छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद
विज्ञान भवन, विधान सभा रोड, दलदल सिवनी सडडू, रायपुर, छ.ग. 492014
Chhattisgarh Council of Science & Technology
Vigyan Bhavan, Vidhan Shabha Road , Daldal Sevni Saddu, Raipur, C.G. 492014
E-mail : karmakar1962@rediffmail.com Tel: 0771-297246

M. K. Beg
Scientist 'E1'

No. _____ /CCOST/2019
Date: ___/___/2019

To,

AGM Mining
Tallaipalli coal mining
ntpc ltd.Gharghoda

Sub: Submission of DGPS report the CA land against the PO 5500033645-108-1071 Dated 15.07.2019.

Please find enclosed the following reports (soft & hard copy) against the DGPS survey of the CA land against t PO 5500033645-108-1071 Dated 15.07.2019.

1. THE REPORT ON DGPS SURVEY USING HIGH RESOLUTION SATELLITE IMAGE FOR 4 Ha OF FOREST LAND IDENTIFIED TOWARDS COMPENSATORY AFFORESTATION AGAINST THE PROPOSED DIVERSION OF 1.732 Ha OF FOREST LAND IN ROAD WIDENING FOR TALAIPALI COAL MINING PROJECT PREPARED BY CCOST (CHHATTISGARH SPACE APPLICATIONS CENTRE CHHATTISGARH COUNCIL OF SCIENCE AND TECHNOLOGY AGAINST THE PO 5500033645-108-1071 Date : 15.07.2019.
2. THE REPORT ON DGPS SURVEY USING HIGH RESOLUTION SATELLITE IMAGE FOR 18 Ha OF FOREST LAND IDENTIFIED TOWARDS COMPENSATORY AFFORESTATION AGAINST THE PROPOSED DIVERSION OF 8.795 Ha OF LEFTOUT FOREST LAND IN MGR FOR TALAIPALI COAL MINING PROJECT PREPARED BY CCOST (CHHATTISGARH SPACE APPLICATIONS CENTRE CHHATTISGARH COUNCIL OF SCIENCE AND TECHNOLOGY AGAINST THE PO 5500033645-108-1071 Date : 15.07.2019.

This is for your kind information please.

(M.K.Beg)

DGM(Mining)
27.08.19
27/8/19

Read

REPORT ON

DGPS SURVEY USING HIGH RESOLUTION SATELLITE IMAGE FOR 18 Ha OF FOREST LAND IDENTIFIED TOWARDS COMPENSATORY AFFORESTATION AGAINST THE PROPOSED DIVERSION OF 8.795 Ha of LEFT-OUT FOREST LAND IN MGR (MERRY GO ROUND RAIL LINE) OF TALAIPALI COAL MINING PROJECT

Submitted to

NTPC LIMITED
LAILUNGA ROAD, TEHSIL-GHARGHODA, DISTRICT-RAIGARH
PIN CODE-496111, CHHATTISGARH

Submitted by

छत्तीसगढ़ अंतरिक्ष उपयोग केन्द्र

CHHATTISGARH SPACE APPLICATIONS CENTRE
CHHATTISGARH COUNCIL OF SCIENCE AND TECHNOLOGY
VIGYAN BHAVAN, VIDHAN SABHA ROAD, DALDAL SEONI,
PIN-492014, RAIPUR C.G.

छत्तीसगढ़ अंतरिक्ष उपयोग केन्द्र

Chhattisgarh Space Application Centre
Chhattisgarh Council of Science and Technology

PROJECT EXECUTION TEAM

1. **M.K. Beg, Scientist "E1"**
2. **Amit Prakash Multaniya, Project Scientist**
3. **Hemant Dansena, Research Associate I**
4. **Kamal Kishor Sahu, Senior Research Fellow**

Official Notification (for DGPS Survey)
No. F7-14/2013/12
Government of Chhattisgarh

DGPS SURVEY CARRIED OUT

FOR

TALAIPALI COAL MINING PROJECT
DISTRICT-RAIGARH, PIN CODE-496111
CHHATTISGARH

रमेश खेर / RAMESH KHER
मुख्य महाप्रबंधक / Chief General Manager
एनटीपीसी लि.लिमिटेड / NTPC Limited
तलाईपली, बनाई और भालुडुडा कोल माईनिंग प्रोजेक्ट्स
Talaipalli, Banai & Bhaludauda Coal Mining Projects
लैलुंगा रोड, घरघोड़ा, जिला - रायगढ़ (छ.ग.) 496111
Lailunga Road Gharghoda, Dist. - Raigarh (C.G) 496111

कार्यालय,
विज्ञान भवन,
छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद,
विधान सभा रोड, दलदल सिवनी,
रायपुर (छ.ग.) पिन - 492014

NTPC LIMITED
LAILUNGA ROAD, TEHSIL-GHARGHODA, DISTRICT-RAIGARH
PIN CODE-496111, CHHATTISGARH

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1. INTRODUCTION

NTPC Limited awarded the task to Chhattisgarh Council of Science & Technology (CCOST) for carrying out DGPS survey of the CA (Compensatory Afforestation) Land against the proposed diversion of 8.795 ha of left out forest land under Construction of MGR (Merry Go Round Rail Line) Of Talaipalli Coal Mining Project Vide Work Order No. 5500033645-108-1071 Dated : 15.07.2019. DGPS survey to be carried out in Orange Area (**Orange area part Baigbhari, Pusalda**) , double the area proposed for diversion towards compensatory Afforestation purpose, (CA Land) identified by Department of Forest, Govt. of Chhattisgarh. The entire work shall comply with the requirement of Chhattisgarh Forest Department and as per the guide lines laid down in Forest Conservation Act 1980. The requirement of Digital Maps by DGPS survey showing geo-referenced boundary in shape file of the CA Land proposed for Afforestation are to be authenticated by concerned agency.

Ministry of Environment and Forests, Govt. of India vide their circular No.F.No.-11-9/98-FC, dated 08-07-2011 have stipulated that to ensure accurate delineation of forest area proposed to be diverted for non-forestry purposes under Section-2 of Forest Conservation Act, 1980 the diversion proposal under Forest Conservation Act shall be accompanied by DGPS/ETS surveyed reports of the forest land proposed for diversion and the area proposed for the Compensatory Afforestation as per guidelines laid down in the circular issued by ministry of forest and environment, Government of India from time to time. While submitting proposal for diversion of forest land for non forest purpose, the user agency has to submit the Georeferenced boundary, using DGPS in shape file containing maps along with hard copy authenticated by Divisional Forest Officer (DFO) concerned. The conventional methods of survey to delineate and demarcate the forest land with reference to the earlier Cadastral/Forest Compartment/compartment base map are time consuming. Further, the conventional surveys are "Unprojected" Surveys, hence linking them to geospatial domain is a challenging task. The modern survey technique using Differential Global positioning system (DGPS) with georeferenced high resolution satellite image bring efficacy in survey in shorter time span compared to old method of survey and record preparation.

Earth observation satellites can today monitor almost every corner of our planet; the collection of information over each location, even in difficult terrain, has been intensively carried out in recent years using satellite data. In the recent years, since high resolution satellites have become operational, the information that can be collected from space borne images has dramatically increased, since the improved geometrical resolution has enabled the detection of natural and man-made features that were simply impossible to distinguish in the past with medium resolution satellite data. Therefore it is now possible to produce accurate representations of a specific location of the earth just sitting in front of a computer.

Around our planet, several earth observation satellites are operational. These satellites observe the earth on several spectral bands, and with different geometrical resolution. As high resolution satellites can be marked those satellites that can collect information with a geometrical resolution equal or better than 2.5 meters. The emerging new satellite technologies enabling earth observation at a high spatial resolution of 2.5 m resolution, together with powerful and high speed computing and processing capabilities have brought revolutionary changes in the field of GIS-based Forest Compartment land information system. The high-resolution satellite imagery is showing its usefulness for Cadastral/Forest Compartment surveys due to which traditional cadastre and land registration systems have been undergoing major changes worldwide.

High-resolution space-borne remote sensing image data show a high level of detail and provide many opportunities to be used as base for Forest Compartment map generation. The combination of GIS and GPS activities play a crucial role in developing the survey of the forest boundary points and making Forest Compartment maps. Area, length other measures in the GIS numerical database are considerably easy to compute and correlate with already available data with line department.

