

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

DGPS Survey Report of Forest Patches in Korba
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.



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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 Urga (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 accepted by IRCON and detailed topographical survey (including DGPS Survey) is conducted on the alignment by DIMTS. The Rail corridor line passes through two Districts, i.e. Korba & Raigarh, and three tehsils of these districts. It passes through two forests Division; Korba Forest Division, & Dharamjaygarh forest Division.

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

Coal Corridors - Overview

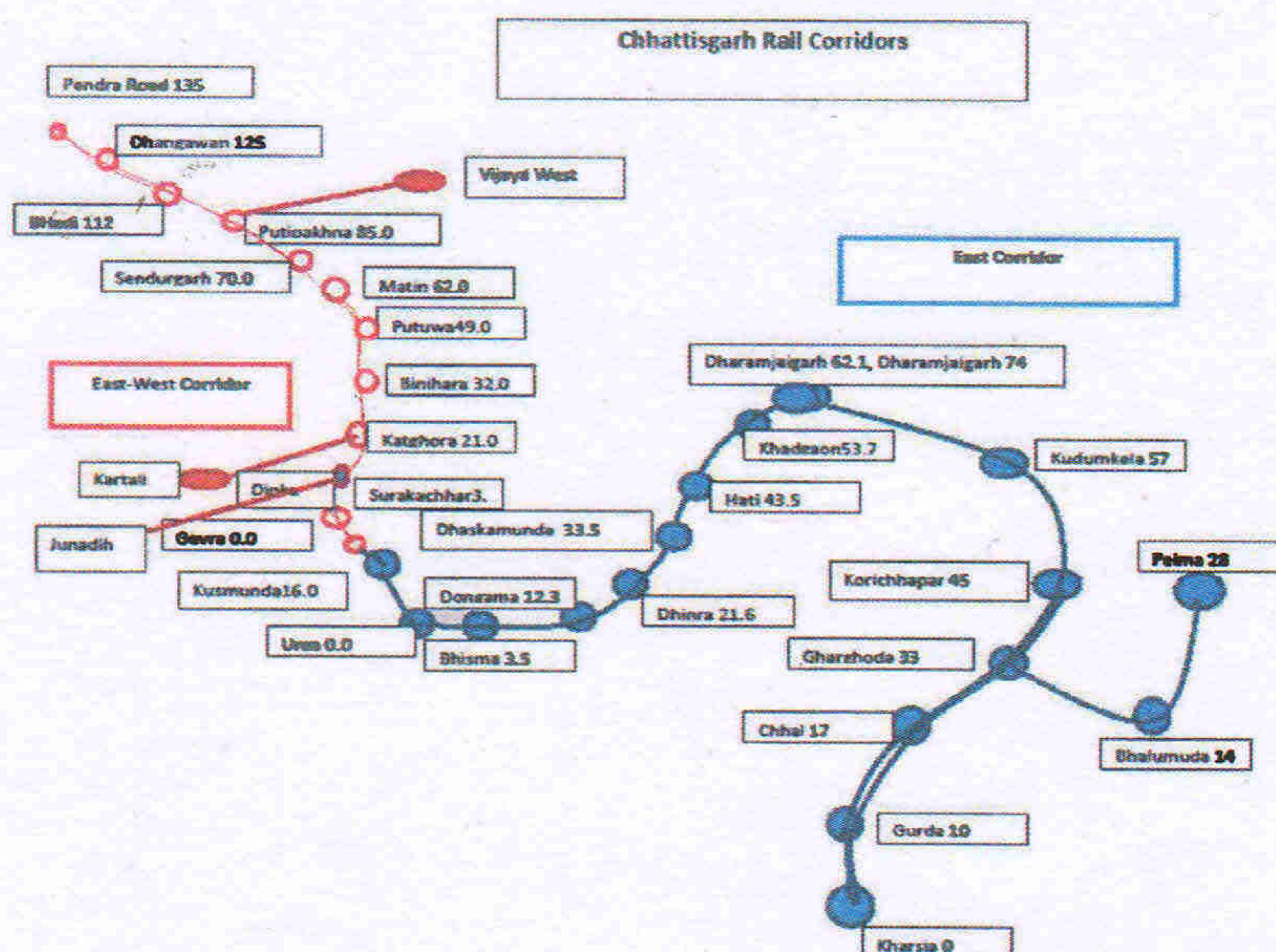




Fig-1: BG Rail Corridor from Uрга to Dharamaygarh on Satellite Imagery

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 centerline 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 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

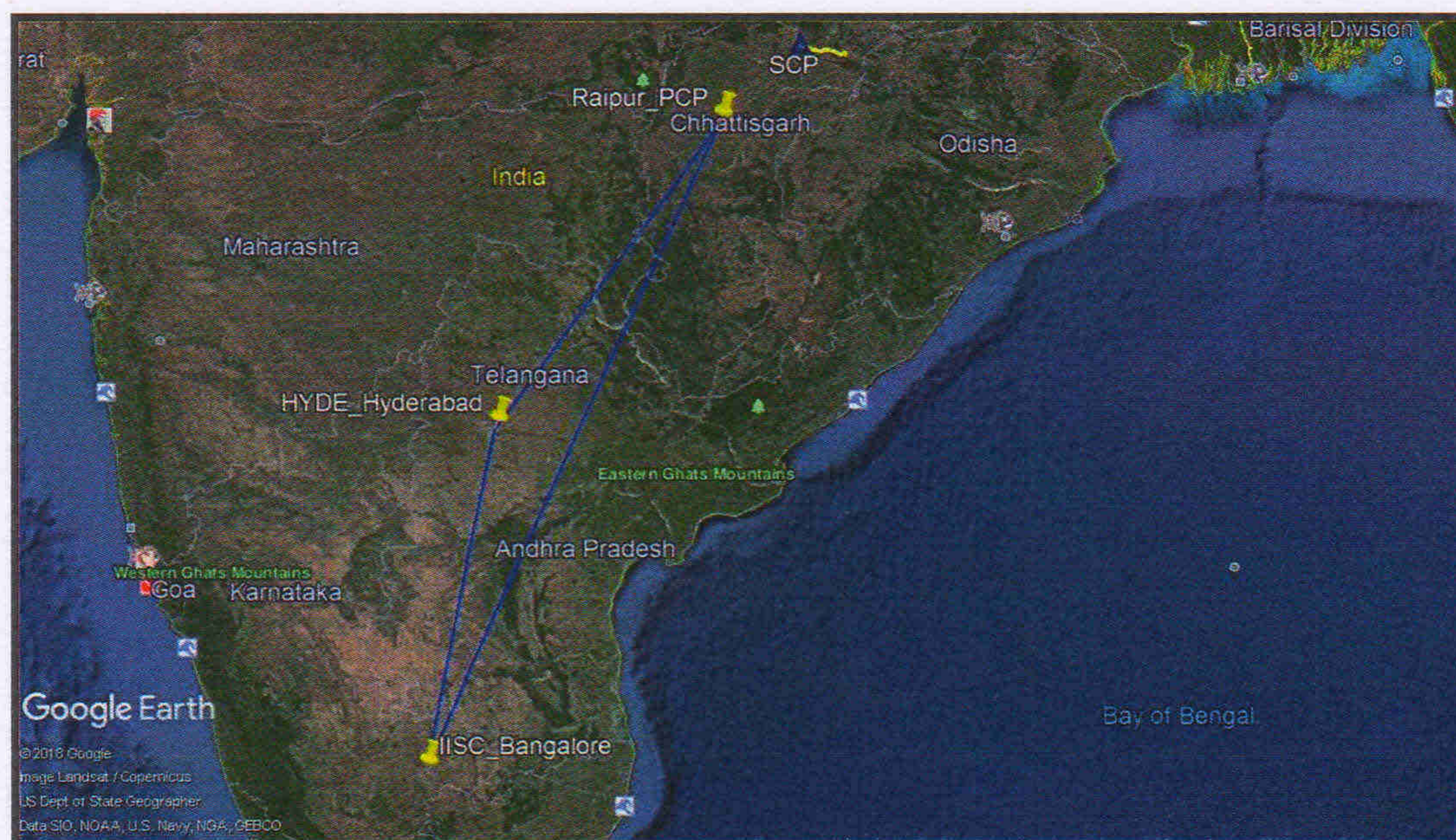


Fig-2: Satellite Image showing the location of the IGS Station-HYDE, IISC, and Raipur Primary Control Point in Raipur

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.

