

PROPOSAL FOR GENERAL EXPLORATION (G2) OF COPPER ORE RESOURCES IN BARAGANDA BLOCK, DIST. GIRIDIH, JHARKHAND.

1.0.0 Introduction

1.1.0 Preamble

- 1.1.1 Copper with its unique physical, mechanical and electrical properties, has played a vital role in the industrial growth of a nation. In India, around 75% of demand is met through imports. The increasing demand of copper metal in the country could be eased with the exploration of new copper deposits of economic importance.
- 1.1.2 The occurrence of copper in the Baraganda area has been known since 1848, when it was first reported by Mc Clelland (1850). Prior to that, the deposit had been worked by the ancients through opencast methods and later on by the European entrepreneur's between 1882-1891.
- 1.1.3 After a lapse of about 70 years, the area was again investigated by large scale geological mapping, geophysical surveys and geochemical prospecting by the GSI between 1961-1964.
- 1.1.4 The entire strike length of 1,100m of the deposit has been explored between 1961-1964 by GSI and both GSI and DMG during 1966 and 1968 was tested by 27 no of boreholes involving 4701.84m of drilling
- 1.1.5 The total ore resources estimated are 0.57m.t. with an average grade of 2.3%Cu.

1.2.0 Location and Communication

- 1.2.1 The area lies along the low ridges immediately to the north of the parsabera village and about 1 km. south of the Baraganda village and falls within the jurisdiction of the Baraganda village in the Dumri block of the Giridih district, Jharkhand. The deposit extends between the vicinity of the Lillian shaft in the east and the Behragadi nala in the west and lies between the latitudes 24°04'23.31"N and 24°05'3.99"N and the longitudes 86°03'25.51"E and 86°04'58.42"E in Survey of India Toposheet No.72 L/4.
- 1.2.2 The nearest railhead is Parasnath on the Grand Chord Line of the Eastern Railway. It is about 23km by road from the deposit. The deposit can be approached by road, which bifurcates from the Dumri-Giridih, which is an all weather metalled road near Dhawatanr (12 km from Dumri). The nearest town is Giridih, the distance to Giridih and Dumri from the block is about 50km and 20km respectively.

1.3.0 Topography Drainage and Climate

- 1.3.1 The mineralised ground lies along a low ridge trending N70°W-S70°E and the surrounding country present a rolling topography and gentle undulations and no prominent hills. The general elevation of the area is around 350 mRL (i.e. 350m above MSL) and the highest point is around 390m RL in the eastern part of the area.
- 1.3.2 The Behragadi nala, a seasonal stream emptying into the Barakar river flowing about 15km north of the deposit, flows north across the mineralised ground and constitutes the main drainage of the area.
- 1.3.3 The average annual rainfall is around 130cm. The climate is dry and healthy, the temperature ranging from 5.5°C in winter to about 42°C in summer.

2.1.0 Previous Work

- 2.1.1 The occurrence of copper and the presence of ancient workings in the Baraganda area was first noted by MC Clelland (1850). The ancient workings are found in three groups, as large opencast excavations extending impersistently between the Behragadi nala in the west and the Lillian shaft in the east and are said to have reached a depth of 36m (approx.).
- 2.1.2 The average production of copper ingots for the best year was probably not more than 25 tons (25.4 tonnes) per month (Oates 1805), whereas during 1888 the production was 218 tons according to Kings (1889).
- 2.1.3 Oates states that when the work ceased the lowest point gave no signs of (the ore) diminishing either laterally or vertically. He attributes the closure of the mines to wrong location of shafts, overhead methods of stoping in soft, sheared country rocks, lack of proper pumping facilities, snail dimensions of the shafts and lack of funds.
- 2.1.4 After a lapse of about 70 years, the area was again taken up for detailed investigation by the GSI in the year 1961-62 and 1963-64 field seasons. Sen (1963) carried out large scale geological mapping, geochemical work and some trenching and recommended drilling of 6 boreholes to determine the nature and extent of the mineralisation. Geophysical investigation of the area around Baraganda using S.P., Magnetic and Resistivity methods was carried out by Bose during 1961-62 and some anomalies confined to the old working areas were ticked up.
- 2.1.5 The results of the first 8 boreholes, drilled mostly in the strike length covered by the ancient workings and the mine development of the Bengal Baraganda Copper Company, were encouraging and exploration was intensified from June, 1967. This phase of the investigation was concluded in June, 1968, after drilling 16 boreholes

involving 2737m of drilling. In all a strike length of about 700m was tested by these boreholes.

- 2.1.6 The exploration was quickly extended to the strike length not covered by the old workings and the mine development of the Bengal Baraganda Copper Company in order to get a complete picture of the copper mineralisation over the entire strike length.
- 2.1.7 Hence, after completing a few more boreholes to confirm the interpretations, the investigation was brought to a conclusion in Dec-1968, after drilling 11 boreholes involving 1964.84m of drilling.
- 2.1.8 Overall total drilling meterage involved in 4701.84m in 27 boreholes drilled both by DMG Bihar and GSI and no. of primary samples analysed were 577 Nos.
- 2.1.9 Details of Mineralised zone intersected in the boreholes drilled by DMG Bihar & GSI are given below:

Table- 2.1
Summary of copper mineralisation intersected in boreholes

Sl. No.	Borehole No.	Depth along the borehole (m)		Recovered length of zone	True width of zone (m)	Grade of zone (% Cu)	Nomenclature of lode
		From	To				
1	BG-1	88.41	89.20	0.79	0.73	1.08	Lode No. 1
		95.80	96.90	1.05	0.89	0.89	Lode No. 1
		115.49	117.40	1.42	1.16	1.89	Lode No. 3
2	BG-2	69.42	70.75	1.23	1.15	0.70	Lode No. 1
3	BG-3	60.67	62.88	2.15	1.93	0.75	Lode No. 2
4	BG-4	105.80	106.57	0.74	0.74	2.84	Lode No. 3
		110.39	110.97	0.58	0.50	1.91	Lode No. 2
		116.70	118.70	1.98	1.87	0.92	Lode No. 3
		146.81	149.18	2.28	2.06	1.25	Lode No. 3
		183.14	184.44	0.34	1.11	1.25	Lode No. 4a
		103.98	105.28	1.30	1.12	1.72/Pb	
					1.12	3.55/Zn	
5	BG-5	146.08	151.27	4.62	3.32	4.01	Lode No. 3
6	BG-6	141.00	144.99	3.29	1.59	0.80	Lode No. 2
		147.10	148.69	1.45	1.13	1.52	Lode No. 2
						Pb: 0.33	
						Zn: 0.58	

Sl. No.	Borehole No.	Depth along the borehole (m)		Recoverd length of zone	True width of zone (m)	Grade of zone (% Cu)	Nomenclature of lode
		From	To				
7	BG-7	199.30	202.05	2.75	1.86	0.97	Lode No. 1
8	BG-8	100.22	104.75	4.23	3.57	1.66	Lode No. 3
		110.70	111.50	0.80	0.60	2.35	Lode No. 3
		115.04	117.51	2.39	1.87	1.53	Lode No. 3
9	BG-9	142.38	143.46	1.08	0.97	1.72	Lode No. 1
		147.14	148.17	1.03	1.00	1.50	Lode No. 1
10	BG-10	146.78	148.11	1.33	1.01	1.08	Lode No. 2
		162.22	164.69	1.53	1.41	0.96	Lode No. 2
11	BG-11	135.15	135.62	0.45	0.44	1.58	Lode No. 2
12	GSI-1	83.00	84.88	1.45	1.22	3.33	Lode No. 2
		84.88	87.38	1.72	1.61	0.89	Lode No. 2
		92.96	93.56	0.50	0.70	1.05	
		96.20	97.87	1.65	1.34	0.93	Lode No. 2a
13	GSI-2	No samples drawn					
14	GSI-4	No samples drawn					
15	GSI-5	167.45	169.33	0.99	1.42	1.72	Lode No. 3
		186.31	186.63	0.28	0.23	4.40	Lode No. 2a
		190.02	192.16	1.83	1.38	3.27	Lode No. 2
		194.14	197.86	2.63	3.11	1.46	Lode No. 2
16	GSI-10	217.61	219.60	1.95	1.52	1.66	Lode No. 3
		241.05	244.56	2.46	2.48	0.65	
		244.56	249.88	5.11	3.92	1.56	Lode No. 2a
		249.88	252.44	2.41	1.95	0.50	
		252.44	257.39	2.56	3.75	2.55	Lode No. 2
17	BGA-1	75.29	78.33	1.12	1.52	1.01	Lode No. 2
18	BGA-2	121.54	126.87	3.53	4.07	3.20	Lode No. 2
		131.31	134.25	2.62	2.23	4.09	Lode No. 2a
		151.64	153.93	2.05	1.84	0.69	Lode No. 3
19	BGA-3	26.10	27.10	1.00	0.86	0.81	Lode No. 1
		27.10	30.46	3.36	2.90	1.69	Lode No. 1
		30.46	35.05	4.59	3.94	0.49	Lode No. 1
		75.29	77.07	1.60	1.35	2.09	Lode No. 3
		78.79	82.31	2.90	2.67	2.19	Lode No. 3
		90.85	93.57	1.24	1.90	0.55	
		105.82	113.38	3.45	5.39	0.58	Lode No. 4
		113.38	114.13	0.65	0.57	5.53	Lode No. 4
20	BGA-4	48.60	52.20	3.37	2.46	2.36	Lode No. 1
		52.20	53.40	1.19	0.79	0.60	Lode No. 3
		62.53	67.08	4.36	3.43	0.90	Lode No. 3
21	BGA-5	No samples drawn					

Sl. No.	Borehole No.	Depth along the borehole in m		Recovered length of zone	True width of zone in m	Grade of zone (% Cu)	Nomenclature of lode
		From	To				
22	BGA-6	11.00	12.19	1.19	0.95	1.09	
		12.19	15.17	2.98	2.48	0.67	
		22.13	24.45	2.15	2.01	1.61	
		26.37	27.43	1.04	0.91	0.06	
		68.41	70.31	1.28	0.91	0.77	
23	BGA-7	58.72	61.42	2.70	2.33	0.72	Lode No. 3
		66.26	68.80	2.54	2.05	0.48	Lode No. 3
		68.80	69.79	1.19	0.81	1.62	Lode No. 3
		87.20	89.94	2.48	2.07	0.84	Lode No. 3
24	BGA-8	109.65	110.48	0.83	0.78	0.74	Lode No. 2
		117.54	123.36	5.78	5.47	0.80	Lode No. 1
		123.36	125.26	1.90	1.79	0.28	Lode No. 1
		125.26	126.49	1.23	1.16	4.34	Lode No. 1
25	BGA-9	70.07	72.85	2.78	1.97	1.31 (Pb)	
						3.87(Zn)	
26	BGA-12	103.36	104.71	1.35	1.04	1.28	Lode No. 1
		106.3	108.61	2.25	1.77	1.15	Lode No. 2
27	BGA-18	39.37	42.82	3.45	2.65	0.89	Lode No. 1
		120.03	121.43	1.40	0.98	1.18	Lode No. 4
		129.73	131.75	2.00	1.41	2.72	Lode No. 4a

3.0.0 Geology and Structure

3.1.0 Regional Geology

- 3.1.1 Meta sediments of Precambrian viz. qtz mica schist, talcose quartz mica schist, quartzites and amphibolites are most predominant rocks occur in the area. The general strike N70°W-S70°E with vertical dips mostly.
- 3.1.2 The host rock of mineralisation is garnetiferous chlorite biotite schist and garnetiiferous quartz biotite schist and occur as lenticular bands within silicified quartz mica schist.
- 3.1.3 The copper mineralisation is fissure vein type. Cu lodes occur along the weaker zones of shearing and brecciation parallel to foliation. The copper minerals are chalcopyrite associated galena, sphalerite

- 3.1.4 The general trend of this foliation is N70°W-S70°E but swings of upto 50° from this trend are locally seen. The dips are mostly vertical and swings to the north and south and thus showing locally dip of upto 60° towards north/south.
- 3.1.5 On a regional scale the area is apparently iso-clinally folded (Sen, 1963). But within the area taken up for detailed Exploration only mesoscopic folds could be seen.

3.2.0 Geology & Structure of the area

- 3.2.1 The area is made up of regionally metamorphosed sedimentary mafic and ultramafic rocks of Pre-Cambrian age. The regional sequence is as follows (after Sen 1963):

Table- 3.1

Super Group	Age	Lithounits	Description
Post (?) - Gondwana		1. Dolerite	Intrusive, occurs as dykes
DHARWARS (Equivalent)	ARCHAEANS	2. Pegmatites and quartz veins	Intrusive, occurs as veins
		3. Granite (?)	Intrusive, occurs as a small irregular body
		4. Granite gneiss	Occurs as a small irregular patch
		5. Amphibolites, amphibole-pyroxene rocks and amphibole schists.	Probably of Intrusive origin (?) occur in the form of concordant bands
		6. Schistose formations i.e., quartz-mica schist hornblende schist etc.	Constitute the country rock and are the oldest formations in the area.

- 3.2.2 The schistose formations and the amphibolite bands are exposed in the present area of Baraganda-Parsabera area.

3.3.0 Structure

- 3.3.1 The rocks in the area are metamorphic tectonite derived mostly from pelitic sediments and basic intrusives. Hence bedding traces have been obliterated and the most conspicuous S-surface is the foliation of the schistose rocks. The general trend of this foliation is N70°W-S70°E but swings of upto 50° from this trend are locally seen. The dips are mostly vertical swings to the north and south and thus showing locally dip of upto 60° towards north/south.

3.4.0 Folds

- 3.4.1 Three sets of minor folds are commonly observed.
- 3.4.2 The first set (b1 folds) is of an isoclinal type with sub-vertical axial planes and their axis trends parallel to the strike of foliation. They plunge at angles of 10° - 30° both to the east and west. These are mostly parasitic drag folds developed on the limbs of the major folds and have very limited amplitudes. These types of folds are well seen in the Lillian shaft area and in the western group of old workings. The rocks occurring in the axial portion of these folds crop out as small lenticular bodies, in the eastern portion of the area boudins of tremolite - quartz rock within biotite-chlorite schist represent there of a series of doubly plunging antiform and synforms with high angle of plunge.
- 3.4.3 The second set of folds (b2 folds) is of the nature of broad subhorizontal warps in the plane of dip. The axial planes are sub-horizontal and the axes are either horizontal or plunge gently (10° to 20°) in the strike direction. Puckers corresponding to this set are common. These folds might have been originated by the component of the same force which caused the isoclinal folds but they are later than the b1 folds as the limbs of b1 folds are affected by these folds.
- 3.4.4 The third set of folds (b3 folds) are in the form of asymmetric drags with sub-vertical axial planes trending diagonally to the general strike. The axis of these folds plunge at steep angles of 60° to 85° and the trend of the axis makes an angle of about 40° - 50° with the, general strike of foliation.
- 3.4.5 b3 folds appear to be later than b2 folds as it is seen at many places that the axis of b2 folds are refolded around the axis of b3 folds and that the packers corresponding to b3 folds are found to cut across that of the b2 folds. Axes of b3 folds are found to coincide with the direction of shearing from which it might be suggested that both shearing and b3 folding resulted from the same set of forces.

3.5.0 Lineations

- 3.5.1 These sets of lineations trending parallel to the minor folds are well developed. The first set (11) is a well developed pucker lineation in the talcose schists and mica schists plunging in the strike direction generally at 10° - 30° i.e. more or less parallel to the trend and plunge of b1 folds. The second set (12) defined by mineral orientation is a sub-horizontal lineation trending in the strike direction and is not well developed.
- 3.5.2 The third set of lineations (13) are prominently developed and are mostly represented by puckers and mullions. They generally plunge at angles of 60° - 90° the direction of plunge being parallel to those of the b3 folds i.e. making an angle of 40° - 50° with the strike of foliation.

3.6.0 Joints

- 3.6.1 Three sets of joints are well developed. The first set of joints (J1) are tension joints trending parallel to the foliation and dipping at steep angles (75°- 90°) both to the north and south. The second sets of joints (J2) are also, tension joints but trending perpendicular to the foliation and dipping at steep angles to the east or west.

3.7.0 Copper Mineralisation

- 3.7.1 The copper mineralisation is fissure vein type. Cu lodes occur along the weaker zones of shearing and brecciation parallel to foliation. The copper minerals are Chalcopyrite, associated galena & sphalerite. The copper mineralisation is confined to silicified and sheared zone of garnetiferous chlorite biotite schist and feldspathic (Muscovite) biotite chlorite quartz rock. Mineralisations occur as lenticular bands within silicified quartz mica schist. Cu lodes occur as short impersistent shoots with considerable intervening barren or partly mineralised portions.
- 3.7.2 In view of the scattered and impersistent nature of the shoots, it may not be feasible to mine profitably (1969), as these mineralised zone had been mined, at higher cut-off. However, 0.5% Cu cut-off the lodes are more or less continuous and persist even beyond 100m depth from the existing data in spite of not being sampled both at hanging wall and foot wall lodes. The zones delineated at 0.5% Cu cut-off have been present below:

Table- 3.2

ZONE DETAILS OF BARAGANDA COPPER DEPOSIT AT 0.5% Cu CUT-OFF

Borehole No.	From (m)	To (m)	Ext. Thick. (m)	True Thick. (m)	Grade Cu (%)	Grade Pb (%)	Grade Zn (%)
BG-1	88.41	96.91	8.50	7.64	0.60		
	114.92	117.40	2.48	1.49	2.09		
BG-2	69.42	70.75	1.33	1.15	0.78		
BG-3	60.67	62.88	2.21	1.99	0.75		
BG-4	103.98	105.28	1.30	1.12	-	1.72	3.52
	105.80	110.97	5.17	4.07	1.10		
	115.45	118.70	3.25	3.04	0.74		
	146.80	149.18	2.38	2.06	0.86		
	183.14	184.44	1.30	1.11	4.82		
BG-5	146.08	151.57	5.49	3.32	4.01		
BG-6	141.02	148.69	7.67	4.11	0.88		
	145.36	148.69	3.33	2.28		0.28	0.60
BG-7	197.00	203.10	6.10	4.15	0.77		
	199.30	202.05	2.75	1.86			1.01
BG-8	100.21	105.15	4.94	3.89	1.63		
	110.70	117.51	6.81	5.42	1.14		
BG-9	142.38	150.35	7.97	7.58	0.77		

Borehole No.	From (m)	To (m)	Ext. Thick. (m)	True Thick. (m)	Grade Cu (%)	Grade Pb (%)	Grade Zn (%)
BG-10	118.80	127.34	8.54	3.54	0.91		
	123.93	125.00	1.07	0.33		0.81	0.32
	146.78	148.11	1.33	1.01	1.08		
	162.22	164.69	2.47	1.41	1.61		
BG-11	67.55	68.10	0.55	0.47	0.78		
	135.22	135.69	0.47	0.44	1.58		
GSI-1	83.00	97.87	14.87	10.71	0.89		
GSI-2	NO ZONE						
GSI-4	SAMPLE NOT DRAWN						
GSI-5	165.11	169.33	4.22	2.87	1.94		
	186.29	197.86	11.57	8.44	1.36		
GSI-10	217.61	220.97	3.36	2.56	1.26		
	241.05	257.39	16.34	12.10	1.80		
BGA-1	75.29	78.82	3.53	1.77	2.66		
BGA-2	121.54	126.87	5.33	4.07	4.88		
	131.31	134.25	2.94	2.23	4.07		
	150.64	153.93	3.29	1.84	0.69		
BGA-3	26.10	35.05	8.95	7.71	1.00		
	72.01	82.17	10.16	8.16	1.38		
	90.66	93.38	2.72	1.80	1.24		
	104.29	114.13	9.84	7.61	1.54		
BGA-4	46.48	56.69	10.21	7.92	1.15		
	62.53	67.76	5.23	3.95	1.60		
BGA-5	SAMPLE NOT DRAWN						
BGA-6	11.00	16.17	5.17	3.33	0.79		
	22.13	27.43	5.30	4.75	1.04		
	68.41	70.31	1.90	0.91	0.77		
BGA-7	58.72	61.42	2.70	2.28	0.73		
	66.26	71.49	5.23	4.27	0.69		
	87.20	89.94	2.74	2.07	0.84		
BGA-8	109.65	110.48	0.83	0.78	0.74		
	117.51	127.40	9.89	9.20	1.11		
BGA-9	58.30	61.17	2.87	1.69	0.06	0.06	1.45
	68.17	72.85	4.68	3.34	0.08	0.88	2.54
	88.43	88.97	0.54	0.54	1.67	0.00	0.58
BGA-12	95.94	108.61	12.67	9.77	0.58		
BGA-18	39.37	42.82	3.45	2.65	0.89		
	120.03	121.43	1.40	0.98	1.18		
	129.73	131.75	2.02	1.41	2.73		
	149.63	150.30	0.67	0.47	0.62		

3.8.0 Depth Persistence

- 3.8.1 With available data, the copper mineralisation persist over the strike length of about 1.3km and up to the vertical depth of 166.00m (355m RL to 189m RL). The mineralised zone thickness is 3.43m /0.79% Cu (BGA-6) and 12.10m/1.45% Cu (GSI-10). Moreover, between shaft-1 and shaft-2 over about 200m strike length up to the depth of 100m, ore has been exploited which had never shown any depletion as stated by Oates. Therefore, the ore shoots are not shown any petering rather open at bottom.

