



Web enabled Road Information System (RIS) coupled with GIS features for National Highways on Golden Quadrilateral of India: Client – National Highways Authority of India, World Bank funded project

Government of India has taken an ambitious plan of improvement of National Highway Network of the country. The highway network after improvement needs to be operated and maintained by developing priority programs and schedules of rehabilitation, maintenance and new construction within budget constraints. To maintain these national Highways, a large amount of data on Road Inventory, Traffic, asset Condition etc. are required to be collected, stored, maintained and retrieved on a continuous basis.

Presently, no comprehensive information system is maintained by road agencies and investment & management decisions for improvement/ maintenance programs are made based on broad performance indicators such as traffic intensity and riding quality of road network. The alternative strategies of improvement are generally not evaluated based on life cycle cost analysis due to lack of availability of information and non availability of analysis tool with road agency and planning organization. This may give rise to making non optimum budget allocations especially while managing fast expanding network of national highways and addition of new expressway system. This has established a need for developing a modern road Information System coupled with intelligent features for management of National Highways.

The RIS system would have the effective role in the process of planning, design, construction and maintenance activities of the department. Budgeting, allocation of funds and maintenance management could be carried out more scientifically through the proposed RIS and thus effective improvements can be achieved in the management of the corridors and environmentally sensitive areas.

Considering above requirements CES-Parkman-PB JV under the aegis of the World Bank has developed a state of the art WEB enabled Road Information System (RIS) of about 5880 Kms. of Golden Quadrilateral (GQ) coupled with GIS features for National Highways Authority of India (NHAI) to monitor the performance of the highways of Golden Quadrilateral “Jewel in the Crown” project in the almanac of Indian Transportation Infrastructure as a stepping stone towards building the intelligent transport system in India.

The RIS would act as a decision support mechanism for monitoring manifold operational activities such as

- Identify & relate Asset to Highway network
- Event Inventory & condition monitoring



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- Pavement condition & Performance Analysis
 - Strategic and Tactical Analysis of Homogeneous sections
 - Vehicle operating cost
 - Travel time Analysis
 - Traffic planning and monitoring
 - Economic performance indicators
 - Identification & monitoring of accident black spots
 - Revenue generation through different Toll operators
 - Information related to Bridge and Special Structures
 - Budgetary Resource Allocation
 - Prioritised road maintenance program

RIS Application Development - Software Engineering Perspective

- Full iterative SDLC (Software Development Life Cycle) deployed in this project consisted of the stages as follows:
 - ❖ System Study and Gap Analysis
 - ❖ Generation of System Requirement Specifications
 - ❖ Conceptual & Detail Design Documentation
 - ❖ Construction of RDBMS & populating with data imports
 - ❖ Iterative process of Software development (Develop – Test – Modify – Develop) at modular functionality, even at sub-assembly level
 - ❖ System integration and alpha-testing
 - ❖ System hosting in the web in public domain ([http://www. NHAI- RIS.org](http://www.NHAI-RIS.org))
 - ❖ Beta testing by clients consultant
 - ❖ Functionality and operational documentation
 - Acceptance Test Plan (ATP)
 - Test Scripts
 - Screen Shots
 - Design Documents
 - User Manuals
 - Training Manuals
 - ❖ Training at four levels
 - Training to Trainers (TTT)
 - Line Managers



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- End Users
 - RIS workshop for NHAI Management

The RIS is envisaged as a **Decision Support System** for management of National Highways on Golden Quadrilateral. The various modules and mandatory components of Road Information System are:

