

# Software Requirements Specification (SRS) Cadastral Mapping

NIC-Land Records-007

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**Amendment log**

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<b>V1.4</b>	<b>1.9.2009</b>	Changes in Use Case Format	1 <sup>st</sup> Draft	
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## INTRODUCTION

### 1.0 Introduction

The Government of India have decided to implement the Centrally-Sponsored scheme in the vector of the National Land Records Modernization Programme (NLRMP) by merging two existing Centrally-Sponsored Schemes of Computerization of Land Records (CLR) and Strengthening of Revenue Administration and Updating of Land Records (SRA&ULR) in the Department of Land Resources(DoLR), Ministry of Rural Development. The integrated programme would modernize management of land records, minimize scope of land disputes, enhance transparency in the land records maintenance system, and facilitate moving eventually towards guaranteed conclusive titles to immovable properties in the country. The major components of the programme are computerization of all land records and integration of textual and spatial records and mutations, survey/re-survey and updation of all survey & settlement records including creation of original cadastral records wherever necessary, computerization of registration, development of core GIS and capacity building. This document outlines detailed requirements for cadastral mapping solution and the integration of ROR and cadastral maps under NLRMP.

### 1.1 Purpose

The document specifies the requirements for development of Cadastral Mapping Solution. The format of the document will be as per IEEE 830:1998 and conform to the standards. The requirements analysis contained in this document defines the specific functionalities that are required to develop and deploy the system. The NLRMP and state requirements have been translated into measurable and definable business roles and functions to allow for successful development of comprehensive cadastral software package.

### 1.2 Scope

The scope of the system is to facilitate end to end solution for cadastral mapping starting from digital verification of raster and vector data of cadastral maps, its integration with Records of Rights (RoR) and services such as mutation, updation, distribution of RoR and map covering the requirements of NLRMP project in G2G and G2C domain. During the process of

development the software will incorporate all organization flows and process of Land Revenue System. The software will be deployed in the tehsils/taluks in the country.

In present scope of work, cadastral maps are maintained within village boundaries with proper village index defining association, direction and orientation among plots constituting the village. This is to ensure “whole to part approach” and keeping errors confined to village boundaries.

The scanning, digitization, verification of cadastral maps are the pre-processes and input to the proposed system. The features of merging/mosaic of village maps to form higher level formations like tehsil/district and State will be covered in next phase.

The scope of the s/w is limited to the day today operations carried by the Tehsildar/ Patwari/ Surveyors for digital verification of scanned (raster) and digitized (vector) data, printing the village maps and individual plots and updating the plots and ROR data as a result of mutation process.

The functional objectives of the system are as follows:

- Digital Verification of Scanned Image
- Digital Verification of Vector Data viz. Digitization Errors such as undershoot/ overshoots, dangles, silver, missing plot ids etc.
- Import of vector data to Spatial Database
- Display of digitally verified village map/plot
- Integration with Record of Rights (RoR) Data
- Printing of RoR and Cadastral Map
- Carryout Mutations and updation of ROR data and subsequent Map data
- Database Management, audit trail, backup

### **1.3 Target Audience**

Land Records and Revenue Functionaries of the States and UTs

### **1.4 Definitions & Acronyms**

Attribute data	All data inputs to this software system shall be textual (alphanumeric) in nature. Does not include images or pictures as inputs.
Cadastral Records	Consist of textual data about the cadastre. The nature of data could include ownership, land, crop, irrigation, cultivation etc.

Cadastre	It is the land parcel in Land administration system parlance
End User	The Ultimate User of land details documents viz. Farmer.
Government	Every person who holds land from the state Government or to whom a
Lessee	right to occupy land is granted by the State Government or to Collector and who is not entitled to hold land as a Owner is called a Government Lessee in respect of such land.
Khatha	A unique number assigned to each landholder comprising total land
Land	holdings under one right in a village. A uniquely and physically defined parcel of land, same as a cadastre.
Legacy Data	All information in "Khatoni" is considered as the Legacy data as it contains complete ownership details of all lands within a given village. This data shall serve as the foundation for subsequent entry of changes in ownership and seasonal cultivation of lands.
Mosaic	Combining multiple village maps to for higher units
Mutation	An act of making changes in the ownership of land
Parcel/Plot	A Uniquely and physically defined plot of Land.
Pattadar	Lessee – Who gets a right to enjoy any land, for a certain period, implied in consideration of price or any other thing of value.
Revenue Village	A Village whose survey number (plots) details are mentioned in the Jamabandi having fixed geographically boundary.
ROR	Record Of Rights - is the main document, which contains details about owners, ownership, rights, liabilities and land revenue demand and collection. It is a legal document certified by Revenue dept. officer. The document may be used for mortgage as well as acquiring loan against the land held and for judicial purpose.
Settlement	Operations that include re-allocation of land to the landowners meeting the land ceiling requirements.
Spatial Data	Inputs that comprise scanned or digitized images conveying pictorial description of legacy data. For e.g. Cadastral maps
Survey	Land administrative operations that conduct re-survey of village land in terms of area and boundaries
User	Trained resource person who will be operating the Tehsil Computer.

### 1.5 Abbreviations

CLR	Computerization of Land Records
DEM	Digital Elevation Model
DOLR	Department of Land Resources
BLRO	Block Level Revenue Officer
ETS	Electronic Total Station
FMB	Field Measurement Book
GIS	Geographical Information System
GPS	Global Positioning System
HRSI	High Resolution Satellite Imagery
ISCI	Indian Standard Code for Information Interchange
LR	Land Records /Land Revenue

LRISD	Land Records Information Systems Division
ROR	Record of Rights
NLRMP	National Land Records Modernization Programme
NIC	National Informatics Centre
OSS	Open Source Software
PKI	Public Key Infrastructure
PDF	Portable Document Format
RI	Revenue Inspector
PostGIS	Spatial database extension for PostgreSQL
RDBMS	Relational Database management System
SQL	Structured Query Language
SRS	Software Requirements Specifications
TCP/IP	Transmission Control Protocol/ Internet Protocol
T-LRC	Tehsil Level Land Records Computerization
UPS	Uninterrupted Power Supply
.shp	Shape File Format

### 1.6 References

- (i) NLRMP EFC Memo
- (ii) NLRMP Guidelines and Technical Manual (<http://dolr.nic.in>)
- (iii) NLRMP-Training Kit 2009 by NIC-DOLR
- (iv) Report of Revenue Secretaries Committee 2005
- (v) Uniform Coding Document for Land Records and Registration –DOLR/NIC

## 2.0 OVERALL DESCRIPTION

The Cadastral Mapping Solution for automation of cadastral maps will be self contained package for the States/UTs' implementing NLRMP. The system will be generic software to handle vectorized cadastral maps and integrate it with Record of Rights. The system will be Client Server based (Version 1.0) and web based (Version 2.0) for tehsil level operations and in order to carry out specific tasks related to cadastral map. The system will support State Revenue and Survey Department in automating cadastral mapping and land records updation. The system will come in force once States are ready with verified digitized maps. The main functions of the proposed package are:

- i) **Digital Verification of Scanned and Digitized Maps** – The input to this module will be physically print verified scanned and digitized vector data with respect to source map. The module will open scanned and digitized files. The system will have provision of printing the map through a plotter. In case of digitized file, system will show the errors such as undershoot/ overshoots, dangles, silver, missing plot ids etc in the digitized map. The list of all these errors will be printed and map will be returned to the empanelled agency for correction. Index of all correctly digitized maps will be stored in the database as the master copy.
- ii) **Import of vector data to spatial database:** The system imports the digitized and verified cadastral vector data in industry standard spatial data format to the spatial database. The system will have provision of importing geo-referenced and non-reference spatial data. The States may decide to geo-reference the maps at the time of digitization.
- iii) **Display of cadastral maps with Scale, North** -The module displays the complete cadastral map or single plot /multiple plots along with appropriate scale and North direction. The system should display the linear dimensions of plots boundaries and area incase required by the states. There will be provision of overlay of other layers like soil layer, road layer etc.
- iv) **Attachment of Standard legends and symbols** – The standard symbology (alamaths) has to be finalized and attached where ever required. The standard library adopted by West Bengal is attached in Annexure – 4.
- v) **Mutation/Updation**- The function allows the user to split the plots in to multiple parts as per the mutation orders. It further assigns new plot numbers to divided parcels. The system also allows merging of plot boundaries where ever required by the user.
- vi) **Integration and Display of Cadastral map with ROR data** –The system integrates RoR with cadastral maps through parcel ids. The module further displays individual plots on

selection. In case of mutation, the system shall invoke ROR (attribute) mutation and further it will pass the parameters for calling map to be updated as per approval of revenue officials. The software will have standard GIS function such as Zoom-in Zoom-out, Pan (navigational function) and Identify (to display RoR attributes against parcel id).

- vii) **RoR printing along with plot boundaries** - On selection of the location details and parcel ids, system shall show and print of Records of Rights with cadastral maps. The system converts the output to print friendly version /.pdf for citizen services
- viii) **Spatial Query system** -As per user requirements, system will provide spatial outputs based on queries on plots, ownership, Government land, forest areas, mining sites, pasture, grazing land and crop type as per the textual data availability. Function such as query builder with interactive section of parameters with logical operator will also be added in order to give user a freedom to define his own queries.
- ix) **Client Server and Web Based Versions** – The base module will be client server based, where Land Records database consisting of spatial and non-spatial will be stored at Tehsil server for processing, ROR and map display, mutation and printing. The second version will be web based software with all functions as available in first version for storing, processing and updating mutation at central server located in the State Level. The tehsils will be authorized to use and update the central database, print ROR and Map, edit the ROR and Map data as per ownership changes etc.

## 2.1 Product Perspective

### 2.1.1 Interfaces

The client-server system will carry out regular operation such as import of vector data, display, print and mutation. The audit trail of all the transaction shall be maintained by the system. The second version will be an online solution with central database to be used over the network by downloading the necessary plug-ins. This is to facilitate seamless updation at central server. The data updation can only be done by authorized users. Necessary authorization checks would be performed before a user is allowed to access the link.

### 2.1.2 Memory Constraints

There is no specific limit on the usage of memory, although memory leaks should absolutely be avoided.

### **2.1.3 Operations**

All users must login to the system to carry out the task and will be responsible for the task assigned. The system administrator shall be responsible for taking the backup of the database. Patwari (Data Entry Operators) can edit the map and data will be saved in transactions. Tehsildar can verify the map edited by the Patwari and finally authenticate. The system administrator shall re-install the package and restore latest backup in case of failure.

Tehsildar (System administrator) only has the authority to approve the changed map and only then it will be saved in the database. In case, he rejects it, the map will be re-sent to Patwari with the reasons for rejection.

### **2.1.4 Site Adaptation Requirements**

It is envisaged that there shall not be any specific initialization required at the operating system level before installing the package. The package will offer an auto installation feature, which will check the availability of the supporting software required at the server, ask few questions like installation directory, log in information for database creation and initialize the site with basic master data required to run the application. The user manual will also be provided along with the package.

## **2.2 Product Functions**

The proposed application package provides role based login access to the package (version 1.0 and version 2.0) so that only relevant and authenticated users can access the system. The detailed description of each function from actor's perspective is given under Functional Requirement in the form of Use Cases.

## **2.3 User Characteristics**

The users of the Proposed Application package will include officials from the State Revenue Departments, Survey and Settlement at the various levels. It is expected that these officials would have minimum knowledge of computer usage and are versed with cadastral map creation, internet browsing and communication through email etc prior to usage of the proposed application package. Software training will also be imparted to the users.

## 2.4 General Constraints

This subsection will specify the constraints placed on design that will limit the development options of the system. The proposed application (Version 1.0) will be hosted at locations as identified by concerned revenue departments at the tehsils. Standard RDBMS like Postgres SQL with spatial data support (Post GIS) will be used for consistent storage and processing of the proposed application. Localization to the extent possible will be supported. Geotool libraries, an OSS GIS engine will be used for software development. However, in Version 2.0, for web based publishing Map Sever or any advanced map based publishing software will be used. In version 2.0 of the software, web based solution will be available offering data storage at centralized location, which will be accessed by the tehsils as per their requirements.

## 2.5 Assumptions and Dependencies

The computed area values and ROR area will be compared as far as the accuracy of data is concerned. In case variation is beyond permissible limit, ROR data will prevail for all practical reporting purposes. Based on mutation orders for ROR and map, the system will update ROR data first and then system will prompt for updating map.

### 3.0 FUNCTIONAL REQUIREMENTS

#### 3.1 Product Actors and their functions

Cadastral Mapping Application offers role based login access to the package so that only authenticated users can enter /access the relevant information. The following actors at the Tehsil level have been identified to carryout the various functions.

**Tehsildar:** Tehsildar is custodian of the land revenue records and cadastral maps. He is treated as the administrator of the system.

**Patwari:** Patwari /village accountant is village level revenue official is responsible for maintaining the attribute registers and village maps. The identified Patwari will be trained to operate the software at Tehsil Computer Centre.

However, in few states, there are sub-tehsils and the officers in those locations are named differently like Naib Tehsildar, Deputy Tehsildar. For those locations, these officials are treated as the administrator of the system. (Tehsildar/Naib Tehsildar/Deputy Tehsildar is synonymous at the Tehsil level).

The following table lists the functions of the cadastral application from Actor's perspective in the form of use cases. The detailed descriptions of each of the use cases are covered under the sections given below.

#### 3.2 Use Cases

Actor	Description	Use Case(s)
Tehsildar	Tehsildar is responsible for the whole Land Records S/W	UC1.0 - Login UC1.1 – Logout UC 1.2 – Switch Language UC1.3 - Create User UC1.4 – Disable/Enable User Account UC1.5 – Change User Password UC1.6 – Change User Role UC1.7 – Maintain Master Information UC1.8 – Mutation Audit Trail
Patwari/ Operator	Import of Vector file. The Patwari acts as on	UC2.1 – Import Vector file to Spatial database UC2.2 - Export to Vector file from Spatial database

	operator and maintains the basic land records and maps. The operations of the Patwari are to be finally approved by the Tehsildar	UC2.3 – Save Scanned Village maps UC2.4 – Visual & Digital inspection Vector file UC2.5 - Integration of Textual and Spatial Data
Patwari/ Operator (Display)	The Patwari acts as an operator who maintains the basic land records and Maps	UC3.1 - Display Village Map UC3.2 - Display Single plot Map UC3.3 – Display Multiple plots UC3.4 – Display linear dimension of plot UC3.5 - Display area of plot UC3.6 -Display plot area from RoR
Patwari/ Operator (Print)	The Patwari acts as an operator who maintains the basic land records and Maps	UC4.1 - Print Village Map(Attach Plotter) UC4.2 – Print Single plot with boundary UC4.3 - Print Multiple plot with Boundary UC4.4 – Print ROR with Map UC4.5 – Export ROR with Map to PDF
Patwari/ Operator (Mutation)	The Patwari acts as an operator who maintains the basic land records and maps and updates the plot for Mutation based on the orders passed by the Tehsildar/Naib Tehsildar.	UC5.1 – Split plot based on mark distance from known points UC5.2 – Adjust the split line for area UC5.3 – Split Plot with Curve UC5.4 – Merge plot UC5.5 – Attach new plot id UC5.6 – Align Symbol UC5.7 – Undo Split UC5.8 – Undo Merge UC5.9 - Crop Plot(s) UC5.10- Show Map Grid UC5.11- Edit map using Grid
Query Management by Operator	By Patwari/RO	UC6.1 – Query Builder
GIS Function by Operator	By Patwari/RO	UC7.1 - Zoom(in/out) village map UC7.2 – Pan Village Map
Data Management Backup operator	By Patwari/RO	UC8.1 - Take Backup UC8.2 - Audit Trail
Index Master	By Patwari	UC9.1 - Maintain village vector file master

		UC9.2 - Splitting/Dividing Single village vector file
Tehsildar Approval	By Tehsildar/Naib Tehsildar	UC10.1 – Approval of the Tehsildar UC 10.2 - Updation to Data Centre UC 10.3 -Web based reporting - ROR with Map

### UC1.0- User Login

**Use Case No UC1.0**

Use Case Name	User Login
Description	This use case will allow the actor to log in to the Cadastral Mapping S/W as system administrator. The privileges with the actor are set according to the role assigned.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	-
Trigger	1. The actor is prompted by the system to login(default scenario) 2. The actor may also be prompted to login if he attempts to take some actions, which require special privileges.
Pre Condition	The actor has invoked the login page of the cadastral mapping s/w
Primary Flow	1. The actor identifies himself by supplying necessary authentication details such as user id, password. 2. The actor chooses to Login 3. On successful login, the system invokes the software and displays the menu page with menu options as per the user's privileges.
Alternate Flow	None
Post Conditions	1. The login details of the actor such as id and the time stamp are recorded in the database. 2. The system becomes aware of the user's privileges as the user navigates through the s/w.
Priority	High
Business Rules	It is mandatory for a user to have a user-id and password and biometrics authentication
Exceptions	<p><u>1.UserId is not Correct</u></p> <p>a. Actor chooses to login with incorrect user id</p> <p>b. The system displays the message "PI enter a valid user ID"</p> <p>c. System returns back to Pre Condition.</p> <p><u>2.Password is not Correct</u></p> <p>a. Actor Chooses to login with incorrect password</p> <p>b. System displays the message "PI enter valid password".</p> <p>c. Actor Acknowledge the message</p> <p>d. System Returns back to pre condition</p> <p><u>3.Finger Print –Bio-authentication is not Correct</u></p> <p>a. Actor chooses to login with correct user id</p> <p>b. The actor locates the finger in finger print device with some scratches on the finger.</p> <p>c. The system displays the message "PI use a valid Finger"</p> <p>d. The System returns back to Pre Condition.</p> <p><u>3.Actor is already logged in</u></p> <p>a. Actor chooses to invoke multiple instances</p> <p>b. System displays the message "User already logged in ... Can not login while the earlier session is active"</p> <p>c. Actor acknowledges the message</p> <p>d. System returns back to Pre Condition</p>
Relationships	<p><u>Extends</u></p> <p>1. The Default Page</p> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <p>1. Login Page</p>
Screen References	None
Nature of Functionality	None

Outstanding Issues	None
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**UC1.1- Logout**

Use Case No	UC1.1
Use Case Name	Logout
Description	This use case will allow the actor to logout of the Cadastral Mapping S/W to which he has already logged in.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	-
Trigger	This use case may be triggered by either of the following actions of the actor: 1. The actor chooses to logout. 2. The system times out the actor.
Pre Condition	The actor has logged into the cadastral mapping s/w
Primary Flow	<u>The actor Chooses to logout</u> 1. The system displays the message "You have successfully logged out of the system. Thanks for using Cadastral Mapping S/W". 2. The system closes the s/w window.
Alternate Flow	None
Post Conditions	1. The system enters the logout details of the user in the database.
Priority	High
Business Rules	It is mandatory for a user to have a user-id and password and biometrics authentication
Exceptions	<u>None</u>
Relationships	<u>Extends</u> 1. The Default Page <u>Is Extended by:</u> None <u>Uses:</u> 1. This use case will be used by all the users.
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC1.2- Switch Language**

Use Case No	UC1.2
Use Case Name	Switch Language
Description	This use case will allow the actor to view the Cadastral Mapping Software in one of the Indian languages of the respective State. All labels on screens drop down list of values, error and warning messages, help text will be displayed in the selected Indian language.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	-
Trigger	This use case may be triggered by either of the following actions of the actor: 1. The actor chooses the Indian language applicable to his state from the list of Indian languages supported by the Cadastral Software
Pre Condition	The actor will view the default screen in one of the Indian languages supported by the cadastral mapping s/w Data is saved in UNICODE
Primary Flow	The actor Chooses the Switch Language option from the menu 1. The system displays the list of all Indian languages supported by the cadastral mapping software 2. Actor selects the language in which to work with the cadastral mapping software 3. The default menu is displayed in the selected language. All labels on screens drop down list of values, error and warning messages, help text will be displayed in the selected Indian language. The system will issue an informational message that the language has been changed. 4. In case label is not available in the selected language, the label will be displayed as per the business rule defined below. 5. In case text is not available in the local language, then the help text will be displayed as per the business rule defined below.
Alternate Flow	None
Post Conditions	1. The selected Indian language becomes the current language of the cadastral mapping software for the actor till the actor switches to another language or quits the cadastral mapping software by logging out. 2. This has the implication that all labels, text on screens, drop down list of values, any error or warning messages generated by the cadastral mapping software including help text will be displayed in the selected language.
Priority	High
Business Rules	1. Cadastral mapping software will display all the labels, text on screen, help text, error and warning messages, drop down list of values as per the following logic in at least one Indian language: a. Display all the labels, text, help text, drop down list of values, error, warning messages in the actor's chosen user interface Indian language. b. By default, all the labels, text, drop down list of values, help text, error, warning messages will be displayed in English language.
Exceptions	If the Indian language font for displaying the data is not available. 1. Actor selects the Indian language in which to view the cadastral

	mapping software 2. The system may display weird characters on the screen.
Relationships	<u>Extends</u> 1. The Default Page <u>Is Extended by:</u> None <u>Uses:</u> 1. Log in if the actor has logged in to the cadastral mapping software.
Special Requirements	Cadastral mapping software will support entry and display of Indian languages that a. Have Unicode enabled fonts b. storage of multi-lingual(Indian languages) data in Unicode The default language of the Cadastral mapping software is English
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC1.3 – Create User**