4.0.0 Present Work

- 4.1.0 Objectives of the present level (G2) exploration are as follows:

1. To know the continuity of the lodes both along the strike and dip.
2. To define the geometry of the ore body.
3. To collect the baseline environmental data based on satellite imageries.
4. To ascertain the amenability of the copper ore through beneficiation studies.

4.2.0 Proposed Scheme of Exploration

- 4.2.1 Topographic Surveying: The deposit area would be tied up with the triangulation network of GSI and earlier MECL work. The reduced levels and co-ordinates of boreholes would be determined, keeping GSI co-ordinates and bench marks intact. The contouring would be done at 1m interval on 1:1000 scale to prepare a detailed topographic map of the deposit.

4.3.0 Geological Mapping

- 4.3.1 The geological map of the block prepared by GSI would be updated by few rapid geological traverses and also with reference to the new subsurface data and would be used as a base map for the purpose of exploration work

4.4.0 Exploratory Drilling

- 4.4.1 It has been planned to drill 30 no. of exploratory boreholes with envisaged meterage 5395.00m to generate data upto a vertical column of above 200m for general exploration in Baraganda Copper deposit. The details of the proposed boreholes are furnished below:

Table- 4.1
Details of proposed boreholes for Baraganda Block

Sl. No.	Section Line No.	Proposed BH. No.	Bearing (Azimuth in degree)	Angle from horizontal (degree)	Proposed depth of boreholes (m)	Proposed level of intersection
1	S1-S1'	PBH 1	N 20° E	50°	80	300 mRL
2	S2-S2'	PBH 2	N 20° E	50°	140	250 mRL
3	S3-S3'	PBH 3	N 20° E	50°	140	250 mRL
4	S4-S4'	PBH 4	N 20° E	55°	180	220 mRL

Sl. No.	Section Line No.	Proposed BH. No.	Bearing (Azimuth in degree)	Angle from horizontal (degree)	Proposed depth of boreholes (m)	Proposed level of intersection
5	S5-S5'	* PBH 5	N 20° E	60°	240	150 mRL
6	S5-S5'	PBH 6	N 20° E	60°	200	200 mRL
7	S6-S6'	PBH 7	S 20° W	50°	120	300 mRL
8	S6-S6'	PBH 8	S 20° W	50°	250	200 mRL
9	S7-S7'	PBH 9	S 20° W	50°	120	300 mRL
10	S8-S8'	PBH 10	N 20° E	50°	165	250 mRL
11	S9-S9'	PBH 11	S 20° W	50°	250	150 mRL and 250 mRL
12	S10-S10'	PBH 12	N 20° E	50°	140	270 mRL
13	S11-S11'	PBH 13	S 20° W	50°	230	210 mRL
14	S12-S12'	PBH 14	S 20° W	50°	110	300 mRL
15	S12-S12'	* PBH 15	S 20° W	50°	170	250 mRL
16	S13-S13'	PBH 16	S 20° W	50°	100	300 mRL
17	S13-S13'	* PBH 17	S 20° W	50°	160	250 mRL
18	S14-S14'	* PBH 18	N 20° E	50°	270	250 mRL
19	S14-S14'	PBH 19	N 20° E	50°	210	240 mRL
20	S15-S15'	* PBH 20	N 20° E	50°	175	260 mRL
21	S15-S15'	PBH 21	N 20° E	50°	110	310 mRL
22	S16-S16'	* PBH 22	N 20° E	50°	250	200 mRL
23	S16-S16'	PBH 23	N 20° E	50°	170	250 mRL
24	S17-S17'	PBH 24	N 20° E	50°	245	270 mRL
25	S17-S17'	PBH 25	S 20° W	50°	205	240 mRL
26	S17-S17'	* PBH 26	S 20° W	60°	250	150 mRL
27	S18-S18'	PBH 27	N 20° E	50°	180	250 mRL
28	S19-S19'	PBH 28	S 20° W	50°	170	200 mRL
29	S19-S19'	* PBH 29	S 20° W	50°	225	210 mRL
30	S20-S20'	PBH 30	S 20° W	50°	140	290 mRL
				TOTAL	5395	

Note - * means conditional borehole for deeper intersection in a section line.

4.4.2 Borehole Deviation survey will be carried out by Multi-shot Borehole Deviation Survey Camera in all the proposed boreholes to know the actual path in azimuth and Inclination for better interpretation of data.

4.5.0 Borehole Core Logging

- 4.5.1 The borehole cores would be logged systematically. Details of the litho-unit viz. colour, structural feature, texture, mineralisation, besides the recovery and rock quality designation (RQD) would be recorded.

4.6.0 Sampling

- 4.6.1 The mineralised cores including the cores of immediate footwall and hanging wall rocks (3m length each) would be sampled at 0.5m to 0.75m interval, as far as possible, depending upon the intensity of mineralisation, change in lithology and core recovery etc. It was envisaged that:
- a) Around 2500 Nos. of primary samples including check samples would be generated from the mineralised intersection, so obtained from the drill holes. All the primary and check samples would be analysed for copper only.
 - b) 300 Nos. of primary samples would be analysed for gold, silver, lead, zinc and tungsten.
 - c) A total of 25 primary samples would be analysed by X-ray diffraction to ascertain the presence of any other rare or gangue minerals.
 - d) Composite samples would be prepared from the mineralised zones of primary drill core samples from each exploratory borehole. It has been envisaged that 250 nos. of composite sample would be generated and analysed for gold (Au), silver (Ag), lead (Pb), zinc (Zn) and tungsten (W).
 - e) 25 Nos. of composite samples would also be subjected to semi quantitative spectroscopic studies for trace and minor elements (10 elements).
 - f) Trace Element (22 element) studies would be carried out on 50 Nos. of composite samples by ICP-MS method.

4.7.0 Petrological Studies

- 4.7.1 Thin and polished section studies on drill cores as well as outcrop samples would be done for detailed petrographic and mineragraphic characteristics. These samples would be drawn from ore zones and host rocks. A provision of 30 specimens for petrographic and 30 specimens for mineragraphic studies have been kept for the purpose.

4.8.0 Specific Gravity Determination

- 4.8.1 To derive the tonnage factors, 40 nos. of samples were proposed to be subjected for specific gravity determination. The sample to be drawn from ore zones/ mineralised zones.

4.9.0 Geo-technical Studies

- 4.9.1 Geo-technical Studies viz., tensile strength compressive strength, young's modulers , protodynakavo test, density etc., would be conducted on the cores of exploratory borehole cores from the mineralised zone along with foot wall and hanging wall at National Laboratory / NIT as to ascertain rock characteristics.

4.10.0 Bulk Samples for Beneficiation Test

4.10.1 A representative bulk sample would be drawn from the duplicate half core samples and would be sent for laboratory scale beneficiation studies in IBM Laboratory.

4.11.0 Base Line Environmental Studies

4.11.0 Based on satellite imageries environmental data around 10km radius of Baraganda Copper Deposit would be studied along with chemical analysis, baseline data collection and the report will be submitted separately.

4.12.0 Quantum of work to be carried out

Sl.No.	Description of Work	Unit	Target
I	a) Topographic Survey (1:1000 Scale)	Sq.Km.	0.6
	b) Geological Mapping (1:1000 Scale)	Sq.Km.	0.6
II	Exploratory Drilling	m	5395 (30 BHs.)
III	Laboratory Studies		
	a) Primary + Check Samples for Copper	Nos.	2500
	b) Primary + Check Samples for Pb, Zn and W	Nos.	300
	c) Primary + Check Samples for Au & Ag by Fire Assay	Nos.	300
	d) Composite Sample		
	e) i) For 4 radicals (Cu, Pb, Zn and W)	Nos.	250
	f) ii) For Au & Ag by Fire Assay	Nos.	250
	g) Trace Element (22 element studies) by ICP-MS method	Nos.	50
	h) XRD Studies	Nos.	25
	i) Spectroscopic Studies (10 elements)	Nos.	25
	j) Petrographic Studies	Nos.	30
	k) Mineragraphic Studies	Nos.	30
	l) Specific Gravity determinations	Nos.	40
IV	m) Geo-technical Studies (BH.)	No.	1
	Base Line Environmental Studies (along with report)	No.	1
V	Beneficiation Studies	Nos.	1
VI	Geological Report preparation (Digital Format)	Nos.	1

5.0.0 Time schedule and Cost estimates

5.1.0 **Time Schedule:** The proposed general exploration (G2) programme is planned in such a way that all the activities like, camp setting, winding, drilling, survey and associated geological work and laboratory work including geotechnical, environmental studies and beneficiation studies will be completed within 15 month time. The bar chart showing activity wise time schedule is placed at Table-2.

5.1.2 Cost estimates

The detail cost estimate is given as Table 2a. The summary is as follows

Sl. No.	Item	Estimated Cost INR
1	Drilling	5,96,43,150.00
2	Geology	59,75,880.00
3	Laboratory	59,91,177.00
4	Preservation of Core	7,62,375.00
5	Total (1+2+3+4+5)	7,23,72,582.00
6	Report (1% of 1+2+3+4+5)	7,23,725.82
7	Environmental Studies	18,75,348.00
8	Total (5+6+7)	7,49,71,655.82
9	GST (18% of Sl. No. 9)	1,34,94,898.05
10	Total cost including 18% GST	8,84,66,553.87

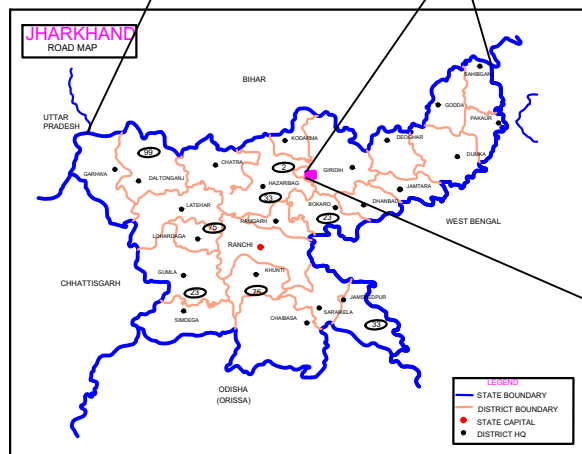
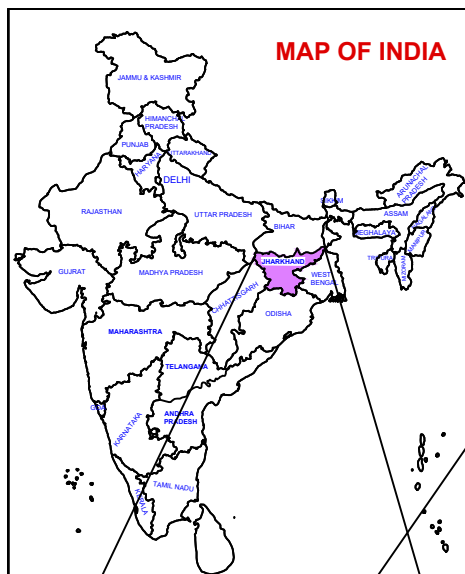
6.0.0 Justification

- i) The mineralised zones intersected in GSI and DGM boreholes are open in dip direction hence the continuity of the lodes requires further proving.
- ii) Enhancement of level of confidence of the resources estimated by GSI and DMG by drilling exploratory boreholes in the data gap as well as at deeper level as per UNFC Scheme.
- iii) Augmentation of resources by drilling deeper level boreholes upto a vertical depth of 350m to 150m).
- iv) Possibility of any other mineral or metal will be tested.

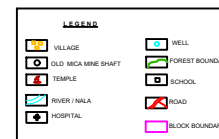
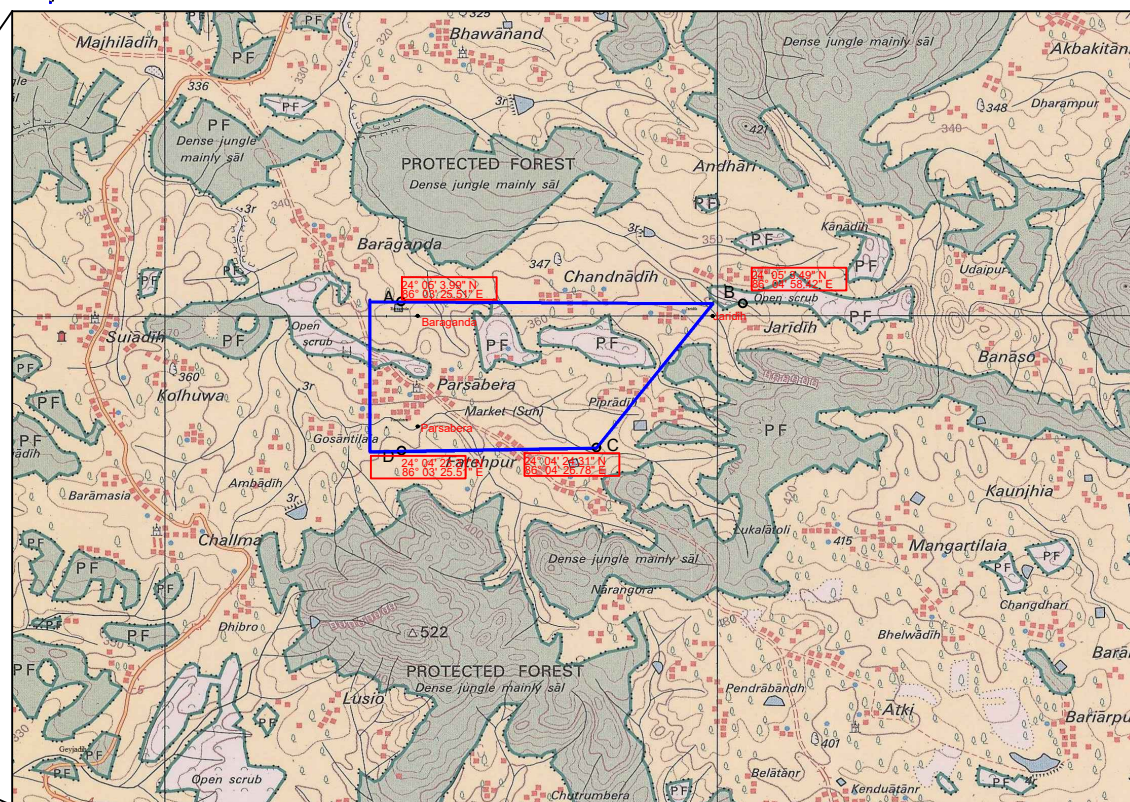
TABLE 2						
Cost Estimate for General Exploration (G2) Proposal for Estimation of Copper Ore in Baraganda-Parsabera Block (0.60 SqKm), in Giridih District, Jharkhand State						
SL. No.	Item of Work	Unit	Base	Financial Year (2019-20)		
			Rate 1.4.90	Esc.Rate (18-19) Rs.	Qty.	Amount (Rs)
A	DRILLING					
1	Surface Drilling (3 Rigs, 30 BH)	m.	2551	10317	5395	55660215.00
2	Transportation	Km.	8.8	33	2200	72600.00
3	Accommodation	One time / Drill	185925	690693	3	2072079.00
4	Camp Setting / Winding	Drill/ month	68606	254864	6	1529184.00
5	Road Making (Flat Terrain)	Km	7800	19317	16	309072.00
	Sub Total A					59643150.00
B	GEOLOGICAL WORK					
1	Survey Party Days (1 party)	day	1180	6056	160	968960.00
2	Geologist Party days (2 party)	day	1541	8083	460	3718180.00
3	Core Sampling Party days (2 parties)	day	525	2905	300	871500.00
4	Bulk Sampling Party days (1 parties)	day	2566	13908	30	417240.00
	Sub-Total B					5975880.00
C	LABORATORY STUDIES					
a	Chemical Analysis					
1	Primary + Check Samples					
	i) for Cu (Classical)	Nos	205	1111	2500	2777500.00
	ii) for Pb, Zn and W (3 radical)	Nos	262	1422	300	426600.00
	ii) for Au and Ag (Fire Assay)	Nos	268	1439	300	431700.00
2	Composite Samples					
	i) For 4 radicals (Cu, Pb, Zn and W)	Nos	338	1838	250	459500.00
	ii) for Au and Ag (Fire Assay)	Nos	268	1439	250	359750.00
b	Physical Analysis					
	i) ICPMS (22 trace elements) ****	Nos		7602	50	380100.00
	ii) XRD Analysis	Nos	1137	5813	25	145325.00
	iii) Spectroscopic analysis	Nos	1173	5603	25	140075.00
	iv) Preparation of thin section	Nos	100	556	30	16680.00
	v) Petrographic Studies	Nos	228	1478	30	44340.00
	vi) Preparation of polished section	Nos	100	556	30	16680.00
	vii) Minerographic studies	Nos	364	2090	30	62700.00
	viii) Specific Gravity determination	Nos	32	195	40	7800.00
	ix) Transportation (Beneficiating sample to IBM Bangalore)	Km	8.8	33	1100	36300.00
	x) Beneficiation sample *	Nos		289327	1	289327.00
	xi) Transportation (Geotechnical sample)	Km	8.8	33	1100	36300.00
	xi) Geotechnical sample (For 60 samples in one borehole) #	Nos	as per Actual	360500	1	360500.00
	Sub-Total C					5991177.00
D	Preservation of Core					
i)	GI Core boxes	Nos.		2000	375	750000.00
ii)	Transportation of Core Boxes	Km	8.8	33	375	12375.00
	Sub-Total D					762375.00
	Total A+B+C+D					72372582.00
E	EXPLORATION REPORT - 1% of (A+B+C+D) or 150000 whichever is more					723725.82
F	Environmental Studies					
1	Satellite Imagery studies	Scene (10 KM Radius Area)	99697	476193	1	476193.00
2	Base line Data Collection		151273	722540	1	722540.00
3	Chemical Analysis	Nos	257400**	626615	1	626615.00
4	Report Writing	Nos	50000	50000	1	50000.00
	Sub Total F					1875348.00
	Total Cost (A+B+C+D+E+F)					74971655.82
	GST 18%					13494898.05
	Grand Total: with GST 18%					88466553.87
						or say Rs. 884.67 Lakhs
Note						
1	* IBM Rate					
2	** Nityanand Committee Rates with actual escalation as per RBI Index as on 31/03/2018 and the same for subsequent year					
3	**** Rate has taken from Schedule of Charges of different activities of GSI as on 2014-15 and 40% escalation on the same has been considered for FY 2018-19.					
4	# the charges of analyzing of Geotechnical Sample will be charged as per actual basis					
5	The date of commencement shall be reckoned after forest clearance.					

