सेन्ट्रल माईन प्लानिंग एण्ड डिजाइन इन्स्टीट्यूट लि.
कोल इंडिया लिमिटेड की अनुषंगी कंम्पनी/भारत सरकार का एक लोक उपक्रम
क्षेत्रीय संस्थान-5,एसईसीएल काम्पलेक्स, सीपत रोड,बिलासपुर 495006 (छ.ग)
Central Mine Planning & Design Institute Limited
A Subsidiary of Coal India Ltd/ A Govt. of India Public sector Undertaking
CIN:U14292JH1975GO1001223
RI-V, SECL Complex, Seepat Road, Bilaspur (CG)- 495006
ई-मेल / e-mail: rdri5.cmpdi@coalindia.in
Tel: 07752-246481-492
Fax: 07752-246481

cmpdi
A Mini Ratna and ISO 9001 Company

NO. RI5/GMT/2017/ 4457 **Dated 25/01/2017**

To,

प्रति,
महाप्रबंधक (प एवं योरि)
एसईसीएल, सीपत रोड
बिलासपुर (छ ग)

Sub: **Geo-referenced Boundary Map (in shape file) of Forest Land, Rajnagar OC, Hasdeo Area,SECL.**

Ref: **SECL/BSP/FOREST/2014/61 dated 03/12/2014**

Dear Sir,

Please find enclosed herewith the report on preparation of geo-referenced boundary map (in shape file) of forest land for Rajnagar OC, Hasdeo Area, SECL and a CD containing shape file and kml file.

This report is prepared for use in forest area diversion application only on the basis of surveyed / digitized coordinates of forest area falling in Rajnagar OC provided by SECL.

Kindly acknowledge receipt.

धन्यवाद

Encl: Report with plans and CD

भवदीय,
25/1/17
क्षेत्रिय निदेशक

सूचनार्थ:
1. महाप्रबंधक (जियोमेटिक्स), सी एम पी डी आई)मुख्यालय), गोंडवाना प्लेस, काँके रोड, रांची for information.
2. महाप्रबंधक (व्यवसाय विकास) सी एम पी डी आई),मुख्यालय) गोंडवाना प्लेस,काँके रोड, रांची for information
3. महाप्रबंधक, Hasdeo क्षेत्र, एसईसीएल, (छ.ग)
4. मुख्य प्रबंधक (खनन वन विभाग), एसईसीएल, बिलासपुर(छ.ग.) .for information

महाप्रबंधक
GENERAL MANAGER
एस.ई.सी.एल.,हसदेव क्षेत्र
SECL Hasdeo Area

सीएमपीडीआई
cmpdi
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GEO-REFERENCED BOUNDARY MAP(IN SHAPE FILE)OF FOREST LAND RAJNAGAR OC,HASDEO AREA, SECL

JAN – 2017

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INDEX

Report on Geo-referenced Boundary Map (in shape file) of Forest Land Rajnagar OC, Hasdeo Area, SECL

1.0 Introduction

South Eastern Coalfields Limited (SECL) vide letter no. SECL/BSP/ FOREST/2014/61 dated 03/12/2014 (Annexure-I) had requested CMPDI to provide geo–referenced boundary map in shape file of forest land. An offer letter No.RV/EXP/2015/DGPS/870 (Annexure-II) dated 30/3/2015 was sent to SECL for acceptance and for doing ground work. Subsequently, this work has been incorporated in the annual action plan of SECL vide letter number SECL/BSP/P&P/H-161 dated 30/03/2015 (Annexure-III) which spilled over to annual action plan of 2016-2017 (Annexure-IV).

The field officials were asked to locate points on the ground so that DGPS observation could be carried out in those points. Points such as RLY61, M11, C18, C26, C31, C43, C4, MP1, and MP5 were located on the ground where DGPS observation was made from 17-12-2015 to 19-12-2015.

The inter-state boundary between Chhattisgarh and Madhya Pradesh is passing through this mine and at times overlap each other within mine boundary. It was decided by SECL officials to check with the government authorities of both the states. After prolonged interaction it was finally decided by SECL that the state boundary as shown in the existing plan will be used.

Moreover, the mine has been covered under various mining lease area such as Dola, JKD, Ramnagar, Rajnagar and KHD. After obtaining GPS coordinates of all the mining leases, final consolidated data was submitted on 13-1-2017. The GPS data submitted by SECL has been processed and plotted. It has been found that the area covering all leases are very large and could not be plotted in the plan to be prepared for DGPS report. Therefore the GPS data of mining has not been included in this report and only mine boundary of the existing mine is shown within which the forest land to be diverted falls.

