

# REQUEST FOR PROPOSAL

## **WATER RESOURCES DEPARTMENT, CHHATTISGARH**

**Office of The Deputy Director, Hydrometeorology Division No.04 Raipur  
Chhattisgarh E-mail: [ddhyd4-wrd@cg.gov.in](mailto:ddhyd4-wrd@cg.gov.in)**

**Raipur, Dated ..... 2026**

Water Resources Department, Chhattisgarh (W.R.D. -CG) invites Request for Proposal for Technology -Driven Water shed intelligence system:

System No.	Details	PAC (Cr.)	Duration in Months	EMD (Rs. In Lakhs)	Processing fee (Rs.)
	Request For Proposal for setting -up a PMC for Technology -Driven Watershed Intelligence system: Aerial LiDAR, Aquatic Terrian Mapping & GIS Cloud Platform for Asset Mapping and water Resource Planning Under Water Resources Department				

### **Terms:**

1. Details can be viewed and downloaded online directly from the from the Government of Chhattisgarh Integrated e-Procurement Portal (<https://eproc.cgstate.gov.in>) from PM 5:30
2. Bid processing fee and scanned copy of EMD of required amount is to be submitted online on Government of Chhattisgarh Integrated e-Procurement Portal.
3. The schedule for bidding process is specified as critical dates on the Government of Chhattisgarh Integrated e-Procurement Portal.
4. The Pre-bid meeting will be held as per schedule mentioned on Government of Chhattisgarh Integrated e-Procurement Portal.
5. CGWRD will not be responsible for any delay in submission of bid due to any reason.
6. CGWRD reserves the right to accept or reject any Bid, cancel the bidding process and reject all bids, at any time prior to the award of contract, without incurring any notice and answerability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders regarding the grounds for the decision.
7. The Bid must be delivered online only upto .....2026... No personal, postal or courier delivery will be entertained.

# **Tender for Technology-Driven Watershed Intelligence: Aerial LiDAR, Aquatic Terrain Mapping & GIS Cloud Platform for Asset Mapping and Water Resource Planning, WRD Chhattisgarh"**

## **I. Introduction**

The Water Resources Department of the Government of Chhattisgarh has issued a tender seeking comprehensive consultancy services for GIS data preparation. The scope of work includes conducting airborne and hydrographic surveys across command and watershed areas, along with the mapping and tagging of water-related infrastructure and assets.

The consultancy will be responsible for the collection, processing, and integration of geospatial data to support the strategic planning, management, and monitoring of water resources and critical infrastructure such as dams, reservoirs, canals, bridges, and associated assets. Large-scale airborne surveys will primarily be carried out using manned aerial vehicles (MAVs), while unmanned aerial vehicles (UAVs) may be employed for detailed asset mapping and tagging as needed.

The Water Resources Department is seeking consultants with specialized expertise in aerial and hydrographic surveys, GIS data processing, asset mapping, and integration of these data sets into a unified geospatial system for water resource management.

The Water Resources Department (WRD) of the Government of Chhattisgarh is responsible for the management and development of the state's water resources, which include ensuring the sustainability of water supplies, safeguarding infrastructure, and facilitating effective flood management. As part of its ongoing efforts to enhance the efficiency and effectiveness of water resource management, the department recognizes the critical need for accurate, up-to-date, and comprehensive geospatial data.

In this context, the preparation of GIS data through airborne and hydrographic surveys is essential for several key reasons.

- First, large-scale geospatial data will support the department in making informed decisions about the planning, operation, and maintenance of critical water infrastructure such as dams, reservoirs, canals, and flood control systems. By acquiring detailed aerial and hydrographic data, WRD aims to improve its capacity for flood risk assessment, water distribution planning, and long-term water resource allocation.
- Furthermore, the integration of GIS data into a central platform will provide WRD with real-time access to accurate information, allowing for more proactive management of water bodies and infrastructure. This initiative will also enhance the department's ability to respond to emergencies, such as floods or droughts, by providing a detailed understanding of the condition and location of critical assets.
- Comprehensive data generated through airborne (MAV-based), and hydrographic (bathymetric) surveys will allow WRD to establish a robust monitoring system, facilitating not only day-to-day operations but also long-term strategic planning. By adopting modern technology and integrating geospatial data into decision-making processes, WRD is positioning itself to ensure the safety, sustainability, and resilience of water resources and infrastructure for the future.

## **II. Objectives and Scope of Work**

The primary objective of this consultancy is to engage a competent consultant to undertake airborne (manned aerial vehicle-based) and hydrographic (bathymetric) surveys, collect high-quality GIS data, and create a comprehensive GIS database. This data will facilitate the efficient planning, operation, and management of water resources, as well as provide insights into the condition of infrastructure critical to water safety and management.

### **A. Airborne Survey (MAV & UAV based Surveys)**

#### **1. Survey Execution:**

- Survey Area Identification: Identify and define the survey areas, focusing on command and watershed regions to ensure comprehensive coverage.
- Coordination with Water Resources Department: Consult with the Water Resources Department to finalize survey specifications and coordinate the survey plan, ensuring it meets all necessary requirements.
- Survey Flight Path and Point Establishment: Plan flight paths for aerial surveys and identify key survey points to ensure full data coverage, especially for large-scale areas.

