Software Requirements Specification

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1 Introduction

1.1 Overview

Gujarat Mineral Development Corporation Limited (GMDC), a Government of Gujarat Enterprise, with its diverse portfolio encompassing mineral exploration, exploitation, green energy generation, and mineral sales, operates across Gujarat and Odisha. Recognizing the criticality of efficient land management for its mining operations, GMDC seeks to develop or customize a robust Land Management System.

This system will be instrumental in:

- Managing, tracking, and streamlining various stages of land management: encompassing both land acquisition and critical land information essential for efficient and productive mining while mitigating associated risks.
- Supporting the monitoring of land acquisition status: facilitating activity planning and tracking to achieve key milestones across different land categories.
- Addressing statutory and internal activities related to land matters: including pre-acquisition activities during land and lease agreements, during acquisition updates on land acquisition approval status, and post-acquisition tracking of approvals and activities on acquired land.

The system will encompass key functionalities such as:

- Data Collection and Collation
- Indexing & Categorization of legacy data/physical records
- Authority mapping/Validation/Authentication
- Uploading legacy data/physical records
- Geo-Database development (Drone Survey/DGPS survey/Satellite Image)
- Document Management /Generation of all types of reports
- Query Module (Map Based/Plot Based/Activity based/Land Use based)
- Reports & Dashboard (Village wise land summary/Land classification wise Land Schedule/Land Statistics over Inside and Outside Project area/Khatian or Tenant Wise Land/Award/Payment/Kisam Wise Land Abstract/R&R Entitlement Summary)

Whether developed in-house or customized from an existing product, GMDC will maintain exclusive ownership of the Source Code, Customized Source Code, and Data. The system's database design will ensure data integrity and future usability without any loss. This comprehensive Land Management System will empower GMDC to optimize its land operations, enhance efficiency, and minimize risks associated with land acquisition and management.

The indicative list of locations to be considered during the implementation of the Land Management System is given below.

61 N			Approx Area	
SI. No.	Name of the Project	ProjectLocation(Hectare)GUJARATIte ProjectTaluka-Valia, Dist-Bharuch3012bur LigniteTaluka-Lakhpat, Dist-Kutch2960bur LigniteTaluka-Ghogha Dist-Bhavnagar3672bur LigniteTaluka-Lakhpat, Dist-Bhavnagar1753bur LigniteTaluka-Lakhpat, Dist-Kutch1753c ProjectTaluka-Lakhpat, Dist-Kutch2187c ProjectTaluka-Jhagadia, Dist-Surat385c ProjectTaluka-Jhagadia, Dist-Bharuch385c ProjectTaluka-Jhagadia, Dist-Bharuch385c ProjectTaluka-Jhagadia, Dist-Bharuch385c ProjectTaluka-Jhagadia, Dist-Bharuch183c ProjectTaluka-Jhagadia, Dist-Bharuch1380c ProjectTaluka-Jhagadia, Dist-Bharuch1600c ProjectTaluka-Mandvi Dist- Surat1600c ProjectTaluka-Kwant, Dist-1600		
	GI	JJARAT	()	
1	EFG (Valia) Lignite Project	Taluka-Valia, Dist-Bharuch	3012	
2	Lakhpat - Punrajpur Lignite Project	Taluka-Lakhpat, Dist-Kutch	2960	
3	Surkha (North) Lignite Project	Taluka-Ghogha Dist-Bhavnagar	3672	
4	Mata-No-Madh Lignite Project	Taluka-Lakhpat, Dist-Kutch	1753	
5	Umarsar Lignite Project	Taluka-Lakhpat, Dist-Kutch	2187	
6	Tadkeshwar Lignite Project	Taluka-Mandvi, Dist-Surat	965	
7	Rajpardi Lignite Project	Taluka-Jhagadia, Dist-Bharuch	385	
8	Rajpardi (Amod G-19) Lignite Project	Taluka-Jhagadia, Dist-Bharuch	183	
9	Panandhro Extension Lignite Project	Taluka-Lakhpat, Dist-Kutch	998	
10	Damlai Lignite Project	Taluka-Jhagadia, Dist-Bharuch	1380	
11	Ghala Lignite Project	Taluka-Mandvi Dist- Surat	1600	
12	Kadipani Fluorspar Project	Taluka-Kwant, Dist- Chhotaudepur	172	
13	Akrimota Thermal Power Station	Taluka-Lakhpat, Dist-Kutch	328	
14	Panandhro Lignite Project	Taluka-Lakhpat, Dist-Kutch	568+1151	

