

Bhunaksha 3.0 User Guide

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1. About Bhunaksha

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.

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.

Bhunaksha is a cadastral mapping software developed by NIC using Open source applications and libraries to facilitate management of digitized cadastral maps. With proper customization Bhunaksha can be integrated with existing Land Records application of any states that deals with textual data. Back end database Postgresql with Postgis spatial module is used for storing geometry and spatial attributes of plots and other features. Bhunaksha talks to other external ROR database which are mostly in MS Sql Server in implemented states. ROR database can be virtually in any RDBMS.

The scanning, digitization, verification of cadastral maps are the pre-processes and input to Bhunaksha application.

For overcoming diverse structure of ROR database in different states Bhunaksha defines certain interfaces for talking with ROR database. The interfaces are implemented differently for different states based on the structure of that state's ROR database. In this way the same Bhunaksha application workbench can be used for any state just by plugging the particular state's implementation of ROR interfaces.

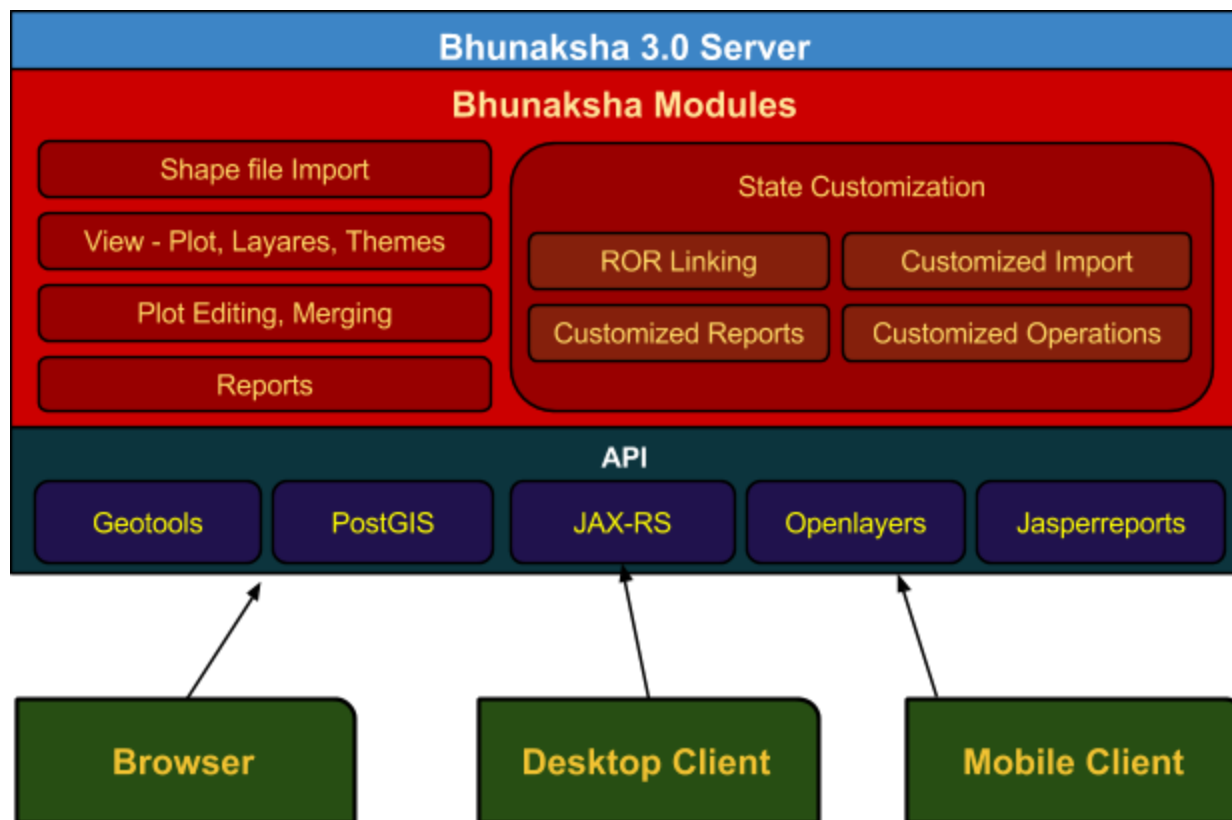
2. Features

1. Developed using Free and Open source software.
2. Works in Windows and Linux
3. Centralized and Distributed architecture.
4. Web, Desktop and Mobile apps available.
5. Responsive web rendering for smaller screens.
6. Plugin architecture to facilitate integration with any state's ROR/Master database.
7. A plot can be divided into multiple subdivisions in a single mutation
8. Multiple methods for creating division lines.
9. Grid and Background image can be used to help in drawing division lines.
10. Multiple plots can be divided in a single operation for cutting road/canal etc.
11. History and Audit trail of division is maintained in the software.
12. Distance measurement and calculation takes into consideration initial scale and local units
13. Plot map and Village map can be displayed and printed to any scale.
14. Vector printing of maps.
15. SLD based styling of plot and layers.
16. Query based thematic maps can be defined by user.
17. Bulk import of Shape files and ADF files.
18. Maps can be generated from Survey data (LandXML) data and FMB
19. Validation reports for comparing data in ROR database and digitized map files
20. Helps to correct geometry errors in Shape file.
21. Adapts to the authentication and authorization features of ROR database users.
22. Online Georeferencing tools for legacy maps.

3. Bhunaksha Architecture

Bhunaksha is designed to work in a centralized environment and distributed environment.

3.1 Centralized Architecture

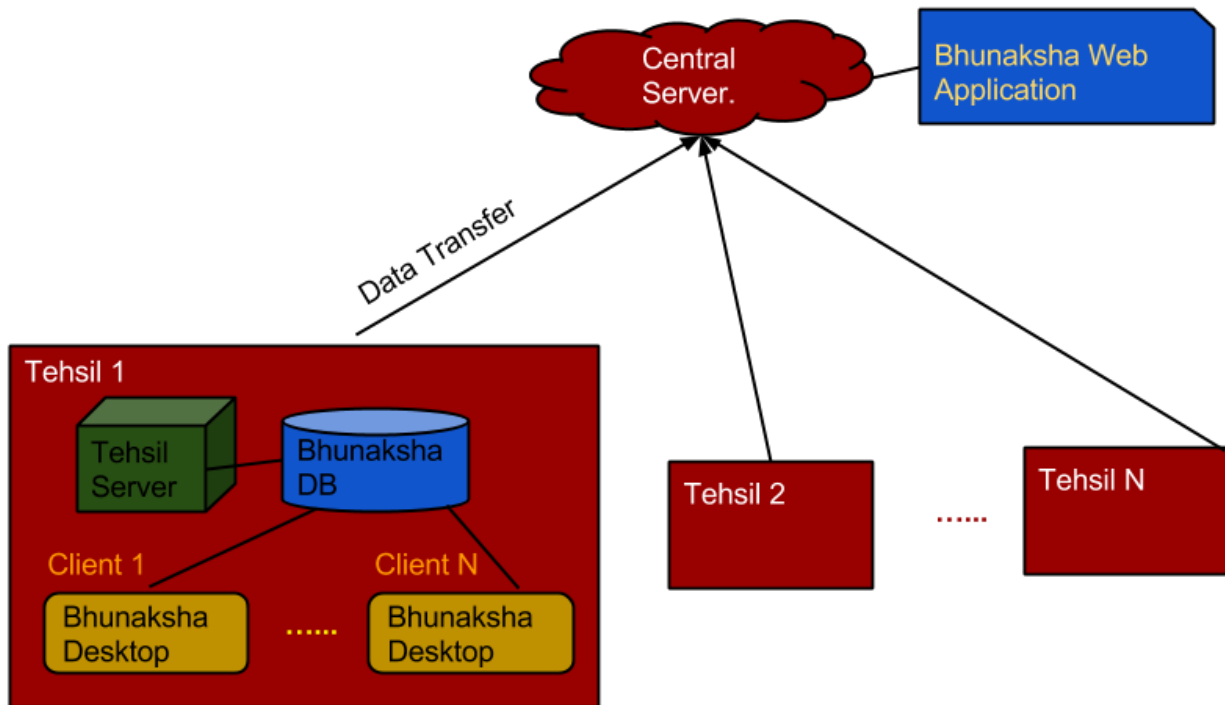


In centralized architecture the core application and database resides on an array of centralised servers. The application can be accessed through browser or Bhunaksha desktop client. The desktop client consumes REST services provided by the server application. Some of the robust features which cannot be implemented with limited facilities of browsers are implemented in Desktop client application alone. Services which are to be used directly by public has been completely implemented in browser client. This setup will be feasible only when there is remarkably high bandwidth connectivity among the department offices and powerful array of servers. The application can also be accessed via the mobile client which provides some mobile friendly features.

3.2 Distributed architecture

Bhunaksha can also can be setup to work in a distributed architecture. In this case Bhunaksha

database can be installed on district or sub district (Tehsils) servers. Desktop applications in LAN can connect to this server. All map management, plot division etc. can be performed at respective office unit with the desktop application. Data can be merged to central server system installed at state data centers in a planned schedule. In this case Bhunaksha installed on central server can be used for view purpose. This architecture can be used even if connectivity to central server is weak.



3.3 Open source application and libraries used in Bhunaksha

Bhunaksha is developed using the power of some of the world's most advanced and popular open source applications and libraries mentioned below.

1. Java

Java is a computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere", meaning that code that runs on one platform does not need to be recompiled to run on another. Bhunaksha application is developed in Java language.

2. Postgresql and Postgis

PostgreSQL is a powerful, open source object-relational database system. As a database server, its primary function is to store data, securely and supporting best practices, and retrieve

it later, as requested by other software applications. PostgreSQL prides itself in standards compliance. Its SQL implementation strongly conforms to the ANSI-SQL:2008 standard.

PostGIS is a spatial database extender for PostgreSQL database. It adds support for geographic objects allowing location queries to be run in SQL. In addition to basic location awareness, PostGIS offers many features rarely found in other competing spatial databases such as Oracle Locator/Spatial and SQL Server.

3. GeoTools

GeoTools is an open source (LGPL) Java code library which provides standards compliant methods for the manipulation of geospatial data, to implement Geographic Information Systems (GIS). The GeoTools library implements Open Geospatial Consortium (OGC) specifications as they are developed.

4. Tomcat Server

Apache Tomcat is an open source web server and servlet container developed by the Apache Software Foundation (ASF). Tomcat implements the Java Servlet and the JavaServer Pages (JSP) specifications, and provides a "pure Java" HTTP web server environment for Java code to run in.

5. Jasperreports

JasperReports is an open source Java reporting tool that can write to a variety of targets, such as: screen, a printer, into PDF, HTML, Microsoft Excel, RTF, ODT, Comma-separated values or XML files.

6. OpenLayers

OpenLayers is an open source JavaScript library for displaying map data in web browsers. It provides an API for building rich web-based geographic applications similar to Google Maps and Bing Maps.

4. System Requirements

4.1 System Requirements Server

CPU: 4 cores, each \geq 2GHz

Disk: 250GB Initial, regular monitoring and backups recommended based on usage.

Memory: 4 GB RAM

Operating System:

(a) Windows 7

or

(b) Linux (CentOS, Red Hat (RHEL), or Ubuntu.)

Java: 7+ (Oracle JRE)

Application Server: Tomcat 7

Database:

(1) Postgresql 9.0+, Postgis 1.5+ (Can be on separate Server)

(2) Connectivity to ROR database

4.2 System Requirements Client

Operating System:

(a) Windows 7 +

or

(b) Linux (CentOS, Red Hat (RHEL), or Ubuntu.)

Browser: Firefox or Google Chrome

Java: Oracle JRE 7+

5. Installation

Install only the relevant applications based on the architecture you have planned. Server installation will be needed on central server only. In a distributed architecture normally you will need database on the Tehsil Server and desktop applications on client machines.

5.1 Building and Downloading

Bhunaksha application can be downloaded from Bhunaksha website [eg:

<http://10.248.31.20/bhunaksha/>].

Download System is tightly integrated with the source code repository (Subversion). You can login by selecting your State and providing proper user ID and password. Once logged in you will be able to view the changes made to source code and **Build** a binary based on the latest source code. Bundle of already built binary files can be downloaded for Web Deployment (WAR) and Desktop deployment. A backup of existing binaries will be created on building new source code. Download statistics will be available for the compiled binary and backup copy. You can also review status of bugs from bug tracking system in this page.

(1) Revision Number of latest Source Code on SVN Server

(2) Compile Latest Source & Build Binary

(3) Revision Number of Compiled Files

(4) Download Relevant Binary file

(5) Revision Number of Compiled Files (Older Backup)

Information on source code

Information Binary Files

Information of Older Binary Files

Status of issues from Mantis Bug Tracking System

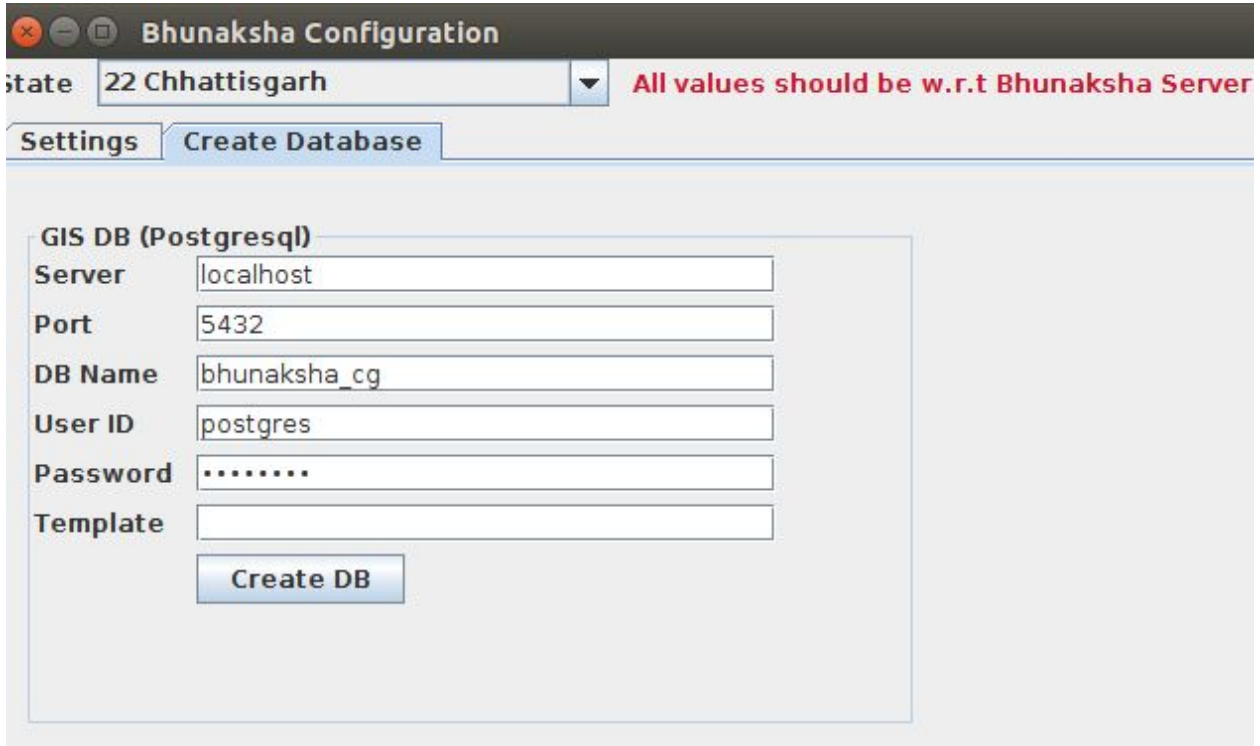
Details of Downloadable files

- (1) WAR :- Web archive. This can be installed in Apache Tomcat Server. This application does not have browser based editing features. After installing this application, user can login and download Bhunaksha Desktop Client from the installed application to perform map editing, shapefile import etc.
- (2) WAR [Experimental browser editing] :- This web archive has browser based map editing features along with all other features available in above WAR.
- (3) Desktop Client For Windows :- Bhunaksha Desktop Client bundled with Java Runtime Environment (JRE) for windows. This desktop client can be used either to work offline with local database or to connect with a live Bhunaksha server.
- (4) Desktop Client (Platform independent). This is as the bundle described in (3) without JRE. To run this desktop client you will need to install latest JRE separately. These compiled Jar files can be executed in Windows or Linux.
- (5) Pre configured JRE for Windows :- This is a version of JRE which can be used for running Bhunaksha Desktop client. This JRE has required fonts bundled with it. This can be merged with Desktop client files downloaded from (4) or from bhunaksha web application to resolve missing font issues.

- (6) DB Configuration File Creator :- This is a small independent application which can be used on server to create Bhunaksha GIS database and configuration file (bhunaksha.properties) which is needed on server before installing Bhunaksha web application (WAR).

5.2 Server

- (1) Install postgresql and postgis. Test connectivity from server
- (2) Test connectivity to ROR database.
- (3) Install Java
- (4) Install and start Tomcat
- (5) Create Bhunaksha GIS database on server using DB Configuration File Creator application described in download section 5.1 (6)



The screenshot shows a window titled "Bhunaksha Configuration". At the top, there is a dropdown menu for "State" with "22 Chhattisgarh" selected. To the right of this menu, a red text warning reads "All values should be w.r.t Bhunaksha Server". Below the menu are two tabs: "Settings" and "Create Database", with "Create Database" being the active tab. The main area contains a form titled "GIS DB (Postgresql)" with the following fields:

Server	localhost
Port	5432
DB Name	bhunaksha_cg
User ID	postgres
Password
Template	

Below the form is a "Create DB" button.

(6) Create bhunaksha.properties using DB Configuration File Creator application described in download section 5.1 (6)

(7) Copy bhunaksha.properties to conf folder of tomcat.

(8) Add maxPostSize="6666666" attribute under the <Connector> tag in "server.xml" found under the /tomcat/conf/ directory.

(9) Deploy Bhunaksha web application by copying war file to webapps folder.

(10) Test Bhunaksha web application by accessing its url on browser. [eg URL: <http://localhost:8080/bhunaksha>]. Actual URL domain or Ip address, port, path with differ based on your installation of your server and tomcat server.

You can login to bhunaksha web application by selecting your location, user id and password.

User ID and password of users are usually the same as linked ROR application.

Bhu-Naksha

Login...

State: **Chhattisgarh**

District : धमतरी

Tehsil : मगरलोड

User ID

Password

[Reset Password](#)

After logging in you can download Desktop Client from Download menu. The desktop client can be used for importing shape files, printing, editing and other map management activities

Maps will be visible in Bhunaksha once you import shapefile using desktop client connected to bhunaksha server or after creating map using FMB or other means.

Bhu-Naksha

Zoom To Scale:

[Login](#)

Land Info

Location

State: Chhattisgarh
 District : राजनादगांव
 Tehsil : डोंगरगांव
 RI : डोंगरगांव
 Village : कोहका

Plot Info

Plot/Survey No
 118/1
 क्षेत्रफल : 0.141 हेक्टेयर
 विचित्र क्षेत्रफल : 0.000
 अविचित्र क्षेत्रफल : 0.141

बसरा नंबर : 118/1
 नाम : जगदीश रामा
 पिता का नाम : पिता
 इनसुराग महार
 पता : सा.देह

Scale 1 : 12352

विद्या : कृष्णमाला, तहसील : 06 मगरगांव, RI : 17 तुमईखोड, ग्राम : 037 कोहका

5.3 Client

A client machine can connect to Bhunaksha server application through Bhunaksha Desktop client or browser. Bhunaksha Desktop client application has more robust map printing and composing capabilities compared to browser based application.

5.3.1 Bhunaksha Desktop Client

On Windows machines Unzip BhunakshaDesktop application and run Bhunaksha.exe. On linux machines platform specific launcher can be invoked. On first run it will ask for server URL of bhunaksha server or parameters to connect to Bhunaksha database.

The screenshot shows a configuration dialog box for the Bhunaksha Desktop Client. It has a 'General' tab and a 'Remote Server' checkbox which is checked. Below this is a 'Database Connection' section with two panels: 'GIS DB Connection (Postgresql)' and 'Textual DB Connection'. The GIS DB Connection panel has fields for Driver (org.postgresql.Driver), Server, DB Name, Port (5432), User ID (postgres), Password (masked), and URL. The Textual DB Connection panel has fields for DB (SQL Server (JTDS)), Driver (net.sourceforge.jtds.jdbc.Driver), Server, DB Name, Port (1433), User ID, Password (masked), and URL (tds:sqlserver://10.1.43.16:1433/ILRMS). There are 'Test', 'Create DB', and 'Initialize DB' buttons for each connection type, and 'Test', 'OK', and 'Cancel' buttons for the overall dialog.

If Remote Server option is selected then you will be able to connect to a remote server where Bhunaksha Server application is installed by providing its URL.

Otherwise you can provide the database details for connecting to Bhunaksha DB in postgresql and Textual database. Both the databases should have proper permissions to connect from the system where Desktop application is being configured. A new Bhunaksha DB can be created and initialized with tables and structures for running fresh Bhunaksha from this screen itself.

Test the connections and click OK button to save the connection details. The saved settings can be changed from menu Settings -> Server Settings.

5.3.2 Bhunaksha Browser Client

The public site of Bhunaksha can be accessed using normal browser without installing any extra software. We recommend open source browsers like Firefox or Chrome.

For officials who will be performing administrative tasks, map printing, map management, division etc. will need extra software to be installed. These tasks can be performed either in browser or using Bhunaksha desktop application.

5.3.3 Bhunaksha Mobile App

The Bhunaksha Mobile App is available for Android phones. Install the APK file on android mobile or tablets. The App requires the network access permission for the device. After installation, the server url can be updated via settings in the app menu.

6. Styling Map

Bhunaksha version 3 introduces limitless map styling features using Styled Layer Descriptor (SLD), an XML schema specified by the Open Geospatial Consortium (OGC) for describing the appearance of map layers. SLD is an XML-based markup language and is very powerful, although somewhat complex. Detailed information regarding SLD can be checked on the following link: <http://docs.geoserver.org/stable/en/user/styling/sld-cookbook/>


In Bhunaksha it is possible to customize appearance of map displayed at any part of the application like village map display, plot selection, layers, themes, plot report, village report etc. Style of map can be customized from admin login of Desktop application. Bhunaksha comes with a lot of predefined style templates and symbols which can be applied and altered during map styling.












The Symbolizer part of SLD XML can be used in Bhunaksha. A handy SLD editor was developed for easy editing of SLD XML fragments.

6.1 Style Templates

Style templates are predefined SLD fragments which can be copied and customized when styling a map. Templates will have a name and will be of category Polygon, Line or Points. For managing Style Templates login as admin user in Desktop application and invoke the module from menu Admin -> Style Template Manager.

Select Type : Search Nam...

Copy From Template: 

Template Code	Template Name	Template Type	
DOTTED_LINE	Dotted Line	LineString	
SPACED_SYMB...	Spaced Symb...	LineString	
DASH_SYMBOL...	Alternative Da...	LineString	
SIMPLE_LINE_L...	Simple Line La...	LineString	
LABEL_FOLLOW...	Label Follow Li...	LineString	
LINE_OPTIM_ST...	Optimized Styl...	LineString	
POINT_STYLED...	Point With Styl...	Point	
POINT_ROTATE...	Point With Rot...	Point	
POINT_FONT	Point Font Ba...	Point	
SYMBOL_BASED	Symbol Based	Point	
SIMPLE_POINT	Simple Point	Point	

Template Code :

Template Name :

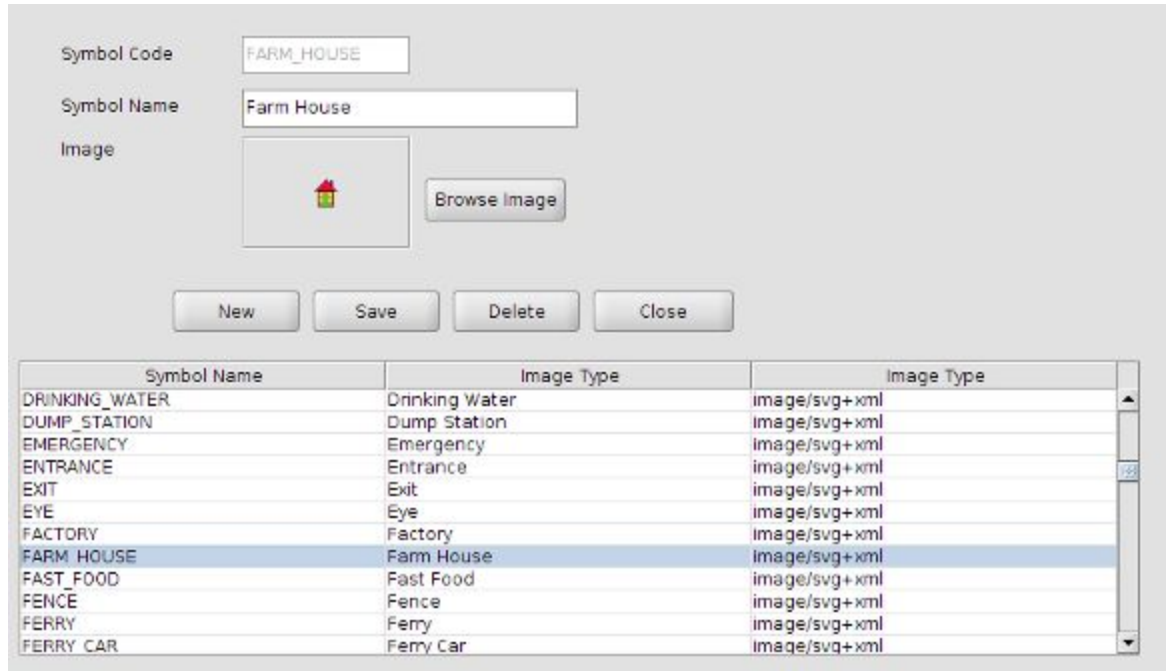
Geometry Type:

Property	Value
Mark WellKnownName	circle
Mark Fill Color	#FF0000
Graphic Size	6
Label ogc:PropertyName	name
TextSymbolizer Font font-family	Arial
TextSymbolizer Font font-size	12
TextSymbolizer Font font-style	normal
TextSymbolizer Font font-weight	bold
AnchorPoint AnchorPointX	0.5
AnchorPoint AnchorPointY	0.0
Displacement DisplacementX	0
Displacement DisplacementY	5
PointPlacement Rotation	-45
TextSymbolizer Fill Color	#990099

Source Design

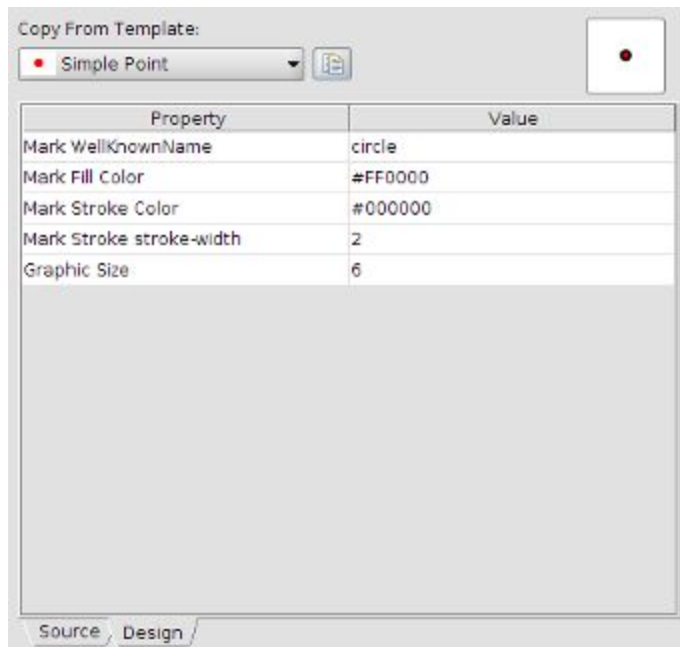
6.2 Symbols

Symbols are graphic images which can be used for styling any point layer. Bhunaksha uses the concept of named symbols instead of hardcoding the image path. Images used as symbols can be a vector image (SVG) or any raster images (jpg, png, gif). It is recommended to use vector image for symbols since it can be scaled without losing clarity during map styling. The library of symbols can be managed from menu Admin -> Manage Symbols after logging in as admin user in Desktop application. You will be able to choose these symbols when defining a point symbolizer while styling a map layer.

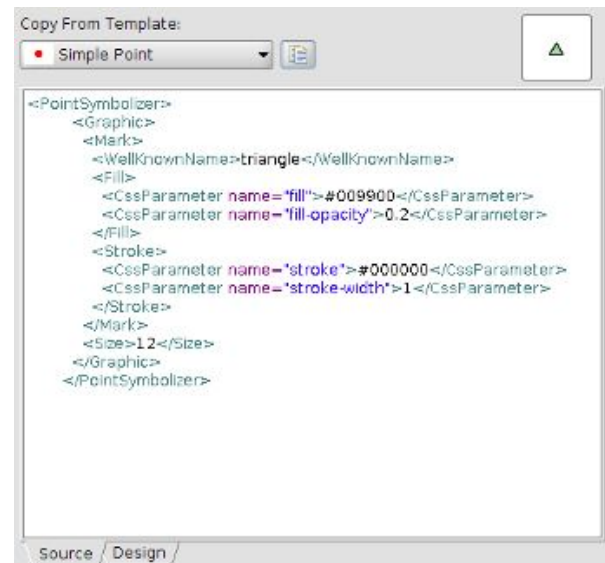


6.3 Style Editor

SLD editor is a tool for easy editing of SLD XML fragments in Bhunaksha. This editor will appear in all sections like layer manager for setting the style of map layer.



SLD Design mode



SLD Source mode

It is possible to create a map style by copying from already defined style template or typing the xml fragment in the source tab of the editor. The Design tab will show the editable part of SLD XML with suitable edit controls. For example in design tab colour it will be possible to edit color using a color picker.

