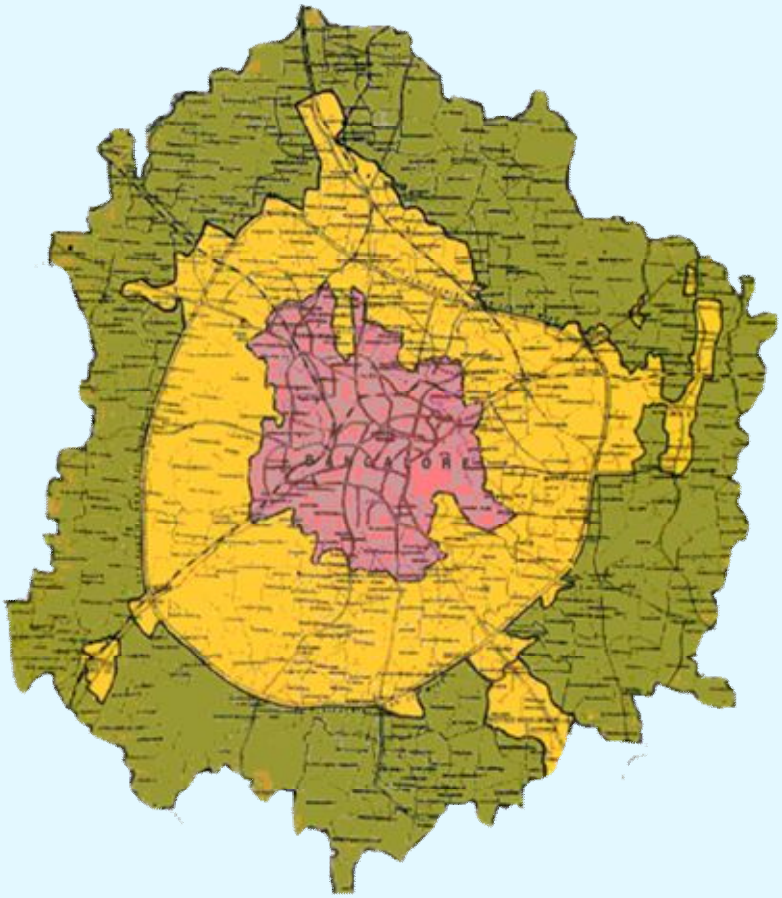
Bangalore Water Supply & Sewerage Board (BWSSB), Bangalore, INDIA

GIS BANGALORE

Computerised Mapping & GIS Development for BWSSB, Bangalore under Indo-French Protocol



GIS Developers

IRAMconsult International

EarthCAD Inc.

Computerized Mapping and GIS Development for BWSSB under Indo-French Protocol

Assignment from

Bangalore Water Supply and Sewerage Board (BWSSB), Bangalore, India under Indo–French Protocol

GIS Developers

IRAMconsult International, New Delhi, India
EarthCAD Inc., Virginia, USA

Implementing Agency

BWSSB, Bangalore, India

Project Duration

30 months (May 2000 – November 2002)

GIS Development Fee

USD 1.8 Million

Brief description of the Project

As urban areas become more densely populated and public infrastructure is progressively modernized, state and local government, strategic planners and utility operators are increasingly required to handle large volumes of information which may often be too complex and may be continually subject to modification. To analyze this geographically related information and facilitate optimum decision making, the decision-makers must be equipped with the appropriate tools.

Project Area

Bangalore City too has witnessed rapid growth in population particularly during the last 4 decades. The population, which was 1.2 million in 1961, increased to more than 6 million in the year 2001.

Map showing Administrative Boundaries of Bangalore and BWSSB jurisdictions

Similarly, the city has expanded phenomenally in area from 29 Sq.Kms. at the beginning of the century and has increased to 446 Sq.Kms. in the year 2001 and is projected as 564 Sq.Kms by 2011. The total network of water supply transmission and distribution pipelines has reached nearly 4000 km and the lateral sewers and out-fall sewers has increased to about 3000 Kms. Bangalore Water Supply & Sewerage Board since its formation in 1964 has augmented the water supply to Bangalore city from 164 MLD to 704 MLD. Until 1964, water was abstracted from Arkavathi river sources only. Now the major quantity of 540 MLD water is being pumped from Cauvery River from a distance of about 93 Kms.