#### **1.1 MAV-based Heliborne Survey:**

- Aerial Surveys with MAVs: Conduct large-scale topographic surveys using manned aerial vehicles (MAVs) equipped with advanced LiDAR and RGB sensors.
- Geospatial Data Collection: Gather data related to terrain elevation, land topography, vegetation, floodplain mapping, and land use/land cover.
- Aerial Imagery and DEM Creation: Acquire aerial imagery to generate Digital Elevation Models (DEMs) and detailed topographic maps, especially for large and complex regions.

#### **1.2 UAV-based Surveys for Asset Mapping (if necessary):**

- Targeted UAV Deployment: Deploy UAVs to survey smaller, more specific areas or critical infrastructure such as dams, gates, embankments, and sluice gates.
- High-Resolution Data Capture: Use UAVs equipped with high-resolution cameras and LiDAR sensors to capture accurate geospatial data, providing detailed mapping and asset condition assessment.

### **2. Data Processing, Integration, and GIS Data Preparation:**

#### **2.1 Data Processing and Integration:**

- LiDAR and Photogrammetry Data Processing: Process LiDAR and photogrammetry data to generate point clouds, digital models, and other essential geospatial products.
- Data Integration into GIS Platform. Integrate all collected data into a unified GIS platform for further analysis and to support existing water resource management models.
- Quality Assurance and Validation. Conduct quality assurance and validation processes to ensure the accuracy and reliability of the geospatial data.

## 2.2 GIS Data Preparation and Reporting:

- Creation of GIS Layers: Develop GIS layers that represent topography, infrastructure assets, land features, and watershed characteristics.
- Spatial Data Set Development: Create spatial data sets that can be integrated with existing hydrological models and other data sets to enhance analysis and decision-making
- Final GIS Maps and Reports: Produce final GIS maps and detailed reports for use in planning, decision-making, and ongoing water resource management efforts.

## 2.3 Establishment of DGPS Control Points

The bidder shall establish both Primary Ground Control Points (PGCPs) and Secondary Control Points (SCPs) using Differential Global Positioning System (DGPS) techniques. These control points will form the foundational geospatial reference for all mapping and analysis tasks in the project.

### 2.3.1 Primary Ground Control Points (PGCPs):

- The bidder shall establish permanent benchmarks using Standard Benchmark Type Design 08, as prescribed by the Water Resources Department.
- Each PGCP shall be constructed using a 1:2:4 cement concrete mix and shall be designed to withstand environmental and physical stress over time.
- The precise coordinates (latitude, longitude, and elevation) shall be determined using DGPS observations with sub-centimeter accuracy.
- Benchmarks shall be properly labelled and geo-tagged with durable plates and documented with photos and sketches.

### 2.3.2 Secondary Control Points (Temporary Benchmarks):

- Temporary DGPS control points shall be established across the project area to support ongoing topographic, environmental, and hydrological surveys.
- These SCPs may not be constructed as physical pillars but must be appropriately marked and referenced with high-accuracy coordinate.
- Locations and coordinates of all SCPs must be included in the final geodatabase.

### Summary of Tasks:

- Establish permanent PGCPs with Standard Design 08 using 1:2:4 concrete.
- Determine precise coordinates using DGPS and RTK methods.
- Establish temporary SCPs as needed for intermediate control.
- Document all control points with photographs, coordinates, and location descriptions.

## **3. Surveying, Feature Digitization, and LULC Mapping**

The bidder shall conduct detailed topographic and thematic mapping, supported by feature digitization and remote sensing. The purpose is to generate accurate base maps for further environmental and hydrological analysis.

### 3.1 Reconnaissance Survey:

- A preliminary site reconnaissance must be carried out to understand the physical setting, accessibility issues, natural features, and anthropogenic influences.
- The bidder must submit a reconnaissance report summarizing observations, constraints, and preliminary layouts of the control network.

### 3.2 Feature Digitization:

- The bidder shall digitize key natural and man-made features such as:
  - Rivers and streams
  - Roads and paths
  - Settlements and infrastructure
  - Agricultural plots and water bodies
- This digitization shall be based on high-resolution satellite imagery and verified through field surveys.

### 3.3 Land Use and Land Cover (LULC) Mapping:

- The bidder shall prepare up-to-date LULC maps using recent satellite data and field validation.
- Classification shall follow standard LULC categories (e.g., forest, agricultural land, water bodies, built-up areas, barren land).
- Change detection (if applicable) shall be performed to assess historical shifts in land cover .

### **Summary of Tasks**

- Conduct field reconnaissance and submit report
- Digitize features from field and satellite data.
- Prepare and validate detailed LULC maps.
- Submit all spatial layers in standard GIS formats.

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## 4. Environmental and Hydrological Study

The bidder shall carry out a thorough assessment of environmental and hydrological aspects to identify risks, opportunities, and strategies for sustainable resource management.

### 4.1 Catchment Area Study C Management Plan:

- Delineate the catchment area using topographic and satellite data.
- Assess hydrological behavior including runoff, infiltration, and storage.
- Identify erosion-prone zones and propose a catchment management plan focusing on soil conservation, vegetation restoration, and water retention.

### 4.2 Drainage and Waterlogging Assessment:

- Analyze existing drainage patterns and evaluate the causes of waterlogging (if any).
- Map all major and minor drainage channels.
- Identify critical bottlenecks and propose drainage improvement measures.