2.0 Background

In India, major percentage of power is being produced by thermal power stations where coal plays a very vital role. With growing concern for increasing power production, the thrust is on increasing coal production on coal producing companies, such as SECL. Coal demand for other industrial and domestic consumption has also increased over the years. Coal producing companies are facing production constraints as many of their mines are reaching the limits of their allotted land.

In order to increase coal production, either the existing mines are to be expanded or new mines are to be opened. As opening new mines is a very time consuming process as well as extending existing mine boundaries. Some portion of coal bearing area within mine boundary is falling in forest areas, for which forest clearance is required so that mining can be done in those areas.

To check irrational exploitation of forest and to maintain ecological balance, Forest (Conservation) Act, 1980 was enacted. Under this act, no forest land can be used for non forestry purpose without prior approval of central government.

Therefore, all proposals of diversion of such areas to any non-forest purpose can only be permitted by central government. The procedure for forest clearance envisaged under this act mandates a two stage approval process.

Stage I: In principal approval: Upon a prima facie review the proposal is either accepted or rejected. If approved, the project authority is required to deposit an amount for compensation of the opportunity cost of the forest (NPV, compensatory afforestation, additional expenses towards mitigating probable environmental damage etc.)

Stage II: Following the deposit of above mentioned costs, forest land is handed over to project authorities provided they have obtained all other requisite clearances.

The forest boundaries, in general, are marked on cadastral (Khasra) maps. In most cases, the boundaries are demarcated on ground by allottee or project proponent, in collaboration with forest officials. At salient points along the boundary, pillaring/ pegging is also done.

As per circular of MOEF, one of the pre-requisite for getting clearance of forest land to be diverted is a geo-referenced boundary map in shape file format of the desired forest land.

About 169.310 Ha forest land is falling in Rajnagar OC. SECL applied for diversion of forest land to MoEF. About 132.509 ha of this forest land is falling in Chhattisgarh State while the remaining 36.801 ha forest land is in Madhya Pradesh State. Both the data are included in this report with separate maps and shape files for each state. The forest land diversion proposal has to be submitted online to different state forest authorities along with geo-referenced boundary in shape file after DGPS survey.

3.0 Location

Rajnagar OC is located in Hasdeo Area of SECL. While part of this mine is falling in Manendragarh district of Chhattisgarh State, another part is located in Anuppur District of Madhya Pradesh. Nearest township is Manendragarh.

4.0 Scope of Services

The scope of services of CMPDI is defined as providing geographical co-ordinates of forest boundary within the leasehold / mine boundary of Rajnagar OC. SECL will provide surveyed coordinates of the land to be diverted.

5.0 Methodology

Execution of the job was planned on the basis of plan of the area provided by the project. For this work, static DGPS (Differential Global Positioning System) survey was found to be appropriate for determining geographical co-ordinates of forest boundary.

The Global Positioning System (GPS) is a satellite-based location, timing and navigation system in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Presently, 30 orbiting satellites of GPS constellation of USA and 24 GLONASS (*Globalnaya navigatsionnaya sputnikovaya sistema* or Global Navigation Satellite System) satellites of Russia are operational for the purpose of GPS survey. In addition to these primary GPS

constellation, European space agency and Chinese have their own constellation such as Galileo and BeiDou respectively.

India's prestigious GAGAN (GPS Aided Geo Augmented Navigation (GAGAN) system) navigation system is also presently operational providing vital positional information to civil aviation and other industries.

The global positioning system is made up of three parts: satellites orbiting the Earth; control and monitoring stations on Earth; and GPS receivers owned by users. GPS satellites transmit three types of information: the satellite's number, its position in space, and time.

These signals are picked up by GPS receiver on ground. With signals from three or more satellites, a GPS receiver can triangulate its location on the ground (i.e., longitude and latitude) from known position of satellites. With four or more satellites, a GPS receiver can determine a 3D position (i.e., latitude, longitude, and elevation).

Differential Global Positioning System (DGPS) refers to using two or more GPS receivers to achieve greater positional accuracy. Basic methods of DGPS survey are Static, Rapid-Static, and Real-time Kinematic (RTK).

For our job, post-processed static survey is found to be most suitable. In static surveys, one GPS receiver is used as base station and other GPS receivers can be used as rover stations. Base receiver is stationed at a point of known co-ordinates for longer duration and rover stations are kept at unknown stations for comparatively shorter duration. Data from base and rovers are then post-processed in GPS data processing software, Leica Geo-Office 8.2 version, to achieve sub-centimeter level accuracies, especially in case of dual-frequency GPS receivers, which is in possession of CMPDI.

