



REPORT ON
DGPS SURVEY FOR
PROPOSED CONSTRUCTION OF SURAJPUR DISTRICT COURT
BUILDING

Submitted to
EXECUTIVE ENGINEER
PUBLIC WORK DEPARTMENT, SURAJPUR,
DISTRICT: SURAJPUR, CHHATTISGARH



Submitted by
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Government of Chhattisgarh

DGPS SURVEY CARRIED OUT

FOR

PROPOSED CONSTRUCTION OF SURAJPUR DISTRICT COURT BUILDING

PUBLIC WORK DEPARTMENT, SURAJPUR,
DISTRICT: SURAJPUR
CHHATTISGARH

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

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1. INTRODUCTION

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 revenue forest land proposed for diversion 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 geo referenced 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.

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.

In view of the above, Office of Executive Engineer Public Work Department Surajpur, District – Surajpur awarded the task to Chhattisgarh Council of Science & Technology (CCOST) for carrying out DGPS survey for revenue forest land (1.82 Ha.) and 3.64 Ha. Compensatory Afforestation land in Surajpur District vide letter No. 1805/व.ले.लि./2019-20/दिनांक 5.09.19. DGPS survey is to be carried out in Revenue Forest area for demarcating boundary. Land identified by Revenue Department, Govt. of Chhattisgarh.

2. OBJECTIVES

- DGPS survey for demarcation of 1.82 Ha. Revenue Forest land in Tilsiwan village, falling in Khasra no. 529.
- Deriving coordinates of each observations point using DGPS in the world geodetic system 1984 (WGS-84) Datum.
- Preparation of Geo-referenced Revenue Forest boundary map showing DGPS observation point.
- Vectorization of boundary map.
- Integration of Geo-referenced Vectorized cadastral map.
- 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.

DGPS Survey was carried out in Tilsiwan and Bakirma Village, District – Surajpur for demarcation of Revenue Forest boundary from 16/10/2019 to 17/10/2019.

3. LOCATION OF THE AREA

DGPS survey carried out in Tilsiwan village located in Surajpur Block of Surajpur District. The total area for proposed court building construction is 1.82 Hectare. The area is falling in Survey of India Toposheet No. 64I/16. Approximate coordinates of the polygon bounding the two corners is given below:-

- Lower left corner - $23^{\circ} 12' 27.613'' \text{ N}, 82^{\circ} 53' 05.465'' \text{ E}$
- Upper right corner - $23^{\circ} 12' 33.159'' \text{ N}, 82^{\circ} 53' 17.691'' \text{ E}$