2. OBJECTIVES

- DGPS survey for 18 Ha CA land identified by the Forest department out of the 25.00 ha Orange area in Pusalda village. Total CA land area identified after survey is 22.00 hectare only instead of 25 Ha.
- Deriving coordinates of each observations point using DGPS in the world geodetic system 1984 (WGS-84) Datum.
- Integration of Geo-referenced Vectorized compartment map and to check the accuracy.
- Merging of Cartosat 1 with LISS-IV (1:4000) and also to superimpose Geo-referenced boundary map on high resolution satellite image (merged product).
- GIS data base creation and analysis.
- Processing of DGPS Observation For Final Coordinates And Generation of Geo-Referenced Shape File Of The Ca Land Boundary
- Submission of Report/Maps/KML and Shape files.

3. LOCATION OF THE AREA

DGPS survey carried out in Pusalda village located in Gharghoda Block of Raigarh district, Chhattisgarh. The total CA land area for afforestation is 18 Ha against the proposed diversion of 8.795 ha left out forest land for MGR (Merry Go Round Railway Line) of Talaipalli Coal Mining Project, NTPC Limited. The area is falling in Survey of India Toposheet No.65N/07. Approximate coordinates of the polygon bounding the two corners is given below:-

- Lower left corner - 22° 18' 18.974" N, 83° 18' 38.548" E
- Upper right corner - 22° 18' 41.228" N, 83° 18' 56.151" E

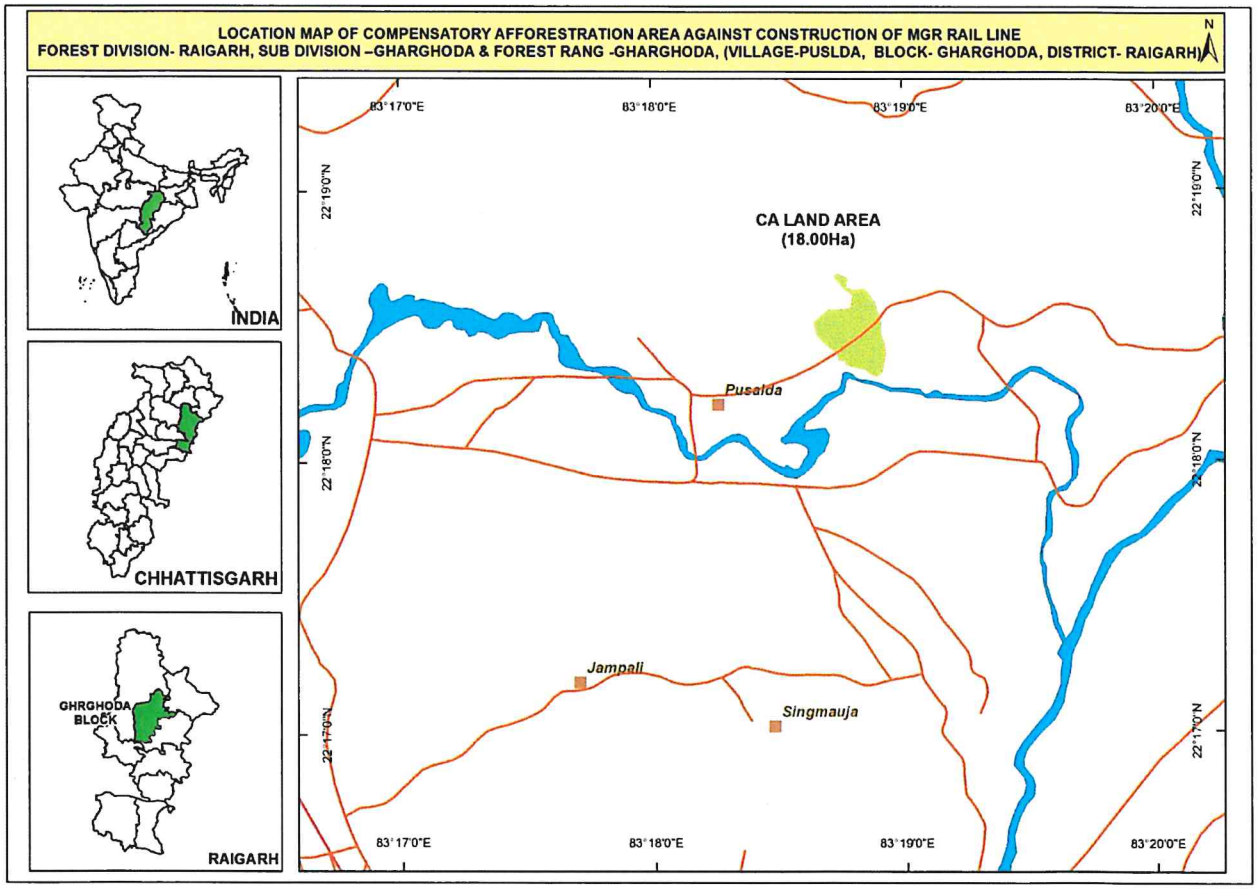

Fig: 1 Location map of the area

4. DATA SETS USED

a) The Satellite Imagery:

High resolution Cartosat-1 data with panchromatic images of 2.5 m resolution and multispectral images of Resourcesat-2 (LISS-IV) with 5.8 m resolution was acquired in SISDP project from National Remote Sensing Centre, Hyderabad used for study areas.

b) DGPS Data:

Lieca DGPS with CS/GS12 Raw Data Logging License for Viva CS field controller, which enables logging of GNSS raw data with a GS12 receiver and GS12 GNSS Smart Antenna, Geodetic 120 channel GNSS receiver was used for GCPs collection.

5. DGPS SYSTEM

DGPS system consist a reference receiver located on a known position and one or more receivers, the antenna, differential correction processing system and data link equipment. Both the reference receiver and user receiver collect and store data for later processing. DGPS system is based on the principle that receiver in the same vicinity will simultaneously experience common error on a particular satellite ranging signal. In the user receiver, measurements are taken from the reference receiver to remove common errors. Based on this principle, the user receiver must use the same set of satellites as the reference station then the DGPS equation is formulated to remove the common error get cancel. The common errors are signal path delay through atmosphere and satellite clock.

6. PROCEDURE FOR SURVEY

DGPS Survey has been carried out along the CA land boundaries which were shown by the concerned local forest staff and NTPC officers and as per confirmation to locations and extent of land, DGPS observations at each observation points along the periphery of land allocated for afforestation are taken by Rover with minimum observation period of about 01 minutes at 50 meter interval in RTK mode.

6.1. Establishment of Base Station:

Base station was fixed near the site for observation in RTK mode of survey as there was no SOI reference points was available in that area.

6.2. Digitization and geo-referencing of Compartment maps

CA Land Boundary vector in the form of shape file has been prepared by generating the coordinates of the observation points in geographic latitude & longitude as well as UTM projection with WGS 84 datum. Demarcated boundary geo-referenced with the help of coordinates and superimposed on Cartosat-1 image. (Merged product)

6.3. GIS Analysis

The surveyed boundary shape file from DGPS survey, geo-referenced CA Land, geo-referenced compartment maps/revenue map is superimposed on the satellite image using ArcGIS software (10.0). Area calculated and statistics of area was generated.

7. INPUT DATA

- Digital data Cartosat 1 PAN and LISS IV was acquired through National Remote Sensing Centre, Hyderabad under SIS-DP project of ISRO.
- Leica GS12 Base and Rover Dual Frequency RTK / Post Processing Differential Global Positioning System with configuration as under.
- Compartment map of the area provided by NTPC Limited.
- Survey of India Toposheet No 64N/07 (1:50000).

