

CHHATTISGARH EAST RAILWAY LTD

(A JV OF IRCON, SECL AND CHHATTISGARH GOVT.)

DGPS Survey Report of Forest Patches in Dharamjaygarh Forest Division for Forest Diversion Proposal under FCA 1980 for Construction of BG Rail Corridor (Length 62 km) from Urga to Dharamjaygarh



DGPS SURVEY AND GIS MAPPING DONE BY:

Geotrax International Services
Raipur, Chhattisgarh.

वन मण्डलाधिकारी
धरमजयगढ़ वन मण्डल
जिला रायगढ़ (छ.ग.)

उप वन मण्डलाधिकारी
धरमजयगढ़ उप वन मण्डल

वन परिक्षेत्राधिकारी
धरमजयगढ़

RANGE OFFICER
Range - Chhal

Division - Dharamjaygarh

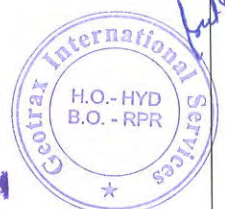


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1. Introduction and Background

Government of Chhattisgarh (GoCG) is keen to develop Rail infrastructure for facilitating passengers and freight traffic in the Northern part of Chhattisgarh. To this extent the State Government, in consultation with Ministry of Railways (MoR), has appointed a high level Committee, chaired by Mr. A.K. Mishra, Retd. Chief Secretary of C.G comprising representatives of MoR, GoCG, NTPC Ltd, SECL and Confederation of Indian Industry to identify the rail corridors. As per the committee's report and in line with the recommendations of Chhattisgarh Integrated Infrastructure Development Committee (CIIDC), three corridors were identified for the development of rail infrastructure.

- 1) Corridor-I, East corridor: Kharsia - Chhal - Gharghoda - Korichhapar - **Dharamjaygarh up to Korba** with a spur from Gharghoda to Donga Mauha to connect mines of Gare-Pelma block, approximately 180km in length.
- 2) Corridor-II, North Corridor: Surajpur-Parsa-Katghora-Korba, approximately 150 km in length.
- 3) Corridor-III, East-west Corridor: Gevra Road to Pendra Road via Dipka, Katghora, Sindurgarh, Pasan, approximately 122 km in length.

Memorandum of Understanding (MoU) was made on 03.11.12 between Government of Chhattisgarh (GoCG), South East Coalfields Limited (SECL) and IRCON for formation of Specific Joint Venture Companies (JVCs) upon the advise/instructions of Ministry of Railways (MoR) to **develop rail infrastructure for facilitating passengers and freight traffic in northern parts of Chhattisgarh**. In consideration of the above, the implementation of developing Corridor-I and Corridor-III would be taken up by JVCs. The names of the JVCs are proposed as "Chhattisgarh East Rail Ltd" for Corridor- I and "Chhattisgarh East-West Rail Ltd" for Corridor-III.

As part of the Corridor-I, East Corridor phase-II, a new BG line is proposed from Uрга (District Korba) to Dharamaygarh (District Raigarh). The approximate length of the rail corridor is 62 kms.

The feasibility cum detailed project study was conducted by Delhi Integrated Multi Modal Transit System Ltd. (DIMTS). The preliminary alignment was

This Project is a passenger cum freight corridor line and will help in overall economic development of Northern Chhattisgarh region.



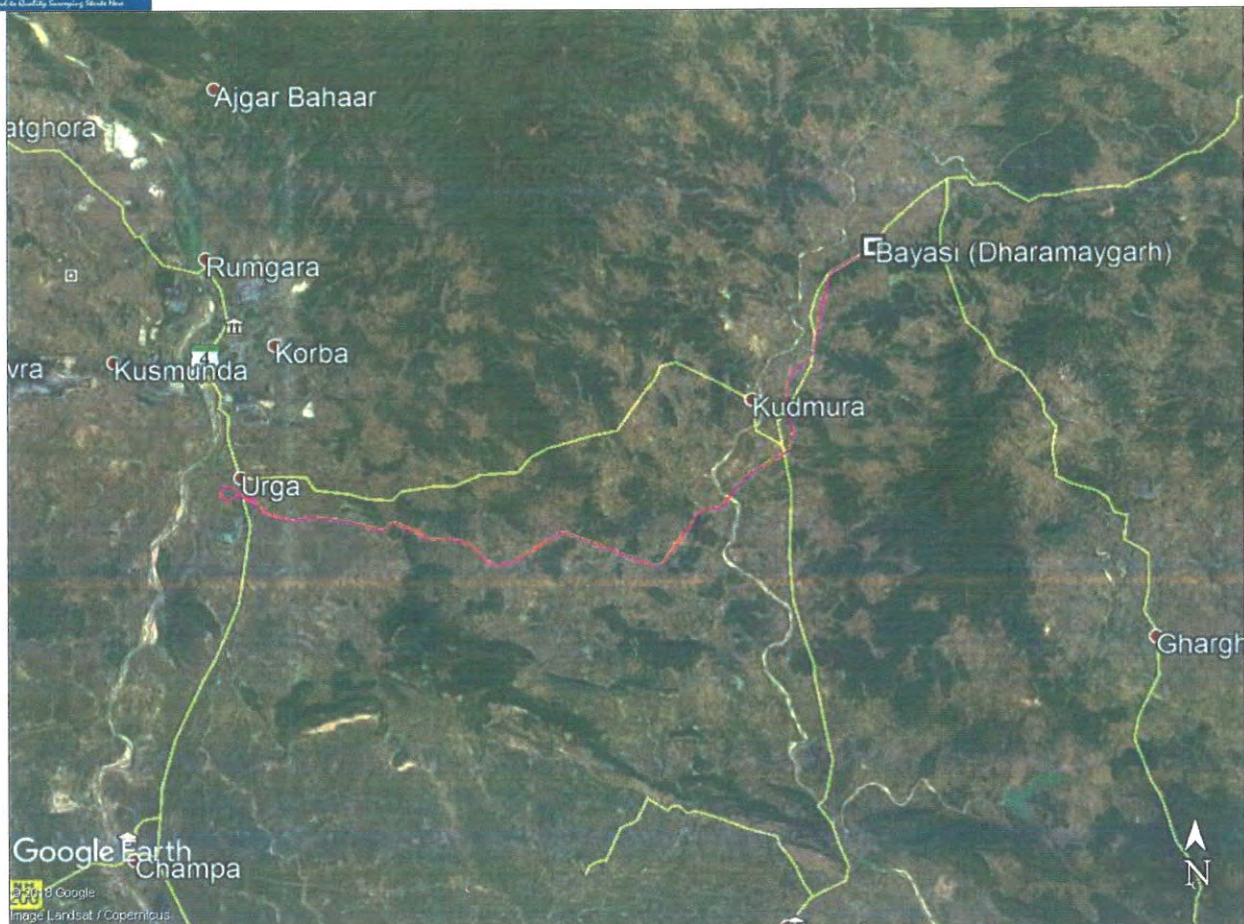


Fig-1: BG Rail Corridor from Uрга to Dharamaygarh on Satellite Imagery

As per directives of Ministry of Environment & Forests dated 8th July 2011; all applications seeking diversion of forest land for non-forest purpose under Forest Conservation Act, 1980 must be accompanied with Geo-referenced shape file (both soft copy and hard copy maps) of the forest land proposed for diversion prepared using Differential GPS (DGPS).



2. Scope of Work

1. Establishment of one base station for DGPS Survey and temporary benchmarks at every 10km.
2. Fixation of corridor boundary point by DGPS (Boundary point fixed at every corner and turning point. It also includes
 - a. DGPS survey to collect the BG Rail Centerline coordinates
 - b. DGPS Survey of revenue forest khasra boundaries
3. Data processing and Interpretation
 - a. Geo-referencing of cadastral map and identification of revenue forest khasras
 - b. Creation of Rail centerline layer using DGPS coordinates and creation of Rail corridor as per the given alignment
 - c. Superimposition of Rail Corridor layer on Georeferenced cadastral maps
 - d. Creation of forest patches (comprise one or more adjoining forest khasras) from the Geo-referenced cadastral maps and computation of forest area of individual forest patches, per village
 - e. Preparation of Geo-referenced forest map and creation of an area statement showing proposed area for forest diversion
 - f. Preparation of DGPS survey report along with soft copy of – maps in shapefile format and kml file
4. Printing of report and Geo-referenced maps (7sets) and Technical compliance.



3. Deliverables

The deliverables envisaged for the assignment are described below

1. Post processed DGPS observations data as well as raw data in RINEX format.
2. DGPS Reports - Base line & network adjustment report for the primary and temporary benchmarks.
3. Geo-referenced cadastral maps & forest block maps (for PF/RF areas, if any) based on DGPS observations.
4. Geo-reference shape file (Soft copy) of Forest Patches, BG Rail ceterline and Railway corridor.
5. Area statement as per DGPS Survey showing proposed area for forest diversion
6. DGPS Survey and mapping report



4. Brief description of the Technical approach

4.1 Input Data

The Rail alignment plan and maps required for geo-referencing were provided by IRCON to M/s Geotrax International Services. The village maps were obtained Chhattisgarh State Govt. revenue department land portal "Bhu Naksha" (<http://cg.nic.in/bhunaksha/>). The revenue forest Khasras are identified by patwari's and revenue department provided the khasra details and assisted our survey team for identification of revenue forest Khasras in the field.

The detailed topographical Survey data along with the location of survey benchmarks (done by DIMTS) was also provided to Geotrax.

4.2 Establishment of Primary Control Point (PCP)

In this process the coordinate of one location (hereafter referred to as PCP) is established with reference to other known locations. For our current study we have established the coordinate of PCP in Raipur, Chhattisgarh with reference to International GNSS ground stations (IGS) that are present in Hyderabad and Bangalore. *The IGS stations are continuously operating stations tracking and receiving satellite signals. The IGS stations records and transmits its precise location for general public use.*

The PCP in Raipur is established with continuous 72 hours observation and processed using the IGS stations in Hyderabad and Bangalore. As per Survey of India (SOI) Guideline, the PCP is to be fixed through continuous observation for 72 hours duration. The observed data is processed with reference to the data of International GNSS Service (IGS) stations- HYDE & IISC as per SOI guideline. The post processing report is herein annexed and marked as **Annexure-1**.

Below table contains the coordinates of the PCP and IGS stations- HYDE and IISC.