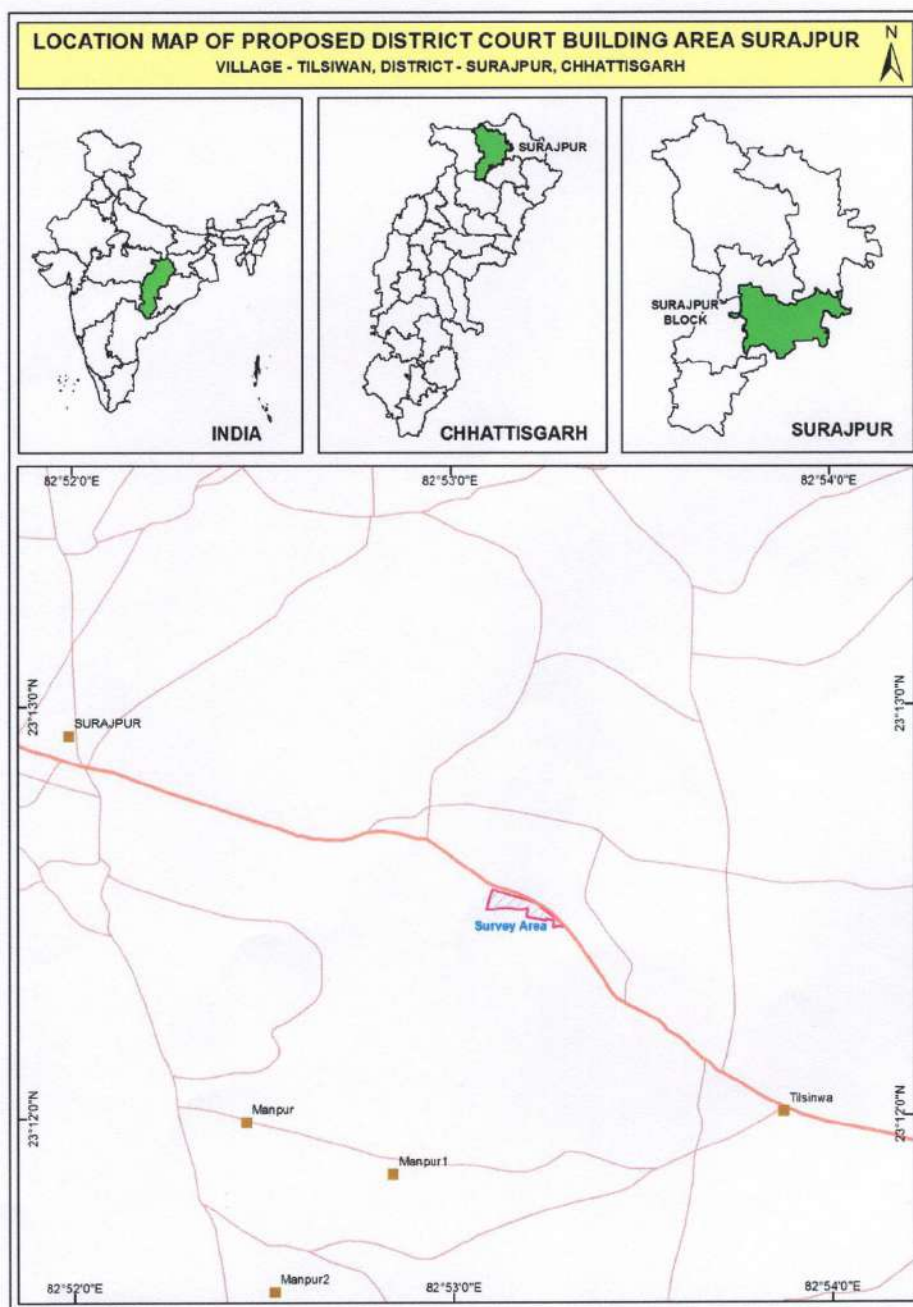


Fig: 1 Location map of the area

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 used for study areas.

b) DGPS Data:

Leica 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 satellites 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 revenue forest boundary for construction of court building area which were shown by the concerned PWD staff as per confirmation to locations and extent of land, DGPS observations at each observation points along the periphery of land allocated for building construction 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

Revenue Forest 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)

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, Satelline-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
	Smart Worx Viva Software (with CS LT license)
4.	Data Processing Software
	Leica Geo Office GNSS-PP Bundle (Node locked). Includes Land XML Import/Export, COGO calculations, L1/L2 GNSS processing, GLONASS, RINEX Import 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 Processing²	
	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 Smart Check+ technology
	Supported RTK network standards	Better than 99.99% ²

**9. DGPS COORDINATES OF REVENUE FOREST AREA FOR CONSTRUCTION
OF DISTRICT COURT BUILDING SURAJPUR, VILLAGE - TILSIWAN,
DISTRICT - SURAJPUR**


Table 1: Survey Coordinates

POINT ID	GEOGRAPHICAL CO-ORDINATES		UTM CO-ORDINATES	
	LATITUDE	LONGITUDE	NORTHING	EASTING
1	23° 12' 33.15941" N	82° 53' 6.38973" E	2567930.63756	692913.91950
2	23° 12' 32.35294" N	82° 53' 9.15092" E	2567906.84711	692992.75215
3	23° 12' 31.42259" N	82° 53' 12.44208" E	2567879.44206	693086.70389
4	23° 12' 30.82005" N	82° 53' 13.65982" E	2567861.35608	693121.56950
5	23° 12' 29.95002" N	82° 53' 14.81351" E	2567835.01791	693154.72082
6	23° 12' 29.01369" N	82° 53' 16.09001" E	2567806.68560	693191.39099
7	23° 12' 28.32946" N	82° 53' 17.02281" E	2567785.98174	693218.18774
8	23° 12' 27.69358" N	82° 53' 17.69119" E	2567766.66741	693237.44665
9	23° 12' 27.71280" N	82° 53' 16.75640" E	2567766.91334	693210.85900
10	23° 12' 27.61345" N	82° 53' 15.91102" E	2567763.54502	693186.86101
11	23° 12' 28.56522" N	82° 53' 16.02552" E	2567792.86599	693189.73637
12	23° 12' 28.80494" N	82° 53' 14.97181" E	2567799.85100	693159.67965
13	23° 12' 28.60750" N	82° 53' 14.92561" E	2567793.76050	693158.44470
14	23° 12' 29.09603" N	82° 53' 11.77243" E	2567807.62470	693068.59202
15	23° 12' 30.36585" N	82° 53' 11.98890" E	2567846.76701	693074.24023
16	23° 12' 30.24404" N	82° 53' 11.08169" E	2567842.68519	693048.49322
17	23° 12' 30.26520" N	82° 53' 10.21473" E	2567843.01598	693023.83376
18	23° 12' 30.41537" N	82° 53' 9.07809" E	2567847.21621	692991.45465
19	23° 12' 30.40817" N	82° 53' 7.94482" E	2567846.57673	692959.23422
20	23° 12' 30.33665" N	82° 53' 7.13100" E	2567844.07651	692936.12276
21	23° 12' 30.25093" N	82° 53' 6.48555" E	2567841.20129	692917.80441
22	23° 12' 30.24813" N	82° 53' 5.46456" E	2567840.73883	692888.77473
BASE STATION	23° 12' 31.82147" N	82° 53' 11.82512" E	2567891.48497	693069.00190


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वन परिक्षेत्र अधिकारी
वन परिक्षेत्र सुरजपुर


कार्यपालन अभियंता
लोक निर्माण विभाग, संभाग सुरजपुर
जि. सुरजपुर (उ.ग.)