#### 4.3 Hydrological and Flood Analysis:

- Conduct flood modelling using rainfall-runoff and hydraulic models (e.g., HEC-RAS, SWAT).
- Simulate flood-prone areas under various return periods.
- Recommend flood mitigation strategies such as embankments, retention basins, or zoning.

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### 5. Documentation, Reporting, and GIS Deliverables

The bidder shall be responsible for compiling all collected data, analyses, and findings into comprehensive documentation, supported by GIS deliverables.

#### 5.1 Reporting:

- Prepare and submit reports for:
  - Control point establishment
  - Survey and mapping
  - Environmental and hydrological assessments
- Each report must include data tables, figures, maps, photographs, and references.

#### 5.2 GIS Deliverables:

- Submit all spatial data in standardized formats (e.g., Shapefile, GeoTIFF, KML).
- Provide metadata for each GIS layer.
- Submit a geodatabase covering:
  - Control point coordinates
  - Digitized features
  - LULC layers
  - Hydrological and environmental maps

#### **Summary of Tasks :**

- Prepare technical reports for each component.
- Submit GIS datasets, maps, and metadata.
- Organize a final presentation / workshop to share findings with stakeholders (if required)

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### 6. Final Recommendation and action plan

Based on the findings from all components, the bidder shall develop a set of final recommendations and an implementation roadmap & for the preparation of **Detailed Project Report** for various project of Water Resources Department Chhattisgarh.

- Recommendations should address
  - Long-term sustainability of natural resources
  - Flood resilience and climate adaptation

- Environmental safeguards
- Land use planning and zoning guidance
- A roadmap or action plan should be prepared with clear short-term, medium-term, and long-term interventions.

**Summary of Tasks:**

- Provide strategic recommendations for sustainable development.
- Prepare a phased action plan for implementing key findings
- Ensure alignment with environmental, social, and economic objectives.

## **B. Hydrographic Survey (Aquatic Terrain Mapping)**

### **1. Survey planning & Execution:**

- Hydrographic Survey Planning: Develop a detailed plan for the hydrographic survey, focusing on key water bodies such as reservoirs, dams, and rivers.
- Identification of Critical Underwater Features: Identify and prioritize critical underwater features and submerged infrastructure (e.g., gates, spillways, dam foundations) that need to be mapped.

#### **1.1 Aquatic Terrain Mapping Execution:**

- Survey Conduct: Perform Aquatic Terrain Mappings using high-precision echo sounders and sub-bottom profilers to capture underwater topography, depth profiles, and sediment layers.
- Data collection: Collect depth data, water levels, sedimentation rates, and underwater infrastructure mapping for comprehensive understanding.

### **2. Data Processing and integration:**

- Bathymetric Data Processing: Process Aquatic Terrain Mapping data to generate detailed maps of underwater features, including depth contours, submerged sets, and water body profiles.
- Data Integration into GIS: Integrate hydrographic data with airborne survey data, creating a comprehensive GIS dataset that includes both terrestrial and aquatic features for further analysis.

#### **2.1 Hydrographic Map Creation:**

- Map Generation: Create detailed bathymetric maps that highlight depth contours, submerged infrastructure, and hydrological features such as sediment layers.
- Risk Identification and Recommendations: Identify potential risks related to underwater Features and provide recommendations for infrastructure inspection and maintenance.

## **C. Asset Mapping and Tagging**

### **1. Infrastructure Identification and Mapping**

- Identification and documentation of critical infrastructure assets such as dams, embankments, sluice gates, floodgates, canals, reservoirs, and spillways.
- Mapping of infrastructure using advanced LiDAR, aerial imagery, and UAV-based surveys for asset condition assessment and spatial analysis.

### **2. Asset Tagging:**

- Geospatial tagging of infrastructure to associate detailed metadata (e.g., condition, functionality) with mapped assets.
- Use of UAVs for asset-specific surveys and tagging to ensure that all critical infrastructure is mapped accurately.

## **D. Aerial Acquired Data Integration and Visualization**

### **1. Platform Integration:**

- Integration of aerial acquired data (topographic, bathymetric, infrastructure, and land use) into a cloud-based GIS platform for centralized storage and visualization.
- Provision of visualization tools, including interactive dashboards, to assist stakeholders in spatial analysis and decision-making.

#### **1.1 Final Reports and Documentation:**

- Creation of reports detailing survey methodologies, data processing techniques, findings, and recommendations
- Development of user manuals and guides to assist stakeholders in navigating the GIS platform for effective data visualization.

#### **1.2 Data Accessibility and Sharing:**

- Implementation of secure cloud-based storage solutions for efficient and scalable access to aerial acquired data.
- Establishment of data sharing mechanisms for authorized users to ensure seamless access and sharing among stakeholders for visualization and analysis.

### **2. Web-Based GIS Platform Features:**

**3D Visualization:** The platform will provide advanced 3D visualization of aerial data, allowing users to interactively explore and analyses geographic regions, terrain, buildings, and infrastructure. This feature enhances spatial understanding by presenting data in a realistic 3D environment, making it easier to interpret geographic relationships and patterns.

**Centralized Cloud Storage:** The platform will offer a secure and scalable cloud-based repository for storing aerial data. This centralized storage will ensure efficient data management, integrity, and real-time updates, providing seamless access to spatial data across the platform. The focus will be on storing and visualizing the data, with easy retrieval and synchronization capabilities.