8. EQUIPMENT SPECIFICATIONS

S. No.	DGPS EQUIPMENT SPECIFICATIONS
1.	**DESCRIPTION BASE AND ROVER**
	GS12 GNSS Smart Antenna, Geodetic 120 channel GNSS receiver, includes GPS L1 + L2, 1 Hz position rate, (e.g. Glonass, Gallileo, GPS L5, Network RTK, Raw data logging ...)
	GS12 GLONASS License for the Viva CS10 field controller, which enables use of GLONASS with a GS12 receiver.
	GS12 Raw Data Logging License for Viva CS10 field controller, which enables logging of GNSS raw data with a GS12 receiver.
	GS12 5Hz License for Viva CS10 field controller, which enables to compute 5 Hz positions with a GS12 receiver.
	GS12 RTK Reference Station License key for Viva CS10 field controller, which enables the GS12 to be used as an RTK base station.
	CS10 Field Controller. Ruggedized WinCE field controller with full VGA touch display, 1GB NAND Flash Memory, 512MB SDRAM, CF/SD card slot and 2MP camera. Includes Bluetooth, virtual numeric keypad, and stylus.
2.	**RTK Base and Rover Radio** HPR2, Satellite-EASY Pro 35W high power radio, 403-473 Mhz RX/TX radio. 5 Meter Mast for Base, Gainflex antenna, CGR10, 403-470 Mhz RXO radio for controllers. ProCom Unity Gain Antenna, GLS13 telescopic aluminum pole
3.	**Field Software** SmartWorx Viva Software (with CS LT license)
4.	**Data Processing Software** Leica Geo Office GNSS-PP Bundle (Node locked). Includes LandXMLImport/Export, COGO calculations, L1/L2 GNSS processing, GLONASS, RINEXImport and Datum & Map., LGO Design & Adjustment 3D
5.	**Measurement Performance & Accuracy**
	Accuracy (rms) Code differential with DGPS / RTCM2
	DGPS / RTCM
	Accuracy (rms) with Real-Time (RTK)[2]
	Standard of compliance

S. No.	DGPS EQUIPMENT SPECIFICATIONS	
	Rapid static (phase) Static mode agree initialization	
	Kinematic (phase) Moving mode after initialization	
	Accuracy (rms) with Post Processing[2]	
	Static (phase) with long observations	
	Static and rapid static (phase)	Typically, 25 cm (rms)
	Kinematic (phase)	
	On the Fly (OTF) Initialization	Compliance with ISO17123-8
	RTK technology	Horizontal: 5 mm + 0.5 ppm (rms) Vertical: 10 mm + 0.5 ppm (rms)
	Reliability of OTF initialization	Horizontal: 10 mm + 1 ppm (rms) Vertical: 20 mm + 1 ppm (rms)
	Time of initialization	
	ORF range	Horizontal: 3 mm + 0.1 ppm (rms) Vertical: 3.5 mm + 0.4 ppm (rms)
	Network RTK	Horizontal: 5 mm + 0.5 ppm (rms) / Vertical: 10 mm + 0.5 ppm (rms)
	Network technology	Horizontal: 10 mm + 1 ppm (rms) / Vertical: 20 mm + 1 ppm (rms)
	Supported RTK network solutions	Leica SmartCheck+ technology
	Supported RTK network standards	Better than 99.99%[2]

9. DGPS COORDINATES OF ORANGE AREA (BAIGBHARI PUSALDA), BLOCK-GHARGHODA, DISTRICT- RAIGARH

Table 1: Survey Coordinates of CA land boundary point (18 Ha)

SURVEY ID	GEOGRAPHICAL COORDINATES		UTM COORDINATES	
	LATITUDE	LONGITUDE	NORTHING	EASTING
F22	22° 18' 33.34118" N	83° 18' 42.91799" E	2468883.20931	738163.94225
F23	22° 18' 33.33563" N	83° 18' 42.97610" E	2468883.06406	738165.60830
F24	22° 18' 33.38406" N	83° 18' 44.02672" E	2468885.01499	738195.66121
F25	22° 18' 33.44054" N	83° 18' 45.25207" E	2468887.29038	738230.71219
F26	22° 18' 33.61565" N	83° 18' 46.60160" E	2468893.26971	738269.26181
F27	22° 18' 33.75326" N	83° 18' 47.66222" E	2468897.96902	738299.55892
F28	22° 18' 35.14536" N	83° 18' 47.87547" E	2468940.89078	738305.00672
F29	22° 18' 36.54923" N	83° 18' 47.99164" E	2468984.13221	738307.66998
F30	22° 18' 37.25023" N	83° 18' 47.02254" E	2469005.27340	738279.59750
F31	22° 18' 37.83522" N	83° 18' 46.26340" E	2469022.93737	738257.59007
F32	22° 18' 39.04228" N	83° 18' 45.03424" E	2469059.53350	738221.83430
F33	22° 18' 39.82626" N	83° 18' 44.23590" E	2469083.30240	738198.61120
F34	22° 18' 40.73905" N	83° 18' 43.48183" E	2469111.05380	738176.59450
F35	22° 18' 41.39400" N	83° 18' 44.54437" E	2469131.66962	738206.70195
F36	22° 18' 40.84919" N	83° 18' 45.24464" E	2469115.21580	738227.00520
F37	22° 18' 40.87906" N	83° 18' 45.47820" E	2469116.23730	738233.67690
F38	22° 18' 40.66512" N	83° 18' 45.92328" E	2469109.85070	738246.51870
F39	22° 18' 40.53839" N	83° 18' 46.05635" E	2469106.01010	738250.38780
F40	22° 18' 40.47100" N	83° 18' 46.47814" E	2469104.12218	738262.49384
F41	22° 18' 40.45933" N	83° 18' 46.55121" E	2469103.79510	738264.59120
F42	22° 18' 40.35021" N	83° 18' 46.74900" E	2469100.52480	738270.30438
F43	22° 18' 39.89838" N	83° 18' 46.73920" E	2469086.61990	738270.23720
F44	22° 18' 39.48537" N	83° 18' 46.61844" E	2469073.86059	738266.97502
F45	22° 18' 38.94612" N	83° 18' 46.46076" E	2469057.20124	738262.71572
F46	22° 18' 38.44479" N	83° 18' 46.60246" E	2469041.83973	738267.00864
F47	22° 18' 38.18915" N	83° 18' 46.81900" E	2469034.07012	738273.32792
F48	22° 18' 38.05641" N	83° 18' 47.16474" E	2469030.13813	738283.28781
F49	22° 18' 37.82097" N	83° 18' 47.62766" E	2469023.09792	738296.65039
F50	22° 18' 37.74998" N	83° 18' 47.98649" E	2469021.07137	738306.95592
F51	22° 18' 37.77618" N	83° 18' 49.14834" E	2469022.38746	738340.20300
F52	22° 18' 37.87254" N	83° 18' 49.96055" E	2469025.70858	738363.40840
F53	22° 18' 37.94882" N	83° 18' 50.60356" E	2469028.33779	738381.77924
F54	22° 18' 38.01969" N	83° 18' 50.71233" E	2469030.56610	738384.85950
F55	22° 18' 37.75023" N	83° 18' 51.15469" E	2469022.47020	738397.64980
F56	22° 18' 37.19500" N	83° 18' 51.60541" E	2469005.58652	738410.81445
F57	22° 18' 36.64885" N	83° 18' 52.04877" E	2468988.97870	738423.76400
F58	22° 18' 35.74693" N	83° 18' 52.55873" E	2468961.45470	738438.78800
F59	22° 18' 35.23922" N	83° 18' 52.99316" E	2468946.02594	738451.46396
F60	22° 18' 35.15580" N	83° 18' 53.29650" E	2468943.59260	738460.18700