Table 2a. Time Schedule / Action Plan for General Exploration (G2) Proposal for Estimation of Copper Ore in Baraganda-Parsabera Block (0.6 SqKm), in Giridih District, Jharkhand State

Sl. No.	Activities	Unit	Months															Total
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	Camp Setting	Month																30 Days
2	Surface Drilling (3 Drills)	Metre																30 BH (5395 meters) 8 months
3	Survey Party days (1 Party)	Days																240 Days
4	Geologist Party days (2 Party)	Days																540 Days
5	Sampling Party days																	
i.	Core Sampling (2 party)	Days																480 Days
ii.	Bulk Sampling (1 party)	Days																30 Days
6	Laboratory Studies	Number/ month																2500 Samples 9 Months
7	Geotechnical Studies (Drill core 1 BH)	Month																90 Days
8	Beneficiation Studies	Month																90 Days
9	Camp Winding	Month																30 Days
10	Baseline Environmental Studies	Month																10 Months
11	Report Writing (Including Peer Review of Report)	Month																6 Months
	NOTE-																	
	* Commencement of projects will be reckoned from the day the exploration acreage is available along with all statutory clearances.																	

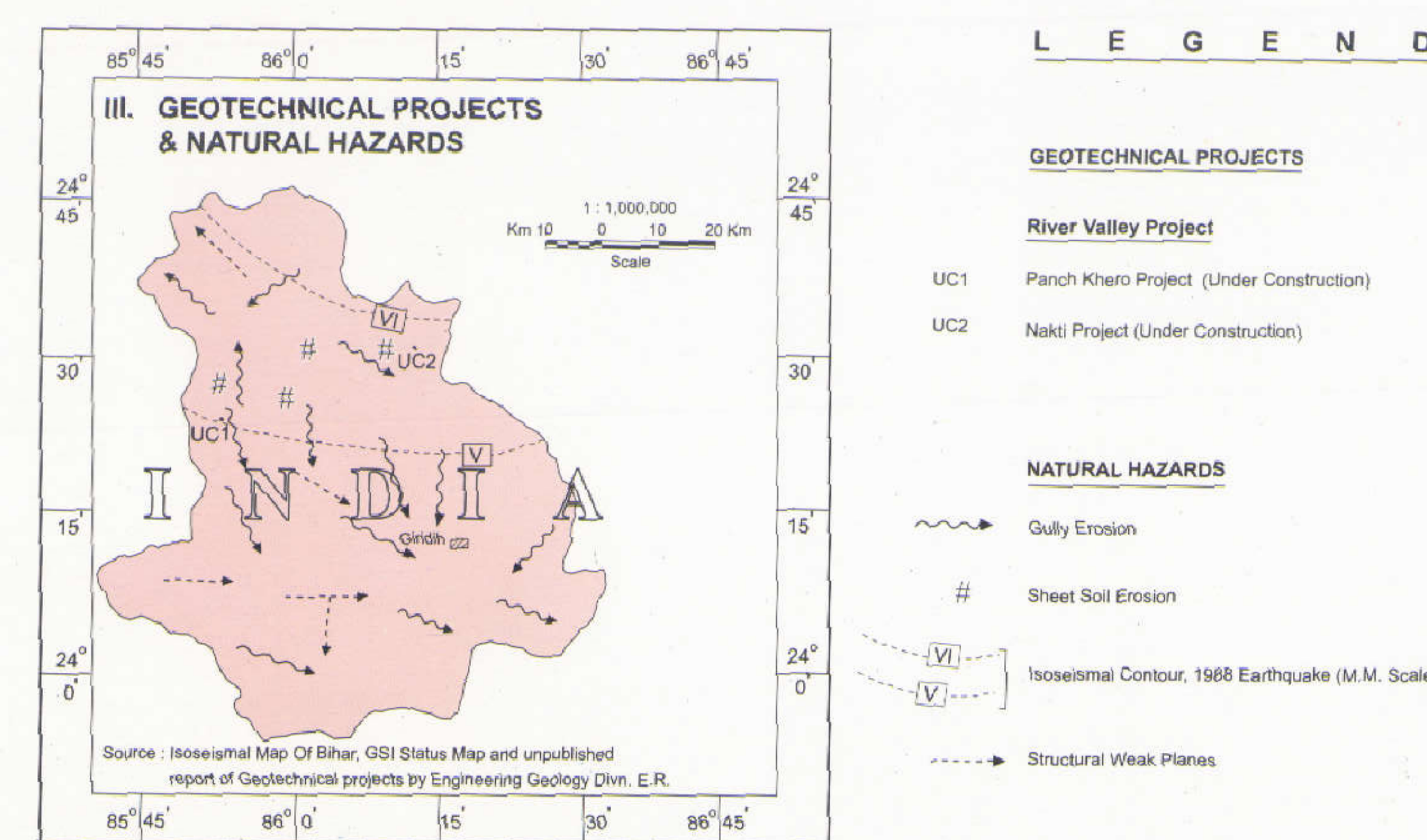
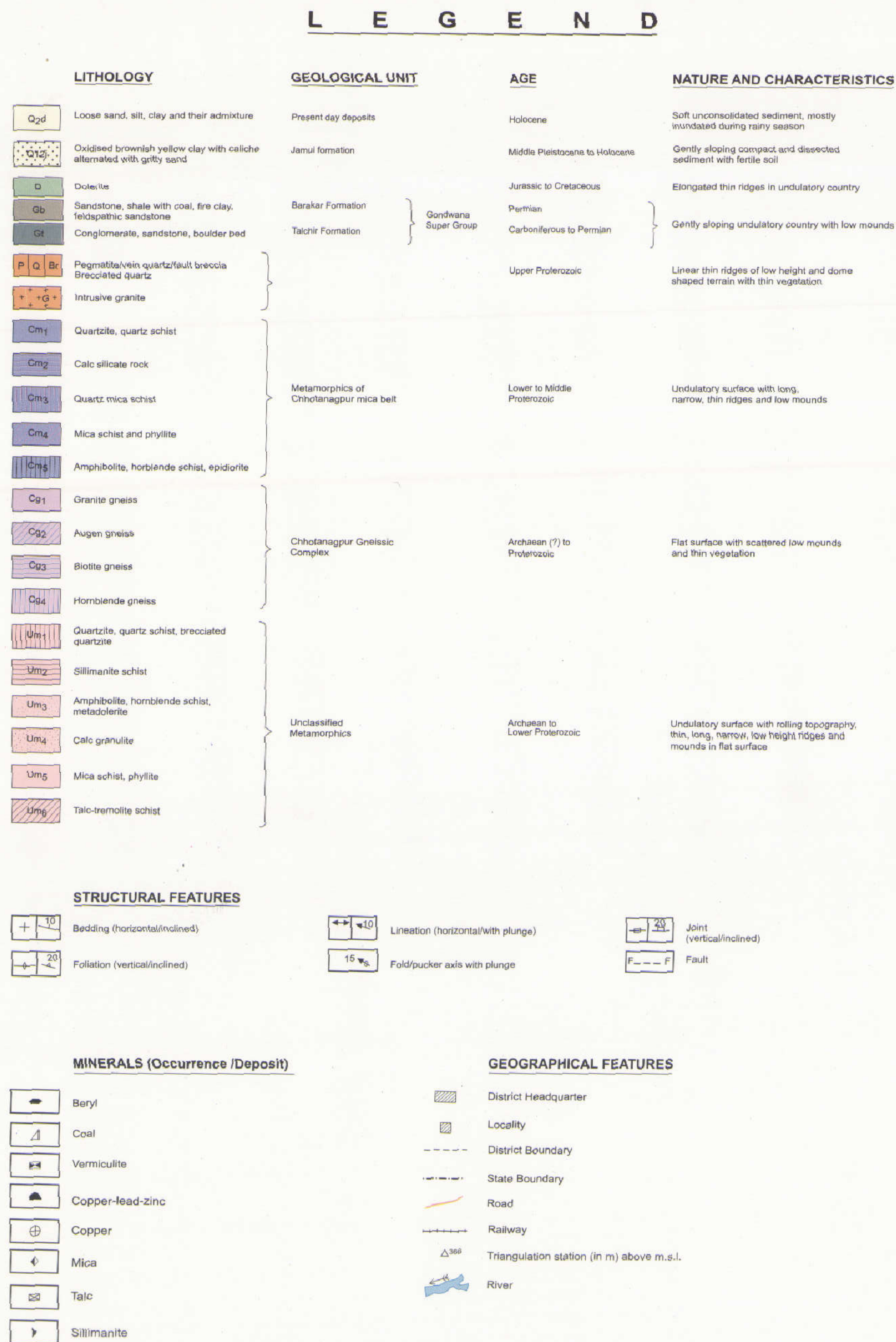
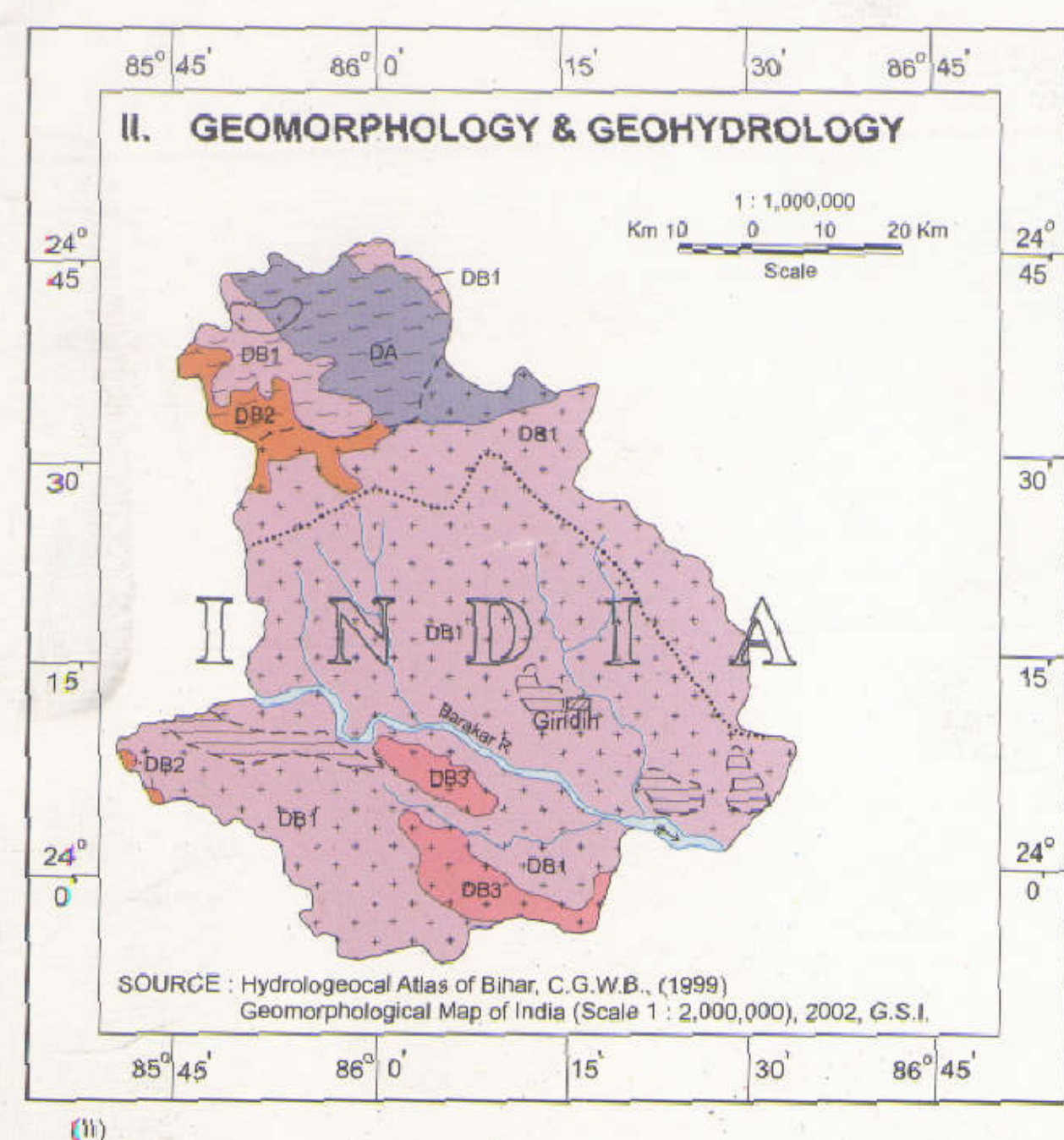
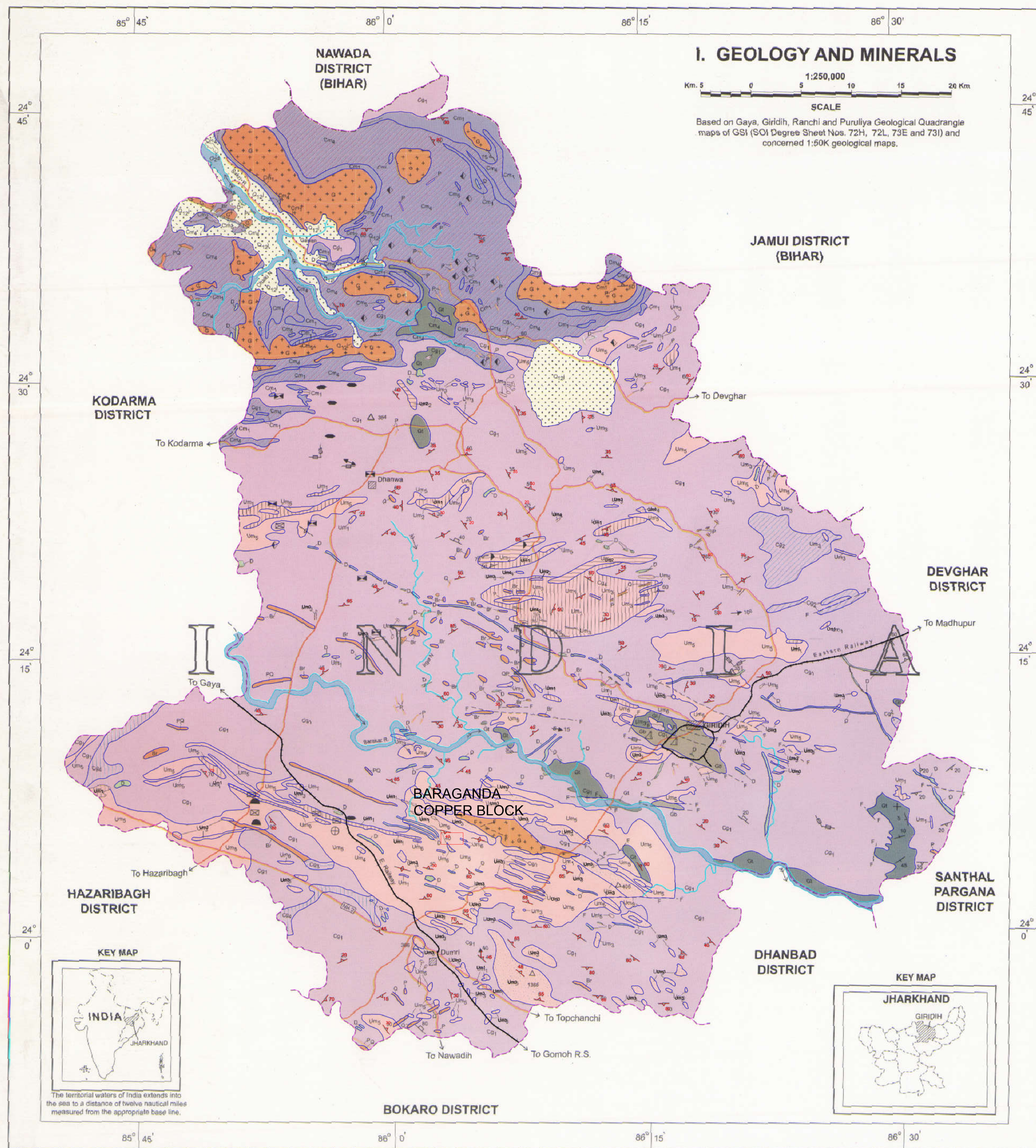


LOCATION MAP OF BARAGANDA COPPER DEPOSIT) GIRIDIH, JHARKHAND



MINERAL EXPLORATION CORPORATION LIMITED	
LOCATION MAP	
BARAGANDA BLOCK	
DISTRICT : GIRIDIH	STATE : JHARKHAND
MAP NOT TO SCALE	
Data Processed At: Information Technology Centre, M.E.C. Ltd. NAGPUR.	Prepared By : MAYANK DIXIT, Sr. Geologist Checked By : J. N. MURTHY, DGM (Exploration) Approved By : B. P. RATURI, HOD (Exploration)
MECL / EXPLOR. / DEC-2018	PLATE NO. I 1

जिला सम्पदा मानचित्र
DISTRICT RESOURCE MAP



गिरिधर शिवलाल शरणदास गजरा के उत्तरी भाग में अवस्थित है। यह उत्तर-पूर्व उत्तरपूर्व में विहार के अम्मा नगरा पूर्व उत्तरी दिशि, पूर्व में शरणदास के देवगढ़, संतोष परमान्य तथा धनबाद जिला, दक्षिण में कोरापट जिला तथा पश्चिम-पूर्व में दक्षिण-गिरिधर में अम्मा-कोरापट पूर्व हजारीबाग जिला के साथ। इसका क्षेत्रफल 6,887 वर्ग कि.मी. है तथा इसकी जनसंख्या 22,25,480। 1951 तक गिरिधर के अनुप्राण है। गिरिधर के दक्षिणी पश्चिम भाग में पूर्वी तट पर प्रथम बड़ा नदी है। शिवलाल मुन्नालाल गिरिधरी, पूर्वी तट पर गिरिधरी तट पर जुड़ा हुआ है। यह शिवलाल शरणदासी बंगला के अगली तरफ से जुनक के तट पर स्थित है तथा पूर्वी तट पर 2 जिले के दक्षिणी पश्चिम तट पर प्रवेश है।

गिरिधरी की राजधानी पूर्व में दक्षिण दिशि (bound) है। शिवलाल शरणदास 400 वर्ग कि.मी. क्षेत्रफल पर फैला हुआ है। शिवलाल शरणदास 400 वर्ग कि.मी. क्षेत्रफल पर फैला हुआ है। शिवलाल शरणदास 400 वर्ग कि.मी. क्षेत्रफल पर फैला हुआ है।

साक्षी एवं बराबर इस जिले की मुख्य नदियाँ हैं जो अरुण, उत्तरी एवं दक्षिणी क्षेत्रों में बहती हैं। इनके प्रवाह अरुण, उत्तरी पश्चिम एवं दक्षिणी पूर्व की ओर हैं। बराबर नदी उनकी अनेक सहायक नदियों जैसे उत्तरी, इराणा, विरकी के साथ मिलकर दुर्गाक्षीक (detrinsic) अवसर्जन संरचना करती हैं। जिले के अधिकांश कृषिक्षेत्रों में इसका जल व्यवहार किया जाता है। जबकि चरखी नदी का जल उत्तरी भाग में अवसर्जन बहाही भू-भाग के बीच सखीन कृषिक्षेत्रों में उपयोग किया जाता है।

[illegible][illegible]