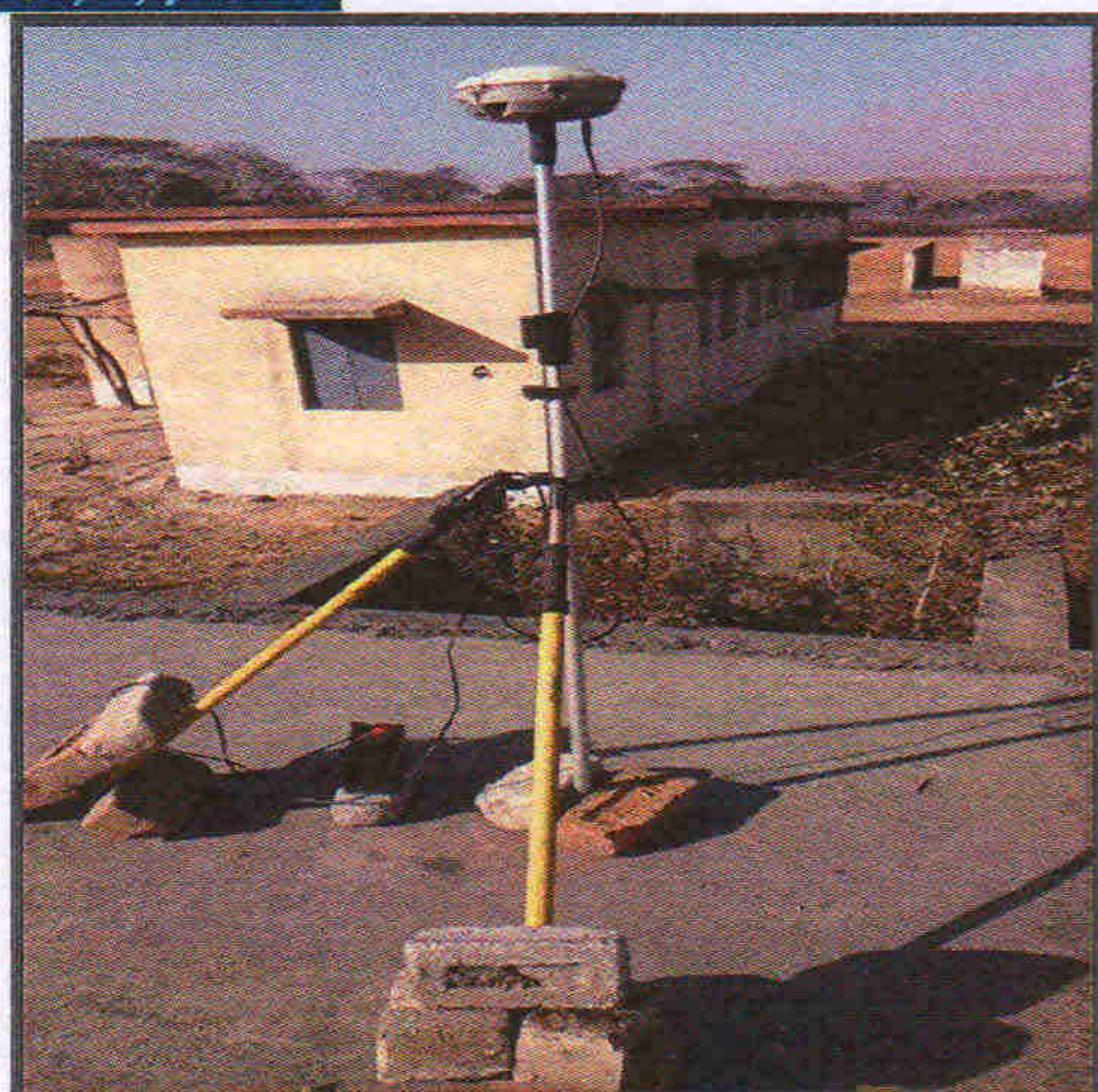


Fig-4: Images showing Secondary Control Point (SCP)

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
4	SCP-3	Static	SCP-3	Sithra	Forest Pillar	718229.805	2474789.61

Sl. No.	Point ID	TBM	Obs. type	Village Name	Location	Easting	Northing
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
29	P-82	TBM	Observed Point	Kervaduware	P-82 Pillar	694028.313	2459840.564

Sl. No.	Point ID	TBM	Obs. type	Village Name	Location	Easting	Northing
30	P-83	TBM	Observed Point	Kervaduware	P-83 Pillar	694191.604	2459755.562
31	P-84	TBM	Observed Point	Kervaduware	P-84 Pillar	694369.837	2459654.133
32	P-85	TBM	Observed Point	Kervaduware	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 Korba 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.

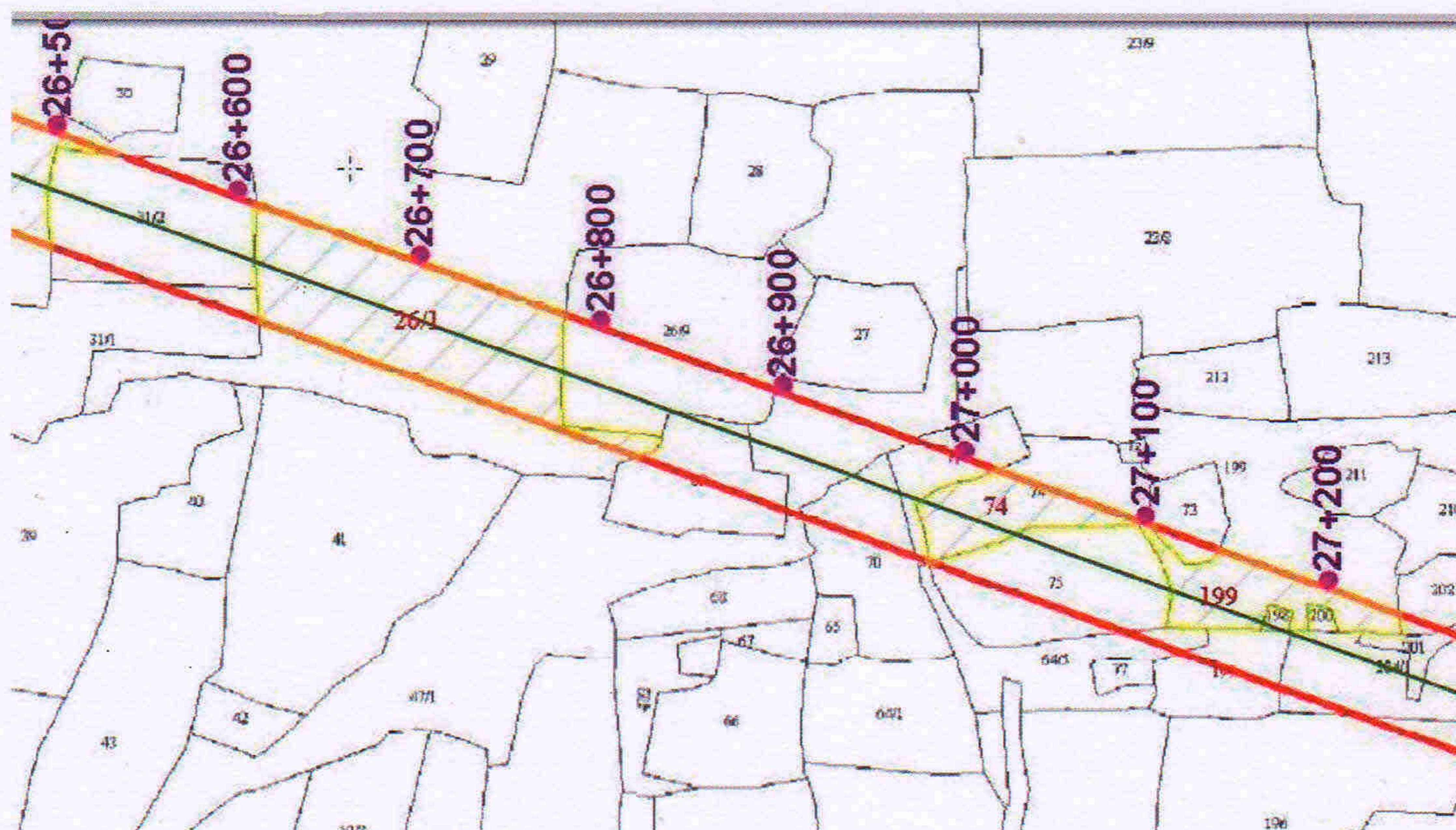
Forest compartment maps are also geo-referenced using the ground control points collected on Forest Boundary pillars. The Orange areas are geo-referenced based on the Khasra boundary and forest boundary pillars.