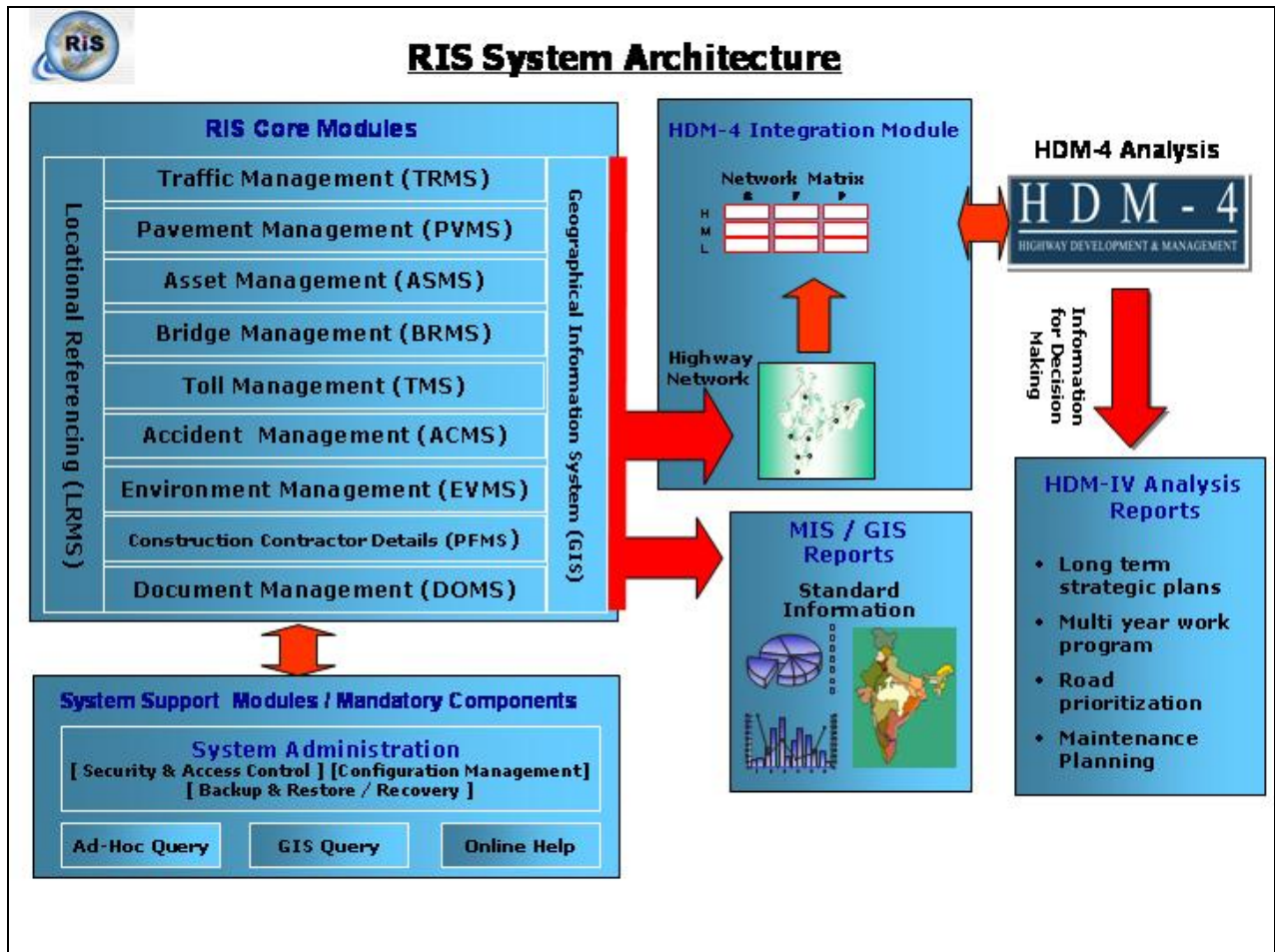
Core Modules

- Locational Referencing System (LRMS)
- Geographical Information System (GIS)
- Traffic Management System (TRMS)
- Pavement Management System (PVMS)
- Asset Management System (ASMS)
- Bridge Management System (BRMS)
- Toll Management System (TOMS)
- Accident Management System (ACMS)
- Environment Management System (EVMS)
- Performance Management System (PFMS)
- Document Management System (DOMS)