(2) इस जिले में केक-मोनोसियम एवं एम्बोसाइट शैलों में पाये गये मूल खनिज खनिज पदार्थों में सेराइट (24°08'15" : 85°53'45") के पश्चिम तथा जेन्सल (24°06'40" : 85°22") में अतिरिक्त एक कुट्ट-पुन विनिर्मित (disseminated) जलसक्त खनिजों जैसे कैल्सीयमसफ़ाइट, मैग्नी, स्फ़ेल्सफ़ाइट, फ्लोक्साइट-पुनरावृत्त वर्गों के रूप में पाये जाते हैं। खनिजीकृत क्षेत्र लगभग 170 कि. मी. चौड़ा तथा 3.2 मी. चौड़ा है एवं 1.02% औसत मात्रा इसमें मिले हैं। इसका सूचित खनिज (indicated reserve) 0.13 मी. है। लाख के एक पतले एवं कठोर वस्तुओं वस्तुओं में अर्चवर्त हैं। कैल्सीयमसफ़ाइट तथा मैग्नीसफ़ाइट के दमागों की खोज (traces) मैन्सोवाराड रिज तथा देवगढ़ शिखर के भीतर परम्पराओं में पाये जाते हैं।

(3) दमरा (24°29' : 85°57'), रंगमाटी (24°30' : 85°57'), लोहगिरिपार (24°29' : 85°57'), तोलीडीह (24°27' : 85°56'30") एवं अमरा (24°07' : 85°57') टीकाबलर के समान ही के समान और

(4) लगभग अंशित प्रकार के टैक्स-मैग्नेसियम सैल के संघिकार्य में चट्टिणी की रूप में पाये जाते हैं अक्षांश 24°05' से 24°07'30" तक एवं 85°50' से 85°57' देशान्तर के बीच तथा अक्षांश 24°23' एवं 85°53' देशान्तर में अवस्थित हैं।

(5) बरगुमगाछा जिले के पश्चिम किनारा बराबर शिष्टोन्नत-तथा नाइस्तिक गैरों राहगीरी पेगाताइड में पाये जाते हैं। यहाँ बहुत से गिरेवों आकार 24'16" से 24'29" तक एवं 85'52" से 85'59" देगातर तक के बीच विस्तार हुये दिखाई देते हैं। एक ऐसी जगह (occurrence) कुकरी गैरों में मिलती है जो 613 मी. लम्बी तथा 320 मी. चौड़ी है एवं पेगमाटाइट, क्रोसि की विराट तथा हॉर्नब्लेंड शिष्ट के साथ सम्मिश्रित है।

(6) **बोयाला** : बोयाला यह जिले की महत्वपूर्ण खेती है। बोयाला सिन्धिया के अखंडत रक्षियों से उपजती है जो राखी है। यह बोयालाखाना दो प्रान्त बंसी द्वारा उत्तरी और दक्षिणी प्रान्तों में सीमाबद्ध है। निम्न गोडवाना के होलतमून में पाये गये महत्वपूर्ण बोयाला उत्तरी टिनकोली जिले, खम्बोरी जिले, सिकंदरा जिले इत्यादि स्थानों में पाये जाते हैं। तीन कोला स्तर अनामिकाय बोया

जल संवर्धन : क्षेत्र के भूजल माध्यम से सूखे से मोटे तरातु अवातत परिसिंचित तथा अवपरीक्षित भूजल के अभावे से पाये जाते हैं। यह गण्डाक शिफ्टस्टोन, फ़िट, सेण्डस्टोन, शैल (shale) तथा किंगडोमेन्ट आदि से बने हैं। इन भागों में से सीमित जलवाहक (14 सेंटीमी प्रति सेण्टीमी) होता है। क्षेत्र का भूजल अवासीय अवशेष (weathered residuum) में भी उपलब्ध है जिसमें लैंड, क्वार्ट्जाइट, कोलाइट, फ़िट, समग्रमर तथा ग्नाइसिक शैलें में स्थित पीपल संरक्षण (secondary porosity) है। इसकी जलप्रति 5-6 सेंटीमी प्रति सेण्टीमी होती है।

प्राकृतिक आपदायें : असमानताओं का उपकरण (Gully erosion) एवं घास अवरुद्ध अनवाछनीय गहरी क्षेत्रों में सामान्य रूप से देखे जाते हैं। यह क्षेत्र भू-कम्प से सहित। 1980 के विहार-मैथिल भू-कम्प के जोन IV एवं जोन VI वाली आइसोटोसमल कौन्टूर इस जिले में से गुजरती है।

यहाँ पर दो मुख्य नदी परिवर्तन हैं - 'दंड खोरी' परिवर्तन एवं गहरी परिवर्तन जो कि निर्माण तार पर है (अब तक)।

(भाषांतर : सी. के. मखरेल)

Explanatory Note

Giridih district is located in northern part of Jharkhand state surrounded by Nawada & Jamui districts of Bihar in the north & NE respectively, Deoghar, Santhal Pargana and Dhanbad districts of Jharkhand in the east, Bokaro district of Jharkhand in south and Kodarma & Hazaribagh districts of Jharkhand in West and SW respectively. It covers an area of 4,887.9q. km. with its total population being 22,25,460 (1991 census). The Eastern Railway Grand Chord passes through the district along its SW part. The district HQ, Giridih, is connected by Eastern Railway Giridih

The area is characterised by rugged terrain with denudational hills with / without valley and undulating plains belonging to the geomorphic province of Chhotanagpur plateau. There are also some small isolated hills in the north and southern parts of the district. It is mostly hilly.

Sakri and Barakar are two major rivers flowing in northern and southern parts of the area respectively with their flow towards NW & SE

The district exhibits a wide variety of rock types of different ages with a storehouse of mineral deposits. The older rock units encountered in

The younger extensional tectonic regime of different ages with a dominance on mineral deposits. The older rock units, encountered in the district, are Unclassified Metamorphics of Archaean age characterised by varieties of schistose rocks, phyllite, amphibolite, quartzite and calc-granulite. The rocks occur as enclaves within Chhotanagpur Gneissic Complex of Archaean (?) – Proterozoic age, which exists as country rocks. This rock group is represented by granite gneiss and other gneissic rocks. Metamorphics of Chhotanagpur Mica Belt of lower to middle Proterozoic age represented by epidiorite, amphibolite, a variety of schistose rocks, phyllite, quartzite and calc-silicate rocks are next younger.

rock group exposed as patches of various dimensions in the northern part of the district. Pegmatites, being main host rock for mica, are preferentially associated with migmatitic mica gneiss, biotite rich mica gneiss and sillimanite rich mica gneiss. Granite/pegmatite/vein quartz etc. of upper Proterozoic age intrude into older rocks and restrict themselves in northern part. Lower Gondwanas represented by Talchir and Barakar Formations of Permo-Carboniferous age unconformably rest over older rocks. Talchir Formation, characterised by conglomerate, sandstone, siltstone, etc. is a typical Gondwanite formation. It is overlain by Barakar Formation, which is a typical Gondwanite formation. The Barakar Formation is characterised by sandstone, siltstone, etc. and is overlain by the Gondwanite formation. The Barakar Formation is characterised by sandstone, siltstone, etc. and is overlain by the Gondwanite formation.

boulder bed and Barakar Formation, characterised by sandstone, shale with coal seams, are restricted along Barakar River and a few exposures of conglomerate, boulder bed are found along Sakri River. Quaternary formations represented by Jamui formation and Present-day deposits are restricted along the banks of Sakri river. Jamui formation characterised by oxidised brownish yellow clay with caliche shows a narrow valley-fill deposit while Present-day deposits made up of loose sand, silt and clay form the river bed in the form of channel/point bars.

(1) Most important mineral found in the district is mica. Excellent books of ruby mica of economic importance are found here. The eastern

part of famous Bihar Mica Belt falls in Giridih district. Pegmatite or strictly speaking mica-rich pegmatites are main source of mica. These are coarse to very coarse grained, pink to pinkish white or dull white coloured rocks composed of alkali feldspar and quartz with muscovite. Promising muscovite deposits lie in between latitudes $24^{\circ}00'$ - $24^{\circ}45'$ and longitude $86^{\circ}05'$ within Giridih district which extends further eastward beyond district boundary. Important old workings are located as Dasaro, Mahugain, Rajardih and Katlo etc.

(2) Base metal mineralization is found in calc magnesian and amphibolite rocks near Deoradih (24°08'15" : 85°53'45"), Dondia (24°06'40" : 85°22") in the form of minute and sporadic dissemination of sulphide minerals eg., chalcopyrite, galena, sphalerite, malachite-azurite stains. The mineralised zone is roughly 170m long and 3.2m wide containing an average 1.02%Cu. The indicated reserve is 0.13 million tonnes.

An old working for copper is present near Baragunda. Traces of chalcocite and malachite stains occur in muscovite schist in association with talc and talc-tremolite schist near Parabara. Disseminated grains and narrow streaks of pyrite with chalcocite have been found in quartzite bands in the central and eastern parts of the area. At Kusmarja, Dondlo and Parasia galena, malachite and azurite are found associated with garniferous quartz-actinolite-talc schists. Pocket type deposits have small strike lengths.

(3) Pegmatites in granitic association occurring at Dughara (24°29' : 85°57'), Rengamati (24°30' : 85°57'), Lohinitatnar (24°29' : 85°57'), Telodih (24°27' : 85°56'30') contain dirty brown coloured pieces of beryl. Sillimanite of inferior quality and non-economic variety is found also in the district in pegmatite.

(5) Vermiculites are found in pegmatites in schistose and gneissic rocks association along western border of the district. There are number of deposits scattered within latitudes $24^{\circ}16'$ to $24^{\circ}29'$ and longitudes $85^{\circ}52'$ to $85^{\circ}59'$. One such occurrence near Kubri is 613m long and 320m

(6) Coal is one of the important minerals in the district where Girdih Coalfield has been exploited since long. The coalfield is bounded by two faults in north and south. Important coal seams, contained in lower Gondwana Formations, occur near villages viz. Tinkonia, Akroni, Katan.

Groundwater occurs in moderately thick but discontinuous confined as well as unconfined aquifers in lithological units of siltstone, grit, sandstone, shale and conglomerate. It provides limited yield against Barakar, Kharib, and Raniganj formations. The Barakar Formation is the main aquifer in the area.

Gully erosion and sheet erosion are common in denudational hill area. The area is seismically active. Isoseismal contours of zone V and VI

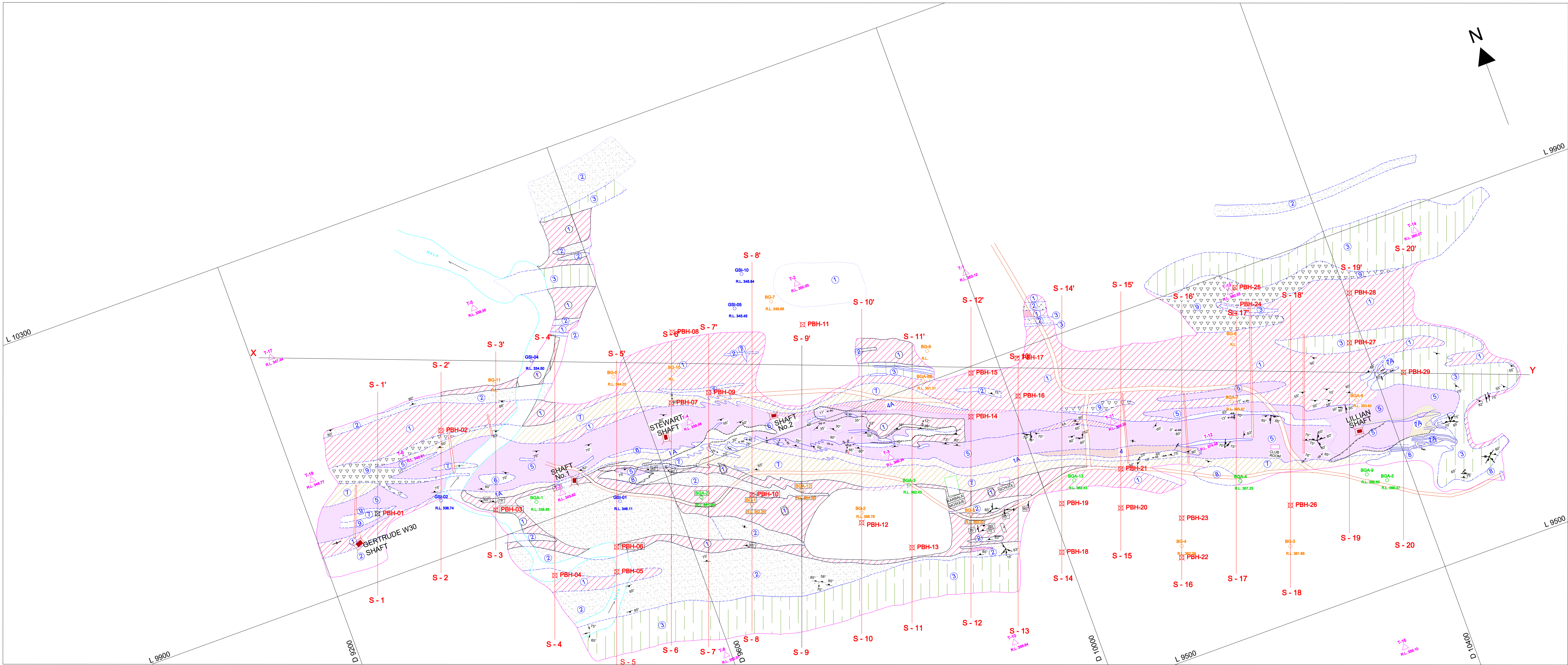
There are two geotechnical projects viz., Panch Khero Project and Nakti Project. Till date, both the projects are under construction stage.

Compilation : J. M. Prasad, Geologist under the guidance of
Buddhadeb Chaudhuri, Director, MCP Division,
Op : B & J, E.R., G.S. I.

Scrutiny, editing and processing : P. K. Mondal, R. Chakraborty, Geologists (Sr.), G. K. Mullan, Smt. S. Hazra, Asstt. Geologists Gr-I, under the guidance of Buddhaddeb Chaudhuri, Director, M & C Divn., GSI, ER

Under the general technical supervision of Dr. D. K. Das, Dy. Director General, GSI, ER., Kolkata.

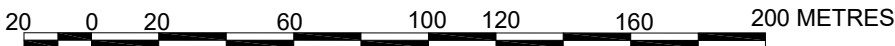
Year of Publication : 2006 A.D.