Point ID	UTM-Easting(m)	UTM-Northing(m)	EGM-Elevation(m)	Latitude	Longitude	Ellipsoidal Height (m)	City	Location
PCP-Raipur	560764.042	2351378.878	298.819	N21°15'47.16512"	E81°35'08.50131"	234.801	Raipur	Geotrax Office Roof

Point ID	UTM-Easting(m)	UTM-Northing(m)	EGM-Elevation(m)	Latitude	Longitude	Ellipsoidal Height (m)	City	Location
								Top
IGS_HYDE	239826.372	1927383.113	521.783	N17°25'02.21987 "	E78°33'03.17892 "	444.790 m	Hyderabad	NRSC, Hyderabad
IGS_IISC	127917.413	1441987.668	929.917	N13°01'16.19707 "	E77°34'13.35337 "	843.714 m	Bangalore	IISC, Bangalore

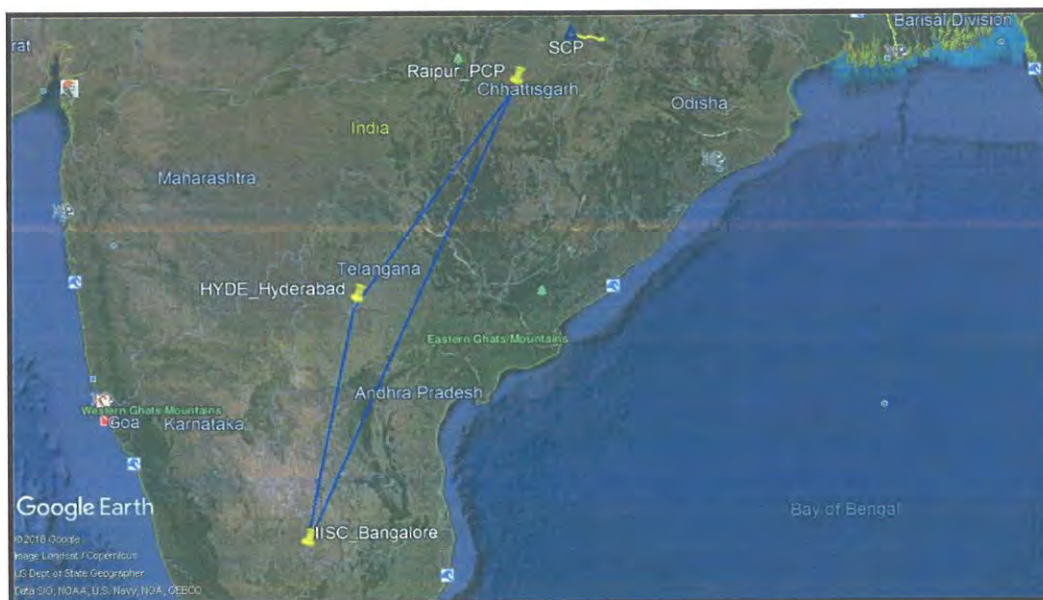


Fig-2: Satellite Image showing the location of the IGS Station-HYDE, IISC, and Raipur Primary Control Point in Raipur

4.3 Establishment of Secondary Control Point (SCP)

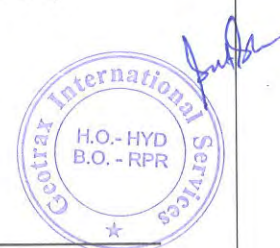
The Secondary Control Point (SCP) with static 24 hours of DGPS Observation is established as the DGPS base station near the project location. The SCP is established in the roof top of the primary school in Urga tehsil in Korba district. The Secondary control point (SCP) is established with reference to the Raipur Primary control point (PCP) and the post processing report is herein annexed and marked as **Annexure-2**.

The coordinate of the SCP is as follows:

Latitude: N22°18'39.55260", Longitude: E82°43'07.23316"

Easting: 677032.804m, Northing: 2468257.701m (as per UTM Zone 45N)

Elevation (EGM2008): 285.201m, Ellipsoidal Height: 224.164m.



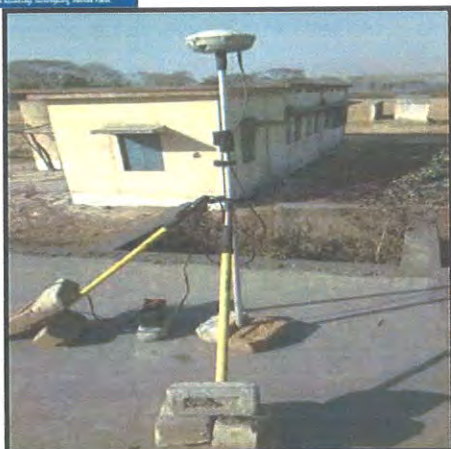


Fig-4: Images showing Secondary Control Point (SCP)

4.4 Establishment of Temporary Benchmarks (TBM)

The Temporary Control Point are established in static & RTK mode along the rail corridor.



Fig-4: Photograph showing Urga Station Temporary Bench Mark (TBM)

All the TBM's are connected to the Primary Control Point (PCP).

Below table lists the coordinates of TBMs:

Sl.No.	Point ID	TBM	Obs. type	Village Name	Location	Easting	Northing
1	Base	Railway TBM-3	Base	Urga Railway Station	Urga Railway Station	678950.865	2463504.69
2	SCP-1	Static	SCP-1	Culvert	IRCON Pillar	682531.463	2461499.022
3	SCP-2	Static	SCP-2	Kortala	P-81 Pillar	693807.999	2459884.503

Sl.No.	Point ID	TBM	Obs. type	Village Name	Location	Easting	Northing
4	SCP-3	Static	SCP-3	Sithra	Forest Pillar	718229.805	2474789.61
5	P-8	TBM	Observed Point	Urga	P-8 Pillar	679260.149	2462273.733
6	P-9	TBM	Observed Point	Urga	P-9 PILLAR	679366.389	2462120.71
7	P-10	TBM	Observed Point	Urga	P-10 PILLAR	679497.513	2461970.678
8	P-11	TBM	Observed Point	Urga	P-11 PILLAR	679669.927	2461897.384
9	TBM-5	TBM	Observed Point	Urga	Culvert	679695.081	2461860.967
10	P-12	TBM	Observed Point	Dilkuja naya bosti	P-12 PILLAR	679858.696	2461804.523
11	P-13	TBM	Observed Point	Dilkuja naya bosti	P-12 PILLAR	680041.598	2461861.392
12	P-14	TBM	Observed Point	Dilkuja naya bosti	P-12 PILLAR	680252.104	2462007.696
13	TBM-1A	TBM	Observed Point	Dilkuja naya bosti	Hard Rock	680505.039	2461498.71
14	TBM-2A	TBM	Observed Point	Dilkuja naya bosti	Hard Rock	681254.502	2460936.274
15	P-30	TBM	Observed Point	Dilkuja naya bosti	P-30 PILLAR	683341.662	2461603.957
16	P-29	TBM	Observed Point	Dilkuja naya bosti	P-29 PILLAR	683156.918	2461625.269
17	P-28	TBM	Observed Point	Dilkuja naya bosti	P-28 PILLAR	682978.411	2461690.747
18	P-27	TBM	Observed Point	Dilkuja naya bosti	P-27 PILLAR	682796.558	2461779.582
19	P-26	TBM	Observed Point	Dilkuja naya bosti	P-26 PILLAR	682604.522	2461841.988
20	P-25	TBM	Observed Point	Dilkuja naya bosti	P-25 PILLAR	682402.578	2461880.669
21	TBM-9	TBM	Observed Point	Dilkuja naya bosti	ON the Rood	682623.852	2461870.714
22	TBM-3A	TBM	Observed Point	Kervaduware	School Roof	693809.454	2459855.017
23	P-75	TBM	Observed Point	Kervaduware	P-75 PILLAR	692653.573	2460219.491
24	P-76	TBM	Observed Point	Kervaduware	P-76 PILLAR	692851.633	2460181.842
25	P-77	TBM	Observed Point	Kervaduware	P-77 PILLAR	693029.754	2460101.594
26	P-78	TBM	Observed Point	Kervaduware	P-78 PILLAR	693229.236	2460050.306
27	P-79	TBM	Observed Point	Kervaduware	P-79 PILLAR	693424.41	2459995.585
28	TBM-15	TBM	Observed Point	Kervaduware	ON the Rood	693741.535	2459867.614

Sl.No.	Point ID	TBM	Obs. type	Village Name	Location	Easting	Northing
29	P-82	TBM	Observed Point	Kervaduvari	P-82 Pillar	694028.313	2459840.564
30	P-83	TBM	Observed Point	Kervaduvari	P-83 Pillar	694191.604	2459755.562
31	P-84	TBM	Observed Point	Kervaduvari	P-84 Pillar	694369.837	2459654.133
32	P-85	TBM	Observed Point	Kervaduvari	P-85 Pillar	694542.581	2459516.849
33	TBM-4A	TBM	Observed Point	Dongaama	Mile Stone	691291.41	2460150.929
34	TBM-5A	TBM	Observed Point	Dongaama	Mile Stone	691340.902	2460217.302
35	TBM-6A	TBM	Observed Point	Dongaama	House Roof	689576.634	2461126.298
36	P-60	TBM	Observed Point	Dongaama	P-60 Pillar	689862.123	2461017.427
37	P-61	TBM	Observed Point	Dongaama	P-61 Pillar	690030.384	2460874.701
38	P-62	TBM	Observed Point	Dongaama	P-62 Pillar	690216.555	2460794.121
39	P-63	TBM	Observed Point	Dongaama	P-63 Pillar	690408.3	2460721.412
40	P-64	TBM	Observed Point	Dongaama	P-64 Pillar	690589.272	2460595.612
41	P-65	TBM	Observed Point	Dongaama	P-65 Pillar	690722.664	2460483.212
42	P-66	TBM	Observed Point	Dongaama	P-66 Pillar	690914.242	2460394.757
43	P-67	TBM	Observed Point	Dongaama	P-67 Pillar	691083.983	2460291.645
44	P-31	TBM	Observed Point		P-31 Pillar	683549.759	2461595.276
45	P-32	TBM	Observed Point		P-32 Pillar	683750.074	2461601.484
46	P-33	TBM	Observed Point		P-33 Pillar	684143.484	2461555.068
47	TBM-7A(P-250)	TBM	Observed Point	Sithra	P-7A(P-250) Pillar	717235.711	2472927.824
48	TBM-8A	TBM	Observed Point	Sithra	P-TREE	716712.564	2472257.026
49	TBM-9A	TBM	Observed Point	Sithra	Culvert	717344.322	2472872.644



4.5 DGPS Survey

DGPS survey was carried out using a pair of DGPS instrument. One DGPS Instrument was used as Base Station. The Base station for the survey was established at the nearest TBM. The distance between the Base Station PCP/TBM and rover was always less than 5km.

The other DGPS instrument was working as Rover. The survey was conducted in Real Time Kinematic (RTK) mode. The survey team collected coordinates of rail centerline pillars and also the left and right corridor pillars by walking along the corridor. Using DGPS receiver the coordinates for prominent locations such as culverts, bridges etc., are also collected.