Use Case No	UC1.3
Use Case Name	Create User
Description	This use case is to create/add user account
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	Patwari/Operator
Trigger	Actor clicks “Create User” option from the menu” under User Management.
Pre Condition	<ol style="list-style-type: none"> <li>1. Actor is logged into the Cadastral Mapping S/W as Tehsildar/Administrator using his password and thumb impression</li> <li>2. The thumb print device must be connected to the system.</li> </ol>
Primary Flow	<p>When the actor selects to add new user the following sequence of steps are followed</p> <ol style="list-style-type: none"> <li>1. Super users (Administrator) logs in into the system using predefined system user-id and password and choose option to create user.</li> <li>2. The system asks the actor to enter name of the user.</li> <li>3. The system asks the actor to enter user-id and choose user role.</li> <li>4. The system asks actor to enter the password. (A message for help will be displayed suggesting that password must be eight characters in length, should be a combination of upper, lower and special characters)</li> <li>5. The system asks the actor to confirm the password by re-entering it.</li> <li>6. The role was selected from the list of Roles.</li> <li>7. The system asks for the registration of finger print of the user (only in case of change of administrator) .The user locates the finger on the thumb printer, and the system captures the finger print of the new user and stores the details in the database.</li> <li>8. The system displays the “User Created Successfully”.</li> </ol>
Alternate Flow:	<ol style="list-style-type: none"> <li>1. User already exists: If the given user-id already exists the system displays an error message &amp; actor is allowed to re-enter different user-id.</li> <li>2. Invalid password: If the user types in a password less than eight characters in length then system displays an error message ‘Password must contain minimum eight characters’. User is allowed to re-enter legitimate password and re-confirm it.</li> <li>3. Error in thumb print capture device: If the device has not captured the finger print of the new user the error message displays to place the finger on the device once again.</li> </ol>
Post Conditions	None
Priority	High
Business Rules	It is mandatory for a user in the Cadastral mapping s/w to have a user-id with passwords and biometrics authentication (only for administrator). Patwari will not have biometrics
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Bio-metric Device Not Found
Relationships	<p><u>Is Extended by:</u> Bio Metrics Authentication</p> <p><u>Uses:</u> 1. Login Creation Page</p>

Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC 1.4 Disable/Enable User Account**

<b>Use Case No</b>	<b>UC1.4</b>
Use Case Name	Disable/Enable User Account
Description	This use case describes how to enable or disable a user account.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor requests to enable or disabled a user account
Pre Condition	<ol style="list-style-type: none"> <li>1. Actor is logged into the Cadastral Mapping S/W as Tehsildar/Administrator</li> <li>2. The thumb print device must be connected to the system.</li> </ol>
Primary Flow	<p>This use case starts when the actor wishes to enable (or disable) a user</p> <ol style="list-style-type: none"> <li>1. The actor selects a user with his/her account disabled (or enabled).</li> <li>2. The system asks for the remark and displays current date and time</li> <li>3. The actor Clicks on enable (or disable) button.</li> <li>4. The system enables (or disables) the user account and records remark, date and time in the database</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Low
Business Rules	<p>It is mandatory for a user in the Cadastral mapping s/w to have a user-id with passwords</p> <p>The administrator can disable any account any point of time.</p>
Exceptions	None
Relationships	<p><u>Extends</u></p> <ol style="list-style-type: none"> <li>1. default page</li> </ol> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <ol style="list-style-type: none"> <li>1. Login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC 1.5 - Change User Password**

<b>Use Case No</b>	<b>UC1.5</b>
Use Case Name	<b>Change User Password</b>
Description	This use case describes how to reset an existing user password.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor requests to reset an existing user password.
Pre Condition	<ol style="list-style-type: none"> <li>1. Actor is logged into the Cadastral Mapping S/W as Tehsildar/Administrator</li> <li>2. The thumb print device must be connected to the system.</li> </ol>
Primary Flow	<p>This use case starts when the actor wishes to reset a user password</p> <ol style="list-style-type: none"> <li>1. The actor selects an existing enabled user.</li> <li>2. The system asks to enter new password</li> <li>3. Then the system asks to re-enter new password.</li> <li>4. System resets password.</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	<p>It is mandatory for a user in the Cadastral mapping s/w to have a user-id with passwords</p> <p>The administrator can change the password of any account any point of time.</p>
Exceptions	None
Relationships	<p><u>Extends</u></p> <ol style="list-style-type: none"> <li>1. default page</li> </ol> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <ol style="list-style-type: none"> <li>1. Login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC1.5.1 - Change Thumb Print**

<b>Use Case No</b>	<b>UC1.5.1</b>
Use Case Name	<b>Change Thumb Print</b>

Description	This use case describes how to change registered thumb print of an administrator
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	None
Trigger	The use case is triggered only if the Bio-metric device is installed and connected to the system and the administrator clicks to change the thumb print.
Pre Condition	1.Biometric Thumbprint device must be installed and connected to the system 2.The actor must have administrative rights
Primary Flow	The primary actor selects an existing administrator. 1.The system requests the administrator to place his/her left thumb on the device 2.The primary actor clicks on the Capture button to register actor's new Thumbprint 3.A message appears to the effect that the Thumb print has been successfully captured 4.System changes administrator's Thumb print
Alternate Flow:	1.Quitting the operation will abort Thumb Print change operation
Post Conditions	None
Priority	Medium
Business Rules	It is mandatory for a user in the Cadastral mapping s/w to have a user-id with passwords The administrator can change the password of any account any point of time.
Exceptions	None
Relationships	<u>Extends</u> 1. default page <u>Is Extended by:</u> None <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC1.6 - Change User Role**

Use Case No	UC1.6
Use Case Name	Change User Role
Description	This use case describes how to change the user role.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor requests to change the user role.
Pre Condition	1.Biometric Thumbprint device must be installed and connected to the system 2.The actor must have administrative rights
Primary Flow	This use case starts when the actor wishes to Change the Role 1.The actor selects an existing enabled user. 2.The system asks to enter new role 3.System sets new role for the user
Alternate Flow:	1.Quitting the operation will abort Thumb Print change operation
Post Conditions	None
Priority	Low
Business Rules	It is mandatory for a user in the Cadastral mapping s/w to have a user id with passwords . This use case will be used in case of Changes in the Tehsildar because of Transfer or Temporary Changes in Administration.
Exceptions	None
Relationships	<u>Extends</u> 1. default page <u>Is Extended by:</u> None  <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC1.7 – Maintain Map Sheet Master Information**

<b>Use Case No</b>	<b>UC1.7</b>
<b>Use Case Name</b>	<b>Maintain Map Sheet Master Information</b>
Description	This use case describes how to maintain the master information regarding the number of vector files in the tehsil, how many files are digitized with remarks and status.
Primary Actor	Tehsildar/Naib-Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor requests to add the digitized .shp file into the master.
Pre Condition	1.The actor must have administrative rights
Primary Flow	<p>This use case starts when the actor wishes to add the digitized map</p> <ol style="list-style-type: none"> <li>1.The system asks for the locations like Dist/Sub Dist/Tehsil/Village</li> <li>2. The actor Clicks on add button.</li> <li>3.The system asks for confirmation in a separate window displaying approved by, authorized by, village name, Date and Time, scale and year of map and remarks</li> <li>4. Actor Confirms or cancels</li> <li>5. If confirmed, system adds the village into master info table and records approved by, authorized by, village name, sheet no, year of the map, scale, remarks, date and Time in the master table database.</li> <li>6. Incase of more sheets, systems asks for more sheets to be entered.</li> <li>6. if cancelled, system will exit.</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	High
Business Rules	There can be multiple shape files per village. In that case each sheet is taken as a unique sheet and registered uniquely in the system.
Exceptions	None
Relationships	<p><u>Extends</u></p> <ol style="list-style-type: none"> <li>1. Default page</li> </ol> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <ol style="list-style-type: none"> <li>1. login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC1.8 –Audit Trail - Mutation**

Use Case No	UC1.8
Use Case Name	<b>Audit Trail – Mutation</b>
Description	This use case describes how to maintain the user activities on the plot and generate the history of activities on the plot.
Primary Actor	The System
Secondary Actor	None
Trigger	The use case starts when actor makes any changes in the plot because of mutation.
Pre Condition	None
Primary Flow	1.This use case starts when the actor wishes to add any changes in plot because of mutation 2. The system saves the details locations like Dist/Sub Dist/Tehsil. Village, plot no, user Name, Date and Time, mutation remarks and the changes done, status of the operations (success/failure)
Alternate Flow:	If the data related to changes are not saved in the database the message will be indicated appropriate action.
Post Conditions	The data will be saved in the database only if the audit trail is recorded in the database.
Priority	High
Business Rules	The audit trail is essential for history purposes.
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None  <u>Uses:</u> 1. login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC2.1 Import Vector File to Spatial database**

Use Case No	UC2.1
Use Case Name	Import Vector File to Spatial database
Description	This main purpose of this use case is to import/add Vector file to Spatial Database.
Primary Actor	Tehsildar/Naib Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor clicks the option Import Vector File.
Pre Condition	1.The user must be validated by the system before performing the import 2.Vector file should be available
Primary Flow	This use case starts when the actor wishes to import vector file to spatial database.  1. The system allows the actors to browse for the vector file. 2. The actor browses the vector file. The system asks for the map scale 4. The system allows the actors to browse for the directory where vector file(s) and the corresponding image files are stored from the CD/DVD or Hard Disc. 5. The system asks for Spatial Reference Identifier (SRID - is based on the - same unit of measurement, datum, and projection used to determine the coordinates of the instances- should be used at the time of digitization) 6. The system asks for name of corresponding fields being imported in the table uniquely identified by village index code 7. The system imports the data to table by adding a row to the table. Village/Mouza identification field(s), Map version type, Sheet no & vector files, image files shall be stored in different fields in BLOB for non-spatial databases. 8. For Spatial database all the spatial objects in the vector shall be populated against its system generated unique identification no available in .shx. Unique Plot no or parcel of the polygon objects available in the .dbf should also be transferred.
Alternate Flow:	1. File not found: If the user enters an invalid path for vector file then system displays an error message & user is allowed to re-browse the vector file.  2. Invalid Vector File: If the vector file is not valid or contains some invalid data then system displays an error message 'Invalid Vector File'.
Post Conditions	None
Priority	High
Business Rules	SRID is taken as zero when the cadastral map is not geo-referenced. In case the map is geo-referenced and with some projection system appropriate SRID value is to be chosen.
Exceptions	In case of partial import the system will send a message for re import of the shape file.

Relationships	<u>Extends</u> 1. default page <u>Is Extended by:</u> None  <u>Uses:</u> 1. login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC2.2 Export to Vector File from Spatial database**

<b>Use Case No</b>	<b>UC2.2</b>
<b>Use Case Name</b>	<b>Export to Vector File from Spatial database</b>
Description	This main purpose of this use case is to export to Vector file from Spatial Database.
Primary Actor	Tehsildar/Naib Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor clicks the option export to vector file.
Pre Condition	1.The user must be validated by the system before performing the import 2.Vector file should be available
Primary Flow	This use case starts when the actor wishes to export to vector file. 1. The system allows the actor to select village from spatial database. 2. The actor browses the folder to which map to be exported as vector file. Or new folder may be created 3. The system exports the data to vector file in the selected folder
Alternate Flow:	Spatial data not found: If the data corresponding to selected village is not found then system displays an error message 'Map data for the village not found'.
Post Conditions	None
Priority	High
Business Rules	SRID is taken as zero when the cadastral map is not geo-referenced.
Exceptions	In case of partial export of the file system will send a message for re export of the shape file.
Relationships	<u>Extends</u> 1. Default <u>Is Extended by:</u> None  <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	Appropriate SRID or existing SRID will be used.

**UC2.3 – Save Scanned Village Maps**

Use Case No	UC2.3
Use Case Name	<b>Save Scanned Village Maps</b>
Description	This main purpose of this use case is to import the scanned files(tiff files) to Database.
Primary Actor	Tehsildar/Naib Tehsildar
Secondary Actor	Patwari
Trigger	The use case starts when actor clicks the option Save the Scanned Village Map option.
Pre Condition	The user must be validated by the system before performing the import The scanned file should be available
Primary Flow	This use case starts when the actor wishes to import scanned file to the database. <ol style="list-style-type: none"> <li>1. The actors can browse for the scanned file to make a digital check first.</li> <li>2. The actor browses the scanned file.</li> <li>3. The system asks for the name of the village with code</li> <li>4. The system imports the data to table by adding a row to the table. Village/Mouza identification field(s), Map version type, Sheet no &amp; vector files, image files shall be stored in different fields in BLOB for non-spatial databases.</li> </ol>
Alternate Flow:	Invalid image File: If the scanned file is not valid or contains some invalid data then system displays an error message 'Invalid Scanned File'.
Post Conditions	None
Priority	High
Business Rules	None
Exceptions	If the actor is not satisfied by the visual and digital inspection of map sheet scanned by the vendor. The actor may send it for rescanning with comments.
Relationships	<u>Extends</u> <ol style="list-style-type: none"> <li>1. Default page</li> </ol> <u>Is Extended by:</u> None  <u>Uses:</u> <ol style="list-style-type: none"> <li>1. Login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	The map should be scanned to tiff format.(200 to 300 DPI as the condition of the map)

**UC2.4 – Visual & Digital inspection vector file**

<b>Use Case No</b>	<b>UC2.4</b>
Use Case Name	<b>Visual &amp; Digital inspection vector file</b>
Description	This main purpose of this use case is to record the user visual and digital observations of the .shp file as digitized by the vendor.
Primary Actor	Patwari/Tehsildar/Naib Tehsildar
Secondary Actor	Patwari
Trigger	The use case starts when actor clicks the option “Visual & Digital Inspection of the vector file” option.
Pre Condition	The user must be validated by the system before performing the import The scanned file and the .shp file should be available
Primary Flow	This use case starts when the actor wishes to verify the digitized village map and want to accept the digitized village map. <ol style="list-style-type: none"> <li>1. The system allows the actors to browse for the .shp file as selected by the actor from the physical location.</li> <li>2. The actor browses the .shp file.</li> <li>3. The system asks for the name of the village with code</li> <li>4. The actor may use the tools (for digital verification of undershoot, overshoot, silvers, double line digitization)</li> <li>5. The system records the observations/remarks by the actor to the table by adding a row to the table. Village/Mouza identification field(s), Map version type, Sheet no &amp; vector files, scale and year image files shall be stored in different fields in BLOB for non-spatial databases.</li> </ol>
Alternate Flow:	Invalid .shp File: If the .shp file is not valid or contains some invalid data then system displays an error message ‘Invalid .shp File’.
Post Conditions	Marked ok for further processing of the vector file in the database.
Priority	High
Business Rules	None
Exceptions	If the actor is not satisfied by the visual and digital inspection of map sheet scanned by the vendor. The actor may send it for rescanning with comments.
Relationships	<u>Extends</u> <ol style="list-style-type: none"> <li>1. Default</li> </ol> <u>Is Extended by:</u> None  <u>Uses:</u> <ol style="list-style-type: none"> <li>1. login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	The map should be scanned to tiff format (200 to 300 DPI as the condition of the map).The Vector file should be with all the topology built and in .shp format. DXF files without topology built should not be accepted.

**UC2.5 - Integration of Textual and Spatial Data**

<b>Use Case No</b>	<b>UC2.5</b>
Use Case Name	<b>Integration of Textual and Spatial Data</b>
Description	This main purpose of this use case is to connect textual RoR data and vector data through common identifier .i.e. location code and plot ids.
Primary Actor	Patwari/Tehsildar
Secondary Actor	None
Trigger	The use case starts when actor clicks the option “ <b>Integration of Textual and Spatial Data</b> ” option.
Pre Condition	1.The user must be validated by the system before performing the import 2. The Records of Rights (Textual Data) database should be available. 3.The map/vector database should be available
Primary Flow	1. This use case starts when the actor has to integrate RoR textual data and map data. 2. The system allows selection of location details and plot id from RoR database and passes the variable to match the same in map database to fetch the record the RoR copy and map together.
Alternate Flow:	In case of missing plot, the system displays an error message. Report will be generated for all such plots.
Post Conditions	Marked ok for further processing of the vector file in the database.
Priority	High
Business Rules	None
Exceptions	If the actor is not satisfied by the visual and digital inspection of map sheet scanned by the vendor. The actor may send it for rescanning with comments.
Relationships	<u>Extends</u> 1. Default <u>Is Extended by:</u> None <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	The map should be scanned to tiff format (200 to 300 DPI as the condition of the map).The Vector file should be with all the topology built and in .shp format. DXF files without topology built should not be accepted.

**UC3.1 Display Village Map**

<b>Use Case No</b>	<b>UC3.1</b>
<b>Use Case Name</b>	<b>Display Village Map</b>
Description	This use case allows actors to display the village map produced by digitizing the data.
Primary Actor	Patwari/Tehsildar
Secondary Actor	None
Trigger	1. The actor selects the "View Village Map" from the available options in reports menu of information system.
Pre Condition	1.The user must be validated by the system before performing the import 2.The map/vector database should be available
Primary Flow	<p>1. Drop down list Box: Select District. District Names are populated from District master database. Default selection "Select Name of District"</p> <p>Validation 1: District Name must be selected Error: "Please Select Name of District"</p> <p>2. Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection "Select Name of Tehsil"</p> <p>Validation 1: Tehsil Name must be selected Error: "Please Select Name of Tehsil"</p> <p>3. Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District &amp; Tehsil chosen. The villages of the earlier selected Tehsil will only be displayed in the Drop down list. Default selection "Select Village Name"</p> <p>Validation 1: Village Name must be selected Error: "Please Select Village Name"</p> <p>4. Drop down list Box: Settlement Year. Select settlement year from the populated options as per available digitized maps from the database view created for the purpose of finding unique settlement years. Initially only one settlement year will be shown when village map are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest settlement year will</p>

	<p>be the default selection.</p> <p>Validation 1: Since Default selection is there, no validation is required.</p> <p>Error: None</p> <p>5. Button: "Clear", "Submit", "Exit". Default selection "Submit"</p> <p>6. The actor selects "Clear". The selected options are initialized. The actor selects "Exit" and the control is returned to the previous menu.</p> <p>7. The actor selects "Submit". The title of the page will display the chosen District, Tehsil, Village, Settlement year, Scale and North Direction and the Village Map on the screen.</p>
Alternate Flow:	In case of missing village vector file the system displays an error message
Post Conditions	None
Priority	High
Business Rules	None
Exceptions	None
Relationships	<p><u>Extends</u></p> <p>1. Default page</p> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <p>1. Login</p>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC3.2 Display Single Plot Map**

<b>Use Case No</b>	<b>UC3.2</b>
<b>Use Case Name</b>	<b>Display Single Plot Map</b>
<b>Description</b>	This use case allows actors to display the plot of a village map.
<b>Primary Actor</b>	Patwari/Tehsildar
<b>Secondary Actor</b>	None
<b>Trigger</b>	1. The actor selects the “View Single Plot Map” from the available options in reports menu of information system.
<b>Pre Condition</b>	1. User must be logged on to the Information System. 2. User must be authorized to view digitized plot area.
<b>Primary Flow</b>	<p>1. Drop down list Box: Select District. District Names are populated from District master database. Default selection “Select Name of District”</p> <p>Validation 1: District Name must be selected</p> <p>Error: “Please Select Name of District”</p> <p>2. Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection “Select Name of Tehsil”</p> <p>Validation 1: Tehsil Name must be selected</p> <p>Error: “Please Select Name of Tehsil”</p> <p>3. Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District &amp; Tehsil chosen. The villages of the earlier selected Tehsil will only be displayed in the Drop down list. Default selection “Select Village Name”</p> <p>Validation 1: Village Name must be selected</p> <p>Error: “Please Select Village Name”</p> <p>4. Drop down list Box: Settlement Year. Select settlement year from the options shows which will be populated as per available digitized maps from the database view created for the purpose of finding unique settlement years. Initially only one settlement year will be shown when village map are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest</p>