SURVEY ID	GEOGRAPHICAL COORDINATES		UTM COORDINATES	
	LATITUDE	LONGITUDE	NORTHING	EASTING
F61	22° 18' 33.73669" N	83° 18' 53.64182" E	2468900.08497	738470.74232
F62	22° 18' 32.19397" N	83° 18' 54.14560" E	2468852.84431	738485.89206
F63	22° 18' 30.34771" N	83° 18' 54.71931" E	2468796.29550	738503.18721
F64	22° 18' 29.23786" N	83° 18' 54.70798" E	2468762.14571	738503.38693
F65	22° 18' 27.75662" N	83° 18' 54.74007" E	2468716.58920	738505.00480
F66	22° 18' 26.26115" N	83° 18' 55.43560" E	2468670.88630	738525.62180
F67	22° 18' 23.55507" N	83° 18' 55.85956" E	2468587.81930	738539.03630
F68	22° 18' 22.73984" N	83° 18' 55.68055" E	2468562.65959	738534.29672
F69	22° 18' 21.29953" N	83° 18' 55.33216" E	2468518.19506	738525.00336
F70	22° 18' 19.98205" N	83° 18' 55.04891" E	2468477.53819	738517.51659
F71	22° 18' 19.54993" N	83° 18' 54.81695" E	2468464.14197	738511.08034
F72	22° 18' 19.04243" N	83° 18' 54.54453" E	2468448.40880	738503.52130
F73	22° 18' 18.75176" N	83° 18' 54.14308" E	2468439.28999	738492.16603
F74	22° 18' 18.78051" N	83° 18' 53.42203" E	2468439.85780	738471.51050
F75	22° 18' 18.86108" N	83° 18' 52.97967" E	2468442.14220	738458.80880
F76	22° 18' 19.07320" N	83° 18' 52.43523" E	2468448.42917	738443.12284
F77	22° 18' 19.20906" N	83° 18' 52.08655" E	2468452.45562	738433.07686
F78	22° 18' 19.25705" N	83° 18' 52.09002" E	2468453.93375	738433.15351
F79	22° 18' 19.67048" N	83° 18' 51.56463" E	2468466.42232	738417.91799
F80	22° 18' 20.11211" N	83° 18' 51.00341" E	2468479.76276	738401.64322
F81	22° 18' 20.25608" N	83° 18' 50.26965" E	2468483.86981	738380.56964
F82	22° 18' 20.34300" N	83° 18' 49.70672" E	2468486.29670	738364.41358
F83	22° 18' 20.62403" N	83° 18' 48.83671" E	2468494.56075	738339.37497
F84	22° 18' 20.76169" N	83° 18' 48.32371" E	2468498.57055	738324.62427
F85	22° 18' 21.01669" N	83° 18' 47.28914" E	2468505.96181	738294.88709
F86	22° 18' 21.19313" N	83° 18' 46.57333" E	2468511.07581	738274.31199
F87	22° 18' 21.20772" N	83° 18' 46.32651" E	2468511.41638	738267.23937
F88	22° 18' 22.00650" N	83° 18' 46.35328" E	2468536.00260	738267.62907
F89	22° 18' 22.12225" N	83° 18' 46.23567" E	2468539.51210	738264.20751
F90	22° 18' 22.30939" N	83° 18' 44.70017" E	2468544.59593	738220.16222
F91	22° 18' 23.26542" N	83° 18' 44.42748" E	2468573.88853	738211.90499
F92	22° 18' 23.72065" N	83° 18' 44.35865" E	2468587.86358	738209.72007
F93	22° 18' 24.07867" N	83° 18' 43.81183" E	2468598.63818	738193.89740
F94	22° 18' 24.57297" N	83° 18' 43.05686" E	2468613.51421	738172.05171
F95	22° 18' 25.60406" N	83° 18' 41.73979" E	2468644.65813	738133.86167
F96	22° 18' 26.72559" N	83° 18' 40.42519" E	2468678.58588	738095.70020
F97	22° 18' 27.23259" N	83° 18' 39.91471" E	2468693.96001	738080.84770
F98	22° 18' 27.96711" N	83° 18' 39.25997" E	2468716.27042	738061.75850
F99	22° 18' 29.18592" N	83° 18' 39.01989" E	2468753.66219	738054.31117
F100	22° 18' 30.75921" N	83° 18' 38.72370" E	2468801.93466	738045.09092
BASE STATION	22° 18' 43.45219" N	83° 18' 29.27025" E	2469188.29338	737768.49480

रमेश खेर / RAMESH KHER
मुख्य महाप्रबंधक / Chief General Manager
एनटीपीसी लिमिटेड / NTPC Limited
तलाईपाली, बनाई और भालुमुड़ा कोल माईनिंग प्रोजेक्ट्स
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उप मण्डलाधिकारी
रायगढ़, वृत्तमण्डल

कार्यालय,
विज्ञान भवन,
छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद,
विधान सभा रोड, दलदल सिवनी,
रायपुर (छ.ग.) पिन - 492014

10. GIS ANALYSIS AND CONCLUSION

Land for compensatory afforestation Orange area, located in Pusalda village was provided by Forest department to NTPC limited. The area computed from the DGPS geo-referenced map was compared with the forest compartment orange area map proposed to be diverted for afforestation. The area as per forest record allocated to NTPC Limited for compensatory afforestation is 18 Ha out of 25.00 Hectare towards the diversion of 8.795 ha left out forest land for MGR rail line.

Forest details are given in Table 2:

Table 2: Summary of Land Statistics to be diverted

SUMMARY OF LAND STATISTICSOF FOREST AREA TO BE TAKEN UP FOR COMPENSATORY AFFORESTATION			
S NO	**TYPE OF LAND**	**Land ID**	**CA AREA AS PER DGPS SURVEY**
1	ORANGE AREA	BAIGHBAHRI PUSALDA	18.00
TOTAL AREA (Ha.)			**18.00**

रमेश खेर / RAMESH KHER
मुख्य महाप्रबंधक / Chief General Manager
एनटीपीसी लि.लिमिटेड / NTPC Limited
तलाईपली, बनाई और भालुमुडा कोल माईनिंग प्रोजेक्ट्स
लैलुंगा रोड, घरघोड़ा, जिला - रायगढ़ (छ.ग.) 496112
Lailunga Road Gharghoda, Distt. - Raigarh (C.G.) 496112

कार्यालय,
विज्ञान भवन,
छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद,
विधान सभा रोड, दलदल सिवनी,
रायपुर (छ.ग.) पिन - 492014

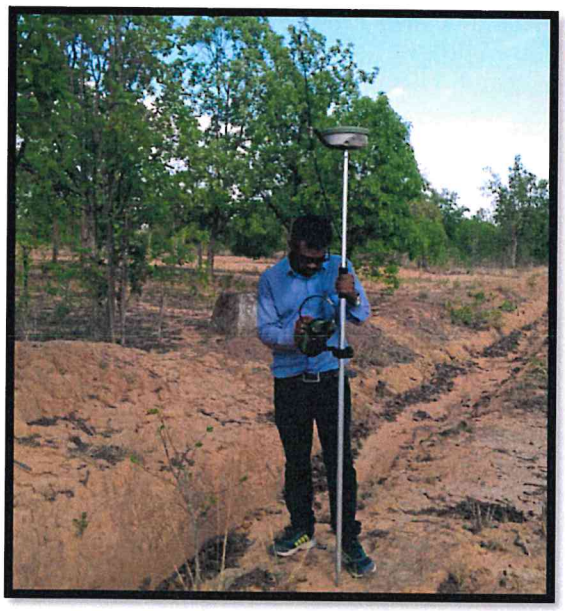
11. DELIVERABLES

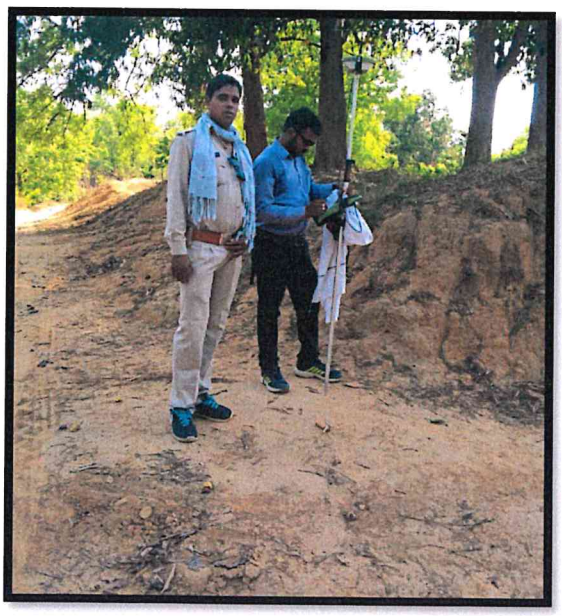
- Index map of 18 Ha Compensatory Afforestation area (CA Land)against the diversion of 8.795 ha of left out forest land for construction of (MGR) Merry Go Round Rail line. **ANNEXURE-I**

- DGPS Survey Boundary of 18 Ha CA Land superimposed on Toposheet against the diversion of 8.795 ha of left out forest land for construction of (MGR) Merry Go Round Rail Line (1:50000) **ANNEXURE-II**