ArcGIS 10.2 version software is found to be suitable for preparation of shape file of forest land in WGS-84 co-ordinates.

AUTOCAD 2015 software has been used for basic digitization and plotting of data generated.

6.0 Survey Instrument

For providing geographical (spherical) co-ordinates of stations along the boundary, Differential Global Positioning System (DGPS) consisting of one base receiver and one rover receiver were used. Brief specifications of DGPS are as follows:

A	***Instrument:***	
	Make	Leica
	Model	Viva
	Signal	**GPS**: L1,L2 & L5 carrier,CA,L1P,L2P,L2C **GLONASS**: L1,L2&L5 carrier,L1,CA,L2CA, L1P,L2 P **GALILEO**: E2-L1-E1, E5, E6
	Channels	72
	Accuracy:	
	Post Processed Static DGPS	3mm +0.5ppm horizontal, 5mm + 0.5ppm vertical
	Real Time RTK	10mm + 1 ppm horizontal, 15mm + 1 ppm vertical
	Power:	

	Internal Battery	2 Li-Ion, 3900mAh, 7.2V
	Communication:	
	Bluetooth	Bluetooth standard 1.2
	USB	1.1 Version
B	***Software***	i) Inbuilt Leica software for data recording
		ii) Leica Geo-Office for data processing

7.0 Details of Field Activity

a) Reconnaissance survey was done after reaching site prior to taking up actual static DGPS work. Officials and survey personnal from Rajnagar OC were associated during reconnaissance and subsequent DGPS static observation work both at base and rover stations.

b) DGPS survey was carried out in Rajnagar OC in reference to following stations in the table below. Location on the ground was marked and shown by the project officials.

Station Name	Co-ordinates converted to coalgrid by CMPDI		Observed Geographic Co-ordinates (WGS-84)	
	Easting(m)	Northing(m)	Latitude	Longitude
RLY61	2809644.327	1023801.186	23° 12' 35.26801" N	82° 08' 13.58026" E
M11	2810362.044	1024645.712	23° 13' 03.03106" N	82° 08' 38.45850" E
C18	2812525.785	1024650.862	23° 13' 04.08442" N	82° 09' 54.59669" E
C26	2812031.626	1024005.174	23° 12' 42.88291" N	82° 09' 37.49274" E
C31	2812232.158	1023376.115	23° 12' 22.50543" N	82° 09' 44.82646" E
C43	2811338.670	1023867.003	23° 12' 38.10578" N	82° 09' 13.17037" E
C4	2811095.407	1024715.224	23° 13' 05.59322" N	82° 09' 04.23413" E
MP1	2808827.117	1023903.038	23° 12' 38.24213" N	82° 07' 44.77918" E
MP5	2808434.067	1024042.169	23° 12' 42.60385" N	82° 07' 30.88617" E

8.0 Computation

a) Data recorded is downloaded from DGPS and processed in computer to get post-processed WGS-84 co-ordinates of surveyed stations. The co-ordinates of other boundary pillars / pegs are then transformed.

b) The geodetic / geographical co-ordinates along forest boundary is tabulated in Table -I.

9.0 Documents Submitted

Following documents are being submitted along with this report:
i) Drg. No. RV/GMT/2016/18 &19
ii) Soft copy of shape files & kml files in CD.