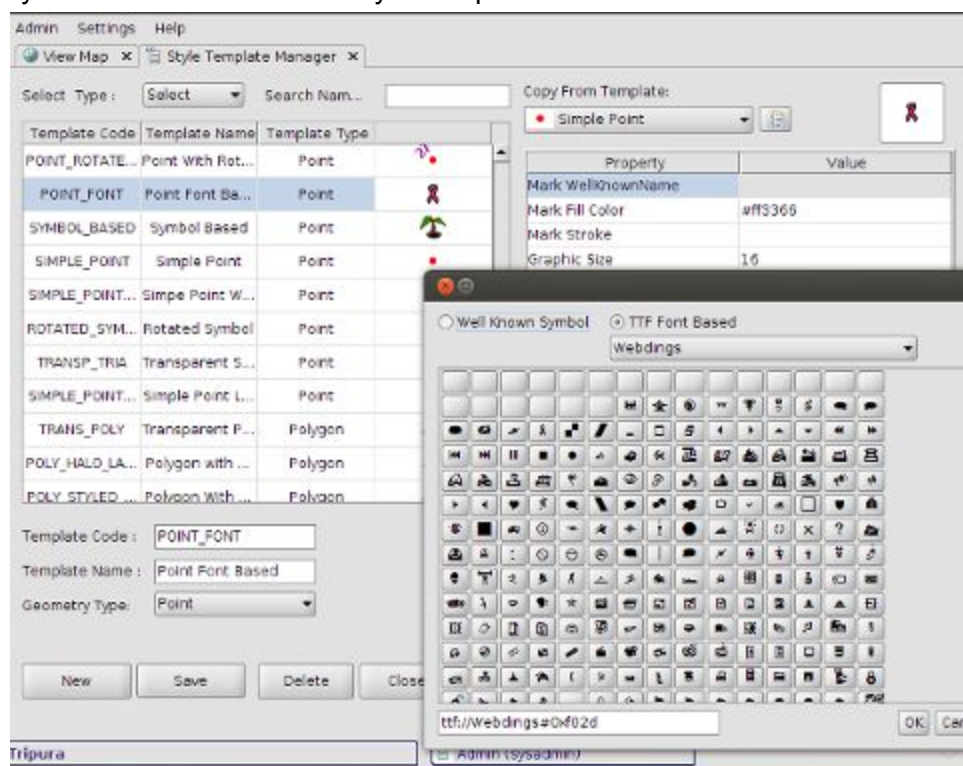
6.3.1 Point Symbolizer Editor

Point Symbolizer editing in the SLD editor needs to be elaborated more.

A point symbolizer can be created mainly in three ways.

- (i) From well known text like circle, square, triangle, star, cross etc.
- (ii) From ttf fonts like Webdings which is a massive symbol library
- (iii) From image symbols.

The SLD editor pops up selectable tool for selecting well known symbols and ttf font based symbols. For ttf font based symbols please make sure that the font is available on server also.



For image based symbols the images stored in symbol library can be selected from an inline dropdown



6.4 Defining Styles for Map

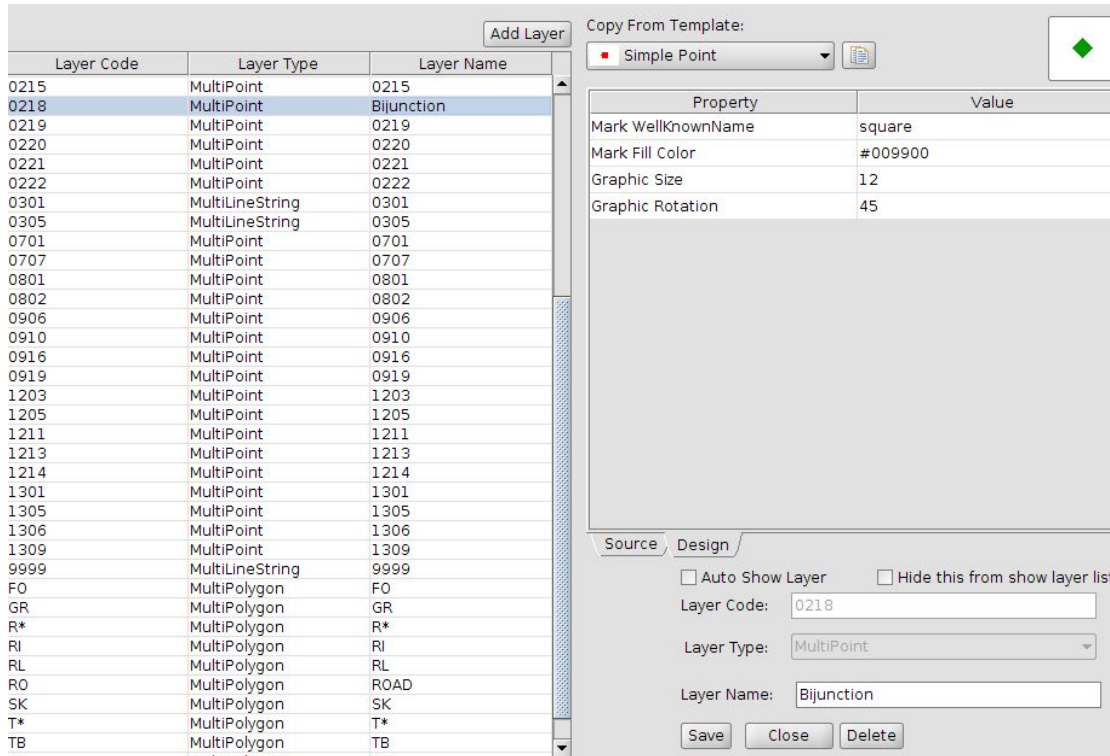
Style of map can be set from different sections of Bhunaksha.

6.4.1 Common map display styles.

Common map styles like village map, plot selection, plot print out , default styles, some predefined layers etc. can be set from menu Admin -> Application settings -> Map Styling (tab). From this section style can be set using the above mentioned style editor.

6.4.2 Layer Styles

Layers like road, river which are imported to bhunaksha can be managed from menu Admin -> Manage layers. It is possible to define code, name, and style of all imported layers from this section. New layers can be created and display style can be defined from this section.



6.4.3 Theme Styles

A thematic map is a map that focuses on a specific theme or subject area, whereas in a general map the variety of phenomena—geological, geographical, political. In bhunaksha a named theme and its style can be defined from menu Admin -> Manage Themes.


The theme can be defined based on a query which can execute either to ROR database or Bhunaksha database. The query should return a set of plot numbers or a set of geometry.

Theme Name : DB:

Query :

```
SELECT kide FROM khasramap WHERE bhucode='$$giscode' AND st_area(wkb_geometry) < 1.
```

(The query should return a list of plot numbers.You can use the parameters in query
\$giscode : Unique Map Code
\$vsrno : Unique Village Code
\$level1 : District Code
\$level2 : Tehsil Code
\$level3 : RI Code
)

Sld Rule :
 Copy From Template:
 

```
<PolygonSymbolizer>
  <Fill>
    <GraphicFill>
      <Graphic>
        <Mark>
          <WellknownName>shape://times</WellknownName>
          <Stroke>
            <CssParameter name="stroke">#F90000</CssParameter>
            <CssParameter name="stroke-width">1</CssParameter>
          </Stroke>
        </Mark>
        <Size>10</Size>
      </Graphic>
    </GraphicFill>
  </Fill>
</PolygonSymbolizer>
```

Source Design

Geometry Type Save Delete Close

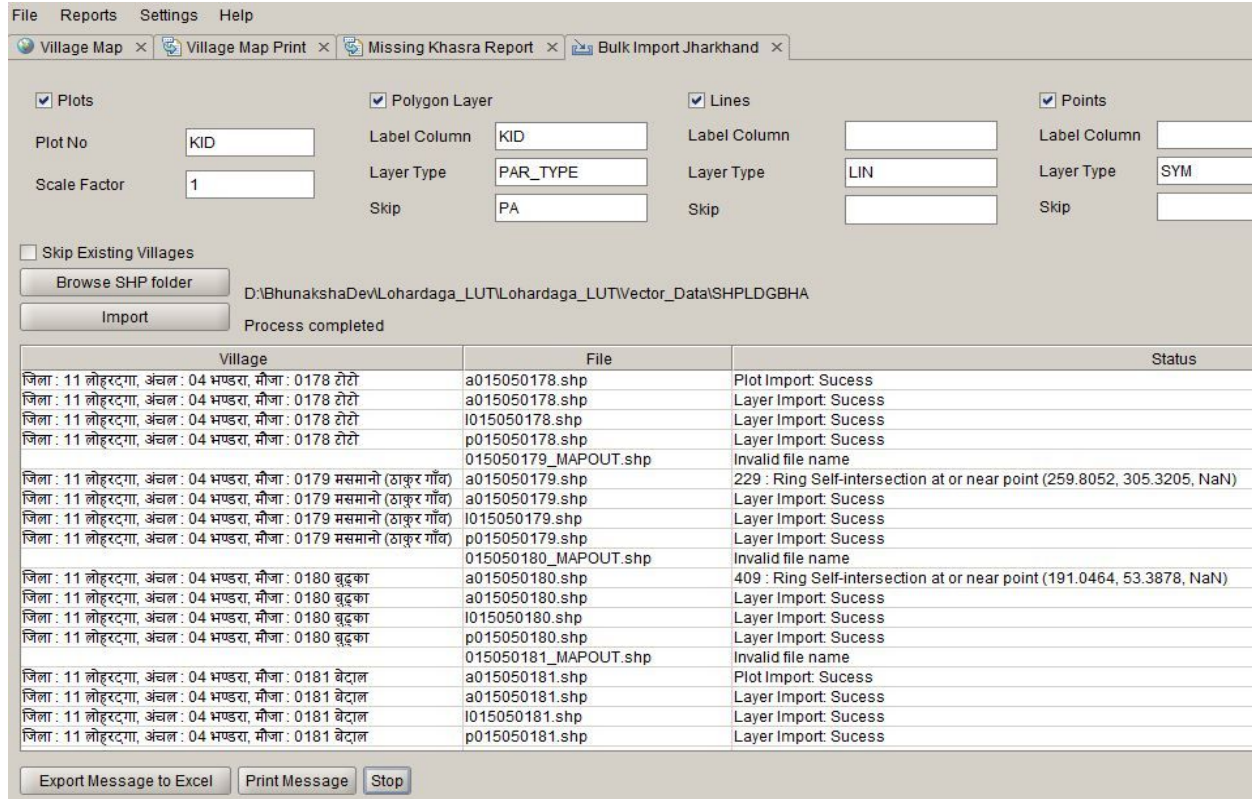
7. Importing Shape File

Import module is intended for importing geometry and attribute data from external file to Postgresql (Postgis) database. During this process the plots and layers will get linked to the village code of ROR data. Plot numbers will get linked to plot numbers in ROR data. Bhunaksha can import data from Shape files.

There are mainly two modules for importing shape files to bhunaksha

7.1 Bulk Import

Bulk import option can be used for importing a set of files in a single go. For using this module login into Desktop application as user and invoke the option from File -> Bulk Import.



Bulk import will be possible only if the shape files are named in a standard way using codes from the selection hierarchy till village/sheet. The file name format, and key attribute fields which store plot number, layer code etc. will have to be configured from Admin -> Application Settings as admin user.

Report Bestfit Scales	1,500,1000,2000,4000,5000
Scale factor for bulk import	1
input unit for scale	1
File Name Format of Shape file to import	a{111}{222}{333}.shp
File Name Format of Line Layer to import	l{111}{222}{333}.shp
File Name Format of Point Layer to import	p{111}{222}{333}.shp
Default Layer Type field for Line Layer import	LIN
File Name Format of Polygon Layer file to import	a{111}{222}{333}.shp
Layer Type field for Point Layer import	SYM
Village Code field for Plot import	BHUCODE
Label Column field for Point Layer import	
Label Column field for Polygon Layer import	KID
Label Column field for Line Layer import	
Layer Type field for Polygon Layer import	PAR_TYPE
Skip codes in Polygon Layer	PA
Plot No field for importing plot	KID

Shape files containing geometry errors, having unrecognizable file name or missing the mandatory attributes will be rejected while importing.

7.2 Individual Import

Plot and layer shape files can be imported individually into bhunaksha if naming pattern used for shape files does not support the bulk import standards. Individual files can be imported from the following options.

7.2.1 Import Plots (SHP)

This module can be used for importing plot shape files.

1. Browse the shape file containing plots.
2. Select Plot No (Khasara) column from shape file.
3. Select the village to which the Shape File belongs.
4. Type sheet no or other map type code associated with the shape file if present.
5. Type Scale factor if the measurements in shape file is different from that of ground.
(In almost all states 1 unit in shape file corresponds to 1 meter(unit) on ground.
In case of Uttar Pradesh 1 unit in shape file was equal to 1 unit on printed paper map which is in 1:4000 scale. So UP has to set scale factor 4000. In case of Himachal units on ground is in Karam and digitization is done in centimeters and map is printed by scaling each inch to some karam. HP has to set scale factor 15.75 if map is 1 inch: 40 karam.
1 inch : 40 karam
1 unit in digitized shape corresponds to 1 cm
So:
2.54 Unit : 40 Karam.
1 Unit : $40/2.54 = 15.748031496$
Scale factor is 15.75 approx.)
6. Click Import to import plots from shape file to Postgres database and to attach it with the selected village.

/media/12.04/home/sunish/Work/Data/tripura/Agartala_sheet_1/D201010229002.shp

Browse Shape File

Plot No.

লক : 01 Indurail

জেলা

মহল্লা

সার্কেল

তহসীল

পৌজা

সিটি

Scale Factor (Keep scale factor 1 if digitized in 1:1 w.r...)

Import Partially on Geometry Error
(import operation will overwrite existing map of the village)

Import Close

Import Messages

7.2.2 Import Layer (SHP)

This module can be used for importing layers other than plots to bhunaksha. The layers can be either polygon, line or points and will signify some features on ground like well, road, diver, temple etc. Individual layer codes are used for identifying layers. Layer codes can be created from Admin -> Manage layer as admin login. The layer codes can also be specified in an attribute of the shape file.

1. Browse shape file containing the layers.
2. Select layer

You can manage the master of layers from Manage Layers button or by selecting Manage Layers from file menu. If different layers are digitized in different shape files then select the layer to which the chosen shape file belongs. If more than 1 layer is merged into a single file and there is a layer code attribute in shape file to differentiate the layers then you can select (Auto) from the Layer combo box. If (Auto) is selected then it will also ask for selecting the field containing layer code. During (Auto) import if layers with the same code in shape file are not created from "Manage Layer" then it will automatically

create the layer master for the codes in shape file with some default theme. Later on you can go to Manage Layer and update the actual theme.

3. Type Skip codes if needed.

In some states it is noticed that plots and other polygon features were merged in a single shape file. For eg. In Himachal the Polygon shape file had plots and other layers like River, Road etc. Plots were having feature code "PA". These plots can be skipped during layer import. For skipping them PA can be typed in Skip code field. If there is more than 1 codes to be skipped then they can be typed separated by comma with out space.

4. Select village to which the layer belongs

5. Click Import button

Shape File

Layer

(Select Layer (Auto) if layer code is mentioned as an attribute of shape file)

Layer Code Field Skip following codes: (Comma seperated)

ID Column (This will be shown as label in Village Map)

মৌজা : 01 Indurail

জেলা

মহালা

সার্কেল

তহসীল

মৌজা

ব্লক

(Import operation will overwright existing mapofthe village)

Messages

7.3 Customized Import for States

7.3.1 Jharkhand

District, Circle, Village codes of Textual (ROR) database is different from codes used for naming the shape files. Both the codes will have to be mapped before performing import in order to link actual shape file with the village code.

To perform the mapping use RoR-GIS mapping panel under File menu 'File --> RoR-GIS Mapping'.

1. Clicking 'Show mapping data' button will list the village code present in ROR database and it's corresponding Digitization code if mapping is already saved.

Digitization code is the shape file name for a village. (eg: R015010011.shp for संगडीह village)

Show Mapping Data		
Village Name	Village codes from RoR	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0011 संगडीह	110101010011	R015010011
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0012 कोपिया	110101010012	R015010012
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 01 बूलबूल	1101010101	R015010001
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 02 केरार	1101010102	R015010002
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 05 परतू	1101010105	R015010005
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 06 मन्हा	1101010106	R015010006
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 08 मुरमु	1101010108	R015010008
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 09 कोचसा	1101010109	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 10 बहागढ़ा	1101010110	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0007 मांची	110101020007	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0013 सिमुवा	110101020013	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0014 सेमराटाँड़	110101020014	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0015 सीरम	110101020015	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0016 मुकरुम	110101020016	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0017 किता	110101020017	
जिला : 11 लोहरदगा, अंचल : 01 kisko, मौजा : 0018 पहाड़गीर	110101020018	

2. Edit the digitization codes and save the mapping table.
3. Open Bulk Import menu item from File menu to perform bulk import of shape files. Working of this module is similar to Bulk Import operation described above.

7.3.2 Chhattisgarh

Chhattisgarh state has digitized data in Arc Info binary (ADF) file format. Bhunaksha has a state specific module for importing ADF files.

For importing ADF files GDAL library will have to be installed and the installation folder will have to be set as System Path.

Plots
 Layer:
 Plot No:
 Scale Factor:

Polygon Layer
 Layer:
 Label Column:
 Layer Type:
 Skip:

Lines
 Layer:
 Label Column:
 Layer Type:
 Skip:

Points
 Layer:
 Label Column:
 Layer Type:
 Skip:

Village Name	ADF File Code	Status
440703.214-हयसंद		
440703.215-भरवार ऊर्क हीरापुर		
440703.216-अदरि		

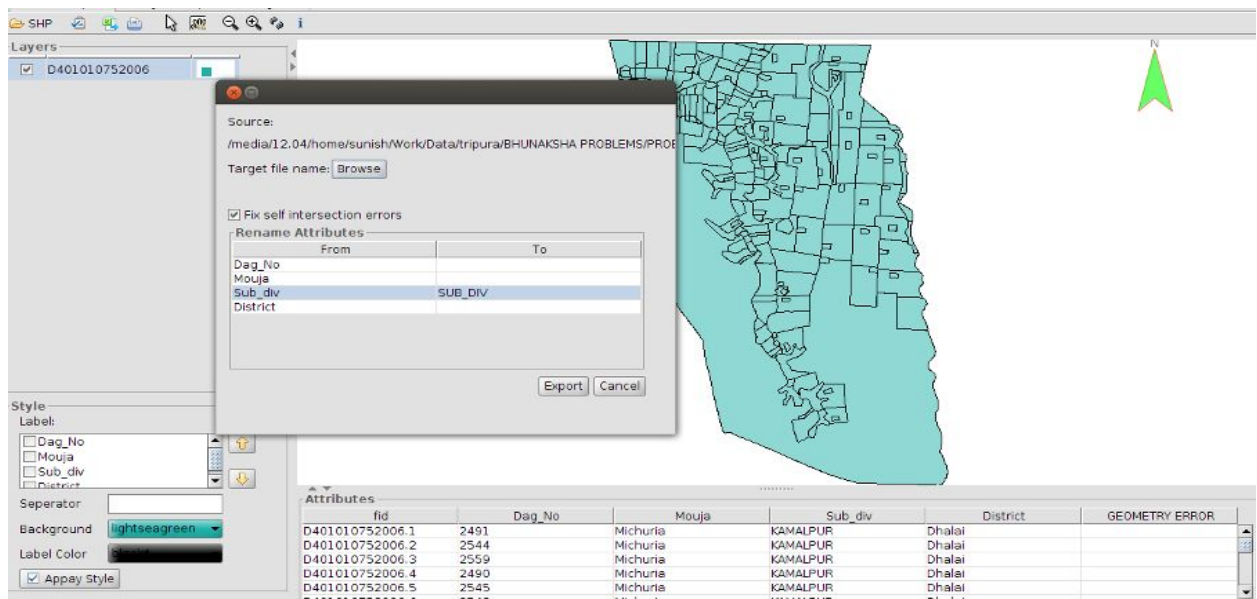
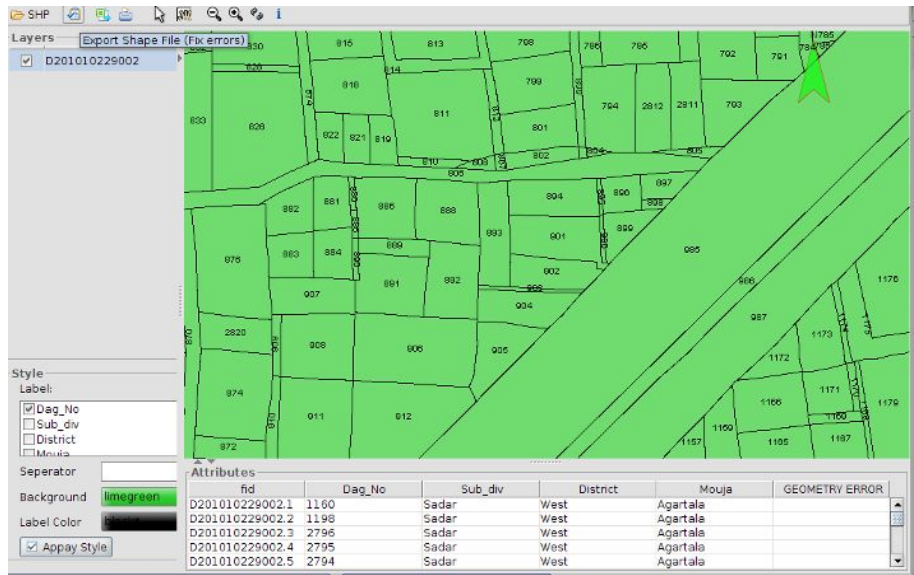
Skip Existing Villages

Browse the parent folder containing ADF files, Select the layers to be imported, Select the folder name of ADF file corresponding to the listed village name and click Import button to start importing the data.

8. Viewing and Correcting Shape files

Shape files can be opened and viewed from menu Admin -> View Map File from admin login and Reports -> View map file in user login in the desktop version. It is possible to view geometry errors and all existing attribute values of shape file from this window. Geometry errors will be listed as a column in the attribute table. The map can be viewed in any colour and overlapping any of the attributes as label.

It is possible to fix some common geometry errors like Self-Intersection error and rename attribute column names from this window. Shape files can be exported as a new shape file after fixing errors and renaming attribute names from the toolbar icon 'Export Shape File (Fix Errors)'.

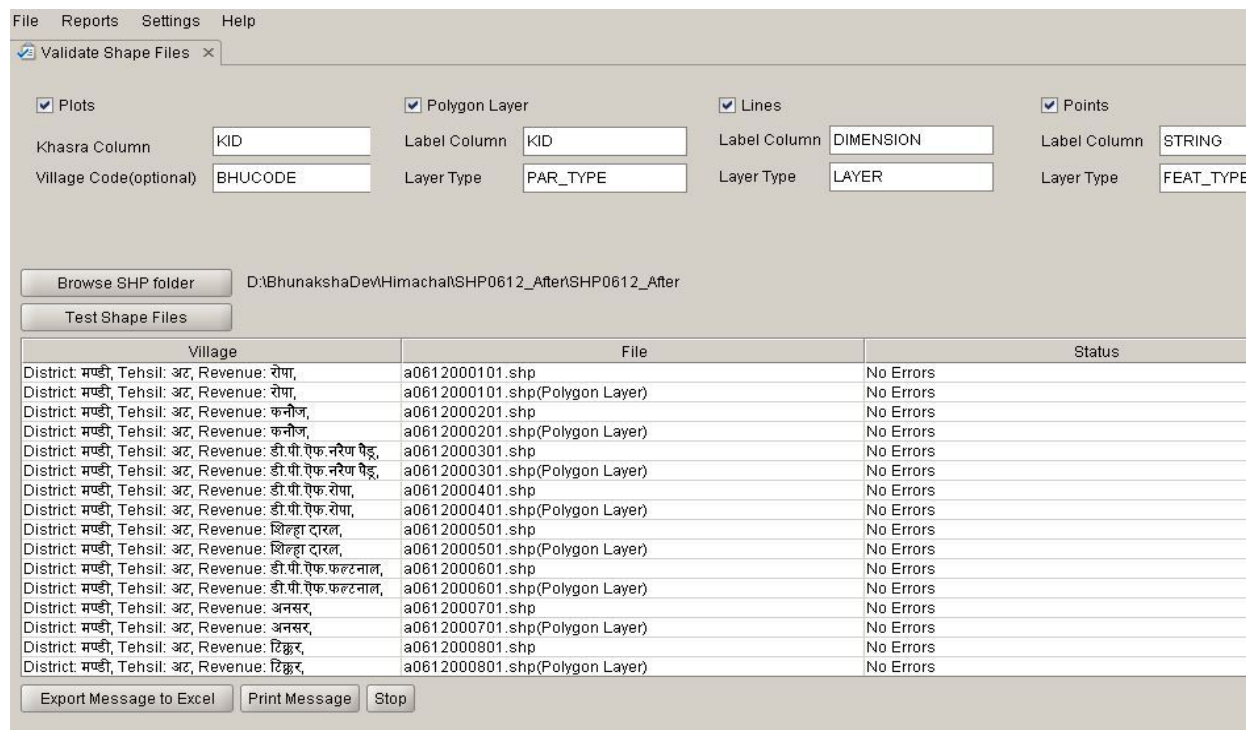


(Export Shape file by fixing Self-Intersection error and renaming attribute names)

9. Validating Shape Files

Shape files which are initial output of digitisation can be validated for required fields and correctness of geometry in Bhunaksha. Shape file validation checking module can be opened from menu File -> Validate Shape file in Desktop client. This module will check whether the set of shape files pertain to certain predefined conditions so as to import in Bhunaksha.

Result of validation will be displayed in a grid format which can be printed or exported as excel file.

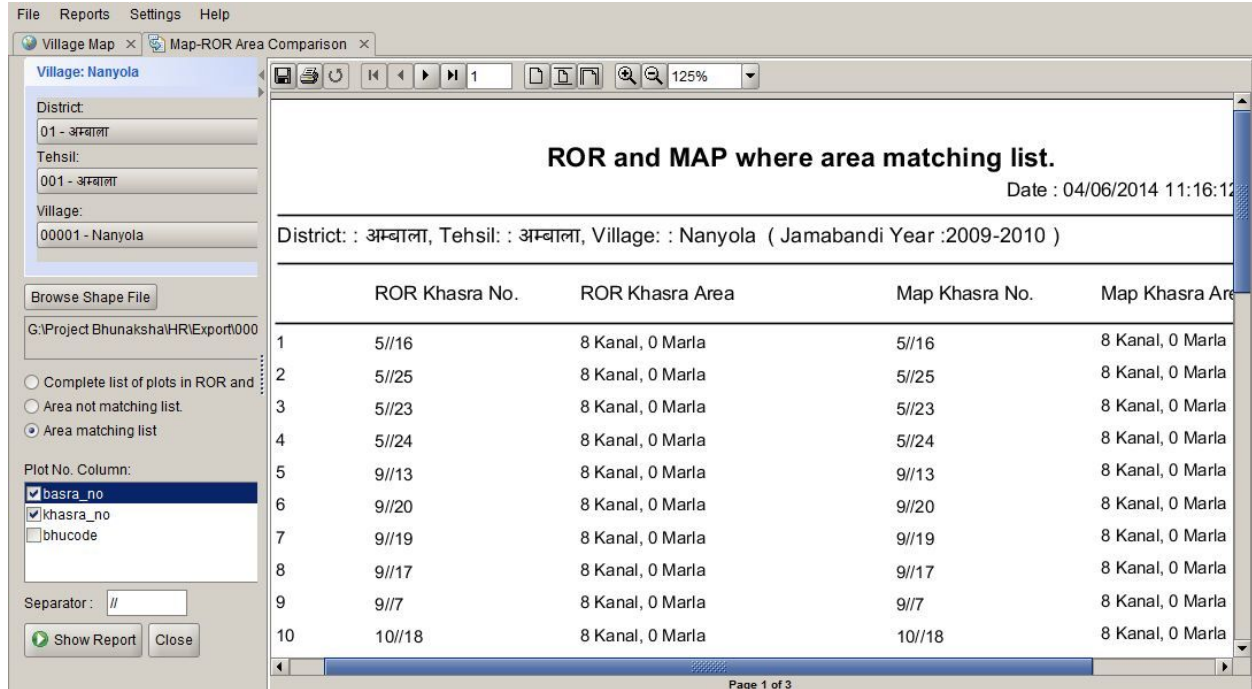


9.1 Custom validations of shape files.

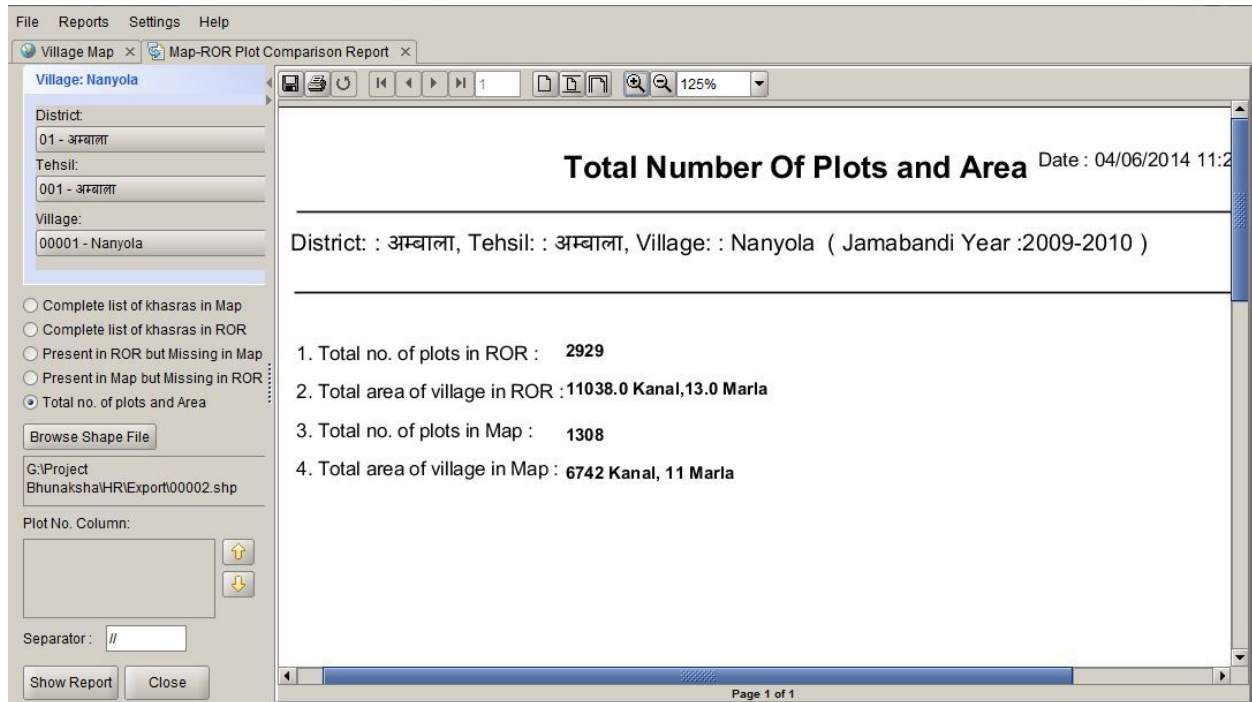
Advanced shape file validation reports are available in Bhunaksha as per special requirements from states.

