RESEARCH ARTICLE OPEN ACCESS

Design and Development of GIS Based Utility Management System at DOS Housing Colony, Vikramnagar, Ahmedabad

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Abstract

The paper presents the conceptual design model of a GIS [Geographic Information system] based Utility Management System for DOS Housing Colony, Vikramnagar, Ahmedabad. The processing capabilities of GIS and the system ability to manipulate geo-referenced data and results in different formats and models make them suitable for planning and operation of all activities of the Construction & Maintenance Group of SAC, Ahmedabad. This is specially designed software for the Civil, Electrical and Horticultural wing of Construction and Maintenance Group, Space Applications Centre (ISRO) in many ways to improve the Planning, Maintenance and Information standards. In this software, all physical information like Vikramnagar area, all buildings, roads, water supply lines, drainage lines, fire fighting lines, pump house, wells, bore points, recharge wells, and STP plant, torrent power substations, DG set rooms, LT panels, LT cables, electrical light poles and solar light poles, nursery area and trees are converting into digital forms using GIS by developing different layers. Thus Digital information will be used for identification of each utility and finally, this software will provide information of the entire Vikramnagar housing colony related to Construction & Maintenance Group by providing instant records availability. The Utility system load flow based on GIS presented in the paper is an ideal tool for performing the analysis and viewing the results on a map superimposed with other geographic layers. It allows power system planners to work on the real system by relating the output to the location of load and feeder. Together with the utilization of water supply lines, fire fighting lines, drainage lines, all buildings, roads, trees and power distribution the System will become an essential tool for utility decision makers and the Occupants of the colony. The data of water supply, fire fighting, drainage and power distribution systems are very complicated to update, and there is a lack of linkage between spatial and non-spatial data.

Thus, the design and implementation of a Geographical Information System (GIS) based Utility Management System at DOS Housing Colony, Vikramnagar, Ahmedabad for the purpose of efficient network monitoring and providing instant information access to all concerned engineers, is essential to minimize time for maintenance of water supply, fire fighting, drainage and power systems, and for efficient planning and Preventive Maintenance. GIS technology provides the facility to create, store, manipulate and analyze the spatial database. The aim of this paper is to describe the benefits of GIS technology in the field of Civil Engineering, Electrical Engineering and Horticulture. GIS technology enables easy update of information which facilitates design and development of cost effective water supply, fire fighting, drainage and power distribution systems. Traditionally, databases regarding maintenance of water supply, fire fighting, drainage and power distribution systems, and enhancement of load on substations, Low Tension (LT) panels and feeders, fault logging etc. are made on paper sheets. Thus the functional objective of this paper is to develop a GIS system which would be useful for maintenance and management of these systems within Vikramnagar in Ahmedabad. GIS based Utility Management System provides the facility to overlay analysis for all utilities. This system further enables update of the maintenance schedule of Electrical wing, civil wing etc. A GIS based Utility Management System also provides basic GIS functionalities like map Navigation, measurement of all utilities and feature identification.

Keywords: GIS Development, Global Positioning System, Global Navigation Satellite system, Utility Network system.

I. Introduction

The GIS (Geographical Information System), GPS (Global Positioning System), GLONASS (Global Navigation Satellite system) and Remote Sensing technologies have evolved over the last two decades, as the three most important spatial database technologies for developmental planning and decision support. Remote sensing is used for real time and accurate data capture. GIS is used as the most effective and efficient tool for storing, integrating, manipulating and presenting spatial and non-spatial information. GPS and GLONASS are

used for obtaining precise coordinates of important geographical features, emergency mapping and establishing connectivity in the neighborhood. The aspect of Information Technology that is saddled with the usage of Computer wares to solve spatial problems is referred to as Geo-Information and Communication technology (Geo-ICT) or Geographic Information System (Salawudeen and Rashidat, 2006). A GIS can be used to store the position of infrastructure such as electric assets, water supply line, and nursery, pumps, and Sewage Treatment Plants etc. covers displaying them on a computerized map. It can also store important data about each asset, including manufacturer, year of installation, repair history, size volume, water quality data or almost any other type of information. Efficient management systems must include location information so valuable decisions can be made relative to the desired assets and surrounding areas. Converting and presenting a non spatial problem in a spatial environment makes it easier to understand for the inexperienced as well as expert users (Sidda et al., 2011). GIS systems include software, hardware, modeling, database management and display the cases unified by geographical area (Gao et al., 2009). To run a distribution system efficiently for providing a reliable service, it is required to manage geographic information, which can help engineers to operate the system as per the requirement (Vader and Kulkarni, 2006). Using GIS, the entire electrical network can be overlaid on a satellite image or a vector base map, with the facility for zooming, resizing and scrolling. Data pertaining to the substations, HT & LT distribution, street lights etc. are maintained by analogue methods. During interruption of the power supply, power failure, break down of feeder and shut down for maintenance purposes, it is very difficult to trace the exact location of the fault. Traditionally all Engineering information pertaining to the Electrical Substation which includes specification of substations, street light etc. were maintained only by analogue methods. Development of a spatial database for power networks and equipment has become a requirement for engineers of power distribution applications like power line information, buildings, equipment and network structures, fault identification at the time of emergency, and load flow studies. Traditionally, data of power distribution systems is maintained through paper sheets in a flat file system. A database of electrical equipment and network of the electrical system is not centralized thus database updating is a critical issue. Geographical Information System (GIS) technology plays an important role in mapping the HT/ LT power lines and electrical network assets, on a geographical jurisdiction, to help engineers to find connectivity of cables. A GIS environment provides the facility to create, store, manipulate and analyse the spatial database. A GIS based power distribution management system provides the facility for overlay analysis, load analysis, with basic GIS functionality like Zoom-in, Zoom-Out, pan, full extent and identify. The Component Object Model (COM) has been adopted in the development of a GIS based power distribution system. The callable map-objects library and Visual Basic 6.0 development tools are used in the development of GIS based power distribution system.

II. Characteristics of existing system

- All engineering information pertaining to the Civil Engineering, Electrical Engineering, Mechanical Engineering and nursery which includes specification of pump houses, Sewage Treatment Plant (STP), Lifts, building, roads, different features like water supply, sewage line, fire line, Electric line, substations, HT & LT distribution, street lighting and service connection of each quarters and service connection of common services etc. are maintained by analogue methods.
- The data for water supply, fire fighting , drainage, details of buildings, roads, pump houses, wells, trees, Electric cables and street light poles is maintained through separate map sheets with facilities data printed in text form. These maps are rarely updated and there is a lack of linkage between spatial and non-spatial data.
- Any decision-making regarding maintenance of buildings like internal plastering, external plastering, painting, roads, pump houses, wells, trees, Electric cables and street light poles, substation equipments, LT panels and other feeders, performance of equipment, fault logging etc are made on a rough basis as data are available by reading sheets and referring to old data is also difficult
- All utilities are located at different places in the housing colony. Hence data are not centralized and data are only available in hard copy file forms.
- There is no facility available for measurement of Roads, size of building, length of cable, length of water supply lines, length of fire fighting lines, sewage line or any utility pertaining CMG during any break down of any line.
- There is no computerized system complete available for all utility of entire CMG

Thus, designing and implementing a GIS based Utility Management System for DOS Housing Colony, Vikramnagar, Ahmedabad for the purpose of efficient network management and providing instant information access to all concerned engineers is essential to minimize time for locating any lines, buildings, power restoration, efficient planning and for preventive maintenance (Syed Nawaz et. al. 2012).

III. Objective

The main objective is to develop a Utility management System using GIS and GPS-GLONASS observations and develop an application for data visualization, query and analysis. The detailed objectives are:

- Study of the existing utility Management system.
- Design and development of a spatial database for the Utility Management system.
- Application of a Mobile GIS system.
- In-Situ data collection for a Utility Management System of DOS Vikramnagar housing colony.
- Customization and integration of GIS, MIS and in-situ data.
- Develop GIS based software for effective functioning of Utility Management for various query, analysis and Information generation.
- Customization of the software to fulfill the application needs.