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	Korba	Kartala	Urga	Patch No-1	1214/1	0.048
2			Gidhauri	Patch No-2	112/1	0.313
3			Gidhauri		1194	0.188
4			Gidhauri	Patch No-3	1194	2.780
5			Gidhauri	Patch No-4	1140	1.145
6			Gidhauri		1200	0.648
7			Gidhauri	Patch No 5	1200	0.140
8			Gidhauri	Patch No 6	1200	2.870
9			Dadarkala		953	0.302
10			Dadarkala	Patch No 7	960	0.829
11			Fatteganj	Patch No-9	1/1	0.395
12			Dhongdraha		668	0.170

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

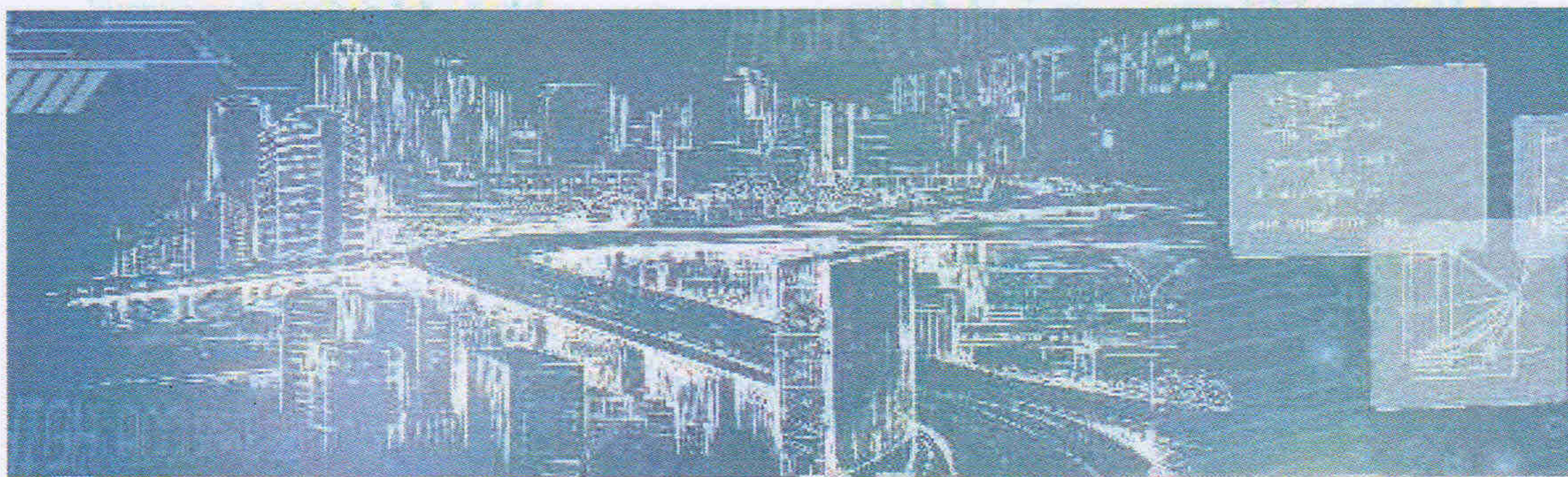
The geo-referenced forest land map (showing forest patches) is prepared by integrating the geo-referenced cadastral map sheets and railway line corridor vector layers.

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.X 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 +65 °C (40 °F to 149 °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	Korba	35.885	23.483	59.368

CERL- Revenue Forest area statement proposed for forest diversion						
Sr. No.	District	Tehsil	Village	Patch No	Khasra No.	Proposed Diversion Area (Ha)
1	Korba	Korba	Urga	Patch No-1	1214/1	0.048
2	Korba	Kartala	Gidhauri	Patch No-2	112/1	0.313
3	Korba	Kartala	Gidhauri		1194	0.188
4	Korba	Kartala	Gidhauri	Patch No-3	1194	2.780
5	Korba	Kartala	Gidhauri	Patch No-4	1140	1.145
6	Korba	Kartala	Gidhauri		1200	0.648
7	Korba	Kartala	Gidhauri	Patch No 5	1200	0.140
8	Korba	Kartala	Gidhauri	Patch No 6	1200	2.870
9	Korba	Kartala	Dadarkala		953	0.302
10	Korba	Kartala	Dadarkala	Patch No 7	960	0.829
11	Korba	Kartala	Fatteganj	Patch No-9	1/1	0.395
12	Korba	Kartala	Dhongdraha		668	0.170
13	Korba	Kartala	Dongaama	Patch No-10	226	1.008
14	Korba	Kartala	Dongaama		11/1	1.582
15	Korba	Kartala	Dongaama	Patch No-11	221/1	0.110
16	Korba	Kartala	Dongaama	Patch No-12	1/1	0.116
17	Korba	Kartala	Dongaama	Patch No-13	1/1	0.653
18	Korba	Kartala	Dongaama		206/1	0.203
19	Korba	Kartala	Dongaama	Patch No-14	221/1	0.002
20	Korba	Kartala	Dongaama	Patch No-15	58/1,56/4,57/2,59/2	0.039
21	Korba	Kartala	Dongaama	Patch No-16	241/1	0.145
22	Korba	Kartala	Dongaama	Patch No-17	58/1,56/4,57/2,59/2	0.038
23	Korba	Kartala	Dongaama	Patch No-18	58/1,56/4,57/2,59/2	1.312
24	Korba	Kartala	Dongaama		58/1,56/4,57/2,59/2	0.098
25	Korba	Kartala	Dongaama	Patch No-19	58/1,56/4,57/2,59/2	0.035

CERL- Revenue Forest area statement proposed for forest diversion

Sr. No.	District	Tehsil	Village	Patch No	Khasra No.	Proposed Diversion Area (Ha)
26	Korba	Kartala	Kervaduware	Patch No 21	125/1 Ka	0.309
27	Korba	Kartala	Kervaduware	Patch No 22	125/1 Ka	0.171
28	Korba	Kartala	Kervaduware	Patch No 23	125/1 Ka	0.063
29	Korba	Kartala	Kervaduware	Patch No 24	125/1 Ka	0.101
30	Korba	Kartala	Kervaduware	Patch No-25	18/1	0.009
31	Korba	Kartala	Kervaduware	Patch No-26	18/1	0.233
32	Korba	Kartala	Kervaduware	Patch No-27	313	0.610
33	Korba	Kartala	Bodajhap	Patch No-28	69/1	1.004
34	Korba	Kartala	Bodajhap	Patch No-29	69/1	1.229
35	Korba	Kartala	Bodajhap	Patch No-30	69/1	0.195
36	Korba	Kartala	Sendripali	Patch No-32	751	2.518
37	Korba	Kartala	Sendripali	Patch No-33	223	0.492
38	Korba	Kartala	Bandhapali	Patch No-34	354	1.150
39	Korba	Kartala	Pidiya	Patch No-35	1126/10	0.176
40	Korba	Kartala	Pidiya	Patch No-36	807/1	2.745
41	Korba	Kartala	Botali	Patch No-37	5/1	1.730
42	Korba	Kartala	Tenganmar		26/1	0.457
43	Korba	Kartala	Tenganmar	Patch No-38	26/1	1.055
44	Korba	Kartala	Jogipali	Patch No-39	210/1	1.809
45	Korba	Kartala	Jogipali	Patch No-40	547/1	0.011
46	Korba	Kartala	Jogipali	Patch No-41	553/1	0.289
47	Korba	Kartala	Nondraha	Patch No-42	49/1	2.021
48	Korba	Kartala	Nondraha		49/1	0.054
49	Korba	Kartala	Nondraha	Patch No-43	69/1	0.070
50	Korba	Kartala	Nondraha	Patch No-44	69/1	0.438
51	Korba	Kartala	Nondraha		69/1	1.777
Total Area						35.885