9.1.1 Khasara Number and area comparison in shape file and textual database

Bhunaksha has advanced shape file validation tools for states like Haryana. There is detailed comparison reports of plot numbers, and area of polygons in digitized shape file and ROR (Textual database)



(Area comparison report)



(Plot comparison report)

9.1.2 Validation of Digitized data as per Data Structure Design format (DDSF) - Bihar

This validation module is a customized validation tool which will check output of digitization for whether it pertains to the standards and codes mentioned in the data structure design format which is communicated to digitizing agencies. This report will check for the presence of files, fields in digitized files, codes used in specified fields and other geometry errors.

A detailed analysis report will be generated for folders and files present at a specified location.

CD Drive :	data\1801	CD Volume Label :	1801000	Show Report	Print	C:\Users\nic4026\Desktop	Report Folder
CD Volume Label : 1801000							
General Details for :1801				C:\Users\nic4026\Desktop\1801\1801.html			
1 - Village Details for :	CS1801000100101	C:\Users\nic4026\Desktop\1801\CS1801000100101.html					
2 - Village Details for :	CS1801000100102	C:\Users\nic4026\Desktop\1801\CS1801000100102.html					
3 - Village Details for :	CS1801000200201	C:\Users\nic4026\Desktop\1801\CS1801000200201.html					
4 - Village Details for :	CS1801000200202	C:\Users\nic4026\Desktop\1801\CS1801000200202.html					
5 - Village Details for :	CS1801000300301	C:\Users\nic4026\Desktop\1801\CS1801000300301.html					
6 - Village Details for :	CS1801000400401	C:\Users\nic4026\Desktop\1801\CS1801000400401.html					
7 - Village Details for :	CS1801000500501	C:\Users\nic4026\Desktop\1801\CS1801000500501.html					
8 - Village Details for :	CS1801000600601	C:\Users\nic4026\Desktop\1801\CS1801000600601.html					
9 - Village Details for :	CS1801000700701	C:\Users\nic4026\Desktop\1801\CS1801000700701.html					
10 - Village Details for :	CS1801000900901	C:\Users\nic4026\Desktop\1801\CS1801000900901.html					

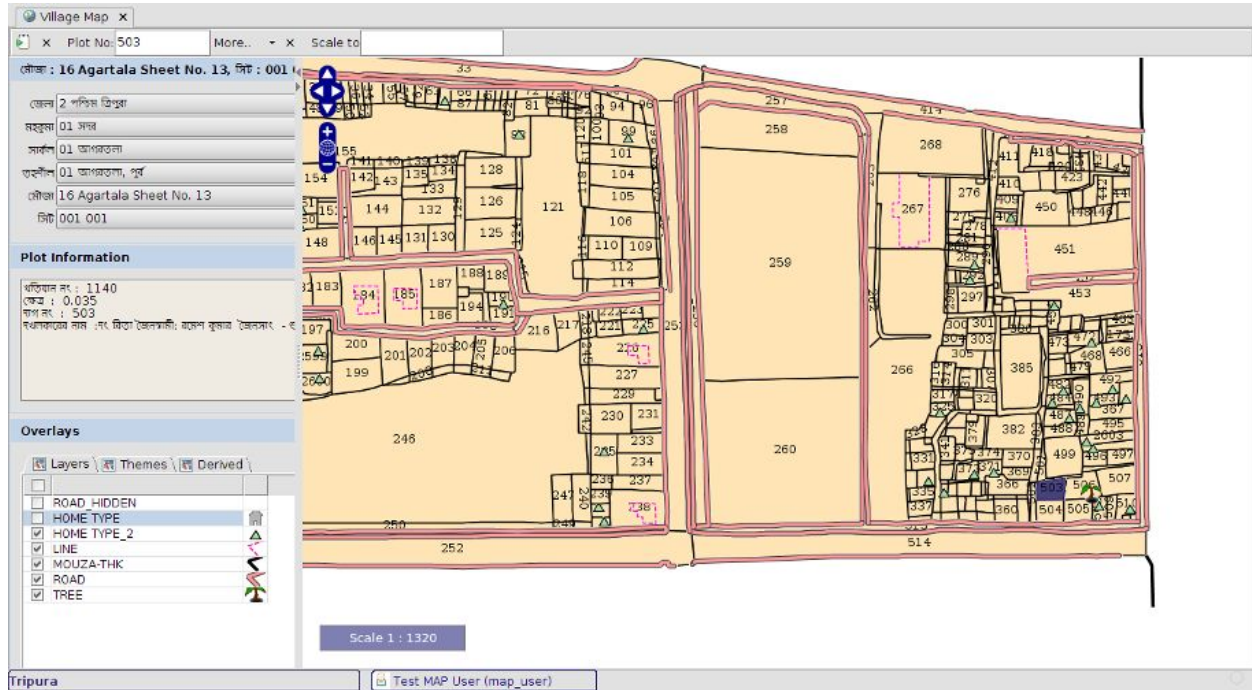
CD Volume Label : 1801000			Date : 03/06/2014
SHP File Details.			
FILE NAME	VALID (Y/N)	ERROR	
aCS1801000100101.shp	Y		
aCS1801000100101.shx	Y		
aCS1801000100101.dbf	Y		
lCS1801000100101.shp	Y		
lCS1801000100101.shx	Y		
lCS1801000100101.dbf	Y		
pCS1801000100101.shp	Y		
pCS1801000100101.shx	Y		
pCS1801000100101.dbf	Y		
anCS1801000100101.shp	Y		
anCS1801000100101.shx	Y		
anCS1801000100101.dbf	Y		
Mauza Code : 0001 RT Code : 001 Sheet Code : 01			
S.No	KID	AREA	ERROR
1		18.1	Parcel Type O, U, P, or Z (Blank KID)
2		41.06	Parcel Type O, U, P, or Z (Blank KID)
3		3.6	Parcel Type O, U, P, or Z (Blank KID)
4		86.05	Parcel Type O, U, P, or Z (Blank KID)
5		6.93	Parcel Type O, U, P, or Z (Blank KID)
6		217.78	Parcel Type O, U, P, or Z (Blank KID)
7	31@240	64.01	
8	44@237	122.34	

(Village Wise Validation Report)

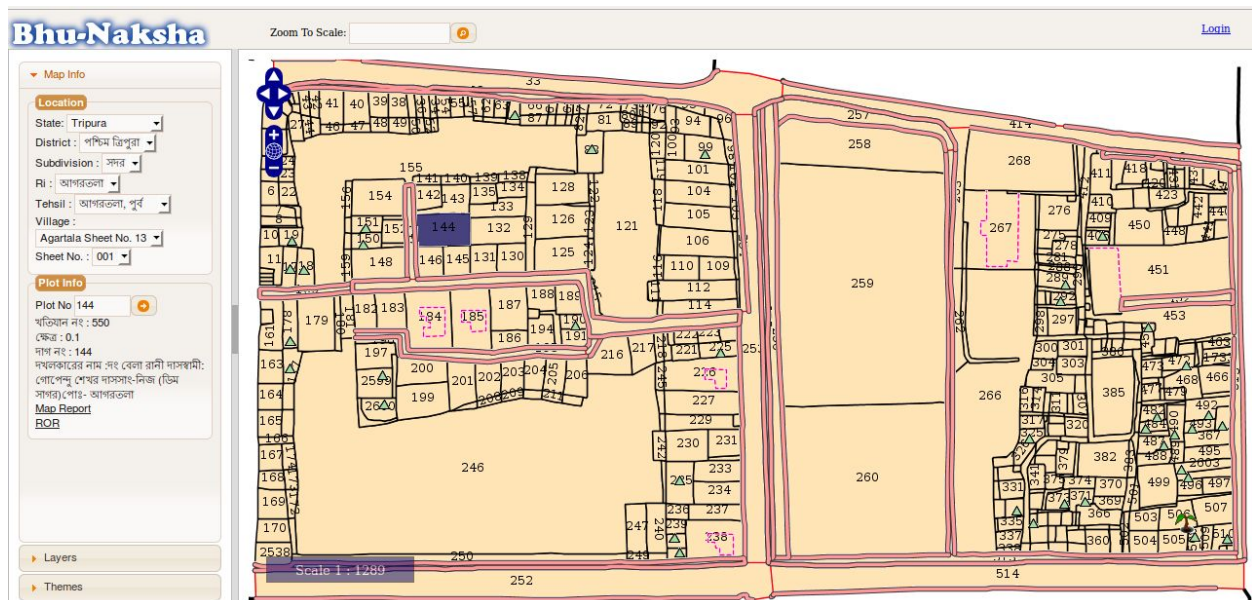
10. Village Map View

10.1 Village Map View

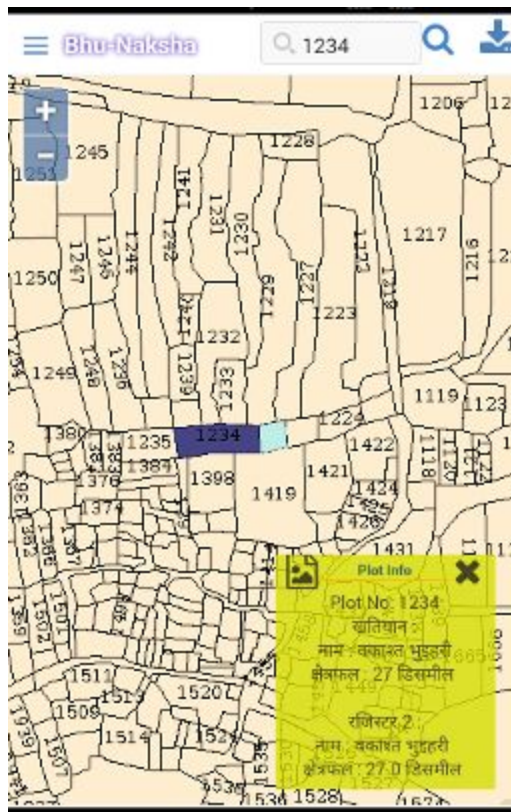
Village map view is the default view of Bhunaksha when invoked through web url by public, after logging in as user in web or desktop application.



(Desktop View)

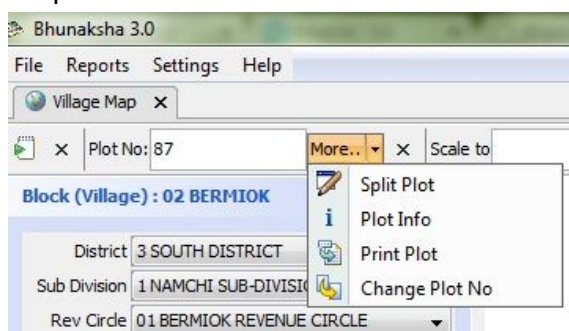


(Web View)



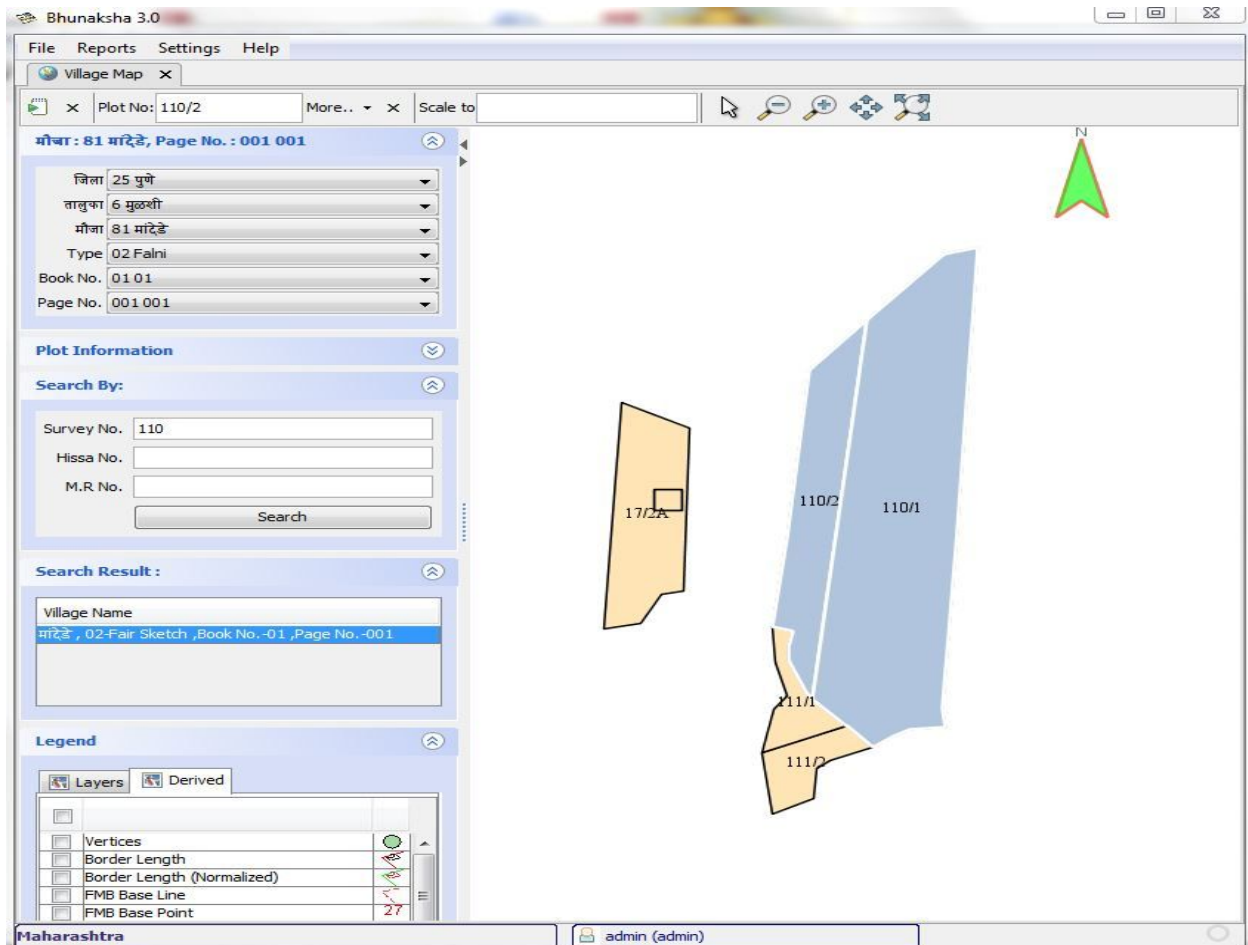
(Mobile view)

It is possible to select any plot by either clicking on the plot or typing 'Plot No'. Owner details and ROR information will be displayed when a plot is selected. All plots belonging to owner of selected plot can also be displayed if the details is available in linked ROR database. It is possible to overlay imported layers and themes on the village map by selecting particular layer or theme. Modules like Plot Report (Printable Plot Map), Split Plot, Plot Info can be invoked directly from this section after selecting a plot. To invoke the modules in Desktop Client select the plot and invoke the module from the 'More..' sub menu adjacent to Plot No. field.



10.2 Customized Village Map for States

10.2.1 Maharashtra



This Village map is customized for state maharashtra. This village map having all the the functionality of default village map with some extra functionality like.

1. Search Option:- we can search the following attributes in map by entering the following value in text boxes .
 - a. Survey Number
 - b. Hissa Number
 - c. M.R Number
2. Search Result :- The village map contains the search attributes appear in search result Table. By click on any row in Search result table you can view the map which contain the search attribute.

Example: See the above figure we enter the attribute "Survey No. " 110 then click on "Search Button" ,then click on click on row of Search result table village map appear.

11. Plot Report

Plot Report is a printable report which will have map of an area containing the plot. It will have location and owner information along with the map. It is possible to generate the map to any scale and overlaying layers.

The quality of map print has been improved from previous version of Bhunaksha. Vector printing is introduced from Bhunaksha 3.0 onwards.

This report will look differently in each state where Bhunaksha is implemented. It is a custom report and requirements are incorporated during customization of Bhunaksha for the state.

For printing map reports from browser it loads the report in an applet. So the browser should have JRE7 plug-in installed with necessary permissions to use network and printer. The applet is signed by a certificate. The certificates will have to be imported to JRE path from java control panel. Applet is used for map printing because there will be scaling & clarity issues if report is directly printed from browser. The report in applet and desktop client uses vector printing for better clarity.

The screenshot displays the Bhunaksha 3.0 Plot Report interface. The main window shows a map of a village with various plots outlined in red. The plot number 146 is highlighted. The interface includes a legend, a scale selector, and a legend panel.

Village: नाँव : 000101 सोपा

Plot No: 146

Scale : Best Fit
1600

Show Single Plot
 Show All Plots of Owner(Multiple Pages)

Legend

Layers \ Derived \

- POLY_NALA
- POLY_SUB_PARCEL
- LINE_REFERENCE
- POLY_MLL_BO
- RI
- SURVEY_POINT
- BURJI
- ABADI
- SHEDA
- POLY_PARCEL

खसरा क्रमांक : 146

वेकेशनल : 02-01-05 मंडल-बी.सोलास-बी.सोलास

नाम : इंदु सिंग भुज अरुत भुज भुज भुज भुज

1. Inch : 40 Karan

Neighbours :

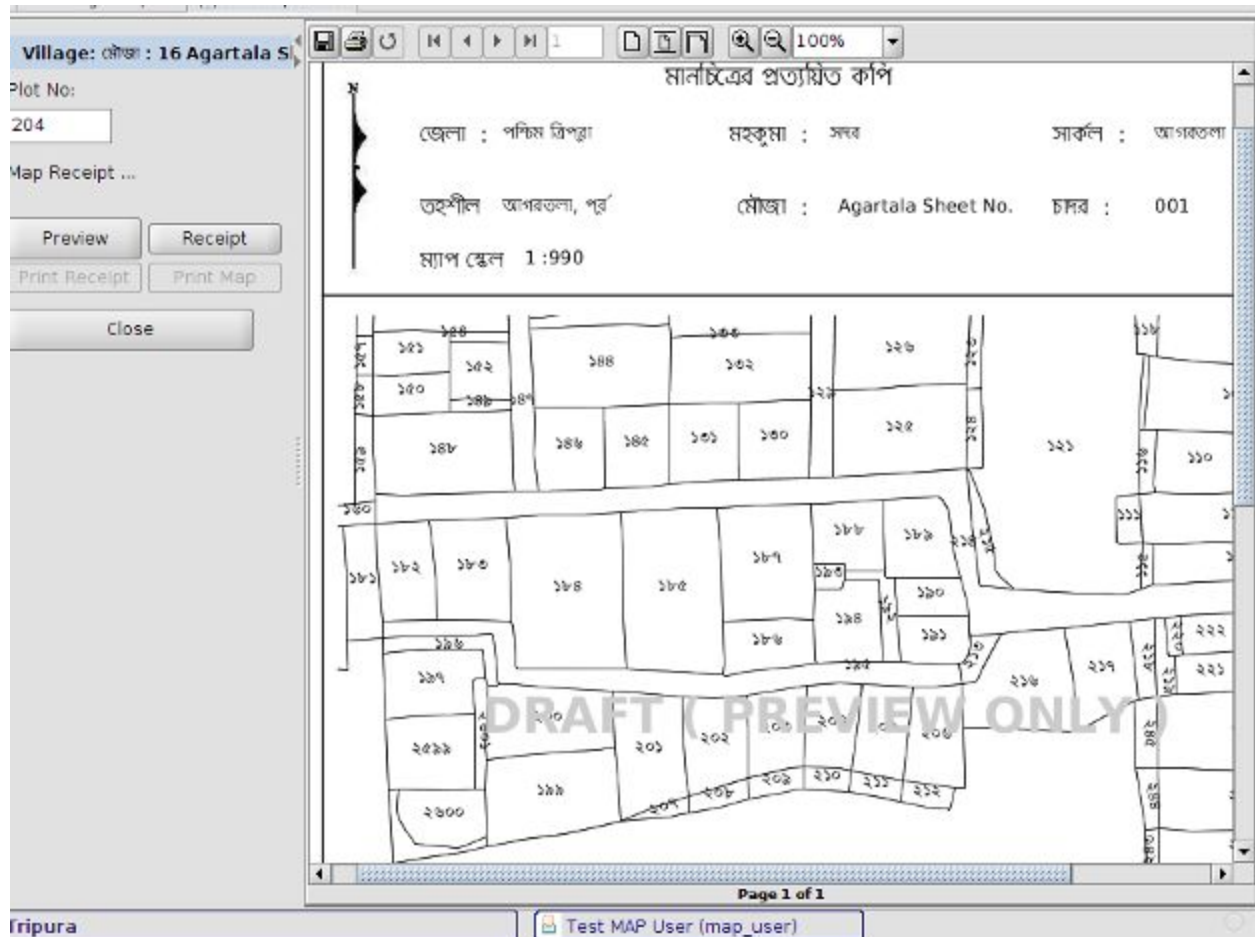
- 142 :
- 143 :
- 144 : श्रीमति धरती भुज वरकर (170640) नाम
- 145 : भुज देव सिंग भुज सोपा श्रीमति सुजा

Page 1 of 1

(Default Plot Report)

By default plot will be printed in an A4 size paper with best fit scale. In the report window it is possible to generate the report to any scale. It is possible to overlay layers on top the plot. It is

possible to generate report of all plots of a particular owner. In such case it will generate report of each plot in different pages.

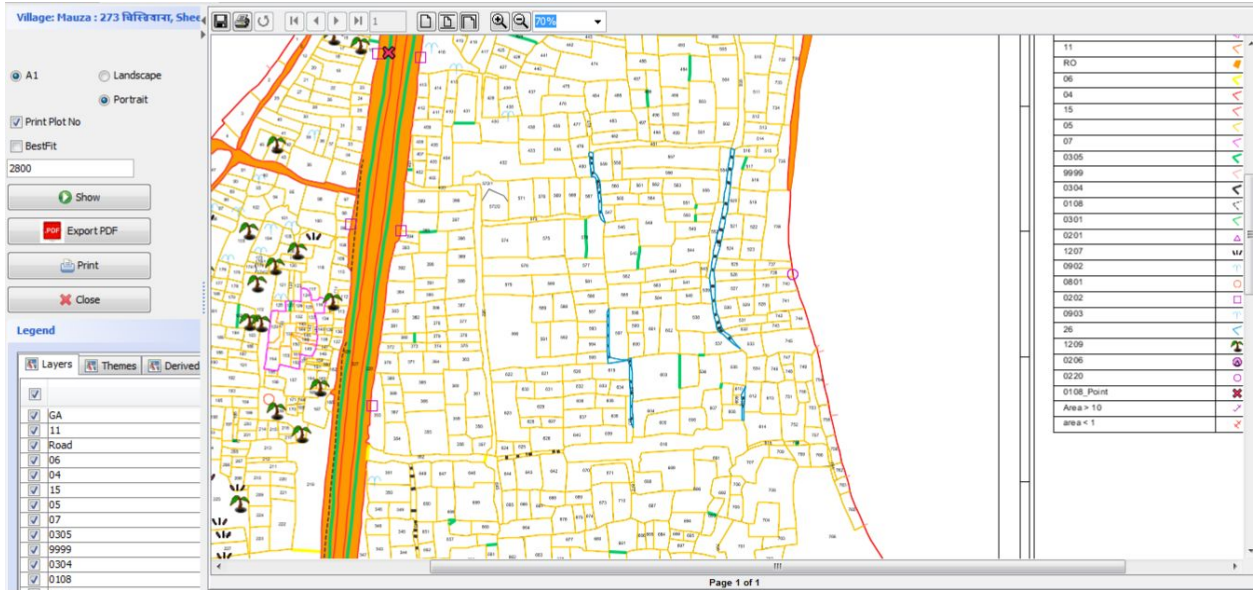


(A customized plot report)

12. Village Map Printing

12.1 Village Map Printing

Bhunaksha has a module for generating map of a village or sheet in printable form. The report can be generated in best fit scale or to a specified scale. It is possible to overlay plot number and other layers on the village map. The report can be generated for A4, A1 or A0 size paper and can be printed using plotter.

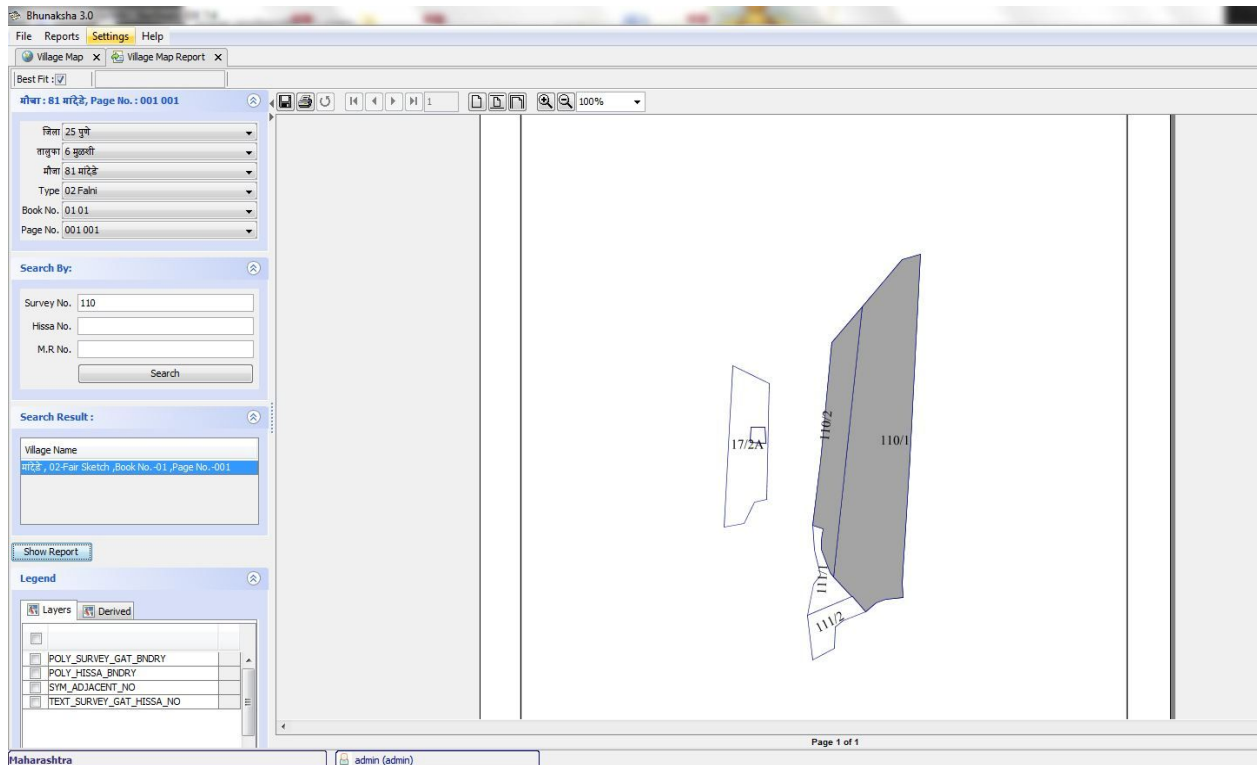


(Village Map with selected Layers on it)

Bhunaksha performs a vector printing for clarity of village map.

12.2 Customized Village Map for States

12.2.1 Maharashtra



This Village map print report is customized for state maharashtra. This village map having all the functionality of default village map with some extra functionality like.

2. Search Option:- we can search the following attributes in map by entering the following value in text boxes .
 - d. Survey Number
 - e. Hissa Number
 - f. M.R Number
3. Search Result :- The village map contains the search attributes appear in search result Table. Select any row in Search Result Table then click on "Show Report " button to view the village map report.

Example: See the above figure we enter the attribute "Survey No. " 110 then click on "Search Button" Village list appear in search result table. select any row in search result table then click on "Show report" button to view the village map report.

13. Splitting Plot (Mutation)

A plot can be split into any number of subdivisions. Splitting is done by creating division line. There are a number of methods for creating division line. A background grid can be used to help in creating division line. The angle and length of the division line will be displayed on the fly.

The following different methods are available for creating division lines.

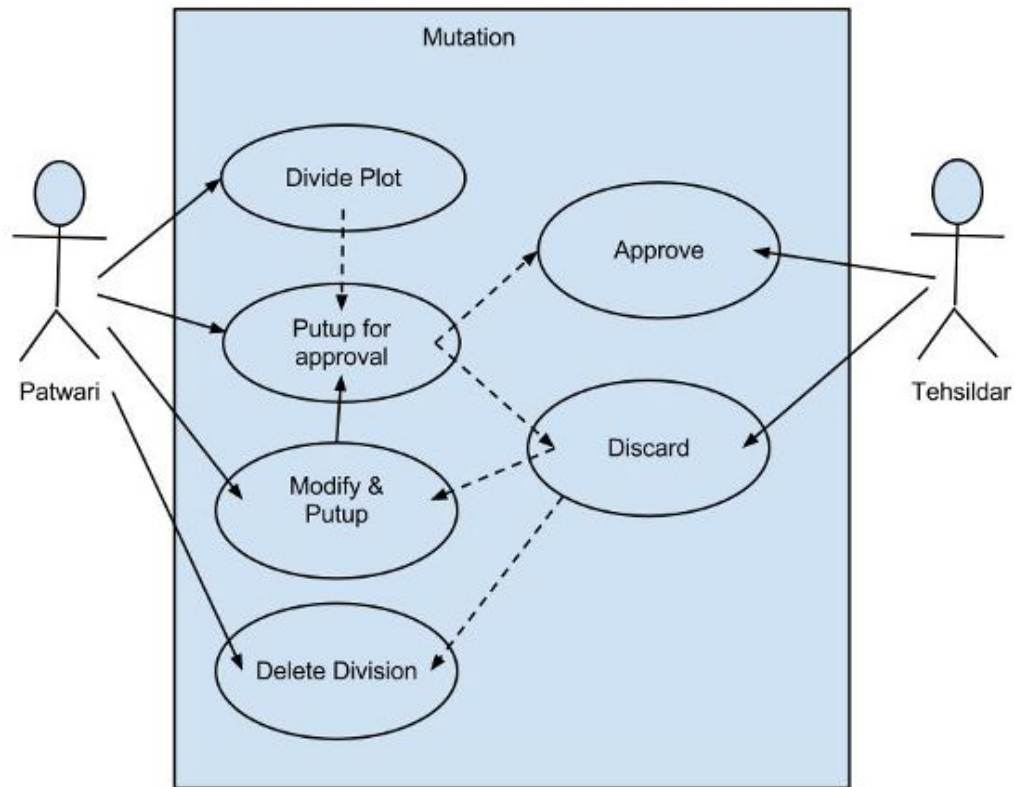
1. Free hand drawing (Background grid can be used as a help)
2. Distance and angle method
3. Arc method
4. Straight line method for joining two sides
5. Methods based on area fractions (for almost rectangular plots)
6. Point measurement method
7. Division with help of grid and background image

After division history of divided plot is saved for reference purpose. Divisions made can be temporarily saved and forwarded to higher level user for approval. The levels can be customized through setup module.