	<p>settlement year will be the default selection.</p> <p>Validation 1: Since Default selection is there, no validation is required.</p> <p>Error: None</p> <p>5. Drop Down List Box: Select Plot No. The user selects the plot no which he wants to display.</p> <p>Button: "Clear", "Submit", "Exit". Default selection "Submit"</p> <p>6. The actor selects "Clear". The selected options are initialized. The actor selects "Exit" and the control is returned to the previous menu.</p> <p>7. The actor selects "Submit". The title of the page will display the chosen District, Tehsil, Village, Settlement year, Scale and North Direction and the Village Map with plot number highlighted on the screen.</p>
Alternate Flow:	In case of missing village vector file the system displays an error message.
Post Conditions	None
Priority	Low
Business Rules	None
Exceptions	None
Relationships	<p><u>Extends</u></p> <p>1. Default page</p> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <p>1. login</p>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC3.3 Display Multiple Plots**

Use Case No	UC3.3
Use Case Name	<b>Display Multiple Plots</b>
Description	This use case allows actors to display Multiple Plots.
Primary Actor	Patwari/Tehsildar
Secondary Actor	None
Trigger	1. The actor selects the "View Plots" from the available options in reports menu of information system.
Pre Condition	1. User must be logged on to the Information System. 2. User must be authorized to view digitized plot area.
Primary Flow	<p>1. Drop down list Box: Select District. District Names are populated from District master database. Default selection "Select Name of District"</p> <p>Validation 1: District Name must be selected</p> <p>Error: "Please Select Name of District"</p> <p>2. Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection "Select Name of Tehsil"</p> <p>Validation 1: Tehsil Name must be selected</p> <p>Error: "Please Select Name of Tehsil"</p> <p>3. Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District &amp; Tehsil chosen. The villages of the earlier selected Tehsil will only be displayed in the Drop down list. Default selection "Select Village Name"</p> <p>Validation 1: Village Name must be selected</p> <p>Error: "Please Select Village Name"</p> <p>4. Drop down list Box: Settlement Year. Select settlement year from the options shows which will be populated as per available digitized maps from the database view created for the purpose of finding unique settlement years. Initially only one settlement year will be shown when village maps are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest</p>

	<p>settlement year will be the default selection.</p> <p>Validation 1: Since Default selection is there, no validation is required.</p> <p>Error: None</p> <p>5. Drop Down List Box: Select Plot No. The user selects the plots which he wants to display.</p> <p>Button: "Clear", "Submit", "Exit". Default selection "Submit"</p> <p>6. The actor selects "Clear". The selected options are initialized. The actor selects "Exit" and the control is returned to the previous menu.</p> <p>7. The actor selects "Submit". The title of the page will display the chosen District, Tehsil, Village, Settlement year, Scale and North Direction and the Village Map with plot numbers highlighted on the screen.</p>
Alternate Flow:	In case of missing village vector file or the plots the system displays an error message.
Post Conditions	None
Priority	Low
Business Rules	None
Exceptions	None
Relationships	<p><u>Extends</u></p> <p>1. Default</p> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <p>1. login</p>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC3.4 Display linear dimension of plot**

Use Case No	UC3.4
Use Case Name	<b>Display linear dimension of plot</b>
Description	<p>This use case allows actors to display linear dimensions of the plot/khasra/polygon. These are distances as per digitized data and computed using spatial database functions to calculate distance between any two points on the map.</p> <p>There will be an additional input in the existing interface (for selecting a particular plot) to select whether the Linear dimensions as per digitized solution are to be shown or as input from the Maps available.</p>
Primary Actor	Patwari/Tehsildar
Secondary Actor	None
Trigger	1. The actor selects the "View Linear Dimensions of Plot" from the available options to display digitized Maps of the Information System.
Pre Condition	<p>1. User must be logged on to the Information System.</p> <p>2. User must be authorized to view Linear Dimensions.</p> <p>3.Option to display Linear dimensions will not be available to general public</p>
Primary Flow	<p>1.Heading: Display Plot Map with Linear Dimensions</p> <p>2.Drop down list Box: Select District. District Names are populated from District master database. Default selection "Select Name of District"</p> <p>- Validation 1: District Name must be selected</p> <p>- Error: "Please Select Name of District"</p> <p>3.Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection "Select Name of Tehsil"</p> <p>- Validation 1: Tehsil Name must be selected</p> <p>- Error: "Please Select Name of Tehsil"</p> <p>4.Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District &amp; Tehsil chosen. The villages of the earlier selected Tehsil will only be displayed in the Drop down list. Default selection "Select Village Name"</p> <p>- Validation 1: Village Name must be selected</p> <p>- Error: "Please Select Village Name"</p> <p>5. Drop down list Box: Settlement Year. Select settlement year from the</p>

options shows which will be populated as per available digitized maps from the database view created for the purpose of finding unique settlement years. Initially only one settlement year will be shown when village maps are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest settlement year will be the default selection.

- Validation 1: Since Default selection is there, no validation is required.

- Error: None

6. Drop down list Box: Select Plot (*Khasra*). Plot Numbers are populated from the database created for digitization of maps. This is to ensure that only those plots are displayed for which maps have been digitized already. The Plot numbers of earlier selected District, Tehsil and Village will only be displayed in the drop down list. Default selection "Select Plot Number"

- Validation 1: Plot Number must be selected

- Error: "Please Select Plot Number"

7. Button: "Clear", "Submit", "Exit". Default selection "Submit"

8. The actor selects "Clear". The selected options are initialized. The actor selects "Exit" and the control is returned to the previous menu.

9. The actor selects "Submit". The plot map with linear dimensions is shown in a new window with the linear Distances "as per Scale: 1: NNNN" where NNNN is the scale on which the maps have actually been prepared manually. The title of the page will display the chosen District, Tehsil, Village, Settlement year, Plot number and dimensions will also be shown. It will also display the map scale and North direction.

Another functionality which is required here is the Change of Scale so that in case the Plot map is not visible properly (either it is too small or too large), the same may be scaled appropriately to fit on the screen. Either we change the linear distances proportionally to the chosen scale or we mention the sentence "Distances are as per Scale 1: NNNN but map zoomed to scale 1: XXXX" where XXXX is

	the scale on which map is being shown.
Alternate Flow	None
Post Conditions	None
Priority	Low
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None  <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC 3.4A Input dimension from Village Map**

<b>Use Case No</b>	<b>UC3.4 A</b>
<b>Use Case Name</b>	<b>Input dimension from Village Map</b>
<b>Description</b>	This use case allows actors to add attribute data as linear dimensions against each plot/Khasra/polygon. These are distances as mentioned on manually prepared map/musavi between any two points on the map i.e. the line length.
<b>Primary Actor</b>	Patwari/Tehsildar
<b>Secondary Actor</b>	None
<b>Trigger</b>	The actor selects the "Input Plot Dimensions as mentioned on Map" from the available options to add linear dimensions for the plot as per available distances on the map.
<b>Pre Condition</b>	<ol style="list-style-type: none"> <li>1.User must be logged on to the Information System.</li> <li>2.User must be authorized to view Linear Dimensions.</li> <li>3.Option to display Linear dimensions will not be available to general public</li> </ol>
<b>Primary Flow</b>	<ol style="list-style-type: none"> <li>1.Heading: Add Line Lengths as mentioned on Village Map</li> <li>2.Drop down list Box: Select District. District Names are populated from District master database. Default selection "Select Name of District" <ul style="list-style-type: none"> <li>- Validation 1: District Name must be selected</li> <li>- Error: "Please Select Name of District"</li> </ul> </li> <li>3.Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection "Select Name of Tehsil" <ul style="list-style-type: none"> <li>- Validation 1: Tehsil Name must be selected</li> <li>- Error: "Please Select Name of Tehsil"</li> </ul> </li> <li>4.Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District &amp; Tehsil chosen. The villages of the earlier selected Tehsil will only be displayed in the Drop down list. Default selection "Select Village Name" <ul style="list-style-type: none"> <li>- Validation 1: Village Name must be selected</li> <li>- Error: "Please Select Village Name"</li> </ul> </li> <li>5. Drop down list Box: Settlement Year. Select settlement year from the options shows which will be populated as per available digitized maps from the database view created for the purpose of finding</li> </ol>

unique settlement years. Initially, only one settlement year will be shown when village maps are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest settlement year will be the default selection.

- Validation 1: Since Default selection is there, no validation is required.

- Error: None

6. Drop down list Box: Select Plot (*Khasra*). Plot Numbers are populated from the database created for digitization of maps. This is to ensure that only those plots are displayed for which maps have been digitized already. The Plot numbers of earlier selected District, Tehsil and Village will only be displayed in the drop down list. Default selection "Select Plot Number"

- Validation 1: Plot Number must be selected

- Error: "Please Select Plot Number"

7. Button: "Clear", "Submit", "Exit". Default selection "Submit"

8. The actor selects "Clear". The selected options are initialized. The actor selects "Exit" and the control is returned to the previous menu.

9. The actor selects "Submit". The plot map is shown in a new window. The title of the page will display the chosen District, Tehsil, Village; Settlement year will also be shown. It will also display the map scale and North direction. Plot Map is shown with each point (vertex) label as alphabet or if more than 26 vertex for the plot then a combination of two or even more characters to label all points forming the plot/polygon. Each line forming the plot is listed as a combination of two points i.e.; if A and B are two points forming the line the line is depicted as "Line A-B". Linear dimensions are also mentioned against each line which is distance arrived at using spatial database functions. Such distances are shown against each line and distance as per village map is enterable against all listed lines.

10. When user enters distance as mentioned in village map for any of the plot lines, system will check for %age variation from digitized distance/length and warns if it exceeds 5%. When first entry is finalized, the system calculates proportionate lengths for the

	remaining lines as digitized line length multiplied by entered value for first line divided by digitized length of the first line. All such calculated line lengths are populated against each listed line and user is allowed to modify it in case of any further variation in any of the lines.
Alternate Flow:	None
Post Conditions	None
Priority	Low
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None  <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC3.5 Display Area of plot**

<b>Use Case No</b>	<b>UC3.5</b>
<b>Use Case Name</b>	<b>Display Area of plot</b>
Description	This use case allows actors to display area of plot/ Khasra/ polygon as projected by digitized data using spatial functions of the database and GIS library.
Primary Actor	Patwari/Tehsildar
Secondary Actor	None
Trigger	T1-The actor selects the “View Area of Digitized Plot” from the available options to display digitized areas under the functionality “Display Plot” T2-The actor selects the “View Plot wise Area as per Digitized Data” from the available options in reports menu of information system.
Pre Condition	1. User must be logged on to the Information System. 2. User must be authorized to view digitized plot area. 3.Option to display actual area as per digitized data will not be available to general public
Primary Flow	Trigger Primary Flow – P1  1.For Trigger T1- System calculates plot area using spatial data functions available with the database and same is displayed with label “Plot Area Projected by Spatial Data/Digitized Map Data is : <Area> <Units of Area>”  For Trigger T2- 1. Heading: Plot wise Area as per spatial data/Digitized Map Data. 2. Drop down list Box: Select District. District Names are populated from District master database. Default selection “Select Name of District”  -Validation 1: District Name must be selected - Error: “Please Select Name of District” 3. Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection “Select Name of Tehsil”  - Validation 1: Tehsil Name must be selected - Error: “Please Select Name of Tehsil” 4. Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District & Tehsil chosen. The villages of the earlier selected Tehsil will only be

	<p>displayed in the Drop down list. Default selection “Select Village Name”</p> <p>- Validation 1: Village Name must be selected</p> <p>-Error: “Please Select Village Name”</p> <p>5. Drop down list Box: Settlement Year. Select settlement year from the options shows which will be populated as per available digitized maps from the database view created for the purpose of finding unique settlement years. Initially only one settlement year will be shown when village maps are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest settlement year will be the default selection.</p> <p>- Validation 1: Since Default selection is there, no validation is required.</p> <p>- Error: None</p> <p>6. Button: “Clear”, “Submit”, “Exit”. Default selection “Submit”</p> <p>7. The actor selects “Clear”. The selected options are initialized. The actor selects “Exit” and the control is returned to the previous menu.</p> <p>8. The actor selects “Submit”. The title of the page will display the chosen District, Tehsil, Village, Settlement year, plot id; Units of area, scale and north direction will also be shown. System will generate report where all plots/ khasra numbers, as are available in database for textual RoR (Jamabandi), for the chosen village and settlement year are listed along with corresponding area of the plot as per digitized map data. If any Khasra/plot is missing in digitized (spatial) data same will be labeled as “Not available in map”.</p>
Alternate Flow:	None
Post Conditions	None
Priority	Low
Business Rules	None
Exceptions	None
Relationships	<p><u>Extends</u></p> <p>1. Default page</p> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p>

	1. login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC3.6 Display plot area from RoR**

<b>Use Case No</b>	<b>UC3.6</b>
<b>Use Case Name</b>	<b>Display plot area from RoR</b>
Description	This use case allows actors to display area of plot/ Khasra/ polygon as per Record of Rights (textual) data.
Primary Actor	Patwari/Tehsildar
Secondary Actor	None
Trigger	<p>1.T1-The actor selects the “View Area of Plot from RoR data” from the available options to display area under the functionality “Display Plot”</p> <p>2. T2-The actor selects the “View Plot wise Area as per RoR Data” from the available options in reports menu of information system.</p>
Pre Condition	<p>1. User must be logged on to the Information System.</p> <p>2. User must have privilege to use functionality.</p>
Primary Flow	<p>For T1</p> <p>1. System connects to textual data (RoR) available for the chosen village and retrieves area unit being followed in the village and plot area for the selected plot. Such area is displayed with label “Plot Area as per Jamabandi (RoR) is: &lt;Area&gt; &lt;Units of Area&gt;”</p> <p>For Trigger T2-</p> <p>1. Heading: Plot wise Area as per textual (ROR/Jamabandi) data.</p> <p>2. Drop down list Box: Select District. District Names are populated from District master database. Default selection “Select Name of District”</p> <p>- Validation 1: District Name must be selected</p> <p>- Error: “Please Select Name of District”</p> <p>2. Drop down list Box: Select Tehsil. Tehsil Names are populated from Tehsil master database based on the District Name chosen. Only Tehsils of the earlier selected District will be displayed in the Drop down list. Default selection “Select Name of Tehsil”</p> <p>- Validation 1: Tehsil Name must be selected</p> <p>- Error: “Please Select Name of Tehsil”</p> <p>3. Drop down list Box: Select Village. Village Names are populated from Village master database and these are based on the District &amp; Tehsil chosen. The villages of the earlier selected Tehsil will only be displayed in the Drop down list. Default selection “Select Village Name”</p>

	<p>- Validation 1: Village Name must be selected</p> <p>- Error: "Please Select Village Name"</p> <p>4. Drop down list Box: Settlement Year. Select settlement year from the options shows which will be populated as per available digitized maps from the database view created for the purpose of finding unique settlement years. Initially only one settlement year will be shown when village maps are digitized for the first time. However, in case of re-survey or fresh settlement, new set of digitized maps will become available and as many settlement years will be displayed for selection. Default selection will be the Settlement Year displayed in case of single year data is available. In case of multiple years, latest settlement year will be the default selection.</p> <p>- Validation 1: Since Default selection is there, no validation is required.</p> <p>- Error: None</p> <p>5. Button: "Clear", "Submit", "Exit". Default selection "Submit"</p> <p>6. The actor selects "Clear". The selected options are initialized. The actor selects "Exit" and the control is returned to the previous menu.</p> <p>7. The actor selects "Submit". The title of the page will display the chosen District, Tehsil, Village, Settlement year, plot id and Units of area will also be shown. System will generate report where all plots/ khasra numbers, as are available in database for digitization of maps, for the chosen village and settlement year are listed along with corresponding area of the plot as per RoR (Jamabandi) data. In case any Khasra Number (Plot) is missing in RoR data then same will be labeled "Not Available in RoR" in this report.</p>
Alternate Flow:	<p>If RoR (Jamabandi) data is not available for the selected village user will get message "RoR (Jamabandi) data not available for the Village".</p> <p>In case of trigger T1 if plot is missing in RoR data user will get message "RoR (Jamabandi) data not available for the chosen plot"</p>
Post Conditions	None
Priority	High
Business Rules	None
Exceptions	None
Relationships	<p><u>Extends</u></p> <p>1. Default</p> <p><u>Is Extended by:</u></p> <p>None</p> <p><u>Uses:</u></p> <p>1. Login</p>

Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC4.1 - Print Village Map (Attach Plotter)**

Use Case No	UC4.1
Use Case Name	Print Village Map (Attach Plotter)
Description	This main purpose of this use case is to print the mouza/village Map.
Primary Actor	Patwari/Tehsildar
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor clicks for Print → Village/Mouza Map
Pre Condition	<ol style="list-style-type: none"> <li>1.The user must be validated by the system before performing the operation</li> <li>2. The appropriate location is selected for identifying the village.</li> <li>3. It is to be ensured that Plotter is in perfect condition for precision printing. Otherwise the plotter has to be calibrated for precision printing.</li> </ol>
Primary Flow	<ol style="list-style-type: none"> <li>1. After clicking Print→ Village Map, a new window shall pop-up the Village Map</li> <li>2. Pop-up window shall also have option to select the scale, legend, direction, Paper Size (A0, A1 etc), etc. (optional). Default shall be A0 size paper.</li> <li>3. The Ok button will activate only after selection of page elements.</li> <li>4. Actor Clicks Ok to Print the Map.</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> <ol style="list-style-type: none"> <li>1. Default page</li> </ol> <u>Is Extended by:</u> None <u>Uses:</u> <ol style="list-style-type: none"> <li>1. Login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC4.2 Print Single plot with boundary**

Use Case No	UC4.2
Use Case Name	Print Single plot with boundary
Description	This main purpose of this use case is to print the plot map.
Primary Actor	Patwari/Tehsildar
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor clicks for Print → Village Map->Single Plot
Pre Condition	1.The user must be validated by the system before performing the operation
Primary Flow	<ol style="list-style-type: none"> <li>1.The appropriate location is selected for identifying the village/mouza</li> <li>2. After clicking Display Village Map, a new window shall pop-up the Village Map</li> <li>3. On selection of a desired plot, a new window shall pop-up the plot only along with the Dimensions of the sides, Directions, legend</li> <li>4. The system also show all the plots of same owner.</li> <li>5. The windows will also display the District/Tehsil/Village</li> <li>6. Default page size can be set. Otherwise page size can be selected.</li> <li>7. Actor Clicks Ok to Print the Map (A4/A3).</li> <li>8. plot map gets printed on Laser printer</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> <ol style="list-style-type: none"> <li>1. Default page</li> </ol> <u>Is Extended by:</u> None <u>Uses:</u> <ol style="list-style-type: none"> <li>1. login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC4.3 - Print Multiple plot with Boundary**

Use Case No	UC4.3
Use Case Name	Print Multiple plot with Boundary
Description	This main purpose of this use case is to print the plot maps.
Primary Actor	Patwari/Tehsildar
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor clicks for Print → Village Map->Multiple Plots
Pre Condition	1.The user must be validated by the system before performing the operation 2. The appropriate location is selected for identifying the village.
Primary Flow	1.After clicking Print→ choose the district, tehsil and village 2.Then chose the plot ids to be displayed and printed., a new window shall pop-up the plot only 3.The windows will also display the District/Tehsil/Village/plot ids and adjoining plots 4. Pop-up window shall also have option to select the scale , legend , direction, paper Size (A4, A3, etc), etc. (optional) 5. The Ok button will activate only after selection of page elements. 6. Actor Clicks Ok to Print the Plots.
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None <u>Uses:</u> 1. login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC4.4 – Print ROR with Map**

Use Case No	UC4.4
Use Case Name	Print ROR with Map
Description	This main purpose of this use case is to print the selected plot no/khasra of a village with the ROR
Primary Actor	Patwari/Tehsildar
Secondary Actor	Tehsildar/Naib Tehsildar
Trigger	The use case starts when the actor clicks for Print Plot icon in the village map display window
Pre Condition	<ol style="list-style-type: none"> <li>1.The user must be validated by the system before performing the operation</li> <li>2. The appropriate location is selected for identifying the village.</li> <li>3.The system shall automatically select only those plots which are owned by the same person(s)</li> </ol>
Primary Flow	<ol style="list-style-type: none"> <li>1.Actor will select a village and plot id for getting RoR details and its map displayed</li> <li>2.System shall highlight all desired plot maps having same owners</li> <li>3.Actor will click on Print plot icon</li> <li>4.Actor will select the scale, legend, direction, Paper Size (A4, A3, etc), etc. (optional)</li> <li>5.Actor Clicks Ok to Print the Plots with ROR</li> <li>6.The print will be done such that only one plot appears in a single sheet</li> <li>7. The corresponding ROR is printed on the last page.</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> <ol style="list-style-type: none"> <li>1. Default page</li> </ol> <u>Is Extended by:</u> None <u>Uses:</u> <ol style="list-style-type: none"> <li>1. Login</li> </ol>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC4.5 – Export ROR with Map to PDF**