IV. Study Area:

The study covers the 39 acre residential area of staff quarters, DOS housing colony, Vikramnagar, Space Applications Centre (SAC), which is one of the biggest residential quarters of the Space Applications Centre (ISRO). Residential area of DOS housing colony, Vikramnagar consists 704 different types of quarters A, B, C, D and E type quarters with 9 high rise buildings along with 2 nos. lifts in each blocks, 4 nos. DG sets to provide emergency power supply, pump houses, Sewage Treatment Plant, Dispensary to provide medical facilities; various play ground for sports, beautiful Nursery, 2 nos. substation of local supply Torrent power etc.

V. Data Acquisition:

The availability of accurate GIS-based power distribution network map showing the geo-coordinates and network configuration is an important prerequisite for analysis, planning and optimization of load flow studies. Proper GPS survey and creation of an accurate digital base map for the distribution network is essential for a successful GIS implementation. Surveyors walk along the HT and LT feeders and capture the spatial position of the Pole, Transformer, Feeder and Substations. Differential correction is then performed on the spatial data and digital base map must show the important landmarks like Roads, building etc. which is necessary for easier identification of network assets and to plan new distribution network. For better visualization, the vector map of the network can be overlaid on the digital base map or a satellite raster image. Two major parts are described (i) database preparation and (ii) application development, for successful implementation and execution of a GIS based Power distribution management system. Materials that have been used for database preparation are: (i) Cartosat-2 and LISS-4 merged products for better spatial resolution for mapping of building structures (ii) Vikramnagar Boundary Map and utility assets design map collected from Construction and Maintenance Group (CMG), SAC in the form of AutoCAD layers (iii) Locations of all utility like pump house, STP, all building etc were collected using GPS-GLONASS survey and existing reference maps (iv) Non-spatial (Attribute) information collected from Construction and Maintenance Group (CMG), SAC and survey with individual assets.

VI. Navigation System GPS-GLOSS-GIS Functions :

The Global Positioning System (GPS) and GLONASS [Global navigation satellite system] are a technology, which provides accuracy and flexibility of determination of stationary or moving spatial objects. Its applications are navigation, surveying, remote sensing, mapping and geodetic positioning. Geodetic positioning can be determined either in relation to a well-defined coordinate system, usually by three coordinate values or in relation to other points, taking one point as the origin of a local coordinate system. GPS uses satellites and computers to compute positions anywhere on earth. In electrical power distribution system for finding the location of any object e.g. buildings, roads, pump houses, wells, trees, electric cables, substations, tracking of routes and street light poles etc. It gives the position in the form of latitude and longitude, which can directly be imported onto computer screen. GPS are becoming very effective tools for GIS data capture. The GPS can easily be linked to a laptop, computer in the field, and, with appropriate software. Users can also have all their data on a common base with very little distortion. Thus GPS can help in several aspects of construction of accurate and timely GIS Samsung smart Mobile phone is equipped to use dual core location based service to find location having twice navigation system i.e. GPS of USA network of 31 satellites covering this planet and has been widely used in commercial devices like mobile phones, navigators etc.

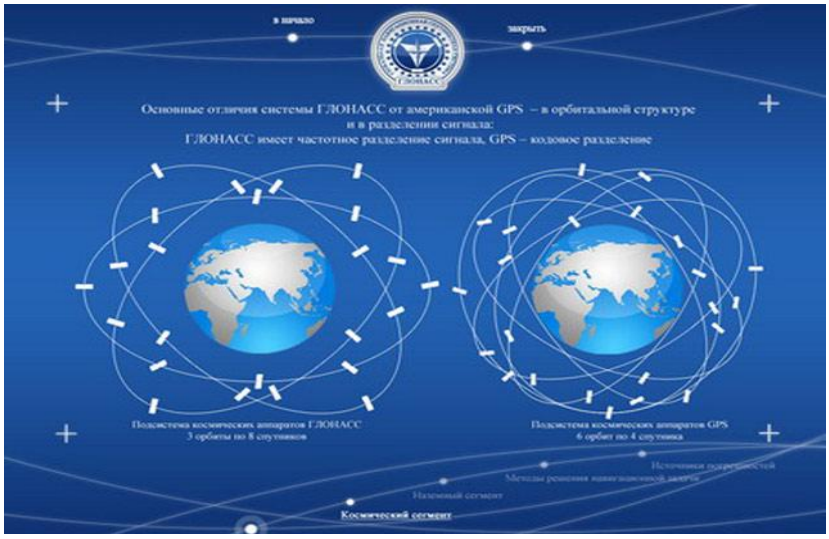


Figure-1: shows the orbit and constellation of GLONASS (left) and GPS (right).

GLONASS constellation is improved and revived, increased satellite availability will continue to offer greater improvements in position availability, reliability. Figure-2 showing screen shots of combined result of both i.e. GPS and GLONASS navigation system.

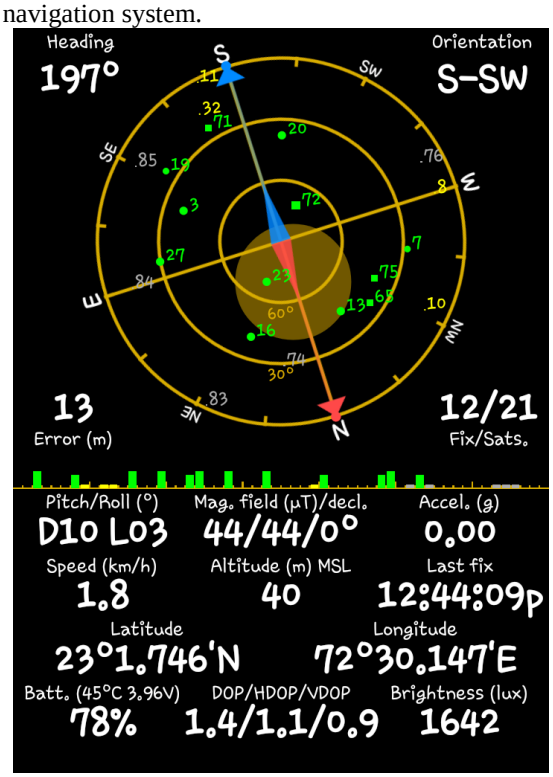


Figure-2: Combined status of both navigation systems.+

VII. Technology and Software Used

- Arc GIS 9.3
- Visual Basic 6.0
- Map Object 2.1
- GPS
- GLONASS

VIII. Methodology:

Methodology is described in two major parts as (1) for GIS database preparation and (2) GIS Application Development. The GIS-mapping involved a participatory approach, where each and every layer should have accurate spatial information associated with attribute information. Methodology for database creation / preparation involves in different steps like base layer creation with geo-

referencing then electrical assets mapping in different layer types like (a) all electric poles, bore point - point layer,(b) all lines including roads, cables, pipe lines- line layer and (c) all building, STP, pump house and sub-stations etc. – Polygon layer etc.

Methodology for the GIS based utility Management project execution is described in figure-1, where the first step describes the input data collected from field, CAD map and existing paper maps. Third step about to, entire database has been converted into spatial format and geo-referenced. Step four describes about the integration of collateral information within GIS. Information about utility assets was collected from Management Information System (MIS) databases. The detailed methodology followed for successful implementation of spatial approach to develop power distribution system adopted in three major parts followed by input data collection, spatial processing and application development, and each unit describes broad processing efforts, further processing steps describes in paper.