CERL-Forest Department controlled Forest Area statement

Sr. No.	Division	Range	Compartment Type	Patch No.	Compartment No	Proposed Diversion Area (Ha)
1	Korba	Korba	Orange Area	Patch No-4	OA1302	0.924
2	Korba	Korba	Orange Area	Patch No-5	OA1302	1.280
3	Korba	Korba	Orange Area		OA1302	0.381
4	Korba	Korba	Orange Area	Patch No-6	OA1302	2.753
5	Korba	Korba	Orange Area		OA1302	0.559
6	Korba	Korba	Orange Area	Patch No-8	OA1302	1.588
7	Korba	Korba	Orange Area	Patch No-9	OA1302	1.030
8	Korba	Kartala	Orange Area	Patch No-20	OA1484	0.608

CERL-Forest Department controlled Forest Area statement

Sr. No.	Division	Range	Compartment Type	Patch No.	Compartment No	Proposed Diversion Area (Ha)
9	Korba	Kartala	Orange Area	Patch No-21	OA1484	1.077
10	Korba	Kartala	Orange Area	Patch No-31	OA1458	1.701
11	Korba	Kartala	Protected Forest	Patch No-37	P1151	2.907
12	Korba	Kartala	Protected Forest		P1151	0.979
13	Korba	Kartala	Protected Forest		P1150	1.793
14	Korba	Kartala	Protected Forest	Patch No-39	P 1149	1.562
15	Korba	Kartala	Orange Area	Patch No-41	OA1466	3.132
16	Korba	Kartala	Orange Area	Patch No-42	OA1466	1.209
Total Area						23.483

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 **Korba forest Division**, Transmission line passes through two forests ranges i.e. Korba forest Range & Kartala forest Range. In Korba district the **total forest** land proposed for diversion is **59.368 Ha**. Out of the total forest land, **23.483 Ha is Protected Forest/Orange area and 35.885 Ha is Revenue forest.**



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.vee	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	?	I
IISC	127917.413	?	1441987.668	?	929.917	?	I
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.fa2/53eddf8.html 29-01-2018

<u>HYDE</u>	N17°25'02.21987"	E78°33'03.17892"	444.790	?	LLh
<u>IISC</u>	N13°01'16.19707"	E77°34'13.35337"	843.714	?	LLh
<u>RAIPUR-PCP</u>	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
<u>HYDE</u>	1208443.561	?	5966808.390	?	1897080.466	?	?	LLh
<u>IISC</u>	1337936.455	?	6070317.126	?	1427876.785	?	?	LLh
<u>RAIPUR-PCP</u>	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
<u>RAIPUR-PCP</u>	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
<u>HYDE --> IISC (PV2)</u>	Az.	192°21'06"	0.650 sec	0.129 sec	0.538

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

	Δ Ht.	398.799 m	0.031 m	-2.839 m	-1.781
	Ellip Dist.	497702.834 m	0.812 m	0.223 m	0.905
<u>IISC --> RAIPUR-PCP (PV3)</u>	Az.	24°31'59"	0.309 sec	0.046 sec	0.214
	Δ Ht.	-609.516 m	1.782 m	2.879 m	0.908
	Ellip Dist.	1007051.774 m	1.090 m	-0.326 m	-0.419
<u>HYDE --> RAIPUR-PCP (PV1)</u>	Az.	36°20'39"	0.254 sec	-0.007 sec	-0.220
	Δ Ht.	-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)
<u>HYDE</u>	<u>IISC</u>	Az.	192°21'06"	0.000 sec	1 : 0
		Δ Ht.	398.924 m	0.000 m	
		Δ Elev.	408.134 m	0.000 m	
		Ellip Dist.	497705.955 m	0.000 m	
<u>RAIPUR-PCP</u>	<u>HYDE</u>	Az.	217°21'00"	0.734 sec	1 : 474828
		Δ Ht.	210.077 m	1.799 m	1 : 473051
		Δ Elev.	223.051 m	1.799 m	
		Ellip Dist.	531858.695 m	1.120 m	
<u>RAIPUR-PCP</u>	<u>IISC</u>	Az.	205°43'13"	0.408 sec	1 : 1076793
		Δ Ht.	609.001 m	1.799 m	1 : 1073130
		Δ Elev.	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 	Fail 
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:					
$\sigma \Delta$ Easting	0.002 m	σ NS fwd Azimuth	0°00'00"	$\sigma \Delta$ X	0.003 m
$\sigma \Delta$ Northing	0.002 m	σ Ellipsoid Dist.	0.003 m	$\sigma \Delta$ Y	0.009 m
$\sigma \Delta$ Elevation	0.010 m	$\sigma \Delta$ Height	0.010 m	$\sigma \Delta$ Z	0.004 m

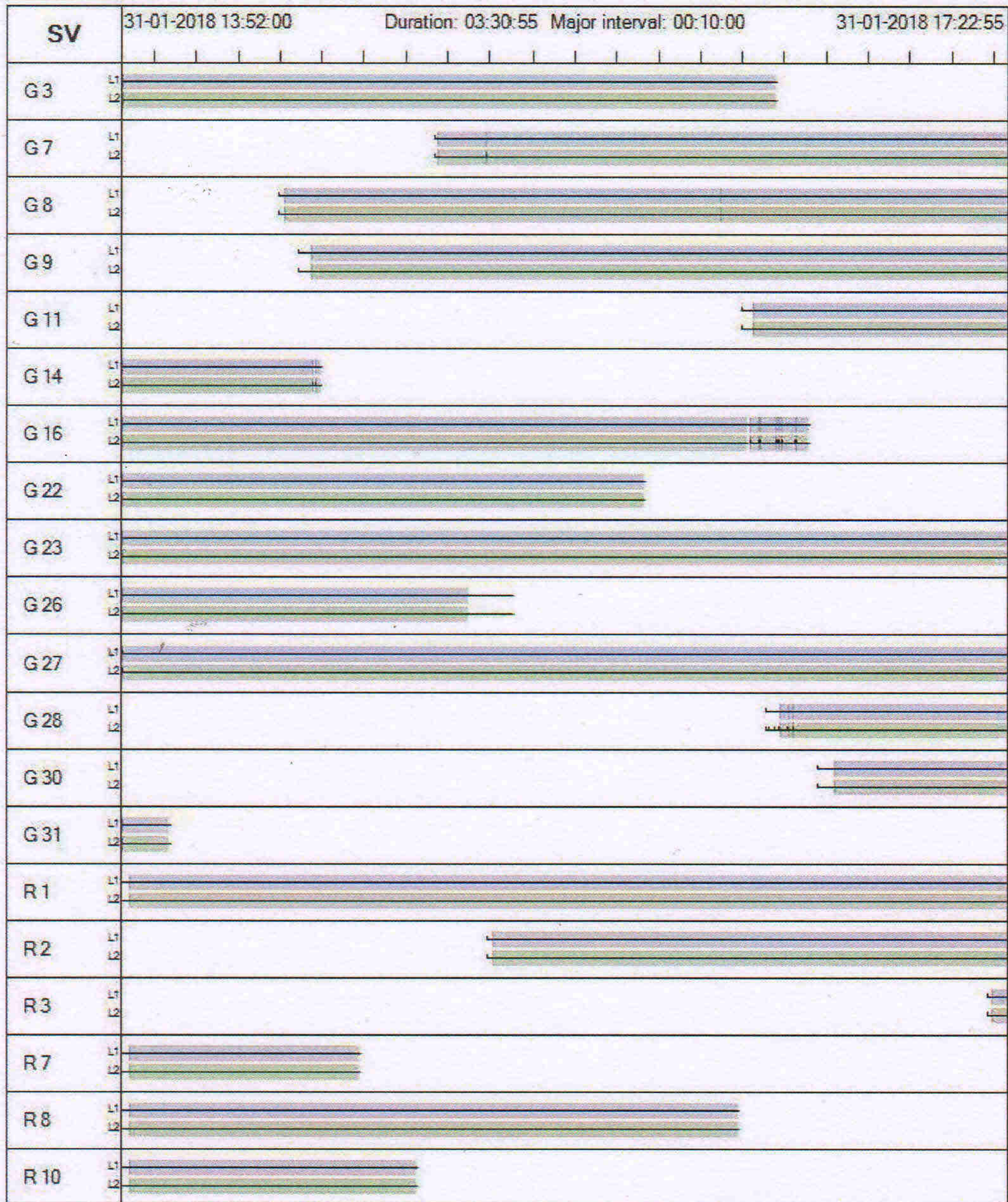
Aposteriori Covariance Matrix (Meter²)