-			
15	Mevasa Bauxite Project	Taluka – Kalyanpur, Dist. – Devbhoomi Dwarka	187
16	Shivrajpur Bauxite Project	Taluka -Halol, Dist. Panchmahal	455
17	Gorsar Wind Project	Taluka and Dist. Porbandar	3
18	Rojmal Wind Project	Taluka Vinchhiya, Dist. Rajkot	25
19	Jodiya Wind Project	Taluka Jodiya, Dist Jamnagar	22
20	Bhanvad Wind Project	Taluka Bhanvad, Dist. Dwarka	24
21	Bada Wind Project	Taluka Mandvi, Dist. Kutch	14
22	Baradiya Wind Project	Taluka and Dist. Dwarka	13
23	Varshame Wind Project	Taluka Maliya, Dist. Morbi	12
24	Ambaji multi metal Project	Taluka Ambaji, Dist. Banaskantha	185
25	Gadhsisa Bauxite Project (Group of mines) at different locations	Dist-Kutch	73 + 8 + 71 + 205 + 361 + 170 + 63 + 67 + 209 + 643 + 6 + 4 + 99 + 6
			0.50
26	Corporate Office	Anmedabad	0.70
		Juisila	
27	Baitarni (West) Coal Project	Taluka Chhendipada, Dist. Angul	1196
28	Burapahar Coal Project	Taluka Hemgir, Dist Jharsuguda	606
29	Kudanali Lubri Coal Project	Taluka Talcher Dist. Angul	670

LIMS shall help do the following activities:

- 1. Reporting and consolidation of all site data.
- 2. This development will also comprise the creation of one dashboard for respective stakeholders for visualization and management perspective.
- LGEOM will need to create a tool where GMDC team can upload KML and CSV of new or updated document and Application should be automatically able to convert it into GIS ready format without any specific requirement to learn GIS by GMDC Team.
- 4. Synchronization of all existing document (inter and intra linking within the group) ensuring duplicity elimination and most importantly, comprehensive access to site information.
- 5. Establish cloud-based system for sharing and exchange of data.
- 1.2 Definitions & Acronyms
 - 1. LIMS Land information management System
 - 2. GIS Geographical Information System
 - 3. SRS Software Requirement Specification
 - 4. UI/UX User Interface/ User Experience
 - 5. DT Digital Technologies

2 System Features and Requirements

2.1 Purpose

- Data Management:
 - $\circ~$ The system will manage both Legacy Data and Geo-Spatial data.
 - Legacy data will be entered manually, and relevant documents will be scanned and uploaded.
 - DGPS maps, Drone/Satellite images, and plans from various GMDC sections will be integrated.
 - Indexing, categorizing, and classifying all important documents before uploading.
 - Streamline land management processes, from acquisition to postacquisition activities, ensuring efficient and safe mining operations.
- Data Integration:
 - The system will integrate all plans developed by various sections of GMDC on a plot-wise basis.
 - A dedicated dashboard will be provided for each stakeholder for visualization and management.
- User-Friendliness:
 - LGEOM will develop a user-friendly tool to upload KML and CSV files of new or updated documents/ section plans/ Cadastral Map.
 - \circ $\;$ The system will automatically convert these files into a GIS-ready format.
- Data Sharing and Exchange:
 - The system will synchronize all existing data, ensuring the elimination of duplicates.
 - A cloud-based system will be established to facilitate data sharing and exchange.
 - Alerts and notification for compliances and license expirations to ensure timely renewal.