For Geo-referencing village maps on an average of 10 GCPs were collected for each village.

The DGPS Survey of forest compartments i.e., Protected Forest/Orange area is carried out with the help of Dharamjaygarh Forest department staff after obtaining due permission for the DGPS Survey. The forest guard identified on the ground the boundary of all the effected protected forest compartments and Orange area compartments and DGPS readings are collected on the Forest pillar.

4.6 Creation of GIS Layers of the Rail Line corridor

The rail line centerline points, corridor points captured through DGPS are plotted in the GIS Software and the centerline, and left & right corridor GIS layer is created by joining the points.

4.7 Geo-referencing & digitization

The Ground Control Points (GCP) collected through DGPS survey are used to geo-reference the digitized cadastral maps and revenue forest survey numbers are digitized from the map.

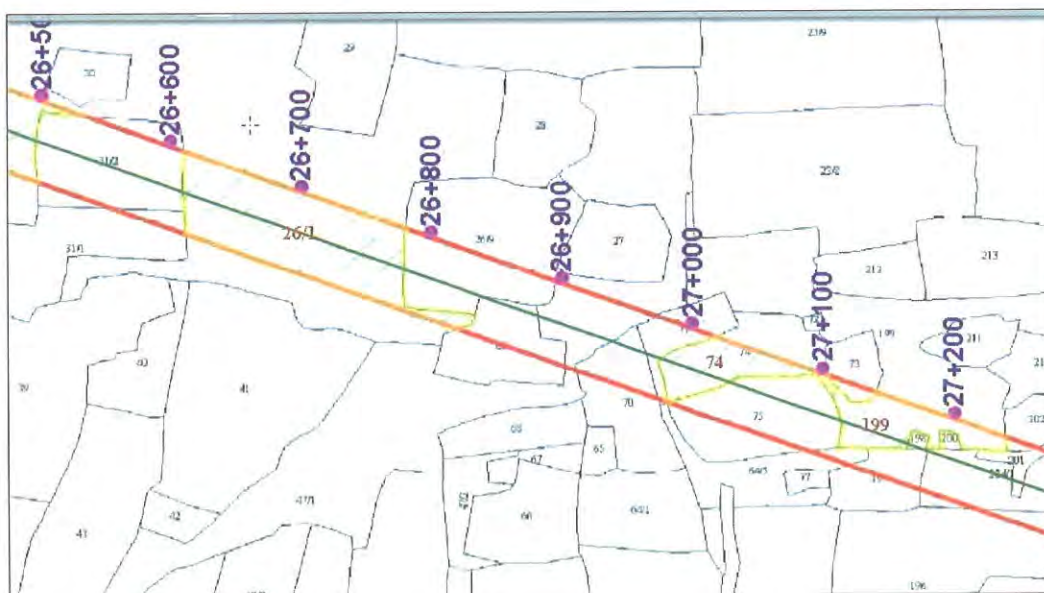
Forest compartment maps are also geo-referenced using the ground control points collected on Forest Boundary pillars. The Orange areas are geo-referenced based on the Khasra boundary and forest boundary pillars.

Digitization of cadastral map is done in ArcGIS software.

4.8 Creation of Forest Patches

Using the revenue forest survey numbers details collected from the revenue department office (Tehsildhar office), the revenue forest Khasra are identified on the map.

The revenue forest Khasra intersecting the railway corridor is digitized and its area computed. In the below picture the hatched lines (on cadastral map) show the revenue forest Khasra area proposed for diversion.



Each revenue forest patch is given a unique number and the total revenue forest effected area is calculated for each village. A single patch number is given if there are two or more revenue forest survey numbers adjacent to each other and are intersecting the railway corridor boundary. Below table shows revenue forest area statement with patch number.

Sr. No.	District	Tehsil	Village	Patch No	Khasra No.	Proposed Diversion Area (Ha)
1	Raigarh	Dharamjaigarh	Maharajganj	Patch No 45	713/1Ka	0.009
2	Raigarh	Dharamjaigarh	Maharajganj	Patch No 46	713/1Ka	0.009
3	Raigarh	Dharamjaigarh	Jogada	Patch No 47	526	0.019
4	Raigarh	Dharamjaigarh	Jogada	Patch No 48	621/1	0.266
5	Raigarh	Dharamjaigarh	Jogada		607	0.022



6	Raigarh	Dharamjaigarh	Jogada	Patch No 49	764/6	0.073
7	Raigarh	Dharamjaigarh	Jogada	Patch No 50	731	0.198
8	Raigarh	Dharamjaigarh	Jogada	Patch No 51	747/1	0.155
9	Raigarh	Dharamjaigarh	Jogada	Patch No 52	813/1 Ka	0.886
10	Raigarh	Dharamjaigarh	Jogada	Patch No 53	933/1	2.532
11	Raigarh	Dharamjaigarh	Jogada	Patch No 54	929/1 Ka	13.166
12	Raigarh	Dharamjaigarh	Hati	Patch No 55	1297/1	0.922

Similar GIS technique (overlay the rail corridor on Geo-referenced forest map) is adopted for computation of the total protected forest, Orange area forest and reserved forest area is using the forest maps

The geo-referenced forest land map (showing forest patches) is prepared by integrating the geo-referenced cadastral map sheets and railway line corridor vector layers.

4.9 Specification of DGPS Equipment

Geotrax deployed the most advance and hi-precision devices to carry out the DGPS survey. The DGPS performance specifications are given below. The corresponding fact sheets are placed below for ready reference.



COMNAV

T300 GNSS Receiver



Features

- **Ultra small**
- **Super light**
- **Many user-friendly conveniences built in**
- **GPS L1/L2/L5, BeiDou B1/B2/B3, GLONASS L1/L2**
- **Low power consumption**
- **Support long baseline E-RTK**

RTK robust enough for challenging environments, in a device that is light and easy to carry

With decades of experience in the surveying GNSS receiver, the T300 is a product which combines lots of market proved advantages together. It can track all the working GNSS constellations. By using ComNav's unique QUAN™ algorithm technology, it can function in RTK mode with all the GNSS constellations or by using any single GNSS constellation such as GLONASS or BeiDou. The strong anti-interference ability of the receiver makes it possible to work in any environment.

Design driven to improve user experience

Our R&D people are always thinking about how to improve the physical experience of users and workflow in the field. With this in mind, the T300 integrates a cutting edge GNSS board, Bluetooth®, UHF (Rx&Tx) into a compact board. Smart design makes the T300 the lightest and smallest (volume) receiver in the world.

Hot swap battery design

Extending the field working time is also a passion for our R&D people. They do lots of tests and analysis to reduce the power consumption, and make the whole system work more efficiently. In parallel, they've designed in the capability to hot swap the battery source. When the warning sounds and LED flashes, put your second battery in place. Then recharge the first while you keep working.

Consumer grade batteries... always available

Losing power in the field is significantly inconvenient for users, as the batteries for GNSS receivers are often unusual types and not readily available. Once again our R&D people developed a solution so that the T300 runs on normal consumer batteries.



Technical Specifications

T300

Signal Tracking

- 256 channels with simultaneously tracked satellite signals
- GPS: L1 C/A, L1 C, L2 P, L5
- BeiDou: B1, B2, B3
- GLONASS: L1, L2
- SBAS: WAAS, EGNOS, MSAS, GAGAN

Performance Specifications

- Cold start: <50 s
- Warm start: <30 s
- Hot start: <15 s
- Initialization time: <10 s
- Singal re-acquisition: <2 s
- Initialization reliability: >99.9%

Positioning Specifications

- Post Processing Static
- Horizontal: 2.5 mm + 0.5 ppm RMS
- Vertical: 5 mm + 0.5 ppm RMS
- Real Time Kinematic
- Horizontal: 8 mm + 1 ppm RMS
- Vertical: 15 mm + 1 ppm RMS
- E-RTK¹ (baseline<100 km)
- Horizontal: 0.2 m + 1 ppm RMS
- Vertical: 0.4 m + 1 ppm RMS
- Code differential GNSS positioning
- Horizontal: 0.25 m + 1 ppm RMS
- Vertical: 0.5 m + 1 ppm RMS
- SBAS: Typically <1 m 3D RMS
- Standalone: <1.5 m 3D RMS

Communications and Memory

- 1 Serial port (7 pin Lemo).
- Baud rates up to 921,600 bps.
- Radio modem: Tx/Rx with full frequency range from 410-470 MHz²
- Transmit power: 0.5-2W adjustable
- Range: 1-4 km
- Position data output rates: 1 Hz, 2 Hz, 5 Hz, 10 Hz
- 5 LEDs (indicating Power, Satellite Tracking, Bluetooth[®] and Differential Data)
- Bluetooth[®]: V 2.2 protocol, work compatible with Windows 7, Windows mobile and Android

Data Format

- Correction data I/O:
 - RTCM 2.x, 3.x, CMR (GPS only), CMR+ (GPS only).
- Position data output:
 - ASCII: NMEA-0183 GSV, RMC, HDT, VHD, GGA, GSA, ZDA, VTG, GST, PJK, PTNL
 - ComNav Binary update to 20 Hz

Physical

- Size(WxH): 15.8 cm x 7.5 cm
- Weight: 0.95 kg (include 2 batteries)

Environmental

- Operating temperature: -40 °C to + 85 °C (40 °F to 140 °F)
- Storage temperature: -40 °C to + 85 °C (40 °F to 185 °F)
- Humidity: 100% condensation
- Waterproof and dust proof: IP67 protected from temporary immersion to depth of 1 meter, floats
- Shock: survives a 2 meter drop on to concrete

Electrical

- Input Voltage: 5-27 VDC
- Power consumption: 2.85 W (3 constellations)³
- Li-ion battery capacity: 2 x 1800 mAh, up to 8 hours typically
- Memory: 256 MB internal with up to 16 GB pluggable memory card

Software

- ComNav field data collection software CGSurvey
- Carlson's SurvCE field data collection software (optional)
- MicroSurvey's FieldGenius field data collection software (optional)

¹ E-RTK, BeiDou B3 signal used in RTK calculate engine; concern the current situation, this mode can be used in APAC.

² 410-470 MHz, 3 frequency range, 410-430, 430-460, 460-470, need to clarify when place the order.

³ Power consumption will increase if using internal radio modem transmitter.

Specifications subject to change without notice.

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5. Results

The forest area proposed for diversion is computed from the Geo-referenced revenue and forest maps. The final forest diversion area statement including the revenue forest survey numbers and forest compartments-PF/RF/OA is prepared and is shown below.