Support Modules / Mandatory Components

- HDM-4 Integration Module (HIM)
- System Administration Module (SAM)
 - Configuration Management
 - Security and Access Control (SACM)
 - Backup & Restore / Recovery (BRM)
- Ad-Hoc Query Module (AQM)
- GIS Query
- Online Help

RIS System Architecture Combined with HIM Module



RIS Deployment Architecture

The deployment of Road Information System requires the setup, installation and configuration of the IIS Web Server, Database Server, GIS Server, Image Server and Backup Server with required layer Software, RIS Web Application, Oracle Database with Spatial and Autodesk MapGuide Suite.

All the servers are established in RIS Data Centre which will be connected to ISP through dedicated & secured high speed internet communication link for publishing RIS on internet. NHAi user can access RIS through internet or through NHAi Intranet where NHAi head Quarter will be connected with RIS Data Centre through dedicated & secured high speed lease line.

The deployment architecture of RIS is depicted pictorially as below:

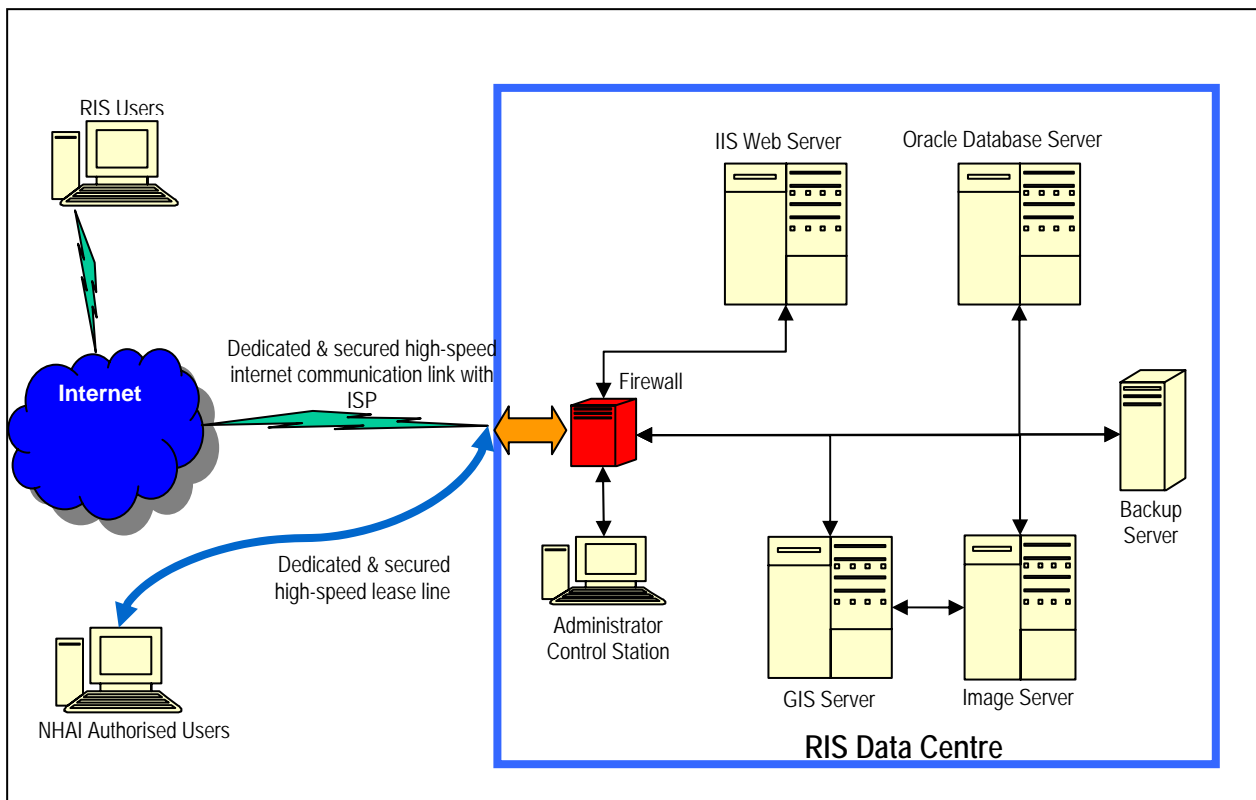


Figure: DEPLOYMENT ARCHITECTURE OF RIS

Few Screen shots of RIS for NHAI (link available on www.nhai.org or www.nhai-ris.org)