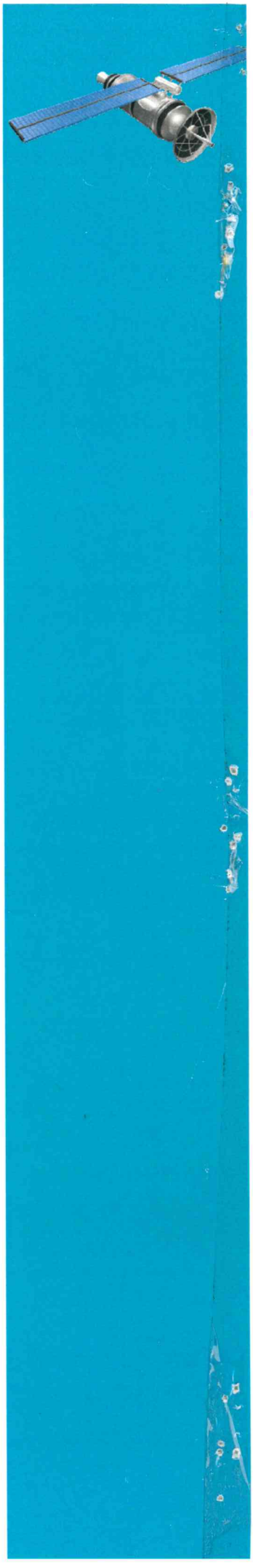
- 18 Ha Compensatory Afforestation area (CA Land) Superimposed on High resolution satellite image against the diversion of 8.795 ha of left out forest land for construction of (MGR) Merry Go Round Rail Line(1:4000) **ANNEXURE-III**

- DGPS Survey Boundary & Coordinates of Compensatory Afforestation area against the diversion of 8.795 ha of left out forest land for construction of (MGR) Merry Go Round Rail Line (1:4000) **ANNEXURE-IV**





***** Glimpses of Field *****



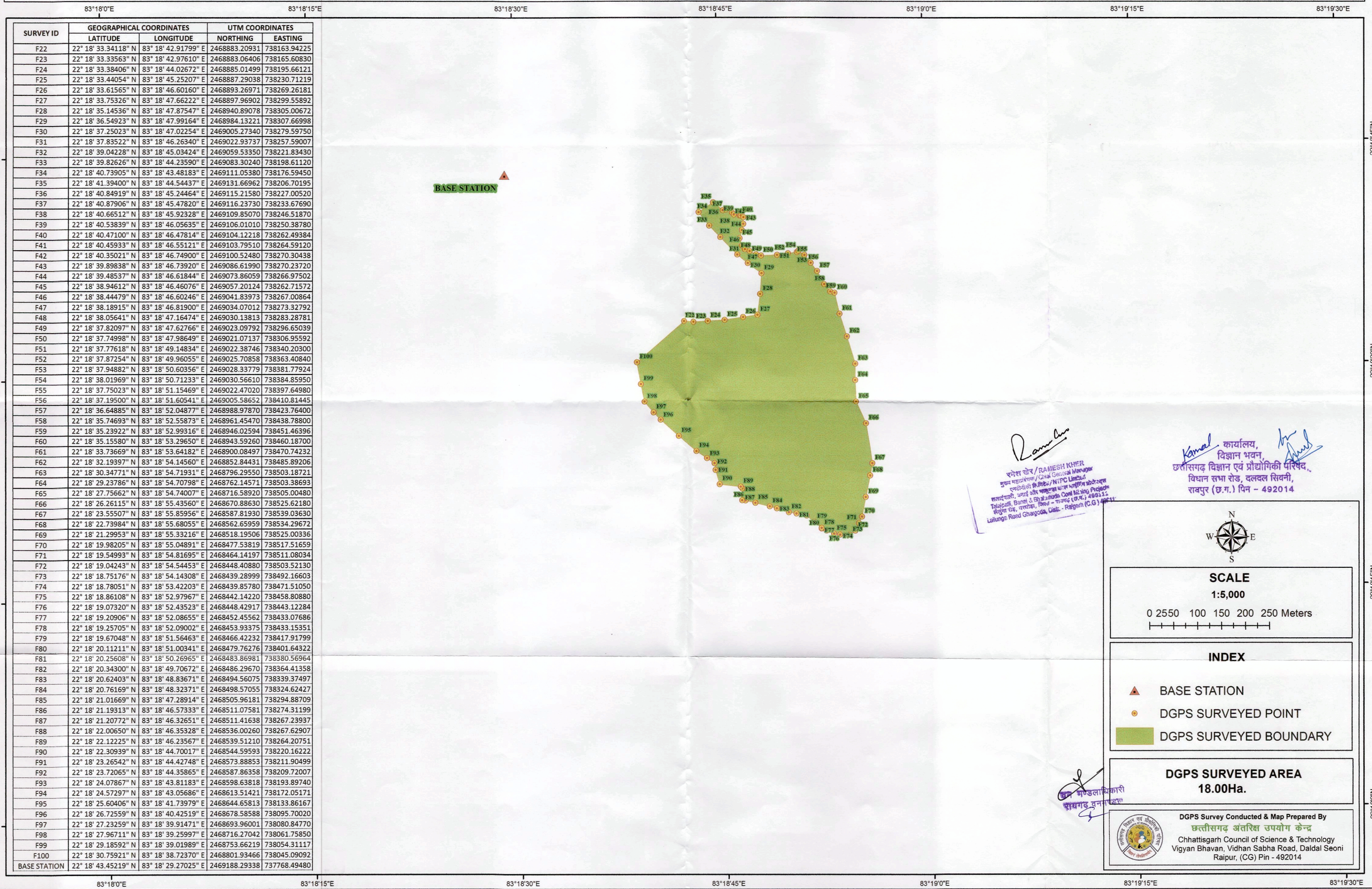
छत्तीसगढ़ अंतरिक्ष उपयोग केन्द्र

CHHATTISGARH SPACE APPLICATIONS CENTRECHHATTISGARH COUNCIL OF SCIENCE AND TECHNOLOGY VIGYAN BHAVAN, VIDHAN SABHA ROAD, DALDAL SEONI, PIN-492014,RAIPUR C.G.

ANNEXURE-III

DGPS SURVEY BOUNDARY AND THEIR COORDINATES OF 18 HA CA LAND AGAINST THE DIVERSION OF 8.795 HA OF FOREST LAND FOR MGR RAIL LINE FOREST DIVISION -RAIGARH, SUB DIVISION -GHARGHODA & FOREST RANG -GHARGHODA (VILLAGE-PUSALDA, BLOCK- GHARGHODA, DISTRICT- RAIGARH, CHHATTISGARH)