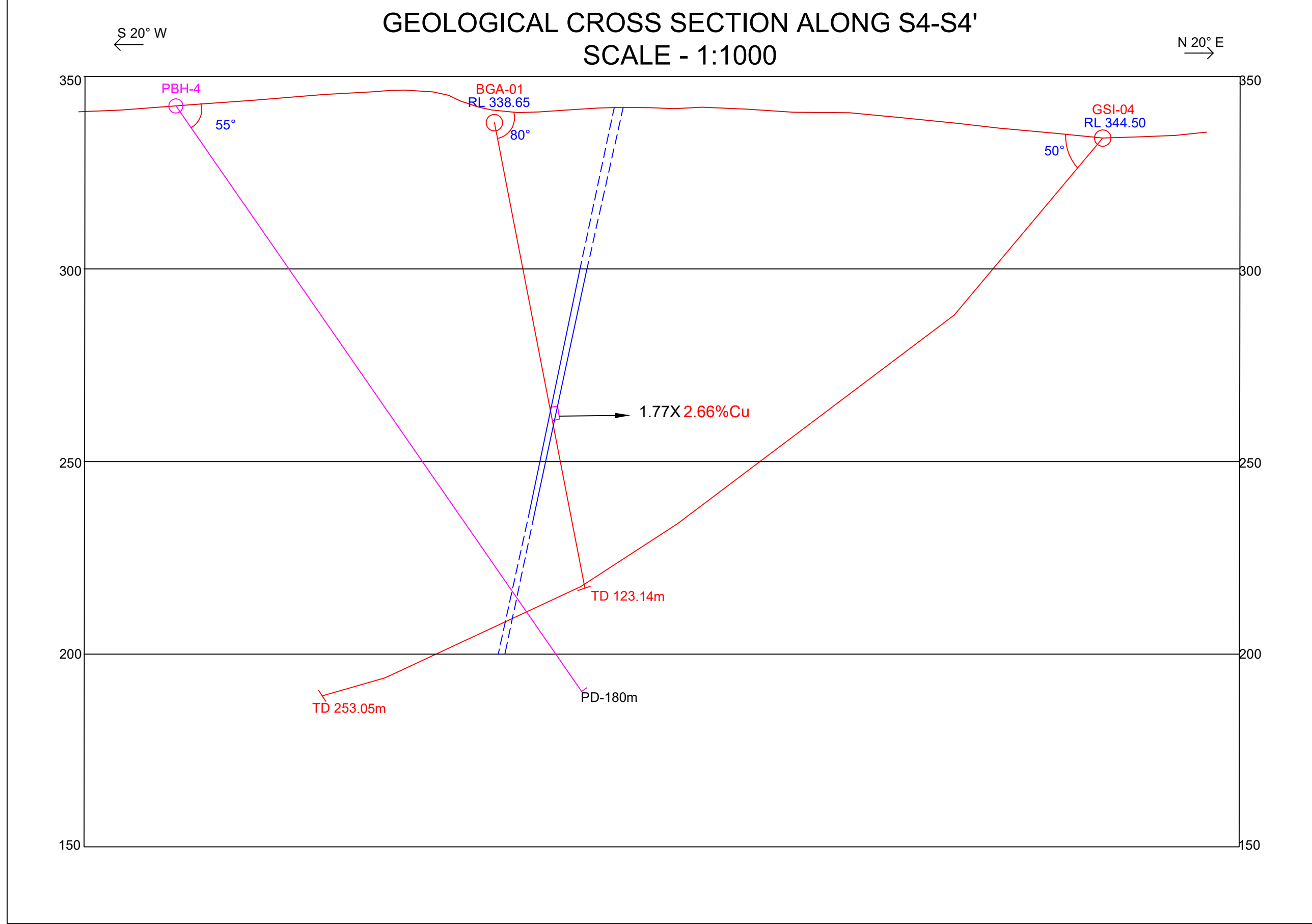
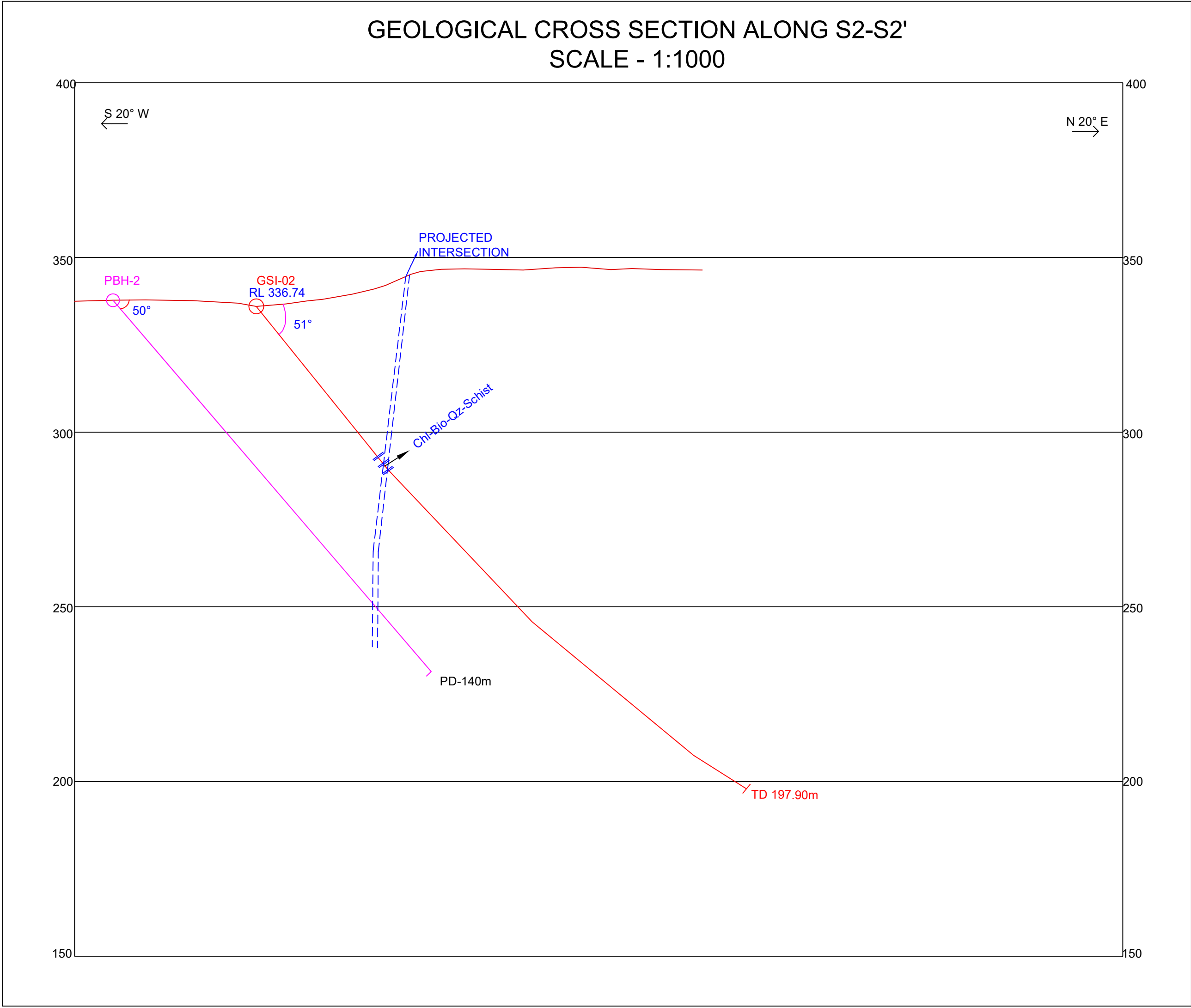
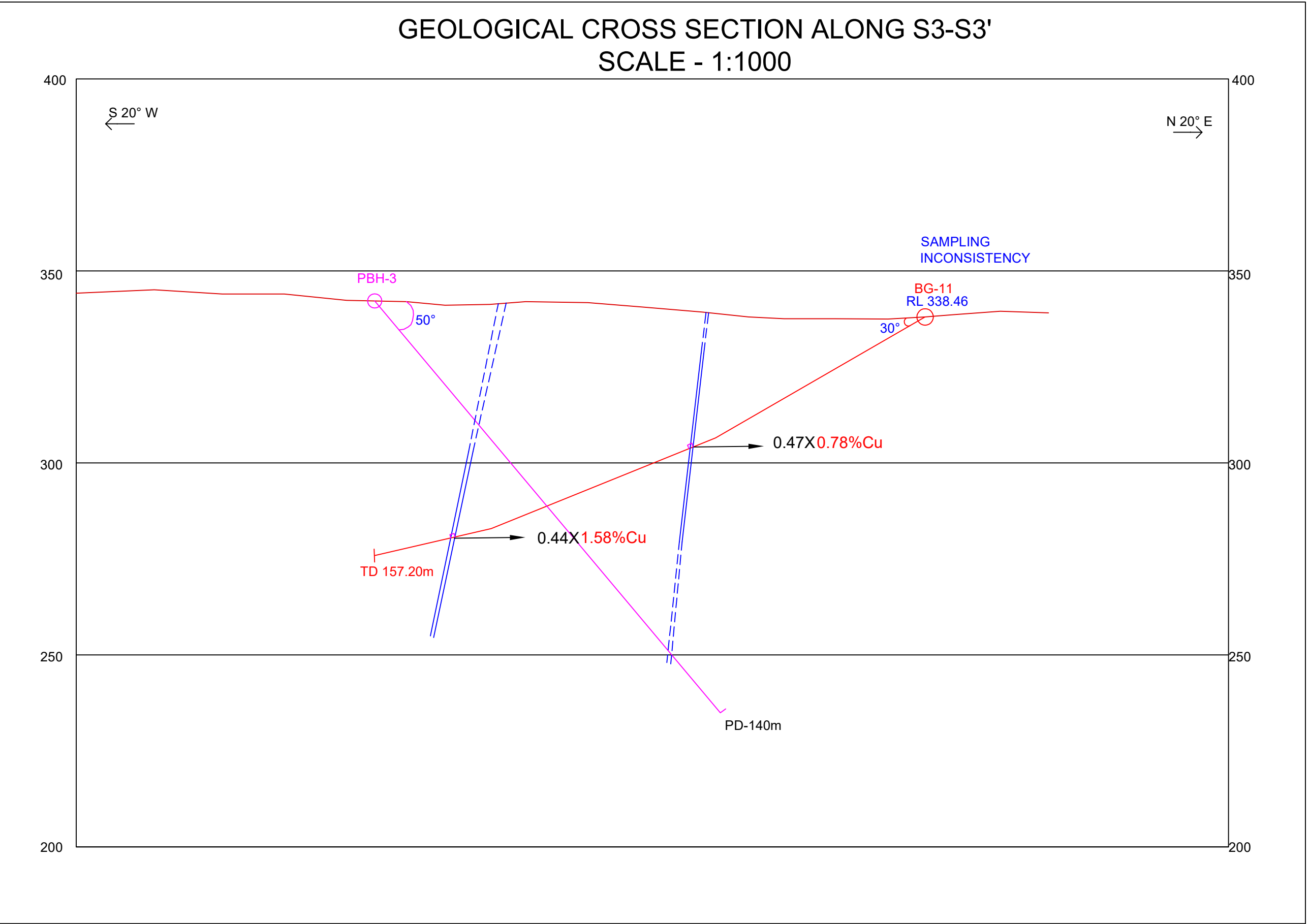
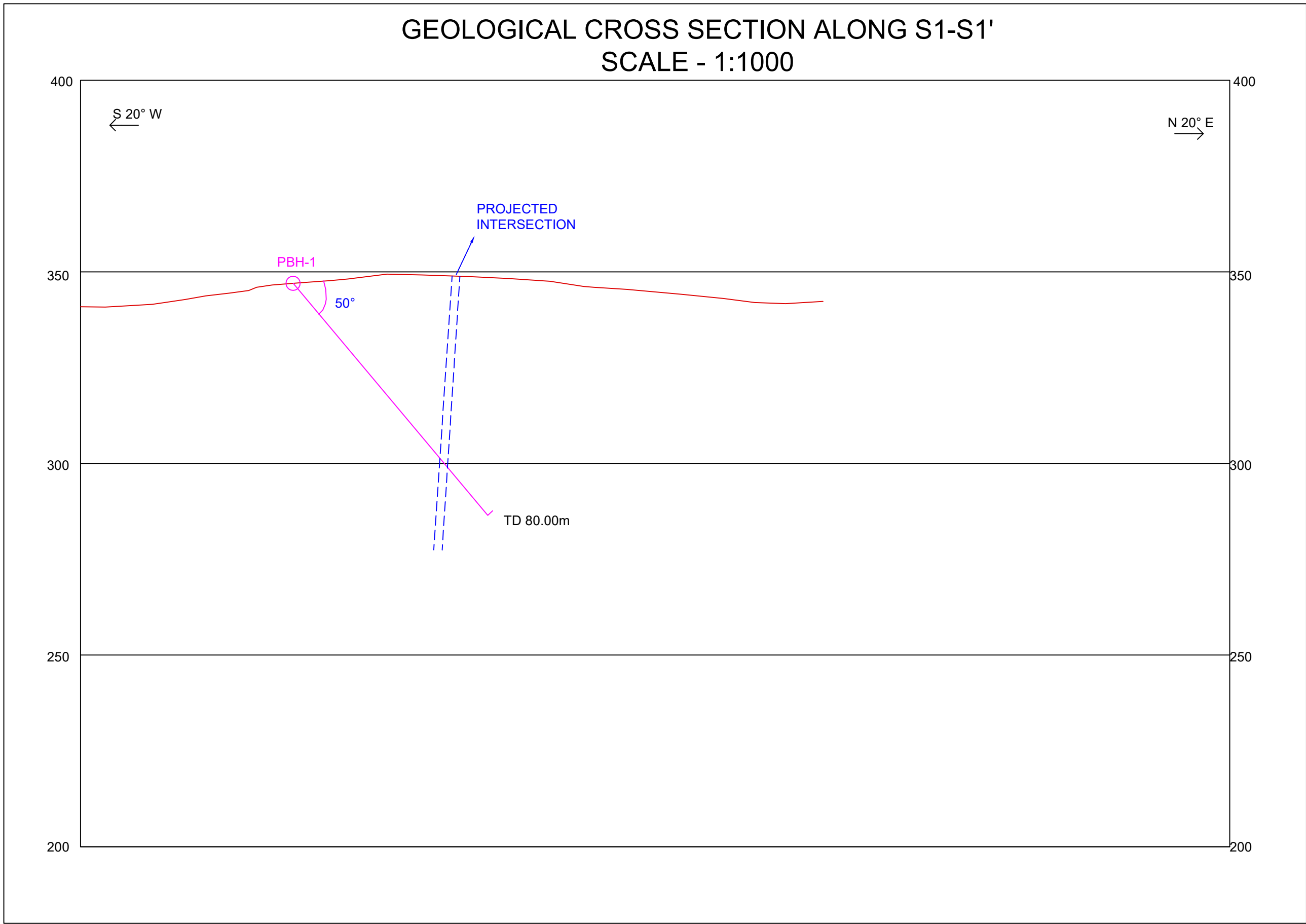
INDEX TO LITHOLOGY	
FELSPATHIC BIOTITE-MUSCOVITE-QUARTZ SCHIST	1
MUSCOVITE-QUARTZ SCHIST	1A
QUARTZITE	2
AMPHIBOLITE	3
GARNETIFEROUS CHLORITE- BIOTITE- SCHIST	4
CHLORITE- BIOTITE-QUARTZ SCHIST	4A
FELSPATHIC (MUSCOVITE)-BIOTITE- CHLORITE- QUARTZ ROCK	5
CHLORITE- ACTINOLITE SCHIST	6
TALCOSE MUSCOVITE - QUARTZ SCHIST	7
TALCOSE CHLORITE -BIOTITE- SCHIST	7A
TALC SCHIST	8
ACTINOLITE - QUARTZ - TREMOLITE ROCK	9
VEIN QUARTZ	10

INDEX TO STRUCTURAL FEATURES	
ATTITUDE OF FOLIATION (INCLINED, VERTICAL)	S ₁
ATTITUDE OF AXIAL PLANE FOLIATION	S ₂
AXES OF FOLDS PARALLEL TO STRIKE (DIRECTION OF PLUNGE WITH AMOUNT)	b ₁
AXES OF SUB-HORIZONTAL WARPS IN DIP PLANE	b ₂
AXES OF SUB-VERTICAL CRENULEATION ALONG THE STRIKE	b ₃
LINEATIONS RELATED TO b ₁ FOLDS	l ₁
LINEATIONS RELATED TO b ₂ FOLDS	l ₂
LINEATIONS RELATED TO b ₃ FOLDS	l ₃
JOINTS	
LITHOLOGICAL CONTACTS (OBSERVED, INFERRED)	
BOREHOLES DRILLED BY G.S.I (PHASE I)	GSJ-02 RL 336.74
BOREHOLES DRILLED BY G.S.I (PHASE II)	BQ-2 RL 336.78
BOREHOLES DRILLED BY D.G.M BIHAR	BGA-13 RL 362.43
PROPOSED BOREHOLES BY MECL	PBH-12

COLLAR OF BOREHOLE	BG-1
TRENCHES	T-10
OPENCAST EXCAVATIONS	
TRIANGULATION STATION	



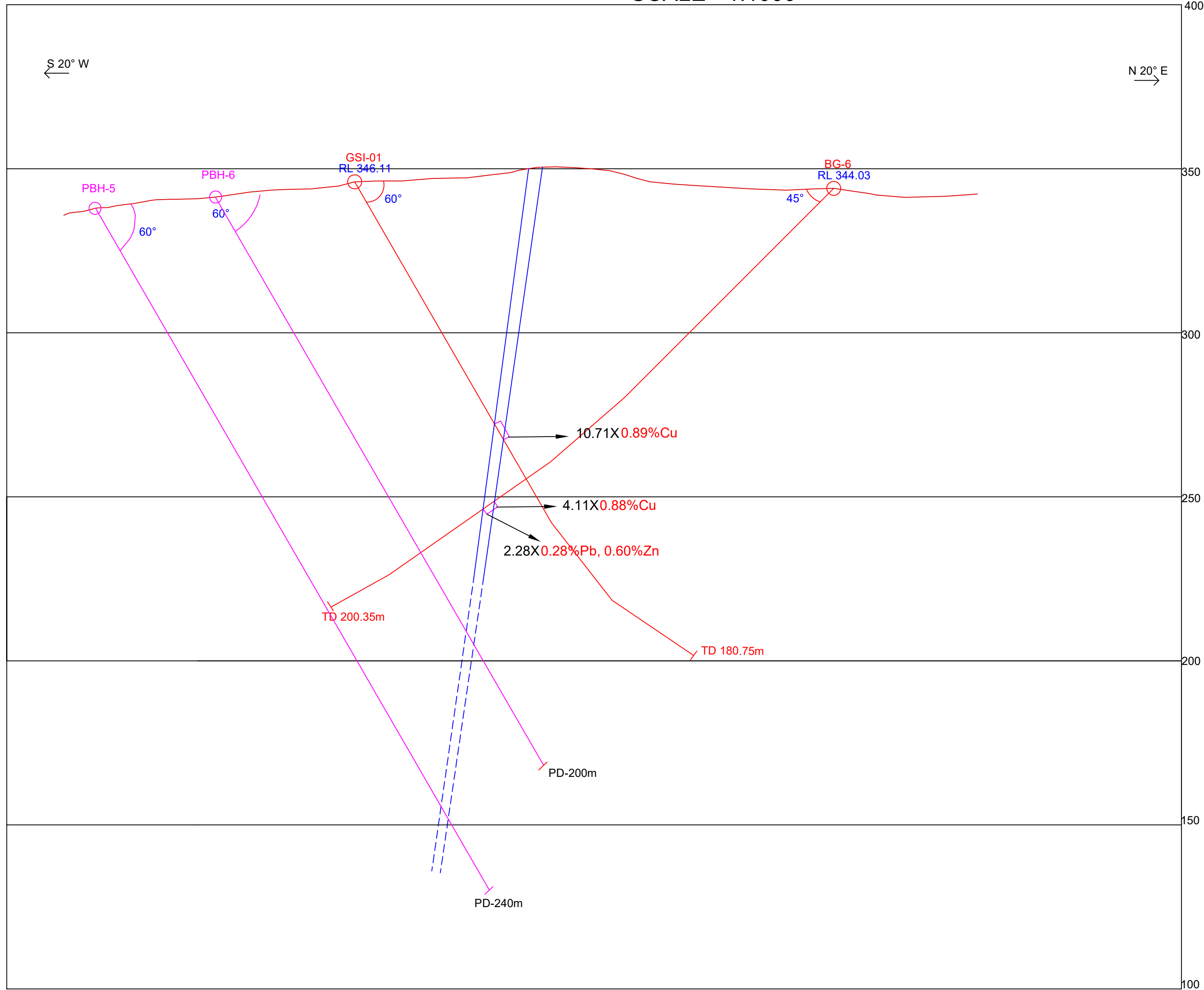
 MINERAL EXPLORATION CORPORATION LIMITED		
GEOLOGICAL MAP (After G.S.I.)		
BARAGANDA BLOCK		
DISTRICT : GIRIDIH		STATE : JHARKHAND
R.F. - 1 : 2000		
Prepared By: Exploration Division, MECL, Nagpur.		Processed at : IT Centre, MECL, Nagpur.
MECL / EXPLORATION / NOV-2018		SOURCE - G.S.I
		3



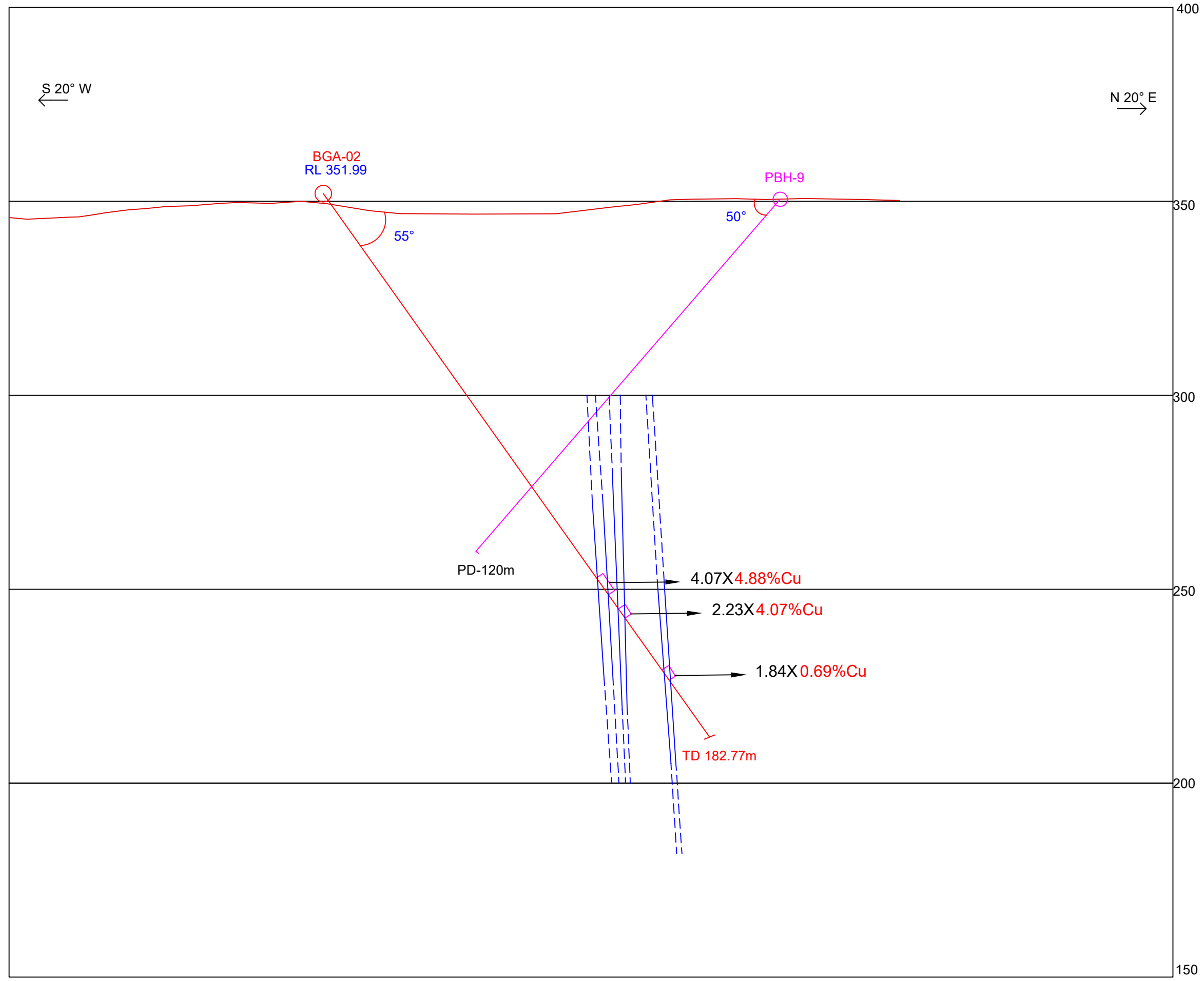
INDEX	
BGA-01	Borehole Drilled By DGM (Bihar), (Core Drilling)
RL 338.65	Borehole Reduced Level (RL In meters)
BG-11	Borehole Drilled By DGM (Bihar), (Core Drilling)
RL 338.46	Borehole Reduced Level (RL In meters)
GSI-02	Borehole Drilled By G.S.I. (Core Drilling) (Phase-II)
RL 336.74	Borehole Reduced Level (RL In meters)
PBH	Proposed borehole by MECL (Core Drilling)
1.77X2.66%Cu	Borehole With True Width (m) of zone and Copper (Cu) % at 0.5% cut-off
TD 129.80m	Total Depth of Borehole (m)
PD-150m	Proposed Depth of Borehole (m)