To ensure optimal performance and user experience, the system must adhere to the following non-functional requirements:

Software Requirements (Environment)

Database	PostgreSQL
GIS System and Map Server	Geoserver
Front End	React
Back End	Node.js

2.2 User Types

The development and implementation of the land management system are based on the following assumptions and dependencies:

- A. ADID User login page.
- B. The user hierarchy will consist of:
 - a. Super-admin
 - b. System-admin
 - c. Viewer
 - d. Updater
- C. *System-admin* will be responsible for adding new users to the system and manage Master Data.
- D. There will be in-mail and application notifications.
- E. The flowchart shows the overall hierarchy of the users, and the functional matrix shows the specific permissions that each role has for each feature.

Users Details	Super Admin	System-Admin	Updater	Viewer
Web Application (MIS, Home Page)	All Sites	Home Page	Allocated Sites	Allocated Sites
Dashboard	All Sites	No Access	Allocated Sites	Allocated Sites
User Management	Can View	All Sites	No Access	No Access
Site Management	Yes (Upload/ Add/ Edit)	No Access	Yes (Upload/ Edit)	Can View
Phase Management	Yes (Upload/ Add/ Edit)	No Access	Yes (Upload/ Add/ Edit)	Can View
Land Parcel Management	Yes (Upload/ Add/ Edit)	No Access	Yes (Upload/ Add/ Edit)	Can View
Notification Intervals Management	No Access	All Sites	No Access	No Access



The LIMS will be as per following chart:

10|Page



^{11 |} Page



12 | Page

Any changes to these assumptions or dependencies may impact on the project timeline, budget, or functionality.

2.3 Functional Requirements

The land information management system will be crucial for assessing, managing, and recording detailed information about mines and sites, including their location, condition, maintenance history, and other relevant details. This system will help users efficiently keep and manage records of Sites and Mines, enabling improved decision-making, cost savings, and overall land information management efficiency. Additionally, the system will allow users to visualize mine and site locations on a map and upload relevant land documents. Users can also export data in PDF or Excel formats for further analysis or reporting. This system will support the monitoring of land acquisition status as well as activity planning and tracking to achieve key milestones for different types of land categories. It will also facilitate statutory and internal activities related to land matters, including pre-acquisition activities, during-acquisition approvals, and post-acquisition activities.

The application will follow the workflow outlined in the flowchart. The process will be:

- 1. User Registration: System-admin will register new users, assigning them appropriate roles (Super-admin, System-admin, Updater and Viewer) and Sites.
- 2. Login: Registered users will log in to the system using their registered ADID.
- 3. Access Control: *Updater* and *Viewer* will only have access to sites and data assigned to their roles.
- 4. Login Success: Upon successful login, a welcome message will appear, and the user will be redirected to the Home Screen.
- 5. Navigation: The Menu bar will provide access to various system functionalities, including MIS, Dashboard, Manage, User Profile, and Notifications. Clicking the logo on any page will redirect the user to the Home page.
- 6. General Access: The Home page, MIS and Project will be accessible to all users except the *System-admin* (and only allocated sites in case of *Updater* and *Viewer*). The *System-admin* can only access Home page and manage Users and Notifications from the Home Page.
- 7. Dashboard Access: *Super-admins* will have default access to the Dashboard. *Viewer* and *Updater* can have Dashboard access granted or revoked by *Super-admin* or *System-admin*.
- 8. Notification Icon: The Notifications icon will open a notification message box where users can view and manage system alerts and messages.
- 9. Manage Notification and its interval: *System-admin* will specify the notification interval, project and users that will receive the notification.

10. User Profile: The User Profile button will open a popup box where users can view their personal information, including name, email, contact details, and preferences along with a button for users to log out of the system.