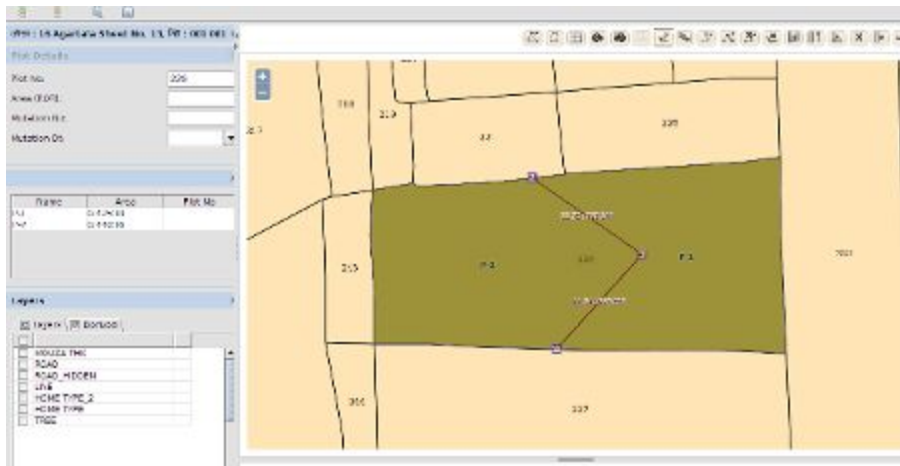
Users and groups in Bhu-Naksha are the same users in ROR application. Bhu-Naksha uses the same ROR user tables for logging into software.

An ROR user group can acquire four levels of permission which includes Approve , Edit , Print & view permissions. The groups to whom such permission is to be granted can be customized in application settings module. The whole process will help in maintaining same work flow in both ROR application and Bhu-Naksha.

A sample workflow which can be achieved through bhunaksha after proper setup is depicted in below diagram.

























Plot division module is available in both browser client and desktop client of Bhunaksha.



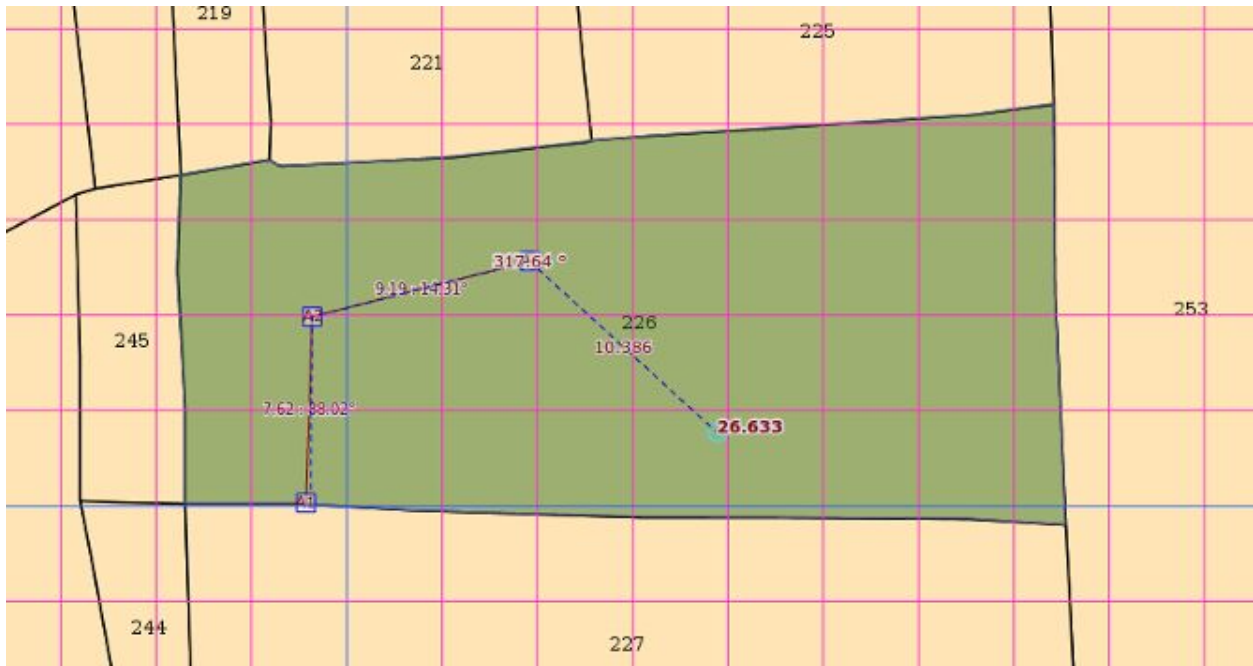
13.1 Division Tool Set

	<p>Highlight vertices</p>		<p>Remove Vertex highlighting</p>
--	---------------------------	--	-----------------------------------

	Place Grid. (Select this icon and click on map to place grid centering the clicked position)		Rotate grid clockwise
	Rotate grid anti clockwise		Remove Grid
	Draw Line (Select this icon and click on map to select points of division line line. This is a free hand drawing tool)		Finish a line. (If the line touches two border of plot it will automatically complete the division line. This is useful if hole is to be cut or when a line is to be completed without touching two borders of the plot)
	Add a new point to a line (Click on the line after clicking this icon)		Drag point of a line (Click this icon and start dragging any point of already created line)
	Delete a point from a line (Click this icon and click on any point on created division line to remove the point)		Delete Line (Click this icon and click on any division line to remove it)
	Distance Angle method		Distance Direction Method
	Arc Method (For adjacent sides)		Arc method (For opposite sides)
	Point measurement method. (Each point of the line can be created by taking measurement from 2 known points on the plot)		Tool for measuring distance.
	Area Division (Divide the plot into fraction of its total area or extract sub parcel of a particular area from plot)		Place Image in Background (Place a scanned image of the division worked out on paper as background to help in dividing plot)
	Put Up for Approval (This will be visible for the users who has permission to forward a division)		Approve (This will be visible for the users who has permission to approve a division)
	List of divisions pending for approval (This will be visible for the users who has permission to approve a division)		List of un-approved (discarded) divisions (This will be visible for the users who has permission to forward a division)

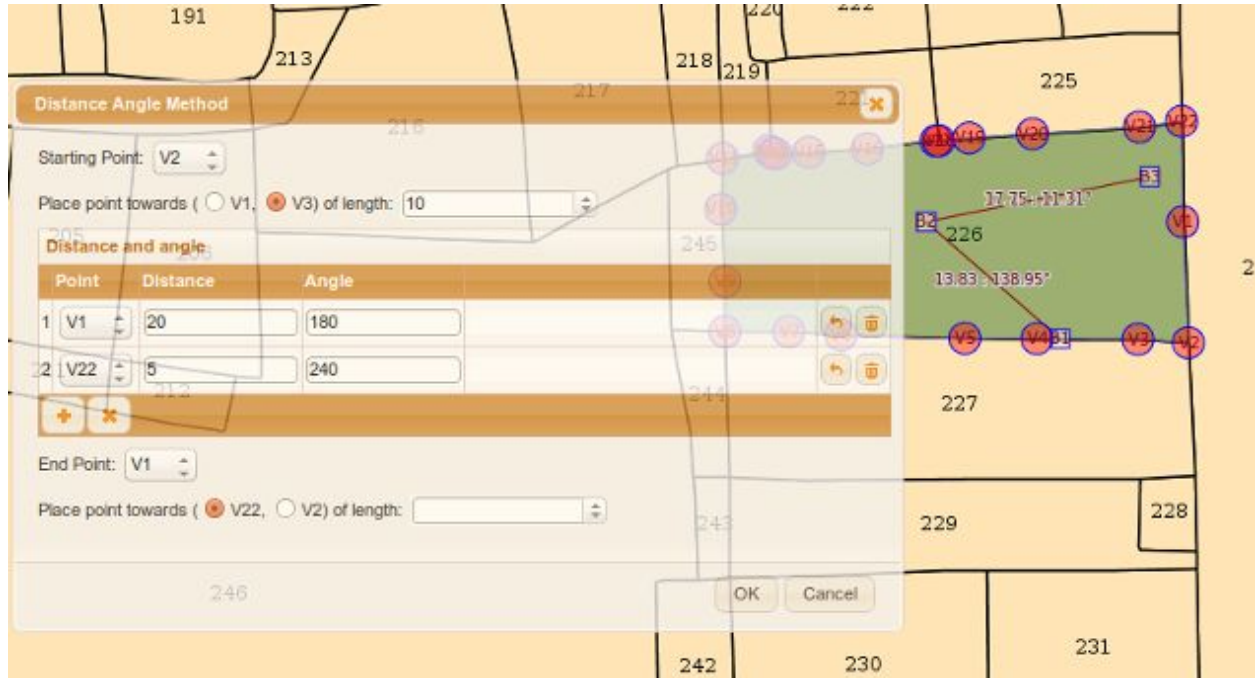
13.2 Free Hand Drawing

Freehand drawing tool helps to create a division line by clicking on the map to identify the points of division line. A background grid can be used to correlate with paper map while creating the division line. While drawing the line it displays distance and angle with respect to an imaginary line pointing to east. Points can be added or deleted at any time after creating the line. The line can be adjusted by dragging any point on the line.



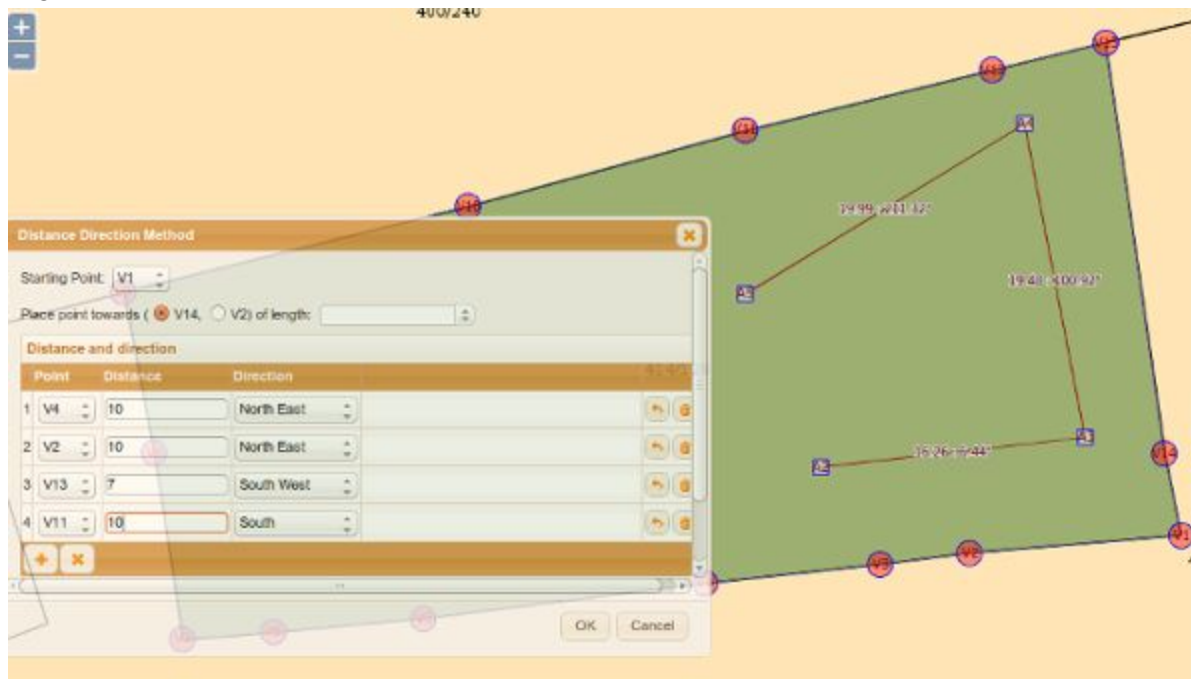
13.3 Distance Angle Method

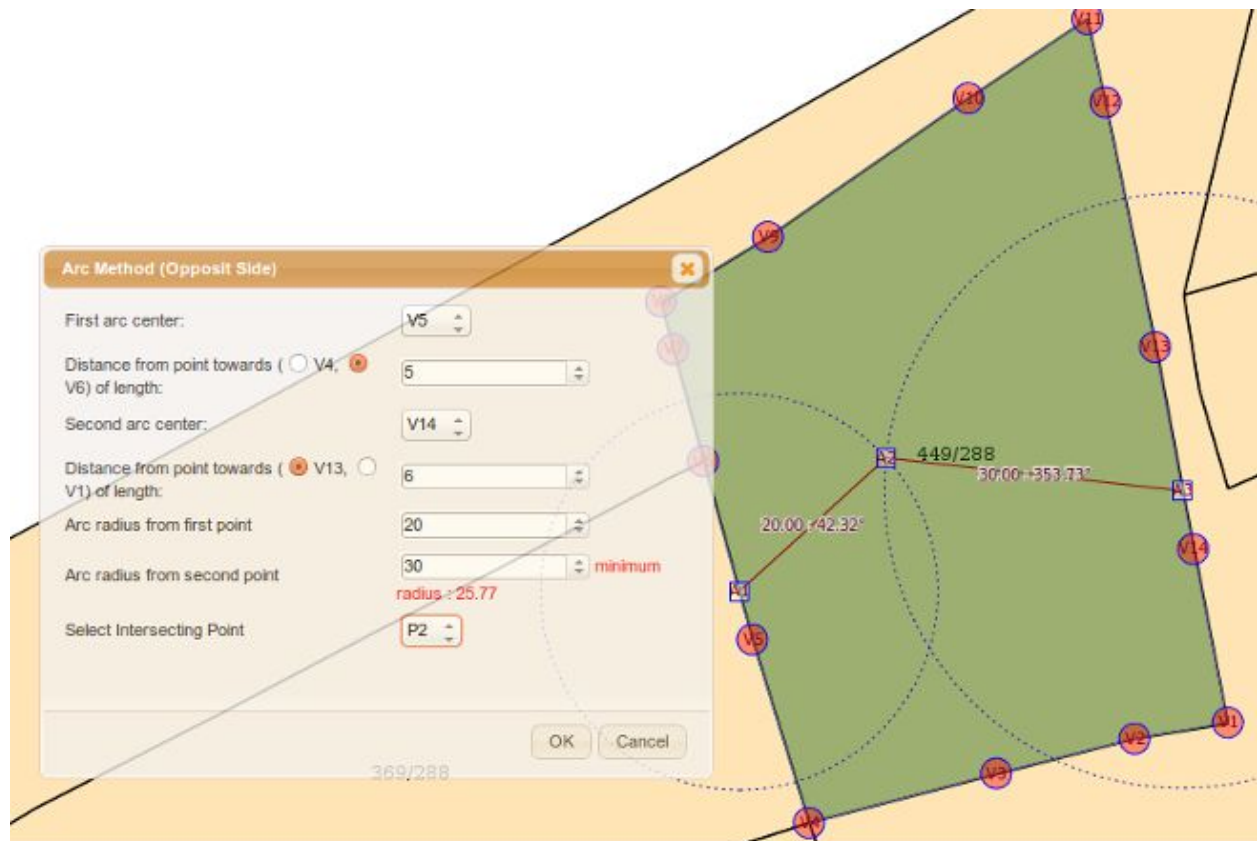
This method can be used to create a division line by specifying distance and angle of each point on the line with respect to some known reference points. The line can either start and end on any border of the plot or it can be inside the plot. Distance has to be mentioned with respect to ground measurements.



13.4 Distance Direction Method

This method can be used to create a division line by specifying distance and direction of each point on the line with respect to some known reference points. The line can either start and end on any border of the plot or it can be inside the plot. Distance has to be mentioned with respect to ground measurements.





First end of the division line (A1) is at a distance of 5 meters from V5 towards V6. Last point of the line (A3) is 6 meters towards V13 from V14. A1 and A3 will act as arc center for the third point at middle of the line. Arc radius is 20 meters from A1 and 30 meters from A3. There are two intersecting points P1 and P2 we selected P2 which will become A2 of the line.

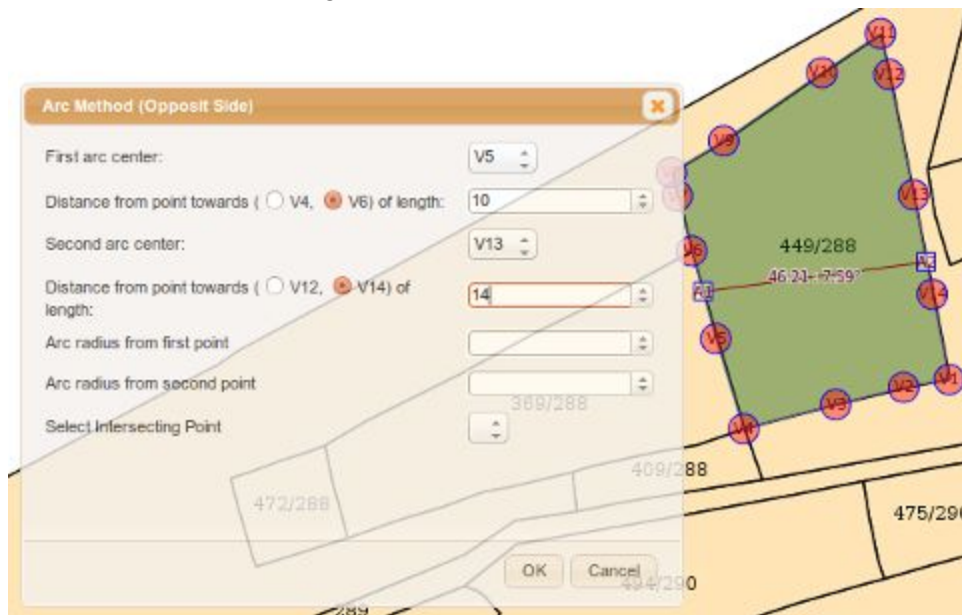
13.7 Point Measurement Method

This method can be used for creating complex division lines accurately. Each point of the division line can be identified by measuring it from two known points. This is a more complex version of the arc method where more than one points can be created by intersecting arcs. The line can start either from border of the plot or can be inside the plot. This can be used for cutting hole inside the plot.



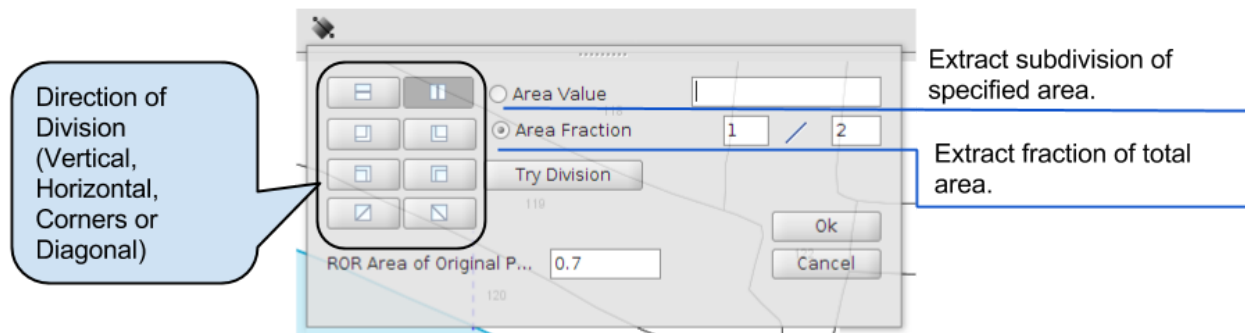
13.8 Straight Line Division

This is not a separate division method. All the division methods can be used for making straight line division by specifying first point and last points on the border of plot and skipping all intermediate points. Image below shows how arc method can be used for making straight line.



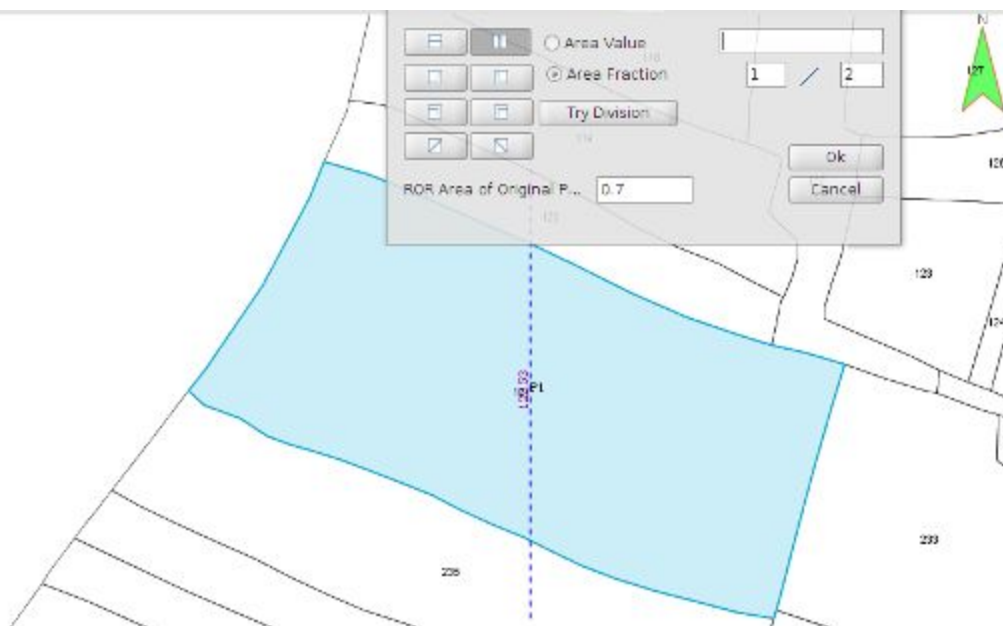
13.9 Area Division

A plot can be divided considering its area and area of the subdivision parcels. Two types of area based divisions are possible. (a) Sub divisions can be extracted from a plot as ratio of its existing area. (b) Sub divisions of some particular area of interest can be extracted from the plot. In both cases the division can be performed either vertically, horizontally, diagonally or in the four corners of the rectangle enveloping the original plot.



If Area value option is selected type the area of interest required for the new subdivision. If area fraction option is selected input a fraction like $\frac{1}{2}$, $\frac{1}{4}$ etc.

After selecting the appropriate options from window as explained in the above figure, click **Try Division** button to view the division line.



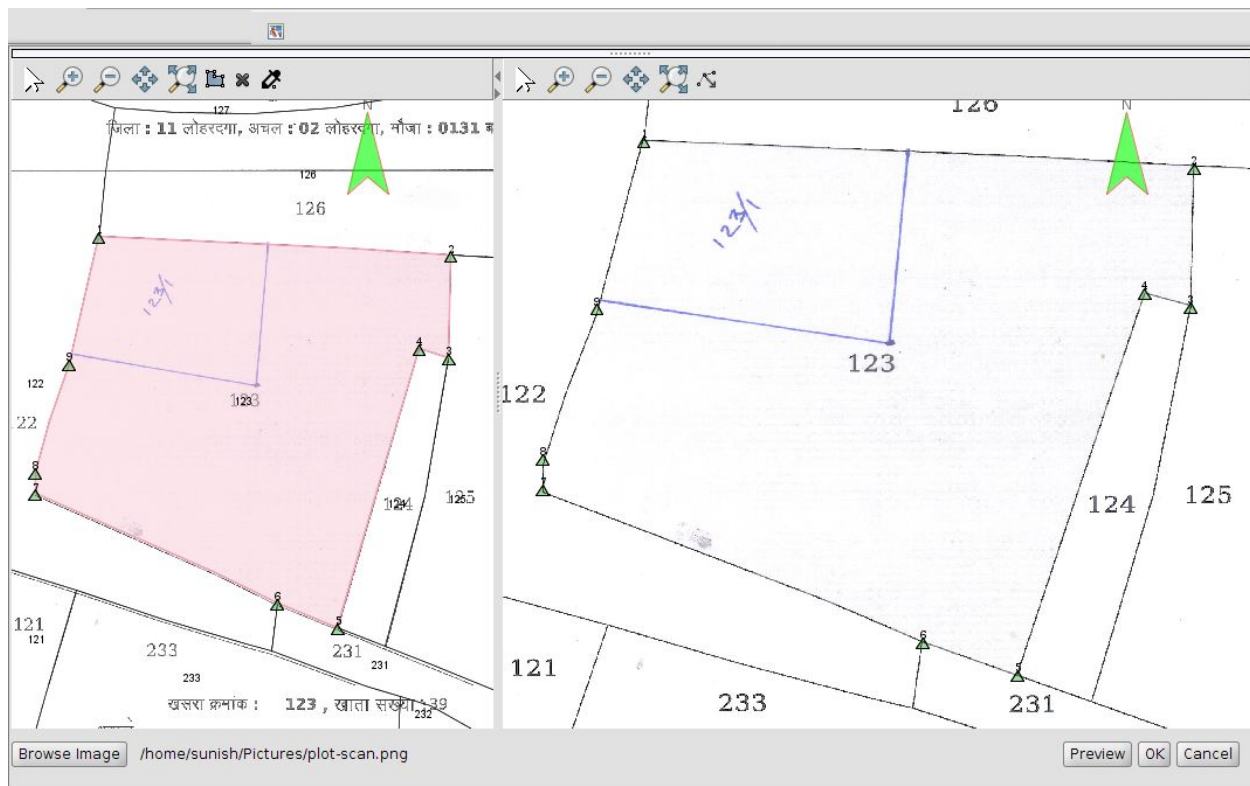
Click OK Button to confirm the division.

13.10 Division with help of background image

In most states initially the maps were created by digitizing existing paper maps. At this time users had better experience in creating subdivision in paper maps compared to digitized map in computer. In Bhunaksha it is possible to align the image of a division made on paper in background of the digitized parcel. Afterwards the same division scenario can be replicated with the digitized map.

For aligning the image at the background the image will have to be geo-referenced with respect to the parcel map. The georeferencing option available in Bhunaksha is to identify some common points in both the map and image. The image will be transformed based on the identified points. The accuracy of alignment will be directly proportional to the accuracy and number of identified points.

Click the icon to popup the window and browse the image to be placed in background. The left pane of the screen will show the digitized parcel and right portion will show the selected image. Next step is to identify some points of the digitized parcel. The same points will be placed in the image also. The location of the corresponding points in the image can be adjusted by dragging the points in the image. The points can be identified on digitized map by clicking on the map. Mouse will snap to existing vertices of the plot while moving mouse to click the point. This will help in identifying points like corner of the plot. It is also possible to highlight all vertices of the plot and adjust them on the image.



Once the points are getting adjusted on image it will show a preview of the background image on the left part. Click OK to project the image to the original division screen. This will show the image aligned in the division window.

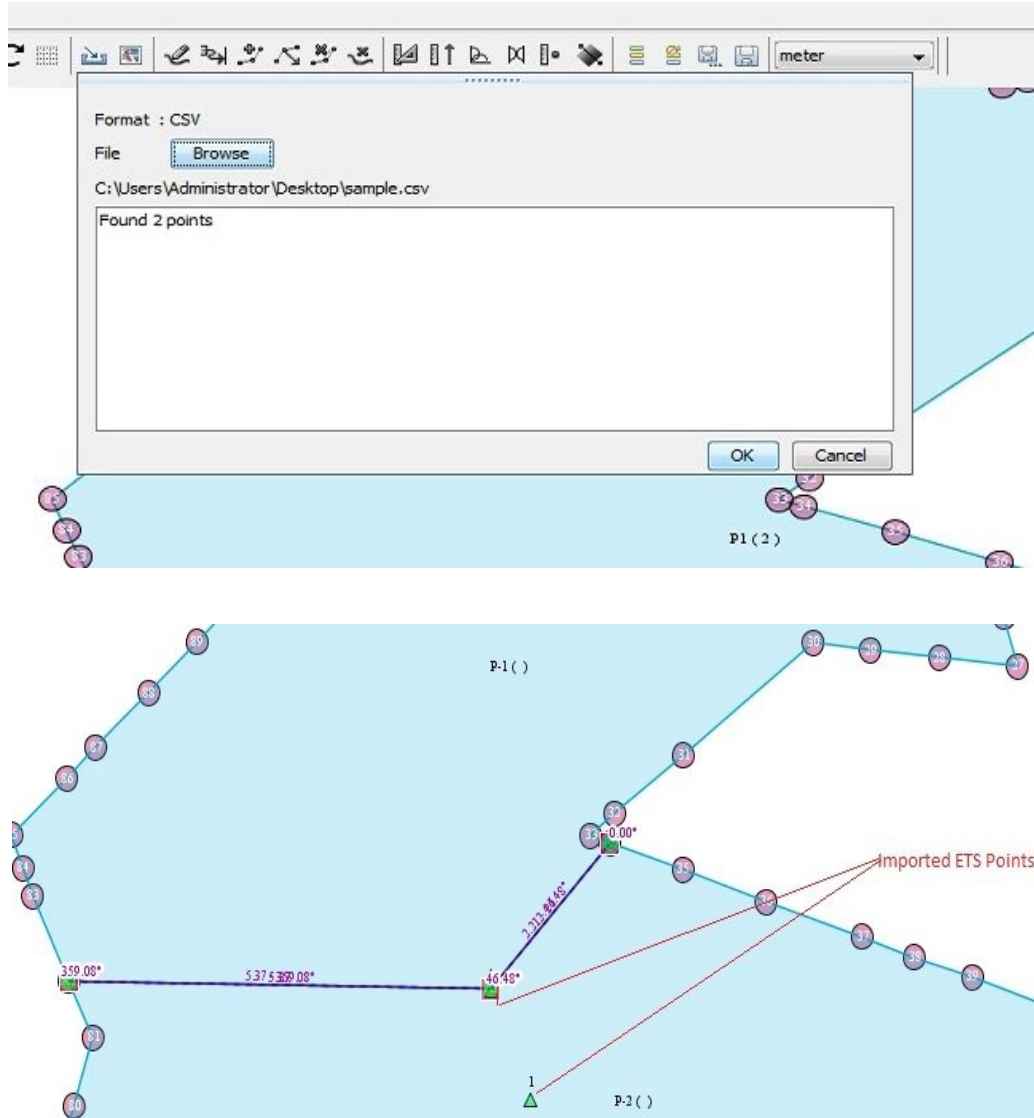
Free hand division can be used to replicate the division lines.



13.11 Division using ETS Data

The division of plot can be done using the ETS data in this method. The ETS data in the csv format is imported by clicking on the browse button and is available during the division of the plot. These points can be used to divide the plot using other division methods.

The images below illustrates how ETS data is imported and used to create the division line.




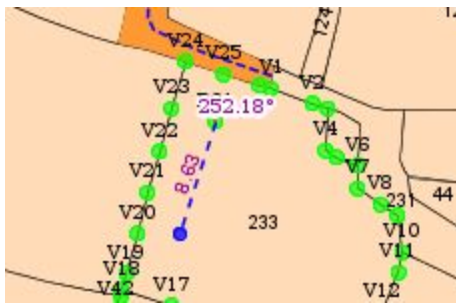
14. Multiple Plot Splitting (Cutting Road/Canal)

Cutting a road in the village map is an example of multiple plot division. During such process the portion of the road will be extracted from the existing plots. Sometimes this kind of process will divide some plots into two or more disconnected parcels. The disconnected parcels will have to be identified by the same plot number. We should utilize vertices of existing plots in the map when the new parcel will have to touch the border an existing plot to maintain clean topology. If the existing boundaries are not considered with all includable vertices then the operation can result in narrow gap between boundary of the affected parcels and new parcel created.