TABLE – I

Coordinates of forest land, Rajnagar OC, Hasdeo Area, SECL

Point_ID	Lat	Long	X_CG	Y_CG
CHHATTISGARH STATE				
CG_0	23° 13' 10.668" N	82° 8' 50.375" E	2810318.130	1024747.034
CG_1	23° 13' 10.588" N	82° 8' 57.694" E	2810526.017	1024741.939
CG_2	23° 13' 10.000" N	82° 9' 02.817" E	2810671.309	1024722.031
CG_3	23° 13' 05.676" N	82° 9' 03.800" E	2810697.548	1024588.772
CG_4	23° 13' 05.191" N	82° 9' 07.031" E	2810789.131	1024572.704
CG_5	23° 13' 05.559" N	82° 9' 10.262" E	2810881.050	1024582.872
CG_6	23° 13' 04.979" N	82° 9' 11.331" E	2810911.191	1024564.669
CG_7	23° 13' 05.309" N	82° 9' 16.960" E	2811071.220	1024572.796
CG_8	23° 13' 05.825" N	82° 9' 22.635" E	2811232.618	1024586.605
CG_9	23° 13' 06.154" N	82° 9' 28.289" E	2811393.365	1024594.711
CG_10	23° 13' 06.629" N	82° 9' 33.356" E	2811537.484	1024607.503
CG_11	23° 13' 06.997" N	82° 9' 39.086" E	2811700.382	1024616.768
CG_12	23° 13' 06.967" N	82° 9' 42.721" E	2811803.638	1024614.564
CG_13	23° 13' 06.790" N	82° 9' 47.289" E	2811933.333	1024607.487
CG_14	23° 13' 06.602" N	82° 9' 49.442" E	2811994.415	1024600.945
CG_15	23° 13' 05.972" N	82° 9' 50.778" E	2812032.108	1024581.107
CG_16	23° 13' 05.219" N	82° 9' 52.674" E	2812085.673	1024557.300
CG_17	23° 13' 04.181" N	82° 9' 54.198" E	2812128.565	1024524.858
CG_18	23° 13' 00.710" N	82° 9' 54.155" E	2812126.012	1024418.164
CG_19	23° 12' 57.599" N	82° 9' 53.135" E	2812095.857	1024322.938
CG_20	23° 12' 54.960" N	82° 9' 52.668" E	2812081.573	1024241.996
CG_21	23° 12' 51.076" N	82° 9' 51.659" E	2812051.418	1024122.964
CG_22	23° 12' 45.196" N	82° 9' 47.772" E	2811938.734	1023943.622
CG_23	23° 12' 43.670" N	82° 9' 45.335" E	2811868.902	1023897.596
CG_24	23° 12' 43.689" N	82° 9' 42.529" E	2811789.214	1023899.185
CG_25	23° 12' 42.962" N	82° 9' 37.090" E	2811634.411	1023878.787
CG_26	23° 12' 37.324" N	82° 9' 38.803" E	2811680.923	1023704.904
CG_27	23° 12' 32.971" N	82° 9' 40.202" E	2811718.987	1023570.614
CG_28	23° 12' 28.637" N	82° 9' 42.609" E	2811785.672	1023436.538
CG_29	23° 12' 24.004" N	82° 9' 44.343" E	2811833.143	1023293.544
CG_30	23° 12' 22.572" N	82° 9' 44.432" E	2811835.138	1023249.489
CG_31	23° 12' 21.583" N	82° 9' 44.014" E	2811822.871	1023219.230
CG_32	23° 12' 22.336" N	82° 9' 42.888" E	2811791.189	1023242.802
CG_33	23° 12' 24.296" N	82° 9' 41.024" E	2811738.978	1023303.682
CG_34	23° 12' 25.563" N	82° 9' 38.067" E	2811655.455	1023343.689
CG_35	23° 12' 27.519" N	82° 9' 35.671" E	2811588.148	1023404.666
CG_36	23° 12' 29.294" N	82° 9' 31.523" E	2811471.016	1023460.679
CG_37	23° 12' 30.837" N	82° 9' 27.421" E	2811355.066	1023509.579
CG_38	23° 12' 32.292" N	82° 9' 24.549" E	2811274.038	1023555.329
CG_39	23° 12' 34.993" N	82° 9' 19.667" E	2811136.403	1023640.065
CG_40	23° 12' 37.829" N	82° 9' 13.969" E	2810975.618	1023729.290
CG_41	23° 12' 37.735" N	82° 9' 12.509" E	2810934.104	1023726.924
CG_42	23° 12' 38.173" N	82° 9' 12.750" E	2810941.131	1023740.285
CG_43	23° 12' 49.337" N	82° 9' 07.028" E	2810782.916	1024085.459
CG_44	23° 12' 58.043" N	82° 9' 00.446" E	2810599.304	1024355.372

CG_45	23° 13' 02.727" N	82° 8' 54.781" E	2810440.216	1024501.368
CG_46	23° 13' 06.388" N	82° 8' 51.563" E	2810350.204	1024615.049
CG_47	23° 13' 10.668" N	82° 8' 50.375" E	2810318.130	1024747.034