	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.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
1	P-1	Patch No-1	677663.0357	2463013.641	22°15'48.84229"	82°43'27.16028"
2	P-2		677661.2904	2463021.318	22°15'49.09251"	82°43'27.10238"
3	P-3		677630.1753	2463025.551	22°15'49.24167"	82°43'26.01735"
4	P-4		677630.7045	2463040.685	22°15'49.73346"	82°43'26.04186"
5	P-5		677638.1128	2463046.189	22°15'49.90962"	82°43'26.30280"
6	P-6		677637.9012	2463027.773	22°15'49.31105"	82°43'26.28807"
7	P-7		677668.5929	2463031.795	22°15'49.43041"	82°43'27.36160"
8	P-8		677675.1622	2463018.602	22°15'48.99909"	82°43'27.58579"
9	P-9	Patch No-2	684278.173	2461495.952	22°14'57.00784"	82°47'17.56739"
10	P-10		684330.2605	2461511.22	22°14'57.48414"	82°47'19.39264"
11	P-11		684375.5043	2461503.283	22°14'57.20872"	82°47'20.96932"
12	P-12		684379.4701	2461521.034	22°14'57.78427"	82°47'21.11514"
13	P-13		684416.2898	2461515.445	22°14'57.58842"	82°47'22.39861"
14	P-14		684462.138	2461508.486	22°14'57.34456"	82°47'23.99679"
15	P-15		684462.961	2461467.903	22°14'56.02498"	82°47'24.00876"
16	P-16		684416.588	2461474.942	22°14'56.27164"	82°47'22.39229"
17	P-17	Patch No-3	684502.035	2461461.971	22°14'55.81713"	82°47'25.37081"
18	P-18		684500.4563	2461502.669	22°14'57.14073"	82°47'25.33250"
19	P-19		684562.0768	2461498.373	22°14'56.97734"	82°47'27.48257"
20	P-20		685067.5307	2461421.647	22°14'54.28840"	82°47'45.10163"
21	P-21		685060.0014	2461372.217	22°14'52.68447"	82°47'44.81821"
22	P-22		684553.8818	2461449.044	22°14'55.37694"	82°47'27.17600"
23	P-23	Patch No-4	685281.621	2461338.577	22°14'51.50534"	82°47'52.54331"
24	P-24		685313.148	2461384.364	22°14'52.98157"	82°47'53.66325"
25	P-25		685490.4892	2461352.387	22°14'51.87353"	82°47'59.84280"
26	P-26		685532.265	2461346.046	22°14'51.65123"	82°48'01.29899"
27	P-27		685702.8123	2461320.157	22°14'50.74366"	82°48'07.24379"
28	P-28		685922.0711	2461276.363	22°14'49.23506"	82°48'14.88212"
29	P-29		685915.28	2461236.801	22°14'47.95165"	82°48'14.62850"
30	P-30		685682.091	2461282.845	22°14'49.53876"	82°48'06.50468"
31	P-31		685532.4011	2461305.567	22°14'50.33531"	82°48'01.28692"
32	P-32		685484.4518	2461312.845	22°14'50.59047"	82°47'59.61555"
33	P-33		685332.8966	2461330.794	22°14'51.23251"	82°47'54.33064"
34	P-34	Patch No-5	685973.5549	2461221.25	22°14'47.42353"	82°48'16.65698"
35	P-35		685975.5551	2461262.118	22°14'48.75128"	82°48'16.74385"
36	P-36		686041.9641	2461244.244	22°14'48.14448"	82°48'19.05541"
37	P-37		686098.17	2461224.19	22°14'47.47078"	82°48'21.00976"
38	P-38		686124.581	2461217.135	22°14'47.23118"	82°48'21.92909"
39	P-39		686410.932	2461150.994	22°14'44.96992"	82°48'31.90082"
40	P-40		686512.5793	2461123.841	22°14'44.04775"	82°48'35.43897"
41	P-41		686476.2517	2461081.792	22°14'42.69496"	82°48'34.15286"
42	P-42		686397.007	2461102.961	22°14'43.41391"	82°48'31.39454"
43	P-43		686119.1748	2461187.527	22°14'46.27080"	82°48'21.72796"

Sr. No.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
44	P-44		686055.3667	2461204.572	22°14'46.84964"	82°48'19.50690"
45	P-45		686030.6613	2461205.996	22°14'46.90552"	82°48'18.64478"
46	P-46	Patch No-6	686501.0776	2461075.16	22°14'42.46974"	82°48'35.01700"
47	P-47		686561.141	2461079.438	22°14'42.58542"	82°48'37.11617"
48	P-48		686594.6454	2461101.92	22°14'43.30322"	82°48'38.29553"
49	P-49		686692.7351	2461075.717	22°14'42.41329"	82°48'41.70982"
50	P-50		686729.5541	2461096.934	22°14'43.08865"	82°48'43.00440"
51	P-51		686968.7556	2461033.038	22°14'40.91837"	82°48'51.33043"
52	P-52		687109.7779	2460995.367	22°14'39.63882"	82°48'56.23905"
53	P-53		687230.343	2460963.161	22°14'38.54486"	82°49'00.43559"
54	P-54		687226.1492	2460948.755	22°14'38.07821"	82°49'00.28310"
55	P-55		687272.3866	2460936.404	22°14'37.65866"	82°49'01.89249"
56	P-56		687198.3551	2460882.79	22°14'35.94471"	82°48'59.28490"
57	P-57		687199.5884	2460857.519	22°14'35.12277"	82°48'59.31738"
58	P-58		686881.988	2460942.358	22°14'38.00447"	82°48'48.26262"
59	P-59		686695.5026	2460992.173	22°14'39.69642"	82°48'41.77153"
60	P-60		686638.538	2461038.441	22°14'41.22265"	82°48'39.80170"
61	P-61	Patch No-7	687378.8286	2460832.904	22°14'34.25260"	82°49'05.56591"
62	P-62		687394.7243	2460903.725	22°14'36.54859"	82°49'06.15069"
63	P-63		687544.1475	2460863.81	22°14'35.19268"	82°49'11.35163"
64	P-64		687518.1708	2460831.564	22°14'34.15459"	82°49'10.43101"
65	P-65	Patch No-8	687629.775	2460758.132	22°14'31.72391"	82°49'14.29724"
66	P-66		687573.131	2460856.068	22°14'34.92966"	82°49'12.36044"
67	P-67		687829.6188	2460796.983	22°14'32.90862"	82°49'21.29183"
68	P-68		687817.8628	2460717.663	22°14'30.33479"	82°49'20.84797"
69	P-69	Patch No-9	687936.0403	2460720.566	22°14'30.38287"	82°49'24.97577"
70	P-70		687968.6338	2460807.697	22°14'33.20245"	82°49'26.15055"
71	P-71		687987.5189	2460796.986	22°14'32.84687"	82°49'26.80548"
72	P-72		688125.484	2460859.209	22°14'34.81547"	82°49'31.64924"
73	P-73		688167.9824	2460890.803	22°14'35.82581"	82°49'33.14654"
74	P-74		688193.4147	2460912.773	22°14'36.53003"	82°49'34.04387"
75	P-75		688233.6296	2460881.687	22°14'35.50374"	82°49'35.43502"
76	P-76		688211.6554	2460862.243	22°14'34.88028"	82°49'34.65951"
77	P-77		688126.1935	2460801.004	22°14'32.92314"	82°49'31.64950"
78	P-78		688000.541	2460748.711	22°14'31.27250"	82°49'27.23987"
79	P-79	Patch No-10	688761.6573	2461288.613	22°14'48.52410"	82°49'54.04507"
80	P-80		688975.1095	2461269.412	22°14'47.81587"	82°50'01.49058"
81	P-81		689169.7228	2461190.779	22°14'45.18306"	82°50'08.25304"
82	P-82		689304.6249	2461134.355	22°14'43.29567"	82°50'12.93979"
83	P-83		689289.6889	2461086.405	22°14'41.74287"	82°50'12.39792"
84	P-84		689053.2606	2461185.293	22°14'45.05064"	82°50'04.18395"
85	P-85		688958.9295	2461222.124	22°14'46.28506"	82°50'00.90557"
86	P-86		688775.813	2461249.664	22°14'47.25242"	82°49'54.52291"