Bhunaksha has the facility to cut out one or more parcels from area of existing plots in a village map. The new parcel can be extracted by joining a group of points identified in the village map.





3. Create any extra points needed for carving out new parcel. New points can be created by clicking on the map after selecting “Click to Insert Point tool” () From tool bar. When this tool is used for creating a point it will show the distance and angle with respect to the previously created point to the new point being created.

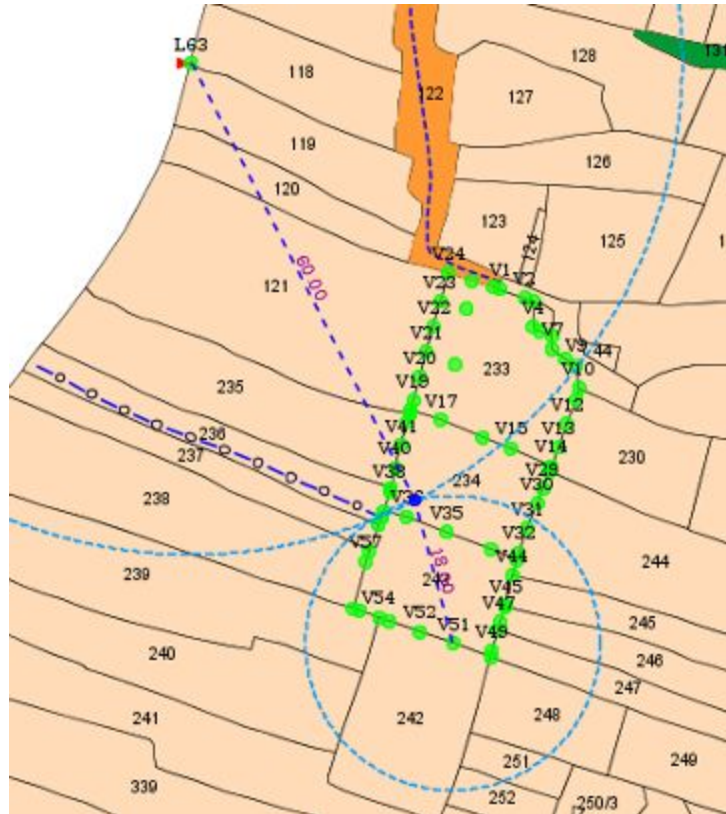




A new point can also be created by specifying its distance from two known points. The intersection of the arc radius as specified distance from the known points will be treated as new point. The known points can be any of the highlighted vertices, any new points created or a point layer like bi-junction, tri-junction.

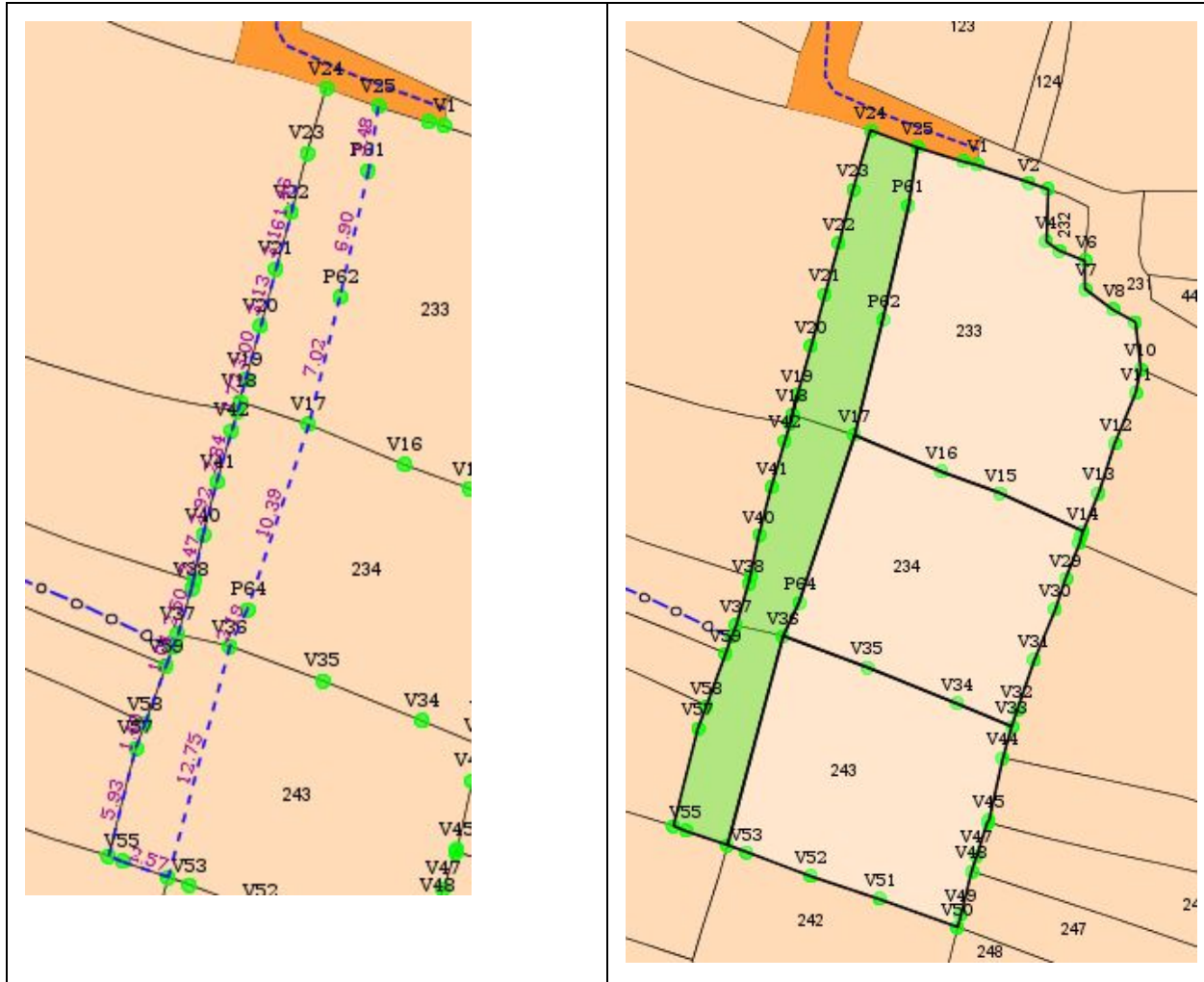
To create a point using the above mentioned procedure, select the tool “Insert Point (Measurement Based)” ().

First Point:	<input type="text" value="L63"/>	
Distance:	<input type="text" value="60"/>	
Second Point:	<input type="text" value="V51"/>	
Distance:	<input type="text" value="18"/>	
Point:	<input type="text" value="1"/>	
<input type="button" value="Add"/>		<input type="button" value="Cancel"/>

The tool will prompt for two known points and its distances to the new point being created. Name of the known points can be typed in the respective boxes or they can be picked from the map using the tool adjacent to the input boxes. Click the Add button after verifying the point.



4. Join the points to carve out new parcel. Points can be joined by clicking on the points after selecting the “Join Points Tool” () or by inputting the name of the points in respective fields after selecting tool (). Make sure to select all points on the boundary of the plots if that boundary is part of the new parcel being cut. Leaving some points in the boundary will result in narrow unnoticed polygon left out in the map. Starting point and end point of the parcel being carved out should be the same. Once the points of the new polygon is completely identified, it will highlight the area of new plot being carved out and the remaining area of older existing plots. It is possible that some of the older plots may have got mutated into two or more disconnected portions. This will happen if the road goes through middle of some plots. The disconnected portions of the existing plot will have same plot number.



Once the new parcel is carved out the details of affected plots and new parcel will be shown in the left pane.

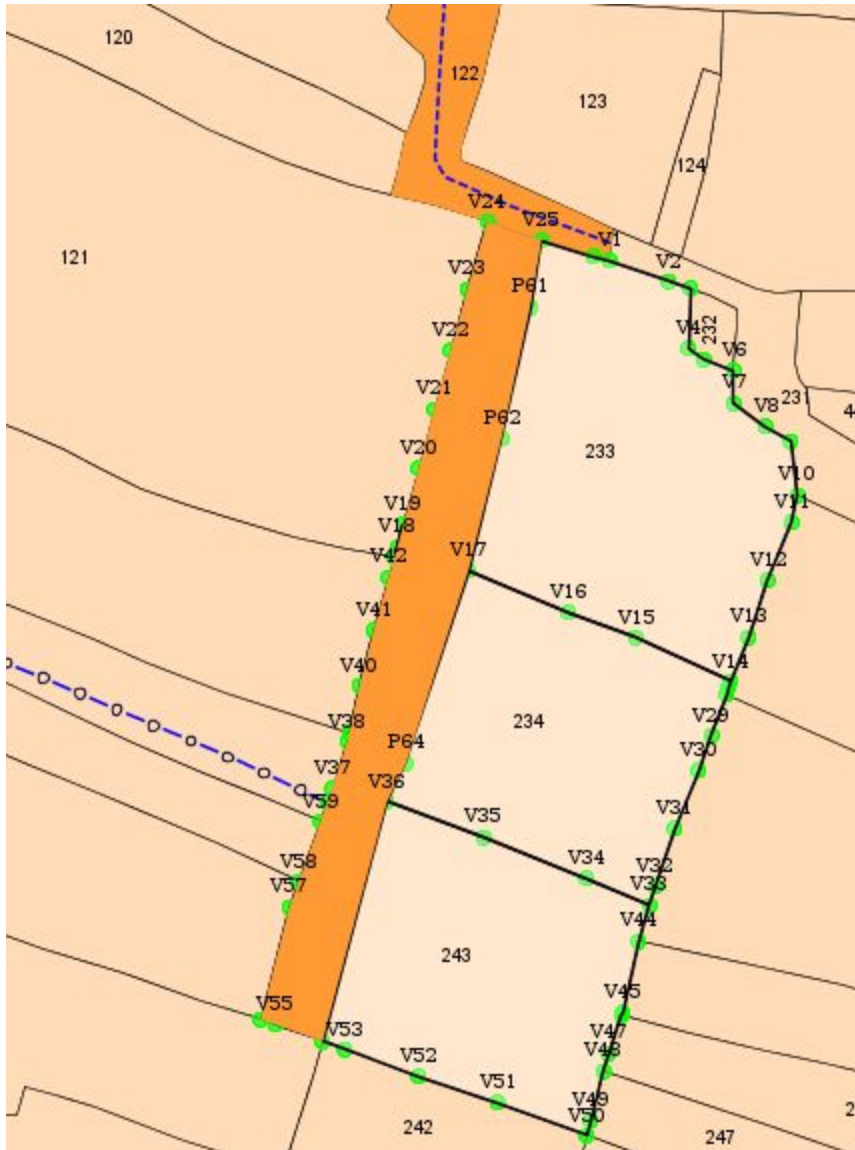
Divided Plots \ Created Layer \ Layers \		
No	Area	Layer
234	177.69	PLOT
243	180.82	PLOT
233	239.39	PLOT

The details of affected plots will be shown in Divided Plots tab.


Divided Plots \ Created Layer \ Layers \		
No	Area	Layer
500	146.78	R0

The new parcel carved out will be shown in Created Layer tab. It is possible to assign plot number and layer type of the new parcel from this table.

5. Assign plot number and layer code to the newly carved out area. This can be done in the Created Layer tab in left pane as shown in above figure. Once the layer type is selected new area will be shown with the actual style of the layer (eg: style of Road).

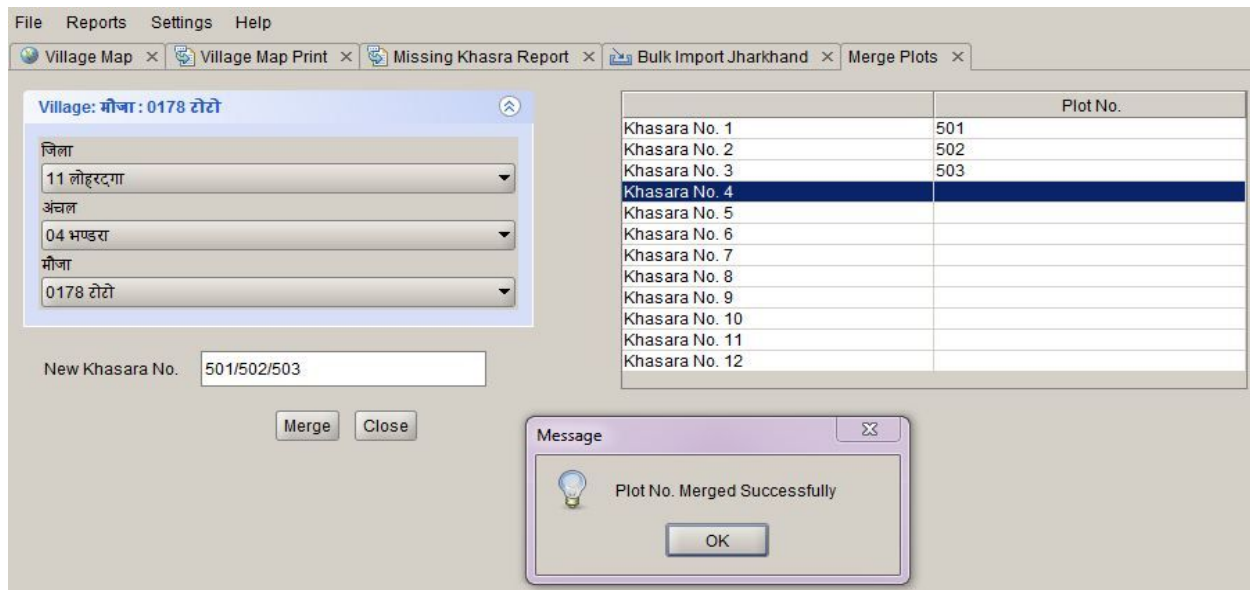


The above process can be repeated for any number of new parcel being carved out from the map.

6. Save the changes ()

15. Merging plots

Bhunaksha has a module for merging one or more plots in a village. A user can merge upto 12 khasra's through this module and assign a new khasra number to the newly created plot.



16. Creating map using FMB and Tippon

Maps can be created interactively from FMB (Field Measurement Book) data and tippon sketch. Once the map is created it will be similar to any other map in Bhunaksha.

Select the village and other details for which you are creating the map. The details being selected will differ from state to state based on the customization performed for the state.

मोजा : 81 मादिडे

जिला 25 पुणे

तालुका 6 मुळशी

मोजा 81 मादिडे

Type 01 Tippan

Book No. 100

Page No. 002

If data already exists for the details entered then it will show the existing map and layers. You will be able to add new offset points and subdivision on the existing map.

The screenshot displays the Bhunaksha software interface. On the left, there is a sidebar with the same form as shown in the previous image. Below the form is a table titled 'Ladder Data \ Polygons \ Lines \ Points'. The table has 5 columns and contains numerical data. The main area of the software shows a map with various polygons and lines. A blue hatched polygon is labeled 'B (150.00)'. A green hatched polygon is labeled 'C (89.61)'. Other polygons are labeled 'A (120.00)', 'D (120.00)', and 'E (120.00)'. The map also shows a road with a dashed blue line and a blue line with cross-ticks. The status bar at the bottom indicates 'Maharashtra' and '(admin)'.

1	2	3	4	5
		H		
		(89.61)		
21	30.00	19.00		
20	10.00	18.00		
		G		
		B		
		(150.00)		
		10.00	20.00	10
		32.00	26.00	19
18	12.00	30.00		
17	10.00	20.00		
		A		
		(120.00)		
16	22.50	23.00		
15	32.00	35.00		
14	43.00	23.00		
13	10.00	11.00		
		C		
		(110.00)		
12	22.00	34.00		

16.1 Diagonal and Offset / Simple Triangulation System.

Draw Base Line.

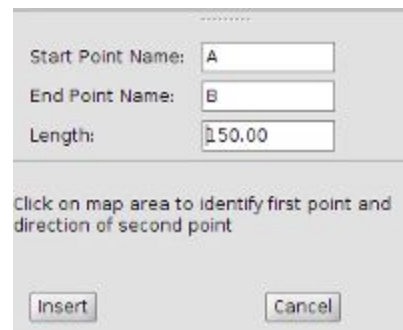
Once you click the draw base line option you will be prompted with options for name of base line points and length of the line.

Enter the start point name and end point name and length of the line. Click Insert and start drawing the line on the map area.

You can start with any G line from the sketch.

Click the start position and adjust and click the end position in such a way that the angle of the line matches with the sketch.

After clicking the first point when you move mouse in the map area it will show the position of second point on the direction of mouse position. Click to accept the angle and position of second point.

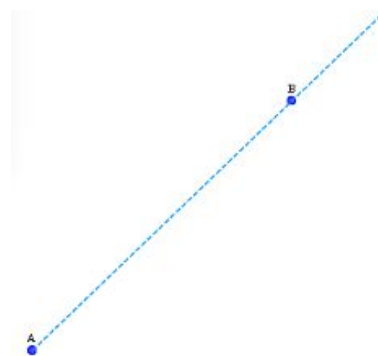


Start Point Name:

End Point Name:

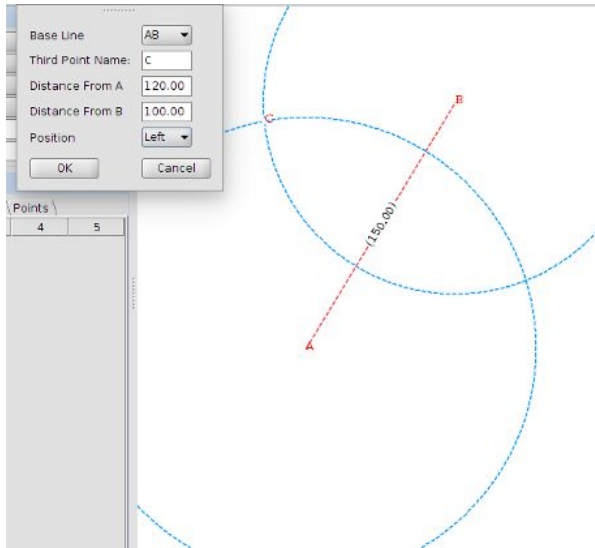
Length:

Click on map area to identify first point and direction of second point

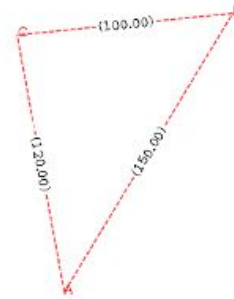


Draw Triangle

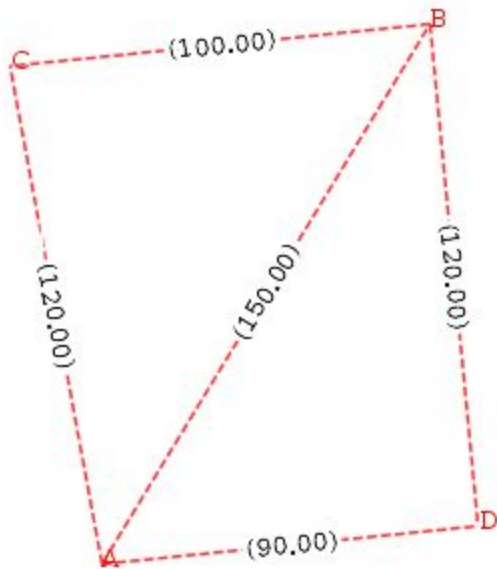
Click the draw triangle icon to build triangulation on the base line.



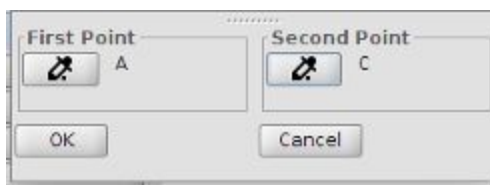
- 1) Select the base line.
- 2) Enter name of the third point of triangle.
- 3) Enter the distances from two points of the selected baseline to third point of the triangle.
- 4) Select the position of the third point.
- 5) Click OK to draw the triangle.



Continue the above steps until you build the triangulation that are in the sketch.



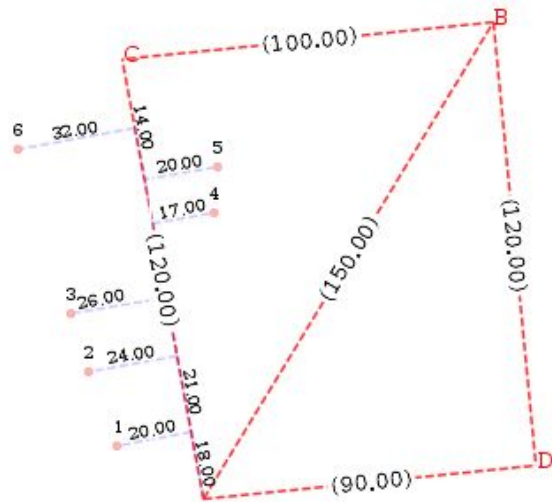
 **Create Offset Points.**



Select first and last point of the line on which you want to create offset points. Click on the 'select point' button and select each points. Click OK to start adding offset points.

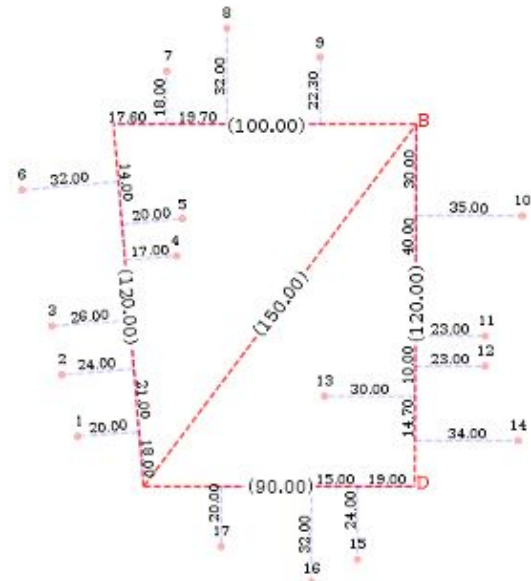
Once you click OK button the line will be added to the ladder table. You can enter ladder data corresponding to the offset points. Ladder data should be entered from bottom to top. On pressing enter key after feeding each row of ladder data it will insert a new row above the current row and focus will transfer to the newly created row. The offset points and its distance line will automatically appear in the map once you start entering the ladder data.

Ladder Data \ Polygons \ Lines \ Points \					
	1	2	3	4	5
			C		
			(120.00)		
6	32.00	14.00			
			12.00	20.00	5
			20.00	17.00	4
3	26.00	16.00			
2	24.00	21.00			
1	20.00	18.00			
			A		



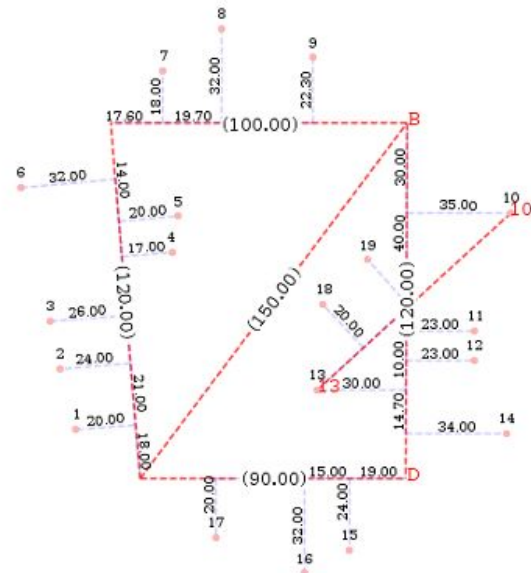
Add offset point on other lines also as required.

Ladder Data				
1	2	3	4	5
		A		
		(90.00)		
17	20.00	30.00		
16	32.00	15.00		
15	24.00	19.00		
		D		
		(120.00)		
14	34.00	14.70		
		10.00	30.00	13
12	23.00	10.00		
11	23.00	40.00		
10	35.00	30.00		
		B		
		(100.00)		
9	22.30	31.00		
8	32.00	19.70		
7	18.00	17.60		
		C		
		(120.00)		
6	32.00	14.00		
		12.00	20.00	5
		20.00	17.00	4



You can also add offset points on an extended base line. Extended line are base lines which has two offset points as it's terminal points. To create an extended base line follow the same procedure as above but select the start and end point as points which are offset points created earlier.

		10		
		(88.46)		
19	21.00	21.00		
18	20.00	21.00		
		13		
		A		
		(90.00)		
17	20.00	30.00		
16	32.00	15.00		
15	24.00	19.00		
		D		
		(120.00)		
14	34.00	14.70		
		10.00	30.00	13
12	23.00	10.00		



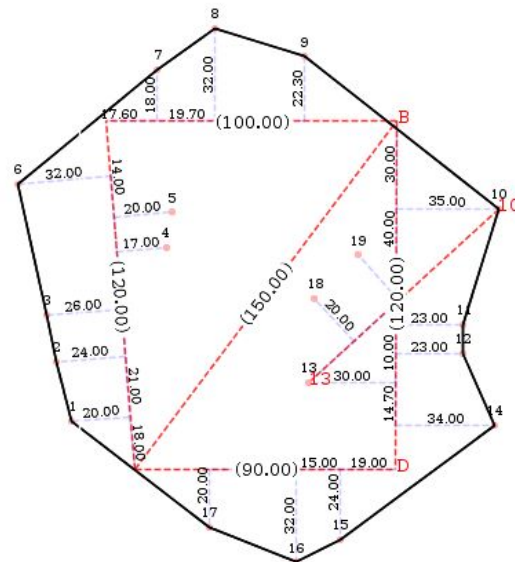
In the above figure offset points 18 and 19 are placed on the line from 13 to 10 which are offset points created earlier.



Join Boundary

To create boundary polygon select the tool and click on the created points in the order they should appear in the boundary. The polygon created will be added to the polygons table once it is drawn. The polygons table will show the polygons created, its area and label (plot number). The plot number can be assigned from this table.

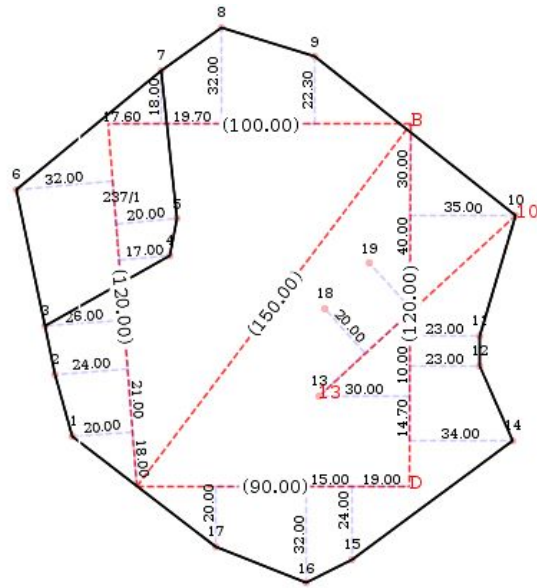
Sl	Layer	Label	Area
1	PLOT	237	20735.28



Create Sub division.

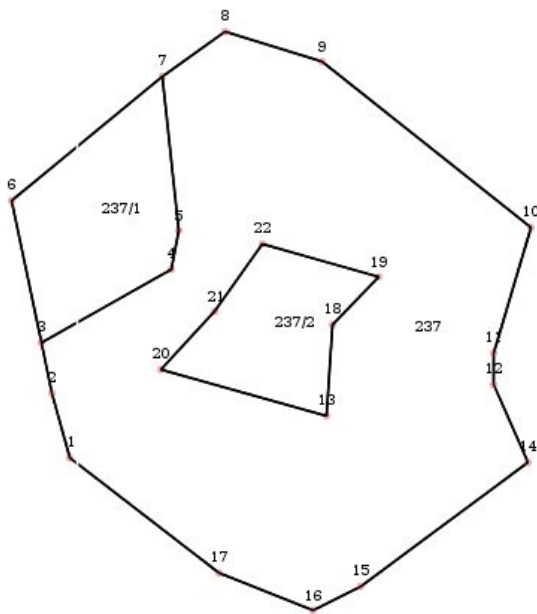
Subdivision can be created after creating the boundary polygon. To create sub division select the tool and click on the points in a series. The subdivision will automatically appear in the polygon table once the line created by clicking the series of points will contribute to a valid sub polygon of the boundary polygon. You can assign the number to the newly created sub division.

Ladder Data				
	Polygons	Lines	Points	
SI	Layer	Label	Area	
1	PLOT	237	18072.19	
2	PLOT	237/1	2663.09	



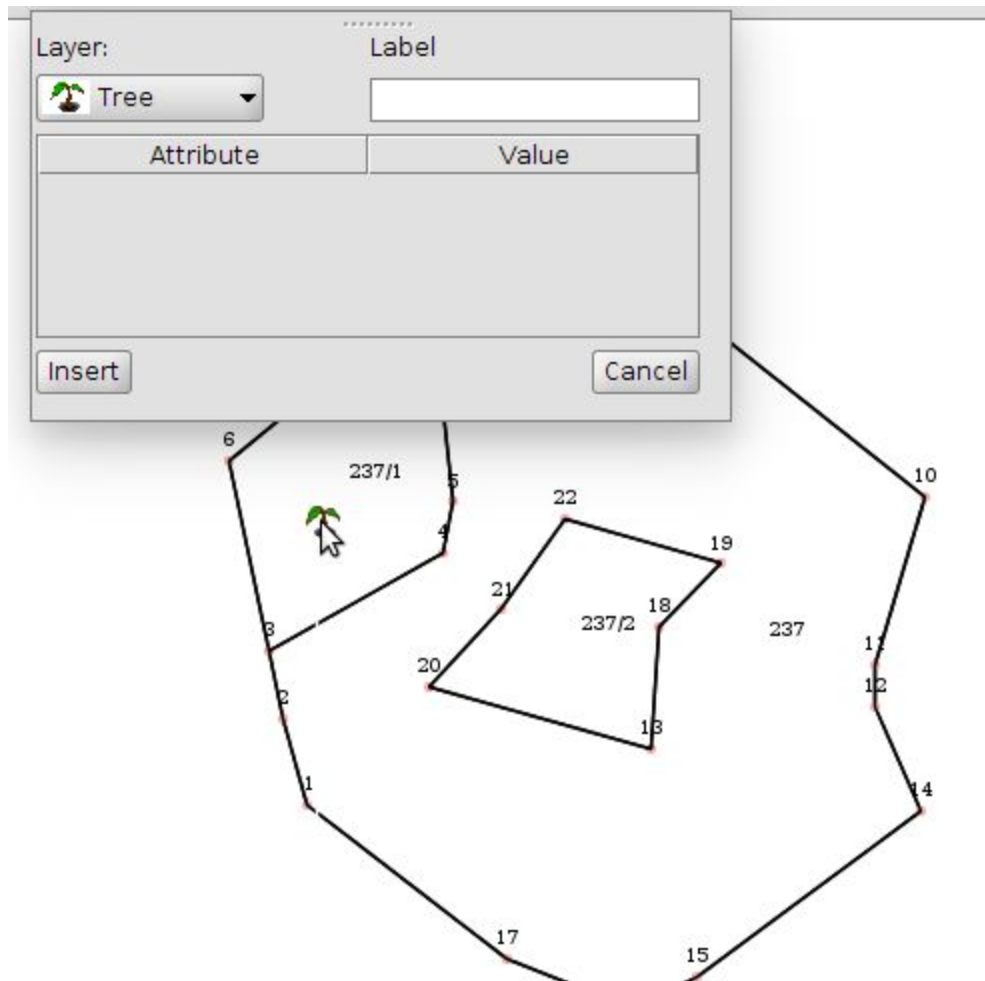
It is also possible to create sub division without touching the boundary of the existing polygons.

