. Nov.	Dec. Jan.	Feb. March	Apr. to June	July to Sept.	Oct. to Dec.	Jan. to March.	Apr. to June	
1	<b>Appointment of Consultant</b>									
2	<b>Literature Review</b> Related Past literature, information and record of the exploration / prospecting, mining, production etc. of the minerals under concessions, propose and present promising areas for SOW.									
3	<b>Execution of SOW by Consultant and supervision by Client</b>									
i	Mobilization of the Resource of the Consultant and submission of inception report.									
ii	Submission of 1 <sup>st</sup> interim Progress report									
iii	Submission of 2 <sup>nd</sup> Interim Progress Report									
iv	Submission of 3 <sup>rd</sup> Interim Progress Report									
v	Submission of 4 <sup>th</sup> Interim Progress Report									
vi	Submission of 5 <sup>th</sup> Interim Progress Report									
4	<b>Submission of reports and Recommendations</b>									
I	Draft report and recommendations by the Consultant									
ii	Final report and recommendations by the Consultant									



## ANNEXURE-G

### DELIVERABLES AND TIMELINES FOR THE CONSULTANT

<b>Sr. No.</b>	<b>Deliverable</b>	<b>Timelines (Days)</b>
<b>COMMENCEMENT OF CONSULTANT JOB WITH EFFECT FROM AGREEMENT DATE</b>		
<b>i.</b>	<i>Mobilization of the resources of the Consultant</i>	30
<b>ii.</b>	<i>Inception Report</i>	90
<b>iii.</b>	<i>1<sup>st</sup> Interim Report: Submission of Geological and Geophysical Reports and Drilling Plan</i>	180
<b>iv.</b>	<i>2<sup>nd</sup> Interim Progress Report: Submissions of Interim/Periodic Drilling Data and Assays Reports</i>	300
<b>v.</b>	<i>3<sup>rd</sup> Interim Progress Report: Submissions of Interim/Periodic Drilling Data and Assays Reports</i>	360
<b>vi.</b>	<i>4<sup>th</sup> Interim Progress Report: Submissions of Interim/Periodic Drilling Data and Assays Reports</i>	480
<b>vii.</b>	<i>5<sup>th</sup> Interim Progress Report: Submissions of Interim/Periodic Drilling Data and Assays Reports</i>	600
<b>viii.</b>	<i>Draft Final Report</i>	650
<b>ix.</b>	<i>Final Report</i>	660