Sr. No.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
87	P-87	Patch No-11	689333.3099	2461068.16	22°14'41.13258"	82°50'13.91338"
88	P-88		689337.9614	2461075.953	22°14'41.38405"	82°50'14.07911"
89	P-89		689389.8199	2461071.587	22°14'41.22166"	82°50'15.88810"
90	P-90		689395.8188	2461042.015	22°14'40.25802"	82°50'16.08503"
91	P-91	Patch No-12	689432.3339	2461026.742	22°14'39.74712"	82°50'17.35362"
92	P-92		689424.2428	2461072.078	22°14'41.22403"	82°50'17.09032"
93	P-93		689448.3539	2461074.239	22°14'41.28475"	82°50'17.93317"
94	P-94		689491.677	2461056.118	22°14'40.67860"	82°50'19.43827"
95	P-95		689437.2451	2461056.362	22°14'40.70803"	82°50'17.53768"
96	P-96		689445.2972	2461021.32	22°14'39.56574"	82°50'17.80398"
97	P-97	Patch No-13	689505.1414	2461005.948	22°14'39.04241"	82°50'19.88714"
98	P-98		689514.325	2461046.646	22°14'40.36173"	82°50'20.22509"
99	P-99		689538.0521	2461036.721	22°14'40.02975"	82°50'21.04940"
100	P-100		689555.5803	2461078.168	22°14'41.37010"	82°50'21.67906"
101	P-101		689653.3709	2461037.266	22°14'40.00187"	82°50'25.07642"
102	P-102		689680.6936	2461014.999	22°14'39.26723"	82°50'26.02104"
103	P-103		689583.8739	2460997.618	22°14'38.74051"	82°50'22.63284"
104	P-104	Patch No-14	689501.4399	2460949.06	22°14'37.19464"	82°50'19.73375"
105	P-105		689502.7487	2460952.189	22°14'37.29584"	82°50'19.78078"
106	P-106		689513.8776	2460943.858	22°14'37.02061"	82°50'20.16585"
107	P-107	Patch No-15	690346.8502	2460604.433	22°14'25.65730"	82°50'49.10732"
108	P-108		690377.8798	2460619.195	22°14'26.12485"	82°50'50.19709"
109	P-109		690381.2433	2460603.505	22°14'25.61346"	82°50'50.30785"
110	P-110		690416.1022	2460611.442	22°14'25.85765"	82°50'51.52843"
111	P-111		690402.2115	2460582.206	22°14'24.91278"	82°50'51.03093"
112	P-112		690408.4125	2460573.858	22°14'24.63899"	82°50'51.24390"
113	P-113	Patch No-16	690444.2447	2460554.582	22°14'23.99815"	82°50'52.48685"
114	P-114		690473.1652	2460571.884	22°14'24.54910"	82°50'53.50406"
115	P-115		690458.841	2460546.458	22°14'23.72827"	82°50'52.99305"
116	P-116	Patch No-17	690488.2133	2460575.788	22°14'24.67004"	82°50'54.03117"
117	P-117		690505.7961	2460596.493	22°14'25.33610"	82°50'54.65395"
118	P-118		690516.3795	2460596.758	22°14'25.34050"	82°50'55.02361"
119	P-119		690502.2236	2460567.825	22°14'24.40564"	82°50'54.51698"
120	P-120	Patch No-18	690488.4846	2460518.116	22°14'22.79521"	82°50'54.01605"
121	P-121		690504.613	2460546.463	22°14'23.71028"	82°50'54.59130"
122	P-122		690627.876	2460555.234	22°14'23.94642"	82°50'58.89907"
123	P-123		690598.0878	2460533.492	22°14'23.25149"	82°50'57.84967"
124	P-124		690609.9945	2460513.297	22°14'22.59031"	82°50'58.25680"
125	P-125		690681.4991	2460543.63	22°14'23.54791"	82°51'00.76650"
126	P-126		690719.4952	2460492.863	22°14'21.88254"	82°51'02.07155"
127	P-127		690681.3951	2460490.217	22°14'21.81168"	82°51'00.74007"
128	P-128		690660.8899	2460463.891	22°14'20.96406"	82°51'00.01284"
129	P-129		690645.8086	2460469.579	22°14'21.15497"	82°50'59.48867"
130	P-130		690642.2367	2460464.155	22°14'20.98007"	82°50'59.36164"

Sr. No.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
131	P-131		690652.2909	2460454.498	22°14'20.66215"	82°50'59.70858"
132	P-132		690639.7875	2460432.032	22°14'19.93682"	82°50'59.26241"
133	P-133	Patch No-19	690657.5826	2460422.086	22°14'19.60646"	82°50'59.87952"
134	P-134		690686.0254	2460424.071	22°14'19.65967"	82°51'00.87350"
135	P-135		690692.5077	2460417.456	22°14'19.44207"	82°51'01.09702"
136	P-136		690687.941	2460404.635	22°14'19.02711"	82°51'00.93210"
137	P-137	Patch No-20	691164.011	2460189.08	22°14'11.83076"	82°51'17.46282"
138	P-138		691216.4527	2460233.169	22°14'13.24305"	82°51'19.31277"
139	P-139		691314.4345	2460203.934	22°14'12.25367"	82°51'22.72145"
140	P-140		691260.6083	2460155.894	22°14'10.71352"	82°51'20.82145"
141	P-141	Patch No-21	691301.3567	2460145.371	22°14'10.35521"	82°51'22.23973"
142	P-142		691374.5136	2460192.28	22°14'11.85089"	82°51'24.81421"
143	P-143		691424.5307	2460185.896	22°14'11.62342"	82°51'26.55789"
144	P-144		691616.3243	2460186.231	22°14'11.55774"	82°51'33.25479"
145	P-145		691518.7652	2460122.021	22°14'09.50946"	82°51'29.82084"
146	P-146		691353.8774	2460134.903	22°14'09.99399"	82°51'24.06909"
147	P-147	Patch No-22	691578.8257	2460124.141	22°14'09.55440"	82°51'31.91884"
148	P-148		691615.7283	2460157.244	22°14'10.61574"	82°51'33.22154"
149	P-149		691678.2098	2460142.547	22°14'10.11302"	82°51'35.39686"
150	P-150		691680.7559	2460129.643	22°14'09.69256"	82°51'35.48023"
151	P-151	Patch No-23	691643.2625	2460187.694	22°14'11.59455"	82°51'34.19600"
152	P-152		691647.346	2460176.903	22°14'11.24214"	82°51'34.33395"
153	P-153		691690.4997	2460176.863	22°14'11.22361"	82°51'35.84071"
154	P-154		691700.1025	2460190.783	22°14'11.67227"	82°51'36.18197"
155	P-155	Patch No-24	691715.5091	2460131.532	22°14'09.74007"	82°51'36.69449"
156	P-156		691722.2233	2460176.982	22°14'11.21481"	82°51'36.94843"
157	P-157		691728.2558	2460178.014	22°14'11.24594"	82°51'37.15951"
158	P-158		691737.7014	2460156.583	22°14'10.54552"	82°51'37.48012"
159	P-159		691788.167	2460135.48	22°14'09.83937"	82°51'39.23313"
160	P-160	Patch No-25	691861.6642	2460139.474	22°14'09.93983"	82°51'41.80109"
161	P-161		691854.1894	2460141.009	22°14'09.99270"	82°51'41.54076"
162	P-162		691854.1374	2460145.571	22°14'10.14104"	82°51'41.54090"
163	P-163		691867.7558	2460145.675	22°14'10.13895"	82°51'42.01645"
164	P-164		691871.8252	2460140.026	22°14'09.95371"	82°51'42.15611"
165	P-165	Patch No-26	691885.5012	2460140.77	22°14'09.97242"	82°51'42.63395"
166	P-166		691930.6826	2460154.327	22°14'10.39503"	82°51'44.21734"
167	P-167		691930.9959	2460203.331	22°14'11.98784"	82°51'44.24933"
168	P-168		691954.661	2460204.617	22°14'12.02017"	82°51'45.07618"
169	P-169		691958.9335	2460144.76	22°14'10.07276"	82°51'45.19964"
170	P-170	Patch No-27	692503.9395	2460184.32	22°14'11.14038"	82°52'04.24623"
171	P-171		692500.9156	2460224.215	22°14'12.43842"	82°52'04.15784"
172	P-172		692631.9618	2460231.329	22°14'12.61706"	82°52'08.73655"
173	P-173		692650.0088	2460192.25	22°14'11.33950"	82°52'09.34983"