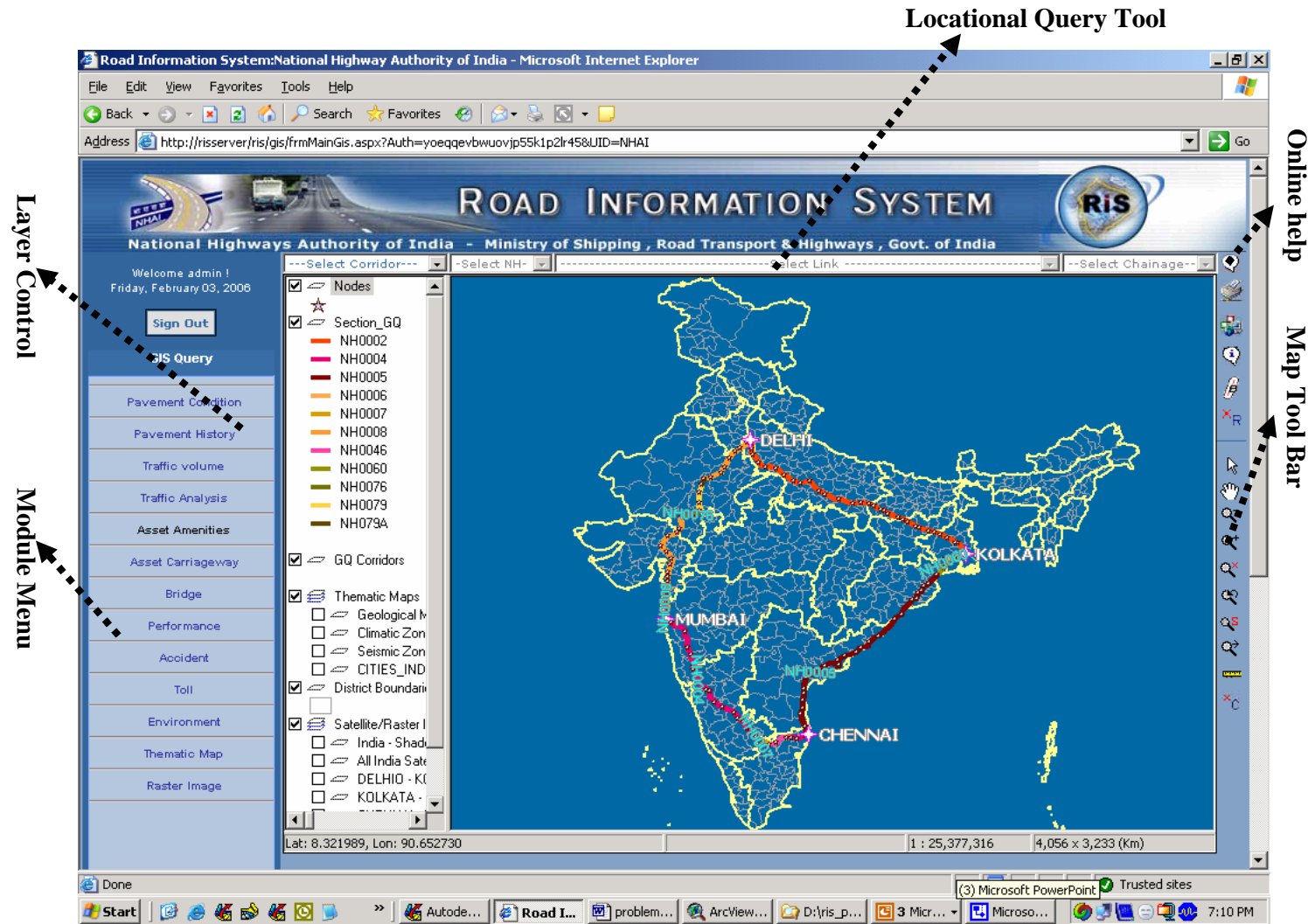


Figure: RIS MAIN PAGE

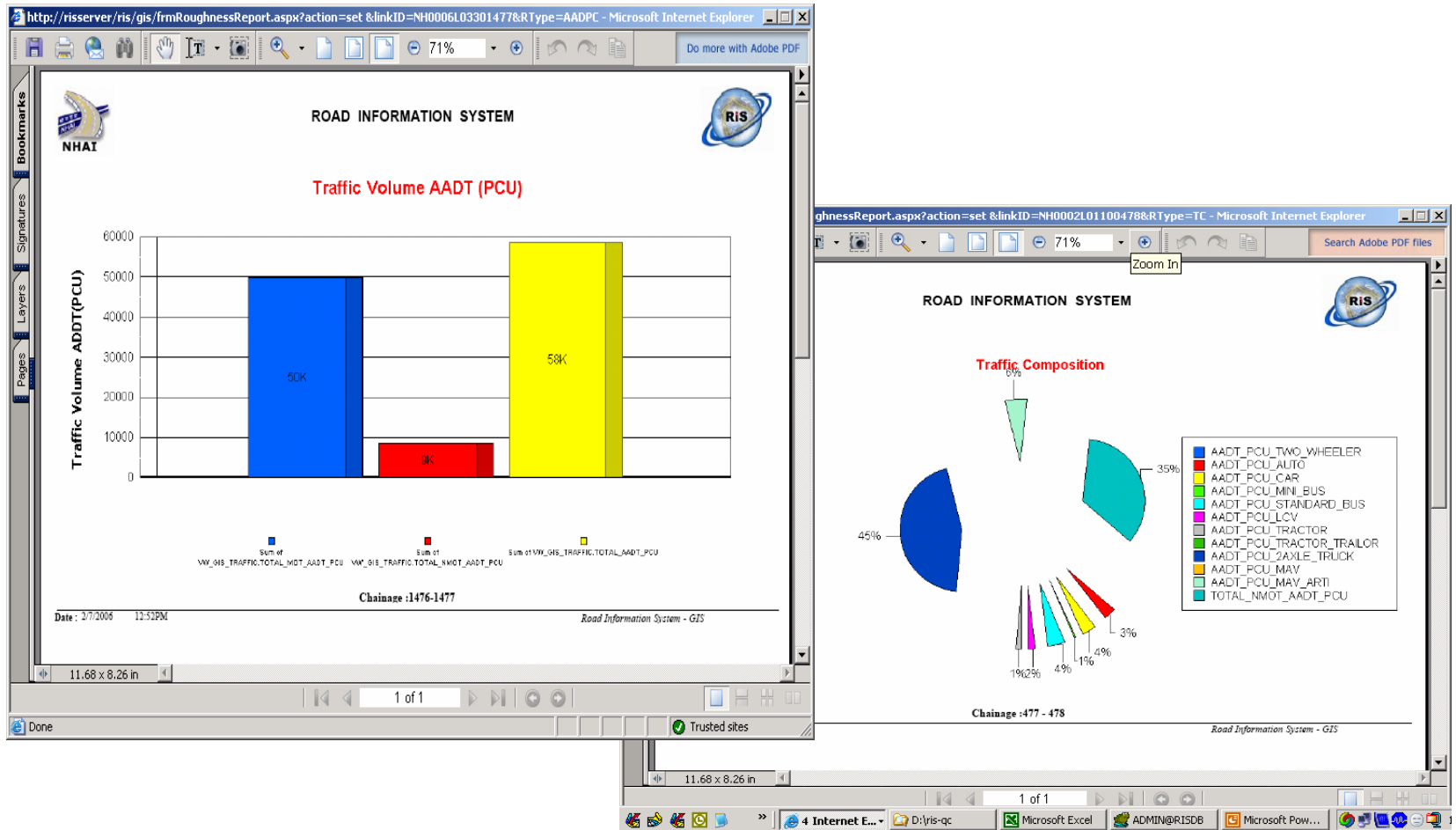


Figure: TRAFFIC GRAPHICAL REPORTS

Popup Window with tabular reporting of data for selected Section

Attribute groups which could be Viewed for selected Section

Selected Section

The screenshot displays the 'Section Information' page in the Road Information System (RIS) web application. The browser address bar shows 'http://risserver - RIS: GIS: Section/Link Details - Microsoft Internet Explorer'. The page title is 'Section Information'.

Module Name: Pavement

Corridor: Mumbai - Delhi

National Highway: NH0076 - Udaipur - Chittaurgarh

Link: Mangalwar - Dungla Road Junction - NH-79 and NH-76 Junction

Chainage: Chainage : 5274-5275

Record 1 to 8 of 8

Sur. Date	Dir.	Rehab. Year	Resur. Year	Pav. Type	Pav. Defl.
01/11/2004	Up	2004		Jointed Plain Concrete Pavement(Dowels)	
01/11/2004	Up	2004		Jointed Plain Concrete Pavement(Dowels)	
01/11/2004	Up	2	2004	Jointed Plain Concrete Pavement(Dowels)	
01/11/2004	Up	1	2004	Jointed Plain Concrete Pavement(Dowels)	
01/11/2004	Down	AVG	2004	Asphalt Mix on Granular Base	
01/11/2004	Down	3	2004	Asphalt Mix on Granular Base	
01/11/2004	Down	2	2004	Asphalt Mix on Granular Base	

The interface also includes a legend for National Highways (NH0076, NH0079, NH079A), a map showing the selected section (NH No. : NH0076, Chainage : 5275), and a sidebar with attribute groups such as Traffic Analysis, Asset Amenities, Bridge, Performance, Accident, Toll, Environment, Thematic Map, and Raster Image.