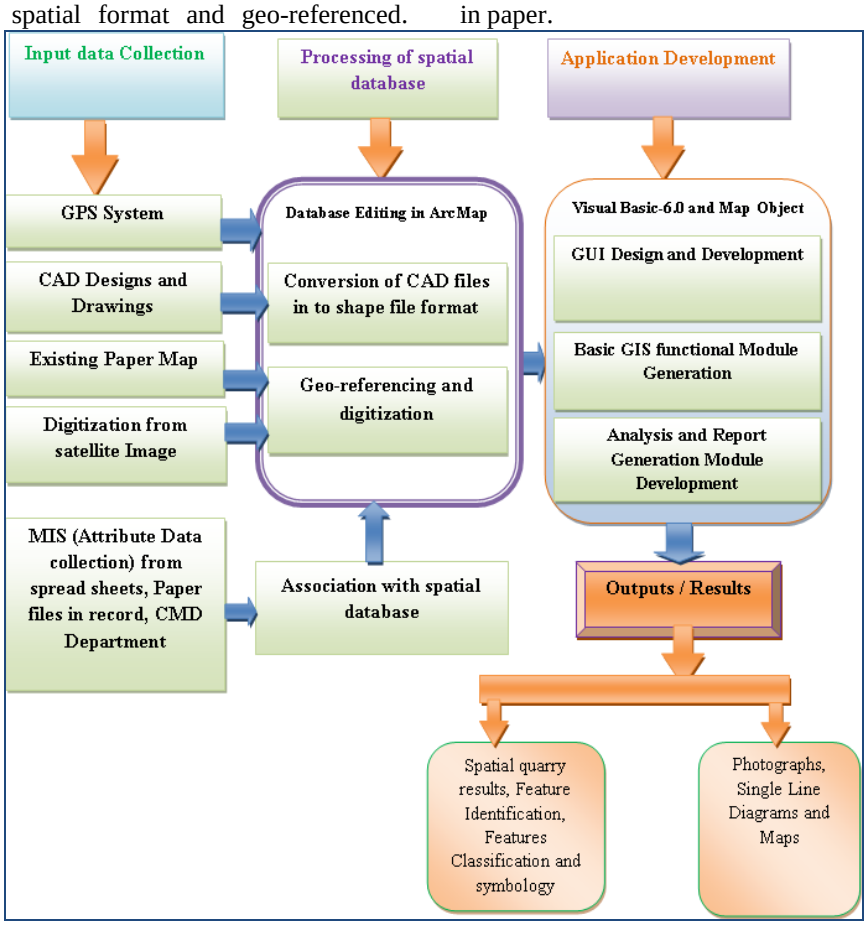


Figure-3: Methodological flow chart

7.1 GIS Databases:

The GIS databases designed and developed for utility of DOS housing colony, Space Applications Centre, Ahmadabad comprises of water supply lines, fire fighting lines, drainage lines, cable lines, poles, blocks of quarters, pump house, sewage treatment plant, substations, DG sets, roads, wells and trees etc layers extracted from existing AutoCAD map Layers and GPS and GLONASS combined survey. To start developing a GIS map for utility Management system, a GPS_GLONASS survey becomes necessary for geo-referencing and mapping the relevant utility assets on the digital base map. GIS mapping, indexing and codification of utility assets with defined schema has been carried out for collection and updating of spatial and non-spatial databases. The collateral data obtained from Construction and Maintenance Group (CMG), SAC and accordingly data has been converted into compatible GIS format and organized as part of integrated GIS database. The following steps were involved for database preparation.

1) Google-earth Image with geo-located identified points.
2) Vikramnagar boundary Map AutoCAD layer then exported into shape file format and geo-referenced with image.
3) Utility layers from existing paper map and CAD map converted and geo-referenced into spatial formats.

4) Locations of buildings, pump houses, wells, electric poles, trees etc. using GPS-GLONASS survey.
5) Non-spatial data collected from field and MIS records and GIS join analysis carried out to associate it with spatial features.
6) Different lines like water supply, drainage lines, fire fighting lines, electric lines, etc. collected from CMG's existing database and converted it into spatial formats.

The description about the number of spatial layers is used for designing and development of utility Management System illustrated in Table-1. For every utility the elements that were imported in the database and can be viewed on the map are:

Layers	Description
Vikramnagar Area	Describes Survey no., Plot area, Plot no., TPS no. etc.
All Buildings	Describes location, name of block, capacity of quarters, Floor, quarter no., Details of lifts etc.
Roads	Describes location size
Water supply lines	Describes location, size and type of pipes etc.
Drainage lines	Describes location, size etc.
Fire fighting lines	Describes location, size and type of pipes, details of pump, installation year etc.
Pumps houses	Describes location, details of motors, details of pumps etc.
Wells	Describes location, size, diameter etc.
Bore points	Describes location, diameter, details of pump & motors etc.
Recharge wells	Describe location, diameter, depth etc.
STP plant	Describes location, details of entire STP including all process with pump & motors etc.

Table 1: List of Spatial Layers generated for civil wing.

Layers	Description
Torrent Power Substations	Information about location, name, capacity and equipments etc.
DG Set rooms	Describes location, capacity, Current, Voltage, etc.
LT Panels	Information about location, name, capacity, cable size and feeder number of each LT panels.
LT Cable	Description about source of supply, cable size and cable type etc.
Electric Light Poles	Description about locations, type of pole, type of fitting and wattage capacity of pole etc.
Solar Light Poles	Description about locations, type of pole, type of fitting and wattage capacity of pole etc.

Table 2: List of Spatial Layers for generated for Electrical wing.

Layers	Description
Nursery Area	Information about location, name etc.
Trees	Describes location, details of tree etc.

Table 3: List of Spatial Layers generated for Horticultural wing.

The availability of accurate GIS-based distribution network map showing the geo-coordinates and network configuration is an important requirement for analysis, planning, and optimization studies. Proper GPS-GLONASS survey and creation of an accurate digital base map for the distribution network is essential for a successful GIS implementation. The GPS-GLONASS survey is required to get exact locations of all utility locations. The attribute data of the utility Management assets is also collected in the process. Differential correction is then performed on the spatial data which are collected from different sources. For better visualization, the vector map of the network has been overlaid on the digital base map or a satellite raster image.

The digitization of electrical network assets and network mapping involves the following steps:
(1). GPS-GLONASS survey of bore point, poles and tree; this involves the database preparation of utility assets, followed by the preparation of GIS base map.
(2). Digitization of utility assets (all lines, building, Substations, Feeders, wells, and Poles). The layers (vector layers) were imported from CAD map file into shape file format that requires the geo-referencing with base map. After geo-referencing

database schema has been defined for each vector layers. All required attribute information has been incorporated with vector layers. The GIS application must facilitate query support with a graphic display of system.

7.2 Application Development

Utility Management System using GIS software has been developed after creation of shape files and the database using Arc Map. This system is developed using Visual basic 6.0 and accessing Map Object 2.1. Visual basic has been used in development of GIS software due to its comprehensive software development tools enabling rapid application software. An ActiveX technology of VB allows using the functionality provided by other applications such as Microsoft Word processor, Microsoft Excel spreadsheet and other windows applications. Finished application is a true .exe file that uses a Visual Basic Virtual Machine and can be freely distributed.

Map Objects comprises an ActiveX control (OCX) called the Map control and a set of over forty-five ActiveX Automation objects. It is for use in industry standard Windows programming environments. Programs built with Map Objects will run on Windows 95, 98 and Windows NT 4 or higher (ESRI, 1996). The Map Objects mainly contains two controls. (1) Map control is the main control comprising almost all objects needed for GIS Functionalities. (2) Legend control is to show the currently used layers status with check boxes. The map layers i.e. the previously created shape files are added to the VB form using the map control. Then the legend control is used for adding check box for each layer. The usual tools of GIS software namely Zoom-In, Zoom-Out, Pan, Zoom to full extent, identify and attribute table etc are created by writing appropriate code in BASIC language. Menus are created for power distribution system in the form displaying the map. The Major GIS functions supported by Map Object 2.1 are as follows.

The following Map Objects components are used to develop GIS functions in Power Distribution System. (1) Map control component for visualization and querying spatial database and also for exporting map output in Jpeg, BMP and TIFF formats. (2). Map Legend control for display the Layers present in a Map Control along with their symbology etc. Basic block diagram of development environment is shown in figure.4.