SURVEY ID	GEOGRAPHICAL COORDINATES		UTM COORDINATES	
	LATITUDE	LONGITUDE	NORTHING	EASTING
F22	22° 18' 33.34118" N	83° 18' 42.91799" E	2468883.20931	738163.94225
F23	22° 18' 33.33563" N	83° 18' 42.97610" E	2468883.06406	738165.60830
F24	22° 18' 33.38406" N	83° 18' 44.02672" E	2468885.01499	738195.66121
F25	22° 18' 33.44054" N	83° 18' 45.25207" E	2468887.29038	738230.71219
F26	22° 18' 33.61565" N	83° 18' 46.60160" E	2468893.26971	738269.26181
F27	22° 18' 33.75326" N	83° 18' 47.66222" E	2468897.96902	738299.55892
F28	22° 18' 35.14536" N	83° 18' 47.87547" E	2468940.89078	738305.00672
F29	22° 18' 36.54923" N	83° 18' 47.99164" E	2468984.13221	738307.66998
F30	22° 18' 37.25023" N	83° 18' 47.02254" E	2469005.27340	738279.59750
F31	22° 18' 37.83522" N	83° 18' 46.26340" E	2469022.93737	738257.59007
F32	22° 18' 39.04228" N	83° 18' 45.03424" E	2469059.53350	738221.83430
F33	22° 18' 39.82626" N	83° 18' 44.23590" E	2469083.30240	738198.61120
F34	22° 18' 40.73905" N	83° 18' 43.48183" E	2469111.05380	738176.59450
F35	22° 18' 41.39400" N	83° 18' 44.54437" E	2469131.66962	738206.70195
F36	22° 18' 40.84919" N	83° 18' 45.24464" E	2469115.21580	738227.00520
F37	22° 18' 40.87906" N	83° 18' 45.47820" E	2469116.23730	738233.67690
F38	22° 18' 40.66512" N	83° 18' 45.92328" E	2469109.85070	738246.51870
F39	22° 18' 40.53839" N	83° 18' 46.05635" E	2469106.01010	738250.38780
F40	22° 18' 40.47100" N	83° 18' 46.47814" E	2469104.12218	738262.49384
F41	22° 18' 40.45933" N	83° 18' 46.55121" E	2469103.79510	738264.59120
F42	22° 18' 40.35021" N	83° 18' 46.74900" E	2469100.52480	738270.30438
F43	22° 18' 39.89838" N	83° 18' 46.73920" E	2469086.61990	738270.23720
F44	22° 18' 39.48537" N	83° 18' 46.61844" E	2469073.86059	738266.97502
F45	22° 18' 38.94612" N	83° 18' 46.46076" E	2469057.20124	738262.71572
F46	22° 18' 38.44479" N	83° 18' 46.60246" E	2469041.83973	738267.00864
F47	22° 18' 38.18915" N	83° 18' 46.81900" E	2469034.07012	738273.32792
F48	22° 18' 38.05641" N	83° 18' 47.16474" E	2469030.13813	738283.28781
F49	22° 18' 37.82097" N	83° 18' 47.62766" E	2469023.09792	738296.65039
F50	22° 18' 37.74998" N	83° 18' 47.98649" E	2469021.07137	738306.95592
F51	22° 18' 37.77618" N	83° 18' 49.14834" E	2469022.38746	738340.20300
F52	22° 18' 37.87254" N	83° 18' 49.96055" E	2469025.70858	738363.40840
F53	22° 18' 37.94882" N	83° 18' 50.60356" E	2469028.33779	738381.77924
F54	22° 18' 38.01969" N	83° 18' 50.71233" E	2469030.56610	738384.85950
F55	22° 18' 37.75023" N	83° 18' 51.15469" E	2469022.47020	738397.64980
F56	22° 18' 37.19500" N	83° 18' 51.60541" E	2469005.58652	738410.81445
F57	22° 18' 36.64885" N	83° 18' 52.04877" E	2468988.97870	738423.76400
F58	22° 18' 35.74693" N	83° 18' 52.55873" E	2468961.45470	738438.78800
F59	22° 18' 35.23922" N	83° 18' 52.99316" E	2468946.02594	738451.46396
F60	22° 18' 35.15580" N	83° 18' 53.29650" E	2468943.59260	738460.18700
F61	22° 18' 33.73669" N	83° 18' 53.64182" E	2468900.08497	738470.74232
F62	22° 18' 32.19397" N	83° 18' 54.14560" E	2468852.84431	738485.89206
F63	22° 18' 30.34771" N	83° 18' 54.71931" E	2468796.29550	738503.18721
F64	22° 18' 29.23786" N	83° 18' 54.70798" E	2468762.14571	738503.38693
F65	22° 18' 27.75662" N	83° 18' 54.74007" E	2468716.58920	738505.00480
F66	22° 18' 26.26115" N	83° 18' 55.43560" E	2468670.88630	738525.62180
F67	22° 18' 23.55507" N	83° 18' 55.85956" E	2468587.81930	738539.03630
F68	22° 18' 22.73984" N	83° 18' 55.68055" E	2468562.65959	738534.29672
F69	22° 18' 21.29953" N	83° 18' 55.33216" E	2468518.19506	738525.00336
F70	22° 18' 19.98205" N	83° 18' 55.04891" E	2468477.53819	738517.51659
F71	22° 18' 19.54993" N	83° 18' 54.81695" E	2468464.14197	738511.08034
F72	22° 18' 19.04243" N	83° 18' 54.54453" E	2468448.40880	738503.52130
F73	22° 18' 18.75176" N	83° 18' 54.14308" E	2468439.28999	738492.16603
F74	22° 18' 18.78051" N	83° 18' 53.42203" E	2468439.85780	738471.51050
F75	22° 18' 18.86108" N	83° 18' 52.97967" E	2468442.14220	738458.80880
F76	22° 18' 19.07320" N	83° 18' 52.43523" E	2468448.42917	738443.12284
F77	22° 18' 19.20906" N	83° 18' 52.08655" E	2468452.45562	738433.07686
F78	22° 18' 19.25705" N	83° 18' 52.09002" E	2468453.93375	738433.15351
F79	22° 18' 19.67048" N	83° 18' 51.56463" E	2468466.42232	738417.91799
F80	22° 18' 20.11211" N	83° 18' 51.00341" E	2468479.76276	738401.64322
F81	22° 18' 20.25608" N	83° 18' 50.26965" E	2468483.86981	738380.56964
F82	22° 18' 20.34300" N	83° 18' 49.70672" E	2468486.29670	738364.41358
F83	22° 18' 20.62403" N	83° 18' 48.83671" E	2468494.56075	738339.37497
F84	22° 18' 20.76169" N	83° 18' 48.32371" E	2468498.57055	738324.62427
F85	22° 18' 21.01669" N	83° 18' 47.28914" E	2468505.96181	738294.88709
F86	22° 18' 21.19313" N	83° 18' 46.57333" E	2468511.07581	738274.31199
F87	22° 18' 21.20772" N	83° 18' 46.32651" E	2468511.41638	738267.23937
F88	22° 18' 22.00650" N	83° 18' 46.35328" E	2468536.00260	738267.62907
F89	22° 18' 22.12225" N	83° 18' 46.23567" E	2468539.51210	738264.20751
F90	22° 18' 22.30939" N	83° 18' 44.70017" E	2468544.59593	738220.16222
F91	22° 18' 23.26542" N	83° 18' 44.42748" E	2468573.88853	738211.90499
F92	22° 18' 23.72065" N	83° 18' 44.35865" E	2468587.86358	738209.72007
F93	22° 18' 24.07867" N	83° 18' 43.81183" E	2468598.63818	738193.89740
F94	22° 18' 24.57297" N	83° 18' 43.05686" E	2468613.51421	738172.05171
F95	22° 18' 25.60406" N	83° 18' 41.73979" E	2468644.65813	738133.86167
F96	22° 18' 26.72559" N	83° 18' 40.42519" E	2468678.58588	738095.70020
F97	22° 18' 27.23259" N	83° 18' 39.91471" E	2468693.96001	738080.84770
F98	22° 18' 27.96711" N	83° 18' 39.25997" E	2468716.27042	738061.75850
F99	22° 18' 29.18592" N	83° 18' 39.01989" E	2468753.66219	738054.31117
F100	22° 18' 30.75921" N	83° 18' 38.72370" E	2468801.93466	738045.09092
BASE STATION	22° 18' 43.45219" N	83° 18' 29.27025" E	2469188.29338	737768.49480



रमेश खेर/RAMESH KHER
मुख्य महाप्रबंधक/Chief General Manager
एनटीपीसी लि.सिंगरौली/NTPC Limited
तलाईपल्ली, बनई और भालुमाडा कोल माईनिंग प्रोजेक्ट
Talaipalli, Banai & Bhalumada Coal Mining Projects
लैलुंगा रोड, घरगोड़ा, जिला - रायगढ़ (छ.ग.) 496111
Lailunga Road Gharpoda, Distt. - Raigarh (C.G.) 496111