Sr. No.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
174	P-174	Patch No-28	692751.405	2460196.717	22°14'11.44401"	82°52'12.89213"
175	P-175		692769.8181	2460237.689	22°14'12.76844"	82°52'13.55273"
176	P-176		693015.2374	2460206.874	22°14'11.66812"	82°52'22.10854"
177	P-177		693010.3522	2460166.766	22°14'10.36634"	82°52'21.92064"
178	P-178	Patch No-29	693056.2815	2460153.607	22°14'09.92012"	82°52'23.51862"
179	P-179		693066.9013	2460192.179	22°14'11.16967"	82°52'23.90609"
180	P-180		693273.8501	2460141.055	22°14'09.42450"	82°52'31.10982"
181	P-181		693325.1216	2460125.802	22°14'08.90805"	82°52'32.89341"
182	P-182		693332.4287	2460061.03	22°14'06.79962"	82°52'33.12052"
183	P-183	Patch No-30	693256.742	2460083.545	22°14'07.56200"	82°52'30.48759"
184	P-184		693398.3129	2460104.029	22°14'08.17080"	82°52'35.43952"
185	P-185		693394.2437	2460074.8	22°14'07.22232"	82°52'35.28479"
186	P-186		693457.2424	2460058.132	22°14'06.65513"	82°52'37.47722"
187	P-187	Patch No-31	693469.0934	2460082.973	22°14'07.45782"	82°52'37.90177"
188	P-188		693669.3752	2459960.793	22°14'03.40548"	82°52'44.84180"
189	P-189		693650.7796	2460028.924	22°14'05.62763"	82°52'44.22205"
190	P-190		693936.1235	2459943.514	22°14'02.73608"	82°52'54.14793"
191	P-191	Patch No-32	693935.1505	2459880.602	22°14'00.69147"	82°52'54.08665"
192	P-192		694042.2245	2459835.497	22°13'59.18199"	82°52'57.80558"
193	P-193		694044.4059	2459901.142	22°14'01.31498"	82°52'57.91025"
194	P-194		694397.1653	2459627.453	22°13'52.27572"	82°53'10.10785"
195	P-195		694395.5228	2459597.252	22°13'51.29470"	82°53'10.03737"
196	P-196	Patch No-33	694314.9048	2459624.229	22°13'52.20423"	82°53'07.23436"
197	P-197		695300.4538	2458640.306	22°13'19.82118"	82°53'41.21437"
198	P-198		695365.9423	2458688.107	22°13'21.34833"	82°53'43.52161"
199	P-199		695420.3711	2458636.41	22°13'19.64575"	82°53'45.39924"
200	P-200		695422.2148	2458614.917	22°13'18.94635"	82°53'45.45422"
201	P-201	Patch No-34	695333.0527	2458608.465	22°13'18.77291"	82°53'42.33856"
202	P-202		698354.5529	2459280.36	22°13'39.37441"	82°55'28.12250"
203	P-203		698324.7313	2459377.994	22°13'42.56032"	82°55'27.12466"
204	P-204		698320.2528	2459393.407	22°13'43.06318"	82°55'26.97514"
205	P-205		698498.8231	2459406.013	22°13'43.39912"	82°55'33.21519"
206	P-206	Patch No-35	698513.0454	2459385.334	22°13'42.72106"	82°55'33.70255"
207	P-207		699765.3786	2460268.756	22°14'10.91705"	82°56'17.82013"
208	P-208		699839.1416	2460350.983	22°14'13.55911"	82°56'20.43233"
209	P-209		699856.1278	2460360.587	22°14'13.86422"	82°56'21.02970"
210	P-210	Patch No-36	699869.9388	2460338.008	22°14'13.12454"	82°56'21.50180"
211	P-211		700798.7083	2460640.814	22°14'22.57938"	82°56'54.06572"
212	P-212		700862.4653	2460718.721	22°14'25.08504"	82°56'56.32686"
213	P-213		701135.7847	2460623.869	22°14'21.88739"	82°57'05.82723"
214	P-214	Patch No-37	701059.8661	2460555.97	22°14'19.71219"	82°57'03.14595"
215	P-215		701110.1508	2460537.393	22°14'19.08729"	82°57'04.89328"
216	P-216		701206.771	2460597.643	22°14'21.00517"	82°57'08.29392"
217	P-217		701467.1461	2460485.46	22°14'17.24945"	82°57'17.33436"

Sr. No.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
218	P-218		701704.196	2460397.885	22°14'14.30331"	82°57'25.57137"
219	P-219		701873.042	2460335.508	22°14'12.20475"	82°57'31.43838"
220	P-220		702191.9735	2460217.683	22°14'08.24065"	82°57'42.52036"
221	P-221		702261.6718	2460191.933	22°14'07.37432"	82°57'44.94215"
222	P-222		702229.9585	2460139.685	22°14'05.68940"	82°57'43.81126"
223	P-223		702128.1945	2460177.281	22°14'06.95431"	82°57'40.27529"
224	P-224		701886.4709	2460266.582	22°14'09.95874"	82°57'31.87609"
225	P-225		701749.066	2460317.345	22°14'11.66653"	82°57'27.10162"
226	P-226		701445.3359	2460429.553	22°14'15.44140"	82°57'16.54765"
227	P-227	Patch No-38	702337.1283	2460100.093	22°14'04.35732"	82°57'47.53505"
228	P-228		702334.9593	2460164.859	22°14'06.46338"	82°57'47.48865"
229	P-229		702495.2286	2460105.649	22°14'04.47122"	82°57'53.05745"
230	P-230		702494.0651	2460045.077	22°14'02.50284"	82°57'52.98937"
231	P-231		702545.5531	2460039.361	22°14'02.29535"	82°57'54.78442"
232	P-232		702533.3156	2460027.614	22°14'01.91868"	82°57'54.35184"
233	P-233	Patch No-39	704677.464	2459240.818	22°13'35.43512"	82°59'08.85090"
234	P-234		704633.9555	2459310.194	22°13'37.70867"	82°59'07.36372"
235	P-235		704985.581	2459180.292	22°13'33.33633"	82°59'19.57992"
236	P-236		705374.1066	2459036.756	22°13'28.50483"	82°59'33.07783"
237	P-237		705252.7887	2459028.272	22°13'28.28096"	82°59'28.83863"
238	P-238		704985.5487	2459127	22°13'31.60416"	82°59'19.55435"
239	P-239		704983.7031	2459136.151	22°13'31.90240"	82°59'19.49412"
240	P-240	Patch No-40	704911.972	2459154.182	22°13'32.51910"	82°59'16.99817"
241	P-241		706519.6675	2458606.631	22°13'14.03289"	83°00'12.87135"
242	P-242		706518.7033	2458619.23	22°13'14.44285"	83°00'12.84351"
243	P-243	Patch No-41	706536.9566	2458612.487	22°13'14.21580"	83°00'13.47761"
244	P-244		706930.2855	2458430.986	22°13'08.14706"	83°00'27.12452"
245	P-245		706914.4318	2458484.02	22°13'09.87770"	83°00'26.59562"
246	P-246		706975.8275	2458475.994	22°13'09.59039"	83°00'28.73518"
247	P-247		707160.005	2458478.647	22°13'09.59720"	83°00'35.16587"
248	P-248		707348.417	2458524.269	22°13'10.99877"	83°00'41.76430"
249	P-249		707569.188	2458645.019	22°13'14.82819"	83°00'49.52727"
250	P-250		707566.074	2458581.078	22°13'12.75124"	83°00'49.38888"
251	P-251		707403.927	2458492.408	22°13'09.93921"	83°00'43.68733"
252	P-252		707186.537	2458431.802	22°13'08.06313"	83°00'36.07037"
253	P-253	Patch No-42	706976.7871	2458425.69	22°13'07.95491"	83°00'28.74539"
254	P-254		707631.53	2458630.703	22°13'14.33591"	83°00'51.69694"
255	P-255		707621.2548	2458622.342	22°13'14.06860"	83°00'51.33435"
256	P-256		707633.6628	2458680.27	22°13'15.94609"	83°00'51.79441"
257	P-257		707634.5134	2458700.038	22°13'16.58826"	83°00'51.83328"
258	P-258		707778.864	2458873.748	22°13'22.17198"	83°00'56.95320"
259	P-259		707844.4318	2458970.347	22°13'25.28338"	83°00'59.28706"
260	P-260		707851.9594	2458930.117	22°13'23.97252"	83°00'59.53115"
261	P-261		707877.5711	2458937.737	22°13'24.20911"	83°01'00.42879"