2.4 Interface Requirements

The land information management system will provide a user-friendly interface that allows for easy navigation and interaction. The interface will be designed to be intuitive and accessible to users of varying technical backgrounds. Key features of the system interface will include:



A. User Roles

- a. Super-admin
 - i. All rights and permissions with full access to All Sites.
 - ii. Will not manage user or master data.
- b. System-admin
 - i. Can not view, upload documents or other data
 - ii. User Management
 - iii. Assigning Roles and Sites/ Projects once the (approval is granted from GM Land via email)
 - iv. Master Data Management
 - v. Manage Notification Intervals and Users to be Notified.
- c. Viewer
 - i. Can Only view land related data and documents allocated to the user.
 - ii. Can not upload or edit any land related data or document.
 - iii. Only access to sites/ projects assigned to the user by the System Admin.
 - iv. No access to user and master data management.
- d. Updater

- i. Only access to sites/ projects assigned to the user by the System Admin.
- ii. Can view/ upload/ edit/ add land related data or document.
- iii. No access to user and master data management.

B. New User Registration

- a. On the approval of *Super-admin* (on mail), the *System-admin* will add new users and there will be no separate registration page.
- b. Unregistered users attempting to log in will receive an error message indicating that their ID is not registered.

C. Login Page

- a. Upon launching the application, the first screen presented to the user will be the Login Page.
- b. Registered users can login by using their ID.
- c. Upon successful login, the system will display a splash screen and will redirect them to the Home Page.

D. Menu Bar

- a. The Menu Bar, located at the top-right of the system interface, will serve as the primary navigation tool.
- b. This ribbon-style menu will provide access to the following key functions:
 - i. Home Page
 - ii. MIS [for Report and Analysis]
 - iii. Project
 - 1. Site
 - 2. Phase
 - iv. Manage [access to administrative functions only visible to Systemadmin]
 - 1. Manage Users
 - 2. Manage Notifications
 - v. Dashboard

E. Home Page

- a. The Home screen will serve as the default landing page for users upon successful login.
- b. Key features of the Home Screen include:
 - i. Menu Bar: A navigation bar for accessing different system functionalities.
 - ii. Map: A full-screen map display for visualizing spatial data.
 - iii. Legend Icon: A legend explaining map symbols and markers.
 - iv. Zoom Controls: Zoom in and zoom out functionality using mouse scrolling and icons.

- v. Basemap Icon: Options to change the basemap or adjust map transparency.
- c. User Profile:
 - i. The User Profile button will open a popup box where users can view their personal information, including name, email, contact details, and other user data.
 - ii. Provide a button for users to log out of the system.
- d. Notifications:
 - i. The Notifications icon will open a notification message box where users can view system alerts and messages.
 - ii. Notifications will be categorized into different types, such as requests, Viewed, Not Viewed, change alerts, etc.
- e. Project boundary and Land Parcel Boundary
 - i. Zoom Level 1: Project boundary will be visible
 - ii. Zoom Level 2: Zooming in to any project boundary, land parcels will be visible.
- f. Project Summary Panel will be provided on the left which will display overall site information summary.
- g. Layers: Turn ON/OFF geospatial layers to view them on the map.
- h. Side Panel: A right-side panel will be included to display land-wise Site data.
- i. Filter Functionality: The filters will be seamlessly integrated with both the Map and the land details panel, ensuring that only information pertaining to the filtered data is displayed in the panel.
- j. Map Interaction: Clicking land parcels on the map will display detailed site information in the side panel.
- k. Export: An option to export site details in PDF (export the visible screen) format will be provided.
- F. MIS
 - a. The MIS page will be primarily used for viewing, data analysis, and exporting specific data after applying filters.
 - b. It will include functionalities such as filtering and sorting to enhance data analysis capabilities.
 - c. An export button will be provided to download the reports in .csv, .xls, .xlsx, and .pdf formats.

G. Project

- a. Site
 - i. Visible to Super-admins, Updater and Viewer.
 - ii. Add New Site button [to add new sites/projects], only Superadmins can add new sites.