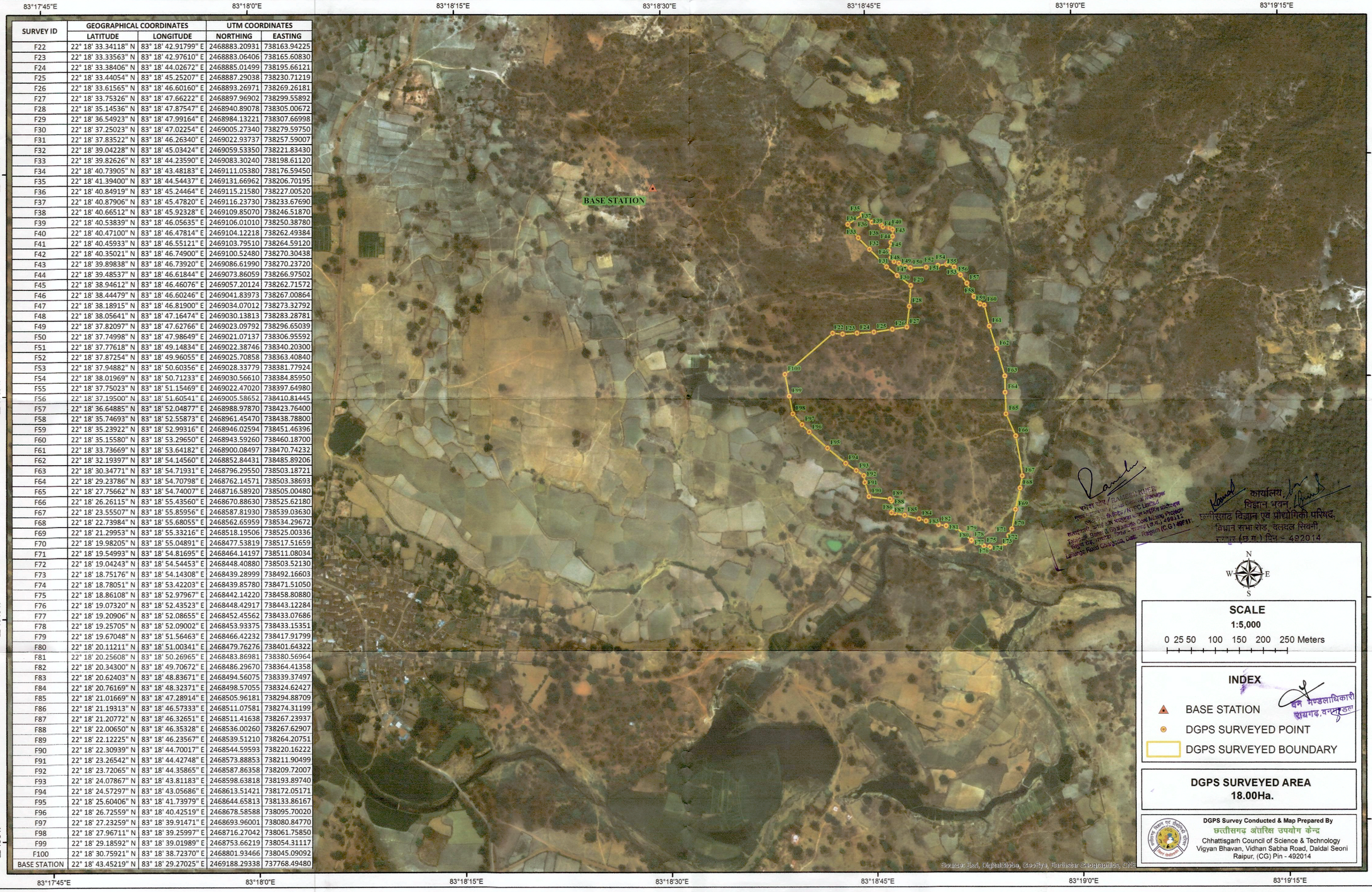
कार्यालय,
विज्ञान भवन,
छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद,
विधान सभा रोड, दलदल सिवनी,
रायपुर (छ.ग.) पिन - 492014

जिला मण्डलाधिकारी
रायगढ़ (छत्तीसगढ़)

ANNEXURE-IV

DGPS SURVEY BOUNDARY OF 18HA CA LAND SUPERIMPOSED ON HIGH RESOLUTION SATELLITE IMAGE AGAINST THE DIVERSION OF 8.795 HA OF FOREST LAND FOR MGR RAIL LINE AT TALAIPALLI COAL MINING PROJECT
FOREST DIVISION- RAIGARH, SUB DIVISION –GHARGHODA & FOREST RANG -GHARGHODA
(VILLAGE-PUSALDA, BLOCK- GHARGHODA, DISTRICT- RAIGARH,CHHATTISGARH)

SURVEY ID	GEOGRAPHICAL COORDINATES		UTM COORDINATES	
	LATITUDE	LONGITUDE	NORTHING	EASTING
F22	22° 18' 33.34118" N	83° 18' 42.91799" E	2468883.20931	738163.94225
F23	22° 18' 33.33563" N	83° 18' 42.97610" E	2468883.06406	738165.60830
F24	22° 18' 33.38406" N	83° 18' 44.02672" E	2468885.01499	738195.66121
F25	22° 18' 33.44054" N	83° 18' 45.25207" E	2468887.29038	738230.71219
F26	22° 18' 33.61565" N	83° 18' 46.60160" E	2468893.26971	738269.26181
F27	22° 18' 33.75326" N	83° 18' 47.66222" E	2468897.96902	738299.55892
F28	22° 18' 35.14536" N	83° 18' 47.87547" E	2468940.89078	738305.00672
F29	22° 18' 36.54923" N	83° 18' 47.99164" E	2468984.13221	738307.66998
F30	22° 18' 37.25023" N	83° 18' 47.02254" E	2469005.27340	738279.59750
F31	22° 18' 37.83522" N	83° 18' 46.26340" E	2469022.93737	738257.59007
F32	22° 18' 39.04228" N	83° 18' 45.03424" E	2469059.53350	738221.83430
F33	22° 18' 39.82626" N	83° 18' 44.23590" E	2469083.30240	738198.61120
F34	22° 18' 40.73905" N	83° 18' 43.48183" E	2469111.05380	738176.59450
F35	22° 18' 41.39400" N	83° 18' 44.54437" E	2469131.66962	738206.70195
F36	22° 18' 40.84919" N	83° 18' 45.24464" E	2469115.21580	738227.00520
F37	22° 18' 40.87906" N	83° 18' 45.47820" E	2469116.23730	738233.67690
F38	22° 18' 40.66512" N	83° 18' 45.92328" E	2469109.85070	738246.51870
F39	22° 18' 40.53839" N	83° 18' 46.05635" E	2469106.01010	738250.38780
F40	22° 18' 40.47100" N	83° 18' 46.47814" E	2469104.12218	738262.49384
F41	22° 18' 40.45933" N	83° 18' 46.55121" E	2469103.79510	738264.59120
F42	22° 18' 40.35021" N	83° 18' 46.74900" E	2469100.52480	738270.30438
F43	22° 18' 39.89838" N	83° 18' 46.73920" E	2469086.61990	738270.23720
F44	22° 18' 39.48537" N	83° 18' 46.61844" E	2469073.86059	738266.97502
F45	22° 18' 38.94612" N	83° 18' 46.46076" E	2469057.20124	738262.71572
F46	22° 18' 38.44479" N	83° 18' 46.60246" E	2469041.83973	738267.00864
F47	22° 18' 38.18915" N	83° 18' 46.81900" E	2469034.07012	738273.32792
F48	22° 18' 38.05641" N	83° 18' 47.16474" E	2469030.13813	738283.28781
F49	22° 18' 37.82097" N	83° 18' 47.62766" E	2469023.09792	738296.65039
F50	22° 18' 37.74998" N	83° 18' 47.98649" E	2469021.07137	738306.95592
F51	22° 18' 37.77618" N	83° 18' 49.14834" E	2469022.38746	738340.20300
F52	22° 18' 37.87254" N	83° 18' 49.96055" E	2469025.70858	738363.40840
F53	22° 18' 37.94882" N	83° 18' 50.60356" E	2469028.33779	738381.77924
F54	22° 18' 38.01969" N	83° 18' 50.71233" E	2469030.56610	738384.85950
F55	22° 18' 37.75023" N	83° 18' 51.15469" E	2469022.47020	738397.64980
F56	22° 18' 37.19500" N	83° 18' 51.60541" E	2469005.58652	738410.81445
F57	22° 18' 36.64885" N	83° 18' 52.04877" E	2468988.97870	738423.76400
F58	22° 18' 35.74693" N	83° 18' 52.55873" E	2468961.45470	738438.78800
F59	22° 18' 35.23922" N	83° 18' 52.99316" E	2468946.02594	738451.46396
F60	22° 18' 35.15580" N	83° 18' 53.29650" E	2468943.59260	738460.18700
F61	22° 18' 33.73669" N	83° 18' 53.64182" E	2468900.08497	738470.74232
F62	22° 18' 32.19397" N	83° 18' 54.14560" E	2468852.84431	738485.89206
F63	22° 18' 30.34771" N	83° 18' 54.71931" E	2468796.29550	738503.18721
F64	22° 18' 29.23786" N	83° 18' 54.70798" E	2468762.14571	738503.38693
F65	22° 18' 27.75662" N	83° 18' 54.74007" E	2468716.58920	738505.00480
F66	22° 18' 26.26115" N	83° 18' 55.43560" E	2468670.88630	738525.62180
F67	22° 18' 23.55507" N	83° 18' 55.85956" E	2468587.81930	738539.03630
F68	22° 18' 22.73984" N	83° 18' 55.68055" E	2468562.65959	738534.29672
F69	22° 18' 21.29953" N	83° 18' 55.33216" E	2468518.19506	738525.00336
F70	22° 18' 19.98205" N	83° 18' 55.04891" E	2468477.53819	738517.51659
F71	22° 18' 19.54993" N	83° 18' 54.81695" E	2468464.14197	738511.08034
F72	22° 18' 19.04243" N	83° 18' 54.54453" E	2468448.40880	738503.52130
F73	22° 18' 18.75176" N	83° 18' 54.14308" E	2468439.28999	738492.16603
F74	22° 18' 18.78051" N	83° 18' 53.42203" E	2468439.85780	738471.51050
F75	22° 18' 18.86108" N	83° 18' 52.97967" E	2468442.14220	738458.80880
F76	22° 18' 19.07320" N	83° 18' 52.43523" E	2468448.42917	738443.12284
F77	22° 18' 19.20906" N	83° 18' 52.08655" E	2468452.45562	738433.07686
F78	22° 18' 19.25705" N	83° 18' 52.09002" E	2468453.93375	738433.15351
F79	22° 18' 19.67048" N	83° 18' 51.56463" E	2468466.42232	738417.91799
F80	22° 18' 20.11211" N	83° 18' 51.00341" E	2468479.76276	738401.64322
F81	22° 18' 20.25608" N	83° 18' 50.26965" E	2468483.86981	738380.56964
F82	22° 18' 20.34300" N	83° 18' 49.70672" E	2468486.29670	738364.41358
F83	22° 18' 20.62403" N	83° 18' 48.83671" E	2468494.56075	738339.37497
F84	22° 18' 20.76169" N	83° 18' 48.32371" E	2468498.57055	738324.62427
F85	22° 18' 21.01669" N	83° 18' 47.28914" E	2468505.96181	738294.88709
F86	22° 18' 21.19313" N	83° 18' 46.57333" E	2468511.07581	738274.31199
F87	22° 18' 21.20772" N	83° 18' 46.32651" E	2468511.41638	738267.23937
F88	22° 18' 22.00650" N	83° 18' 46.35328" E	2468536.00260	738267.62907
F89	22° 18' 22.12225" N	83° 18' 46.23567" E	2468539.51210	738264.20751
F90	22° 18' 22.30939" N	83° 18' 44.70017" E	2468544.59593	738220.16222
F91	22° 18' 23.26542" N	83° 18' 44.42748" E	2468573.88853	738211.90499
F92	22° 18' 23.72065" N	83° 18' 44.35865" E	2468587.86358	738209.72007
F93	22° 18' 24.07867" N	83° 18' 43.81183" E	2468598.63818	738193.89740
F94	22° 18' 24.57297" N	83° 18' 43.05686" E	2468613.51421	738172.05171
F95	22° 18' 25.60406" N	83° 18' 41.73979" E	2468644.65813	738133.86167
F96	22° 18' 26.72559" N	83° 18' 40.42519" E	2468678.58588	738095.70020
F97	22° 18' 27.23259" N	83° 18' 39.91471" E	2468693.96001	738080.84770
F98	22° 18' 27.96711" N	83° 18' 39.25997" E	2468716.27042	738061.75850
F99	22° 18' 29.18592" N	83° 18' 39.01989" E	2468753.66219	738054.31117
F100	22° 18' 30.75921" N	83° 18' 38.72370" E	2468801.93466	738045.09092
BASE STATION	22° 18' 43.45219" N	83° 18' 29.27025" E	2469188.29338	737768.49480