### **III. Project Area Overview for Survey and Data Collection**

This section provides a comprehensive overview of the designated survey areas and the specific data collection requirements for the Watershed Intelligence & Planning; Asset Mapping project Bidders are required to conduct both airborne surveys (MAV & UAV-based) and hydrographic to the surveys (bathymetric) across key areas outlined below. The gathered data will be integral to the planning, management, and maintenance of water resources and associated infrastructure of Accurate survey execution is essential for enhancing water safety, ensuring the functionality of critical infrastructure, and supporting long-term water resource management in the region.

#### **A. Survey Area and Data Collection Scope**

The project areas are defined as major command areas within the watershed regions, as outlined in the table below. These areas include terrestrial and aquatic environments, which will require airborne surveying for topographic mapping and hydrographic surveys for underwater features and infrastructure.

Total Gross Command Area (GCA): 2,00,000 hectares

These command areas encompass critical regions used for agriculture and irrigation, as well as critical infrastructure supporting water distribution and storage. The project's focus includes mapping and surveying both cultivated and non-cultivated lands, water bodies, and infrastructure that form part of the region's irrigation system.

### **IV. Detailed Scope of Work**

#### **A. Airborne Survey Requirements (MAV & UAV-based)**

##### **1. Survey Area Identification and Execution**

The consultant will be responsible for identifying and executing surveys across the designated command and watershed regions. This will require both large-scale and targeted data collection. Specifically, the survey areas will include:

- Irrigation command areas where water management infrastructure such as canals, sluice gates, and

reservoirs are present.

- Watershed regions for mapping critical water resources and assessing potential floodplain zones.

## 2. Flight Path and Data Point Establishment

- MAV (Manned Aerial Vehicle)-based Surveys: For large-scale topographic mapping of the command areas, aerial surveys will be planned using MAVS equipped with LiDAR and RGB sensors to capture terrain elevation, floodplain characteristics, land cover, and vegetation.
- UAV (Unmanned Aerial Vehicle)-based Surveys: For more precise, high-resolution mapping of critical infrastructure such as dams, sluice gates, embankments, spillways, and irrigation networks, UAVs equipped with high-resolution cameras and LiDAR sensors will be deployed.

## 3. Airborne Survey Data Collection Focus

The data collection will focus on generating:

- Digital Elevation Models (DEMs) of the terrain
- Topographic maps and floodplain delineation for planning irrigation and water management systems.
- Vegetation mapping, particularly around water bodies and critical infrastructure.
- High-resolution imagery for detailed assessment of infrastructure conditions.

### **B. Hydrographic Survey Requirements (Aquatic Terrain Mappings)**

#### 1. Hydrographic Survey Planning and Execution

- Aquatic Terrain Mappings will be conducted in key water bodies, including reservoirs, rivers, and other critical water features within the command areas.  
Surveys will focus on depth profiles, underwater topography, and sedimentation rates to assess water storage capacity, infrastructure condition, and potential risks to infrastructure integrity.

#### 2. Underwater Infrastructure Mapping

Special attention will be given to mapping submerged infrastructure such as dam foundations, spillways, gates, and sluice gates. This will involve:

Using high-precision echo sounders and sub-bottom profilers to capture depth contours, sediment layers, and submerged assets.

- Identifying critical underwater features for risk assessment and future inspection.

#### 3. Data Collection

- Depth Data: Collect precise depth profiles to map the underwater features of reservoirs and rivers.
- Sedimentation Analysis: Capture sedimentation rates to assess the build-up of material that

may affect the storage capacity and operational safety of water bodies.

### **C. GIS Data Integration and Cloud Platform for Data Visualization and Storage**

The government seeks a cloud-based platform exclusively for data visualization and storage of geospatial data collected from airborne and hydrographic surveys. The cloud solution will serve as a centralized repository for both terrestrial and aquatic data, enabling easy access and visualization by stakeholders. No development or advanced processing of the data will be required on the platform itself.

#### **1. GIS Data Integration into the Cloud Platform:**

- The bidder will be responsible for ensuring the integration of the following types of data into the cloud platform:
  - Topographic Data: Land features, terrain elevation, floodplains, and vegetation.
  - Hydrographic Data: Bathymetric data such as depth contours, sedimentation rates, and submerged infrastructure.
- Infrastructure Data: Mapped assets such as dams, sluice gates, canals, reservoirs, and spillways.

#### **2. Cloud Platform Usage:**

- The platform will serve visualization and storage of geospatial data. The data should be easily accessible for stakeholders to view, but no advanced analysis or processing of data will occur on the platform.
- The bidder will ensure that the cloud platform is secure and scalable, providing storage capacity and the ability to visualize data in a user-friendly manner.

The bidder's role will be limited to ensuring smooth integration of the collected data into the cloud platform, ensuring that the platform supports basic visualization and storage functionalities without any additional development or processing capabilities.

#### **3. Final GIS Reports and Mapping**

Bidders will be expected to deliver:

- GIS layers representing the full scope of the survey, including detailed maps and reports.
- Risk identification related to both terrestrial and aquatic features, with specific recommendations for infrastructure monitoring and maintenance.