Use Case No	UC4.5
Use Case Name	<b>Export ROR with Map to PDF</b>
Description	This main purpose of this use case is to Export the Map composition to PDF format.
Primary Actor	Patwari/Tehsildar
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor clicks for Export → PDF
Pre Condition	1.The user must be validated by the system before performing the import 2.The plot is selected for Export.
Primary Flow	<ol style="list-style-type: none"> <li>1. After clicking Export → PDF, a new window shall pop-up for selection of Output path for saving the PDF and map elements like Scale, North Arrow, Legend, etc. for inclusion in the output. A check box with default selected for inclusion of ROR in the output is provided.</li> <li>2. Pop-up window shall also have option to select page-setup elements like Orientation (Landscape/ Portrait), Paper Size (A4, A3, etc), etc.</li> <li>3. The Ok button will activate only after selection of page elements.</li> <li>4. Actor Clicks Ok to export to PDF.</li> <li>5. The export mechanism is such that it will prepare the map composition such that the output is prepared in a single sheet having map of the plot with scale and other elements in the upper half and ROR details in the lower half of the sheet.</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None  <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.1 Split Plot****(Based on Distances from Known Points)**

Use Case No	UC5.1
Use Case Name	Split Plot(Based on Distances from Known Points)
Description	The main purpose of this use case is to split Plot/Polygon based on distance from known points.
Primary Actor	Patwari)/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for option for Split Plot in the menu.
Pre Condition	The user must be validated by the system before performing the Split operation The plot is selected for Split.
Primary Flow	<ol style="list-style-type: none"> <li>1.System allows the actor to select the plot to be split and in what numbers the plot is to be split</li> <li>2. The changes in the attribute data because of mutation are done by choosing the "mutation of attribute" data button.</li> <li>3. When actor opts for splitting a plot, system must make enable the facility to ON coordinate points on the map and should show distances between the various coordinate points. This can be done only after the changes in the attribute data are done.</li> <li>4.For splitting the khasra the actor must either select two point as the source and destination coordinate points based on the distances shown between the coordinate points on the khasra map</li> <li>5. Actor may also split the plot by specifying distance(s) from the source coordinate point.</li> <li>6.The actor will also scan the mutation orders related to the attribute data and graphical data (by surveyors) in to the database</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None <u>Uses:</u> 1. Login
Screen References	None
Nature of Functionality	None

Outstanding Issues	None
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**UC5.2 – Adjust the split line for area**

Use Case No	UC5.2
Use Case Name	Adjust the split line for area
Description	The main purpose of this use case is to adjust the area of the new plots by manual shifting the joining lines either left or right so that manual correction can be done in getting actual area of the splitted (new) plots.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for the option of adjusting the line Splitting Plot in the menu.
Pre Condition	1.The user must be validated by the system before performing the Split operation 2. The plot is selected for Split.
Primary Flow	1. System allows the actor to select the plot to be adjusted for area by shifting the line dividing the plot. 2. The user checks area of the new plots with actual area mentioned in the orders after division. 3. When actor then selects the dividing line and shifts either left right or top bottom as per the action required to increase or decrease the area of the new plots. The present area of the plots is shown in the screen. The actor stops shifting when the area matches with the area as indicated in the mutation orders
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None <u>Uses:</u> 1. login
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.3 Split Plot****(Based on Curve tracing)**

<b>Use Case No</b>	<b>UC5.3</b>
Use Case Name	<b>Split Plot</b> <b>(Based on Curve tracing)</b>
Description	The main purpose of this use case is to split Plot/Polygon based on curve tracing from a known corner of the plot.
Primary Actor	Patwari)/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for the option of Split Plot through curve tracing in the menu.
Pre Condition	The user must be validated by the system before performing the Split operation The plot is selected for Split.
Primary Flow	<ol style="list-style-type: none"> <li>1. System allows the actor to select the plot to be split and in what type of splitting mechanism. (joining line with two points, viz. curve, etc. also a free hand pencil is to be make available for drawing in any direction manually.</li> <li>2. The field map is to be scanned and digitized data is to be overlaid on the scanned raster image for splitting operation.</li> <li>3. Scan the mutation orders and save the orders in the database as sanctioned by the Tehsildar.</li> <li>4. The changes in the attribute data because of mutation are done by choosing the "mutation of attribute" data button. The splitting of the plot can be done only after the changes in the attribute data are done.</li> <li>5. Actor splits the plot by tracing curves as per the subdivision lines in the raster image.</li> <li>6. System also has the facility to spit the plot by specifying angles for drawing the subdivision lines.</li> <li>7. The actor will also scan the mutation orders related to the attribute data and graphical data (by surveyors) in to the database.</li> </ol>
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None <u>Uses:</u> 1. Login

Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.4 Merge Plot**

Use Case No	UC5.4
Use Case Name	Merge plot
Description	The main purpose of this use case is to Merge Plots, Mosaic Sheets & Rubber sheeting.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when actor opts for the option Merge Plots/Mosaic Sheet from the menu.
Pre Condition	<ol style="list-style-type: none"> <li>1.The user must be validated by the system before performing the merge operation</li> <li>2. The plots are selected for merge. They should be adjoining plots</li> <li>3. Village sheets must be present as a whole unit in spatial database.</li> <li>4. All the sheets to be mosaic must be properly verified and in same scale.</li> </ol>
Primary Flow	<p>When the actor selects to merge plot the following sequence of steps are followed</p> <p>Merge plot:</p> <ol style="list-style-type: none"> <li>1. Combining two or more independent adjacent Land Parcels/Khasras into a single Land Parcel/Khasra.</li> <li>2. System should allow more then two plot/land parcel to be merged at a time.</li> </ol> <p>Rubber Sheeting:</p> <ol style="list-style-type: none"> <li>1. Also known as warping/edge matching.</li> <li>2. Attempts to correct errors by stretching a map to fit known control points.</li> <li>3. To implement Rubber Sheeting of a map, XY values of known coordinates within the survey control map are entered in conjunction with screen selections of the corresponding locations within the map overlay to be rubber sheeted. Each coordinate within the map overlay being processed is moved to the location of the prescribed control coordinate to achieve rubber sheeting.</li> <li>4. Village map sheets should be edge-matched based on the village index map.</li> </ol> <p>Mosaic Survey Sheet:</p> <ol style="list-style-type: none"> <li>1. System asks the actor for selecting the sheets to be mosaic. Facility must be for selecting more than one sheet at a time for mosaic.</li> <li>2. Mosaicing of sheets comprises of a sheet assembled from two or more than two survey sheets. Each sheet may come from a different</li> </ol>

	<p>source and may have a different angle of orientation, but all the sheets must be geometrically rectified and calibrated to a common coordinate framework. The mosaic process rotates and re-scales each sheet and creates a single combined sheet.</p> <p>3. If all sheets are geo-referenced to the same map projection, they can be automatically mosaiced based upon their geographic calibration without additional adjustments.</p> <p>4. The actor will also scan the mutation orders related to the attribute data and graphical data (by surveyors) in to the database</p>
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	<p>1. It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors</p> <p>2. It is mandatory for the users in the Cadastral mapping software to have valid user id, password and biometric authentication for the secondary actors.</p>
Exceptions	<p>User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters)</p> <p>Bio Metric Device Not Found</p>
Relationships	<p><u>Is Extended by:</u> Bio Metrics Authentication</p> <p><u>Uses:</u> 1. Login Creation Page</p>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.5 Attach new plot id**

<b>Use Case No</b>	<b>UC5.5</b>
Use Case Name	Assign new plot id

Description	The main purpose of this use case is to assign new id either when a Plot is split into two or more plots or when two or more plots are merged into a new plot.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when a new plot is formed after Split/Merge operation and when the actor selects the assign new plot id from the menu
Pre Condition	<ol style="list-style-type: none"> <li>1.The user must be validated by the system before performing the merge operation</li> <li>2.The plot is selected for merge.</li> <li>3.Village sheets must be present as a whole unit in spatial database.</li> <li>4.All the sheets to be mosaic must be properly verified and in same scale.</li> </ol>
Primary Flow	<p>When the actor selects to assign new plot id the following sequence of steps are followed</p> <ol style="list-style-type: none"> <li>1.System allows the actor to assign new ID while a Plot is split according to point number 2 and 3.</li> <li>2.The split polygon is to be assigned a new ID for e.g.: according to the State Land Revenue Act. However, general practice where new khasra number/ID is assigned as given below New Khasra Number = The last khasra number + 1/ The parent Khasra Number</li> <li>3. System also allows the actor for merging plot two or more plots as to form a single new plot and assign new khasra number/ID as per their State Land Revenue Act. New Khasra Number = The last khasra number + 1/ Merged Khasra Numbers, separated by comma</li> <li>4.Actor must keep in mind that the new ID assigned must be an integer and must not be same as the ID of the plot split/merged.</li> <li>5.In some states the new plot is assigned like (10 is original plot after splitting it may be assigned 10/1, 10/2) or(10 is original plot after splitting it may be assigned 10/1, 10) or (10 is original plot after splitting it may be assigned 10/ka, 10/kha) (Hindi Ka and Kha), or 10 Min (temporary). However, the approach suggested above may be adopted.</li> </ol>
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	<ol style="list-style-type: none"> <li>1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors</li> <li>2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the</li> </ol>

	secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.6 Align Symbol**

<b>Use Case No</b>	<b>UC5.6</b>
Use Case Name	Align symbol
Description	The main purpose of this use case is to align the symbols/alamats as per the original map sheet
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned

Trigger	The use case starts when the actor opts for the option to align the symbols from the menu.
Pre Condition	1. The user must be validated by the system before performing this operation. 2..Original village sheets must be present as a whole unit in spatial database. 3. All the symbols must be there in the symbol library of the cadastral mapping software.
Primary Flow	When the actor selects to align symbols the following sequence of steps are followed 1.System allows the actor to select the plot as required. 2.The actor selects any existing symbol/alamat or selects the new symbol/alamat as required. 3.Locates the symbol/alamat at the required location by a mouse click.
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

### UC5.7 Undo Split

Use Case No	UC5.7
Use Case Name	Undo split
Description	The main purpose of this use case is to undo any splitting of plot. This also treated as a mutation.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for the option undo split from the menu.
Pre Condition	1. The user must be validated by the system before performing the

	undo split operation. 2.The plot is selected for undo split
Primary Flow	When the actor selects to undo split of the plot the following sequence of steps are followed 1.System allows the actor to select the plots as required. 2.The actor selects the plots and indicates merge the plots. 3.The necessary orders of Tehsildar or the revenue courts for merging or undo split is also scanned. 4.The activity is logged as it introduces the changes in the plot.
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.8 Undo Merge**

Use Case No	UC5.8
Use Case Name	Undo Merge
Description	The main purpose of this use case is to undo any merging operation. This also treated as a mutation.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for the option undo merge from the menu.
Pre Condition	1. The user must be validated by the system before performing the undo merge operation. 2.The plot is selected for undo merge of plots
Primary Flow	When the actor selects to undo merge the following sequence of steps are followed 1.System allows the actor to select the plots as required. 2.The actor selects the plots for the undo the merge operation as indicated by the orders of the Tehsildar or courts. 3.The necessary orders of Tehsildar or the revenue courts for undo of the merge operation or undo merge is also scanned. 4.The activity is logged as it introduces the changes in the plot.
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.9 Crop Plot(s)**

<b>Use Case No</b>	<b>UC5.9</b>
Use Case Name	Crop plot(s)
Description	The main purpose of this use case is to Crop Plot(s) or surrounding area on the same scale/desired scale and probably area belonging to one owner.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for the option of Plot Cropping from the menu.
Pre Condition	1. The user must be validated by the system before Cropping a Plot. 2.The plot is selected for the cropping
Primary Flow	When the actor selects to crop plot(s) the following sequence of steps are followed 1. System asks for dimensions for cropping (i.e. height & width) when actor opts for Plot Cropping. 2. System allows for free Cropping (framing of rectangle). 3. System also asks for the scale at which the plot is to be cropped. Standard scale is 1:4000 though requirement is to crop plot at any desired scale. And if no scale is specified by the user then system should crop the plot at the same scale as of the survey sheet being cropped. 4. System also allows actor to crop multiple khasra owned by one user.
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC5.10 Show Map Grid**

<b>Use Case No</b>	<b>UC5.10</b>
Use Case Name	Show map grid

Description	This main purpose of this use case is to show/hide grid to use it as an aid during splitting of map.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	None
Trigger	This use case starts when the actor wishes to show grid on the plot to be split.
Pre Condition	The user must be validated by the system for editing map
Primary Flow	When the actor selects to show map grid the following sequence of steps are followed 1.The actor clicks on the grid Icon available along with panning, zooming tools. 2.The actor mentions the size of the grid (Ex. 15 units or 5 units etc.). 3.By default the grid size would be 10 units. 4.The actor clicks on a point on the plot boundary from where he desires the grid's intersection point to be. 5.The system asks displays grid covering the plot 6.The actor can hide the grid by clicking again on the grid icon
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters)
Relationships	<u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	1. The Grid Icon is available along with symbols of Pan, zoom and other editing tools in the Edit map window. 2. Clicking on the Grid icon changes its colour to Gray indicating it is active. Clicking again restores its original colour and hides Grid. There is a text box adjacent to Grid Icon. Its default value is 10. Actor can input any number as size of grid he ants to draw on plot map.
Outstanding Issues	None

**UC5.11 Edit map using Grid**

Use Case No	UC5.11
Use Case Name	Edit map using grid
Description	This main purpose of this use case is to use grid to edit the map
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	None
Trigger	This use case starts when the actor wishes to edit map with the help of Grid.
Pre Condition	1.The user must be validated by the system for editing map 2. A grid on a transparent sheet to be placed on trace of plot must be available (This can be prepared by printing grid on transparent sheet through laser printer).
Primary Flow	When the actor selects to edit the map with the help of grid the following sequence of steps are followed 1. The actor shows grid of desired size (as the grid on transparent sheet) on the plot to be edited. 2. The actor places a transparent sheet having a grid, of the same size as he selected in the previous step, on the trace of the Plot map. He adjusts the Grid on the paper as it exactly appears on the screen 3. The actor draws line through those sub grids on the screen as the dividing line on the trace paper appears to be passing through the sub grids on the transparent sheet.
Alternate Flow	None
Post Conditions	None
Priority	High
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters)
Relationships	<u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC6.1 Query builder**

Use Case No	UC6.1
Use Case Name	Query builder
Description	The main purpose of this use case is to make desired query on any

	specific requirements of the plot for which information is present in the system.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when actor selects the option to query on Plot.
Pre Condition	The user must be validated by the system before firing a query on Plot.
Primary Flow	When the actor selects to query on plot the following sequence of steps are followed 1.System allows actor for build dynamic queries based on the fields (Government land, private land, wasteland, irrigated, non-irrigated, crop details, encroached plots, garden, orchard, forest land, institutional land, mining, water logged) available from ROR and database. 2. System shall show the result of dynamic query if information is available in the system.
Alternate Flow	System shall show the appropriate message if requested query information is not available in the system.
Post Conditions	None
Priority	Medium
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

### UC7.1 Zoom (in/out) Village map

Use Case No	UC7.1
Use Case Name	Zoom (in/out) Village map
Description	This use case describes how to zoom in/out the map of a village or plot. The map display screen has two buttons + and – and text box to enter

	scale.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when actor tries to zoom in/out a village map or plot.
Pre Condition	1.The user must be validated by the system 2. Village map must be selected
Primary Flow	When the actor selects to zoom in or out village map the following sequence of steps are followed 1.The actor selects a village and gets the map displayed (and plot if necessary). 2.The actor presses + or – to zoom in or out respectively. Alternatively he/she will enter a scale to which the map is to be zoomed. 3.System zooms the map
Alternate Flow	None
Post Conditions	None
Priority	Medium
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2. It is mandatory for the users in the Cadastral mapping software to have valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

### UC7.2 Pan Village map

Use Case No	UC7.2
Use Case Name	Pan Village map
Description	This use case describes how to pan the map of a village.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when actor tries to pan village map.
Pre Condition	1.The user must be validated by the system 2. Village map must be selected
Primary Flow	When the actor selects to zoom in or out village map the following

	sequence of steps are followed 1.The actor selects a village and gets the map displayed 2.The actor presses Left, Right, Up, or down buttons to pan the map Right, Left, Down or Up respectively. 3.System pans the map
Alternate Flow	None
Post Conditions	None
Priority	Medium
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	The map display screen has four buttons  to pan the map Left, Right, down and Up
Outstanding Issues	None

### UC8.1 Take back up

Use Case No	UC8.1
Use Case Name	Take back up
Description	This use case describes how to take back up of spatial database.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	This use case is triggered when the actor intends to take a back up of the spatial database
Pre Condition	1.The user must be validated by the system 2. Backup will be on a specific directory in the hard disk.
Primary Flow	When the actor selects to take back up the following sequence of steps are followed 1. The actor selects the back up option.

