LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
ROADS & TRANSPORT

Travel Demand Management Study

Business Plan: Road Network Management System (RNMS)

Mopani District Municipality

September 2010

25 Thabo Mbeki Street
2ND Floor
The Mall Building
POLOKWANE
0700
(015) 295 3053 (T)
(015) 295 3076 (F)

SSI
A DHV COMPANY
ENGINEERS AND ENVIRONMENTAL CONSULTANTS

Table of Contents

List of Figures

List of Appendices

1. Introduction

The Department of Roads and Transport: Limpopo Province has undertaken an overall Travel Demand Management (TDM) Study covering Mopani and Capricorn District Municipalities. This business plan focuses on the Mopani District Municipality. As described in the District Municipality's TDM report, five pilot programmes were listed in which feasible pilot projects could be identified for short-term implementation. The TDM programmes identified for further investigation included the following:

- ***Maintain a Road Network Management System (RNMS);***
- Undertake a public transport demand study;
- Undertake NMT planning;
- Undertake a traffic signals study;
- Undertake a road safety study.

This document covers the business plan for the implementation and maintenance of a Road Network Management System (RNMS) in the Mopani District and is also applicable to the various local municipalities (Greater Giyani, Greater Letaba, Ba-Phalaborwa, Greater Tzaneen and Maruleng). The purpose of this business plan is not to forward an argument for a Road Network Management System, but to provide a plan to implement an RNMS Plan in the whole of Mopani and on a more detailed level in the local municipalities. This business plan fits into the larger TDM Policy of the District Municipality as well as all the other relevant frameworks and policies.

2. Need for Road Network Management System

In order to prepare meaningful input to the annual roads budget program, it is important that accurate information on the extent and condition of the existing road network is available to officials at the Department. This information is also required for the maintenance of the existing road network and the planning and costing of proposed improvements to the road network. The data permits the prioritizing of expenditure on transport related projects, so that the most urgent needs are addressed first and that the available finances are spent in the most cost-effective manner.

3. Relevant Road Network Management System

There are many different forms of RNMS in current use and these vary substantially in complexity. Essentially these systems consist of a number of modules that are often linked to a Geographic Information System (GIS), which provides a means to analyse the data and also provides a user-friendly method of displaying the information captured in the database. These individual modules generally address issues such as:

- Road traffic information;
- Road pavement condition;
- Inventories of road furniture (such as road signs);
- Costs.

The effectiveness of a Road Network Management System depends to a large extent on the

capabilities of the GIS used and the ability of the different modules to communicate with it. A decision is required regarding the number and type of modules to be incorporated in the system. It is recommended that the system chosen should permit the addition of additional modules later, if so required. The RNMS could be upgraded at a later stage based on the need for specific information and the available budget.

Prior to collecting data for the RNMS, it is necessary to develop a suitable road link identification system. This will enable the GIS to reference data to individual elements of the road network.

There are different available methods of assessing the condition of road pavements and classifying roads according to road type and a decision is required in this regard. Pavement condition assessment is generally conducted using the TRH 9 methodology. The Kwazulu Natal Department of Transport has developed a system of classifying roads in terms of their functionality in the road network and it is anticipated that this methodology will be adopted through-out South Africa.

4. Proposed Methodology

A Road Network Management System (RNMS) is generally comprised of a series of independent modules, each of which addresses a specific issue, but together forms the total system. Since the Modules are independent, the RNMS can be built up by incorporating some or all of the Modules. The RNMS can also be built in a step-wise fashion by starting with one or more modules and then adding additional modules over a period of time.

A list of the modules generally included in a RNMS and the inter-related activities are provided below:

Road Network Module

- Develop coding system for road links;
- Identify suitable road classification system;
- Collection of existing road network data;
- Identify proposed future road links.

Traffic Management Module

- Establish details of traffic data required;
- Collect available traffic data;
- Populate database with traffic information;
- Analyse traffic data;
- Establish annual traffic counting program.

Pavement Management Module

- Identify suitable pavement condition classification system;
- Assess existing pavement condition;
- Populate database with pavement condition data;
- Analyse pavement condition data.

Road Sign Module

- Prepare inventory of existing road traffic signs;

- Assess condition of existing road signs;
- Populate database with traffic sign data.

Geographic Information System (GIS) Module

- Prepare mapping of existing road network
- Link road classification database to maps
- Link traffic information database to maps
- Link pavement condition database to maps
- Link road sign database to maps

Financial Module

- Analyse available data;
- Identify problem areas in road network;
- Prioritize road improvements;
- Prepare annual budget for road maintenance.

This list of Modules is not comprehensive and other modules can also be incorporated in the System, if required.