Ladder Data				
	Polygons	Lines	Points	
SI	Layer	Label	Area	
1	PLOT	237/1	2663.09	
2	PLOT	237	16135.97	
3	PLOT	237/2	1936.22	



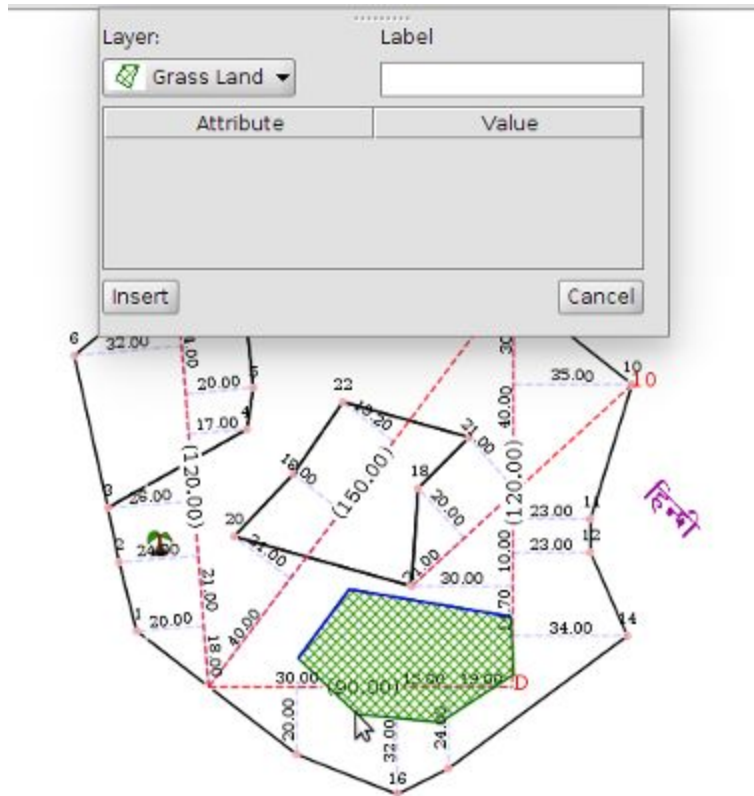
 **Insert Point Layer**

You can insert point layers to the map using this tool. Code, name and appearance of point layers can be defined in Manage Layer option as described above. On selecting this tool you will be able to select the layer from list of already defined layers. You will also be able to enter label and other properties of the layer being inserted. There is no limit on the number of layers that can be defined. The appearance of layer can be made robust by using SLD styles and symbols.



After clicking the Insert button the pointer can be moved to the proper place where the layer is to be inserted. The actual layer will be following the mouse pointer once you start moving mouse in the map area after clicking insert button. You can click on the map to insert the layer at the mouse position. Point layer can be snapped to already existing points. Already existing points will be highlighted when mouse is moved around them.

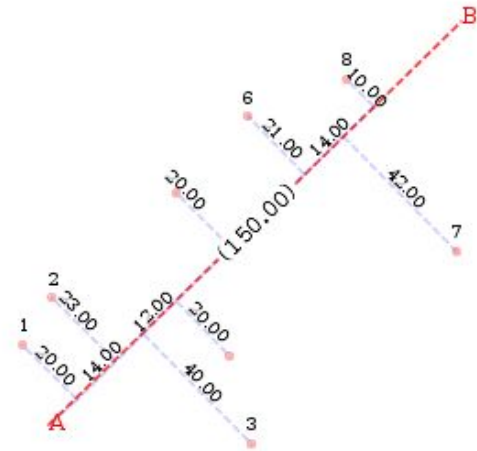
It is also possible to define layer attributes which can contribute to style of individual layer. For example it is possible to define attributes like rotation and font size for a text layer while defining the layer. The same can be made part of SLD style. The values for these attributes can be



16.2 Bombay Style

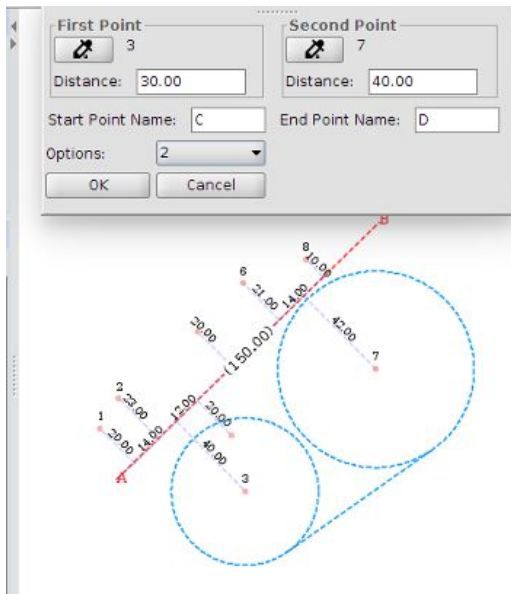
The procedure for creating base line in Bombay style is almost similar to the process defined above. In Bombay style there may not be any proper triangle involved. Offset points can be entered on a single base line, extended line and hanging base line.

Ladder Data				
1	2	3	4	5
		B		
		(150.00)		
8	10.00	11.00		
6	21.00	27.00	42.00	7
5	20.00	20.00		
		12.00	20.00	4
		10.00	40.00	3
2	23.00	14.00		
1	20.00	10.00		
		A		



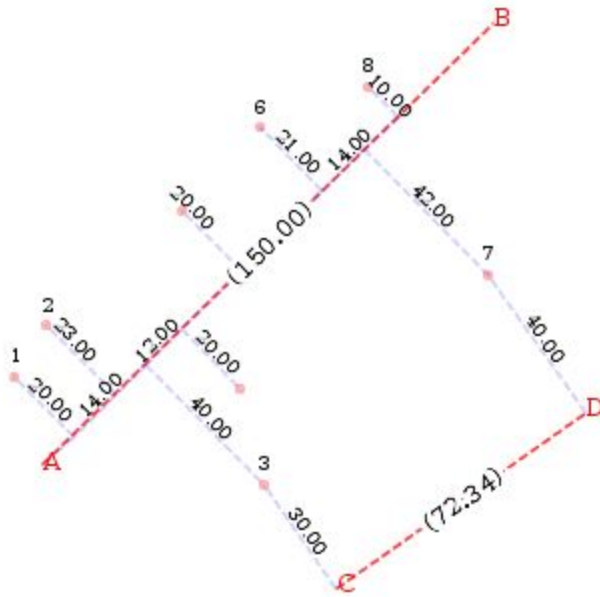
Hanging Base Line

Use this option to create a hanging base line.



1. Select first and last point from which the hanging baseline is to be drawn. These may be two offset points.
2. Enter distance from the selected two points to the hanging base line.
3. Enter name of points on hanging base line.
4. Select the hanging base line from the list of options which meet the entered criteria.
5. Click OK

After clicking the OK button the hanging base line will be drawn on screen. You can start creating offset points on the hanging base line.



16.3 Viewing/ Printing Map created from FMB.

Maps created by FMB are quite similar to maps created by other methods like importing from shape file. Base line and offset points will be shown as derived layer.

The map and its layers will be available in all display, printing and export modules of Bhunaksha in both browser and desktop client.

Bhu-Naksha

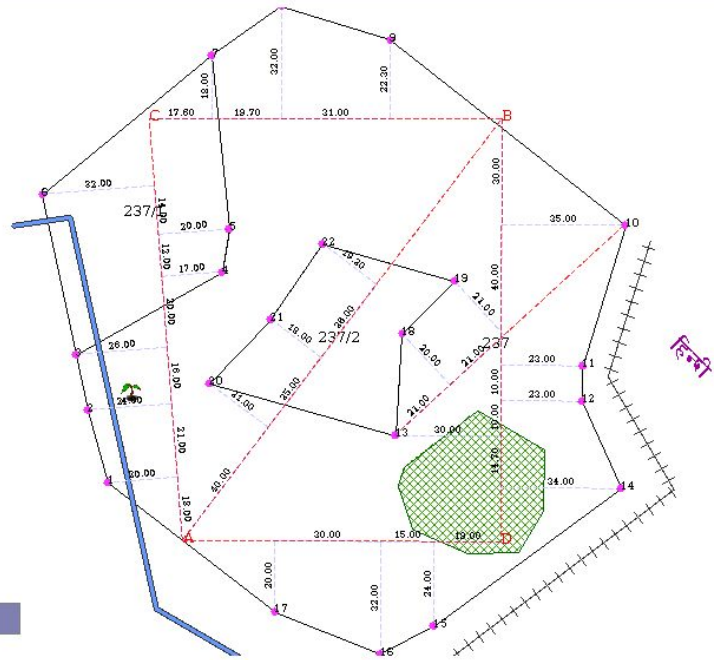
Zoom To Scale:

Map Info

Layers


- (All Layers)
- Tree
- Grass Land
- Text Layer
- HATCHED LINE
- Stream
- Vertices
- Border Length
- Border Length (Normalized)
- FMB Base Line
- FMB Offset Points
- FMB Offset Length

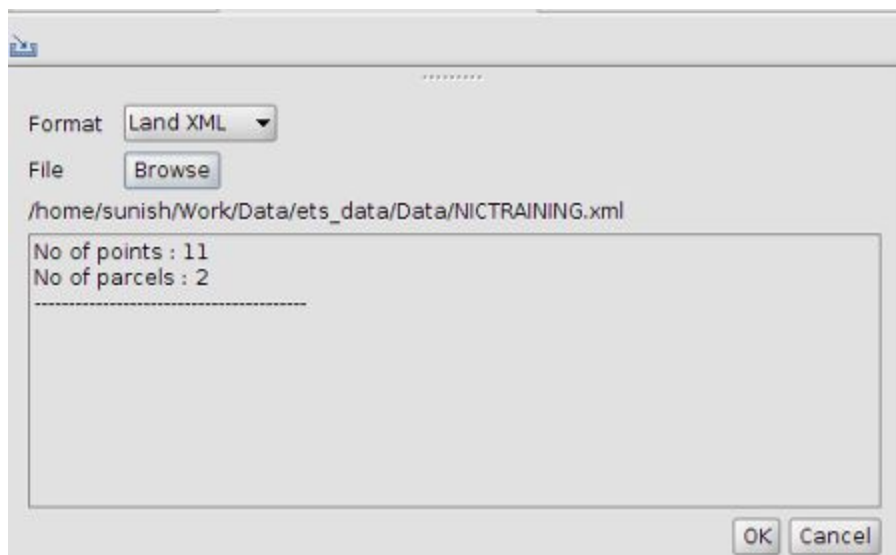
Themes



17. Composing Survey Data

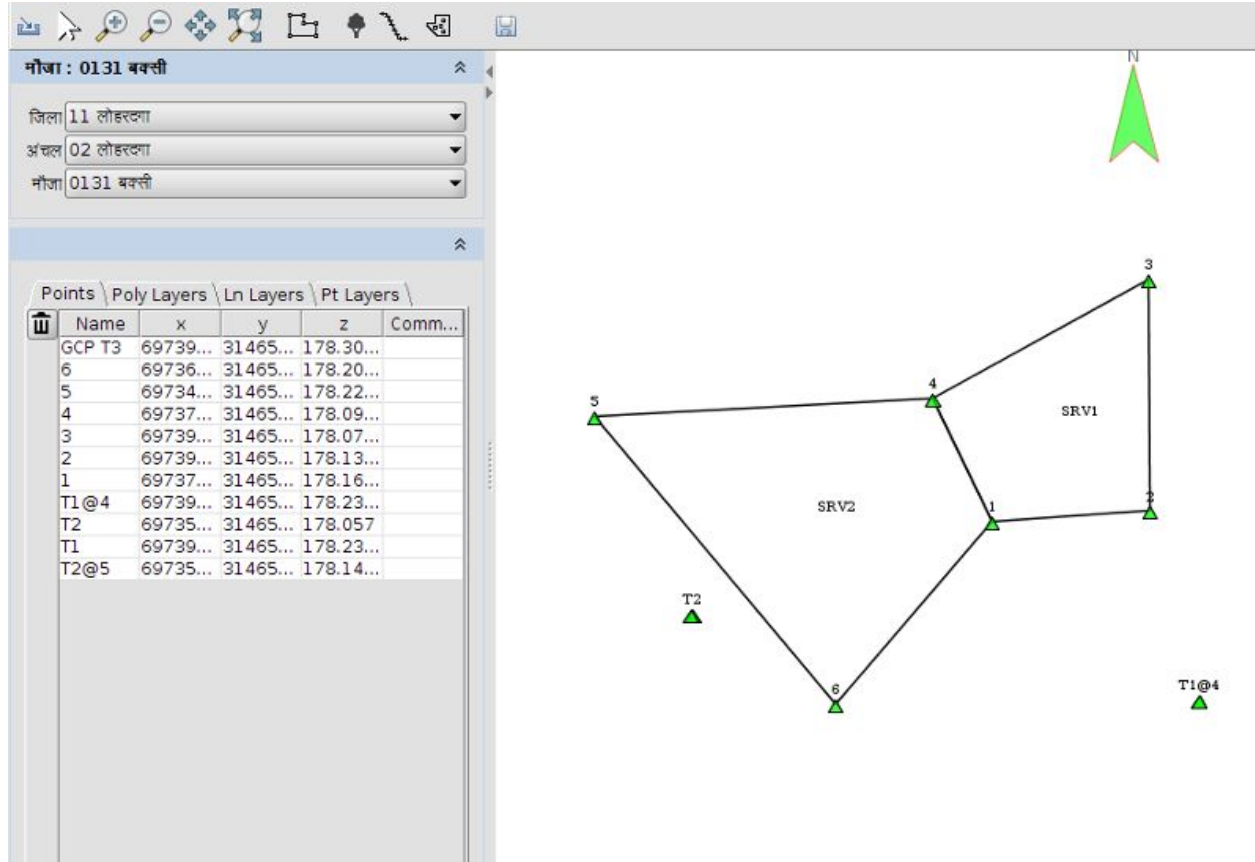
Data extracted from ETS can be imported to Bhunaksha and processed further to build village map and other layers. Bhunaksha supports ETS data in LandXML (<http://www.landxml.org>) and comma separated value (CSV) of coordinate points. For processing survey data open Compose Survey Data module from File menu.


LandXml and CSV coordinate points can be imported to the screen by using Import Data () tool bar icon.



Select file format and browse the data file. It will show a summary of points or parcels present in the data. Click OK to further process the data.

The left panel of the screen has village selection control and a section to view and manage the points, plots and layers. Points tab shows coordinates of each point present in the survey. Poly Layers tab lists parcels and other polygon layers. Ln Layers and Pt Layers tab lists line and point layers.



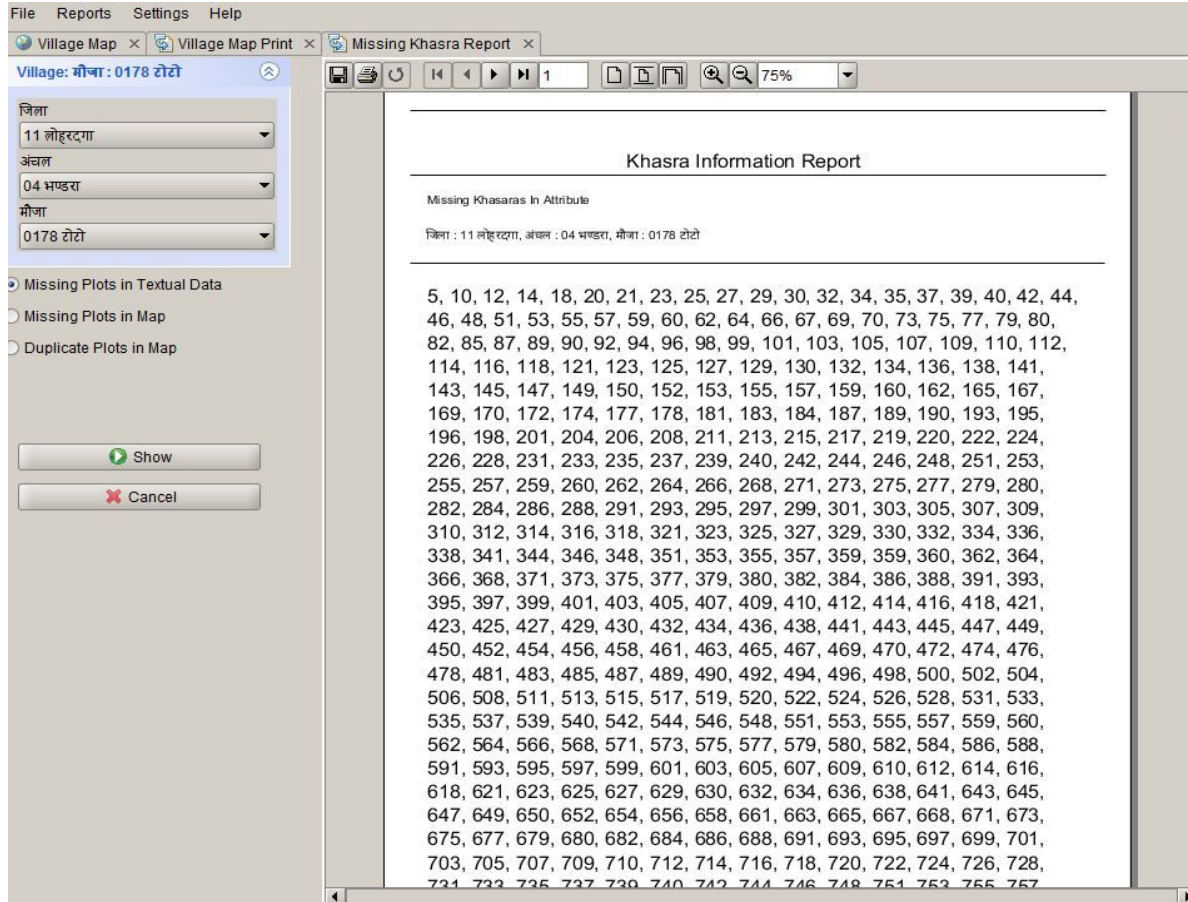
A plot or parcel can be created by using the Create Parcel () tool. After selecting this tool you can draw a parcel by joining the points present in the field. The parcels created will be listed in the Poly Layers table. A plot number can be assigned to the parcel by editing the Label field in the table.

It is possible to insert other Polygon, Line and Point layers by similar method described for FMB

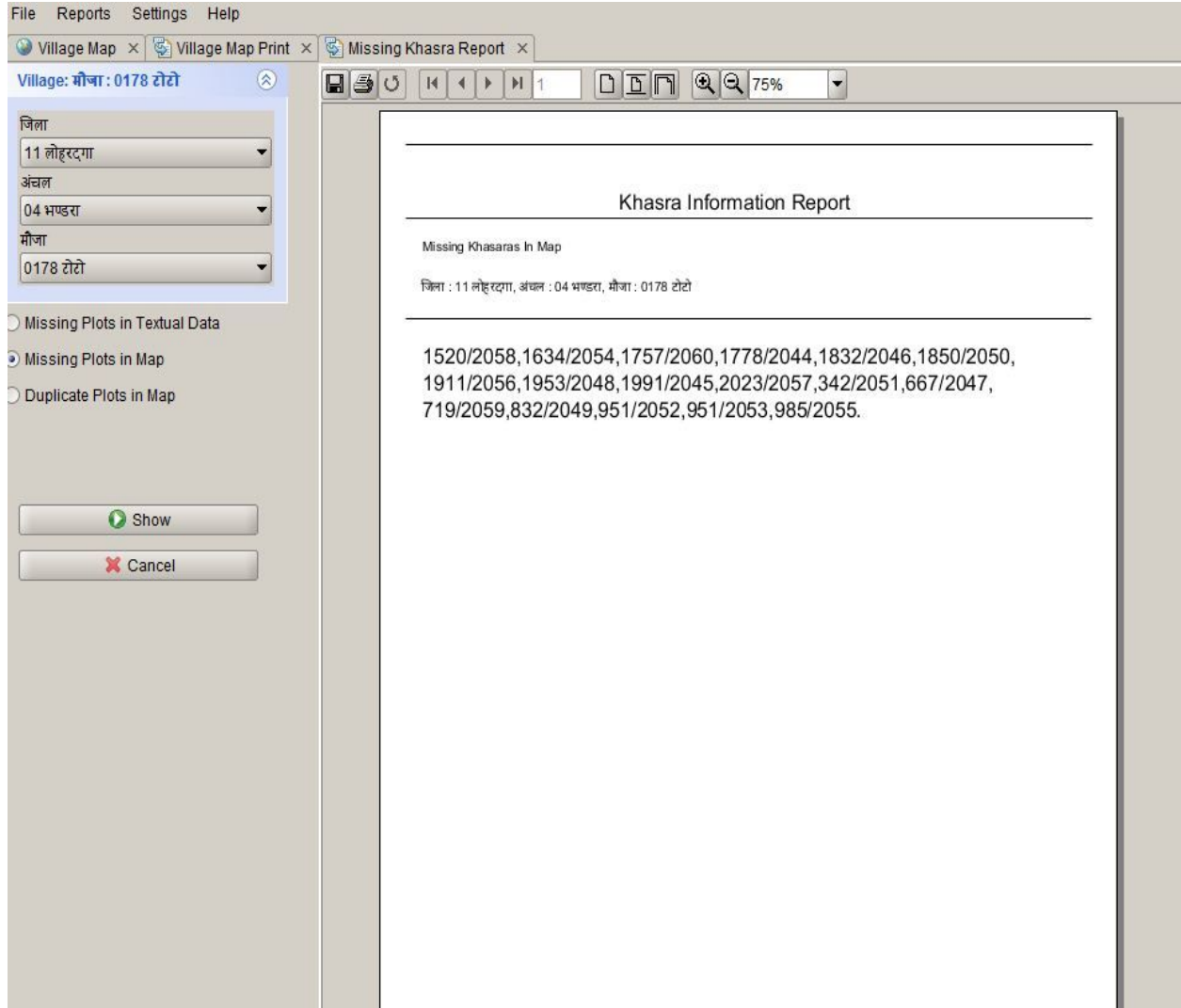
18. Plot Comparison Reports

Bhunaksha has reports for comparing plot numbers present in map and ROR (Textual) data. It is possible to generate report of plots present in map and missing in ROR, present in ROR and missing in map and duplicate plots in map.

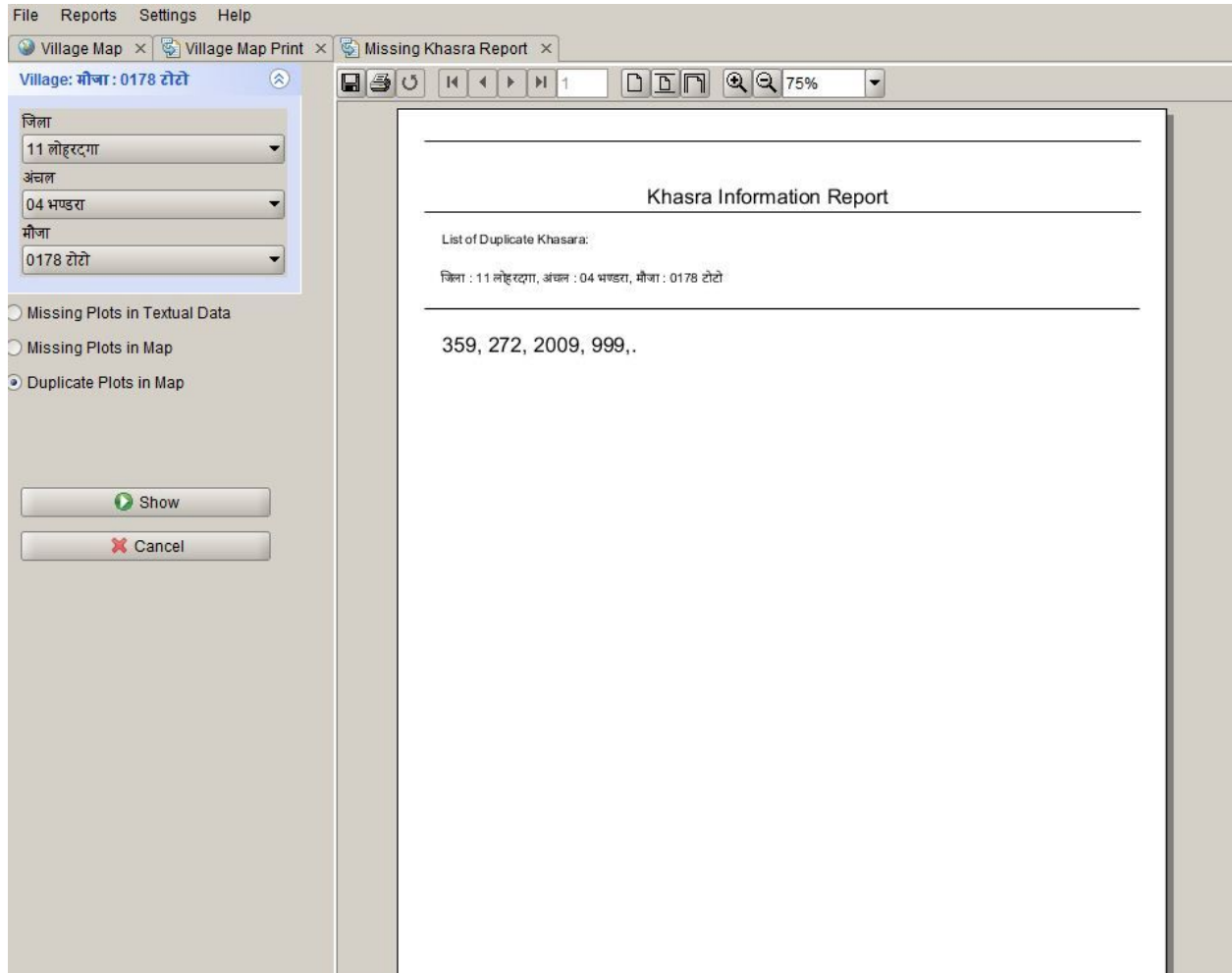
18.1 Plots Present in map missing in ROR



18.2 Plots Present in ROR missing in Map

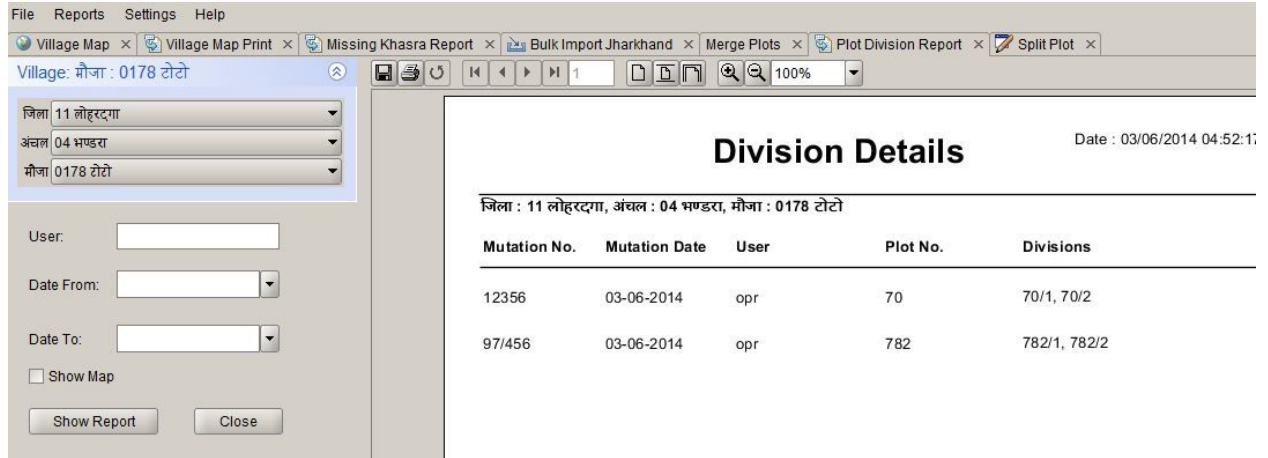


18.3 Duplicate Plot numbers in map

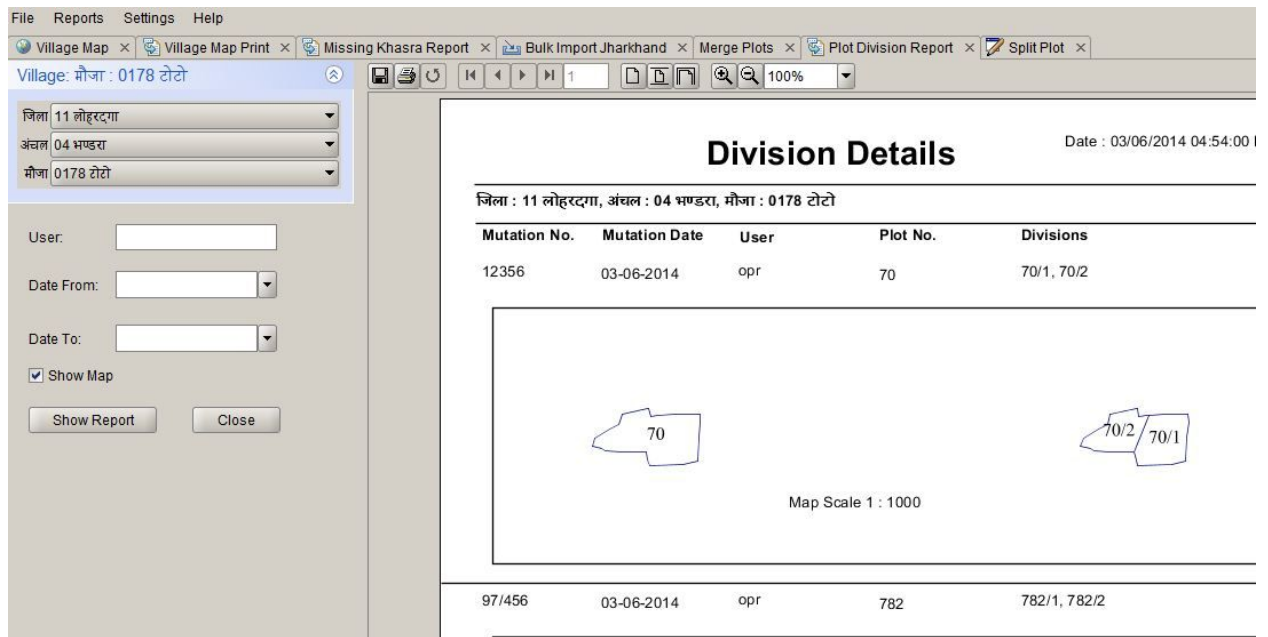


19. Mutation Report

Bhunaksha has report for displaying all the divisions/Mutations done in a village. It is possible to generate report for all the mutations done in a village. Options for filtering report data is also there. User can filter the data according to UserName and date. User can also view the image of the actual plot and divided plot in the report.