Figure: FEATURE BASED TABULAR REPORTING FOR SELECTED ATTRIBUTE GROUPS

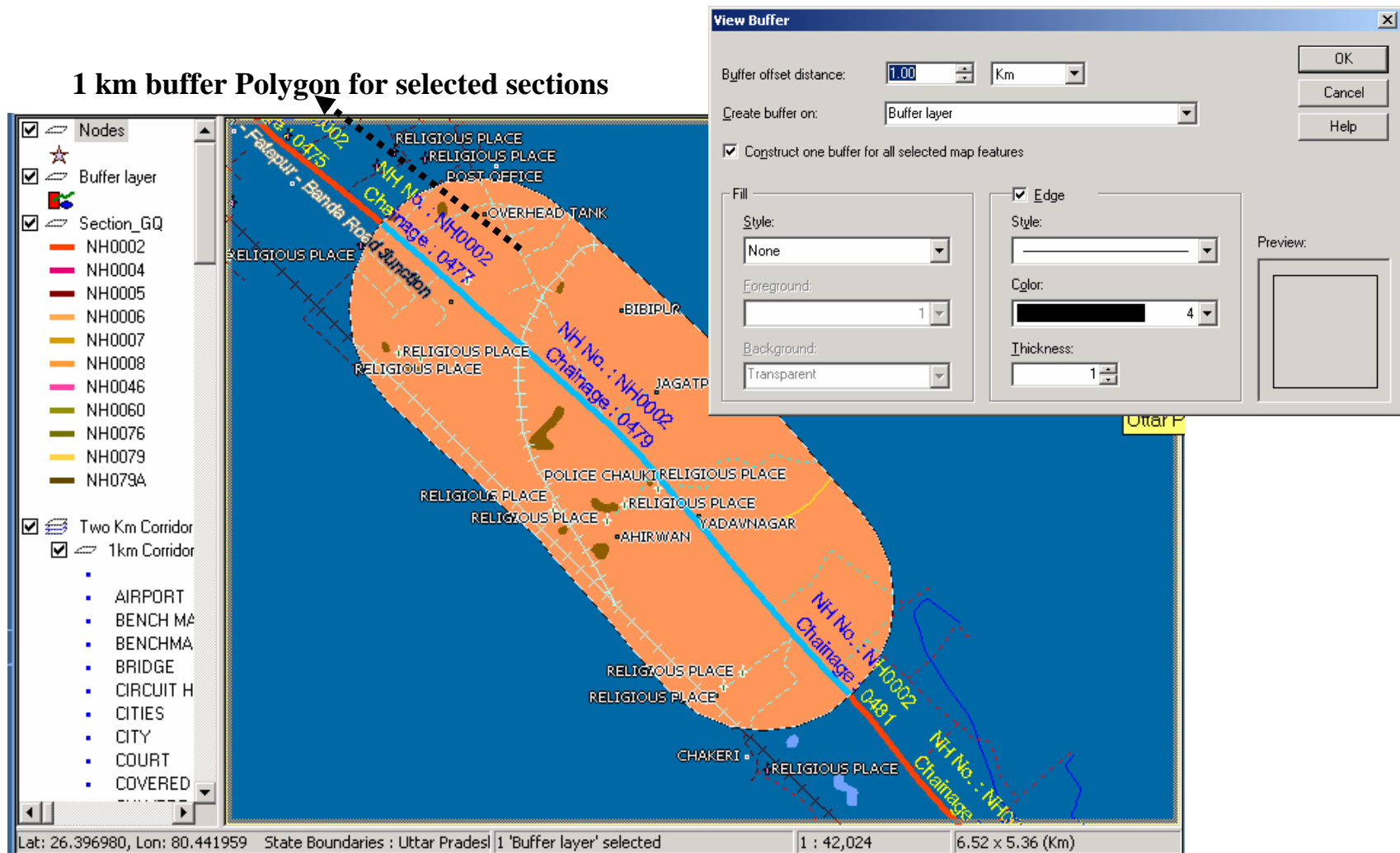
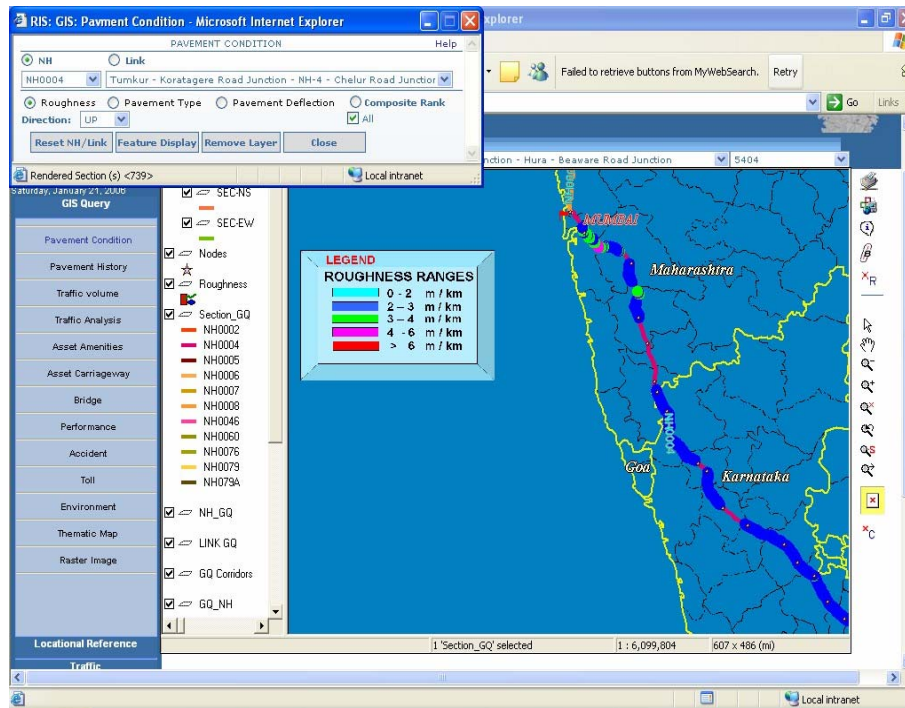