- iii. Clicking the Add New Sites button will open a pop-up form. The user will enter relevant Site details, State, City, etc.
- iv. Updater and Viewer can only view the allocated sites.
- v. The *Super-admin* will add new sites by entering the basic details of the project (site name, location, etc.) and will allocate the site to *Updater*. The *Updater* will fill and upload all the remaining details and documents.
- vi. *Viewer* can only view the allocated site details and cannot modify the existing details/ documents.
- vii. Include a button to depreciate or deactivate site. [Indicating that site is no longer in use]
- b. Phase
 - i. Visible to Super-admins, Updater and Viewer.
 - ii. *Viewer* can only view the phases of the allocated sites and cannot perform any modifications in existing details/documents.
 - iii. Add New Phase button. [To add new phase for any existing sites/projects]
 - iv. The *Super-admin* or *Updater* can add new phase and upload all the relevant documents.

H. Manage

- a. The Manage button will provide access to various administrative functions accessible by only *System-admin*.
- b. Manage Users
 - i. Visible to System-admin only.
 - ii. A table with registered user details and filters.
 - iii. Option to set user as Active/ Deactive.
 - iv. Add new User button.
 - v. Clicking the Add New User button will open a pop-up form. *System-admins* will enter relevant user details, allocate site, and role. Upon adding the user, their details will be added to the User Table.
- c. Manage Notification Interval

I. Dashboard

- a. Real-time progress of projects/ sites and latest status and updates of all activities.
- b. Filters
- c. Features: It will primarily consist of charts and cards to visualize data.

3 User Interface

The User Interface can be viewed at https://gmdc-lams.lgeom.com/

Sign in as: jon@gmail.com and password: Jondoe123@

The user interfaces are provided for Home Screen, User Profile, Manage Users/ Site and Phase, basemap and layers icon, Site and Plot Summary Panels.

3.1 Home Screen



3.2 User Profile



3.3 Manage



3.4 Basemap



3.5 Layers



3.6 Site/ Project Summary



3.7 Plot-wise summary



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3.9 Assign Sites/ Projects

Gujarat Mineral Development Corporation Ltd						•	
Users list							
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Corporation Ltd											
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Add Site											
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Block Area (Ha.) :	Block Ar	ea				Lease Area (Ha.)	:	Lease Area	a		
Project Area (Ha.) :	Project /	Area				Toposheet No. :		Toposheet	t No.		
Net Geo. Reserve (MT) :		Lignite		Limestone			Silica			Coal	
Extractable Reserve (MT) :		Lignite (Main Mineral)		Limestone	(Associated	Mineral)	Silica	(Associated M	lineral Open Cas	st Coal	UG / Gasification Co
Life (Years) :		0/C					U/G				
PRC (MTPA) :		Lignite		Limestone	e (Tentative)		0/C C	oal		U/G Co	al
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Date of Approval of Mining Pl	an :	Lignite/Coal :	DD/MM/YY	YY			Limesto	one :	DD/MM/	YYYY	
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3.11 Add Phase

Phase Details										
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Proposal Applied 🏾										
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4 Non-functional Requirements

1. The solution should have a single sign-on mechanism (allowing a user to log in with AD ID while accessing the platform).

2. Scalability

- Initial implementation shall be based on a projection of future sites and support future scale and project types in context of the current business growth plans.
 - a. Solution must be scalable both horizontally (growing number of installations and users) and vertically (increased load, data volume, and system complexity), ensuring seamless performance and reliability as the business expands.

3. Information, Network & Cyber Security

• The system shall be capable of displaying its screens through a virtual private network (VPN) to users on the internet.

4. Roles and Authorisation

- System should have facility to assign role and authorisations to different level of users. System shall have the facility of assigning various types of rights to different access levels and the same shall be finalized during implementation phase.
- System shall be able to configure Roles and authorisation.

5. Maintenance and Support

- Establish a plan for maintenance and support including all the relevant SLAs with their thresholds for all existing and new systems.
- Handholding and active support in stabilization and fine tuning of software tool for at-least 6 months from date of go live.
- Set up the ticketing and SLA measurement process and systems. Online ticketing system for raising bugs, change requests, technical, non-technical queries with ability for contacting the support team over phone, chat, video call, remote access etc.
- Monitor SLAs and take corrective action.
- Review and prioritize improvement areas and conversion to actionable items.
- Setting up of the periodic re view framework for continual improvement and desired outcome.