Area Statement of Forest Area proposed for diversion				
Sl.No.	District Name	Revenue Forest Area (Ha)	Orange Area, Protected Forest, and Reserved Forest Area (Ha)	Total Forest Area proposed for diversion (Ha)
1	Dharamjaigarh	51.494	46.173	97.667

CERL- Revenue Forest area statement proposed for forest diversion						
Sr. No.	District	Tehsil	Village	Patch No	Khasra No.	Proposed Diversion Area (Ha)
1	Raigarh	Dharamjaigarh	Maharajganj	Patch No 45	713/1Ka	0.009
2	Raigarh	Dharamjaigarh	Maharajganj	Patch No 46	713/1Ka	0.009
3	Raigarh	Dharamjaigarh	Jogada	Patch No 47	526	0.019
4	Raigarh	Dharamjaigarh	Jogada	Patch No 48	621/1	0.266
5	Raigarh	Dharamjaigarh	Jogada		607	0.022
6	Raigarh	Dharamjaigarh	Jogada	Patch No 49	764/6	0.073
7	Raigarh	Dharamjaigarh	Jogada	Patch No 50	731	0.198
8	Raigarh	Dharamjaigarh	Jogada	Patch No 51	747/1	0.155
9	Raigarh	Dharamjaigarh	Jogada	Patch No 52	813/1 Ka	0.886
10	Raigarh	Dharamjaigarh	Jogada	Patch No 53	933/1	2.532
11	Raigarh	Dharamjaigarh	Jogada	Patch No 54	929/1 Ka	13.166
12	Raigarh	Dharamjaigarh	Hati	Patch No 55	1297/1	0.922
13	Raigarh	Dharamjaigarh	Hati	Patch No 56	1297/1	0.002
14	Raigarh	Dharamjaigarh	Hati	Patch No 57	1297/1	0.326
15	Raigarh	Dharamjaigarh	Hati	Patch No 58	1310/1	0.063
16	Raigarh	Dharamjaigarh	Hati	Patch No 59	957/1	0.672
17	Raigarh	Dharamjaigarh	Sithara	Patch No 61	1369/1 Ka	1.611
18	Raigarh	Dharamjaigarh	Sithara	Patch No 62	618/1	1.544

CERL- Revenue Forest area statement proposed for forest diversion

Sr. No.	District	Tehsil	Village	Patch No	Khasra No.	Proposed Diversion Area (Ha)
19	Raigarh	Dharamjaigarh	Sithara	Patch No 63	719/1	0.247
20	Raigarh	Dharamjaigarh	Sithara		501/1/Ka	0.096
21	Raigarh	Dharamjaigarh	Sithara	Patch No 64	501/1/Ka	0.004
22	Raigarh	Dharamjaigarh	Sithara	Patch No 65	501/1/Ka	0.300
23	Raigarh	Dharamjaigarh	Sithara		965/3/Ka	3.702
24	Raigarh	Dharamjaigarh	Sithara		965/3/Ka	0.080
25	Raigarh	Dharamjaigarh	Sithara	Patch No 66	63/1/Ka	1.317
26	Raigarh	Dharamjaigarh	Sithara		25-Jan	0.374
27	Raigarh	Dharamjaigarh	Sithara		28/2 Ka	0.333
28	Raigarh	Dharamjaigarh	Sithara	Patch No 67	25/5 Ka	0.102
29	Raigarh	Dharamjaigarh	Khadgaon	Patch No 68	667/1 Ka	0.035
30	Raigarh	Dharamjaigarh	Khadgaon	Patch No 69	667/1 Ka	1.944
31	Raigarh	Dharamjaigarh	Khadgaon	Patch No 70	667/1 Ka	0.324
32	Raigarh	Dharamjaigarh	Khadgaon	Patch No 71	543/1 Kha	0.029
33	Raigarh	Dharamjaigarh	Khadgaon	Patch No 72	89/1 Ka	0.015
34	Raigarh	Dharamjaigarh	Khadgaon	Patch No 73	71/1 Ka	0.644
35	Raigarh	Dharamjaigarh	Khadgaon		85/1 Kha	0.025
36	Raigarh	Dharamjaigarh	Khadgaon	Patch No 74	85/1 Ka	0.024
37	Raigarh	Dharamjaigarh	Khadgaon	Patch No 75	66/1	0.007
38	Raigarh	Dharamjaigarh	Khadgaon	Patch No 76	66/1	0.024
39	Raigarh	Dharamjaigarh	Khadgaon	Patch No 77	71/1 Ka	1.262
40	Raigarh	Dharamjaigarh	Khadgaon		65/1	0.333
41	Raigarh	Dharamjaigarh	Koilar		385/1	2.000
42	Raigarh	Dharamjaigarh	Koilar		376/1 Kha	6.850
43	Raigarh	Dharamjaigarh	Koilar		376/1 Ka	8.300
44	Raigarh	Dharamjaigarh	Baysi	Patch No 78	1379/1 Ka	0.648
Total Area						51.494

CERL-Forest Department controlled Forest Area statement						
Sr. No.	Division	Range	Compartment Type	Patch No.	Compartment No	Proposed Diversion Area (Ha)
1	Dharamjaigarh	Chhal	Reserved Forest	Patch No 46	1179	1.500
2	Dharamjaigarh	Chhal	Protected Forest	Patch No 54	P552	1.677
3	Dharamjaigarh	Chhal	Protected Forest	Patch No 55	P551	6.973
4	Dharamjaigarh	Chhal	Protected Forest	Patch No 60	P554	2.890
5	Dharamjaigarh	Chhal	Reserved Forest		562	3.596
6	Dharamjaigarh	Chhal	Protected Forest		P554	7.903
7	Dharamjaigarh	Chhal	Protected Forest	Patch No 66	P591	5.948
8	Dharamjaigarh	Chhal	Protected Forest	Patch No 67	P591	1.096
9	Dharamjaigarh	Chhal	Protected Forest	Patch No 70	P592	10.534
10	Dharamjaigarh	Chhal	Protected Forest	Patch No 73	P476	2.017
11	Dharamjaigarh	Chhal	Protected Forest	Patch No 77	P476	2.039
Total Area						46.173

DGPS coordinates of Forest Patches is in annexed herein and marked as Annexure-3. The geo-referenced map of forest land is annexed herein and marked as Annexure -4 and Survey of India Toposheet map showing alternate routes & proposed route is annexed herein and marked as Annexure-5.

In **Dharamjaigarh forest Division**, Transmission line passes through Chhal forest Range. In Raighr district the **total forest** land proposed for diversion is **97.667 Ha**. Out of the total forest land, **46.173 Ha is Protected Forest/Orange area and 97.667 Ha is Revenue forest.**

वन मण्डलाधिकारी
धरमजयगढ़ वन मण्डल
जिला रायगढ़ (छ.ग.)

उप वन मण्डलाधिकारी
धरमजयगढ़ उप वन मण्डल

वन परिक्षेत्राधिकारी
धरमजयगढ़

RANGE OFFICER
Range - Chhal
Division - Dharamjaigarh



6. Background of Organization

6.1 Company Profile: Geotrax

Geotrax International Services (www.geotrax.in) is a Professional Land Mapping and Services provider across India established in the year 1999. During the last 14+ years, we had an opportunity to execute a variety of surveying jobs all over India and in the Middle East to various customer specifications for RIS, LIS, and Municipal GIS oriented jobs. Cadastral Surveys using ETS/DGPS and Provision of Ground control conforming to stringent accuracy standards using high end instruments as RTK/GPRS DGPS is our specialty. We also have a UAV (Drone) and Ground Penetrating Radar (on Roaster).

Geotrax is headed by Mr. V.V.S Bandhakavi (Ex-Survey of India employee) who has more than 40+ years' experience in the field of surveying in India and abroad.

Some of our major clients include:

- Adani Enterprises Limited (AEL)
- Sterlite Power
- National Mineral development Corporation Ltd (NMDC)
- Bharat Aluminium Company Ltd (BALCO)
- Chhattisgarh Rail Corporation Ltd (CRCL)
- Ircon International Limited (IRCON)
- Odisha Space Application Centre (ORSAC)
- Steel Authority of India (SAIL)
- National Thermal Power Corporation (NTPC)
- Survey Settlement and Land Records Department (Govt. Of Gujarat)
- Survey Settlement and Land Records Department (Govt. Of Madhya Pradesh)
- Irrigation Dept. (Govt. of Jammu and Kashmir)
- National Remote Sensing Agency (Hyderabad)
- Meinhardt India Private Limited (Delhi),
- Nagarjuna Construction Company (NCC, Hyderabad)
- Consulting Engineering Services (CES, New Delhi)
- Lee Associates of South Asia (LASA, Delhi)
- Power development Corporation (Govt. of Jammu and Kashmir)

Geotrax expertise covers:

- ❖ DGPS Surveys for Mining lease boundary, and Forest Diversion
- ❖ Consultancy services for Mining Plan & EIA
- ❖ Boundary and cadastral surveys using DGPS and Total station;
- ❖ Topographic surveys.
- ❖ Ground control surveys for photogrammetric projects, including Airborne GPS.
- ❖ Only one of the two companies in India who are empanelled by NRSA for DGPS survey for ground control point collection
- ❖ Route and alignment surveys combining conventional and photogrammetric methods.
- ❖ Construction and cross-section surveys (from road design to precision layout and quality control).



Being a client focused organization, Geotrax's combination of survey equipment, personnel, and computer resources allow for the tailoring of the project approach to match the orders of accuracy and precision requirements for each project. Geotrax's equipment resources include 250 DGPS, 33 hand-held GPS units, theodolites, electronic digital and automatic levels, 19 Electronic Total Stations, and data collectors.

On the mapping side, our CAD and GIS professionals assist the survey projects by creating accurate maps. We have dedicated CAD experts who have extensive experience with different CAD software.



7. Annexures

7.1 Annexure – 1: Primary Control Point (PCP) DGPS Post-Processing Report

Network Adjustment Report

Page 1 of 5

Project Information		Coordinate System	
Name:	D:\Kurud Dron Survey\PCP-Raipur-25-28-jan.vce	Name:	UTM
Size:	631 KB	Datum:	WGS 1984
Modified:	29-01-2018 19:32:41 (UTC:5)	Zone:	44 North (81E)
Time zone:	India Standard Time	Geoid:	EGM96 (Global)
Reference number:		Vertical datum:	
Description:			

Network Adjustment Report

Adjustment Settings

Set-Up Errors

GNSS

Error in Height of Antenna: 0.000 m

Centering Error: 0.000 m

Covariance Display

Horizontal:

Propagated Linear Error [E]: U.S.

Constant Term [C]: 0.000 m

Scale on Linear Error [S]: 1.960

Three-Dimensional

Propagated Linear Error [E]: U.S.