(Mutation Report without Map)



(Mutation Report with Map)

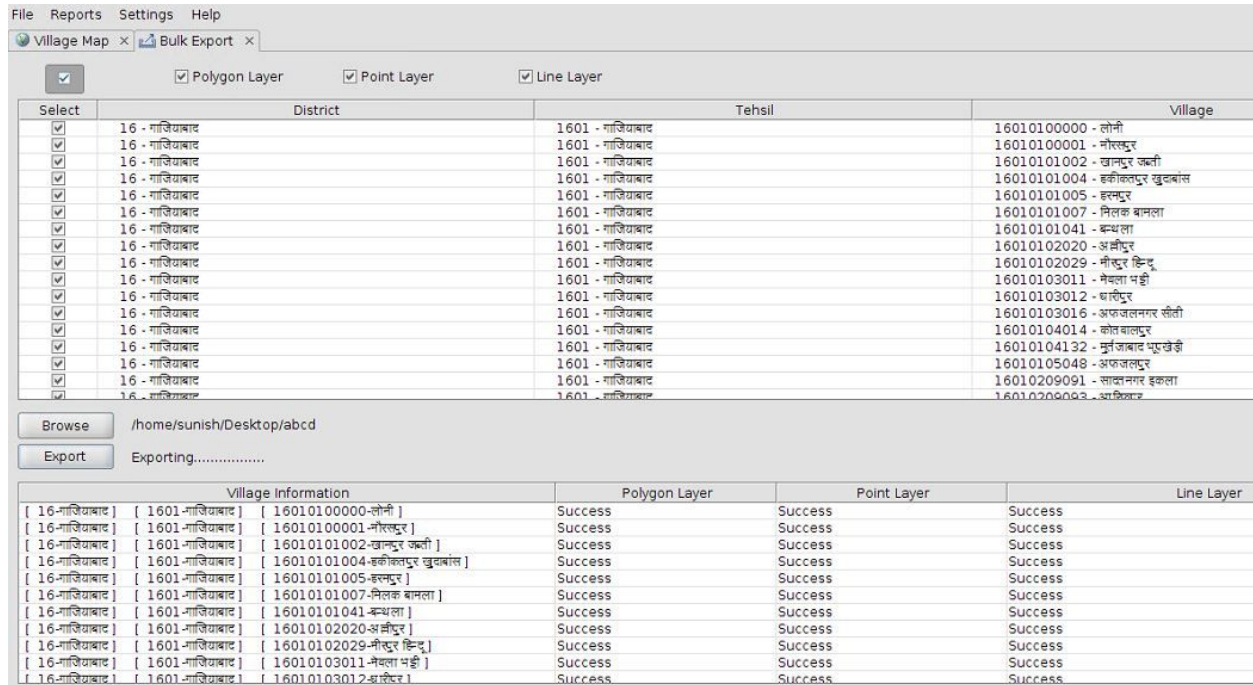
20. Export Map as Shape file

Bhunaksha export module is intended for exporting geometry and attribute data from bhunaksha database to shape files.

There are mainly two modules for exporting shape files from bhunaksha

20.1 Bulk Export

Bulk Export option can be used for exporting a set of village's geometry and attribute in a single go. For using this module login into Desktop application as user and invoke the option from File -> Bulk Export.



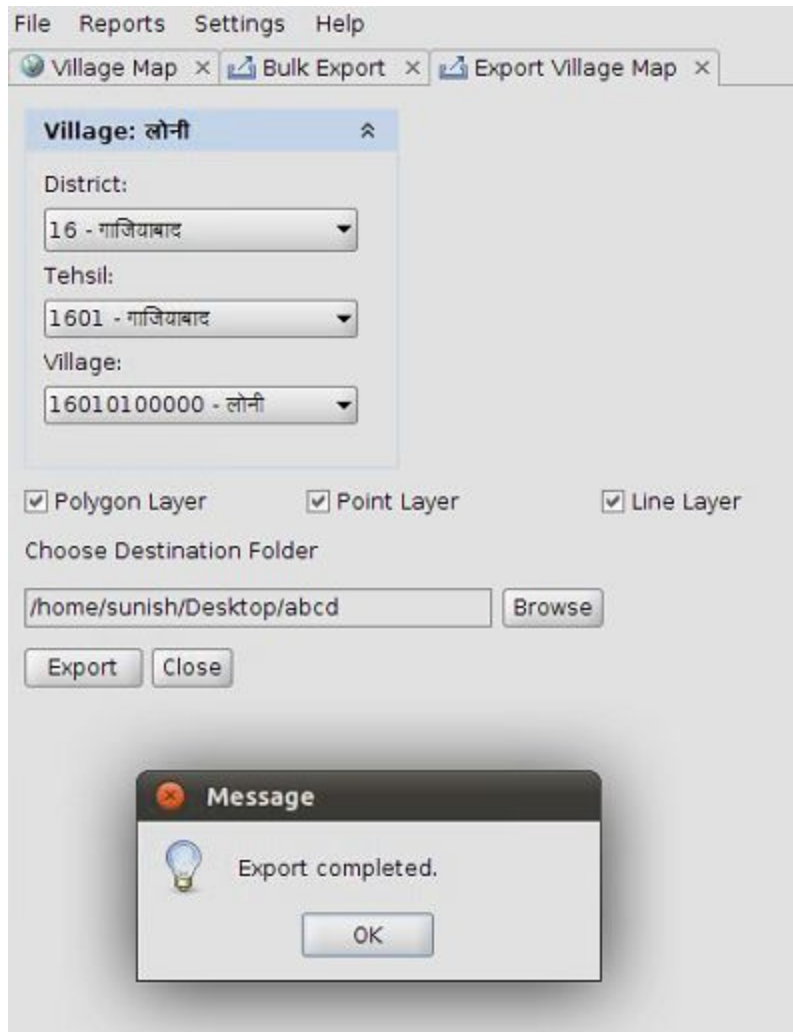
20.2 Individual Export

Plot and layer geometry and attributes can be exported individually from bhunaksha if naming pattern used for shape files does not support the bulk export standards. Individual files can be exported from the following options.

18.2.1 Export Plots (SHP)

This module can be used for exporting plot shape file.

1. Select the village for which data is to be exported
2. Select the check boxes as per requirements for exporting.
3. Browse the destination folder for saving the exported files.
4. Click export to export the bhunaksha geometry and attribute data to shape file.



21. Embedding Plot Map in ROR report.

It is possible to request map of a plot to any specified scale by providing parameters. The resulting map image output can be used to embed in ROR reports.

A sample URL for requesting plot map is as follows.

```
http://<server>/<bhunakshapath>/PlotImage?state=02&giscode=0612000101&plotno=123&height=700&width=700&scale=600&layerCodes=POLY_PARCEL,RI
```

Please consider actual server, state code etc in the above example.

The following parameters are acceptable.

state = state code.

giscode = districtcode-tehsilcode-villagecode (This can be different in different states) Like (06-District code,12-Tehsil code,000101-Village code)

plotno=plot number

scale= (Optional) scale of map. eg: scale=4000 gives image in 1:4000 scale.

If scale is blank it will fit the map in size of image.

height = image height.

width = image width.

layerCodes = Comma separated list of Layer Codes

राजस्व विभाग, हिमाचल प्रदेश - नकल खसरा (मुसावी)

जिला : चम्बा
 तहसील : होली (उप. तहसील)
 कानूनगोचर : नैहटा
 पटवार वत : कुठेड
 मोहाल (हदबस्त न.) : कुठेड (175)
 क्षेत्रफल : 00-07-00 बीघा-वि.-वि.

खेट नं	खतीनी नं	खसरा नं
32	39	20
33	40	19
38	47	15
73	89	1
73	89	21

1 Inch : 12 Karam

Certified that this copy has been generated from the database of Revenue Department Tehsil होली (उप. तहसील) as accessed by the Lok Mitra Kendra on 29-May-2014

To Verify, enter the Copy No above Bar Code at <http://admis.hp.nic.in/himbhoomilnk>
 For Validity Refer : Notific. No:Rev-C(F)/10-1/2009 Dated 14-Feb-2011

JamSampleCopy

22. Audit Trail

Audit trail is available as activity log in Bhunaksha. The activity log gets an entry when a user logs in, starts a division and put up for approval, when a higher user approves the division. It has listing of time, user who performed the operation and description of operation. Plot number on which the operation is performed is part of description.

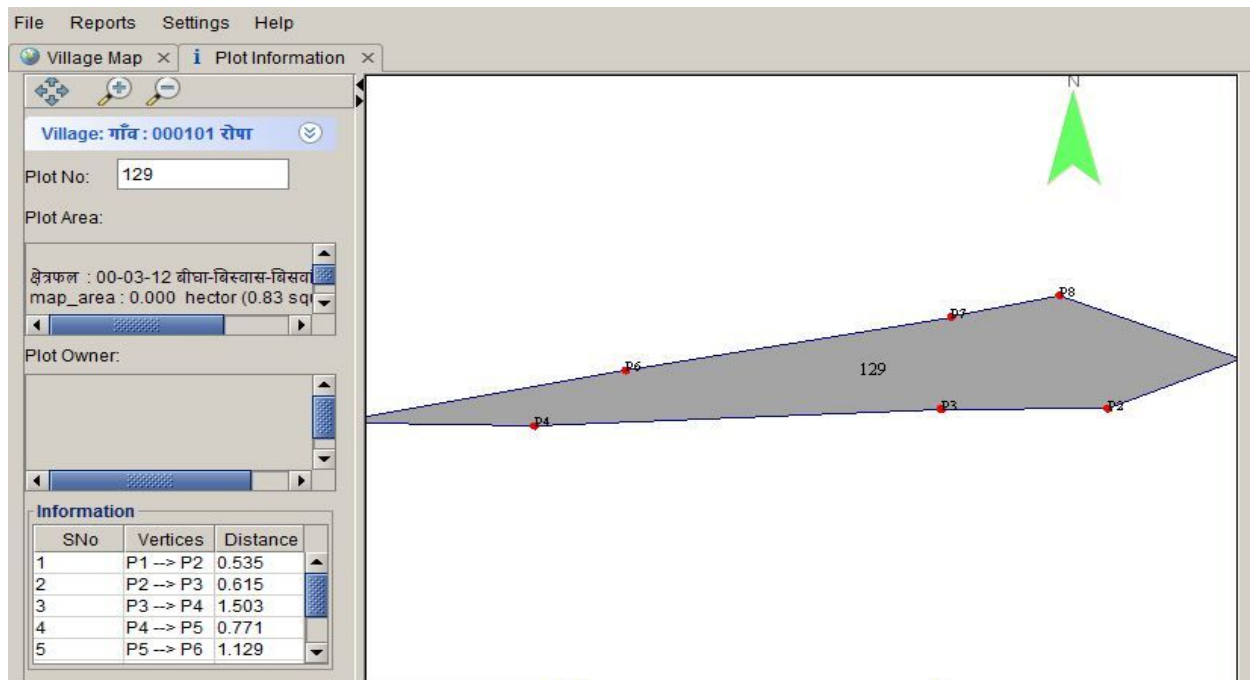
Activity Log Details

21/03/2014 5.36 PM

Activity Time	User ID	Remarks
21/03/2014 17.36.15	supervisor	Plot Division is Approved 0612000101 (31-->, 31/1, 31/2)
21/03/2014 17.36.00	supervisor	LOGIN
21/03/2014 17.35.49	dio	LOGOUT
21/03/2014 17.35.36	dio	Plot Division Put Up for Approval 0612000101 (31 --> , 31/1 , 31/2)
21/03/2014 17.34.49	dio	LOGIN

23. Plot Info

Bhunaksha Plot info module can be used for viewing all the details of the plots in addition to the owner and area details vertices distance details is also available in this module.



(Plot info Desktop View)



(Plot Info Web View)

24. Imported Villages Report

Bhunaksha has a report for displaying all the imported villages in the bhunaksha database. In the report all the details of imported sheet numbers and total no of plots in the village is displayed.

File Reports Settings Help

Village Map x Imported Villages Report x

Show Report Close

100%

Date : 04/06/2014 11:40:30 AM

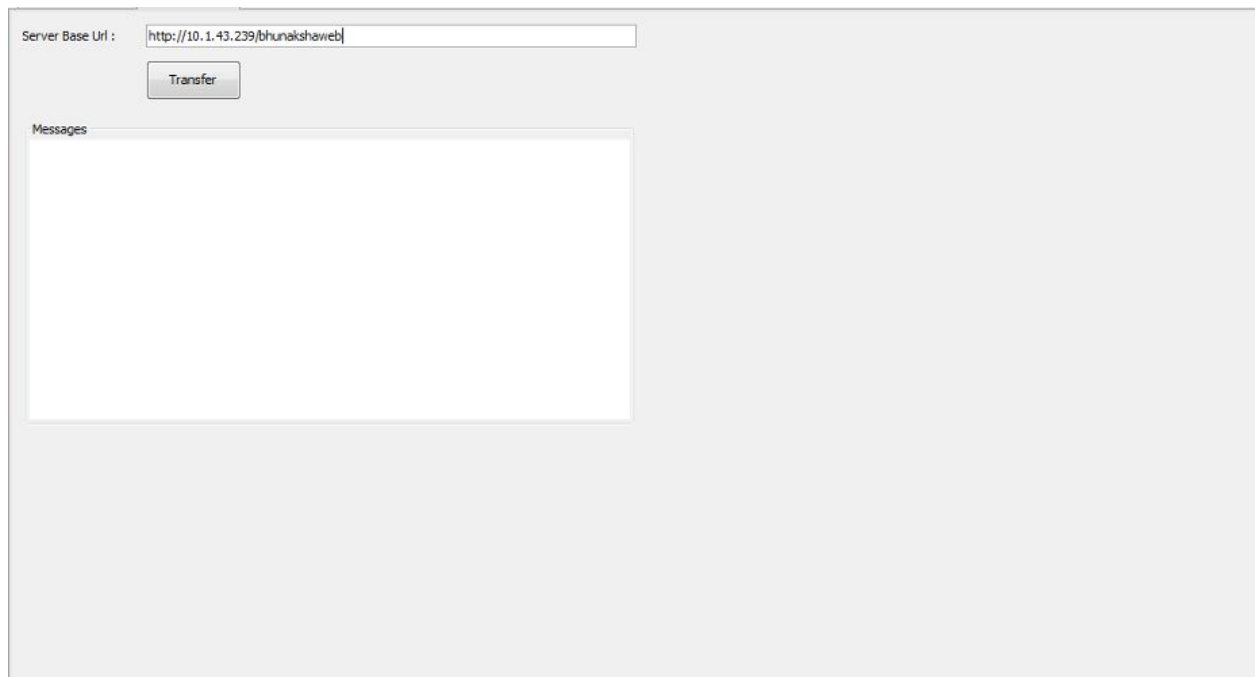
List of Imported Villages

SNo.	Village Code	Village Name	No. of plots	Sheet No.	Total Sheets
1	12-04-01-01-206,117	District: टोंक, Tehsil: उनियारा, RI: अलीगढ़, Halkas: अलीगढ़, Village: अलीगढ़,	1304	1,2	2
2	12-04-01-01-206,882	District: टोंक, Tehsil: उनियारा, RI: अलीगढ़, Halkas: अलीगढ़, Village: अलीगढ़,	1304	1,2	2
3	12-04-01-02-119,779	District: टोंक, Tehsil: उनियारा, RI: अलीगढ़, Halkas: उखलना, Village: आसलगाव,	486		0
4	12-04-01-02-202,720	District: टोंक, Tehsil: उनियारा, RI: अलीगढ़, Halkas: उखलना, Village: उखलना,	486		0
5	12-04-01-09-137,144	District: टोंक, Tehsil: उनियारा, RI: अलीगढ़, Halkas: हैटरीपुरा, Village: अलीमपुर,	240		0
6	12-04-02-01-82,622	District: टोंक, Tehsil: उनियारा, RI: उनियारा, Halkas: उनियारा, Village: उनियारा,	486		0
7	12-04-02-03-109,278	District: टोंक, Tehsil: उनियारा, RI: उनियारा, Halkas: बोहल्या, Village: बड़ोदिया,	732	1,2	2
8	12-04-02-09-104,748	District: टोंक, Tehsil: उनियारा, RI: उनियारा, Halkas: म्हातानकचपुरा, Village: सीतारामपुर,	457	1,2	2
9	12-04-03-04-237,847	District: टोंक, Tehsil: उनियारा, RI: पलाई, Halkas: फुलेता, Village: बालपुरा,	1111	1,2,3,4	4
10	12-04-04-04-14,14	District: टोंक, Tehsil: उनियारा, RI: बनेठ, Halkas: गुमानपुरा, Village: वेसकी,	403	1,2	2
11	12-04-04-07-34,440	District: टोंक, Tehsil: उनियारा, RI: बनेठ, Halkas: ब्रुन्दी, Village: परवन,	1006	1,2,3,4	4
12	12-04-05-01-172,758	District: टोंक, Tehsil: उनियारा, RI: शोप, Halkas: अनवास्गर, Village: अनवास्गर,	83		0
13	12-04-05-01-176,401	District: टोंक, Tehsil: उनियारा, RI: शोप, Halkas: अनवास्गर, Village: बासला,	377	1,2	2
14	12-04-05-07-149,704	District: टोंक, Tehsil: उनियारा, RI: शोप, Halkas: पागडा, Village: पागडा,	739	1,2	2
15	12-04-05-11-162,533	District: टोंक, Tehsil: उनियारा, RI: शोप, Halkas: रसूलपुरा, Village: र्हमानपुरा,	629	1,2	2

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25. Data Transfer to server

If Bhunaksha is running in a distributed environment then data can be exported to web application installed on a central server.



The screenshot shows a window titled "Server Base Url" with a text input field containing "http://10.1.43.239/bhunakshaweb". Below the input field is a "Transfer" button. Underneath the button is a section labeled "Messages" with a large, empty white rectangular area.

Type the URL of Bhunaksha web application server and click Transfer button after logging in as a valid user in Bhunaksha Desktop Application to perform data transfer.

26. Unimported Villages Report

In addition to Imported villages report Bhunaksha has a report for displaying all the unimported villages. In this report all the villages whose data is present in ROR but not in bhunaksha database are displayed.

File Reports Settings Help

Village Map x UnImported Villages Report x

Show Report Close

125%

UnImported Villages List

Date : 04/06/2014 11:42:01 AM


Village Code	Village Name
District: टोंक - Tehsil: उनियारा - RI: अलीगढ़ - Halkas: अलीगढ़	
1	अनवारनगर
2	अनवारनगर
3	अनवारनगर
4	अनवारनगर
5	आली
6	आली
7	आली
8	आली
9	गोपाली
10	गोपाली
11	गोपाली

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27. Data Migration from previous version

There is significant change in database structure of Bhunakhas 3.0 from that of previous versions. Customized data migration modules are available for states where Bhunaksha 2.0 was in use. Data can be migrated from database of a Desktop version of old Bhunaksha. Double click the launcher for data migration for your state to invoke data migration module.

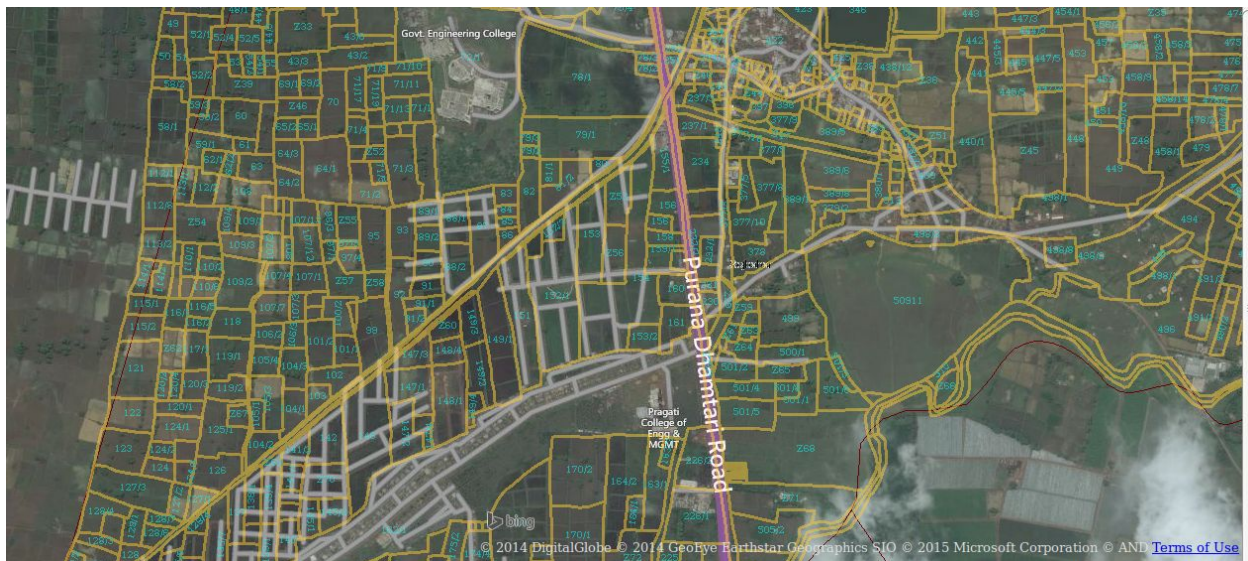
Source Database Value		Destination Database Value	
Host	<input type="text"/>	Host	<input type="text"/>
Port	<input type="text"/>	Port	<input type="text"/>
UserName	<input type="text" value="postgres"/>	UserName	<input type="text" value="postgres"/>
Password	<input type="password"/>	Password	<input type="password"/>
Database Name	<input type="text"/>	Database Name	<input type="text"/>
<input type="button" value="Test Connection"/>		<input type="button" value="Test Connection"/>	<input type="button" value="Create Database"/>
			<input type="button" value="Initialise Blank Structure"/>



The system where data migration module is invoked should have permission to connect to old and new database. New database can be created and initialized from the Migration module itself. After providing connection parameters for both old version and new version click the Migrate button to start data migration.

28. Georeferencing Village Maps

It is possible to georeference a village map with the help of village boundary layers from NIC Maps (<http://nicmaps.rsgis.nic.in/>) and other online services offered by Bing, Google, Bhuvan etc. Onscreen georeferencing is possible by correlating some known coordinates of digitized map with the coordinates of georeferenced maps. Identifying a minimum of four such points will facilitate transforming the coordinate system to world coordinate system. Accuracy will depend on the accuracy and number of the known coordinates.



29. Custom Services

29.1 Himachal Pradesh

Custom services are available for GIS data from Settlement and Consolidation maps of the state. For accessing the services the following parameters has to be configured in application settings for connecting to respective databases.

1. Host name for settlement map database: IP address of DB server
2. Port number for settlement map database: Port no. of settlement DB
3. Database name for settlement map database: Name of settlement DB
4. Database User for settlement map database: User name of settlement DB
5. Database password for settlement map database: Password of settlement DB
6. host name for consolidation map database: IP address of DB server
7. Port number for consolidation map database: Port no. of Consolidation DB

8. Database name for consolidation map database: Name of consolidation DB
9. Database user for consolidation map database: User name of Consolidation DB
10. Database password for consolidation map database: Password of Consolidation DB

29.1.1 PlotImage Service

The PlotImageService is used to access plot image either for consolidation database or settlement database or main database. You would be required to pass four parameters in the URL to access the service as...

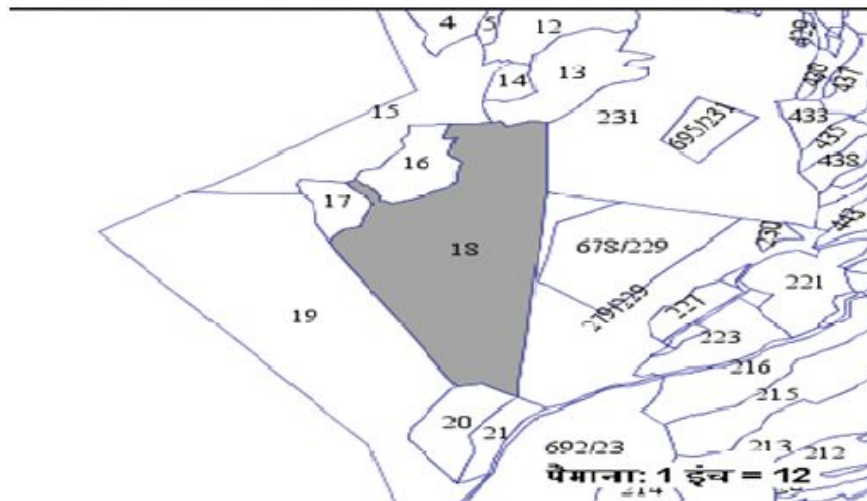
1. State Code
2. GIS code
3. Plot No.
4. Map Type

In Map Type, pass a character as 'C' for Consolidation map, 'S' for Settlement map and L or blank character for main map.

To access this service kindly use the URL as prescribed below...

<http://localhost:8080/bhunakshaweb3/rest/PlotImage?state=02&giscode=0612000701&plotno=18&mapType=C>

You would be able to get plot image using this URL if the detail is passed correctly, as shown in the below image ...



29.1.2 Neighboring Plots

This NeighbourPlotsService is used to access the details of neighbours plots either for main database or consolidation database or settlement database. It would also be required to pass four parameter in the URL to access the service as

1. State Code
2. GIS code
3. Plot No.
4. Map Type

In Map Type pass a character as 'C' representing Consolidation neighbour detail, 'S' for Settlement detail and any other character for main database detail.

To check this service kindly use the URL given below ...

<http://localhost:8080/bhunakshaweb3/rest/getNeighboursPlots?state=02&giscode=0612000701&plotno=18&mapType=C>

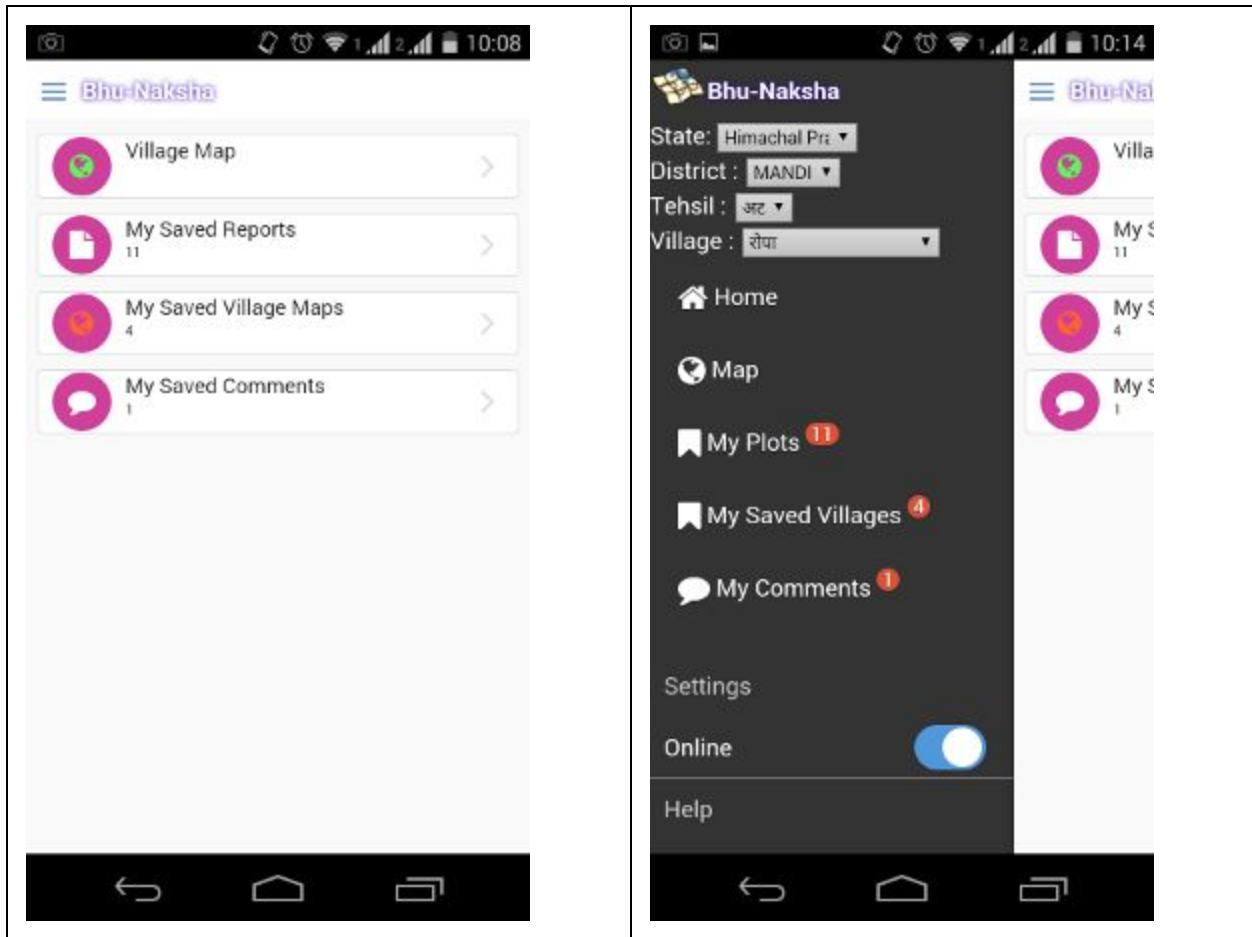
You would be able to get neighbours plot detail using this URL if the detail is passed correctly, as shown in the below image ...



30. Bhunaksha Mobile App

Bhunaksha mobile app is available for android mobiles. It supports viewing village map and plot details online, viewing plot report offline, saving village map and plot report for offline operation, updating comments of any selected plot.