	<p>2. The actor browses and specifies the location (folder) where the back up file is to be kept.</p> <p>3. The actor specifies the back up file name</p> <p>4. System back ups the spatial data.</p>
Alternate Flow	None
Post Conditions	None
Priority	Medium
Business Rules	<p>1. It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors</p> <p>2. It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.</p>
Exceptions	<p>User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters)</p> <p>Biometric Device Not Found</p>
Relationships	<p><u>Is Extended by:</u> Bio Metrics Authentication</p> <p><u>Uses:</u> 1. Login Creation Page</p>
Screen References	None
Nature of Functionality	The window contains two text boxes one for back up file name and the other for mentioning the location where back up is to be kept. Two buttons 'Back up' and 'Cancel' are available at the bottom of the window. Back up button causes the system to create back up file and store it in at the location and with file name specified by the actor.
Outstanding Issues	None

### UC8.2 Audit Trail

Use Case No	UC8.2
Use Case Name	Audit trail
Description	This use case describes how the audit trail of business processes is maintained
Primary Actor	System
Secondary Actor	None
Trigger	This use case is triggered whenever a business process takes place i.e. every time any change is made to the database.
Pre Condition	<p>1. The actor must be validated by the system</p> <p>2. Audit logs are written in the database for all the operations the actors perform.</p>
Primary Flow	The system maintains audit log into the database for all the actors logged in to the system and carry out write, update, insert or delete operations to the database through proposed application.
Alternate Flow	None

Post Conditions	None
Priority	High
Business Rules	The system records actor name, user id, date, time, table name, affected columns in that table, old and new values of each such column
Exceptions	None
Relationships	<u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC9.1 Maintain village vector file master**

Use Case No	UC9.1
Use Case Name	Maintain village vector file master
Description	This use case describes the list of the shape files in a Tehsil with status of digitization and fit for day to day mutation updation.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	This use case is triggered when the actor selects the option to maintain village vector file master
Pre Condition	1.The actor must be validated by the system
Primary Flow	When the actor selects to maintain village vector file master the following sequence of steps are followed 1.The actor logs in 2. The actor enters the name (code) of the digitized village map, year and remarks. 3. The data is saved into the table in the database with data, time and user name.
Alternate Flow	None
Post Conditions	None
Priority	Medium
Business Rules	1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors 2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Creation Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC9.2 Splitting/Dividing single village vector file**

Use Case No	UC9.2
Use Case Name	Splitting/Dividing single village vector file
Description	The main purpose of this use case is to split/divide a single shape file of a village into two or more new vector files.
Primary Actor	Patwari/Data Entry Operator (DEO).
Secondary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Trigger	The use case starts when the actor opts for splitting/dividing vector file of a village into two or more new vector files as a result of formation of new villages from old village.
Pre Condition	<ol style="list-style-type: none"> <li>1. The user must be validated by the system before performing the split/divide operation on village sheet.</li> <li>2. Village to be split must be available as a single independent Sheet.</li> </ol>
Primary Flow	<p>When the actor selects to maintain village vector file master the following sequence of steps are followed</p> <ol style="list-style-type: none"> <li>1.The actor logs in</li> <li>2. System allows the actor to select the State, District.</li> <li>3. System asks the actor to select the village vector file to be split.</li> <li>4. System allows the actor to set the source and destination coordinate points for splitting the vector file. Also a free hand pencil is to be made available for splitting in any direction manually.</li> <li>5. The field map (containing subdivision lines for new village formation) is to be scanned and digitized data is to be overlaid on the scanned raster image for splitting operation.</li> <li>6.Actor splits the village vector file by tracing curves as per the subdivision lines in the scanned raster image.</li> <li>7.System should also have the facility to split the plot by specifying angles for drawing the subdivision lines.</li> </ol>
Alternate Flow	None
Post Conditions	None
Priority	Medium
Business Rules	<ol style="list-style-type: none"> <li>1.It is mandatory for a user in the Cadastral mapping s/w to have a valid user id with password for the primary actors</li> <li>2.It is mandatory for the users in the Cadastral mapping software to have both valid user id, password and biometric authentication for the secondary actors.</li> </ol>
Exceptions	<p>User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters)</p> <p>Biometric Device Not Found</p>
Relationships	<p><u>Is Extended by:</u> Bio Metrics Authentication</p> <p><u>Uses:</u> 1. Login Page</p>

Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC10.1 – Approval of the Tehsildar**

Use Case No	UC10.1
Use Case Name	Approval of the Tehsildar
Description	The main purpose of this use case is to update the new plots generated because of splitting or merging operations with all the polygon and topology information to the server.(locally in Version 1.0, and to the central server in Version 2.0) During this operation the Tehsildar also approves the changes in the map database.
Primary Actor	Tehsildar/Naib Tehsildar of the Tehsil concerned
Secondary Actor	None
Trigger	The use case starts when the actor chooses the approve option from the menu. .
Pre Condition	<ol style="list-style-type: none"> <li>1. The actor must be validated by the system.</li> <li>2. The actor must be a valid user with administrative privileges.</li> </ol>
Primary Flow	<p>When the actor selects to maintain village vector file master the following sequence of steps are followed</p> <ol style="list-style-type: none"> <li>1.The actor logs in</li> <li>2 .System will check for validity of operation whether resulted polygons are close and minimum of two plots are resulting due to splitting, whereas, minimum of two plots are being clubbed while clubbing plots. All the new plot map information will be updated in the sever located at the Tehsil ( Ver. 1.0)</li> <li>3. In version 2.0 the data will be updated to a central server located at District/State as the case may be.</li> <li>4. Proper audit trail and versioning/history should be maintained before updation.</li> <li>5. Bio metric authentication should be used to achieve for non repudiation.</li> <li>6. All the data changes will be within a transaction block so that all changes will rollback to initial state if any error is encountered. The system will check that the transactions are completely committed into the master database.</li> <li>7. In case of partial commit the system will alert the Tehsildar. Rollback of the changes will also be intimated to the system administrator.</li> </ol>
Alternate Flow	<ol style="list-style-type: none"> <li>1. If the Tehsildar rejects the changes in the map as done by the Patwari the case reported to patwari with the Tehsildar comments. The Patwari may reinitiate the case.</li> <li>2. Failure in updation should be reported to the system administrator/Tehsildar.</li> </ol>
Post Conditions	None

Priority	High
Business Rules	It is mandatory for the actors (administrator) in the Cadastral mapping software to have valid user id, password and biometric authentication.
Exceptions	User Password not conforms to the Standard(8 Characters and should be a combination of upper, lower and special characters) Biometric Device Not Found
Relationships	<u>Is Extended by:</u> Bio Metrics Authentication <u>Uses:</u> 1. Login Page
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

### UC10.2 – Data updation to Data Centre

Use Case No	UC10.1
Use Case Name	Data updation to Data Centre
Description	The copy of data will be kept at Data Centre at State Level for web based reporting and display. The purpose of this use case is to update the transactions to the central in batch mode.
Primary Actor	Tehsildar/System
Secondary Actor	None

Trigger	The script is invoked as per schedule every day to push the transactions to central server.
Pre Condition	<ol style="list-style-type: none"> <li>1. The actor must be validated by the system.</li> <li>2. The actor must be a valid user with administrative privileges.</li> <li>3. Copy of Database should be available in the Data Centre</li> <li>4. Tehsils should have network connectivity to Data Centre</li> </ol>
Primary Flow	<p>When the actor selects to maintain village vector file master the following sequence of steps are followed</p> <ol style="list-style-type: none"> <li>1. The actor logs in</li> <li>2. The batch update module is activated as per the fixed schedule every day or Administrator can invoke the module at any time as per requirements. Message "Data Updated to Data Centre"</li> <li>3. In case if partial commit/failure the system will generate alerts.</li> <li>4. Rollback of the changes will also be intimated to the system administrator.</li> </ol>
Alternate Flow	<ol style="list-style-type: none"> <li>1. Any failure in updation of records the whole transactions will be reverted back to the old condition and proper messages will be generated.</li> </ol>
Post Conditions	None
Priority	High
Business Rules	It is mandatory for the actors (administrator) in the Cadastral mapping software to have valid user id, password and biometric authentication. Data Centre must be updated daily.
Exceptions	<p>User Password not conforms to the Standard (8 Characters and should be a combination of upper, lower and special characters)          Biometric Device Not Found.</p> <p>In case data is not updated to the Data Centre, next day when he boots the system, system prompts to updating to the central server.</p>
Relationships	<p><u>Is Extended by:</u> None</p> <p><u>Uses:</u> 1. Login Page</p>
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

**UC10.3 – Web based reporting - ROR with Map**

Use Case No	UC4.3
Use Case Name	Web based reporting
Description	This main purpose of this use case is to display RoR and corresponding map over the web
Primary Actor	Citizen
Secondary Actor	-
Trigger	The use case starts when the actor invokes the url /enters in to the web page
Pre Condition	1. The user system should be network enabled. 2. The appropriate location is selected for identifying the village.
Primary Flow	1.Actor will select a village and plot id for getting RoR details and its map displayed 2. System shall display Record of Rights (RoR) for the selected plot. 3.System shall display the map of selected plot ids
Alternate Flow:	None
Post Conditions	None
Priority	Medium
Business Rules	None
Exceptions	None
Relationships	<u>Extends</u> 1. Default page <u>Is Extended by:</u> None <u>Uses:</u> None
Screen References	None
Nature of Functionality	None
Outstanding Issues	None

## 4.0 NON-FUNCTIONAL REQUIREMENTS

### 4.1 External Interface Requirements

The following section lists the user, hardware, software and communication interface requirements of the proposed application package.

#### 4.1.1 User Interface

It is envisaged to have a simple, consistent and easy user interface that requires a low level of competence from its users. The user interface should offer a quick learning curve. The screen layout for the proposed application should be such that the users know where to look for the information they want, even on never before seen screens. Look and feel of the screens shall be consistent across all screens. Extreme consistency throughout the application lends itself to intuitive, predictable use and operation. The interface should provide abort/reset to the users so that they can back out at any time.

On the graphical interface part, the color/size/font etc should be consistent and should give an aesthetic appeal to the application.

#### 4.1.2 Hardware Interface

It is proposed that the version 1.0 application will be installed on Tehsil Server (Server with 8-16 GB RAM with 320 GB HDD). However, it will be preferred to run the front end on clients with 4 GB RAM and 160GB Hard disk space. Version 2.0, Web based Application will be installed in the State/Revenue Data Centre, with a proper access authentication to tehsils.

#### 4.1.3 Software Interface

The application will run on server under Windows operating system with RDBMS having spatial data support as the backend for data storage (Postgres with Post GIS extension). In version 1.0 the s/w shall be invoked over LAN as client /server application and data will be saved /stored in at local server to be accessed through clients.

Version 2.0 of the software will be web based, where application and database will be hosted at the State/Revenue Data Centre. All the tehsils will be allowed to update and use database as per roles and authentication.

#### 4.1.4 Communication Interfaces

Version 1.0 of the software shall be client server based where server and client at Tehsil will be on LAN. Version 2.0 of the software shall be web based application where each and every tehsil can access data, update online to State data centre server. The tehsil should have dedicated connectivity .i.e. LL/ISDN for real time updation to the central server.

#### 4.2 Performance Requirements

##### 4.2.1 Time/Space Bound and Efficiency

- Version 1.0 of the software will be client server based where all clients available in tehsils will be connected to the server.
- Version 2.0 of the software will be web based designed to support a minimum of 20 concurrent users at any one point of time, though it will be designed scale up to support a much higher level of concurrent usage about 30 users at any point of time.
- Processing time of any transaction or any request submitted to the proposed application system will be served within maximum time duration of 45 seconds, subject to the 2 MBPS speed of network connectivity/ISDN/LL availability.

##### 4.2.2 Exception Requirements

The software shall gracefully handle any exception of error situations that may arise during its operation by returning the control to the user with a user friendly error message. Besides, any exception will be stored in a log to allow maintenance/repair of the system.

##### 4.2.3 Testing Requirements

The Proposed application shall be thoroughly tested against the requirements specified in this document before deploying it in the production environment.

#### 4.3 Logical Database/Spatial Database requirements

Version 1.0 will be client server based and all data shall be stored into the database server at the tehsil. The database shall allow concurrent requests, as there shall be several SQL requests to render the proposed application. Version 2.0 will be web based application

wherein the data will be stored in a central database server. The detailed description of the logical entities will be described during design phase of the application.

#### 4.4 Design Constraints

- The software must trace (Audit Trail) all updation processing activity and store the information.
- Data naming shall conform to a standard data naming convention
- Report formats shall be in standard configuration.
- The proposed system is for storage of the spatial data and the spatial operations on the map data requires high resource systems. Hence a server with 16 GB RAM and Clients with 4 GB RAM is preferable.
- There is no provision to merge the village maps to form the higher levels like Tehsil/District/State because the existing maps are not geo-referenced and not based on any ellipsoid (not having any projection system) and traditional methods with high permissible errors are used to prepare the maps during last few decades.
- There is no provision of over-laying of any other layer like contour, 3-D model, etc.

#### 4.4 Legal

All licensed copies of System Software will be used for the project. All legal aspects will be properly taken care of. Information Technology Act 2000 violation will not be permitted.

## 5.0 SOFTWARE SYSTEM ATTRIBUTES

### 5.1 Correctness

Proposed application must be correct to the extent that satisfies all specifications specified in this document and update the village map as per the mutation order.

### 5.2 Interoperability

There are no interoperability requirements of proposed application. However, it shall be fully compatible in terms of functionality of the use cases. Cadastral maps and ROR data can be rendered in .pdf format.

### 5.3 Portability

There is no requirement for this system to be portable. The system is platform independent, can run both on Windows and Linux.

### 5.4 Reliability

This system must be extremely reliable. Minor bugs at a rate not greater than 2 per 5 KLOC are acceptable. Major and Critical bugs affecting the software functions or the integrity of stored data is unacceptable.

### 5.5 Security

Access to the system shall be through User ID/Password with/without Biometric (Finger Print Reader) mechanism. User groups shall be given specific access privileges. Access to interface is linked to user privileges. The Administrator (Super user or Tehsildar) shall be able to set up user groups, or give completely custom access to one or more users. Main user groups would include:

- Administrator (Super user/Tehsildar): Full access to all data/interfaces and Final approval for his respective Tehsil/Taluk.
- Supervisor (Naib Tehsildar): Supervision/Verification/Report Generation at the respective levels.
- Data Entry Staff (Patwari): Record keeping Interfaces available.

The above user groups should be considered as guidelines and must be customizable. The security level must be assigned to each user. The main security concern, with respect to designing access levels, is the security of both the map data and attribute data.

#### 5.6 Survivability

- The backup facility provided by the proposed application shall be used to maintain the backup.
- The system shall support backup onto CD-ROM/DVD so that data can be stored off site and old data can be archived and removed from the system.

#### 5.7 Usability

This attribute is of significant importance to the client. The users shall be able to navigate the system at a minimal level without any training. A minimal amount of training will provide most users with all the information they need to successfully use the system. The GUI design must be intuitive and task-based without any superfluous design. This characteristic can be measured by customer satisfaction with user ability to navigate and use the system, and can be tested by the effectiveness of the limited and refresher training.

#### 5.8 Maintainability

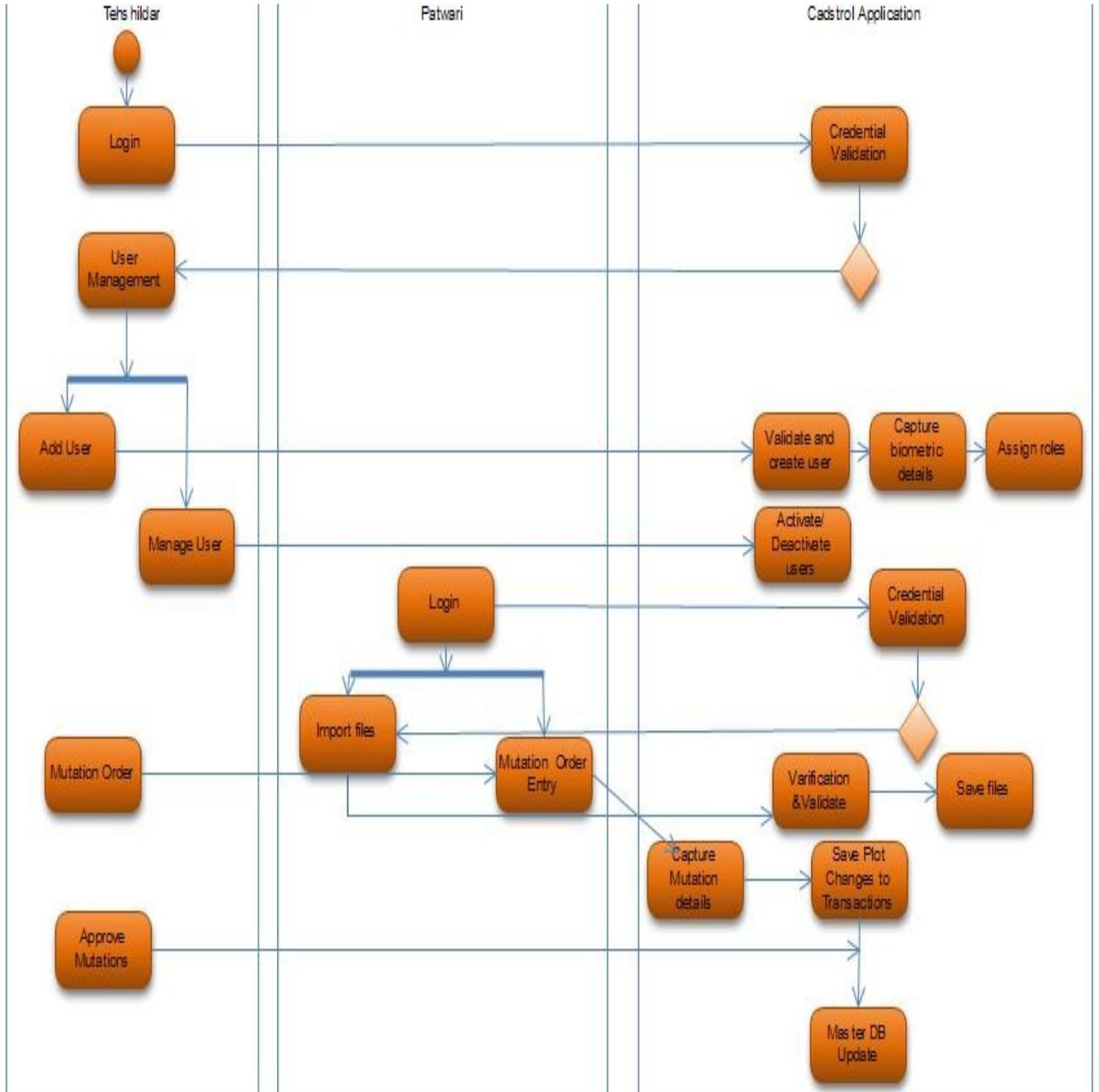
The system shall be of modular design to minimize the effort required to locate and fix an error after delivery. This attribute can be measured by the number of hours that must be spent per year fixing and maintaining the software.

**Annexure – 1**

**Use Case Diagram**

**Annexure – 2**

**Activity Diagram**



**Sequence Diagram**

**Annexure – 3**

**For Create User**

**Sequence Diagram  
For Disable User**

← Disabled User

**Sequence Diagram  
For Change Password**

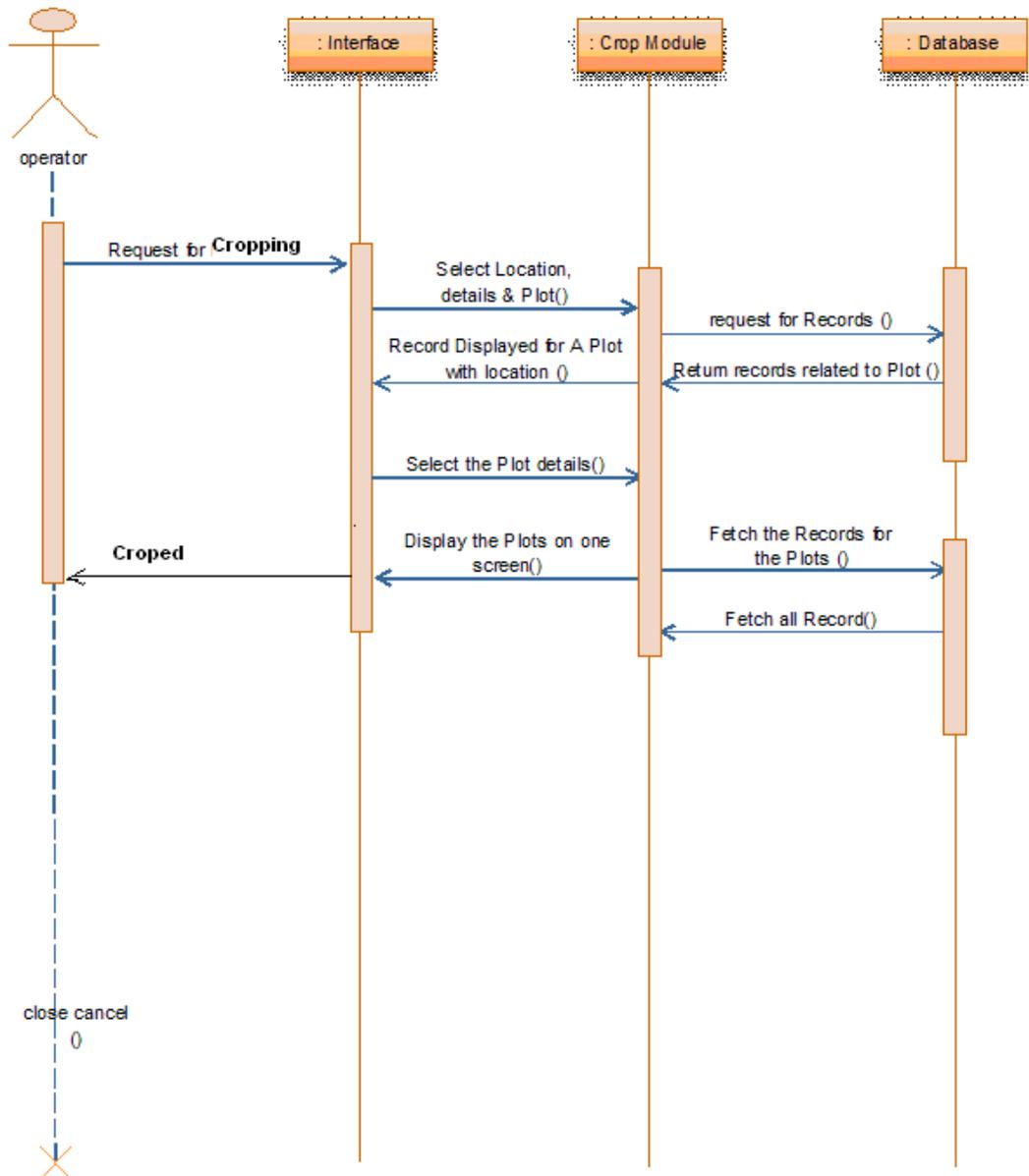
← New Password

**Sequence Diagram**  
**For Change User Security Role**

**Sequence Diagram**  
**For Import/ Export from Spatial Database**

**Sequence Diagram  
For Split Plot**

## Sequence Diagram For Crop Plot



**Sequence Diagram**  
**For Display plots / Print Plots**

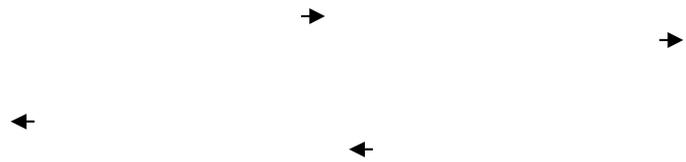


**Sequence Diagram**  
**For Query / Print Report**



**Sequence Diagram  
For Merge Plot**

**Sequence Diagram**  
**Approval by Tehsildar**



**Sequence Diagram**  
**Backup**

**Entity-Relationship Diagram**

**Annexure – 4**

## Annexure – 5

**Data Dictionary****Table Name : khasramap**

This table stores geometry of plots

Column	Type	Not Null	Default	Constraints	Comment
<a href="#">wkb_geometry</a>	geometry				Geometry column
<a href="#">bhucode</a>	character varying(100)				Village code
<a href="#">kide</a>	character varying(100)				Khasra Number
<a href="#">mapscale</a>	bigint				Input scale of map
<a href="#">id</a>	bigint	NOT NULL	nextval('khasramap_id_seq'::regclass)	PK	Primary key column

**Table Name : khasramap1**

This table stores geometry of plots before splitting

Column	Type	Not Null	Default	Constraints	Comment
<a href="#">wkb_geometry</a>	geometry				Geometry column
<a href="#">bhucode</a>	character varying(100)				Village code
<a href="#">kide</a>	character varying(100)				Khasra Number
<a href="#">mapscale</a>	bigint				Input scale of map
<a href="#">id</a>	bigint	NOT NULL	nextval('khasramap_id_seq'::regclass)	PK	Primary key column

**Table Name : layer\_master**

This table stores name of layers , geometry type and default color of the layer when displayed in map.