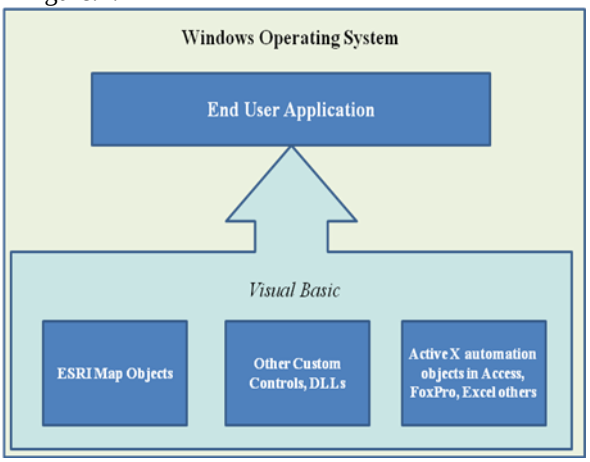


Figure-4: Block diagram of Development Environment

For the deployment of the developed GIS based power distribution system, a Setup file prepared containing required DLLs and control is to be installed at the target system based on Microsoft Windows XP (service pack 3.0 or higher). The deployment of GIS based power distribution system does not require ESRI map-objects and Visual Basics 6.0 for the target system.

Table-4 describes the system's menu and sub menus structures, and Table-5 illustrates the toolbar contents and description.

Menu	**Sub menu**	**Sub-Sub menu**
File	About Vikramnagar	
	Details of Quarters	
	Site Plan	
	Total Inventory	
	Print	
	Exit	
Theme	Add Theme	
	Remove Layer	
	Remove all Layers	
Layer Symbology	Symbology and class	

	Transparent fill	
	Outline color	
	Feature color	
Maintenance Shedule	Civil wing	
	Electrical Wing	
	AC Mechanical Wing	
Civil Wing Info	Fire Fighting System	
	Pumping System	
	Sewage Treatment Plant	
	Rain Water Recharge Well	
Actual Meintenance Done	Civil Wing	Actual Painting Done
		Due Date for Painting
	Electrical Wing	
Photographs	Vikramnagar Colony	
	Vikramnagar Nursary	
	Sewage Treatment Plant	
	DG set Room No.1	
	DG Set Room No.2	
	DG Set Room No.3	
	DG Set No.4	
	LT Panel Behind D-3	
Power Distribution SLD	DG Set Room No.1 and 2	
	DG Set Room No.3	
	DG Set No.4	
	LT Panel Room Behind D-3	
	All DG Set Details	
LT Panels	LT Panels for DG Set No.1	AMF Panel DG Set No.1
		Motive power panel DG Room No.1
		Starter Panel DG set-1
	LT Panels for DG Set No.2	AMF Panel DG Set No.2
		Lighting Panel DG set-2
		motive Power panel DG Set-2
	LT Panels for DG set No.3	AMF Panel DG Set-3
		Motive Power Panel DG Set-3
		Lighting Panel DG set-3
	LT Panels for DG Set No.4	AMF Panel for DG Set-4
		Power Panel for DG Set-3 phase VII and VIII
		Lighting Panel DG Set-4
	LT Panels under Phase-VIII	Motive Power Panel
		Lighting Panel
		GLR Panel phase VIII
	LT Panels for D Type Blocks	LT Panel D-1 block

		LT Panel D-2 block
		LT Panel D-3 block
		LT Panel D-9 block
		LT Panel D-10 block
		LT Panel D-11 block
	LT Panels for E Type block	LT Panel E-1 block
		LT Panel E-2 block
		LT Panel E-3 block
		LT Panel E-7 block
	LT Panels for STP	STP Panel-1
		STP Panel-2
Check List	SBs and DB	
	Light fitting	
	Cable Check List	
	Diesel Engine	
	Motor Check Chart	
Service Connection		

Table: 4.

Toolbar

Toolbar	Description
Zoom IN	Feature zoom in by drawing rectangle
Zoom Out	Feature zoom out by drawing rectangle
Pan	Feature navigation in map window using directional move
Full Extent	Map zoom to show all layers in map window
Identify	Provides information about selected feature
Attribute Table	Opens attribute table of active layer
Length Measurement	Features for measurement of Length of Cable,Pipes,Roads etc.
About Vikramnagar	Features for History of vikramnagar
Details of Quarters	Features for Type and inventory of quarters
Vikramnagar Site Plan	Indicating complete plan of vikramnagar
Print Map	Printing of preventive maintenance schedule, Actual preventive maintenance done and photographs.
Power Saving	Energy conservation and various technique of power saving
Vikramnagar Photo	Various photographs of Vikramnagar
Vikramnagar Nursary Photo	Various photographs of Nursary
Sewage Treatment Plant photo	Various photographs of STP

Table: 5.

Figure-5: shows the start up page of GIS based Utility Management system at DOS housing colony, Vikramnagar. Figure -6: describe all vector layers of Civil wing which include vikramnagar area, all buildings, roads, water supply lines, drainage lines, fire fighting lines, pump house, wells, bore point, recharge wells, and STP plant. All vector layers of Electrical wing which include torrent power substation, DG set rooms, LT panels, LT cables, electrical light poles and solar light poles. All vector layers of Horticultural wing which includes nursery area and trees. Figure-7 is about to add symbology and class for separate layers, as Symbology is defined in GIS as the set of convention, or rules or encoding

the system that describe the Graphical User Interface (GUI) about to add spatial database in an application and browse the attribute information. Symbology is defined in GIS as the set of convention, or rules or encoding system that defines how spatial themes are rendered on maps (www.wiki.gis.com). Developed system contains the facility to symbolize spatial features on the basis of unique values, group of values (classes), and single symbols. Classification of features based on unique values, classes range, multi color scheme for different sizes of cables.

Figure-8: represents details of DG set with all attributes and Figure-9 is about to visualize maintenance schedules for civil wing. Figure-11 describes the maintenance scheduling details about electrical wing, and all fire fighting system details are shown in figure -11. The developed system contains the facility to visualize pump house details about motor type, manufacturer details, recharge capacity etc. which is shown in figure-12. Facility to browse STP details also incorporated in Utility Management system as shown in figure-13. The system contains the facility to browse check lists for diesel engine set and light fitting which can be updated in every fortnightly, which contains information about diesel engine, oil condition, water level etc., and light fitting status as shown in figure-14 and figure-15. Figure-17 and figure-18 represents the facility to visualize recent photographs of Vikramnagar nursery and DG sets. Figure-18 illustrates the Single Line Diagrams for DG set; the same has been implemented for all sub stations and HT panels. Figure-19 illustrates the measurement capability of the system where user can measure the distances in roads as well as distance between two assets.