#### **4. Responsibilities of the Bidder:**

##### **i. Cloud Platform Setup for Data Storage and Visualization:**

- The bidder will ensure the integration and storage of GIS data in a cloud platform, providing centralized storage and real-time access for all authorized stakeholders.
- The platform will be set up to support data visualization and storage functionality, ensuring that the data is easily viewable and accessible by stakeholders.

ii. Data Visualization:

- The bidder will integrate basic visualization tools into the cloud platform, enabling stakeholders to view geospatial data through 2D/3D maps and interactive dashboards.

iii. Data Accessibility and Sharing:

- The platform will be designed to provide secure and easy access to the data, ensuring that all authorized users can view the stored data whenever needed.
- The bidder will ensure the platform supports data sharing features, enabling authorized stakeholders to access and retrieve data for decision-making purposes.

**The bidder will ensure that the cloud platform meets the requirements for data storage, visualization, and secure sharing among stakeholders, enabling efficient access and collaboration.**

## **V. Deliverables**

The deliverables for this consultancy will be aligned with the key objectives outlined earlier. The consultant is expected to provide high-quality, accurate data and comprehensive reports in formats that are compatible with the WRD's existing systems. Below is a breakdown of the primary deliverables, along with the specific data formats and expected outputs:

<b>Sl. No.</b>	<b>Description of Deliverable</b>	<b>Details / Format</b>
1	Topographical and Bathymetric GIS Maps	GIS-ready digital maps representing terrain, water features (submerged & land), and asset locations.  Data in GeoTIFF, Shapefile (SHP), or KML format.
2	3D Point cloud and 2D Maps of Infrastructure and Surrounding Areas	High-resolution 3D Point cloud and 2D maps representing infrastructure (dams, reservoirs, sluice gates, etc.) and surrounding areas.  Data in 3D Point cloud format (OBJ/LAS) and PDF for visualization.
3	Integrated GIS Data (Land Use, Infrastructure, and Water Features)	Fully integrated GIS datasets containing topography, land use, water features, and infrastructure assets.  Data in Shapefile (SHP), Geo JSON, or File Geodatabase (GDB) format.
4	Survey Data Reports	Detailed reports documenting survey methodologies, data processing steps, and accuracy assessments.  Report in PDF or MS Word format.
5	Aquatic Terrain Mapping Data	Depth, sedimentation, and underwater feature maps of

		critical water bodies. Data in XYZ points (CSV) for depth and sedimentation, and GeoTIFF for bathymetric maps.
6	Final Documentation and Presentation	A comprehensive document summarizing all survey results, GIS data, and asset assessments. Data in PDF format, with accompanying PowerPoint presentation for stakeholder briefings.
7	Cloud GIS Platform with advanced visualization	Cloud-based platform for the storage and visualization of GIS data, offering interactive mapping and basic 3D visualization tools. The platform will ensure real-time access to data, with secure storage for authorized stakeholders to easily view and manage geospatial information.
8	User Manual and Training Material	A guide for stakeholders on how to navigate and utilize the GIS platform, along with instructions on data access and analysis. User manual in PDF format, with training presentations in PowerPoint.
9	Data Accessibility and Sharing Mechanisms	Secure cloud storage solutions for easy and scalable access to all data. The data will be provided in cloud-based systems (Google Drive, AWS, or similar) with access-controlled sharing.

## **Detailed Explanation of Deliverables:**

### **1. Topographic and Bathymetric GIS Maps:**

These maps will represent the terrain and bathymetric features (underwater topography) of key water bodies. The topographic maps will include land features such as elevation contours, floodplains, vegetation, and land use in the watershed and command areas. Bathymetric maps will show depth contours, submerged infrastructure, and sedimentation in reservoirs, rivers, and dams. These maps will be available in formats such as **GeoTIFF** (for raster data) and **Shapefile** (for vector data), allowing for easy integration with existing GIS tools.

### **2. 3D Point cloud and 2D Maps of Infrastructure:**

These will include detailed models of infrastructure such as dams, sluice gates, embankments, canals, and reservoirs, generated from both MAV (Heliborne) and UAV surveys. The 3D models will help visualize the spatial relationships between various assets and the surrounding environment. The output will be in **3D Point cloud format (OBJ/LAS)** for visualization in 3D, GIS platforms and **PDF** format for easy printing and sharing.

### **3. Integrated GIS Data:**

The GIS datasets will include all the collected data from both airborne and hydrographic surveys. These data will be integrated into a unified format, which will include layers for land use, topography, water features, and infrastructure assets. The data will be delivered in Shapefile (SHP), or File Geodatabase (GDB) format, which are widely accepted by GIS platforms.

#### **4. Survey Data Reports:**

The consultant will provide detailed technical reports documenting the methodologies used for data collection, processing, and validation. The report will include information on survey specifications, data quality checks, error analysis, and a summary of findings. The final report will be delivered in PDF or MS Word format.

#### **5. Aquatic Terrain Mapping Data:**

Hydrographic data will include bathymetric profiles showing the depth, sediment layers, and underwater features of critical water bodies such as reservoirs and riverbeds. This will also include underwater asset mapping of structures such as gates and spillways. Data will be provided in CSV format for depth measurements and GeoTIFF format for bathymetric maps. Final Documentation and Presentation:

The consultant will submit a comprehensive report that summarizes all survey findings, the GIS data generated, and any recommendations or actionable insights. This will include a presentation for WRD's stakeholders, summarizing the project results. Both the report and presentation will be delivered in PDF and PowerPoint format, respectively.

#### **6. GIS Web-based Platform:**

A key deliverable will be a web-based platform for stakeholders to visualize and store GIS data, supporting 3D visualization and dynamic mapping. The platform will follow Web-GIS standards, ensuring scalability and user-friendliness for efficient data access. and management.