 MINERAL EXPLORATION CORPORATION LIMITED		
REPRESENTATIVE GEOLOGICAL CROSS SECTIONS ALONG S1, S2, S3 & S4		
BARAGANDA BLOCK		
DISTRICT : GIRIDIH		STATE : JHARKHAND
R.F. - 1 : 1000		
Prepared By: Exploration Division, MECL, Nagpur.		Processed at : IT Centre, MECL, Nagpur.
MECL / EXPLORATION / DEC-2018		4

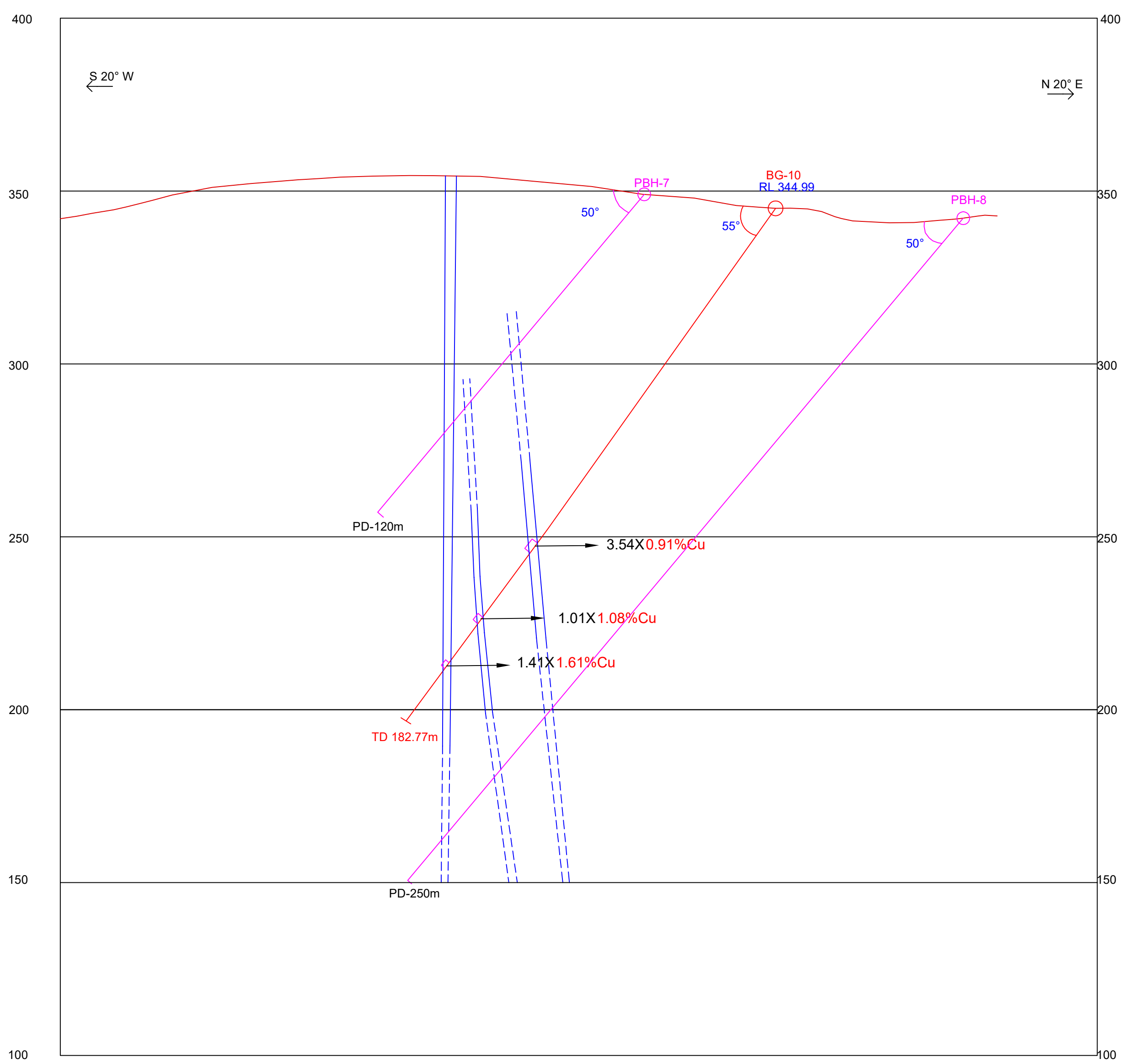
GEOLOGICAL CROSS SECTION ALONG S5-S5'
SCALE - 1:1000



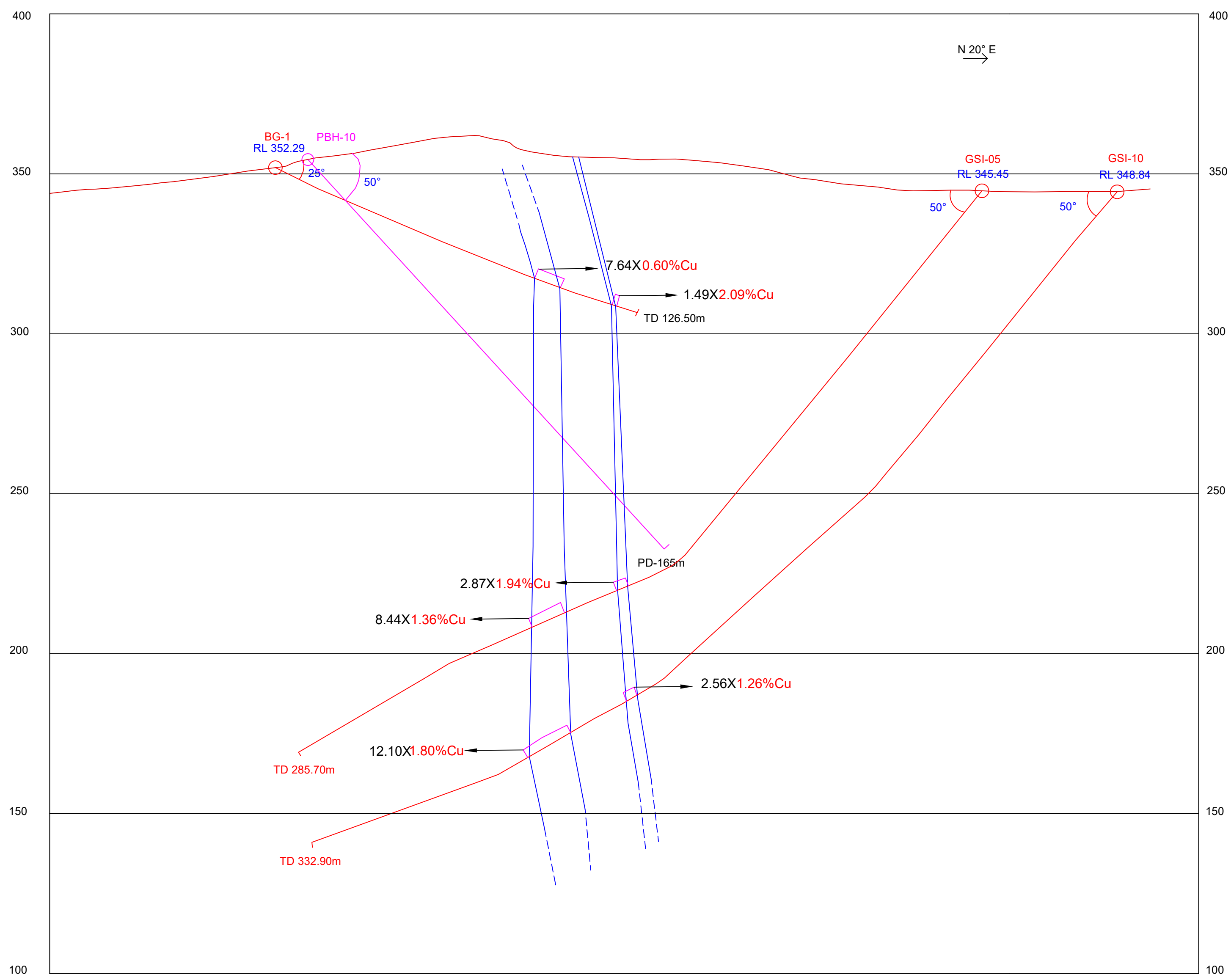
GEOLOGICAL CROSS SECTION ALONG S7-S7'
SCALE - 1:1000



GEOLOGICAL CROSS SECTION ALONG S6-S6'
SCALE - 1:1000



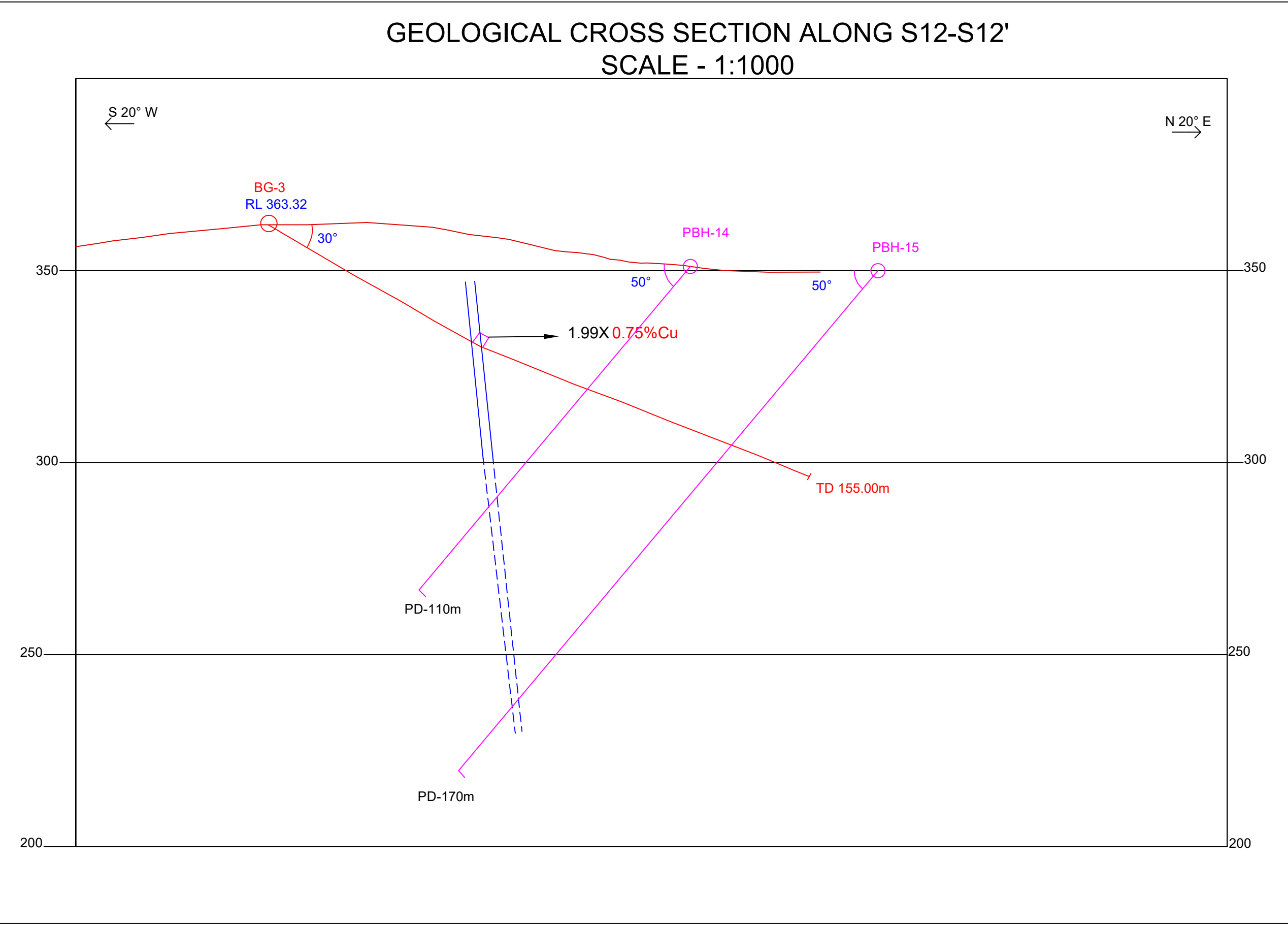
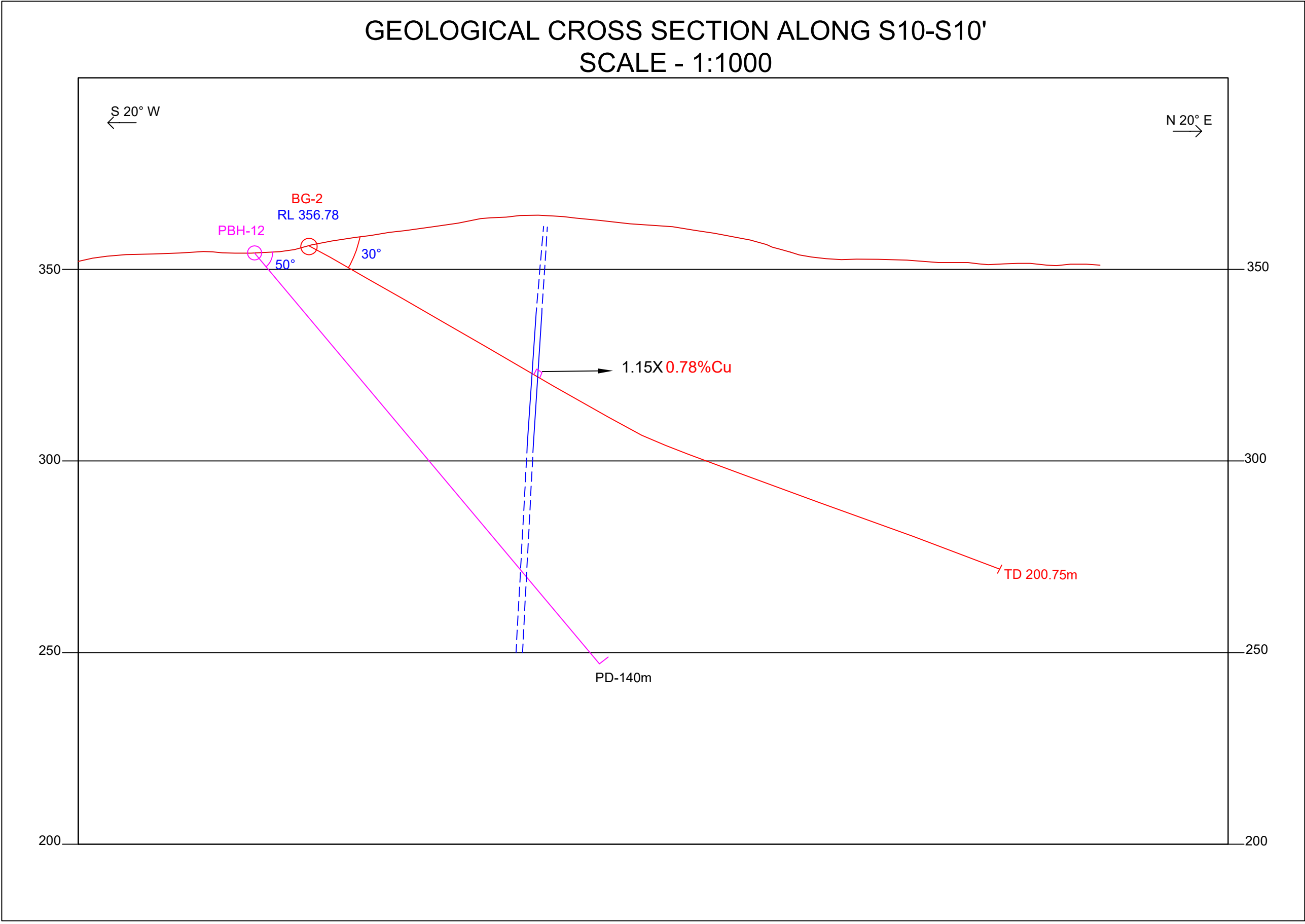
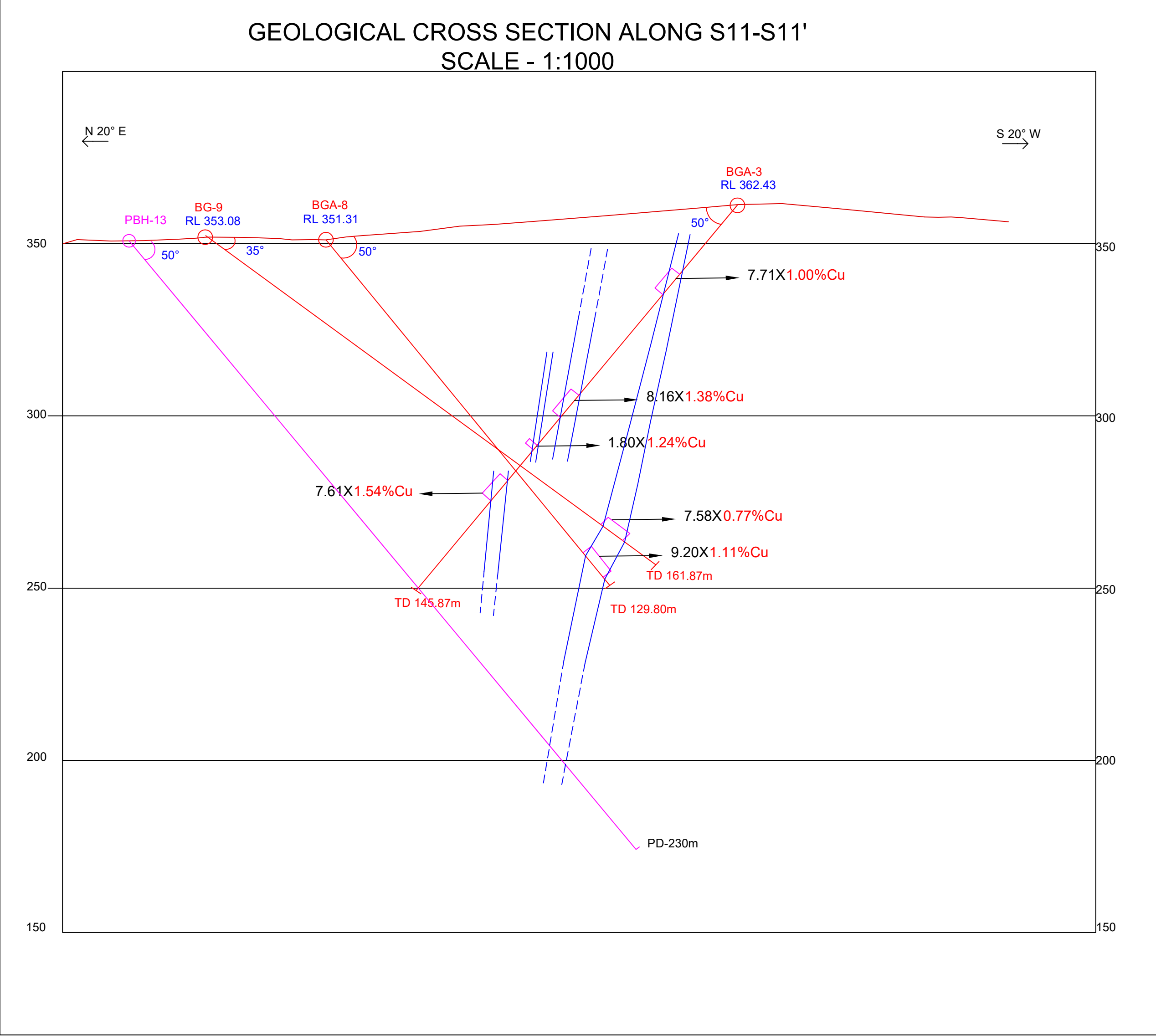
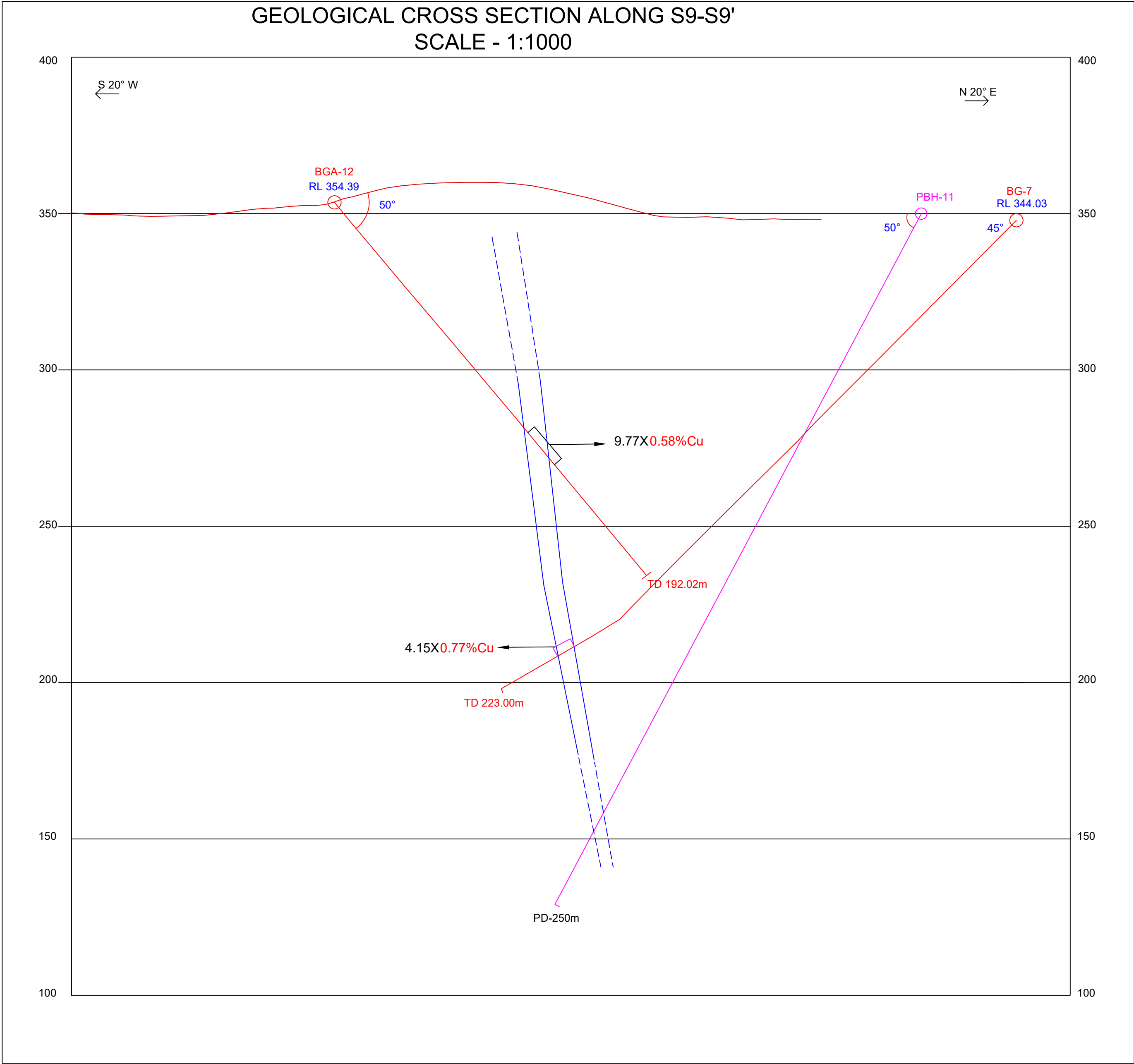
GEOLOGICAL CROSS SECTION ALONG S8-S8'
SCALE - 1:1000