Figure- 5: Home page of software

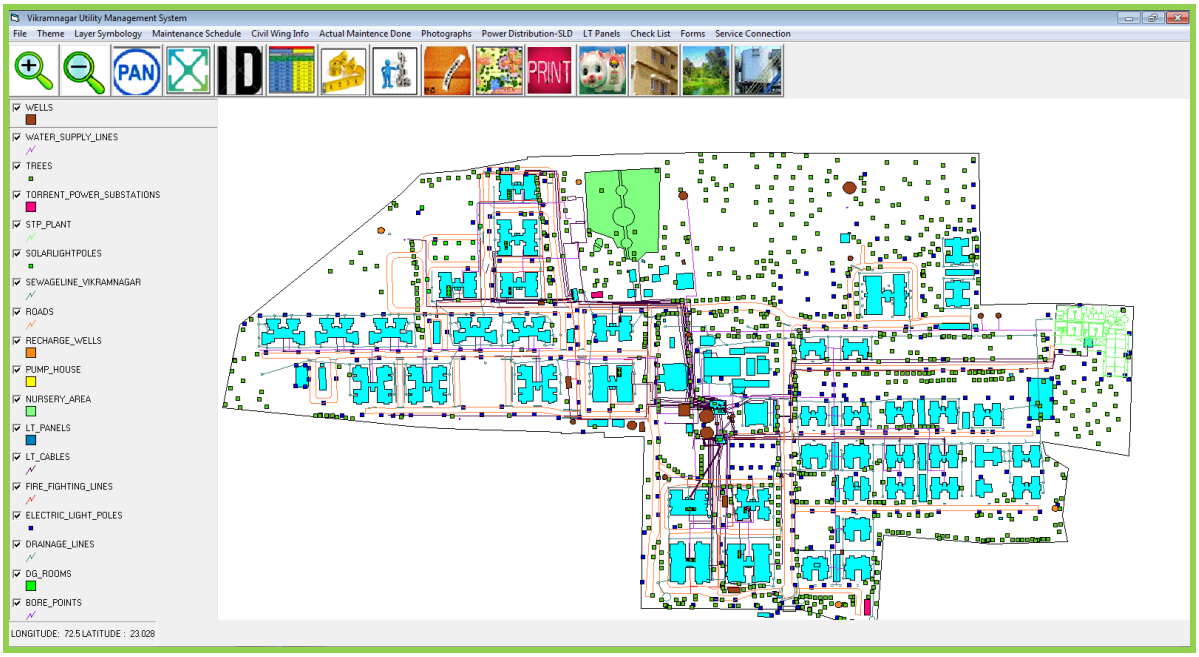


Figure -6: Layer incorporated with System

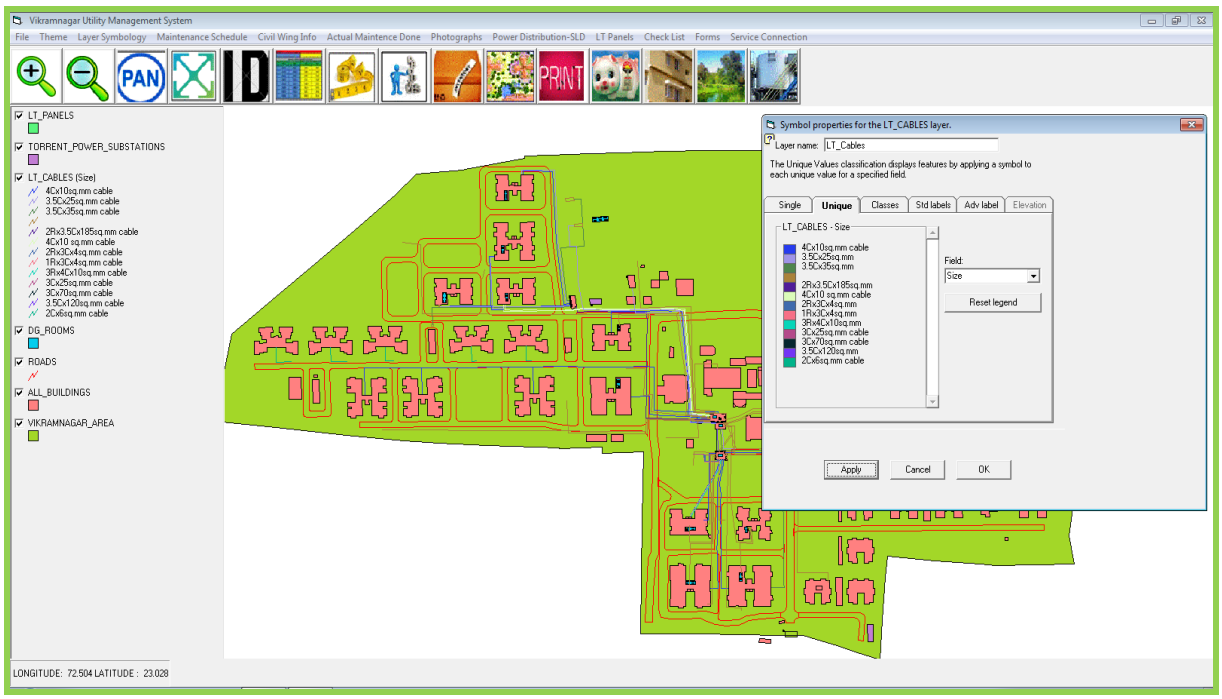


Figure -7: GUI of Layer's Symbology, classification with labels.

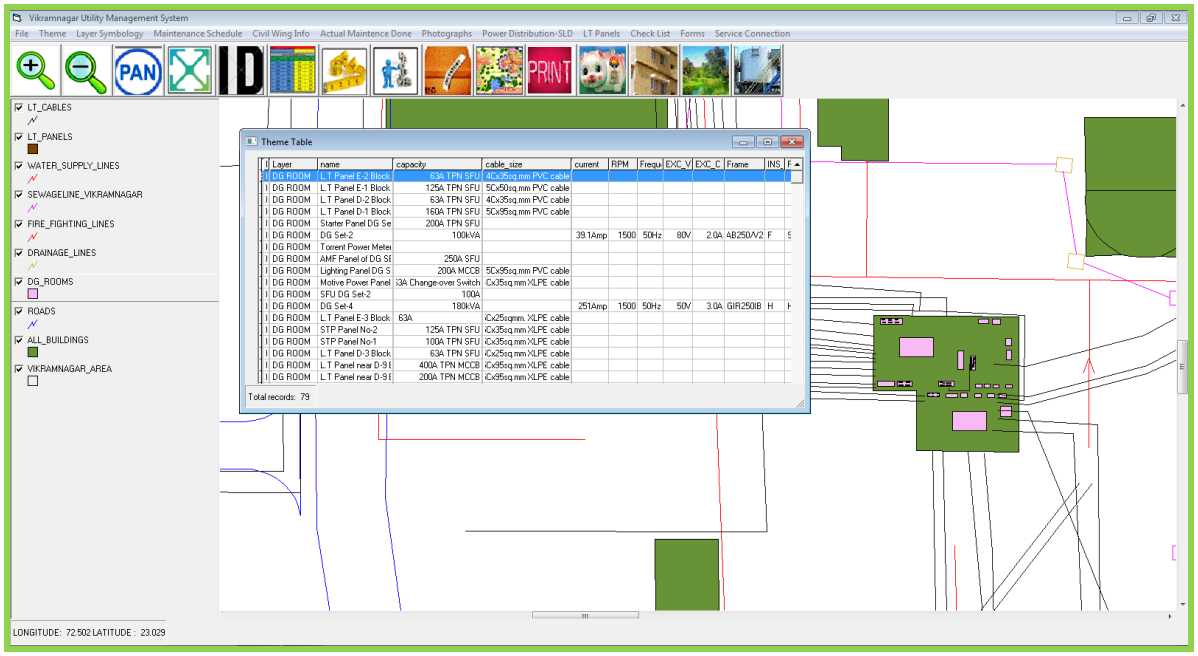


Figure-8: Attribute Information of DG sets.