Constant Term [C]: 0.000 m

Scale on Linear Error [S]: 1.960

Adjustment Statistics

Number of Iterations for Successful Adjustment: 2

Network Reference Factor: 1.00

Chi Square Test (95%): Passed

file:///C:/Users/Srinivas/AppData/Local/Temp/TBCTemporal/hyn12dqn.fa2/53eddf8.html 29-01-2018



Precision Confidence Level: 95%
Degrees of Freedom: 4

Post Processed Vector Statistics

Reference Factor: 1.00
Redundancy Number: 4.00
A Priori Scalar: 101.62

Control Point Constraints

Point ID	Type	East σ (Meter)	North σ (Meter)	Height σ (Meter)	Elevation σ (Meter)
HYDE	Global	Fixed	Fixed	Fixed	
IISC	Global	Fixed	Fixed	Fixed	
Fixed = 0.000001(Meter)					

Adjusted Grid Coordinates

Point ID	Easting (Meter)	Easting Error (Meter)	Northing (Meter)	Northing Error (Meter)	Elevation (Meter)	Elevation Error (Meter)	Cor
HYDE	239826.372	?	1927383.113	?	521.783	?	1
IISC	127917.413	?	1441987.668	?	929.917	?	1
RAIPUR-PCP	560766.517	1.972	2351381.191	0.974	298.732	1.799	

Adjusted Geodetic Coordinates

Point ID	Latitude	Longitude	Height (Meter)	Height Error (Meter)	Constraint

file:///C:/Users/Srinivas/AppData/Local/Temp/TBCTemporal/hyn12dqn.faz/53eddf78.html 29-01-2018



HYDE	N17°25'02.21987"	E78°33'03.17892"	444.790	?	LLh
IISC	N13°01'16.19707"	E77°34'13.35337"	843.714	?	LLh
RAIPUR-PCP	N21°15'47.24008"	E81°35'08.58749"	234.714	1.799	

Adjusted ECEF Coordinates

Point ID	X (Meter)	X Error (Meter)	Y (Meter)	Y Error (Meter)	Z (Meter)	Z Error (Meter)	3D Error (Meter)	Constraint
HYDE	1208443.561	?	5966808.390	?	1897080.466	?	?	LLh
IISC	1337936.455	?	6070317.126	?	1427876.785	?	?	LLh
RAIPUR-PCP	870190.163	1.927	5882769.522	1.780	2298653.662	1.091	2.841	

Error Ellipse Components

Point ID	Semi-major axis (Meter)	Semi-minor axis (Meter)	Azimuth
RAIPUR-PCP	2.525	1.079	104°

Adjusted GPS Observations

Transformation Parameters

Azimuth Rotation: -0.230 sec (95%) 0.651 sec

Scale Factor: 1.00000628 (95%) 0.00000163

Observation ID	Observation	A-posteriori Error	Residual	Standardized Residual
HYDE → IISC (PV2)	Az. 192°21'06"	0.650 sec	0.129 sec	0.538

File:///C:/Users/Srinivas/AppData/Local/Temp/TBCTemporal/hyn12dqn.faz2/53eddf8.html 29-01-2018



	ΔHt.	398.799 m	0.031 m	-2.839 m	-1.781 m
	Ellip Dist.	497702.834 m	0.812 m	0.223 m	0.905 m
IISC → RAIPUR-PCP (PV3)	Az.	24°31'59"	0.309 sec	0.046 sec	0.214
	ΔHt.	-609.516 m	1.782 m	2.879 m	0.908
	Ellip Dist.	1007051.774 m	1.090 m	-0.326 m	-0.419
HYDE → RAIPUR-PCP (PV1)	Az.	36°20'39"	0.254 sec	-0.007 sec	-0.220
	ΔHt.	-210.215 m	1.792 m	-0.237 m	-0.850
	Ellip Dist.	531855.361 m	0.619 m	0.001 m	0.008

Covariance Terms

From Point	To Point	Components	A-posteriori Error	Horiz. Precision (Ratio)	3D Precision (Ratio)
HYDE	IISC	Az.	192°21'06"	0.000 sec	1 : 0
		ΔHt.	398.924 m	0.000 m	
		ΔElev.	408.134 m	0.000 m	
		Ellip Dist.	497705.955 m	0.000 m	
RAIPUR-PCP	HYDE	Az.	217°21'00"	0.734 sec	1 : 474828
		ΔHt.	210.077 m	1.799 m	
		ΔElev.	223.051 m	1.799 m	
		Ellip Dist.	531858.695 m	1.120 m	
RAIPUR-PCP	IISC	Az.	205°43'13"	0.408 sec	1 : 1076793
		ΔHt.	609.001 m	1.799 m	
		ΔElev.	631.185 m	1.799 m	
		Ellip Dist.	1007058.067 m	0.935 m	

file:///C:/Users/Srinivas/AppData/Local/Temp/TBCTemporal/hyn12dqn_fa2/53eddf8.html 29-01-2018

Date: 29-01-2018 19:56:03	Project: D:\Kurud Dron Survey\PCP-Raipur-25-28-jan.vce	Trimble Business Center
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7.2 Annexure -2: Secondary Control Point (SCP) DGPS Post-Processing Report

Primary Control Point (PCP Raipur) to Secondary Control Point (SCP-1) Baseline Processing Report

Project Information		Coordinate System	
Name:	D:\IRCON\IRCON-URGA TO KUSUMUNDA\SCP-4Hr.vce	Name:	UTM
Size:	97 KB	Datum:	WGS 1984
Modified:	1/31/2018 10:43:08 PM (UTC:5)	Zone:	44 North (81E)
Time zone:	India Standard Time	Geoid:	EGM96 (Global)
Reference number:		Vertical datum:	
Description:			

Baseline Processing Report

Processing Summary

Observation	From	To	Solution Type	H. Prec. (Meter)	V. Prec. (Meter)	Geodetic Az.	Ellipsoid Dist. (Meter)	ΔHeight (Meter)
SCP-01 --- PCP- Raipur (B1)	PCP-Raipur	SCP-01	Fixed	0.007	0.019	45°04'15"	164895.663	-10.637

Acceptance Summary

Processed	Passed	Flag 	Fall 
1	1	0	0

SCP-01 - PCP-Raipur (13:52:00-17:22:55) (S1)

Baseline observation: SCP-01 → PCP-Raipur (B1)
 Processed: 31-01-2018 22:53:28
 Solution type: Fixed
 Frequency used: Dual Frequency (L1, L2)
 Horizontal precision: 0.007 m
 Vertical precision: 0.019 m
 RMS: 0.002 m
 Maximum PDOP: 2.939
 Ephemeris used: Broadcast
 Antenna model: US National Geodetic Survey Calibration
 Processing start time: 31-01-2018 13:52:00 (Local: UTC+5hr)
 Processing stop time: 31-01-2018 17:22:55 (Local: UTC+5hr)
 Processing duration: 03:30:55
 Processing interval: 5 seconds

Vector Components (Mark to Mark)

From:	PCP-Raipur				
	Grid		Local		Global
Easting	560764.042 m	Latitude	N21°15'47.16512"	Latitude	N21°15'47.16512"
Northing	2351378.878 m	Longitude	E81°35'08.50131"	Longitude	E81°35'08.50131"
Elevation	298.819 m	Height	234.801 m	Height	234.801 m

To:	SCP-01				
	Grid		Local		Global
Easting	677032.804 m	Latitude	N22°18'39.55260"	Latitude	N22°18'39.55260"
Northing	2468257.701 m	Longitude	E82°43'07.23316"	Longitude	E82°43'07.23316"
Elevation	285.201 m	Height	224.164 m	Height	224.164 m

Vector					
ΔEasting	116268.761 m	NS Fwd Azimuth	45°04'15"	ΔX	-121949.442 m
ΔNorthing	116878.823 m	Ellipsoid Dist.	164895.663 m	ΔY	-26672.621 m
ΔElevation	-13.618 m	ΔHeight	-10.637 m	ΔZ	107740.077 m



Standard Errors

Vector errors:					
$\sigma \Delta \text{Easting}$	0.002 m	$\sigma \text{ NS fwd Azimuth}$	0°00'00"	$\sigma \Delta X$	0.003 m
$\sigma \Delta \text{Northing}$	0.002 m	$\sigma \text{ Ellipsoid Dist.}$	0.003 m	$\sigma \Delta Y$	0.009 m
$\sigma \Delta \text{Elevation}$	0.010 m	$\sigma \Delta \text{Height}$	0.010 m	$\sigma \Delta Z$	0.004 m

Aposteriori Covariance Matrix (Meter²)

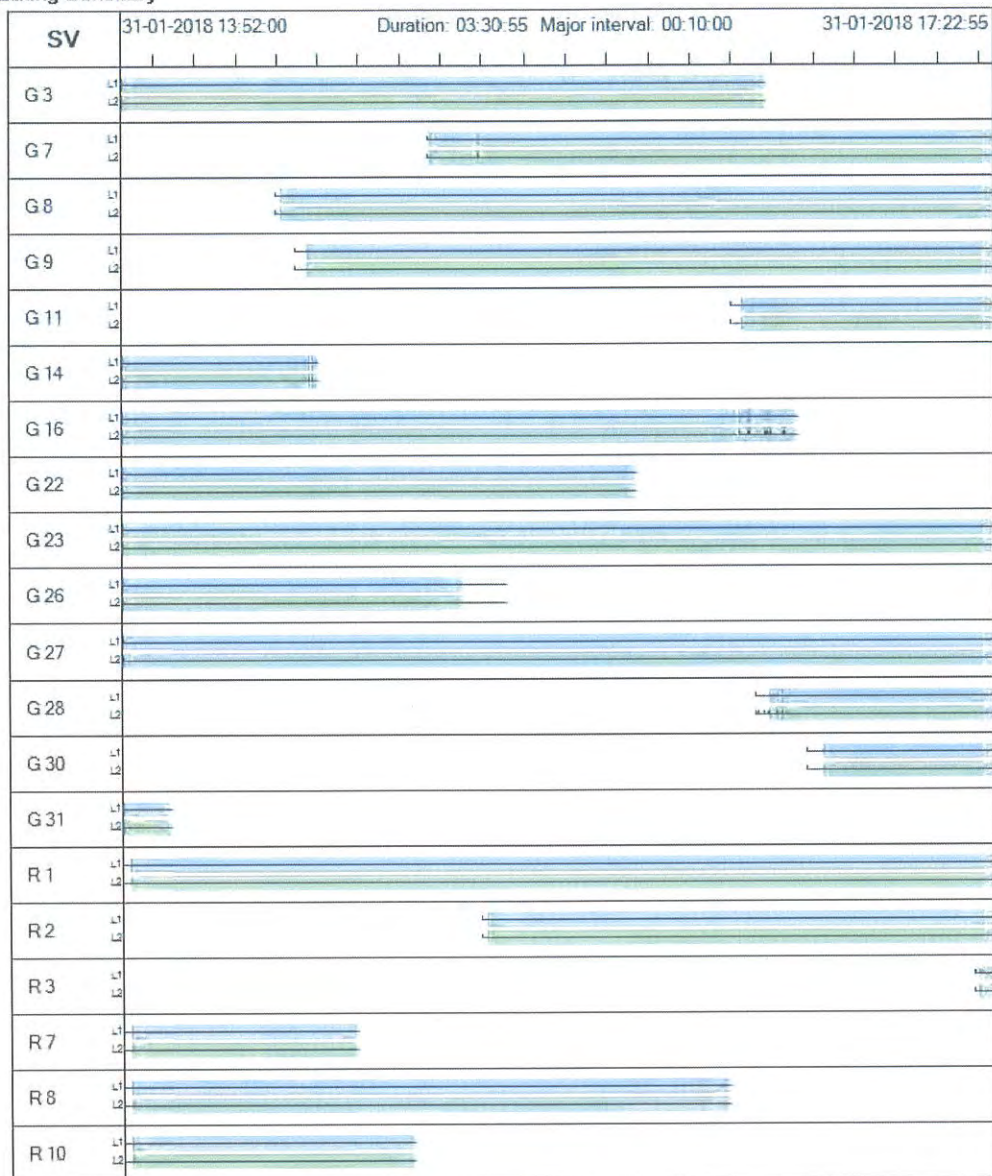
	X	Y	Z
X	0.0000094767		
Y	0.0000173797	0.0000858756	
Z	0.0000039199	0.0000272577	0.0000131925