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S.D.O. (F)
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Surajpur (C.G.)


10. GIS ANALYSIS AND CONCLUSION


Area for proposed construction of district court falling in revenue forest land, located in Tilsiwan village was provided by Public Work Department Surajpur. The area computed from the DGPS geo-referenced map was compared with the Revenue forest land schedule proposed to be diverted for construction of district court building. The area as per revenue record allocated to Public Work Department Surajpur for district court building construction is 1.82 Hectare, which were confirmed by DGPS survey. Details of Khasra/Rakba are given in Table 2:


Table 2: Summary of Land Statistics for District Court Building Construction Area


S. No.	TYPE OF LAND	KHASRA No.	APPLIED AREA AS PER DGPS SURVEY (In Ha.)
1	Revenue Forest	529	1.82
TOTAL AREA (In Ha.)			1.82



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वन परिक्षेत्राधिकारी
वन परिक्षेत्र सूरजपुर


कार्यपालन अभियंता
लोक निर्माण विभाग, संभाग सूरजपुर,
जि.सूरजपुर (छ.ग.)

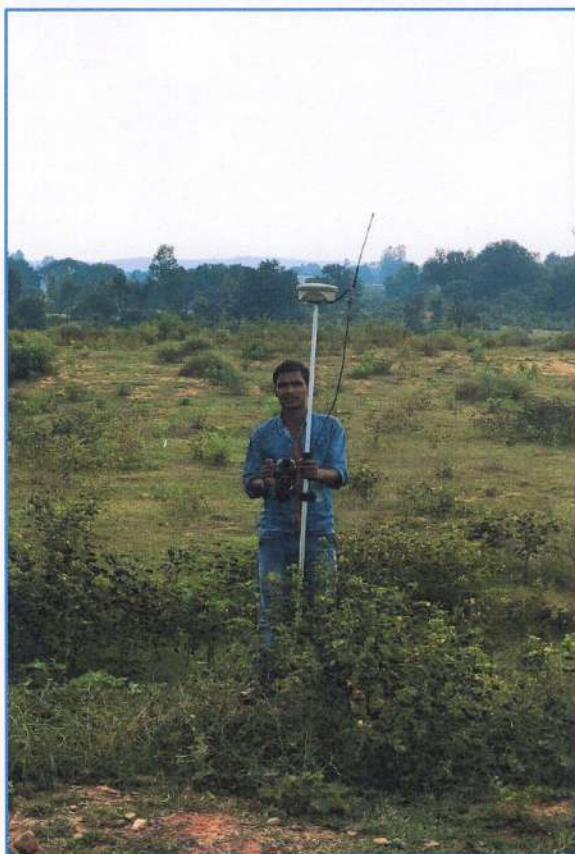

S.D.O. (F)
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Kamal
कार्यालय
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छत्तीसगढ़ विज्ञान एवं प्रौद्योगिकी परिषद,
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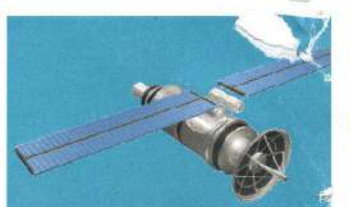

Divisional Forest Officer
Surajpur Division
Surajpur (C.G.)

DELIVERABLES

- Index map of Revenue Forest area for Proposed District Court Building Construction, Surajpur **ANNEXURE-I**
- DGPS Survey of Revenue Forest area for Proposed District Court Building Construction superimposed on Toposheet on (1:50000) scale **ANNEXURE-II**
- Revenue Forest area for Proposed District Court Building Construction Superimposed on High resolution satellite image on (1:5000) scale **ANNEXURE-III**
- Revenue Forest area for Proposed District Court Building Construction Superimposed on Cadastral Map on (1:4000) scale **ANNEXURE-IV**
- DGPS Survey Boundary & Coordinates of Revenue Forest area for Proposed District Court Building Construction on (1:4000) scale **ANNEXURE-V**



**** Glimpses of Field ****



छत्तीसगढ़ अंतरिक्ष उपयोग केन्द्र

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