INDEX

- BGA-01
■
RL 338.65
Borehole Drilled By DGM (Bihar), (Core Drilling)
Borehole Reduced Level (RL In meters)
- BG-11
■
RL 338.46
Borehole Drilled By G.S.I. (Core Drilling) (Phase-I)
Borehole Reduced Level (RL In meters)
- GSI-01
■
RL 346.11
Borehole Drilled By G.S.I. (Core Drilling) (Phase-II)
Borehole Reduced Level (RL In meters)
- PBH
○
Proposed borehole by MECL (Core Drilling)
- 1.77X 2.66%Cu
Borehole With True Width (m) of zone and Copper (Cu) %
at 0.5% cut-off
- TD 129.80m
Total Depth of Borehole (m)
- PD-150m
Proposed Depth of Borehole (m)

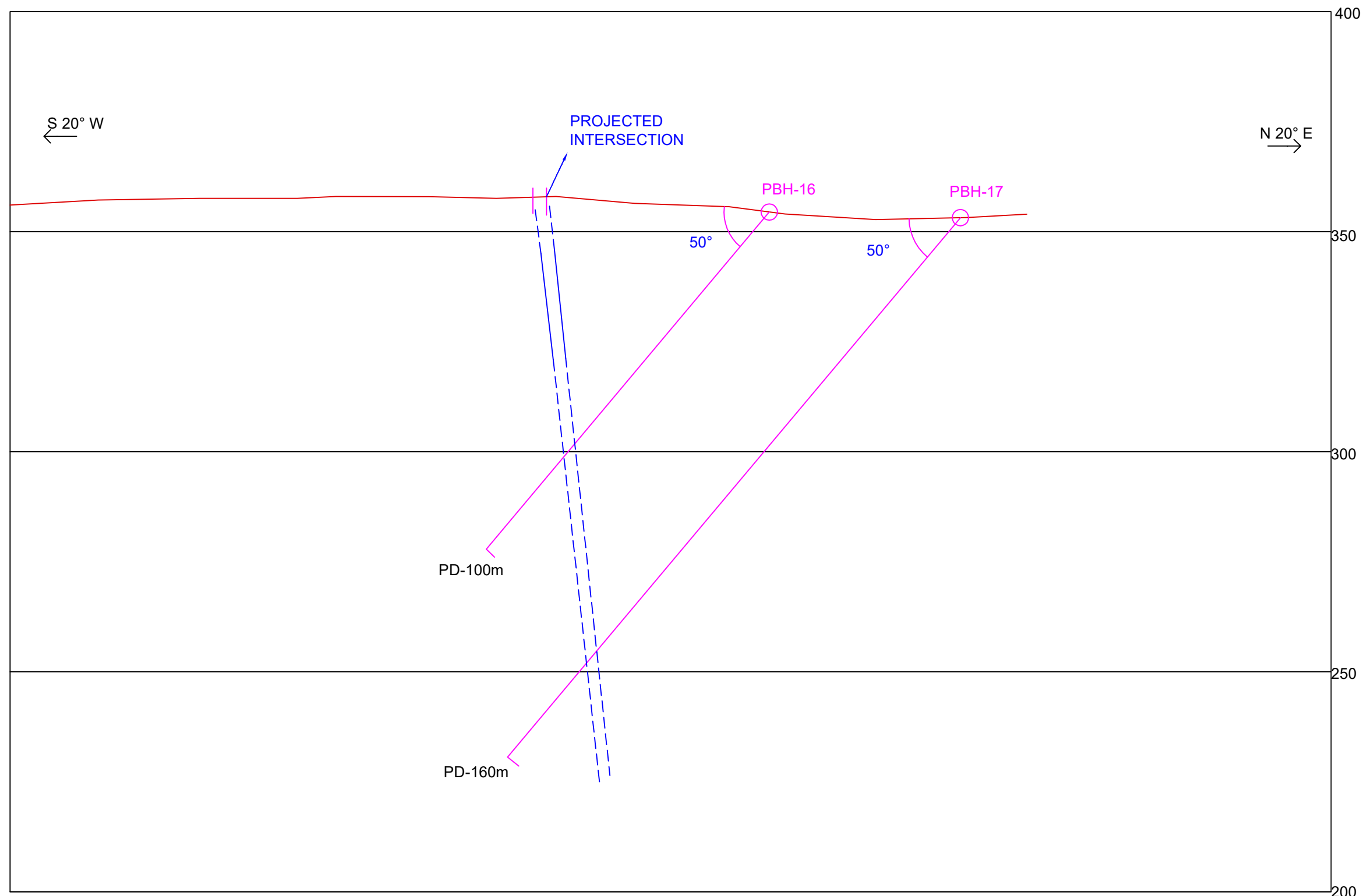
 MINERAL EXPLORATION CORPORATION LIMITED		
REPRESENTATIVE GEOLOGICAL CROSS SECTIONS ALONG S5, S6, S7 & S8		
BARAGANDA BLOCK		
DISTRICT : GIRIDIH		STATE : JHARKHAND
R.F. - 1 : 1000		
Prepared By: Exploration Division, MECL, Nagpur.		Processed at : IT Centre, MECL, Nagpur.
MECL / EXPLORATION / DEC-2018		5



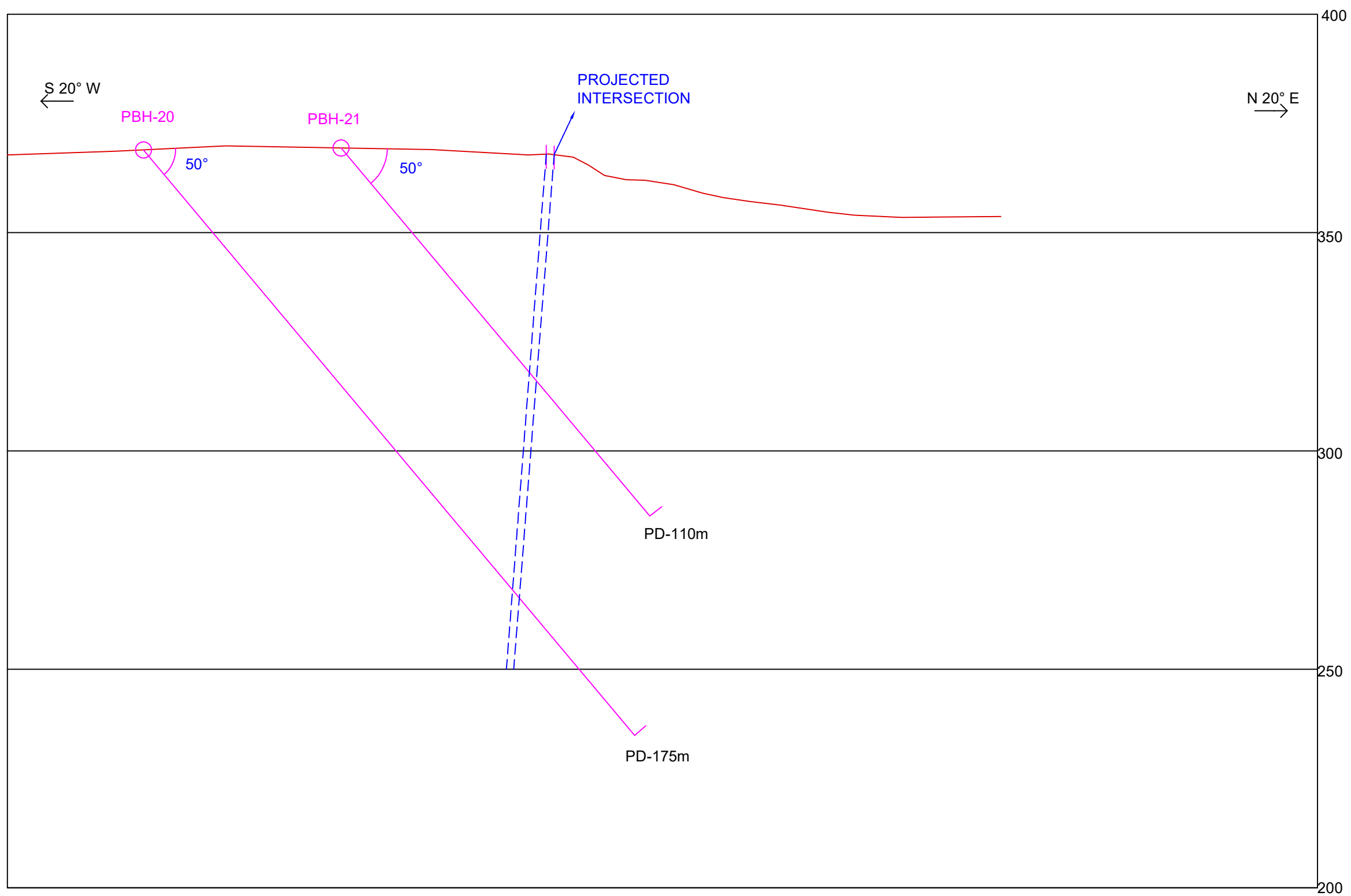
INDEX	
BGA-01	Borehole Drilled By DGM (Bihar). (Core Drilling)
RL 338.65	Borehole Reduced Level (RL in meters)
BG-11	Borehole Drilled By G.S.I. (Core Drilling) (Phase-I)
RL 338.46	Borehole Reduced Level (RL in meters)
PBH	Proposed borehole by MECL (Core Drilling)
1.77X2.66%Cu	Borehole With True Width (m) of zone and Copper (Cu) % at 0.5% cut-off
TD 129.80m	Total Depth of Borehole (m)
PD-150m	Proposed Depth of Borehole (m)

 MINERAL EXPLORATION CORPORATION LIMITED		
REPRESENTATIVE GEOLOGICAL CROSS SECTIONS ALONG S9 , S10 , S11 & S12		
BARAGANDA BLOCK		
DISTRICT : GIRIDIH		STATE : JHARKHAND
R.F. - 1 : 1000		
Prepared By: Exploration Division, MECL, Nagpur.		Processed at : IT Centre, MECL, Nagpur.
MECL / EXPLORATION / DEC-2018		6

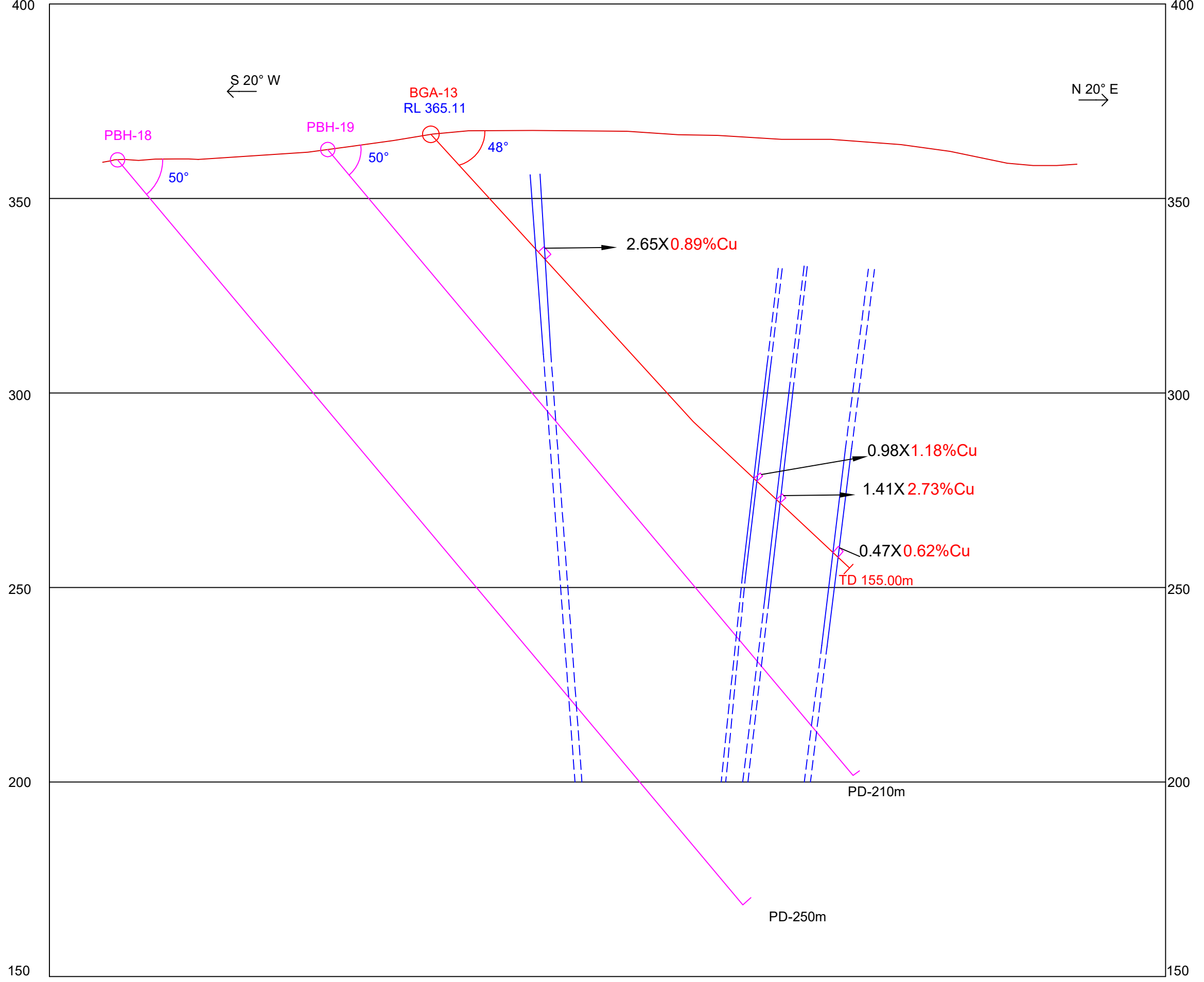
GEOLOGICAL CROSS SECTION ALONG S13-S13'
SCALE - 1:1000