#### **7. User Manual and Training Material:**

To ensure that WRD personnel can effectively use the platform and visualize the data, the consultant will provide a user manual with detailed instructions on accessing and analyzing the GIS data. Additionally, training presentations will be prepared for WRD staff, and both the manual and presentations will be delivered in PDF and PowerPoint formats.

#### **8. Data Accessibility and Sharing Mechanisms:**

All survey data, GIS layers, reports, and other deliverables will be uploaded to a secure cloud platform to ensure easy and scalable access. The cloud platform will allow authorized WRD personnel to access and visualize the data. The data will be stored in formats compatible with common GIS software, and the platform will support access-controlled sharing.

### **Terms of Reference (TOR) for Data Products and Technical Specifications**

#### **1. Overview:**

This document outlines the minimum requirements for data products from Heliborne (MAV), UAV, and Hydrographic surveys. These specifications ensure that the geospatial data collected meets the necessary standards for integration into GIS platforms for accurate analysis. Bidders must adhere to these minimum standards.

## **2. Data Products for Heliborne (MAV) Survey:**

Bidders must deliver LiDAR point cloud data in LAS/LAZ format with a minimum point density of 10 points per square meter, horizontal accuracy of +10 cm, and vertical accuracy of  $\pm 15$  cm. The resolution for terrain modelling should be at least 10 cm (GSD) in tiff format.

- Orthophotos must have a minimum GSD of 10 cm, with horizontal accuracy of  $\pm 10$  cm and vertical accuracy of 15 cm. Data must be delivered in GeoTIFF or TIFF format.
- The Digital Elevation Model (DEM) and Digital Terrain Model (DTM) should have a 1-meter grid resolution and vertical accuracy of +15 cm, in GeoTIFF or ASCII Grid format.

## **3. Data Products for UAV Survey:**

- UAV Orthomosaic should have a GSD of at least 10 cm, with horizontal accuracy of 10 cm and vertical accuracy of 15 cm, in GeoTIFF or TIFF format.
- The bidder must also provide 3D models (mesh or point cloud) with a GSD of 10 cm, DSM, and DTM with a 1-meter grid resolution and vertical accuracy of 15 cm, in GeoTIFF or ASCII Grid format.
- Additionally, an asset condition report based on UAV data must be delivered in PDF or DOCX format.

## **4. Data Products for Hydrographic Survey:**

- A bathymetric map with depth contours (0.5 to 2-meter intervals) and a 1-meter grid resolution is required, in GeoTIFF or Shapefile format. The sediment layer map and submerged infrastructure map should also be in GeoTIFF or Shapefile format.

## **5. DGPS Control Point Establishment**

### **5.1 DGPS Control Point Report**

- Description, methodology, and procedures for establishing Primary and Secondary DGPS control points.
- Coordinates (latitude, longitude, elevation) with accuracy details.
- Photographs, sketches, and maps showing locations.
- Details of pillar construction (for primary points), including materials used and quality control.
- Format: PDF report + GIS-compatible data (Shapefile/KML)

### **5.2 Control Point Geodatabase**

- Geo-referenced locations of all benchmarks (primary and secondary).
- Attribute data including point ID, coordinates, elevation, installation date, and pillar status.
- Format: ESRI Shapefile/Repackage + Metadata documentation

## **5. Surveying, Mapping, and Digitization**

### **5.1 Reconnaissance Survey Report**

- Summary of field observations.
- Terrain assessment, constraints, and control point planning.
- Initial maps with proposed layout.
- Format: PDF

### **5.2 Feature Digitization Output**

- Digitized spatial layers for natural and man-made features (e.g., rivers, roads, settlements).
- GIS data with attribute information (feature name, type, condition).
- Format: Shapefile/GeoPackage + Metadata + Map layouts (PDF/JPEG)

### **5.3 Land Use and Land Cover (LULC) Report and Maps**

- Methodology used for LULC classification (including satellite sources).
- Final LULC classification maps with legends and area statistics.
- LULC Change Detection Analysis (if required).
- Format: PDF Report + Thematic maps (PDF and GeoTIFF) + GIS Layers

## **3. Environmental and Hydrological Studies**

### **3.1 Catchment Area Study & Management Plan**

- Catchment delineation maps and hydrological characteristics.
- Erosion-prone zones, runoff analysis, and recommendations.
- Format: PDF report + Catchment maps (PDF + GIS format)

### **3.2 Drainage and Waterlogging Assessment Report**

- Maps and analysis of drainage patterns and waterlogged areas.
- Proposed improvement strategies and technical designs.
- Format: PDF Report + Drainage maps (PDF + Shapefile)

### **3.3 Hydrological and Flood Analysis Report**

- Description of hydrological/flood models used.
- Flood hazard and inundation maps for various return periods.
- Recommendations for flood control and mitigation.
- Format: PDF Report + Simulation models (if applicable) + Flood maps (PDF + GIS layers)

## **4. Documentation and GIS Data Deliverables**

#### 4.1 Final Technical Report

- Comprehensive project report covering all activities, analyses, and conclusions.
- Integration of survey, environmental, hydrological, and land use findings.
- Format: PDF + Editable Word copy