5. Professional Team

In order to operate a successful Road Network Management System, it is proposed that the following key positions should be included as part of the professional team. These positions include amongst others the following:

- A project leader with similar experience and a technical background in this particular field;
- A transportation engineer with expertise in road network planning and classification;
- A pavement engineer experienced in pavement assessment;
- A roads engineer experienced in the costing of road projects and the design of road signage;
- A Geographic Information Systems (GIS) expert experienced in the preparation of data linked mapping.

6. Time-frame

The implementation of a Road Network Management System can be an expensive exercise. These costs are largely dependent on the size of the road network, the selected detail of the system, the number of modules incorporated in the system and the frequency of surveys. To be an effective tool, the RNMS should be updated, using the results of surveys that are conducted on a regular basis. An example of one year of a typical RNMS program for setting up the system is attached as **Figure 6.1**. Note that the order of tasks undertaken is not fixed and can be adjusted to suit particular circumstances.

Road Network Management System Development	Month 1		Month 2		Month 3		Month 4		Month 5		Month 6		Month 7		Month 8		Month 9		Month 10		Month 11		Month 12	
	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H	1st H	2nd H
1. Road Network Module																								
Develop suitable systems																								
Data collection																								
2. Traffic Module																								
Data collection																								
Analyse traffic data																								
Populate GIS database																								
3. Pavement Module																								
Develop suitable systems																								
Assess pavement condition																								
Analyse data																								
Populate GIS database																								
4. Road Sign Module																								
Inventory of road signs																								
Assess condition of road signs																								
Populate GIS database																								
5. GIS Module																								
Mapping of road network																								
Link road classification to database																								
Link traffic information to database																								
Link pavement condition to database																								
Link road sign information to database																								
6. Financial Module																								
Analyse data																								
Identify problem areas																								
Prioritize Road Improvements																								
Prepare budget																								

Figure 6.1: Project Schedule

7. Budget

It is difficult to estimate the cost of setting up and maintaining a Road Network Management System, as this depends largely on the complexity of the system chosen and the extent of the detail of the information collected. It should be noted that there will be a cost associated with setting up the system and an annual cost of maintaining the system. For preliminary budget purposes an amount of R2 million could be anticipated for setting up the system and an additional amount of R500 000 per annum for maintaining the system. These cost estimates are approximate and the amounts will vary substantially depending on the system chosen.

8. References

- Guidelines for the Functional Classification of Roads in terms of RISFSA; Kwazulu Natal Department of Transport; February 2010.
- TMH 9: 1992: Pavement Management Systems: Standard Visual Assessment Manual for Flexible Pavements, CSRA, Pretoria, December 1992.
- Towards a Travel Demand Management Strategy, City of Cape Town, ITS Engineers, 2006.

ANNEXURE A:

TYPICAL ROAD CLASSIFICATION SYSTEM

RISFSA CLASSIFICATION SYSTEM AND DEPARTMENT OF TRANSPORT ROAD CHARACTERISTICS

NOTES: A 2 Step approach is recommended:

Step 1 Use criteria in columns A to C to determine appropriate classification

Step 2 **Only if classification determined in step 1 is not clear,** use the criteria in column D

A	B	C	D
Road Class	**RISFSA Strategic Function**	**Nature of Roads**	**Road Characteristics**
1. Primary distributor	High mobility roads with limited access for rapid movement of large volumes of people, raw materials, manufactured goods, and agricultural produce of national importance	Public Roads: - Between, through and within regions of national importance; Between, through and within provincial capitals and key cities; Between, through and within major city nodes, which have significant economic or social road traffic; Between South Africa and adjoining countries which have significant national economic or social interaction; Providing access to major freight and passenger terminals including major ports and airports.	• Route Numbering – Freeways numbered on blue background – Other roads on green background – Route number preceded by N / R / M (e.g. N3) • Traffic – Volume (Urban) > 50 000 veh/day/direction – Volume (Rural) > 10 000 veh/day/direction • Access Spacing (freeway standards) – Urban Area – 1,6 to 2,4 km interchange spacing – Rural Area – 15 to 30 km interchange spacing – At-grade intersections positioned at locations aligned to future upgrade planning • Geometric – Urban – Dual Carriageway (3+ lanes) with physical separation and shoulder lanes – Rural – Single Carriageway (2 lanes) with shoulders – Lanes 3,5m+ wide • Public Transport – Urban – Provisions not made, but roads may be used by express services such as SPTN & BRT – Rural – PT facilities available for long distances services at limited locations along route • Pedestrian – Not prevalent due to high traffic volumes and speeds – Provision for pedestrians via grade separated crossings – Developments along roads cordoned off to prevent pedestrians / vehicles / livestock access • Traffic Calming prohibited – except limited sections of high pedestrian accidents / fatalities