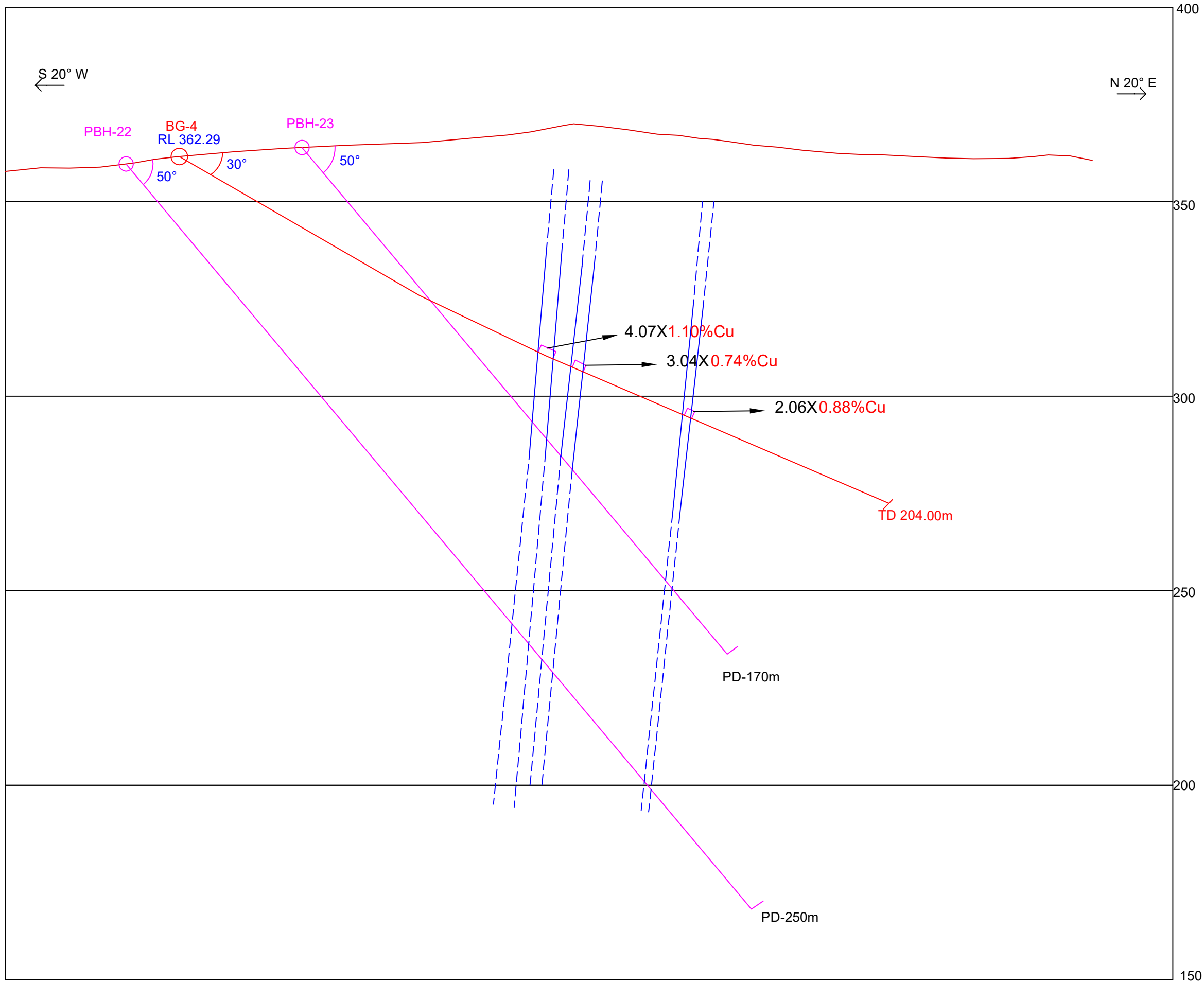
GEOLOGICAL CROSS SECTION ALONG S15-S15'
SCALE - 1:1000



GEOLOGICAL CROSS SECTION ALONG S14-S14'
SCALE - 1:1000



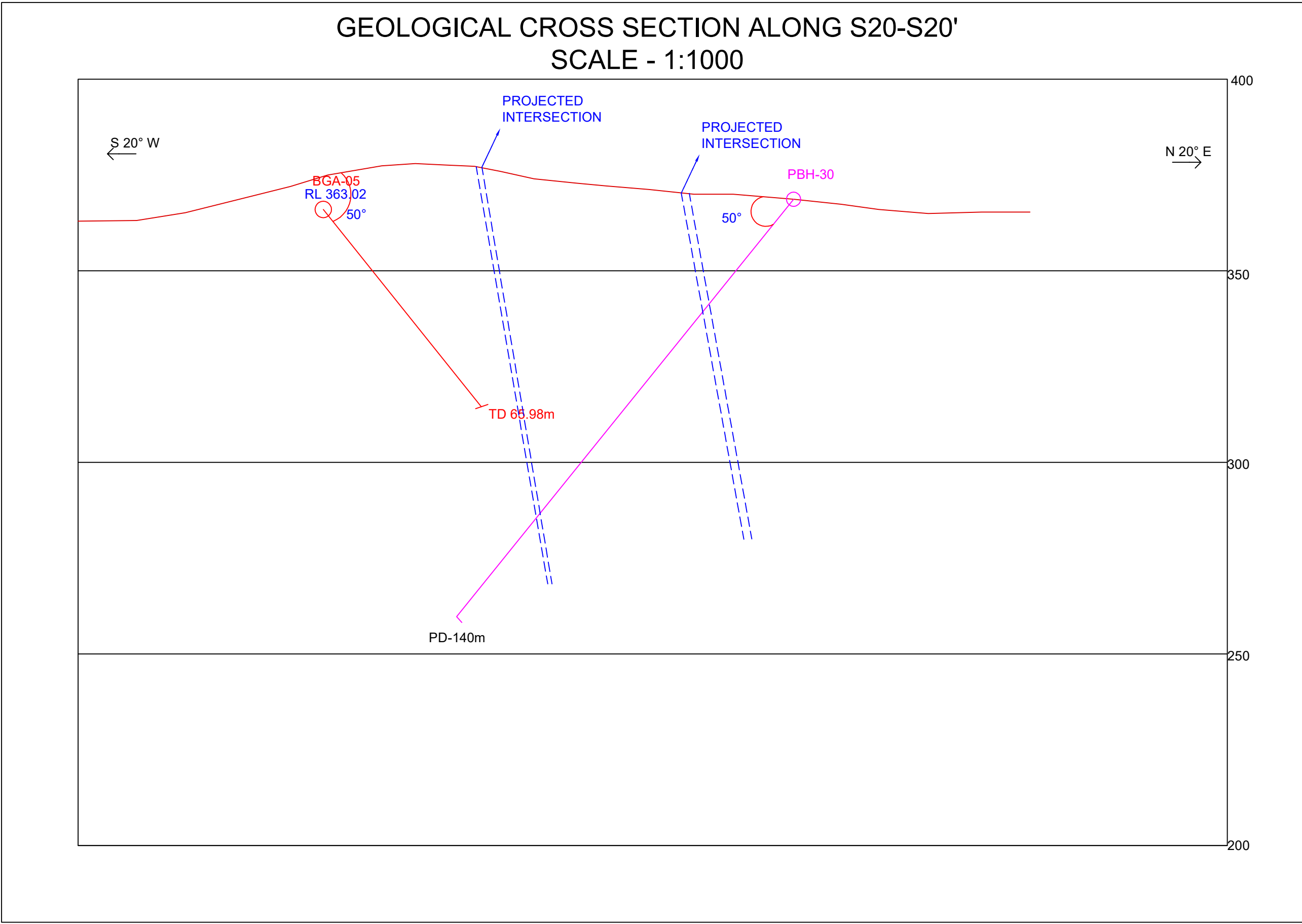
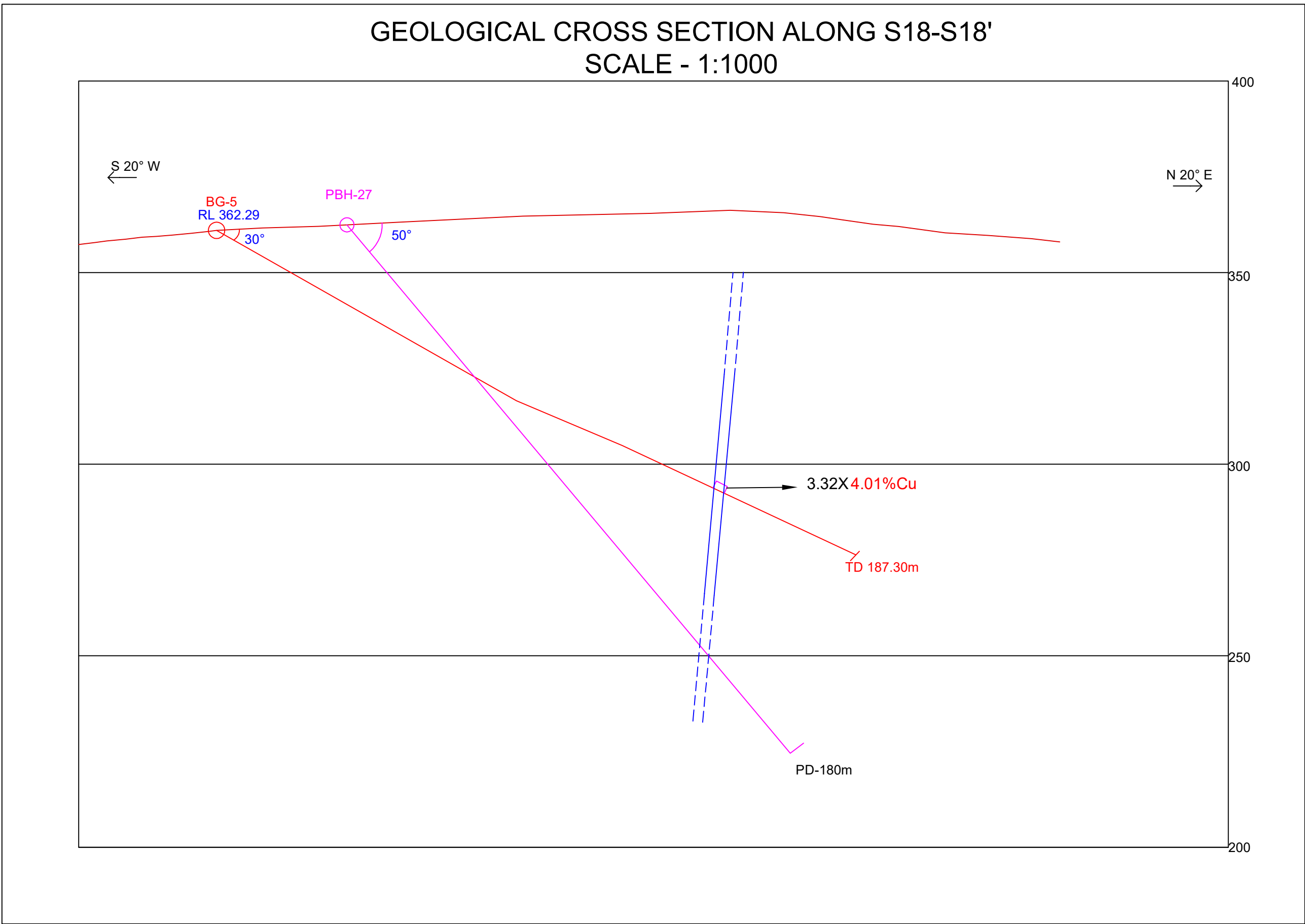
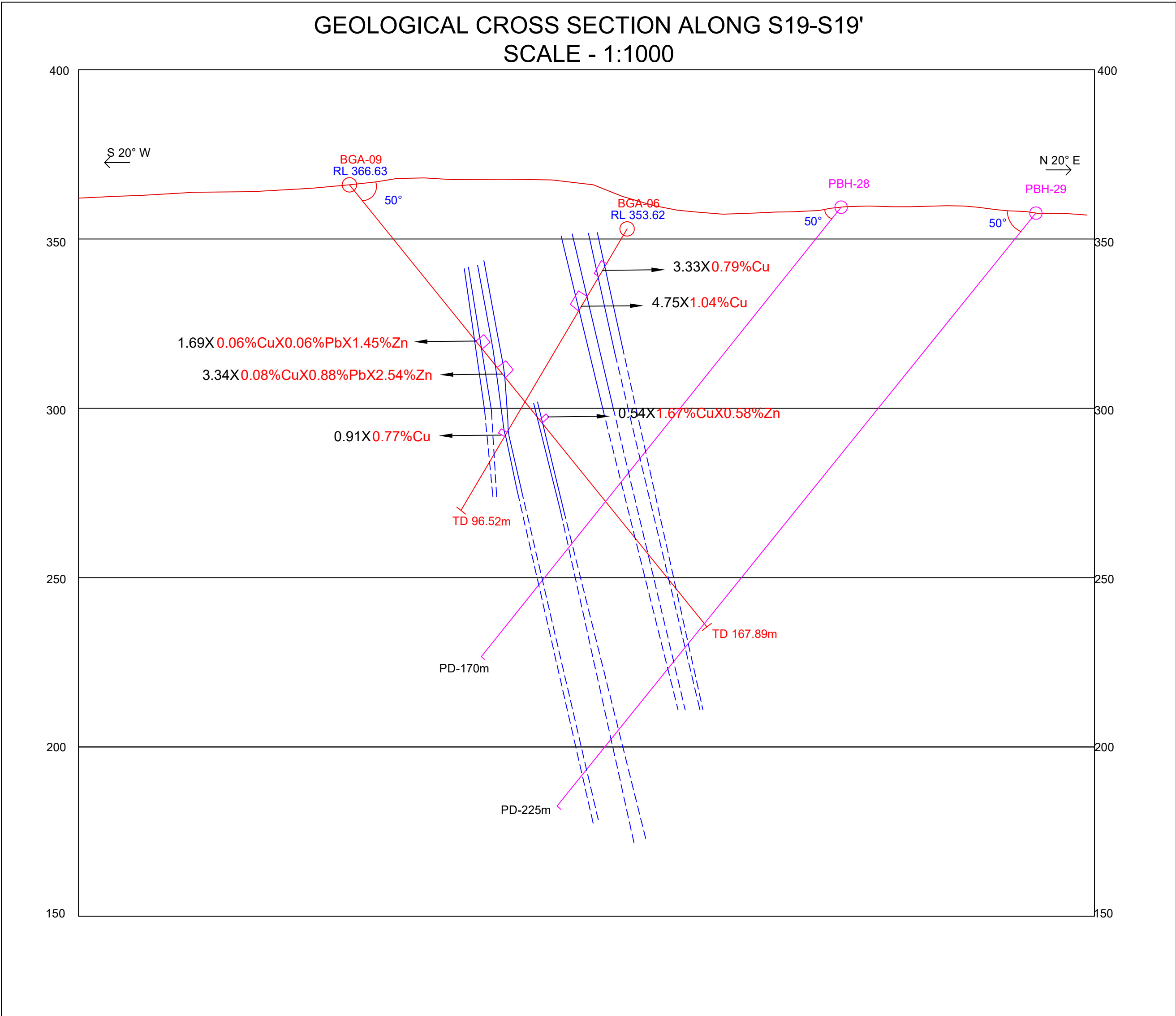
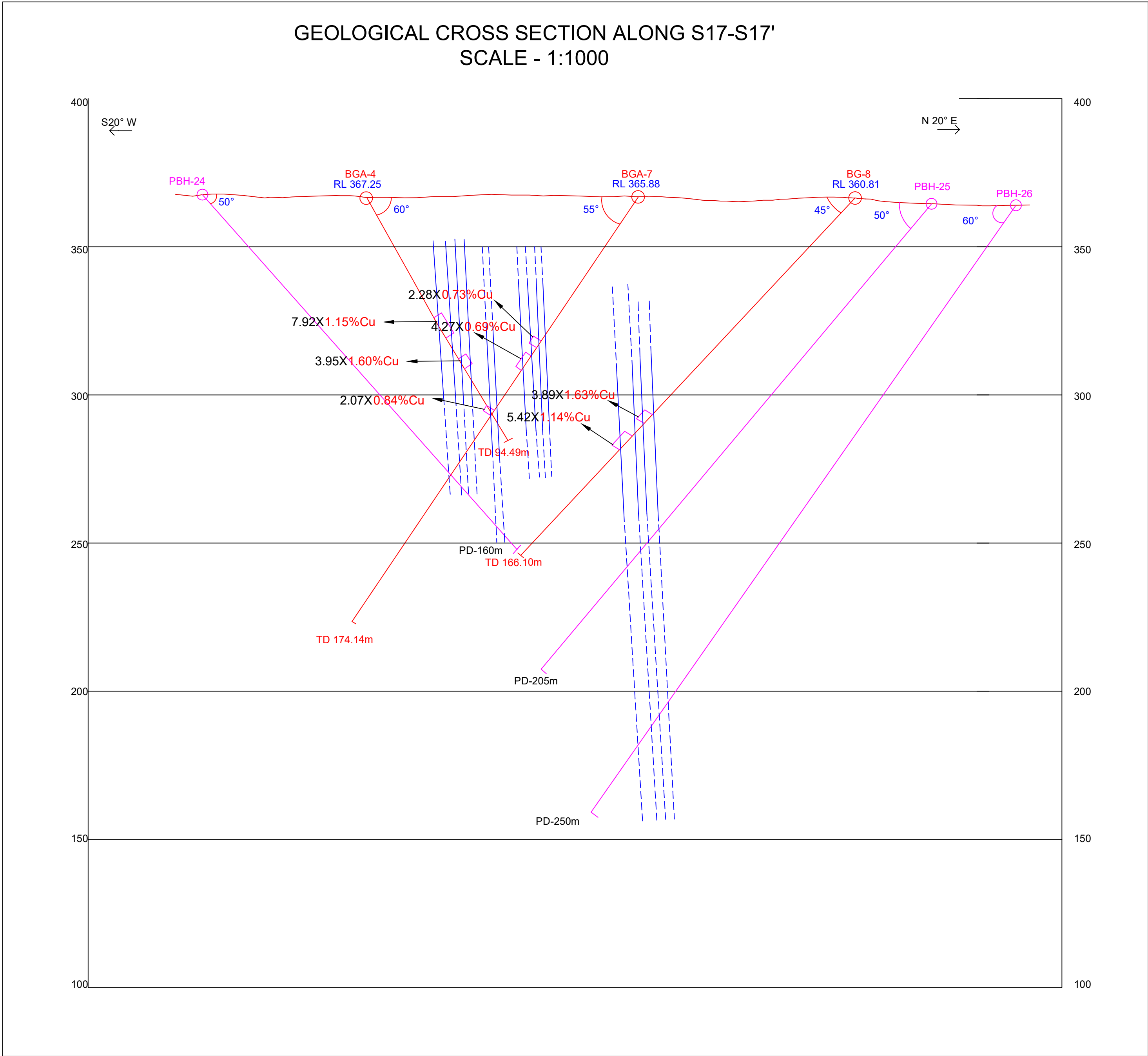
GEOLOGICAL CROSS SECTION ALONG S16-S16'
SCALE - 1:1000



INDEX

- BGA-01**
■ Borehole Drilled By DGM (Bihar). (Core Drilling)
RL 338.65 Borehole Reduced Level (RL In meters)
- BG-11**
■ Borehole Drilled By G.S.I. (Core Drilling) (Phase-I)
RL 338.46 Borehole Reduced Level (RL In meters)
- PBH**
○ Proposed borehole by MECL (Core Drilling)
- 1.77X2.66%Cu**
Borehole With True Width (m) of zone and Copper (Cu) %
at 0.5% cut-off
- TD 129.80m**
Total Depth of Borehole (m)
- PD-150m**
Proposed Depth of Borehole (m)

MINERAL EXPLORATION CORPORATION LIMITED	
REPRESENTATIVE GEOLOGICAL CROSS SECTIONS ALONG S13 , S14 , S15 & S16	
BARAGANDA BLOCK	
DISTRICT : GIRIDIH	STATE : JHARKHAND
R.F. - 1 : 1000	
Prepared By: Exploration Division, MECL, Nagpur.	Processed at : IT Centre, MECL, Nagpur.
MECL / EXPLORATION / DEC-2018	7



INDEX	
■ BGA-01	Borehole Drilled By DGM (Bihar), (Core Drilling)
■ RL 338.65	Borehole Reduced Level (RL in meters)
■ BG-11	Borehole Drilled By G.S.I. (Core Drilling) (Phase-I)
■ RL 338.46	Borehole Reduced Level (RL in meters)
○ PBH	Proposed borehole by MECL (Core Drilling)
○	
1.77X2.66%Cu	Borehole With True Width (m) of zone and Copper (Cu) % at 0.5% cut-off
TD 129.80m	Total Depth of Borehole (m)
PD-150m	Proposed Depth of Borehole (m)

MINERAL EXPLORATION CORPORATION LIMITED	
REPRESENTATIVE GEOLOGICAL CROSS SECTIONS ALONG S17, S18, S19 & S20	
BARAGANDA BLOCK	
DISTRICT : GIRIDIH	STATE : JHARKHAND
R.F. - 1 : 1000	
Prepared By: Exploration Division, MECL, Nagpur.	Processed at: IT Centre, MECL, Nagpur.
MECL / EXPLORATION / DEC-2018	
8	