4.1 Assumptions and Requirements

Development and deployment of Web GIS Portal will be carried out based on the assumptions below.

- 1. All requisite data will be provided through the collaborative efforts of the GMDC and Lgeom teams.
- 2. GMDC team needs to provide the SPOC (single point of contact) for all the project related activities.
- 3. LGEOM has no control on the content and quality of the data available on Online Base map.
- 4. GMDC team to ensure that resources are available and setup prior to the User Acceptance Testing phase.
- 5. Application performance is dependent upon other factors also like network bandwidth, infra configuration etc.
- 6. Training will be provided related to the environment in which the application will be developed, as per the GIS scope.
- 7. Sign-Off of SRS, UI/UX, UAT will be required for proceeding to next stage of the project. Any delay in signoffs will affect the project timelines & schedule.
- 8. GMDC team to provide timely feedback and resolutions to queries raised by LGEOM especially during UAT and Production Stage and signoff on the SRS and other deliverables.
- The project execution will be carried out from LGEOM offsite Gandhinagar office. LGEOM will carry out only bug fixing during the AMC period from offsite (LGEOM Gandhinagar Office) and any expansion of scope will necessitate adjustments to project effort and time.
- 10. The SSL certificate required for securing services will be provided by the customer.
- 11. The customer will provide VPN / Remote access on need basis.
- 12. LGEOM is not responsible for any other services and maintenance of any other product not ordered by us and not supplied by us.
- 13. LGEOM won't be responsible for keeping the backup/ storing the deliverables data after acceptance from the client.

4.2 Application Testing

The following testing will be conducted before deployment:

- a. **Application Functional Testing** of the proposed systems shall be carried out to validate whether the application meets the specified functional requirements covering the workflows. The functional testing should be done following the black box approach and using end-to-end user scenarios.
- b. **Application Usability Testing** shall include systematic observation under controlled conditions to determine how well users can use the application. The proposed systems are likely to be used by users of different levels of computer knowledge. Usability testing will ensure that all types of users are comfortable using the system. This shall be done by using defined international standards which recommend extensive user interaction and analysis of user behavior for a defined task.
- c. **Performance Testing** of the system shall be done to ensure that the system is capable of handling defined users as well as transactional loads. The performance testing of the proposed system will include measuring the response time of the system for defined scenarios. Also, the manner/ trend in which performance changes with load will determine the scalability of the proposed system systems.
- d. **Application Security Testing (VAPT)** conducted to unearth various application security vulnerabilities, weaknesses and concerns related to Data /Input Validation, Authentication, Authorization /Access Control, Session Management, Error Handling, Use of Cryptography, etc. Typical issues which may be discovered in an application security testing include Cross-site scripting, Broken ACLs/Weak passwords, Weak session management, Buffer overflows, Forceful browsing, Form/hidden field manipulation, Command injection, SQL injection, Cookie poisoning, Insecure use of cryptography, is-configurations, Well-known platform vulnerabilities, Errors triggering sensitive information leak etc.
- e. The **test cases** which were earlier designed during planning phase need to be executed in this phase. This phase includes Unit testing, Integration testing, and also testing for security. The LGEOM should ensure that:
 - i. The test results are documented.

- ii. Code review checklists are filled up and the code is reviewed and verified. This ensures that all the coding conventions are followed correctly.
- iii. Test cases and the results need to be documented and demonstrated.
- f. **User Acceptance Testing:** While performing the user acceptance testing, following types of errors may be followed:
 - **Minor Errors:** The error occurred does not affect other functionalities of the GIS application.
 - **Major Errors:** This has high criticality for application functioning. The error occurred affects other functionalities of the GIS application and in works case can be a showstopper.
 - **Interface Errors:** The GIS application runs as expected, however, while interfacing with the core application, error may occur. This type of error does not constitute acceptance criteria. However, both the customer team and LGEOM team will resolve the issues.