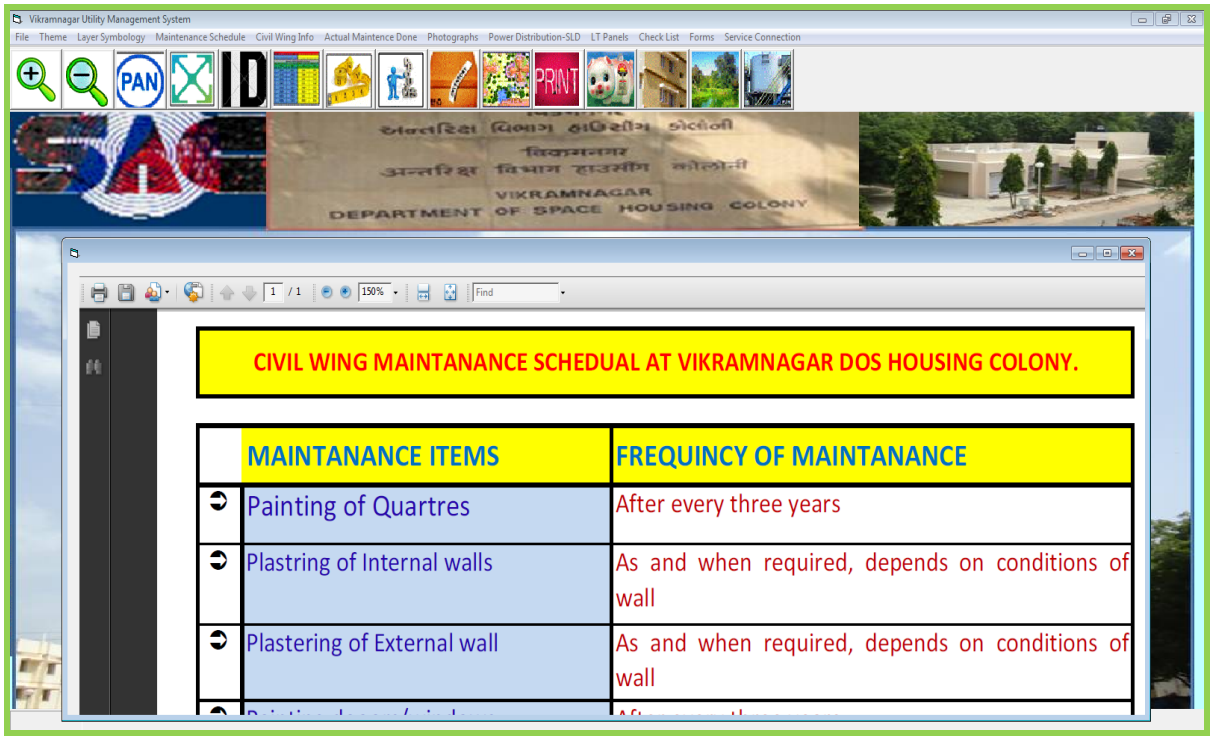


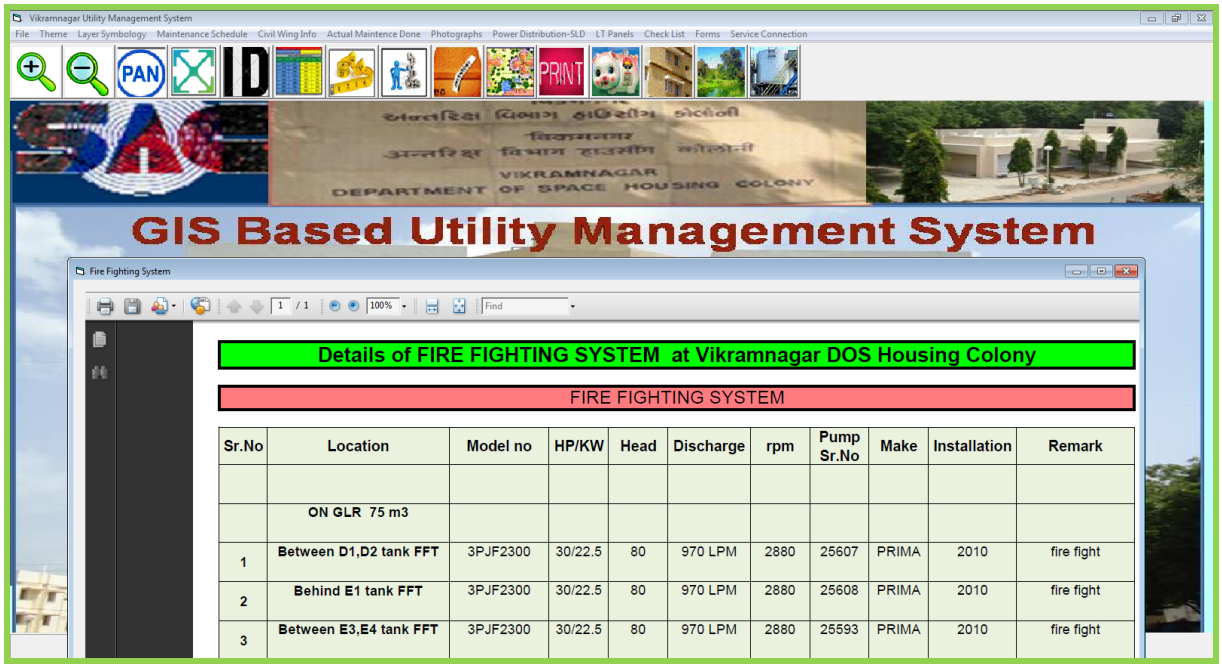
Figure-9: Showing Maintenance schedule of civil wing

ELECTRICAL MAINTANANCE SCHEDUAL AT VIKRAMNAGAR HOUSING COLONY

2014

PANEL NO.	NAME	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEPT	OCTO.	NOV	DEC
1	AMF Panel DG Set-1	☑											
2	Power panel DG room-1	☑											
3	AMF Panel DG set-2	☑											
4	Power panel DG-2		☑										
5	Starter Panel DG Set-2		☑										
6	Lighting panel DG set-2		☑										

Figure-10: Maintenance schedule for Electrical wing

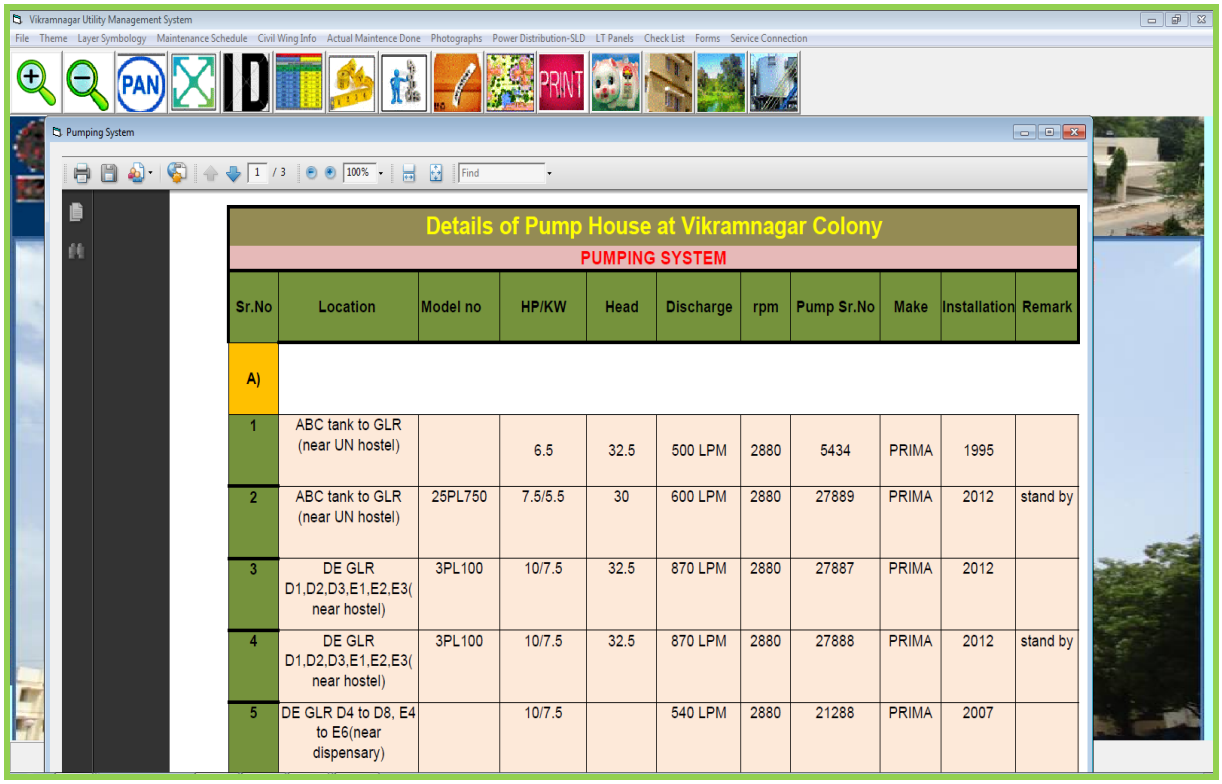


Details of FIRE FIGHTING SYSTEM at Vikramnagar DOS Housing Colony

FIRE FIGHTING SYSTEM

Sr.No	Location	Model no	HP/KW	Head	Discharge	rpm	Pump Sr.No	Make	Installation	Remark
	ON GLR 75 m3									
1	Between D1,D2 tank FFT	3PJF2300	30/22.5	80	970 LPM	2880	25607	PRIMA	2010	fire fight
2	Behind E1 tank FFT	3PJF2300	30/22.5	80	970 LPM	2880	25608	PRIMA	2010	fire fight
3	Between E3,E4 tank FFT	3PJF2300	30/22.5	80	970 LPM	2880	25593	PRIMA	2010	fire fight