POINT-ID	FID	Area	Lat	Long	X_CG	Y_CG
CG_0	0	132.4046788	23° 13' 10.668" N	82° 8' 50.375" E	2810318.130	1024747.034
CG_1	1	132.4046788	23° 13' 10.588" N	82° 8' 57.694" E	2810526.017	1024741.939
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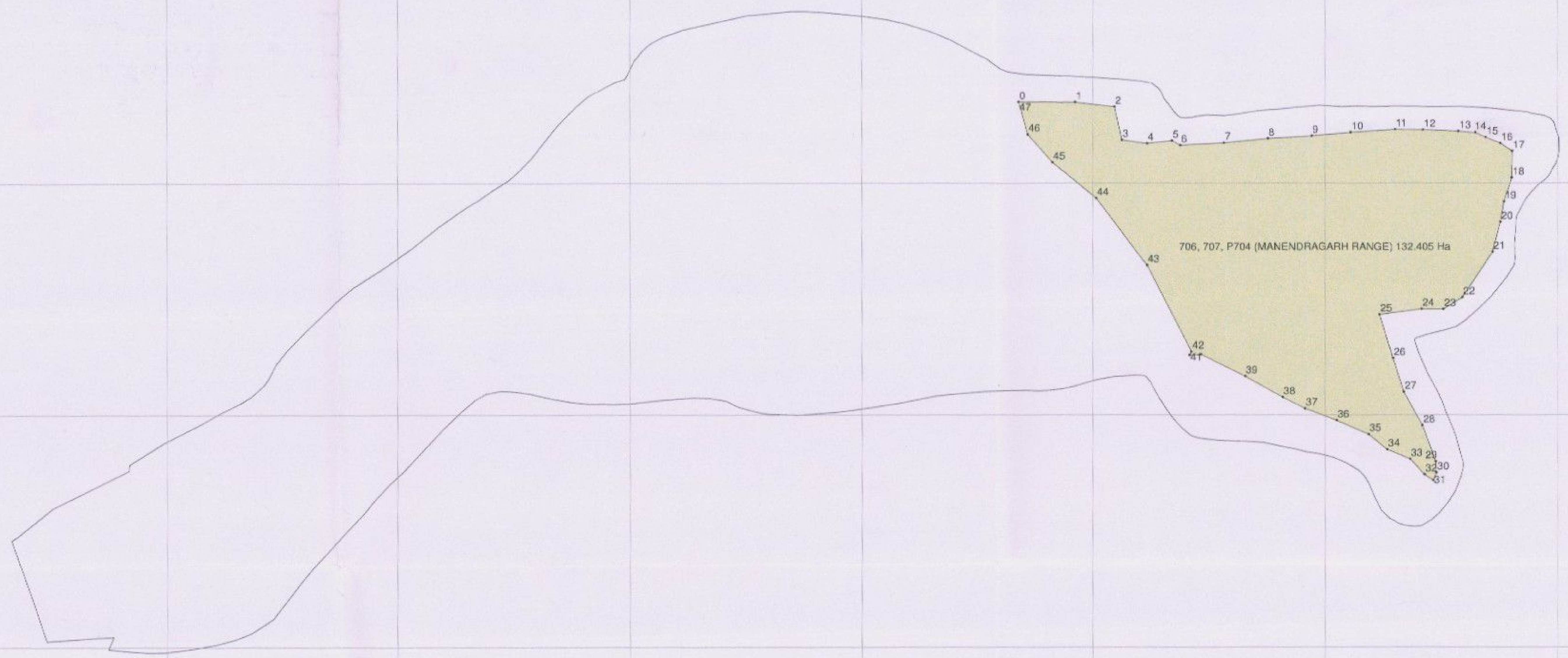

Disclaimer:
This map is prepared on the basis of survey coordinates provided by SECL and data obtained from LEICA DGPS instrument. Every effort is made to ensure the information displayed is as accurate and current as possible. However minor errors due to digitization and transformation cannot be ruled out.

This map is prepared for use in obtaining clearence from MoEF for diversion of forest land falling within the mining leasehold area. This map may not be used for any other purpose than intended. Copyright of this map rests with CMPDI Ltd. This map may not be copied either fully or partly without prior written approval from CMPDI Ltd.

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree
Projected Coordinate System: COALGRID
Datum: Everest 1956
Units: Meters

Dy GM/ SUB AREA MANAGER
RAJNAGAR OPENCAST PROJECT

महाप्रबंधक
GENERAL MANAGER
SECL,Hasdeo Area

Customer	SOUTH EASTERN COALFIELDS LIMITED				
Project	GEO-REFERENCED BOUNDARY MAP (IN SHAPE FILE) OF FOREST LAND RAJNAGAR OC (CHATTISGARH)			Job No. 560069	
Subject: PLAN SHOWING FOREST BOUNDARY OF RAJNAGAR OC IN CHHATTISGARH STATE	Activity	Name	Designation	Signature	Date
	Surveyed By	Madhusudan Banik	Surveyor (C)		23.01.17
	Processed By	Madhusudan Banik	Surveyor (C)		23.01.17
	Checked By	K M Darwin Singh	HOD(Geomatics)		
	Approved By	Manoj Kumar	RD		
cmpdi	Scale 1:15,000 (0 70 140 280 420 M)			Sheet	
	Dwg No. RV/GMT/2016/19			Rev No.	

H.O.D. (Geomatics)
C.M.P.D.I., RI-V, Bilaspur