The water supply, storm water drainage and sewerage systems have grown enormously and to handle such a large system, there was an imperative need to develop a Geographic Information System (GIS) in BWSSB on a priority basis. The development of GIS was undertaken with external assistance under Indo-French Protocol. The technology and development services for this GIS project were provided by IRAMconsult International (New Delhi, India) and EarthCAD Inc (Virginia, USA).

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Project Objectives

The BWSSB GIS project was aimed at setting up a Geographical Information System for Water Supply and Sewerage Systems using geographical and numerical data. The main aim and objectives of the project were:

- To acquire digital maps of BWSSB Area at 1:2000 scale, supporting all geo-referenced data, to establish baseline information.
- To get a geographic, descriptive and analytical knowledge of BWSSB assets, and to develop a computer based Asset Management System.
- To get repository data to be shared between various departments.
- To develop a multi-usage tool customized to answer the new challenges being faced by BWSSB.
- To enhance revenue recovery by better monitoring of consumer records and development of better Urban Governance.

Scope of Work

The scope of work under this project included the following:

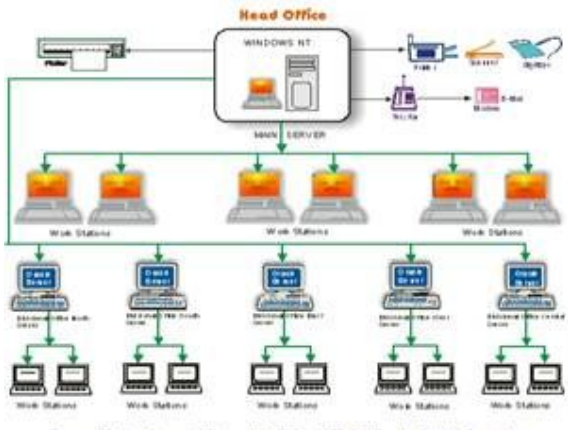
- Supply and Installation of Computers, Networking Products and Peripherals for BWSSB head office and divisional offices.
- Supply of Software on Main Server at Head Office and Workstations at Divisional Offices.

Software for Database/ other Application Development

- **Windows NT Server**
- **Windows NT Workstations**
- **Oracle 8.0 Server and Clients**
- **Oracle Developer 2000**
- **Spatial Database Engine (ArcSDE)**
- **Microsoft Exchange Server**
- **Visual Basic Pro. 5.0**
- **Visual C++ 5.0**
- **PowerBuilder**

Software for GIS Creation and Analysis

ArcInfo Core, ArcFM, ArcView, ArcEdit, ArcCOGO, ArcNetwork, ArcTIN, ArcGRID, ArcSCAN, ArcEXPLORER, ArcPRESS, AutoCAD and ERDAS Imagine.



Computer Network Architecture

GIS Development Services

- Detailed water supply and sewerage systems analysis
- User needs assessment
- Detailed database and GIS design
- Graphical and alphanumerical data collection
- Graphical and alphanumerical data integration
- Development and testing of front-end applications
- Proposals for organizational set-up for BWSSB to use the GIS
- GIS implementation and trial runs
- Capacity Building and Training of BWSSB staff

Project Approach and Methodology

Basemaps for the Project Area

The digital vector data and maps based on aerial photography were provided by NRSA (National Remote Sensing Agency), Hyderabad. 195 A0 maps at 1:2000 scale, each covering 2 sqkms or less, covered the entire BWSSB service area of 290 sq. kms.

BWSSB GIS Application - BISON (Expert & Lite)

The main BWSSB GIS application developed has been named as **BISON Expert** (Bangalore Information System on Networks). This application will be based at BWSSB Head Office and will be used by expert GIS personnel. The **Bison LT** will be based at Divisions & Service Stations.