Figure-11: Details of fire fighting system



Details of Pump House at Vikramnagar Colony

PUMPING SYSTEM

Sr.No	Location	Model no	HP/KW	Head	Discharge	rpm	Pump Sr.No	Make	Installation	Remark
A)										
1	ABC tank to GLR (near UN hostel)		6.5	32.5	500 LPM	2880	5434	PRIMA	1995	
2	ABC tank to GLR (near UN hostel)	25PL750	7.5/5.5	30	600 LPM	2880	27889	PRIMA	2012	stand by
3	DE GLR D1,D2,D3,E1,E2,E3(near hostel)	3PL100	10/7.5	32.5	870 LPM	2880	27887	PRIMA	2012	
4	DE GLR D1,D2,D3,E1,E2,E3(near hostel)	3PL100	10/7.5	32.5	870 LPM	2880	27888	PRIMA	2012	stand by
5	DE GLR D4 to D8, E4 to E6(near dispensary)		10/7.5		540 LPM	2880	21288	PRIMA	2007	

Figure-12: Pump house details

Details of PumpMotor insalled at STP plant Vikramnagar DOS Housing Colony

STP AREA

Sr.No	Location	HP	Head	Discharge	rpm	Pump Sr.No	Make	Installation	Remark
A)	Dry Well								
1	Raw Sewage	5	14	12.5	1420	A3GD500069	Kirloskar	2003	
2	Raw Sewage	5	14	12.5	1420	A7G0500182	Kirloskar	2003	
3	Raw Sewage	10	18	25	1440	C3BM700232	Kirloskar	2003	
4	Raw Sewage	10	18	25	1440	C3BM700233	Kirloskar	2003	
5	Submersible sewage pump	5	17.5	120 cum		20852320	Lubi	2009	