Home Screen



From home screen we can navigate to the available modules in the application. A swipeable context menu is also available for navigating to the modules from any screen. Menu can be opened by touching the context icon (☰).

Settings

Settings option can be opened from the context menu. It is possible to save server URL of bhunaksha in settings menu. When the server URL is setup correctly, you will be able to view maps from that server in the mobile application.

Server URL:

If server is available then the Online Switch in the menu will be on. You can go offline any time by switching off it from the menu.

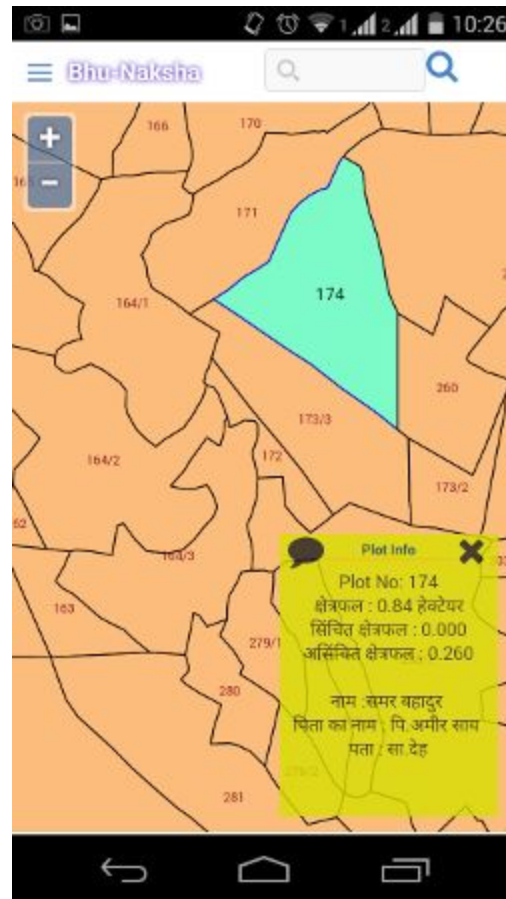


Viewing Village Map

Bhunaksha mobile application can display online village map when connection to server is available. Village can be selected from the select box on left context menu. In online mode it is possible to select a plot either by touching it on the map or by searching (🔍) the plot on the top bar of the app screen. When the plot is selected it will popup the owner and area details of the plot. It is possible to view a detailed map report of the selected plot by touching report icon (📄) from the popup. It is also possible to update a comment (💬) about the plot and save it to the server. Village map data can be downloaded (⬇️) for offline purpose from this screen. Village map data stored offline will use storage space of the mobile.




Online Village Map



Offline Village Map

Offline village maps can be viewed from the saved village map list or when the Online Switch is off. In offline mode it is possible to select a plot, search a plot, view owner and area details, and save a comment about the selected plot. The comment can be updated to server on going online.

It is possible save a report for offline purpose by touching download () icon.

Saved Village List


List of villages for which offline maps are available can be viewed from the respective options in menu and home screen. Map of a village can be viewed by selecting the respective row from the list. Data of a saved village can be deleted by touching

delete () button.



Saved Plot Report List

List of offline plot reports can be viewed by invoking the respective options in menu or home screen. Report can be viewed by selecting the respective row from the list. A saved report

can be deleted by touching the delete() icon. It is also possible to view a report of a plot online from this screen if connection is available to bhunaksha server.



Saved Comments List

List of comments stored offline can be viewed by invoking the respective options in menu or home screen. It is possible to delete a comment and update the comments to server from this screen.



31. Bhunaksha FAQ

1. **Why map is too small or too large compared to original map sheet when the same scale is applied**
2. **Why line lengths of some lines shown in Bhunaksha differs significantly with actual ground measures**

By default Bhunaksha assumes 1 unit of measurement in the imported shape file is equal to 1 meter on ground. This assumption can be wrong if digitization was not performed with the same parameters. In such cases it is possible to input a scale factor of the map while importing it to Bhunaksha. Scale factor is the ratio ratio of actual digitized meters in meters. For eg: if i unit in digitized unit is equal to 1 inch on ground then scale factor should be 0.0254 (1 inch = 0.0254 meter).

3. **Why There is a slight difference in print out taken in Bhunaksha and original sheet map.**

Bhunaksha rely on the digitized data. It will match properly to the scaled print out taken from digitized data in any GIS software. Proper quality check like glass table test must be performed during digitization to ensure matching of original sheet map and digitized data.

4. **What is self-intersection error? How to rectify them?**

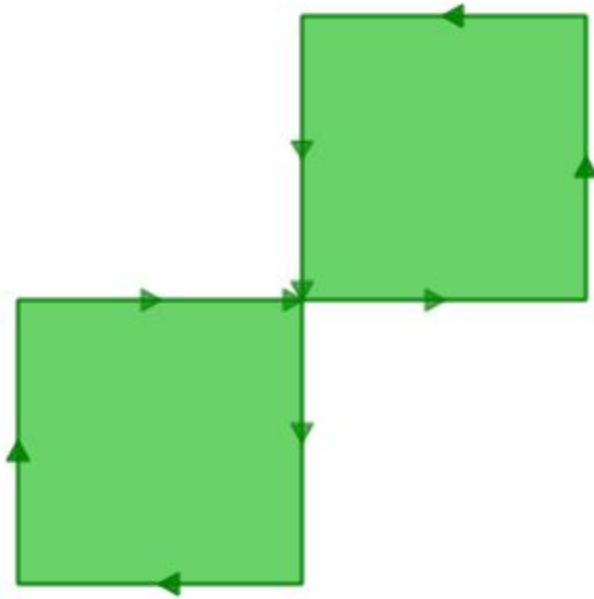
Open Geospatial Consortium (OGC) standard specifies and a valid Polygon must confine the following criteria:

- Polygon rings must close.
- Rings that define holes should be inside rings that define exterior boundaries.
- Rings may not self-intersect (they may neither touch nor cross one another).
- Rings may not touch other rings, except at a point.

The reason the rules are important is because algorithms for geometry calculations depend on consistent structure in the inputs. It is possible to build algorithms that have no structural assumptions, but those routines tend to be very slow.

Example of an invalid polygon:

```
POLYGON((0 0, 0 1, 2 1, 2 2, 1 2, 1 0, 0 0));
```

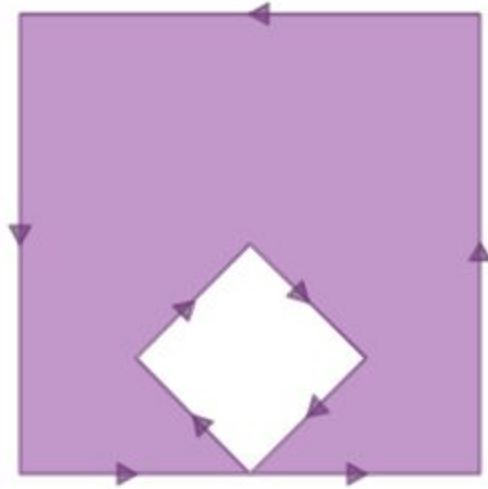


The outer ring is actually a figure-eight, with a self-intersection in the middle. Note that the graphic routines successfully render the polygon fill, so that visually it appears to be an “area”: two one-unit squares, so a total area of two units of area. Most GIS applications pertaining to OGC standard will report its area as 0 because algorithm that calculates area assumes that rings to not self-intersect.

A valid representation of the above geometry is :

```
MULTIPOLYGON(  
  ((0 0,0 1,1 1,1 0,0 0)),  
  ((1 1,1 2,2 2,2 1,1 1))  
)
```

Lets take another example a classic invalidity – the “banana polygon” – a single ring that encloses an area but bends around to touch itself, leaving a “hole” which is not actually a hole.



A valid representation of the above geometry is:

```
POLYGON((0 0,0 4,4 4,4 0,2 0,0 0),(2 0,3 1,2 2,1 1,2 0))
```

Polygons must be made valid while building the topology and correcting topological errors during digitization. Some of the errors cannot be corrected by any automated routines.

Some of the self-intersection errors like banana polygon in shape file can be corrected in Bhunaksha (Refer section : 8.Viewing and Correcting Shape files)

5.

32 Annexure

32.1 Installation of Postgresql & Postgis

32.1.1 On Ubuntu 14.04 LTS.

1) Open terminal and install required packages.

```
sudo apt-get install postgresql postgresql-contrib postgis postgresql-9.3-postgis-2.1
```


Please verify the name of packages as per version of your OS.

- 2) Creating postgis template database.

In terminal type the following commands:

```
sudo su - postgres  
(Provide OS administrator user password)  
createdb postgis  
psql -d postgis -c "CREATE EXTENSION postgis;"  
psql -d postgis -c "CREATE EXTENSION postgis_topology;"
```

- 3) After this you can create database for Bhunaksha using template postgis

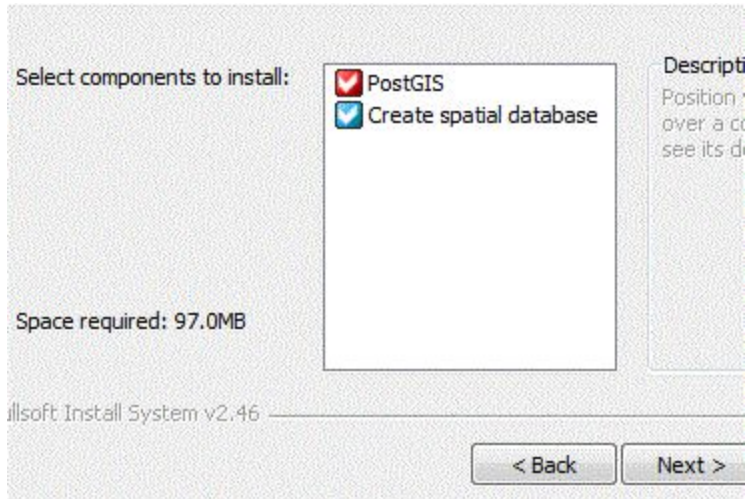
32.1.2 On Windows

Postgres Installation

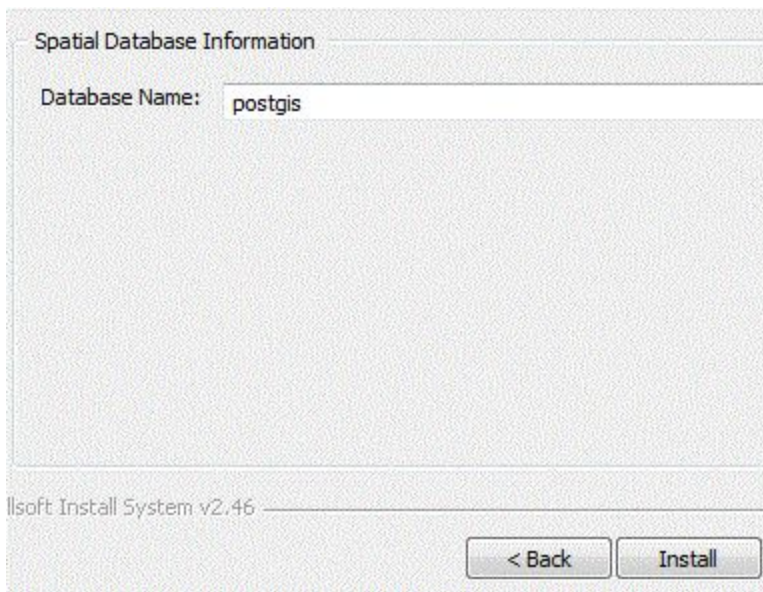
1. Go to Postgres windows download page and download "One click installer for Postgres".
2. Run the .exe that has been downloaded to install Postgres.
3. All the normal settings should be "ok" click next to accept all the default settings.
4. Enter the password when prompted.
5. Make sure the "Launch Stack Builder at exist?" box is **unchecked** and clicks finish.

PostGis Installation

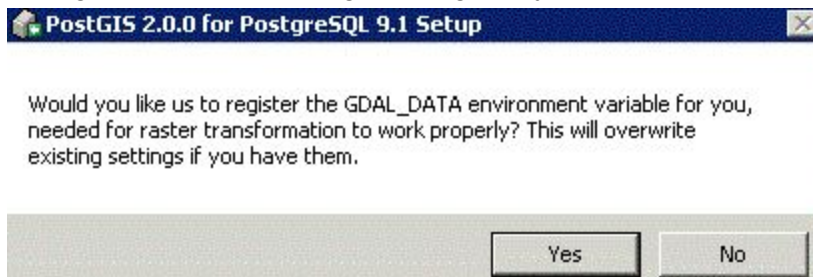
1. Download the postgis .exe(<http://download.osgeo.org/postgis/windows/pg92/>)
2. Run the .exe that has been downloaded to install postgis.
3. Check "create spatial database" when prompted and click next.



4. All the normal settings should be "OK" click next to accept all the default settings.
5. Enter Postgres password when prompted.
6. Provide the default postgis template name ("Postgis as default template name is recommended") and click next.



7. During installation following message may appear. click "YES" for it.



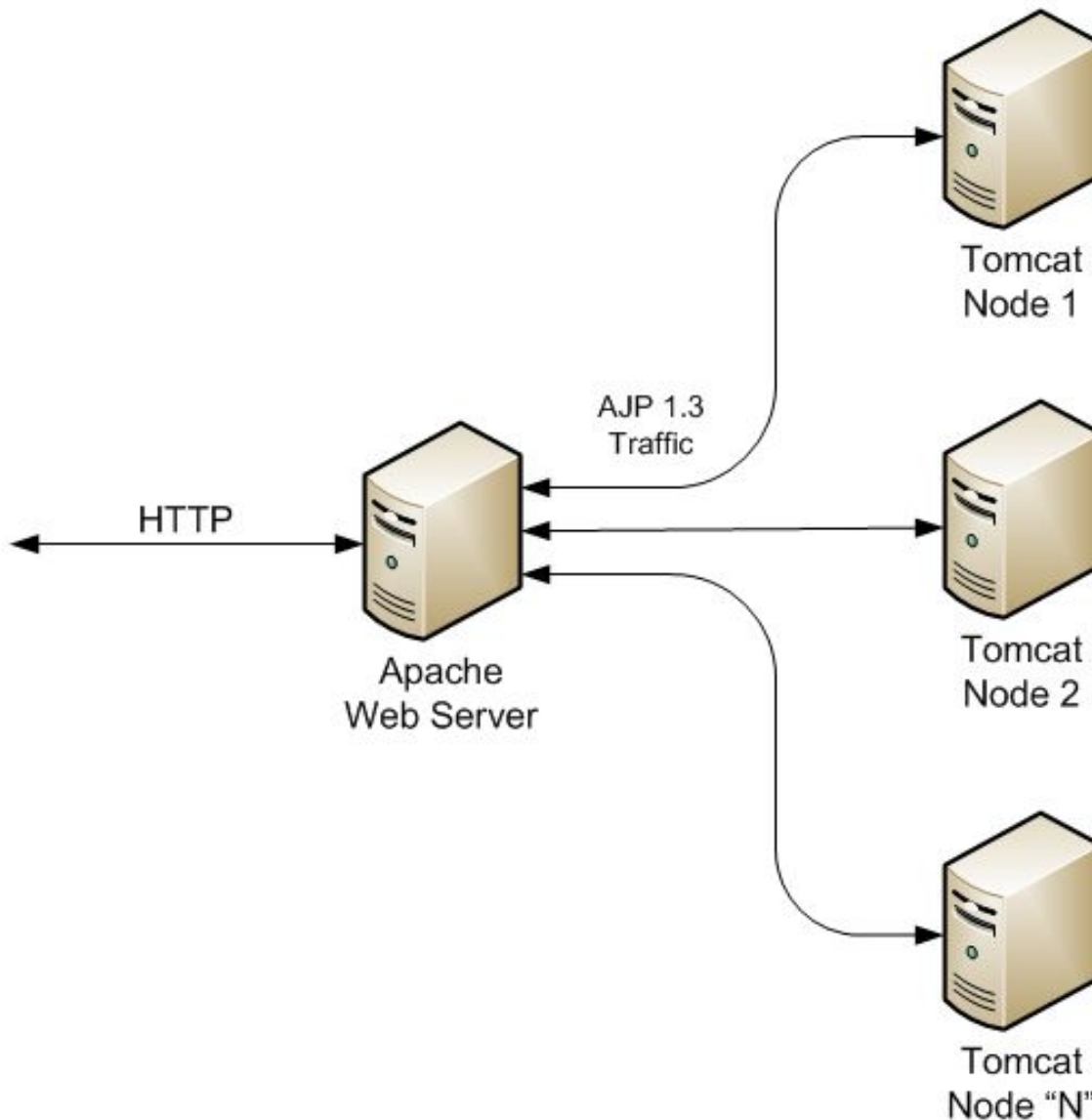
32.2 Load balancing and High availability Clustering setup for Tomcat

Clustering allows us to run an application on several parallel servers (a.k.a cluster nodes). The load is distributed across different servers, and even if any of the servers fails, the application is still accessible via other cluster nodes. Clustering is crucial for scalable enterprise applications, as you can improve performance by simply adding more nodes to the cluster.

Clustering solutions usually provide:

- **Scalability**
As load increases gradually, the system should allow to reduce response time by increasing computing resources and number of servers.
- **High Availability**
If one server in the cluster goes down, then other servers in the cluster should be able to take over -- as transparently to the end user as possible.
- **Load Balancing**
The objective here is that the solution should distribute the load among the servers in the cluster to provide the best possible response time to the end user.
In a typical clustering solution, this involves use of a load distribution algorithm, like a simple round robin algorithm or more sophisticated algorithms, that distributes requests to the servers in the cluster by keeping track of the load and available resources on the servers.

The below figure depicts an overview diagram of a clustered setup. Application (Bhunaksha) will be installed in tomcat servers on as many nodes as possible. All requests from users will be routed through the apache server. The apache server will forward the requests to tomcat servers. For reference we will name the apache server as **balancer1** and tomcat servers as **tomcat1**, **tomcat2**, **tomcatn** etc. The names in the procedure can be replaced by their domain names or IP address while setting up the environment.



This procedure describes setting up the environment in Ubuntu Linux servers using Apache and memcached session manager. This step also sets up sticky session ie. if user begins session with Tomcat 1, he would be served by Tomcat 1 throughout the entire session, unless of course this instance goes down. This can be beneficial in a clustered environment, as application servers can use session data stored locally without contacting a remote memcached. If Tomcat 1 fails further requests will be forwarded to new server Tomcat 2 along with its session from memcached session manager.

Setting up tomcat server

All all the servers install Oracle Java and tomcat7. Make sure to install the same version of both.

The jar files to be downloaded are available on this link

<http://code.google.com/p/memcached-session-manager/downloads/list>

For each copy, download the following jars and install them to the tomcat_dir/lib directory:

- **memcached-session-manager-x.y.z.jar**
- **memcached-session-manager-tc7-x.y.z.jar** (for Tomcat 7)
- **spymemcached-x.y.z.jar**,
- **msm-javolution-serializer-x.y.z.jar**
- **javolution-a.b.c.jar** (Consider latest available version)

On each server, open conf/context.xml, and add the following lines inside the <Context> tag:

```
<Manager className="de.javakaffee.web.msm.MemcachedBackupSessionManager"
    memcachedNodes="n1:balancer1:11211"
    requestUriIgnorePattern=".*\.(ico|png|gif|jpg|css|js)$"
    transcoderFactoryClass="de.javakaffee.web.msm.serializer.javolution.JavolutionTranscoderFactory" />
```

Replace **balancer1** with domain name or IP address of apache server. 11211 is the default port on which memcached listen. n1 is a key used for identifying memcached session manager. If more than one session manager is used parallelly they can be typed separated by comma. In this way the session manager also can be load balanced.

Open tomcat_dir/conf/server.xml, look for the following lines:

```
<Server port="8005" ...>
...
<Connector port="8080" protocol="HTTP/1.1" ...>
...
<Connector port="8009" protocol="AJP/1.3" ...>
```

This is optional, but we can disable the HTTP/1.1 connector by commenting out its <Connector> tag, as the setup documented here only requires the AJP connector to be enabled.

Finally, look for this line, also in tomcat_dir/conf/server.xml:

```
<Engine name="Catalina" defaultHost="localhost" ...>
```

Add the jvmRoute property, and assign it a value, that is different between the two installations. For example:

```
<Engine name="Catalina" defaultHost="localhost" jvmRoute="jvm1" ...>
```

And, for the second instance:

```
<Engine name="Catalina" defaultHost="localhost" jvmRoute="jvm2" ...>
```

Setting up balancer

Install apache server and memcached with the following commands.

```
sudo apt-get install apache2
```

```
sudo apt-get install memcached
```

Enable required modules in apache:

```
sudo a2enmod proxy
```

```
sudo a2enmod proxy_ajp
```

```
sudo a2enmod lbmethod_byrequests
```

Open `/etc/apache2/sites-available/000-default.conf` and enter the following details inside the VirtualHost tag.

```
<Proxy balancer://cluster>
    BalancerMember ajp://tomcat1:8009 route=jvm1
    BalancerMember ajp://tomcat2:8009 route=jvm2
    BalancerMember ajp://tomcatn:8009 route=jvmn
</Proxy>
```

```
ProxyPass /bhunaksha/ balancer://cluster/bhunaksha/ stickysession=JSESSIONIDjsessionid
```

Type 1 entry for each tomcat servers with proper route name as mentioned in `jvmRoute` attribute of its `server.xml`

Restart apache and memcached.

```
sudo service apache2 restart
```

```
sudo service memcached restart
```

You can access Bhunaksha application with the URL <http://balancer1/bhunaksha>

33. Configuring Bhunaksha Demo application

Bhunaksha Demo application has some data by default which you can view and work on for understanding working of Bhunaksha. Demo application can also connect to your ROR textual

database by configuring the connection parameters and queries for fetching details from the database. Once configured properly you can import shape files for your villages and have a feel of working Bhunaksha with your database. *We recommend this only for demonstrating and learning the application. For permanent use we will customize it separately for your state by studying the textual data structure and workflow present in your state.* You can provide the database details for connecting Textual and Vector (Bhunaksha - Postgresql) database from Settings -> Server Settings menu. Both the databases should have proper permissions to connect from the system where Desktop application is being configured. A new Bhunaksha DB can be created and initialized with tables and structures for running fresh Bhunaksha Demo application from this screen itself. Initially if you wish to work with the default data provided for demo use, provide the same bhunaksha database connection parameters in both Vector and Non Vector database settings area. Test the connections and click OK button to save the connection details.

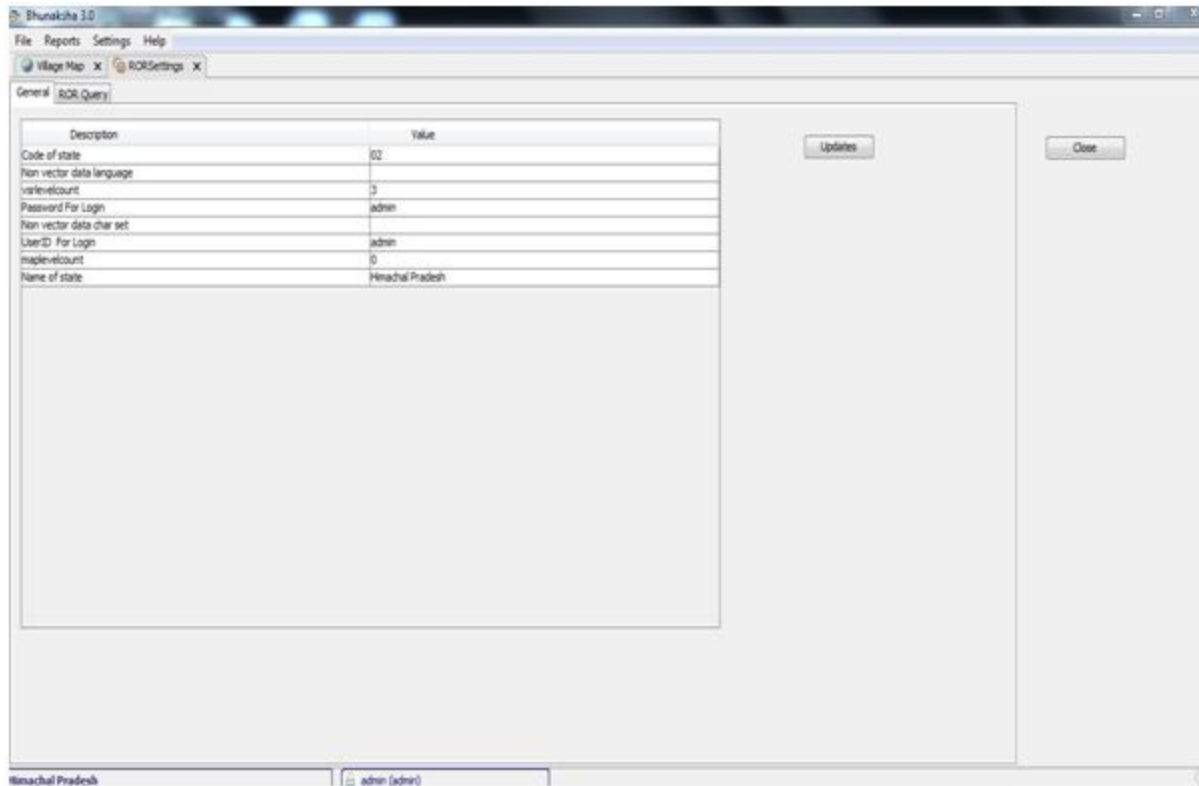
Run the again Bhunaksha.exe. Fill the user as **admin** and password as **admin**.

Changing ROR Settings-:

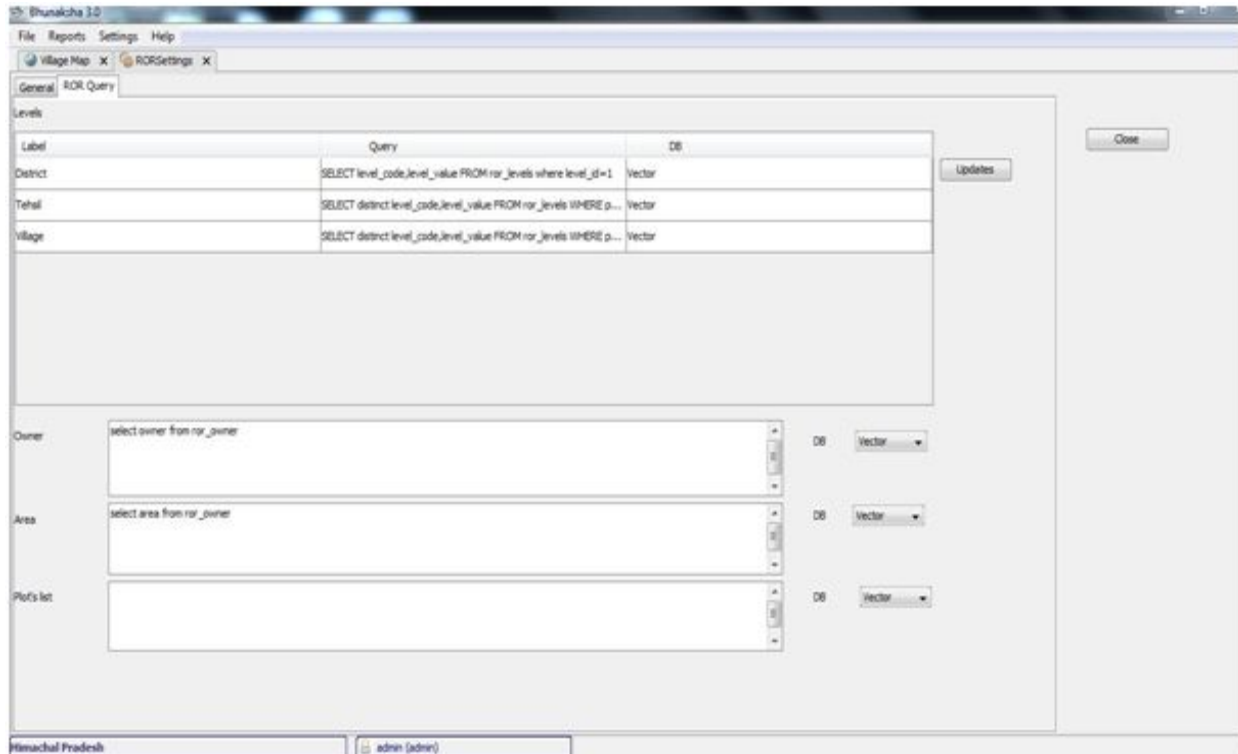
The ROR Settings can be from menu Settings -> ROR Settings.

- **General Settings-:**

In General Settings you can change state code ,state name, vsrlevelcount , maplevelcount etc. And updated it. vsrlevelcount is the number of levels present in database for navigating to village. For example if the levels present in database are District, Tehsil and village then this field should have value 3. maplevelcount is the number of levels present in map in a village. If you have different sheet maps for each village then it should have value 1. If village map sheets are mosaiced to a single shape file for each village then every village will have a one shape file and this field can be kept 0.



- **ROR Query Settings:-** In this you can configure Label for each selection level and setup up queries needed to fetch the selection levels and owner/area details from ROR database. In the queries you can use substitution variables like \$level1, \$level2, \$vsrno, \$plotno etc. to refer to currently selected levels and plots.

**Example:**

Suppose we have three label as **District** , **Tehsil** and **Village** . Now we will change query according this-

1-District-:

- 1.1 **Label -:** Suppose we have first label is **District**.
- 1.2 **Query-:** The query will be- select dist_code,dist_name from dist_table.
- 1.3 **DB -:** Vector/Nonvector.

2-Tehsil -:

- 2.1 **Label -:** Suppose we have second label is **Tehsil**.
- 2.2 **Query-:** The query will be-select teshil_code, teshil_name from teshil_table where dist_code='\$level1'.
- 2.3 **DB -:** Vector/Nonvector.

3- Village -:

- 3.1 **Label -:** Suppose we have third label is **Village**.
- 3.2 **Query-:** The query will be-select village_code, village_name from village_table where dist_code='\$level1' and teshil_code='\$level2'.
- 3.3 **DB -:** Vector/Nonvector.

After changing the ROR settings that you can again provide the database details for connecting to Bhunaksha DB in postgresql and Textual database.

34. Downloads

The following items can be downloaded via the File->Downloads option present in the web application.

1. Desktop Client

The Bhunaksha desktop client can be downloaded from this link. The Latest Java runtime has to be installed on your system to run this application. The preconfigured JRE can be downloaded from “<http://10.1.43.239/bhunaksha>” and merged with this folder structure.

Whenever the web application is upgraded on the server, the desktop application installed on client machines will get an update automatically on the login screen.

2. Fonts
3. Bhunaksha Mobile App
4. Certificates

More Information about Java, PostgreSQL and PostGIS, Documentation and GDAL is also available there.