ANNEXURE-II

DGPS SURVEY BOUNDARY OF 18 HA CA LAND SUPERIMPOSED ON TOPOSHEET AGAINST THE DIVERSION OF 8.795 HA OF FOREST LAND FOR MGR RAIL LINE AT TALAIPALLI COAL MINING PROJECT FOREST DIVISION- RAIGARH, SUB DIVISION –GHARGHODA & FOREST RANG -GHARGHODA (VILLAGE-PUSALDA, BLOCK- GHARGHODA, DISTRICT- RAIGARH,CHHATTISGARH)

TOPOSHEET NO-65N/07

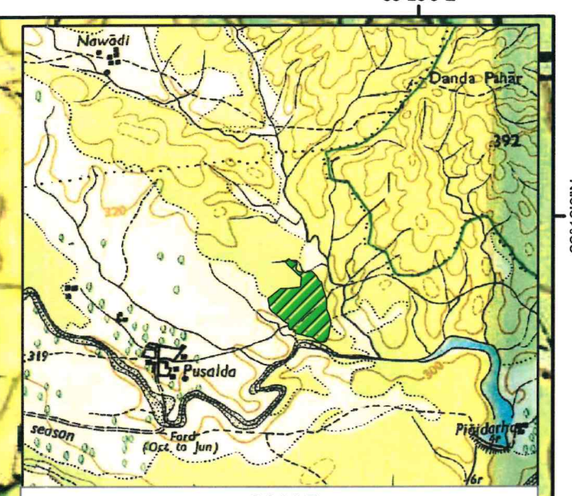
83°17'0"E 83°18'0"E 83°19'0"E 83°20'0"E

22°19'0"N 22°18'0"N

Roads. metalled: according to importance; distance stone ..
.. unmetalled; do. do. ; bridge .....
Cart-track. Pack-track and pass. Foot-path with bridge.....
Bridges: with piers: without. Causeway. Ford or Ferry.....
Streams: with track in bed; undefined. Canal.....
Dams: masonry or rock-filled: earthwork. Weir.....
River banks: shelving; steep. 3 to 6 metres; over 6 metres...
.. dry with water channel: with island & rocks. Tidal river...
Submerged rocks. Shoal. Swamp. Reeds .....
Wells: lined; unlined. Tube-well. Spring. Tanks: perennial: dry.
Embankments: road or rail; tank. Broken ground .....
Railways. broad gauge: double; single with station; under constrn.
.. other gauges: do. ; do. with distance stone; do.....
Mineral line or tramway. Telegraph line. Cutting with tunnel..
Contours with sub-features. Rocky slopes. Cliffs.....
Sand features: (1) flat. (2) sand-hills and dunes (surveyed). (3) shifting dunes.

Towns or Villages: inhabited: deserted Fort .....
Huts: permanent; temporary. Tower Antiquities.....
Temple. Chhatri. Church. Mosque. Idgāh. Tomb. Graves...
Lighthouse. Lightship. Buoys: lighted; unlighted. Anchorage....
Mine Vine on trellis. Grass. Scrub.....
Palms: palmyra: other. Plantain. Conifer. Bamboo. Other trees.
Boundary, international.....
.. state: demarcated; undemarcated.....
.. district: subdivn.; tahsīl or tāluk; forest.....
Boundary pillars: surveyed; unlocated; village trijunction...
Heights. triangulated: station. point: approximate ..... 200 .200 .200
Bench-mark: geodetic: tertiary; canal..... BM 63·3 .BM 63·3 .63
Post office. Telegraph office. Combined office. Police station. PO TO PTO PS
Bungalows: dāk or travellers; inspection. Rest-house..... DB IB (Canal) RH (Forest)
Circuit house. Camping ground. Forest: reserved; protected..CH CG RF PF
Spaced names: administrative; locality or tribal..... KIKRI NAGA

Pusalda
Ford (Oct. to Jun)
Nala



N W E S

SCALE
1:15,000
0 250 500 1,000
Meters

INDEX
DGPS SURVEY BOUNDARY

DGPS SURVEYED AREA
18.00 Hac

Dgps survey conducted & map prepared By
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