Figure-13: Details of STP plant

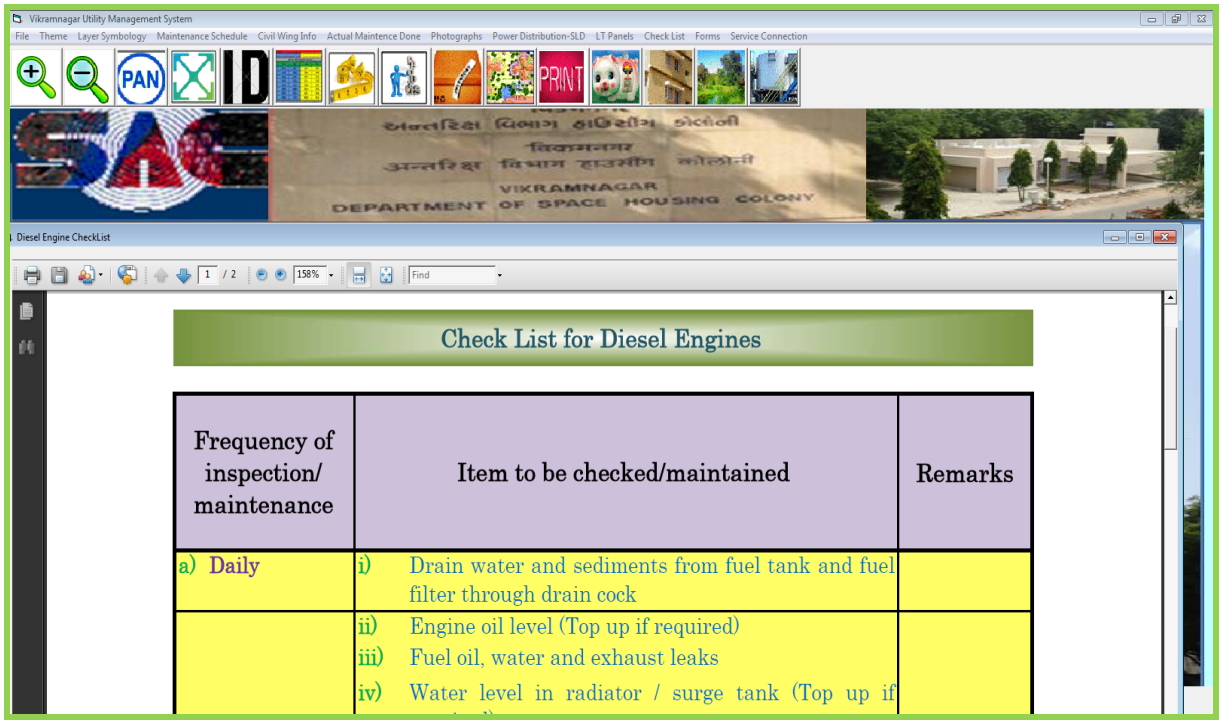


Figure-14: Check list of diesel engine set

Figure-15: Check list for light fitting

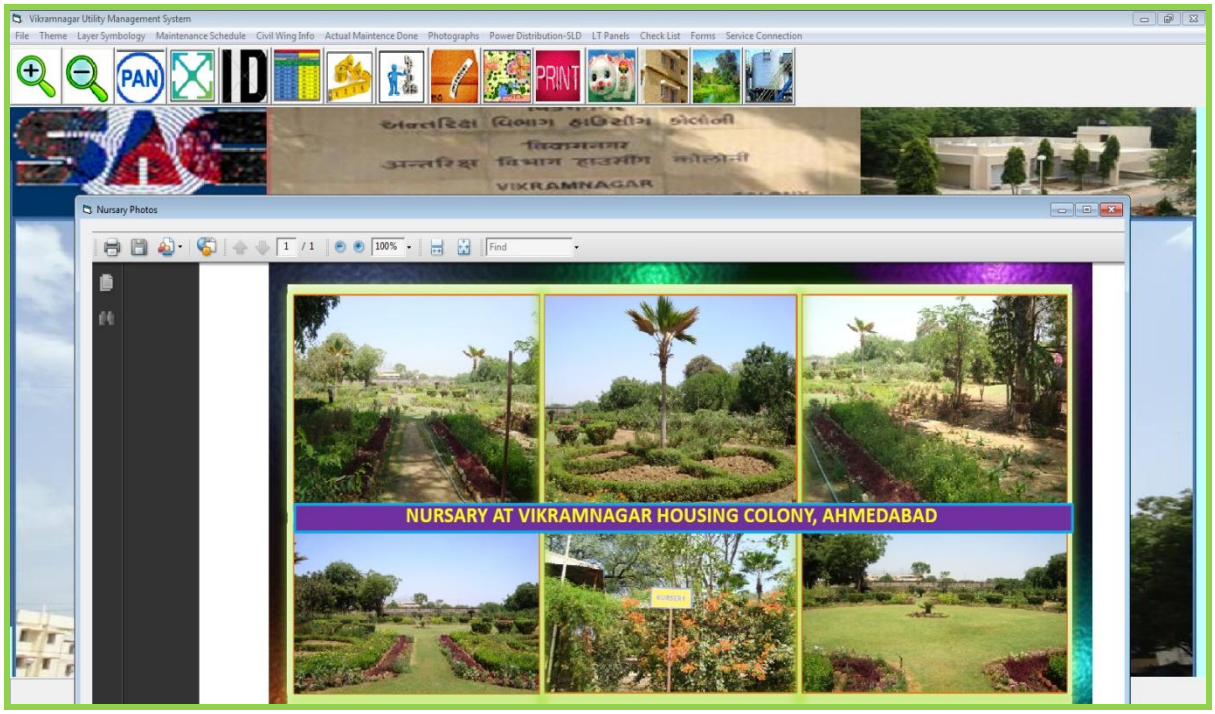


Figure-16: Photos of Vikramnagar Nursary

Figure-17: Photos of 180 kVA DG set

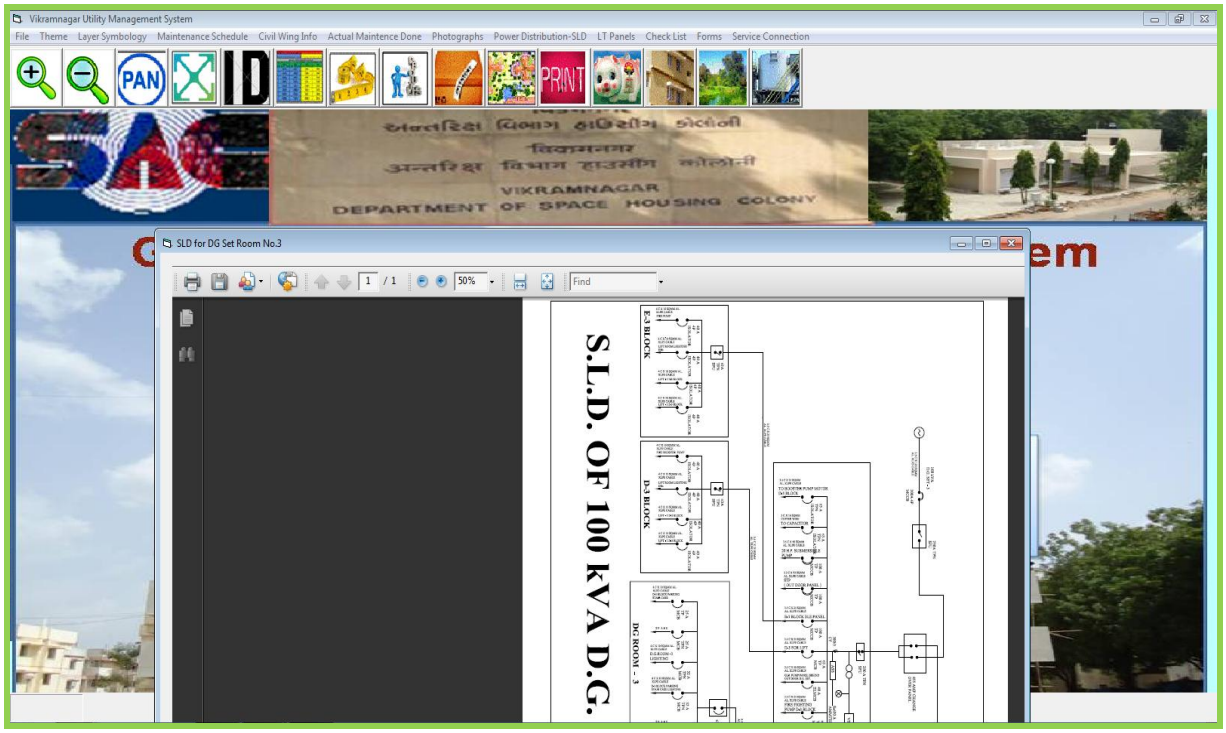


Figure-18: Power distribution of 100 kVA DG set

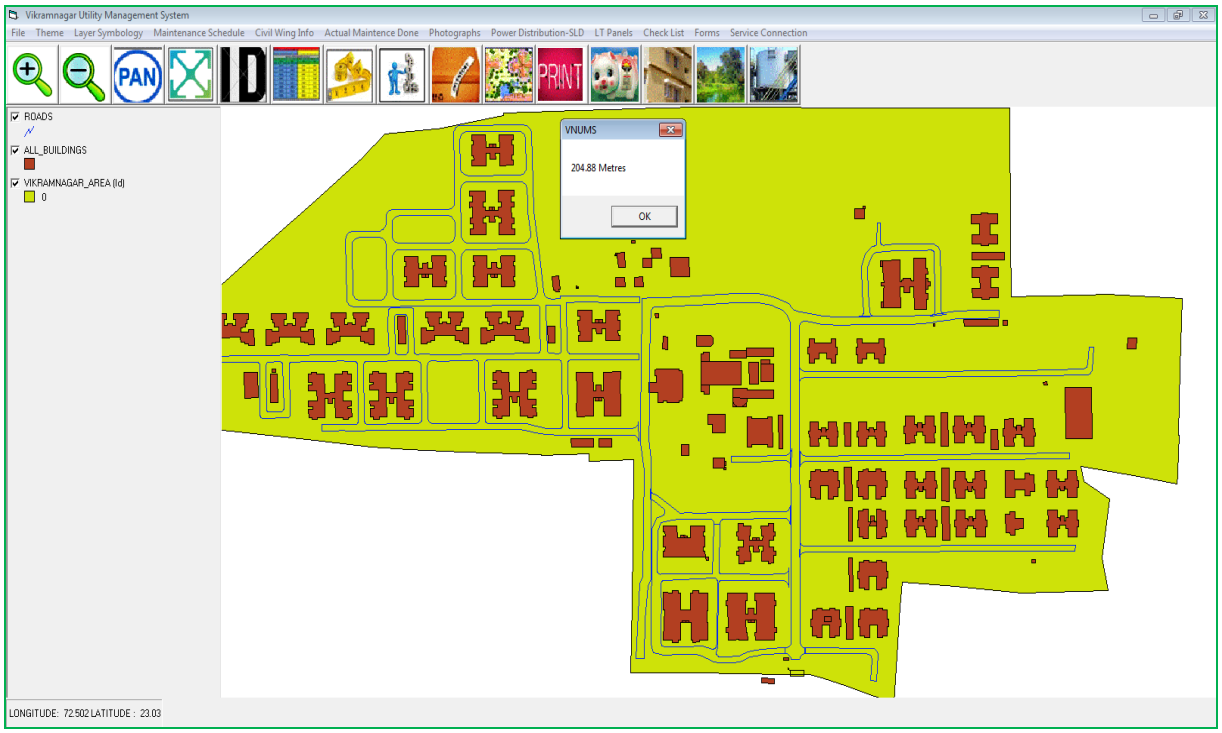


Figure-19: Measurement of Road

IX. Conclusions

From this case study undertaken, it can be concluded that SAC (ISRO) can be used in many ways to improve the planning, maintenance and management standards. Developed GIS model has been designed to manage utilities for vikramnagar residential colony. The developed utility management system may provide a wide range of data for various types of analysis to enable routine maintenance and management. Strength of GIS is integrating data and preparing it for analysis or modeling apart from tying together data from various sources makes it an important tool for the planning and decision making. User can display legend of all layers displayed on the

map. This legend will be represented by the symbol of each layer with color and the name of the layers in a list. System will display coordinate of the current mouse position and the coordinate value will change with the movement of mouse pointer over the map area. User can see co-ordinate only when the mouse pointer is inside the map area. If the mouse pointer goes outside the map area then the system will not display the coordinate. Use can measure length of cable, roads, water supply line, fire fighting lines, drainage lines, form one place and other place in entire vikramnagar colony. User can query any layer of the GIS map to get the attribute data for a particular feature of that layer. User has to click on any feature of a particular layer to get the attribute of that feature. GIS provides a wide range of solutions encompassing the entire business value chain in the power distribution sector from setting up distribution network and load management to customer information, assets management, billing and customer services. Digital system provides timely, accurate and easier way of acquiring information, which is very vital in taking prompt and accurate decisions.

This software has been installed at different locations for internal usage of civil engineers, Electrical engineers, and Horticulture section of CMG-SAC. The software is useful for Planning, Maintenance, and Improvement in Information standard and decision making during maintenance and shut down.

X. Future scope and Enhancement

This paper presents the strength of developed Utility Management System although it is capable to handle most of the utility layers and information but; still there is a chance to enhance the capability of the system like development of module for alerts regarding preventive maintenance where managers can know complain status weather it is attended by engineers or not with defined time frame. Future enhancement of the system can be implemented in web application thus people can easily get the information about their electrical network, water supply, maintenance request and response related to civil as well as electrical complaints and concerning authorities can access with privilege permission thus they can update the spatial as well as non-spatial databases.

XI. Acknowledgement

The authors are thankful to Shri A. S. Kiran Kumar, Director, Space Applications Centre (SAC) and Dr. J. S. Parihar, Deputy Director, EPSA, for providing encouragement. The kind support provided by Dr. B.S. Gohil, Group Director, ADVG is thankfully acknowledged. The authors acknowledge to Mrs. Pushpalata B. Shah Head, DWD, SAC. We would like to express our thanks to Shri Rajesh Ranjan, Group Head, CMG, Shri S.S. Chadar, Head, Maintenance Division,CMG and their team for support and encouragement provided during design and implementation of project.

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