#### 4.2 GIS Database and Digital Atlas

- Structured geodatabase containing:
  - Control points
  - Digitized features
  - LULC
  - Drainage and flood maps
- Digital map atlas containing thematic layers (LULC, hydrology, flood zones, etc.)
- Format: GIS files (Shapefiles/GeoPackage), GeoTIFFs, metadata + Map booklet in PDF

#### 4.3 Stakeholder Presentation

- PowerPoint presentation summarizing major findings and recommendations.
- To be presented in a stakeholder meeting or review session.\
- Format: PowerPoint + Handouts (PDF)

### 5. Recommendations and Action Plan

#### 5.1 Strategic Recommendations Report

- Sector-wise and theme-wise development and conservation recommendations.
- Integration of environmental, hydrological, and land use perspectives.
- Format: PDF Report + Action Plan Matrix (Excel/PDF)

#### 5.2 Implementation Roadmap

- Phased action plan outlining short, medium, and long-term interventions.
- Resource requirements, institutional roles, timelines, and potential funding sources.
- Format: PDF report + Gantt Chart or Timeline (Excel or MS Project)

### 6. General Requirements:

- **Accuracy:** Horizontal accuracy must be  $\pm 10$  cm, and vertical accuracy  $\pm 15$  cm for all products.
- **Resolution:** Orthophoto/Orthomosaic GSD: 10 cm; LiDAR point cloud density: 10 pt/m<sup>2</sup> (MAV).
- **Formats:** LAS/LAZ (point cloud), GeoTIFF, TIFF, ASCII Grid (DEM/DTM), topographic map in Shapefile.
- **Delivery:** Data must be organized with clear folder structures, and metadata must be included for each dataset, detailing the source, accuracy, and processing steps.

These minimum requirements ensure the delivery of high-quality geospatial data for accurate GIS-based analysis.

## Provision and support of GIS-Based Cloud Platform for Project Duration

The GIS-based cloud platform will be provided to the department for the duration of the project period, which is 1 year. The bidder will be responsible for the following during this period:

- 1. Provision of GIS Platform:** The bidder will ensure access to the GIS platform for data visualization, management, and storage exclusively for the project period.
- 2. Platform Maintenance and Updates:** The bidder will be responsible for maintaining the platform and ensuring it remains up-to-date and fully functional throughout the project period.
- 3. Technical Support:** The bidder will provide technical support to assist WRD staff with any issues related to the platform's usage during the project duration.

## VII. Eligibility Criteria for Bidders

Bidders submitting the response to this Bid for the Preparation of GIS Data through Airborne and Hydrographic Survey for Command & Watershed Areas and Asset Mapping for the Water Resources Department (WRD), Government of Chhattisgarh, must fulfil the following eligibility criteria in full. Only those bidders who meet the criteria outlined below will be considered for the technical evaluation and subsequent award of work.

S. No.	Parameter	Documentary Evidence
1	<p>The bidder shall be a legal entity registered as a Pvt Ltd/Public Ltd. Company registered under the Indian Companies Act, 1956/2013; or a Limited Liability Partnership (LLP) registered under the LLP Act, 2008; or a Proprietary Firm in India and should be in operations for a period of at least 5 (five) years.</p> <p>i. Copy of Certificate of Incorporation /Registration/LLP deed ii. MOA &amp; AOA iii. PAN iv. GST</p>	<p>i. Certificate of Registration/Incorporation under companies Act 2013/Relevant Registration certificate ii. MOA &amp; AOA iii. PAN iv. GST</p>
2	<p><b>Financial Turnover:</b> The lead bidder must have a minimum average annual financial turnover of INR 40 Crores for the preceding three financial years: FY 2022-23, FY 2023-24 and FY 2024-25 in their company's name.</p>	<p>i. Audited Balance sheet duly certified by Statutory Auditor / Chartered Accountant with UIDN No mention should be submitted for financial year (FY 2022-23, FY 2023-24 and FY 2024-25) ii. Turnover certificate duly</p>

		certified by Statutory Auditor Chartered Accountant with UDIN
3	<b>Bidder's Experience in Similar Works:</b> The lead bidder must have a minimum of one service contract of value not less than INR 5 Crores executed in their name, which includes Aerial Survey. The contract should have been carried out for any of the State/Central Govt/PSUs in the last 5 FY.  Only completed work will be considered.	Relevant Copy of work order and one completion certificate should be submitted by the bidder.
4	<b>Blacklisting:</b> The bidders must not be blacklisted by any Government department or PSU as on bid submission date.	A Self-declaration/Undertaking on bidder's letterhead stating that the bidder is not backlisted should be provided in this regard.

### Evaluation Criteria

The evaluation of technical proposals for the Preparation of GIS Data through Airborne and Hydrographic Survey for Command & Watershed Areas and Asset Mapping for the Water Resources Department (WRD), Government of Chhattisgarh, will be undertaken by the Tender Evaluation Committee based on the following criteria:

#### **A. Evaluation of Technical Proposals:**

The evaluation process will follow these broad steps:

1. After receipt of technical bids within the prescribed date, an authorized officer or committee of WRD Chhattisgarh, shall undertake the exercise for evaluation of the technical bids for which the marks allocated shall primarily be decided on the basis of information/ data available in the technical bid document.
2. The evaluation of the technical bid of the tender(s) shall very much depend upon the technical strength of the bidder, the qualification & experience of the manpower deployed, the turnover of the company, the nature of the projects executed of the similar type etc.
  - The bidder shall be awarded marks based on documents (e.g. Performance certificates, Completion certificates, financial turnover, availability of various resources eg, survey instruments, software, hardware, infrastructure etc.) provided by him with the technical bid.
  - The bidder must provide details such as description & work experience of the company, technical qualification & experience of manpower, availability of survey instruments /hardware/software(s) with the company, turnover of the company, work schedule and understanding of the objectives

and scope of work to satisfy the work requirements and time schedule.