Column	Type	Not Null	Default	Constraints	Comment
<a href="#">id</a>	integer	NOT NULL	nextval('layer_master_id_seq'::regclass)		
<a href="#">layer_type</a>	character				Road, River

	varying(100)				etc
<a href="#">geometry_type</a>	character varying(100)				MultiPolygon, MultiLine, MultiPoint
<a href="#">layer_description</a>	character varying(100)				Descriptive name of the layer
<a href="#">default_color</a>	character varying(100)				Color in which the layer to be displayed in map

**Table Name : multipoint\_layer**

This table stores geometry of layers having point as geometry type

Column	Type	Not Null	Default	Constraints	Comment
<a href="#">id</a>	integer	NOT NULL	nextval('layer_master_id_seq'::regclass)	pk	
<a href="#">wkb_geometry</a>	geometry				
<a href="#">bhucode</a>	character varying(100)				
<a href="#">layer_type</a>	character varying(100)			FK to layer_master	

**Table Name : multipolygon\_layer**

This table stores geometry of layers having polygon as geometry type

Column	Type	Not Null	Default	Constraints	Comment
<a href="#">id</a>	integer	NOT NULL	nextval('layer_master_id_seq'::regclass)	pk	
<a href="#">wkb_geometry</a>	geometry				
<a href="#">bhucode</a>	character varying(100)				
<a href="#">layer_type</a>	character varying(100)			FK to layer_master	

## Annexure – 6

**Sample Screenshots**

### Create User

Name	<input type="text"/>
User Id	<input type="text"/>
Role	Select <input type="text"/>
Choose a Password	<input type="text"/>
Re-enter Password	<input type="text"/>
<input type="button" value="Next"/>	

### Registration Thumb Print

Browse Thumb Print	<input type="text"/>	<input type="button" value="Browse..."/>
<input type="button" value="Submit"/>		

### Define User Role

Select User	Select <input type="text"/>
Action Performed	Vector File Image <input type="text"/>
<input type="button" value="Confirm"/>	

### Disable User Account

S.No	User ID(name)	Enable/Disable	Remarks
1	some(Ram Kishan)	<input type="radio"/> Enable <input type="radio"/> Disable	<input type="text"/>

## Change Password

Current Password

New Password

Confirm Password

Save

Cancel

## Change User Role

S.No	User ID(name)	User Role	Remarks
1.	035(Prabhu Ram)	<input type="text"/>	<input type="text"/>

## Map Sheet Master

District

Tehsil

Village

Scanned

Vector

Total Number of Sheets

Uploaded sheets

Browse...

Upload

270 (379) ▼

326 (458) ▼

## Mutation Audit Trail

S.No	District/Sub District	District/Tehsil	Village	Plot	User Name	Date and Time	Mutation Remarks	Chandes Done	Status of Operations
1.									Failure
2.									Success

### Input Layer

District	Select
Tehsil	Select
Village	Select
Sheet No	
Layer Type	Select
Import	Browse...

Input

234 (399)      256 (438)

### Visual & Digital Inspection Vector

Scanned	<input type="checkbox"/>
Vector	<input type="checkbox"/>
Open File	Browse...
Generate Quality Report	

### Show Village Map

District	Select
Tehsil	Select
Village	Select

Control-click to select cells

Show Map

### Show Plot Map with Adjoining Boundries

District	Select
Tehsil	Select
Village	Select
Plot No	

Show Map   Scale   Area   Point

### Display multiple Plots and Area

District	Select
Tehsil	Select
Village	Select
Plot Id	

GIS Functions

Save

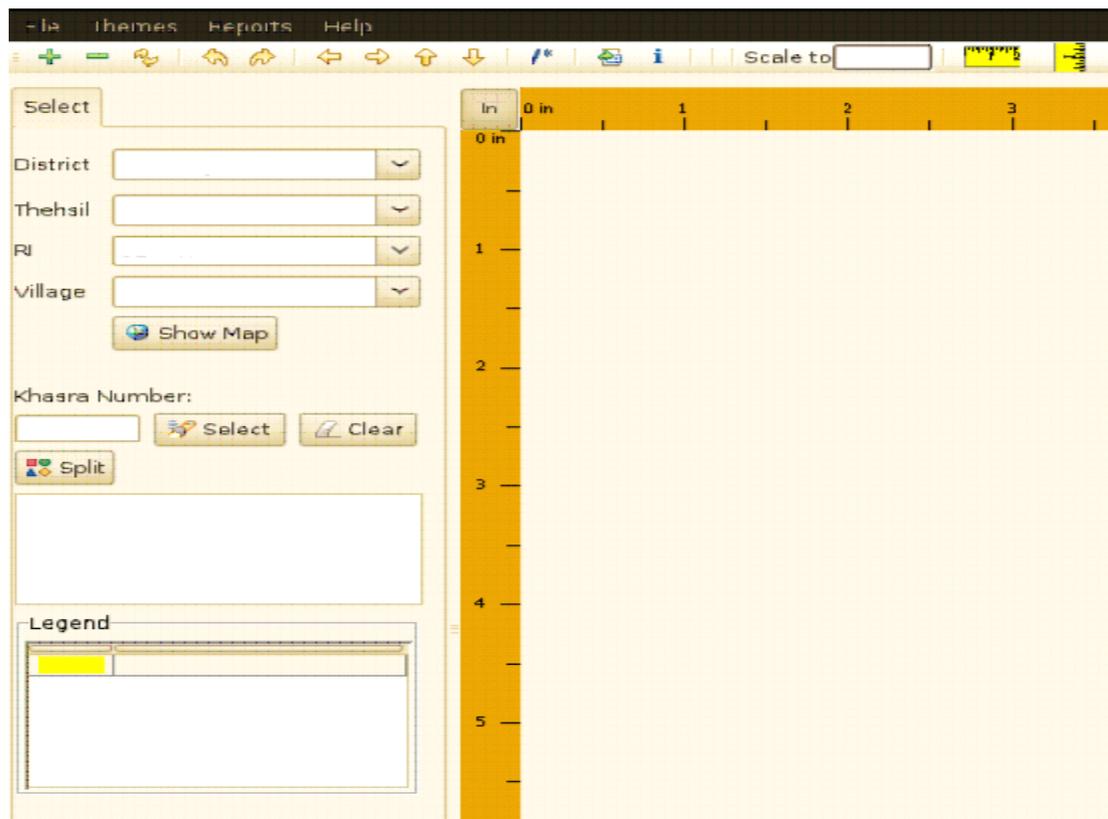
### Display ROR & Maps

District	Select
Tehsil	Select
Village	Select
Plot Id	
ROR	Map
<input type="text"/>	<input type="text"/>
Print	

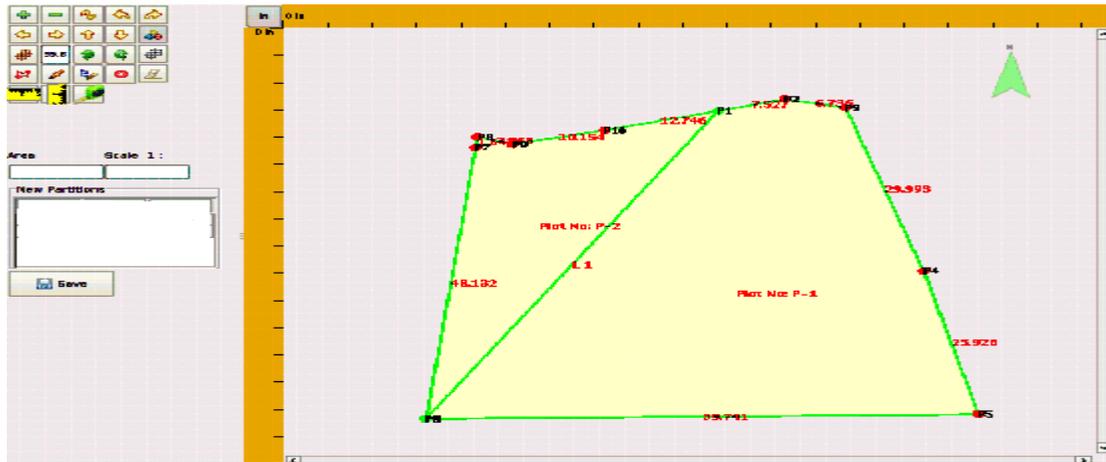
### Merge Plot

District	<input type="text"/>
Tehsil	<input type="text"/>
Village	<input type="text"/>
Khasra No 1:	<input type="text"/>
Khasra No 2:	<input type="text"/>
New Khata No :	<input type="text"/>
Merge	

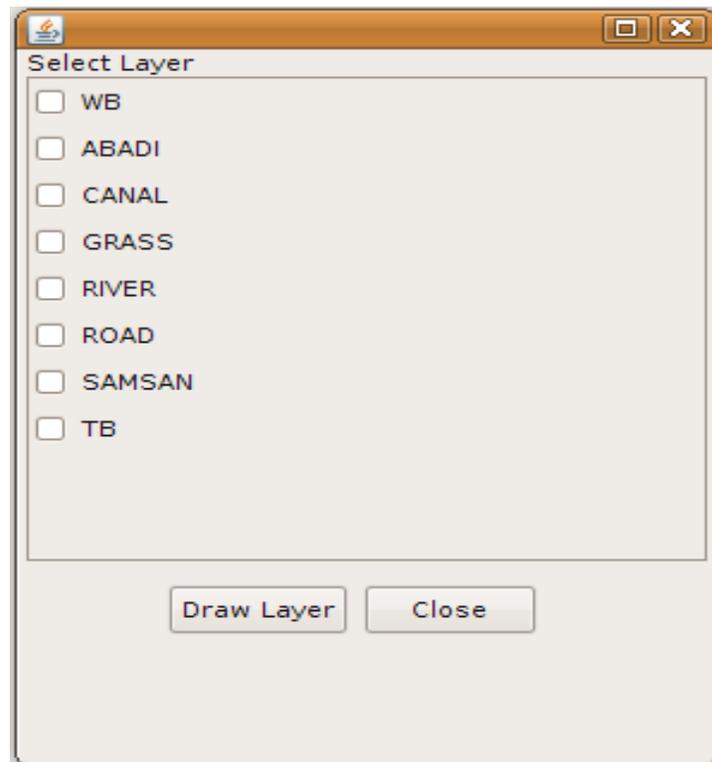
Main Window : Inputs village map selection parameters and plot number



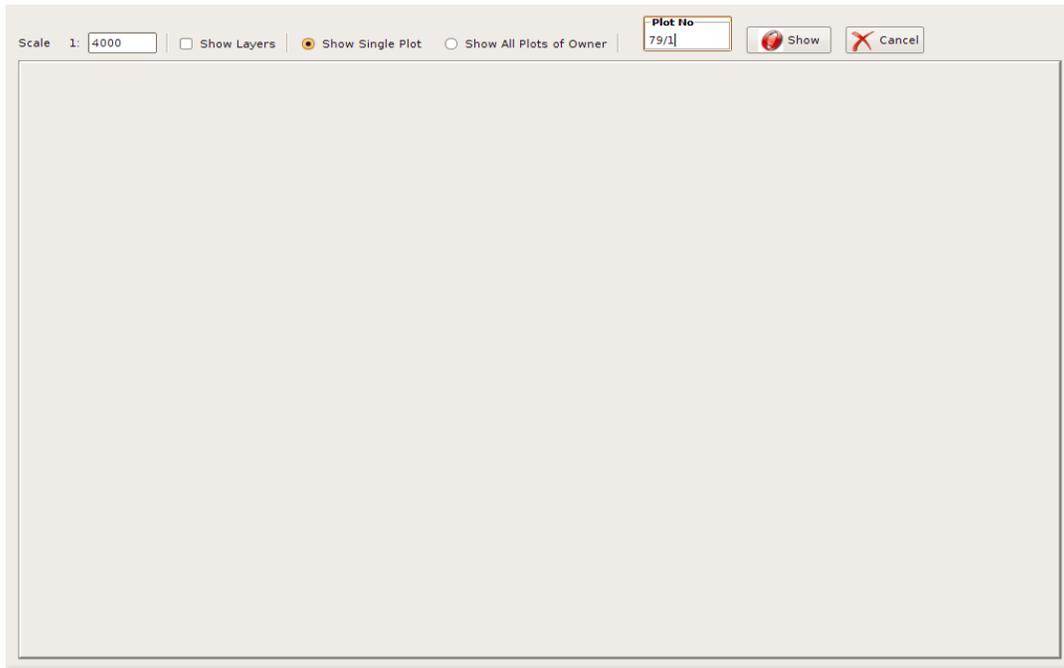
Split Window : Inputs new plot numbers



Show Layer Window :



### Report Window: Parameters for showing report



**Annexure-7****Symbol Library (Alamath)****Attaching Symbol Library (Alamaths & Images):**

There are number of symbols that are put on the map. These are more or less 92 numbers in all and are also called Alamaths. Some of the symbols are in-situ and others are non-in-situ. In-situ symbols are location specific i.e. its location is fixed on the map where as non-in-situ symbols can be placed anywhere within a boundary in a map. As for example, a symbol called Tri-junction pillar has a fixed point on the map while a symbol "Coconut Tree" can be placed any where within the plot signifying that the plot is meant for coconut cultivation. Most of the Alamaths are captured in point layer while others are in the line & in area layers. In-situ symbols can be in point, line & area layers.

**Specifications for the images and alamaths:-****Images**

The images (gif format) provided for map composition must be accompanied with a point layer in which the each point coordinate would give the lower-left corner of the image. The layer must have a separate attribute column, named "image" along with the necessary columns (specific to a point layer table). This attribute column will contain the file name of the image files corresponding to each point of the point layer. There is no restriction on the names of the image files but it must be noted that the file names mentioned in the "image" column of the point layer must correspond to the file names of the images provided. The base name of the files for this point layer must be "img". Thus the ". shp" file for the above mentioned point layer must be "img.shp". The names of other necessary files (. shx, etc.) for the same point layer must be given accordingly. All the images (\*.gif or \*.tiff) of a particular sheet must be given in the same directory i.e. the JL-No sub-directory.

Note: - i) The scale of the map must not be an image but must be digitized and provided in the line layer.

ii) Attribute naming: The "image" attribute column must be a character field and have a maximum length of 8 characters.

## Alamaths

### a) At point layer: -

Some of the alamaths that can be represented by points are to be provided in a point layer. The point layer required for this purpose must contain the attribute field “symbol” along with other necessary fields. The following table contains the “symbol” column for the above mentioned point layer. The other columns are given as descriptions to the “symbol” column. The column named “Sl.No.” is the Serial Number of the various symbols as per the conventions followed by the Directorate of Land Records And Survey and is given in the booklet for the list of conventional signs of the department. The base name of the files for the point layer for the alamaths must be “almp” i.e. the “. shp” file for the point layer must be “almp.shp”. The names of other necessary files (. shx, etc.) for the same point layer must be given accordingly.

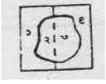
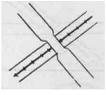
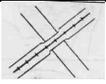
Note: - i) Some alamath notation comprises of a line and several points on the line. In such cases the points are to be provided in the point layer and the lines are to be provided in the Line layer that is described in the next subheading (b).

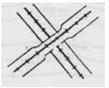
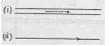
ii) In some cases, two or more alamaths are represented by the same symbol or have some symbol in common. Care should be taken in such situations.

iii) Attribute Naming: The “symbol” attribute column must be a character field and have a maximum length of 4 characters.

iii) **Attribute Naming:** The “style” attribute column must be a **character field** and have a **maximum length of 4 characters**.

Item	Images used	Remarks
Specific lines on the village boundary		The portion of the village boundary drawn with broken lines must be digitized in a continuous fashion as a separate line and provided with the mentioned style no.
Village boundary		The alignment of the village boundary is along the middle of the thick line.
Municipal / Notified Town Boundary		Only the broken line of the boundary should be given in the line layer.
Ward (municipal) boundary		This is for the broken line denoting the boundary
		This is for the small line segments that are perpendicular to the broken line.
Forest boundary		Only the line representing the forest boundary (as mentioned in the DLRS booklet) should be given in the line layer. The entire boundary may be divided into different segments such that each segment is an entity in

Item	Images used	Remarks
		the line layer, provided all these segments contain the same style no.
Wire fencing / Railing along property boundary (showing ownership)		Only the line representing the property boundary (as mentioned in the DLRS booklet) should be given in the line layer (the 'X' marks had already been given in the point layer as mentioned in the previous table). The entire boundary may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Village boundary cutting along the length of River / Road		Only the line representing the village boundary (as mentioned in the DLRS booklet) should be given in the line layer. The entire boundary may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Village boundary cutting across a water body		Only the line representing the village boundary (as mentioned in the DLRS booklet) should be given in the line layer.
Plot boundary where there is a water body across it		Only the line representing the plot boundary (as mentioned in the DLRS booklet) should be given in the line layer.
Tram line		Only the line representing the Tram line (as mentioned in the DLRS booklet) should be given in the line layer. The entire line may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Railway		Only the line representing the Railway line (as mentioned in the DLRS booklet) should be given in the line layer. The entire line may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Trekking route in hilly areas (too narrow for both sides of the path to be surveyed separately).		Only the line representing the Trekking route (as mentioned in the DLRS booklet) should be given in the line layer. The entire line may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Culvert		Only the small line segments representing the culvert (as mentioned in the DLRS booklet) should be given in the line layer.
Road (flyover) over Railway		1) Style 4 is used for the edges of the Road (flyover) above the Railway. 2) Style 6 is used for the Railway line under the Road (flyover). 3) The Railway line as shown in the figure (see DLRS booklet) comprises of two line segments on either side of the Road (flyover).
Railway (flyover) over Road		1) Style 4 is used for the edges of the Railway (flyover) above the Road.

Item	Images used	Remarks
		2) Style 6 is used for the Road under the Railway (flyover). 3) The Road as shown in the figure (see DLRS booklet) comprises of two parts on either side of the Railway (flyover).
Railway (flyover) over Railway		1) Style 4 is used for the edges of the flyover. 2) Style 6 is used for the Railway line passing under the flyover. 3) The Railway line as shown in the figure (see DLRS booklet) comprises of two line segments on either side of the Road (flyover).
Subway (underground) under Railway		1) Style 2 is used for the broken line denoting the subway under the Railway line. 2) Style 6 is used for the Railway line.
Subway (underground) under Road		1) Style 2 is used for the broken line denoting the subway under the Road. 2) Style 4 is used for the Road above the subway.
Road (flyover) over Road		The Road lying below consists of two parts on either sides of the Road lying above it (see DLRS booklet).
Level Crossing		It is assumed that the Railway line is already present as an item as given in Sl.No. 19.
River with, Ferry and Direction of flow of water		1) Style 4 is used to denote the direction of water flow along the River (as shown in the DLRS booklet). 2) The entire arrow showing the direction should be digitized. 3) Style 7 is used denote the Ferry (as shown with dotted line across the River in the DLRS booklet).
Tidal Stream		The entire arrow (as shown in the DLRS booklet) is to be digitized.
Jhora (Rivulet in hills)		1) Style 4 is used to indicate the edges of the Jhora as surveyed in situ. 2) Style 8 is used to indicate the middle of the deepest courses of the Jhora as surveyed in situ.
Narrow water channel along the plot boundaries with direction of flow of water (having width too small to be surveyed).		The arrows on the line (boundaries) must be digitized such that it shows the proper direction of the water flow.
Drain / Nala (in Basti or Town Areas) with direction of flow of water.		The arrow showing the direction of flow of water (as mentioned in the DLRS booklet) should be given in the line layer.
Pylon / electric		Only the broken line is required in the line layer, the dots

Item	Images used	Remarks
/ telegraph / telephone post with line		being provided in the point layer as mentioned in the previous table.
The North-West sides of the water bodies including TANK (sl.no 40) drawn with thick lines in the map		Only the thick lines are to be provided with the mentioned style number. Any other lines inside the mauza having a line thickness identical to the North-West side of the water bodies should be allotted the same style.