Occupations

	From	To
Point ID:	PCP-Raipur	SCP-01
Data file:	D:\IRCON\IRCON-URGA TO KUSUMUNDA\SCP-4Hr\03101049031p_20180131131419.180	D:\IRCON\IRCON-URGA TO KUSUMUNDA\SCP-4Hr\03102966031q_20180131135158.180
Receiver type:	Unknown	Unknown
Receiver serial number:		
Antenna type:	NGS D/M+gp60	NGS D/M+gp60
Antenna serial number:	-----	-----
Antenna height (measured):	1.427 m	1.523 m
Antenna method:	Antenna Phase Center	Antenna Phase Center



Tracking Summary



7.3 Annexure-3: DGPS Surveyed co-ordinates of Forest Patches

Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
1	Patch No-45	P-295	709510.7945	2461213.603	22°14'37.47167"	83°01'58.51124"
2		P-296	709512.6219	2461228.54	22°14'37.95636"	83°01'58.58205"
3		P-297	709524.2815	2461229.709	22°14'37.98928"	83°01'58.98969"
4	Patch No-46	P-298	709633.4591	2461376.132	22°14'42.70073"	83°02'02.87033"
5		P-299	709624.144	2461404.091	22°14'43.61357"	83°02'02.55821"
6		P-300	709616.8679	2461410.309	22°14'43.81884"	83°02'02.30709"
7		P-301	709619.7503	2461429.952	22°14'44.45604"	83°02'02.41695"
8		P-302	709614.948	2461458.218	22°14'45.37685"	83°02'02.26254"
9		P-303	709701.4378	2461613.832	22°14'50.39695"	83°02'05.35543"
10		P-304	709788.976	2461652.553	22°14'51.61720"	83°02'08.43006"
11	Patch No-47	P-305	712503.5414	2463714.497	22°15'57.43999"	83°03'44.19148"
12		P-306	712502.6668	2463716.428	22°15'57.50316"	83°03'44.16186"
13		P-307	712528.27	2463750.194	22°15'58.58927"	83°03'45.07200"
14		P-308	712530.6464	2463742.913	22°15'58.35156"	83°03'45.15152"
15	Patch No-48	P-309	713025.955	2464274.161	22°16'15.39831"	83°04'02.70120"
16		P-310	713034.3944	2464304.157	22°16'16.36948"	83°04'03.01024"
17		P-311	713036.543	2464378.594	22°16'18.78789"	83°04'03.12083"
18		P-312	713084.1	2464371.77	22°16'18.54494"	83°04'04.77830"
19		P-313	713083.9718	2464350.677	22°16'17.85943"	83°04'04.76374"
20		P-314	713046.1771	2464300.832	22°16'16.25617"	83°04'03.42011"
21	Patch No-49	P-315	713217.3402	2464526.571	22°16'23.51699"	83°04'09.50518"
22		P-316	713208.8122	2464551.507	22°16'24.33127"	83°04'09.21930"
23		P-317	713234.7442	2464557.426	22°16'24.51210"	83°04'10.12770"
24		P-318	713229.2409	2464574.676	22°16'25.07523"	83°04'09.94377"
25		P-319	713256.0429	2464577.613	22°16'25.15875"	83°04'10.88114"
26	Patch No-50	P-320	713284.2743	2464618.359	22°16'26.47051"	83°04'11.88650"
27		P-321	713222.3279	2464632.359	22°16'26.95311"	83°04'09.72995"
28		P-322	713263.5366	2464683.817	22°16'28.60726"	83°04'11.19363"
29	Patch No-51	P-323	713395.1901	2464743.642	22°16'30.49305"	83°04'15.81979"
30		P-324	713374.4818	2464739.017	22°16'30.35194"	83°04'15.09442"



Sr. No.	Patch No.	Point Id	Easting''m''	Northing''m''	Latitude''N''	Longitude''E''
31		P-325	713348.9482	2464771.696	22°16'31.42547"	83°04'14.21838"
32		P-326	713377.7278	2464796.486	22°16'32.21838"	83°04'15.23528"
33		P-327	713400.2412	2464774.911	22°16'31.50710"	83°04'16.01116"
34	Patch No-52	P-328	713484.8276	2464808.507	22°16'32.56136"	83°04'18.98114"
35		P-329	713473.0397	2464865.4	22°16'34.41575"	83°04'18.59673"
36		P-330	713641.312	2464969.683	22°16'37.73010"	83°04'24.52308"
37		P-331	713582.7236	2464867.245	22°16'34.42680"	83°04'22.42797"
38	Patch No-53	P-332	714048.1234	2465150.417	22°16'43.42264"	83°04'38.81652"
39		P-333	714039.4683	2465215.592	22°16'45.54482"	83°04'38.54556"
40		P-334	714303.2481	2465378.508	22°16'50.72190"	83°04'47.83573"
41		P-335	714305.0549	2465426.637	22°16'52.28539"	83°04'47.92197"
42		P-336	714427.6704	2465337.818	22°16'49.34372"	83°04'52.16132"
43		P-337	714334.7766	2465327.459	22°16'49.04863"	83°04'48.91224"
44	Patch No-54	P-338	714538.7261	2465406.408	22°16'51.52327"	83°04'56.07269"
45		P-339	714487.6943	2465539.439	22°16'55.86988"	83°04'54.35455"
46		P-340	714761.1773	2465778.876	22°17'03.52939"	83°05'04.02081"
47		P-341	715083.7966	2465978.132	22°17'09.86070"	83°05'15.38399"
48		P-342	715115.0093	2465967.206	22°17'09.49156"	83°05'16.46878"
49		P-343	715157.0743	2465952.861	22°17'09.00643"	83°05'17.93093"
50		P-344	715195.9301	2465940.57	22°17'08.58949"	83°05'19.28198"
51		P-345	715143.2865	2465779.796	22°17'03.38773"	83°05'17.36583"
52	Patch No-55	P-346	715324.9916	2465892.021	22°17'06.95353"	83°05'23.76583"
53		P-347	715267.1154	2465898.489	22°17'07.18979"	83°05'21.74771"
54		P-348	715371.3814	2465971.334	22°17'09.51047"	83°05'25.42427"
55		P-349	715379.1602	2465944.505	22°17'08.63499"	83°05'25.68297"
56		P-350	715407.894	2465951.649	22°17'08.85425"	83°05'26.68991"
57		P-351	715401.8836	2465983.24	22°17'09.88372"	83°05'26.49528"
58		P-352	715582.3144	2466050.948	22°17'12.00310"	83°05'32.82938"
59	Patch No-56	P-353	715642.2337	2466246.587	22°17'18.33468"	83°05'35.01670"
60		P-354	715642.4983	2466250.821	22°17'18.47215"	83°05'35.02799"
61		P-355	715644.3601	2466251.945	22°17'18.50787"	83°05'35.09355"

Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
62		P-356	715647.7104	2466246.521	22°17'18.33005"	83°05'35.20794"
63		P-357	715624.5662	2466077.044	22°17'12.83222"	83°05'34.31761"
64		P-358	715627.309	2466096.085	22°17'13.44986"	83°05'34.42261"
65		P-359	715682.8187	2466115.585	22°17'14.05863"	83°05'36.37067"
66		P-360	715689.0156	2466234.384	22°17'17.91697"	83°05'36.64462"
67	Patch No-57	P-361	715714.341	2466250.025	22°17'18.41393"	83°05'37.53666"
68		P-362	715927.043	2466381.395	22°17'22.58773"	83°05'45.02882"
69		P-363	715980.8087	2466344.08	22°17'21.35069"	83°05'46.88847"
70		P-364	715720.6884	2466183.425	22°17'16.24645"	83°05'37.72609"
71		P-365	715717.0894	2466134.188	22°17'14.64780"	83°05'37.57655"
72		P-366	716270.0446	2466560.846	22°17'28.26526"	83°05'57.09512"
73		P-367	716199.6051	2466560.974	22°17'28.30127"	83°05'54.63509"
74		P-368	716220.66	2466579.246	22°17'28.88560"	83°05'55.37931"
75		P-369	716325.4428	2466692.506	22°17'32.51935"	83°05'59.09385"
76		P-370	716428.0872	2466904.469	22°17'39.36202"	83°06'02.78174"
77		P-371	716341.3726	2466929.968	22°17'40.23000"	83°05'59.76556"
78		P-372	716348.6377	2466948.679	22°17'40.83482"	83°06'00.02839"
79		P-373	716435.1753	2466923.231	22°17'39.96862"	83°06'03.03841"
80		P-374	716497.2676	2467162.162	22°17'47.70608"	83°06'05.32320"
81	Patch No-58	P-375	716551.5433	2467329.642	22°17'53.12482"	83°06'07.30030"
82		P-376	716611.026	2467320.541	22°17'52.80211"	83°06'09.37340"
83		P-377	716584.9367	2467141.811	22°17'47.00498"	83°06'08.37524"
84		P-378	716521.675	2466897.795	22°17'39.10278"	83°06'06.04710"
85		P-379	716608.1469	2466872.367	22°17'38.23721"	83°06'09.05482"
86		P-380	716601.3175	2466853.529	22°17'37.62801"	83°06'08.80713"
87		P-381	716514.729	2466878.991	22°17'38.49476"	83°06'05.79537"
88		P-382	716373.0305	2466655.964	22°17'31.31017"	83°06'00.73811"
89		P-383	716283.4785	2466555.841	22°17'28.09651"	83°05'57.56187"
90		P-384	716695.6415	2467707.71	22°18'05.34726"	83°06'12.51719"
91	Patch No-59	P-385	716620.4519	2467810.372	22°18'08.71795"	83°06'09.94097"
92		P-386	716618.3881	2467874.666	22°18'10.80852"	83°06'09.90018"

Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
93	Patch No-60	P-387	716693.8002	2467825.722	22°18'09.18362"	83°06'12.51032"
94		P-388	716564.003	2468353.933	22°18'26.40992"	83°06'08.23385"
95		P-389	716460.008	2468428.667	22°18'28.88595"	83°06'04.63778"
96		P-390	716373.748	2468736.821	22°18'38.94039"	83°06'01.77466"
97		P-391	716372.595	2468778.036	22°18'40.28044"	83°06'01.75443"
98		P-392	716231.0122	2469283.827	22°18'56.78335"	83°05'57.05483"
99		P-393	716170.2148	2469501.021	22°19'03.86990"	83°05'55.03669"
100		P-394	716087.92	2469823.478	22°19'14.38739"	83°05'52.31870"
101		P-395	716078.242	2469947.113	22°19'18.41006"	83°05'52.04071"
102		P-396	716103.3642	2470180.705	22°19'25.99074"	83°05'53.03184"
103		P-397	716140.9743	2470397.313	22°19'33.01376"	83°05'54.45099"
104		P-398	716177.2258	2470606.095	22°19'39.78301"	83°05'55.81893"
105		P-399	716236.069	2470591.81	22°19'39.29212"	83°05'57.86760"
106		P-400	716181.312	2470278.904	22°19'29.14706"	83°05'55.80254"
107		P-401	716144.1666	2470055.168	22°19'21.89217"	83°05'54.39615"
108		P-402	716138.4411	2469938.1	22°19'18.08989"	83°05'54.13924"
109		P-403	716166.715	2469737.46	22°19'11.55606"	83°05'55.02937"
110		P-404	716276.724	2469343.11	22°18'58.68943"	83°05'58.68042"
111		P-405	716450.7867	2468758.386	22°18'39.60641"	83°06'04.47609"
112		P-406	716466.96	2468700.607	22°18'37.72119"	83°06'05.01291"
113	Patch No-61	P-407	716298.819	2470951.235	22°19'50.94542"	83°06'00.23464"
114		P-408	716245.6129	2470933.243	22°19'50.38476"	83°05'58.36714"
115		P-409	716239.8979	2470905.091	22°19'49.47238"	83°05'58.15379"
116		P-410	716228.5028	2470901.413	22°19'49.35799"	83°05'57.75392"
117		P-411	716243.816	2470989.606	22°19'52.21744"	83°05'58.33179"
118		P-412	716269.4784	2470992.033	22°19'52.28472"	83°05'59.22949"
119		P-413	716284.0305	2471031.192	22°19'53.55082"	83°05'59.75692"
120		P-414	716250.253	2471026.678	22°19'53.41942"	83°05'58.57471"
121		P-415	716281.9301	2471209.116	22°19'59.33451"	83°05'59.77015"
122		P-416	716342.3722	2471200.702	22°19'59.03368"	83°06'01.87761"
123	Patch No-62	P-417	716348.0894	2471233.45	22°20'00.09543"	83°06'02.09329"

Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
124		P-418	716287.8235	2471243.058	22°20'00.43499"	83°05'59.99256"
125		P-419	716342.8815	2471560.152	22°20'10.71598"	83°06'02.07044"
126		P-420	716350.3969	2471554.627	22°20'10.53301"	83°06'02.33031"
127		P-421	716387.3039	2471458.066	22°20'07.37793"	83°06'03.57266"
128		P-422	716364.3426	2471326.546	22°20'03.11381"	83°06'02.70644"
129		P-423	716355.4315	2471329.161	22°20'03.20283"	83°06'02.39640"
130		P-424	716343.2628	2471300.232	22°20'02.26810"	83°06'01.95719"
131		P-425	716358.8112	2471294.863	22°20'02.08657"	83°06'02.49777"
132	Patch No-63	P-426	716732.0152	2472277.44	22°20'33.85213"	83°06'16.01524"
133		P-427	716711.3549	2472282.223	22°20'34.01696"	83°06'15.29575"
134		P-428	716806.2933	2472369.909	22°20'36.82374"	83°06'18.65548"
135		P-429	716838.0183	2472399.211	22°20'37.76166"	83°06'19.77819"
136		P-430	716849.7241	2472354.223	22°20'36.29421"	83°06'20.16520"
137		P-431	716820.0448	2472363.04	22°20'36.59425"	83°06'19.13257"
138	Patch No-64	P-432	717041.3897	2472579.244	22°20'43.52049"	83°06'26.97155"
139		P-433	717034.0336	2472580.252	22°20'43.55662"	83°06'26.71503"
140		P-434	717042.4802	2472588.054	22°20'43.80633"	83°06'27.01395"
141		P-435	717044.35	2472587.292	22°20'43.78072"	83°06'27.07891"
142	Patch No-65	P-436	717195.1682	2472647.452	22°20'45.66736"	83°06'32.37765"
143		P-437	717181.2509	2472663.911	22°20'46.20862"	83°06'31.89946"
144		P-438	717156.0641	2472692.961	22°20'47.16426"	83°06'31.03368"
145		P-439	717168.8099	2472704.734	22°20'47.54107"	83°06'31.48476"
146		P-440	717196.2285	2472704.669	22°20'47.52648"	83°06'32.44269"
147		P-441	717212.5873	2472745.167	22°20'48.83527"	83°06'33.03405"
148		P-442	717281.0922	2472808.439	22°20'50.86048"	83°06'35.45848"
149		P-443	717699.4602	2473195.824	22°21'03.26016"	83°06'50.26565"
150		P-444	717733.5699	2473182.336	22°21'02.80623"	83°06'51.45081"
151		P-445	717658.7201	2473075.549	22°20'59.36971"	83°06'48.78324"
152		P-446	717266.3394	2472713.18	22°20'47.77121"	83°06'34.89642"
153		P-447	717208.4957	2472694.33	22°20'47.18488"	83°06'32.86623"
154		P-448	717216.2509	2472666.923	22°20'46.29060"	83°06'33.12377"

Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
155	Patch No-66	P-449	717838.0129	2473257.077	22°21'05.18770"	83°06'55.13666"
156		P-450	717746.7719	2473242.512	22°21'04.75599"	83°06'51.94160"
157		P-451	717882.7256	2473439.119	22°21'11.08380"	83°06'56.78827"
158		P-452	717945.262	2473606.322	22°21'16.48946"	83°06'59.05540"
159		P-453	718034.2576	2474044.659	22°21'30.69507"	83°07'02.38031"
160		P-454	718107.5008	2474405.914	22°21'42.40259"	83°07'05.11712"
161		P-455	718118.9628	2474462.447	22°21'44.23473"	83°07'05.54542"
162		P-456	718141.3189	2474572.713	22°21'47.80820"	83°07'06.38081"
163		P-457	718179.8911	2474461.333	22°21'44.17064"	83°07'07.67384"
164		P-458	718176.558	2474444.894	22°21'43.63790"	83°07'07.54929"
165		P-459	718165.9636	2474392.644	22°21'41.94457"	83°07'07.15340"
166		P-460	718084.2433	2473989.61	22°21'28.88308"	83°07'04.09981"
167		P-461	718003.6062	2473591.919	22°21'15.99468"	83°07'01.08688"
168		P-462	717944.1467	2473428.627	22°21'10.71474"	83°06'58.92916"
169	Patch No-67	P-463	718199.7494	2474559.271	22°21'47.34461"	83°07'08.41591"
170		P-464	718190.8978	2474515.616	22°21'45.92985"	83°07'08.08514"
171		P-465	718161.8534	2474617.554	22°21'49.25617"	83°07'07.12040"
172		P-466	718153.1303	2474630.969	22°21'49.69618"	83°07'06.82219"
173		P-467	718175.0546	2474739.105	22°21'53.20064"	83°07'07.64147"
174		P-468	718229	2474794	22°21'54.96007"	83°07'09.55348"
175		P-469	718246.6957	2474790.804	22°21'54.84810"	83°07'10.17025"
176	Patch No-68	P-470	718280.3235	2474956.652	22°22'00.22286"	83°07'11.42692"
177		P-471	718262.954	2474972.486	22°22'00.74545"	83°07'10.82777"
178		P-472	718286.1224	2474985.251	22°22'01.14970"	83°07'11.64363"
179	Patch No-69	P-473	718313.4309	2475119.933	22°22'05.51444"	83°07'12.66419"
180		P-474	718294.8806	2475117.927	22°22'05.45773"	83°07'12.01498"
181		P-475	718285.6819	2475284.746	22°22'10.88368"	83°07'11.77567"
182		P-476	718331.6824	2475511.632	22°22'18.23654"	83°07'13.49484"
183		P-477	718346.7655	2475529.019	22°22'18.79473"	83°07'14.03047"
184		P-478	718396.9236	2475531.708	22°22'18.85913"	83°07'15.78454"
185	Patch No-70	P-479	718424.0994	2475665.736	22°22'23.20265"	83°07'16.80022"



Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
186		P-480	718372.8501	2475714.681	22°22'24.81689"	83°07'15.03343"
187		P-481	718380.4852	2475752.34	22°22'26.03731"	83°07'15.31879"
188		P-482	718399.2748	2476042.32	22°22'35.45323"	83°07'16.11827"
189		P-483	718518.3291	2476630.39	22°22'54.51122"	83°07'20.56866"
190		P-484	718480.2191	2476638.105	22°22'54.77945"	83°07'19.24064"
191		P-485	718491	2476672	22°22'55.87611"	83°07'19.63411"
192		P-486	718657.4125	2476611.832	22°22'53.84429"	83°07'25.42005"
193		P-487	718536.438	2476014.279	22°22'34.47899"	83°07'20.89770"
194		P-488	718435.8897	2475723.884	22°22'25.08709"	83°07'17.24088"
195		P-489	718520.879	2476970.565	22°23'05.56591"	83°07'20.82555"
196	Patch No-71	P-490	718533.9912	2477035.334	22°23'07.66492"	83°07'21.31574"
197		P-491	718541.9617	2477033.72	22°23'07.60882"	83°07'21.59350"
198	Patch No-72	P-492	718704.4592	2477549.779	22°23'24.30638"	83°07'27.52723"
199		P-493	718716.7534	2477610.506	22°23'26.27439"	83°07'27.98689"
200		P-494	718721.4927	2477609.547	22°23'26.24103"	83°07'28.15205"
201	Patch No-73	P-495	718847.7452	2477753.571	22°23'30.86387"	83°07'32.63563"
202		P-496	718798.404	2477812.233	22°23'32.79309"	83°07'30.94017"
203		P-497	718856.8867	2478101.106	22°23'42.15468"	83°07'33.12689"
204		P-498	718864.6306	2478139.356	22°23'43.39429"	83°07'33.41645"
205		P-499	718870.3891	2478167.802	22°23'44.31613"	83°07'33.63177"
206		P-500	718877.0621	2478144.008	22°23'43.53974"	83°07'33.85323"
207		P-501	718905.4255	2478152.757	22°23'43.81104"	83°07'34.84886"
208		P-502	718913.1724	2478248.734	22°23'46.92679"	83°07'35.16707"
209		P-503	718949.0499	2478321.442	22°23'49.27331"	83°07'36.45697"
210		P-504	718962.0454	2478318.156	22°23'49.16055"	83°07'36.90955"
211		P-505	718922.6915	2478123.766	22°23'42.86090"	83°07'35.43798"
212	Patch No-74	P-506	718909.1452	2478280.019	22°23'47.94540"	83°07'35.04179"
213		P-507	718891.664	2478272.888	22°23'47.72169"	83°07'34.42729"
214		P-508	718897.617	2478302.291	22°23'48.67456"	83°07'34.64989"
215	Patch No-75	P-509	718936.8736	2478474.541	22°23'54.25469"	83°07'36.10711"
216		P-510	718932.6962	2478475.567	22°23'54.28995"	83°07'35.96162"



Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
217		P-511	718936.1927	2478492.84	22°23'54.84972"	83°07'36.09236"
218		P-512	718939.7311	2478486.765	22°23'54.65065"	83°07'36.21303"
219		P-513	718938.6713	2478505.083	22°23'55.24648"	83°07'36.18505"
220	Patch No-76	P-514	718952.7228	2478574.49	22°23'57.49578"	83°07'36.71049"
221		P-515	718956.2279	2478563.162	22°23'57.12600"	83°07'36.82740"
222		P-516	718981.5822	2478414.658	22°23'52.28793"	83°07'37.64010"
223	Patch No-77	P-517	718949.3531	2478432.084	22°23'52.86909"	83°07'36.52229"
224		P-518	718979.3834	2478693.096	22°24'01.33825"	83°07'37.70099"
225		P-519	719019.8647	2478736.752	22°24'02.73847"	83°07'39.13747"
226		P-520	718980.4927	2478711.657	22°24'01.94097"	83°07'37.74894"
227		P-521	718987.6488	2478796.745	22°24'04.70306"	83°07'38.04116"
228		P-522	718999.9671	2478849.431	22°24'06.40971"	83°07'38.49777"
229		P-523	719077.477	2479049.328	22°24'12.87076"	83°07'41.30583"
230		P-524	719195.594	2479221.358	22°24'18.40740"	83°07'45.51950"
231		P-525	719383.955	2479385.854	22°24'23.66676"	83°07'52.18476"
232		P-526	719570.9452	2479501.945	22°24'27.35350"	83°07'58.77822"
233		P-527	719819.1977	2479643.167	22°24'31.82861"	83°08'07.52558"
234		P-528	720122.023	2479829.761	22°24'37.75293"	83°08'18.20319"
235		P-529	720292.294	2479934.679	22°24'41.08396"	83°08'24.20704"
236		P-530	720536.387	2480076.933	22°24'45.59413"	83°08'32.80997"
237		P-531	720817.971	2480190.585	22°24'49.15719"	83°08'42.70924"
238		P-532	721054.4238	2480272.349	22°24'51.70470"	83°08'51.01517"
239		P-533	721359.4814	2480390.455	22°24'55.40126"	83°09'01.73741"
240		P-534	721385.4289	2480336.358	22°24'53.63103"	83°09'02.61731"
241		P-535	721069.2333	2480213.984	22°24'49.80095"	83°08'51.50365"
242		P-536	720829.9328	2480131.235	22°24'47.22278"	83°08'43.09773"
243		P-537	720616.413	2480048.804	22°24'44.64283"	83°08'35.59319"
244		P-538	720323.77	2479883.597	22°24'39.40922"	83°08'25.28181"
245		P-539	719850.635	2479592.062	22°24'30.15316"	83°08'08.59903"
246		P-540	719614.9276	2479435.079	22°24'25.16003"	83°08'00.28235"
247		P-541	719343.0325	2479255.172	22°24'19.43843"	83°07'50.68962"

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धरमजागर वन मण्डल
जिला रायगढ़ (छ.)

वन वन अधिकारी
धरमजागर वन मण्डल

वन अधिकारी
धरमजागर

RANGE OFFICER
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Division - Dharamjaigarh





Sr. No.	Patch No.	Point Id	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
248		P-542	719164.6735	2479041.472	22°24'12.57528"	83°07'44.34966"
249		P-543	719064.9836	2478775.814	22°24'03.98722"	83°07'40.73378"
250		P-544	719054.5044	2478774.524	22°24'03.95012"	83°07'40.36688"
251	Patch No-78	P-545	721374.4138	2480397.784	22°24'55.63251"	83°09'02.26303"
252		P-546	721509.1999	2480472.303	22°24'57.99161"	83°09'07.01176"
253		P-547	721656.3506	2480573.289	22°25'01.20505"	83°09'12.20601"
254		P-548	721547.493	2480456.699	22°24'57.46664"	83°09'08.34248"
255		P-549	721452.2232	2480423.39	22°24'56.42847"	83°09'04.99566"
256		P-550	721414.8838	2480398.675	22°24'55.64261"	83°09'03.67810"

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जिला चम्पाद (छ.ग.)

उप वन मण्डलाधिकारी
धरमजयगढ़ उप वन मण्डल

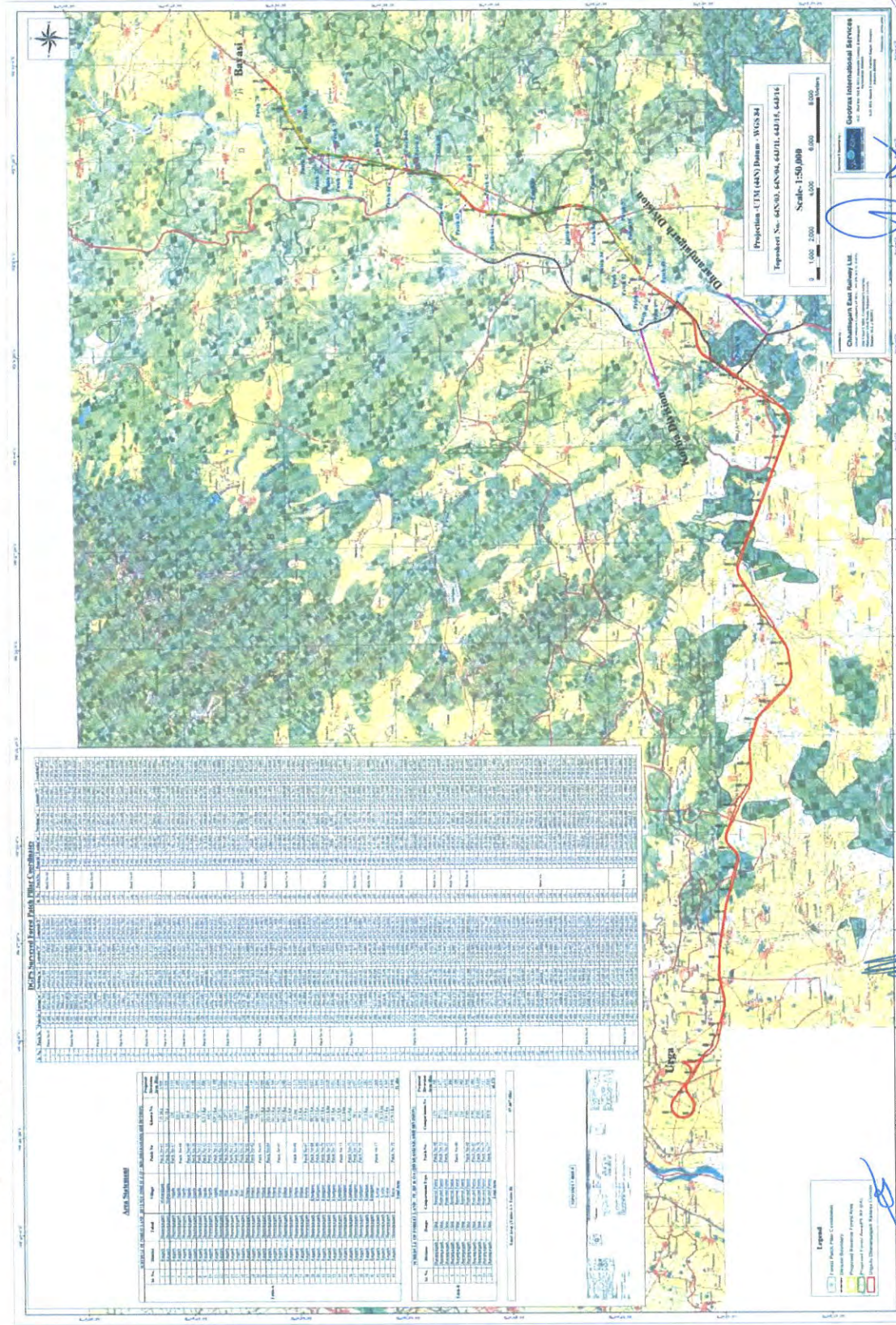
वन परिमन्त्राधिकारी
धरमजयगढ़

RANGE OFFICER
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7.4 Annexure – 4: DGPS Surveyed Map of BG Rail Line corridor showing proposed forest diversion area

Map Showing The Forest Patches In Dharamjaigarh Forest Division Proposed For Diversion For New BG Railway Corridor Form Urga To Dharamjaigarh.



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जिला रायगढ़ (छ.ग.)

एन वन मण्डलाधिकारी
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जिला रायगढ़ (छ.ग.)

न परिक्षेत्राधिकारी
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7.5 Annexure – 5: DGPS Surveyed Map of BG Rail Line corridor showing proposed & alternate routes

Map Showing the Forest Division Area for Proposed Railway Track Corridor from Urga to Dharamjaigarh with Alternative Route- 1 & 2, Belonging to Chhattisgarh East Railway Ltd. (Joint Venture Company of SECL, IRCON & C.G. Govt.)