- The bidder must provide the methodology, work plan strategy, capabilities of procuring /processing/analyzing/plotting of survey data, schedule of completion etc. which he proposes and project management approach to which he will stick. Any failure to the work schedule will invite a penalty. The bidder shall provide all relevant details justifying the technical competence of the agency as per the evaluation criteria indicated below.

3. No cognizance will be taken of any further supporting documents or clarifications or any such additional information furnished subsequently by the bidder. However, WRD Chhattisgarh reserves the right to call for such clarifications confined to the scope to the content of the technical bid, if such clarification becomes necessary for the proper judgment in the evaluation of the bids.

4. The exercise for evaluation of technical bid shall be undertaken by the duly constituted Technical Evaluation Committee, based on the following broad criteria and their weightage shown against them:

S. No.	Description	MM	Documentary Evidence
1	The bidder /consortium shall be a legal entity registered as a Pvt Ltd/Public Ltd. Company registered under the Indian Companies Act, 1956/2013; or a Limited Liability Partnership (LLP) registered under the LLP Act, 2008, or a Proprietary Firm in India and should be in operations for a period of at least 5 (five) years.	10	i. Certificate of Registration/Incorporation under companied Act 2013/Relevant Registration certificate ii. MOA & AOA iii. PAN iv. GST
2	<b>Financial Turnover:</b> Average Annual turnover of the bidder /consortium from the last 3 financial years ending 31st March 2025 should not be less than INR 40 Crores. i. ≥ INR 40 Crores and < 50 Crore: 10 Marks ii. Above INR 50 Crores: 15 Marks	15	i. Audited Balance sheet duly by certified Statutory Accountant with UDIN mentioned should be Auditor/Chartered submitted for financial year (FY 2022-23, FY 2023-24 and FY 2024-25) ii. Turnover certificate duly certified by Statutory Auditor/Chartered Accountant with UDIN
3	<b>Bidder's Experience in Similar Works:</b> The lead bidder must have a minimum of one service contract of value not less than INR 5 Crores executed in their name, which includes Aerial Survey. The contract should have been carried out for any of the State/Central Govt/PSUs in the last 5 FY. <b>Only complete works will be considered.</b>	10	Relevant Copy of work order and completion certificate should be submitted by the bidder.
4	Must have done aerial survey including EIA /Preparation of Detailed Project Report	10	Completion certificate is required

	including Survey of value 8 cr or above in single work order for any of the Central/State Govt/PSUs in the last 5 FY.		
5	The lead bidder should have completed work related to Topographical Survey using MAV with lidar including cloud platform & analysis for Water Resources/Irrigation/Forest of at least INR 20 Crore in single work order for any of the Central/State Govt/PSUs in the last 3 FY. AND Bidder should have the following equipment: 1. At least one MAV LIDAR Scanner (Owned) 2. Optical camera with a resolution of 150 MP and above (Owned) Aircraft (Owned/Leased)	20	Relevant copy of work order & completion certificate along with DGCA permit of the same project. AND lease Invoice copy, Custom Duty paid Copy and Aircraft agreement should be submitted as a proof.
6	The lead bidder should have completed minimum two projects of Aerial Survey using Drone/Aircraft of value Rs.10 cr. each for any of the Central/State Govt/PSUs in the last 3 FY.	5	Relevant Copy of work order and completion certificate should be submitted by the bidder.
7	Bidder's competence procedures, workplan and approach. Presentation in this regard will be conducted by department with the pre-qualified bidders	30	Technical Presentation shall consist of:  a) Understanding of the scope of work b) Proposed methodology and timeline for execution c) Experience of similar work

6. It is at the sole discretionary power of the W.R.D. Chhattisgarh to empanel Bidders.

7. Each or any firm, if desired by WRD Chhattisgarh, may be required to give an oral/power point presentation for the information given by them before the Tender Evaluation Committee either through online or offline during the validity of the tender for final technical evaluation of bid. This will enable W.R.D. CHHATTISGARH to ascertain their understanding of the scope and the technical specifications of the work involved.

## Payment Terms

The payment for the consultancy services under this will be made based on the successful completion of defined milestones. The payment will be made in sections as outlined below.

### **Phasing of Payment for Consultancy: GIS Data Preparation through Airborne and Hydrographic Surveys**

#### **Payment Milestones:**

<b>S. No.</b>	<b>Payment Milestone</b>	<b>Payment Percentage</b>	<b>Conditions</b>
1	Mobilization Advance	20%	Payment will be made upon signing of the contract and mobilization of resources.
2	Submission of Raw Data	40%	Payment will be made as per BOQ Section 1 & 2. Payment is based on the unit rate, proportional to the data. acquired at the time of monthly billing.
3	Submission of Processed Data and Report Generation	30%	Payment will be made as per BOQ Section 1& 2. Payment is based on the unit rate, proportional to the area completed during monthly billing.
4	Final Data Verification and Approval	10%	Payment will be made after the department verifies and approves the final data, as per BOQ Section 3.

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