**b) At line layer: -**

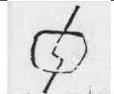
Some of the alamaths that can be represented by lines are to be provided in a line layer. The line layer required for this purpose must contain the attribute field "style" along with other necessary fields. The following table contains the "style" column for the above mentioned line layer. The other columns are given as descriptions to the "style" column. The column named "SI.No." is the Serial Number of the various symbols as per the conventions followed by the Directorate of Land Records And Survey and is given in the booklet for the list of conventional signs of the department. The base name of the files for the line layer for the alamaths must be "alml" i.e. the ".shp" file for the line layer must be "alml.shp". The names of other necessary files (.shx, etc.) for the same line layer must be given accordingly.

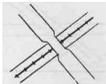
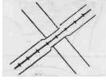
In order to define the extents of the total map area it is essential to have a sheet boundary. This boundary is to be provided in a separate line layer, which must contain similar attribute fields as defined previously for the above mentioned line layer. This layer would contain a single line with style number 16. The basename of the files for the line layer for sheet boundary must be "bnd" i.e. the ".shp" file for the line layer must be "bnd.shp". The names of other necessary files (.shx, etc.) for the same line layer must be given accordingly. The "style" attribute column is as defined previously.

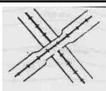
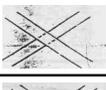
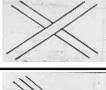
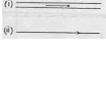
Note :- i) Some alamath notation comprises of a line and several points on the line. In such cases the lines are to be provided in the line layer and the points are to be provided in the Point layer that is described in the previous table.

ii) In some cases, two or more alamaths are represented by the same symbol or have some symbol in common. Care should be taken in such situations.

iii) Attribute Naming: The "style" attribute column must be a character field and have a maximum length of 4 characters.

Item	Images used	Remarks
Specific lines on the village boundary		The portion of the village boundary drawn with broken lines must be digitized in a continuous fashion as a separate line and provided with the mentioned style no.
Village boundary		The alignment of the village boundary is along the middle of the thick line.
Municipal / Notified Town Boundary		Only the broken line of the boundary should be given in the line layer.
Ward (municipal) boundary		This is for the broken line denoting the boundary
		This is for the small line segments that are perpendicular to the broken line.
Forest boundary		Only the line representing the forest boundary (as mentioned in the DLRS booklet) should be given in the line layer. The entire boundary may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Wire fencing / Railing along property boundary (showing ownership)		Only the line representing the property boundary (as mentioned in the DLRS booklet) should be given in the line layer (the 'X' marks had already been given in the point layer as mentioned in the previous table). The entire boundary may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Village boundary cutting along the length of River / Road		Only the line representing the village boundary (as mentioned in the DLRS booklet) should be given in the line layer. The entire boundary may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Village boundary cutting across a		Only the line representing the village boundary (as mentioned in the DLRS booklet) should be given in the

Item	Images used	Remarks
water body		line layer.
Plot boundary where there is a water body across it		Only the line representing the plot boundary (as mentioned in the DLRS booklet) should be given in the line layer.
Tram line		Only the line representing the Tram line (as mentioned in the DLRS booklet) should be given in the line layer. The entire line may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Railway		Only the line representing the Railway line (as mentioned in the DLRS booklet) should be given in the line layer. The entire line may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Trekking route in hilly areas (too narrow for both sides of the path to be surveyed separately).		Only the line representing the Trekking route (as mentioned in the DLRS booklet) should be given in the line layer. The entire line may be divided into different segments such that each segment is an entity in the line layer, provided all these segments contain the same style no.
Culvert		Only the small line segments representing the culvert (as mentioned in the DLRS booklet) should be given in the line layer.
Road (flyover) over Railway		4) Style 4 is used for the edges of the Road (flyover) above the Railway. 5) Style 6 is used for the Railway line under the Road (flyover). 6) The Railway line as shown in the figure (see DLRS booklet) comprises of two line segments on either side of the Road (flyover).
Railway (flyover) over Road		4) Style 4 is used for the edges of the Railway (flyover) above the Road. 5) Style 6 is used for the Road under the Railway (flyover). 6) The Road as shown in the figure (see DLRS booklet) comprises of two parts on either side of the Railway (flyover).

Item	Images used	Remarks
Railway (flyover) over Railway		4) Style 4 is used for the edges of the flyover. 5) Style 6 is used for the Railway line passing under the flyover. 6) The Railway line as shown in the figure (see DLRS booklet) comprises of two line segments on either side of the Road (flyover).
Subway (underground) under Railway		3) Style 2 is used for the broken line denoting the subway under the Railway line. 4) Style 6 is used for the Railway line.
Subway (underground) under Road		3) Style 2 is used for the broken line denoting the subway under the Road. 4) Style 4 is used for the Road above the subway.
Road (flyover) over Road		The Road lying below consists of two parts on either sides of the Road lying above it (see DLRS booklet).
Level Crossing		It is assumed that the Railway line is already present as an item as given in SI.No. 19.
River with, Ferry and Direction of flow of water		4) Style 4 is used to denote the direction of water flow along the River (as shown in the DLRS booklet). 5) The entire arrow showing the direction should be digitized. 6) Style 7 is used denote the Ferry (as shown with dotted line across the River in the DLRS booklet).
Tidal Stream		The entire arrow (as shown in the DLRS booklet) is to be digitized.
Jhora (Rivulet in hills)		3) Style 4 is used to indicate the edges of the Jhora as surveyed in situ. 4) Style 8 is used to indicate the middle of the deepest courses of the Jhora as surveyed in situ.
Narrow water channel along the plot boundaries with direction of flow of water (having width too small to be surveyed).		The arrows on the line (boundaries) must be digitized such that it shows the proper direction of the water flow.
Drain / Nala (in Basti or Town Areas) with direction of flow of		The arrow showing the direction of flow of water (as mentioned in the DLRS booklet) should be given in the line layer.

Item	Images used	Remarks
water.		
Pylon / electric / telegraph / telephone post with line		Only the broken line is required in the line layer, the dots being provided in the point layer as mentioned in the previous table.
The North-West sides of the water bodies including TANK (sl.no 40) drawn with thick lines in the map		Only the thick lines are to be provided with the mentioned style number. Any other lines inside the mauza having a line thickness identical to the North-West side of the water bodies should be allotted the same style.

**c) At area layer: -**

Some of the alamaths (in situ) that are to be represented by areas must be provided in an area layer. The area layer required for this purpose must contain the attribute field "shade" along with other necessary fields. The following table contains the "shade" column for the above mentioned area layer. The other columns are given as descriptions to the "shade" column. The column named "Sl.No." is the Serial Number of the various symbols as per the conventions followed by the Directorate of Land Records And Survey and is given in the booklet for the list of conventional signs of the department. The base name of the files for the area layer for the alamaths must be "alma" i.e. the ". shp" file for the line layer must be "alma.shp". The names of other necessary files (. shx, etc.) for the same line layer must be given accordingly.

Note: - i) Some alamath notation comprises of a line and several points on the line. In such cases the lines are to be provided in the line layer and the points are to be provided in the Point layer that is described in the previous table.

ii) In some cases, two or more alamaths are represented by the same symbol or have some symbol in common. Care should be taken in such situations.

iii) Attribute Naming: The "shade" attribute column must be a character field and have a maximum length of 4 characters.

Item	Images used
Pucca Buildings (in situ)	

Pan Baroz			
Sand Char			

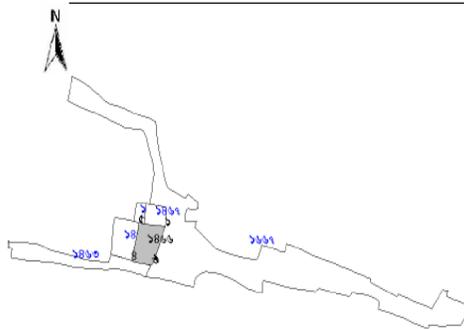


## A. Detailed Measurement of PlotNo:1893

Edges	Linear Distance		Along the Line	
	in feet	in GC	in feet	in GC
1-2	173.256	2.625	173.643	2.63
2-3	243.399	3.687	243.486	3.689
3-4	37.035	0.561	37.037	0.561
4-5	19.045	0.288	19.045	0.288
5-6	162.845	2.467	162.916	2.468
6-7	142.671	2.161	142.69	2.161
7-8	76.829	1.164	76.855	1.164
8-9	209.122	3.168	209.122	3.168
9-1	221.911	3.362	221.959	3.363

## B. Area

Sq. Feet	Sq. Meter	Acre
107156.763	9955.189	2.46



## ১৪৬৬ নং দাগের জমির পরিমাপ

বাহ	নৈখিক দূরত্ব		বাহ বরাবর	
	ফুট	জি.সি.	ফুট	জি.সি.
১-২	১৮৪.০৯৯	২.৯৪	১৮৪.১৭৫	২.৯৪২
২-৩	১০.৫৭৩	০.১৬	১০.৫৭৩	০.১৬
৩-৪	১২১.৭০৮	১.৮৪৪	১২২.৪৬৭	১.৮৫৫
৪-৫	১৮৭.৫৪১	২.৮৪১	১৮৭.৫৪১	২.৮৪১
৫-১	১৬০.৪২৪	২.৪৩	১৬০.৫৪	২.৪৩২

পরিমাণ - (০.৬৩ একর) বা (২৫৪৯.৪৯ বর্গ মিটার)

Fig-2 Multiple plot with boundary



**Annex  
ure –9****Scanning, Digitization and Data Verification Guidelines**

**The present document is update of the NLRMP guidelines for digitization provided by the Ministry of Rural development as per discussions on various procedures within NIC.**

Department of Land Records during 2009 – 2010 has emphasized on digitization of cadastral map. The broad guidelines are given by NLRMP – program of the Deptt. As per the NLRMP guidelines for land records computerization, a methodology should be developed for generating digital cadastral maps from hard copy maps. The computerization of village maps covers the tasks of procuring, scanning, digitization of all the features from the village maps. It is seen that there are different systems for cadastral mapping adopted in different states. Digitization is applicable for only those states where data has been available in map form. Various steps involved in the digitization work are as under;

1. Examination and availability of Cadastral Maps
2. Indexing & Coding
3. Preparation of Maps for scanning
4. Scanning
5. Tiling map using GRID
6. Digitization of village maps
7. Mosaic
8. Verification
9. Attribute Data Attachment
10. Quality Control
11. Hard copy output generation

Land records computerization work undertaken by NIC in past has addressed creation of land record database captured from ownership records as maintained at the taluka level. LRIS system operational at various states incorporates update of this data and related output such as ROR and various transactions etc.

### **1. Examination and availability of Cadastral Maps.**

Before executing the project, the availability of the sheet-wise cadastral maps has to be ascertained. By and large the khasra maps are available at Settlement Department which is the owner/producer of this data. At District Collector Office/Level, it is made available as reference map in the form momia / MAT sheet and finally it is also used as Patwari Halka map, in the field and named as Nazri Naksha. Quality of these maps, media, nomenclature etc. may vary from state to state.

- Digitization of Cadastral Maps depends upon availability of maps, their sizes, quality of maps, scale, features, availability of grid points, S/W or color status, media used, etc. hence in the first step it would be required to examine availability of the same and evaluate them for further processing.
- As per the experience from various groups involved in digitization work at district/state level it is observed that approximately 20% of the cadastral maps may not be available due to several reasons e.g maps may not be physically available or maps may be in poor quality/condition for scanning or map is available but land pattern has changed etc
- In areas, where cadastral maps are not available or Cadastral maps are in bad quality or land pattern has changed, survey/re-survey using modern technology of surveying & mapping is proposed. In such cases a policy decision is to be taken for conducting fresh survey (De-nova Survey).
- Appointment of a Nodal Officer
- Formation of QC Team
- Single point of contact

- Setting up of tolerance limit (depending upon the source map)

## 2. Indexing and Coding of Cadastral Maps

- Based on examination of condition of maps an assessment index needs to be prepared for planning of work.
- Indexing shall be the important exercise towards planning of digitization work.
- Prepare a district map with tehsil marking.
- If work is initially tehsil wise then identify and prepare village list.
- Marking of villages in tehsil map.
- No of maps available/ not available in each village, their sizes, condition of map area covered etc. Visual inspection of village maps from Department of Land Records should be done and inventory work for missing, problematic etc. maps should be carried out.
- All the village maps may be indexed to the standard numbering/naming convention and the same should be used for scanning and further activities. This should enable to keep track of all sources in proper order.
- The source condition, legibility and completeness should be checked. If any discrepancies are observed with source material, they should be referred back to Land Records Department for replacement or clarification.

### Organizing Orientation Training:

An Orientation training program for field officials (Patwari & ILR) is to be organized for briefing of the project. It is to be conducted in association with stake holder departments. In this program, list of the villages, its hierarchy, map conditions / newly created villages after the settlement operation, verification etc related issues are to be discussed. Based on this orientation training program, a "Village Index of Survey Sheets" is to be prepared. This process will help in effective monitoring and verification strategy of the project

### 3. Preparation of Maps for scanning

The Quality Control has to be performed at this stage before it is sent for scanning. The quality check procedure will include the following;

- Condition of the map – not torn or ragged or folds.
- Features of the map should be clear and distinguishable.
- Parcel number (khasra no.) should be distinct and readable.
- All symbols (*alamats*) should be distinct and properly understandable.

Once found OK with the entire above-mentioned characteristics, the sheet is to be processed for next steps.

#### **Sheet indexing and Tics Highlighting:**

All sheets have to be indexed with appropriate index number. The index number is to be generated using the village metadata with respects of the various administrative codes (state, district, tehsil, revenue inspector/patwari circle/mouza and village code). The index number should be a unique number with information of the administrative hierarchy of the village. Census Code may be used for sheet indexing.

One of the very important processes before scanning is the highlighting the tics (wherever it is present) and transferring of the tics (where it is absent). Following procedures describes transfer the tics in different conditions:

-

- **Gridlines & tics are available on the maps** - The tics on the maps may be faint or in the form of grid lines. Uniformly distributed tics should be highlighted with a cross (X) depicting the exact intersection of the gridlines or tic position. The distance between the tics/gridlines, based on the scale has to be ascertained and measured. This will be useful in selecting the mathematical grid for GRID correction.
- **Four corner tics available on the maps**– The tentative distance of the corner tics has to be measured based on the scale and highlighted with a cross (X) depicting the tics position.

- **NO Gridlines & tics are available** – This map will have no reference points, but to remove the scanning error, if any, may be rectified by using the transferred tics. The tics from standard mathematical GRID (GRID will change depending upon the scale) has to be transferred on the analog sheets by overlay method on light-table. These transferred tics will rectify any distortion during scanning of the sheet. However, the map sheet can be corrected by registering the graphical scale with the standard template scale.

#### 4. Scanning of Cadastral Maps

The maps are to be scanned with the following specifications:

- Maps should be scanned at 200 dpi Black/White (8 bit gray tone) mode. If all the details are not picked up during scanning, the scanning parameters should be changed to 400 dpi on 24-bit color.

Scanning of the maps depends on various factors like quality of maps, scale features, b/w or color status (resolution may be selected based on condition of maps, bad maps may be scanned on higher resolution). A committee may be set upon to decide upon the resolution and mode and the financial implications.

- B/w scanning shall be sufficient in case of color markings not available on map.
- Color scanning in case color marking available on the map.
- The scan copy archival shall be essential in future as this shall be a true representation of the document incorporating all the proceedings of survey till the time of digitization. This forms a base document for initiating computerization process.
- The image should be stored in TIFF format \*.TIF (this format is well accepted by the industry )
- The image orientation should be upright.
- The image should be cleaned and despeckled to remove noise.
- Measured length and width within the bounding box of map should be +/- 0.1% of the map manuscript measurements.
- The image should not be skewed or warped.

- If the cadastral map is not in a camera ready condition, the map should be re-traced on a mylar film and subsequently used for scanning.

The agency may collect map sheets from the source department for scanning. The State may allow undertaking scanning at vendor's premises or may ask the agency to work in user premises. The process of collecting sheets may be part of the tender document or the same may be in the form of an agreement with agency is to be done before starting of work. The Nodal Officer of Settlement Department shall ensure the availability of maps as per schedule. Agency will ensure proper quality of work and clear demarcation of layers. After scanning the survey sheets, these are to be handed over to department without disturbing originality of hard copy of scaled map on trace paper. The scanned maps are termed as " Raster image".

#### **5. Tiling Scanned Map using GRID/MESH**

The scanned map might have carried forwarded the errors due to differential scanning, wear and tear, differential shrinkage / expansion. The net result is non-uniform scale at parts of the map, deflection in north orientation etc. To make the map planimetrically accurate, rectifying the map with the vector grid is suggested.

A vector grid is generated in digital environment. The grid is scale dependent. (For e.g for a map there may be 28 \* 20 grids (or 20 \* 28 grids) depending upon the map orientation. The length of the grid is 2800 meters on one side and 2000 meters on the other side of the map. The area of each sub-grid is 100 meters by 100 meters). There are 28 \* 20 grids (or 20 \* 28 grids) depending upon the map orientation. The length of the grid is 2800 meters on one side and 2000 meters on the other side of the map. The area of each sub-grid is 100 meters by 100 meters, and hence the area is one hectare. At least 16 – 20 control points are identified on the scanned map as well as on the corresponding vector grid. A transformation model is developed to establish one-to-one correspondence between the vector grid and scanned raster map. The scanned map is rectified using the transformation model. After rectifying, the vector grid is overlaid on the rectified raster file to ensure that there are no gaps between the background grid lines and vector grid lines.

Prior to the correction, selection of the appropriate GRID has to be made. The grid is scale dependent. Generally, the grid found on 1:3960 (16"-1mile) will be placed at a distance of 10 zaribs (i.e. 50.8 mm or 2.00000008 inch) and the maps with 1:4000 scale will have a metric system grid and will be placed at a distance of 25 mm. Each sheet will have 10 X 14 grid blocks in 1:3960 scale and 20 X 28 grid blocks in 1:4000 scale sheet. After ascertaining the scale of the maps under consideration, appropriate mathematical grid has to be generated.

In some states the maps are available i.e. 1:4000, 1:3960 and 1:3600. The grid is scale-dependent, the grid on 1:4000 will be 20 X 28 placed at a distance of (i.e. 2.5 X 2.5 cm or 0.98425 X 0.98425 inch); the grid on 1:3960 will be 20 X 28 placed at a distance of (i.e. 2.54 X 2.54 cm or 1 X 1 inch), the grid on 1:3600 will be 16 X 22 placed at a distance of (i.e. 3.175 X 3.175 cm or 1.25 X 1.25 inch).

After selecting the appropriate grid, the cadastral scanned maps have to be registered with the grid.

- **Gridlines & tics are available** - The highlighted tics in the scanned has to be stitched/ tagged with its appropriate intersections of the gridlines of the mathematically GRID and then transformed.
- **Four corner tics available** – The highlighted four corner tics in the scanned has to be stitched/ tagged with its appropriate intersections of the gridlines of the mathematically GRID and then transformed.
- **NO Gridlines & tics are available** – This is executed by two steps:
  - a) The transferred tics before scanning is to be stitched/ tagged with its appropriate intersections of the gridlines of the mathematically GRID which was used to transfer the tics. Then first transformation is made. This will remove the scanning distortion, if any.
  - b) Comparing the available graphical scale of the map with the mathematically generated graphic scale of the same type and then registering the scale and transform. This may correct the distortion of the map scale, if any.
  - c) Gridlines not available at precise interval: All the Settlement maps have been drawn on standardized grid intervals of 2.5 cm with each grid representing an area of 1 hectare. However, it is observed that grid lines are not represented at precise intervals of 2.5 cm as there is a marginal error in these grids. The error could have occurred due to printer/ climatic conditions/lamination etc. Therefore, to overcome grid error or other visible error then it may be minimize by putting raster image into actual grid lines. The overlay on raster to grid helps us in deciding the error limit. Hence, a facility is essentially to be framed to have a variable size of grid so that raster can be overlaid instantly and error can be minimized

The above process is intended to eliminate the possible warping effect of cadastral maps. High accuracy and low residual error is to be achieved while during GRID correction of cadastral images. The transformed rectified cadastral scanned imaged is termed as 'registered scanned cadastral map' and can take the name as R + old name.tif.