For main decision makers of BWSSB like Chairman & Chief Engineers, another decision making tool has also been developed called **Management Indicator Panel** (MIP)

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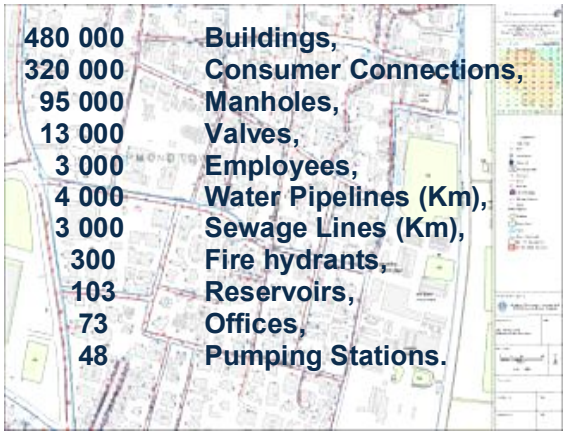
BISON application developed for BWSSB



BWSSB database created by GIS Developers

BWSSB Overhead Tank, Office & Staff

GIS Development Services

Detailed water supply and sewerage systems analysis

- A micro level analysis of the existing situation at BWSSB in terms of data acquisition, storage and management
- Compilation and synthesis of available information
- Identification of information gaps
- Acquisition of the basic knowledge to conduct the UNA (User Needs Assessment)
- Study of BWSSB organization
- Detailed description of procedures followed by BWSSB
- Preliminary stage for GIS and Database design

User needs assessment

This crucial step was undertaken to ascertain the requirements of BWSSB. The main objectives were:

- To assess what BWSSB expects from the GIS
- To assess how BWSSB will utilize the GIS so that the system could be designed to supplement these expectations
- To carry out a detailed analysis of BWSSB's needs
- To inform BWSSB what their expectations really mean in terms of data collection, data integration, data updation, required equipment, staff availability and training on a long term basis
- To finalize in consultation with BWSSB the needs for which applications are to be developed as part of the GIS and Geodatabase
- To select the needs that can be fulfilled within the current project, the needs that can be fulfilled during a project extension and the needs that can only be fulfilled later
- To arrive at a mutual consensus about the implementation of the selected user needs and to tailor a customized GIS

Detailed GIS and Oracle Database Design

- Conceptual Data Model for definition and relations between all data required for the application
- Conceptual Organization and Process Model for elaboration of processes necessary to fulfill the selected needs
- Logical Data Model for definition of logical links between tables designed in the Conceptual Data Model
- Functional Architecture to identify which sites have to be equipped according to the above organization and design
- Physical Data Model, which is a collection of scripts building the entire structure of the Oracle database, designed according to the above requirements
- Design of User Interfaces such as application menus, toolbars, popups and windows, as it will be seen by the users
- Operational Process Model for details of procedures to be coded and Development & testing of front-end application.

Graphical and Alphanumerical Data Collection

- 290 sq. kms spread over 5 Divisions of BWSSB
- 56 Service Stations
- Over 4000 kms of water pipelines
- Over 3000 kms of sewage lines
- Over 3,20,000 consumer connections

Data collected

- Water Supply and Valves
- Sanitary Pipes and Manholes
- House connections and Consumers

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- Overhead Tanks and Ground Level Reservoirs,
- Pumping stations, pumps for Water Supply, Fire hydrants, BWSSB offices, treatment plants and Pumping stations

Data collection team

Data Integration

- Data Entry of Alphanumerical Data using MS Access
- Reporting of Graphical data collected on the field on reference base maps (A0 size – 1: 1200 scale)Conversion of NRSA base maps into the ARCINFO / ARCFM GIS coverages
- Digitization of Graphical data
- ARCINFO conversion after Quality Control
- Corrections and validation by BWSSB
- Final Integration of Data after Topology Building

Development and Testing of Front End Application

- Development of User Interfaces to fulfill BWSSB Needs and procedures of their Functioning
- Coding in VB (Visual Basic) and VBA (Visual Basic for Applications) and Map Objects Lite to implement the Application Modules for the BWSSB needs.
- Procedure Level as well as Global Testing to ensure strict Quality Controls
- Development of Screens and Menus for effective viewing, updation and editing

Training of BWSSB Staff

- Identification and Selection of Trainees
- On-the-job Training to BWSSB Service Station staff during Field Surveys
- Categorized Training to various users according to proposed usage (updation, viewing etc.)
- Training to Decision Makers as well as the Operational Staff

Project Consortium:

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