Figure: FEATURE BASED BUFFERING FOR SELECTED SECTION



Pavement condition Query with All value Category

Bridge Type query in the Bridge form

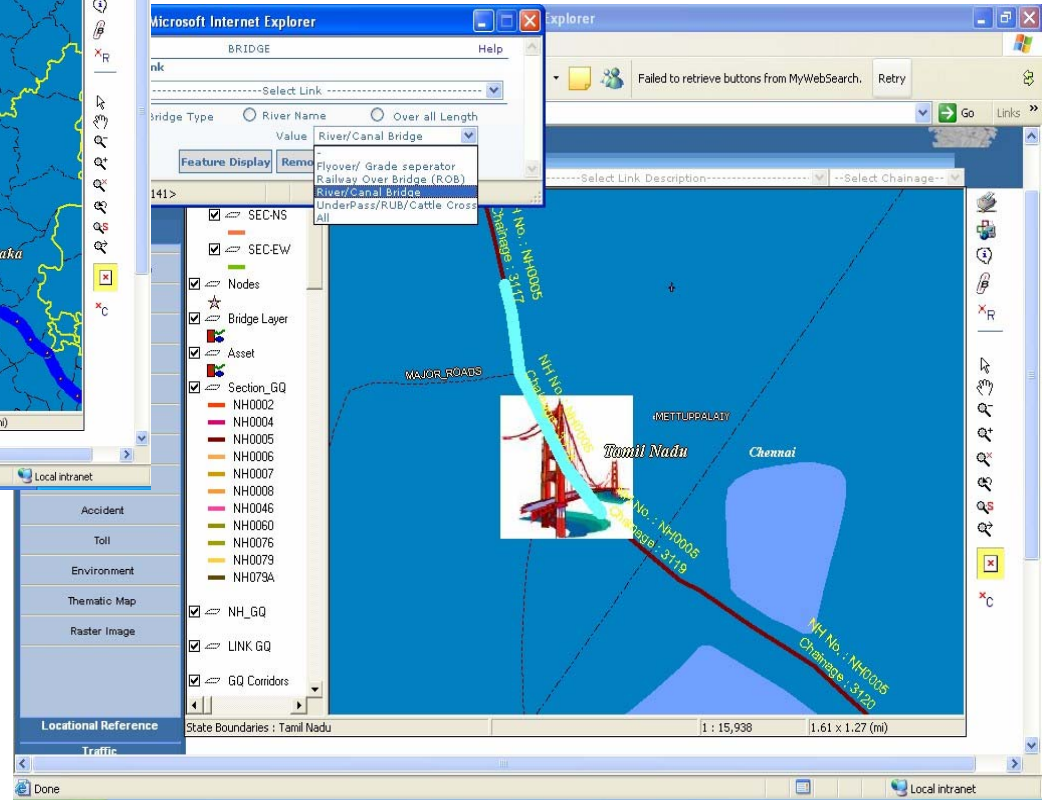


Figure: GIS QUERIES OF THE CRITICAL PARAMETERS