## 6. Digitization of Cadastral maps

Vectorisation is carried out keeping the rectified raster file in the background along with the paper/film manuscript if required and any other source that may be of use. The output required at this stage would be the vectorized drawing export format file for each sheet and village level as per the layering scheme, symbology, color coding specified below along with the metadata information and quality control forms. In the States/UTs, where ladder data is the basic record, the same shall be used for generating vectorized maps. These individual maps should be merged/mosaiced to generate the village maps.

**Creation of template:** Before starting of the digitization, a standard template is created. In the template the layer name, line type and color for each feature like road, railway, habitation, river, trees present on the map is standardized. This system helps where a number of village maps is needed to be mosaiced at village level. This process maintains uniformity in all the maps, which are to be digitized.

**Creation of symbols:** A symbol library is made which contains the various symbols, and is shown in a village map. The main intention behind this is to keep its uniformity in all over the villages that has to be digitized.

### Specifications for digitization of scanned Village map sheets

The aim of this task is to digitize all the Khasra & administrative boundaries from the village maps. In this phase, data capture of points, lines, and polygons should be done with respect to the following specifications and the scanned images.

- Data capture should be performed in GIS using internally developed menus with appropriate layer and symbology.
- Polygons, points, and lines shall be captured in different layers.
- The coincident lines should be digitized only once and used for both the polygons.
- The data should be topologically correct for each of the layers.

- The features such as wells, temples, trees, village tri-junctions etc. should be digitized as point features.
- The features such as rivers and roads should be digitized as linear features
- Logical connectivity of the features should be followed i.e. a river would not join a road.
- Centre lines should not be digitized for the double line features / polygons.
- The digitized line should be followed in the centre of the raster data.
- If the vector of the parcel boundary is shown straight in the image, it should be digitized only with use of two nodes/ vertices.
- There should not be any overshoots, undershoots and duplicate features.
- Appropriate symbols should be used as per the source.
- The polygon feature should be closed without any dangles or slivers.
- The connectivity of the rivers/roads should be maintained except cases where a river feature is crossing a road feature.
- Feature-specific codes should be used for attribution. Each parcel polygon would have a unique Khasra number as per the coding scheme provided.

The required attribute information such as parcel / Khasra numbers available on the maps should be assigned to the vectorized polygons as unique texts. The drawing file for each village should be created in this task. If village information is available in more than one map sheet, all the sheets are edge matched into one village drawing (Edge matching, removal of redundant / duplicate text/labels, scale adjustments etc.,).

For Vectorisation, an approved template should be used with necessary legends, Title, scale bar, north arrow, different layers used for capturing various information, map text details and borders etc. The symbols, standard legend, and logo block for use in the Vectorisation process should be created as GIS blocks and used whenever necessary.

**Method of Digitization:** This process can be done through 3 methods i.e. Manual method, Semi-automatic method and Automatic method. As per the condition of scanned map digitization method is adopted. In this process all the features are captured on the respective layers. After completion of digitization, symbol code is inserted in the corresponding feature layer as per their

location on cadastral maps. Text is inserted for Parcel/Khasra Number and for various other details present on the map, (such as village name, names of adjoining villages, scale etc.).

The following criteria is adopted for digitization:

- Digitization is done in unit as mentioned in map sheets.
- Digitization is done at a comfortable zoom level so that vector line follows through the center of raster width.
- In the first step village boundary is digitized and it is seen that polygon is complete (as in case of village having single sheet)
- In places where village boundary passes through river it should be digitized on a separate layer
- Utmost care should be taken to see that linear features such as roads and rivers are continuous.
- As parcel lines are usually straight there should be minimum nodes in a parcel edge.
- The map prepared should be free from dangles, overshoots, undershoots etc.
- Color-coding for the hatch pattern should be given as provided on a village map and as provided by District centres.

## **7. Mosaic**

Village level mosaic is done at village level to join two or more parts of village to form a complete village. Edge Matching is done by bringing two different maps of same village into same file and matching their edges with reference to grid and features on the maps. Continuity should be maintained for all the features at the edges. Care is taken to minimize dangles and label errors. On screen check is done to check the common edge between the mosaic maps. One has to ensure the complete polygon features such as parcels, continuity in line features such as river, roads etc.

### **Edge matching of sheets within a village**

- The village map sheets should be edge-matched based on the village index map.
- If the displacement is more than 5 mm, then the feature should not be edge matched.
- Care should be taken to eliminate duplicate features, dangles, slivers, text and labels.

- If the feature boundary is common to road and river, care to be taken that there would not be any sliver polygon / gap.

## 8. Verification

One of the primary user requirements is noted to be the need for availability of “ True Copy” map in the computer environment vis-à-vis the hard copy map which is treated as the legal document in processing of land records transactions. The copy of ROR being distributed from present LIS efforts in the country, so far, includes description of land holding in descriptive format which is felt to be insufficient to provide true ground information. It is felt that in first step, such information replaced with parcel map shall be extremely valuable at citizen level.

Further, it is noted that digitization of map is a voluminous work and hence data development must address in parallel, the verification of data also. As data development would involve massive movement of papers for scanning and thereafter digitization from raster files, verification at the last stages may not be a feasible option. Verification procedure from the user organization needs to be developed at various stages. Such procedures are likely to cause delay, however, shall provide authenticated data in the softcopy media and may fulfill long term requirements. It may also be noted that delay in view of verification may lead to dispute on releasing the payments or may raise other issues; these may, however, be handled through the administrative procedures. The verification is proposed to be taken up through visual inspection of hard copy maps and softcopy data. The hard copy generation may involve sufficient cost in terms of type of output, media and size of the paper. On an average 3 hardcopy generation provisions may be made in the P.O. As there has been sufficient cost involved in the printing of large size maps the necessary provisions must be made in the PO to meet such expenditure. The larger no of such output may depend on no of rejected cases at 1<sup>st</sup> and 2<sup>nd</sup> level verification, mistakes in data entry e.g. Duplicate line, unclosed polygon etc. A copy of all delivered output shall be preserved by the user and ensure completion. Verification procedures therefore, are required to be discussed in advance and details to be worked out to understand the number of hard copy output required during the process of verification by the users and handle the issue at the stage of releasing the PO. The following stages have been identified for verification;

### 1st Level Verification:

The first level verification is proposed after undertaking scan output of the maps. Take a print out of the scanned map after necessary corrections like image orientation (with North arrow)/ and cropping, cleaning etc. which will be an exact replica of the provided paper maps on transparency sheet on 1:1 scale output and submit to the user dept along with the soft copy. The user dept will check the output against the original map. This is only a visual inspection with validation of the

scale of the data ensuring no error during the scanning process. **After the hard copy verification the soft copy also needs to be verified** in terms of proper file name and ensure opening of the file on the system. On acceptance at this level, the user dept. will issue an acceptance certificate for the vendor to proceed with digitization work. If there is any mismatch beyond the tolerance, do the rescanning with caution improving the output and repeat the exercise. Final prints on matt polyester paper/mylar sheet may be retained subject to the user requirements.

### **2<sup>nd</sup> Level verification:**

The second level of the verification is after the digitization. Digitization is verified as per source map. The vendor should submit the digitized output on transparency or suitable paper with proper symbols and color along with the softcopy of the data.

- 2.1) Verification of the hardcopy is by visual inspection by the user dept. Visual checks shall include verifying each feature / map element with reference to the source map by one-to-one comparison. Missing / extraneous features should be identified and marked with reference to the source data.
- 2.2) System level inspection of the digitized data will require a suitable product to view and query all probable errors by the user dept. Trained manpower is mandatory to carryout this task and DLR may appoint 3rd party auditing for verification of digital data. For evaluating the digital data the following guidelines/parameters would be checked.
  - Attribute verification providing the correctness of feature coding by listing it out and comparing with the manuscript maps. Complete checking of all parcels for vector & form and listing of polygons with zero/no attribute.
  - Checks for digitization errors like slivers, dangles etc.
  - Checks for mosaic of maps.
  - A view on total area of the village by aggregating the parcels, etc. vis-à-vis the area reported available with Land Records Dept
  - A view on understanding mismatches with ROR shall be essential at this stage. Any mismatch of data on map with ROR shall lead to erroneous display of map in further processing.

**3<sup>rd</sup> level verification:**

In the present scenario, the villages are not same as that of the maps. Current village boundaries are also to be marked by the user dept on the verification plot during 2nd level verification. Based on this input, vendor should redraw/realign the village boundaries to create the updated village database. This exercise involves more than one map data, extra care should be taken by the vendors for proper mosaic and regenerating the new village database. A print of all changed villages on the on suitable paper are to be submitted to the user dept. to carry out the verification as in the 2<sup>nd</sup> stage verification both for hard and soft copy output. All the errors are to be reported back to the vendor to rectify the same resubmit it.

It is seen that at this stage, user involvement is very high and may require larger editing for cases where ground reality has larger variations. Such cases may take longer durations at the user level. In view of this, measures such as split of the P.O. into two steps may be examined. 1<sup>st</sup> P.O. to cover scanning and digitization up to 2<sup>nd</sup> level verification and the second P.O. for the processes covering in the 3<sup>rd</sup> verification.

**9. Attribute Data Attachment**

Attribute data for each parcel is attached in the text layer. The parcel number is the two main attributes that is linked to the village polygons. Parcel number is the primary key for linking of RoR details.

A primary key field should be generated which should be amenable to attribute data attachment. Attribute data for each parcel should be attached in the text layer. All the text outside village boundary, text showing road direction should also be depicted in text layer.

**10. Procedure for Building the Database**

The elements of the database are to be created as per the standards herein and scientists/consultants have to take care that digitization is as per the standards. The inputs are subject to validation at each stage, and will include qualitative as well as quantitative checks for input accuracy.

The creation of a clean digital database is the most important and complex task upon which the usefulness of the database lies. Two aspects need to be considered here one is the geographic data necessary to define where the parcel of land or for that matter any other feature is located and second is its unique identification for associating attributes that link to the records.

At every stage, there should be necessary and proper data verification to ensure that the resultant database is as free as possible from error. Errors would generally be of the following types.

- Spatial data are incomplete or double
- Spatial data are at the wrong scale
- Spatial data are distorted
- Spatial data are linked to wrong attributes
- Non-spatial data are incomplete
- Spatial data are in the wrong place

For evaluating the digital data the following guidelines/parameters would be checked.

- Comparison of total area of the village by aggregating the parcels, etc. vis-à-vis the area reported available with Land Records Dept.
- Attribute verification providing the correctness of feature coding by listing it out and comparing with the manuscript maps. Complete checking of all parcels for vector & form and listing of polygons with zero/no attribute.
- Verification of registration points and RMS error for the transformation model.
- Verification of edge matches with adjacent maps by displaying them side-by-side.
- Checks for digitization errors like slivers, dangles.
- Checks for mosaicing of maps.

## 11. Quality Control

**Quality Requirement:** Quality assurance should comply with the following aspects, viz. i) positional accuracy, ii) attribute accuracy, iii) logical consistency, iv) Completeness and v) mosaicing fit of the data.

Visual checks include verifying each tile of digital data with reference to the source data by one-to-one comparison. Missing / extraneous features should be identified and corrected with reference to the source data.

Quality control checks shall include edge matching, topology checks, outside neat line check, incorrect extent check, double point check, pseudo/dangle node check etc. The errors identified in the data should be corrected accordingly.

Plot QC shall be basically concentrating on identifying any errors related to below aspects:

- Missing features
- Additional features
- Wrong placement of features
- Placement of features in wrong scale
- Wrong vector of features
- Incorrect attributes
- Incomplete attributes

## **12. Hard Copy Output Generation**

Hard copy color output would be generated using the template decided upon by the State/UT concerned for the purpose, as described above. The first hard copy is generated at the original scale of input map for each sheet. Good quality paper is used for printing the digitized map. The color scheme and paper thickness should be according to the standards for printing to be decided by the State/UT. The officers from the concerned department dealing with land records/maps should carry out 100% validation of the hard copy color output. The output will be validated completely for physical dimensions, parcel size, vector, numbering, feature coding, etc. The corrections are marked on the output and incorporated in the digital data.

### **Deliverables to Departments:**

- Source Sheets

- Scanned copy of Survey sheet on Trace Paper (True Replica). The print out of scanned map on transparency sheet with 100 % matching on 1:1 scale output for first level checking
- Softcopy and hardcopy of Scanned Source Survey Sheets
- Single .shp file in case the village is consists of multiple sheets.
- Hard/ soft copy of the digitized village level data (Vector File)

## Annexure-10

### 1.0 Digitization Template

Prior to digitization, a standard template is to be designed. It shall cover all the features depicted on the map within the geographic extent of the project. Optimum number of layers may be used so that the data management becomes easier. Layer name, layer type, features, feature codes, etc. are to be defined in the template. Feature color, style, size, etc may also be mentioned to maintain uniformity across the maps. Moreover this will facilitate proper mosaicing of different village maps. Non-spatial / attribute columns are also to be standardized for each layer. Symbols associated with each features is another area which require standardization with mutual consultation with nodal agency.

A sample template for digitization covering different types of layers (polygon, line and point) with feature codes is attached given below. State / user specific layers may be added with proper feature codes and other parameters.

#### 1.0 Polygon layers

Sl.No	Layer Name	Description	Feature Name	Feature Code	Overlap_code
1	Village	Village boundary	Village boundary	1	
2	xxxx_Parcel	All types of polygon on the cadastral map	Parcel	10	11
			River/stream	11	10
			Canal	12	

			Embankment	13	
			Forest	14	
			Pipeline	15	
			Railway	16	
			Road	17	
			Water body	18	
			Habitation	19	
			Any other state specific feature	20	

Note : 1) Proper naming convention may be devised for layers.

- 2) Intersecting polygons may be given the feature code and overlap\_code according to its priority.

### 1.1 Non-Spatial / Attribute data for polygon layers.

S.NO	Field Name	Field Width/Type	Field description
1	F_name	20,20,C	Feature Name
2	F_code	2,2,C	Feature code
3	Overlap_code	2,2,C	Overlapping feature code
4	Parcel_id	2,2,C	Parcel/Khasra No
5	Source_scale	10,10,C	Scale of the source map

### 2.0 Line layers.

S.No	Layer Name	Description	Feature Name	Feature Code
1	xxxx_line	Line features of a village	Metalled road	101
			Unmetalled road	102
			Cart track	103
			Foot path	104
			Railway line broad gauge	201

			Railway line other gauges	202
			Water bodies	301
			Canal	302
			Pipe lines	304
			Village boundary	401
			Village boundary_stream	403
			Traverse line	501
			Embankment	601
			Grid line	701
			Any other state specific feature	901
2	xxxx_grid	System generated grid according to the scale of the map	System Grid line	999

## 2.1 Non-Spatial / Attribute data for Line layers.

### 2.1.1 Non-Spatial / Attribute data for xxxx\_line

S.NO	Field Name	Field Width/Type	Field description
1	F_name	20,20,C	Feature Name
2	F_code	3, 3, C	Feature code
3	Description	20,10,C	Remarks

### 2.1.2 Non-Spatial / Attribute data for xxxx\_grid

S.NO	Field Name	Field Width/Type	Field description
1	F_name	20,20,C	Feature Name
2	F_code	3, 3, C	Feature code
3	Source_scale	10,10,C	Scale of the source map for which the grid is generated.

4	Grid_match	20,10,C	Match between system generated grid and captured grid from the map (100% match = "yes" otherwise "no")
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Note : A grid may be generated whose interval will depend on the scale of the map as explained in the digitization guidelines. A comparison may be made against the grid/ tic digitized from the map and the error report may be entered in the attribute column Grid\_match. This is to assess the quality of the map against the dimensional stability of the map and there by the scale consistency.

### 3.0 Point Layers

S.No	Layer Name	Description	Feature Name	Feature Code
1	Village code_point	Point features on the map	Habitation	1100
			Airport	1201
			Industry	1202
			Brige	1203
			College	1301
			Guest house	1302
			Hospital	1303
			Hotel	1304
			Office	1305
			Petrol pump	1306
			Post Office	1307
			Police station	1308
			Overhead water tank	1309
			School	1310
			Telephone Exchange	1311
			Cinima hall	1312
			Hill	1501
			Church	1601
			Gurudwara	1602
			Mosque	1603
Temple	1604			
Boundary pillar1	1701			
Boundary pillar2	1702			
Boundary pillar3	1703			

S.No	Layer Name	Description	Feature Name	Feature Code			
			Boundary pillar4	1704			
			Historical place	1801			
			Monument	1802			
			Traverse station (secondary)	1901			
			Traverse station (Teritory)	1902			
			Internal Traverse Station)	1903			
			Grave yard	2001			
			Electric pole	2101			
			Telephone post	2102			
			Tree name1	2301			
			Tree name2	2302			
			Tree name3	2303			
			Bore well	2401			
			Open well	2402			
			Tube well	2403			
			Lined well	2404			
			Tics	3000			
			Any other features	3100			
			2	xxxx_text	All texts appearing on the map	Parcel number	5000
						Text inside	5100
Text outside	5200						
Any other text	5300						

### 3.1 Non-Spatial / Attribute data for Point layers.

S.NO	Field Name	Field Width/Type	Field description
1	F_name	20,20,C	Feature Name
2	F_code	4, 4, C	Feature code
3	<b>Text</b>	20,20,C	Text on the map (In case of xxxx_text only)
4	<b>Source_scale</b>	10,10,C	Scale of the Source map
5	<b>Remarks</b>	20,10,C	Remarks

## 2. Symbol Library \*

A symbol library has to be made within the software to accommodate all the features in consultation with the nodal department. The main intention behind this is to maintain uniformity of symbols across all the digital as well as hard copy maps under the project. A sample symbol chart proposed by MP State is attached for reference.

चिन्ह	विवरण
	खसरा(स्थायी मेंड), खसरा(अस्थायी मेंड), धान की डोलियाँ
	ग्राम सीमा, नदी मे ग्राम सीमा, ग्राम विभाजीत रेखा
	नदी/नाला, नहरनाली, तालाब
	खाइयाँ (बेहड़)
	पक्की सड़क, कच्ची सड़क
	अस्थायी मार्ग, पगड़डियाँ
	रेल मार्ग: ब्रॉड गेज, मीटर/नॅरो गेज
	नदी पर पुल
	नदी पर रपट
	कुआ: पक्का, कच्चा, बावडी
	पायरी, मोट, डीशेल, विद्युत,
	निरुपयोगी, टंकी, बोरवेल, टयुबवेल
	श्मशान, कब्रिस्तान
	पहाड़ी
	मंदिर, मस्जिद, चर्च, गुरुद्वारा
	आबादी, ग्राम आबादी
	चट्टान
	इक्के-दुक्के वृक्ष
	पड़ती भुमी घास
	बड़े वृक्ष के उपवन
	छोटे वृक्षों के उपवन
	पड़ती भुमी के वृक्ष
	छोटे झाड़ का जंगल
	बड़े वृक्षों के वन
	झाड़ : संतरा, आम, सिंदी, नारीयल, इमली, अन्य झाड़
	ट्रावर्स स्टेशन बाहर
	ट्रावर्स स्टेशन भीतर
	शासकीय वन सीमा
	तिगड्डा, चौगड्डा, तिगड्डा ट्रावर्स स्टेशन, चौगड्डा ट्रावर्स स्टेशन
	बंधान, तालाब बंधान
	विद्युत खंबा, टेलीफोन खंबा
	स्कूल, कॉलेज, कारखाना
	घर, अस्पताल, बाजार, कॉलोनी
	ऑफिस : टेलीफोन, पोस्ट, पुलिस,अन्य
	विवाह स्थल, पेट्रोलपंप, सिनेमा, स्मारक, होटल
	गेस्ट हाऊस : फौरिस्ट, सिंचाई अन्य
	प्रांगण
	धान के खेत की डोलियाँ
	ऐतिहासिक स्थल
	हवाई अड्डा

\* The standardized symbol libraries will be finalized by us after getting the symbols from other states.

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