Sr. No.	Point Id	Patch No	Easting"m"	Northing"m"	Latitude"N"	Longitude"E"
262	P-262		707878.0929	2459019.941	22°13'26.88077"	83°01'00.48523"
263	P-263		707931.3127	2459098.351	22°13'29.40632"	83°01'02.37961"
264	P-264		707910.3969	2459112.547	22°13'29.87680"	83°01'01.65603"
265	P-265		707910.1614	2459138.414	22°13'30.71767"	83°01'01.65984"
266	P-266		707973.3348	2459231.49	22°13'33.71558"	83°01'03.90855"
267	P-267		708064.9466	2459249.628	22°13'34.26545"	83°01'07.11521"
268	P-268		708104.209	2459192.826	22°13'32.40217"	83°01'08.45944"
269	P-269		708066.0275	2459136.573	22°13'30.59031"	83°01'07.10032"
270	P-270		707989.4636	2459156	22°13'31.25492"	83°01'04.43649"
271	P-271		707936.441	2459150.444	22°13'31.09729"	83°01'02.58287"
272	P-272		708018.6218	2459066.728	22°13'28.34066"	83°01'05.41287"
273	P-273		708005.7797	2459047.807	22°13'27.73124"	83°01'04.95575"
274	P-274		707966.243	2459060.782	22°13'28.17009"	83°01'03.58156"
275	P-275		707890.9409	2459031.766	22°13'27.25958"	83°01'00.93925"
276	P-276		707898.2505	2458960.607	22°13'24.94352"	83°01'01.16134"
277	P-277		707852.7737	2458893.604	22°13'22.78539"	83°00'59.54260"
278	P-278		707814.7407	2458889.42	22°13'22.66585"	83°00'58.21293"
279	P-279		707822.855	2458849.527	22°13'21.36569"	83°00'58.47766"
280	P-280		707803.0945	2458820.704	22°13'20.43739"	83°00'57.77443"
281	P-281	Patch No-43	708022.6705	2459264.392	22°13'34.76363"	83°01'05.64620"
282	P-282		707993.7071	2459261.505	22°13'34.68235"	83°01'04.63372"
283	P-283		708019.9745	2459300.205	22°13'35.92883"	83°01'05.56874"
284	P-284		708029.2058	2459290.85	22°13'35.62078"	83°01'05.88666"
285	P-285	Patch No-44	708156.8547	2459418.89	22°13'39.72716"	83°01'10.40259"
286	P-286		708140.705	2459360.299	22°13'37.82975"	83°01'09.81151"
287	P-287		708045.2147	2459337.392	22°13'37.12660"	83°01'06.46720"
288	P-288		708099.0861	2459416.762	22°13'39.68305"	83°01'08.38484"
289	P-289		708161.0724	2459508.09	22°13'42.62462"	83°01'10.59138"
290	P-290		708251.4199	2459529.544	22°13'43.28278"	83°01'13.75550"
291	P-291		708249.6736	2459551.769	22°13'44.00592"	83°01'13.70489"
292	P-292		708385.36	2459598.151	22°13'45.45459"	83°01'18.46349"
293	P-293		708298.4095	2459478.947	22°13'41.61783"	83°01'15.37238"
294	P-294		708223.6915	2459412.801	22°13'39.50027"	83°01'12.73309"


वन परिक्षेत्राधिकारी
करतला परिक्षेत्र, करतला


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कोरबा परिक्षेत्र-कोरबा


उप वन मण्डलाधिकारी
दक्षिण कोरबा उपवनमण्डल

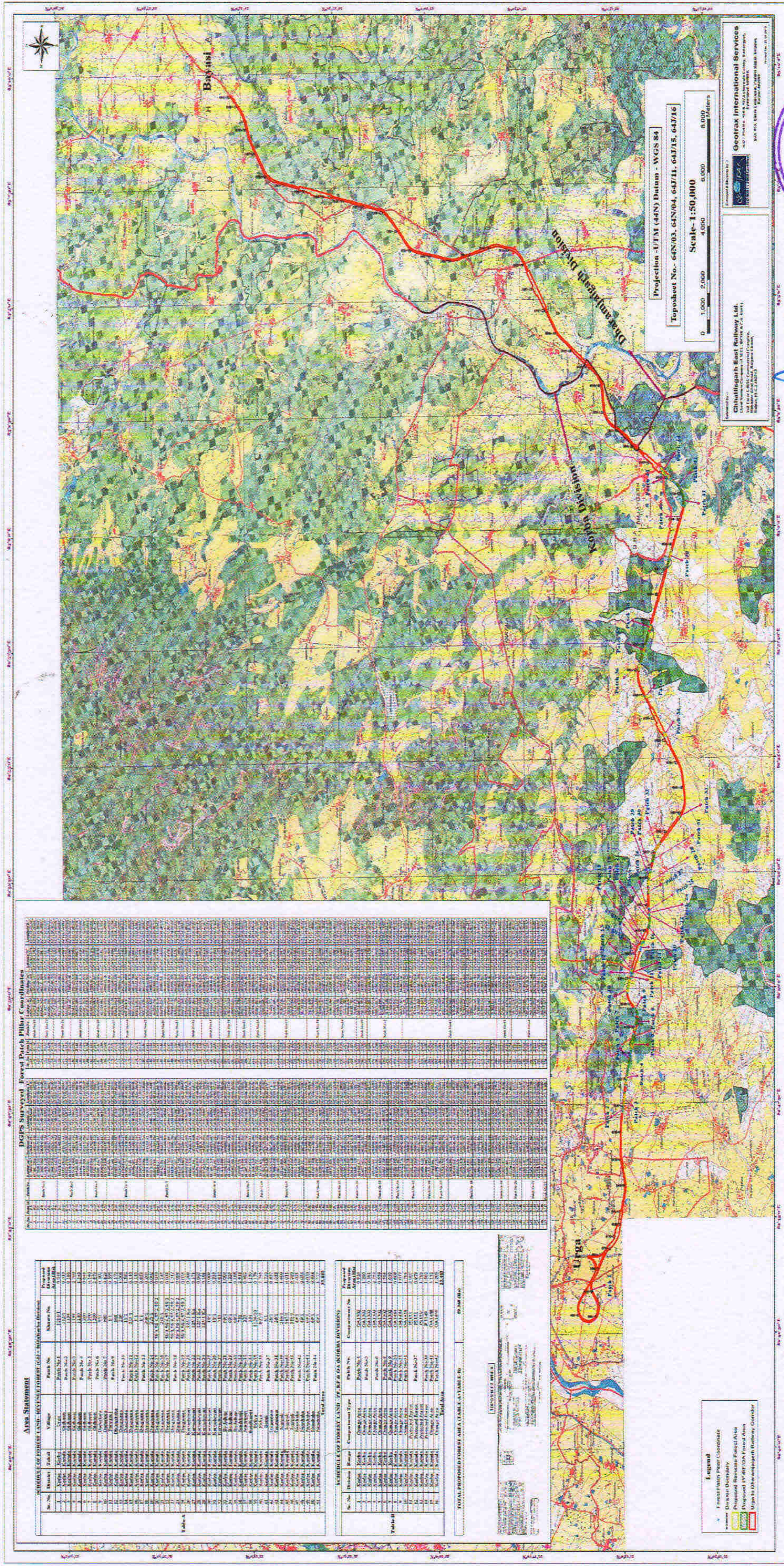

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उत्तर कोरबा उपवनमण्डल





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

Map Showing The Forest Patches In Korba Forest Division Proposed For Diversion For New BG Railway Corridor From Urga to Dharamjaigarh



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

Map Showing the Forest Diversion 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.)