A	B	C	D
Road Class	**RISFSA Strategic Function**	**Nature of Roads**	**Road Characteristics**
2. Regional distributor	Relatively high mobility roads with lower levels of access for the movement of large volumes of people, raw materials, manufactured goods, and agricultural produce of regional importance in rural and urban areas	Public roads: - Between and through centres of provincial importance. Between provincial capitals, large towns and municipal administration centres. Between class 1 roads and key centres which have a significant economic, social, tourism or recreational role. Between South Africa and adjoining countries which carry limited economic or social road traffic. For access to transport hubs of regional importance.	• Route Numbering – Numbered with green background – R – Provincial (followed by 2 digits – 10 to 99) – M – Metropolitan eded by N / R / M (e.g. N3) – K – routes (planning) / P – routes administration • Traffic – Volumes – 20 000 to 50 000 veh/day/direction – Lower in rural due to intersection restrictions (e.g. signals) • Access Spacing – Urban Area – 0,6 to 0,8 km intersection spacing – Rural Area – 0,8 to 1,6 km intersection spacing • Geometric – Urban – Dual carriageway (2+ lanes) with physical separation, and no stopping / parking – Rural – Single carriageway with surfaced / gravel shoulders • Public Transport – Formal and informal PT facilities prevalent – Urban – High occupancy vehicles lanes and dedicated right-of-ways for BRT or other forms found • Pedestrian – Crossings provided at intersections – Mid-block pedestrian crossings not allowed – Formal / informal walkways prevalent along routes with high pedestrian activity • Traffic Calming – Prohibited – except limited sections of high pedestrian accidents / fatalities

A	B	C	D
Road Class	**RISFSA Strategic Function**	**Nature of Roads**	**Road Characteristics**
3. District distributor	Moderate mobility with controlled higher levels of access for the movement of people, raw materials, manufactured goods, agricultural produce in rural and urban areas of regional importance	Public roads: - Between centres, towns, and rural residential areas and villages. Between centres, towns and industrial/ farming areas. Between residential areas and local industrial/commercial areas. Between large residential areas. Which provide linkages between a Class 2 and/or Class 1 routes. Which provide linkage between centres, towns, rural residential, industrial/farming areas and Class 2 or Class 1 routes.	• Route Numbering – Roads generally numbered with green background – Rural – R prefix (provincial) with 03 digits – Metropolitan – M prefix • Traffic – Minor arterials carrying 10 000 – 40 000 veh/day/direction – Lower in rural / developing areas • Access Spacing – Urban Area – 0,45 to 0,6 km intersection spacing – Rural Area – 0,8+ km intersection spacing – Direct access prohibited, with marginal and partial access often permitted • Geometric – Urban – Dual carriageway (2 lanes) with physical separation, or undivided 4 lanes with no on-street parking permitted – Rural – Single carriageway, which can include gravel roads • Public Transport – Important public transport routes in urban and rural areas – Formal / informal PT facilities such as taxi lay-byes can be found at intersections • Pedestrian – Pedestrian use road in some numbers – Pedestrian-vehicular conflict widespread, especially near public transport facilities • Traffic Calming – Prohibited – except limited sections of high pedestrian accidents / fatalities

A	B	C	D
Road Class	**RISFSA Strategic Function**	**Nature of Roads**	**Road Characteristics**
4. District collector	High levels of access and lower levels of mobility for lower traffic volumes of people, raw materials, manufactured goods, agricultural produce in rural and urban areas of local importance	Public roads: - Between villages, farming areas and scattered rural settlements and communities, which primarily serve local social services as well as access to markets. Within a commercial, residential, industrial areas. Linking Class 3 roads.	• Route Numbering – Not numbered unless they form continuation of Class 03 route • Traffic – Volumes in excess of 10 000 veh/day – Capacity may be limited to 25 000 vehicle/day due to slowing moving nature of traffic, delays at intersections, and interaction between vehicular- pedestrian traffic • Access Spacing – Urban Area – 0,2 to 0,5 km intersection spacing – Closer than Class 03 roads, which reflects in the lower maximum speed regime • Geometric – Urban – Dual carriageway (2 lanes) – Physical separation usually provided to protect right turn movements – Lane widths may be as low as 3,2 m wide • Public Transport – Often serve as primary public transport routes – Formal / informal PT facilities such as taxi lay-byes can be found at intersections • Pedestrian – Paved sidewalks and protected pedestrian crossing points are common • Traffic Calming – Prohibited – except limited sections of high pedestrian accidents / fatalities

A	B	C	D
Road Class	**RISFSA Strategic Function**	**Nature of Roads**	**Road Characteristics**
5. Access roads	High access and very low mobility routes for the movement of people and goods within urban and rural areas.	Public roads: Within a residential community. From a Class 3 or 4 to a residential community. To provide direct access to industries and businesses. To provide access to specific destinations such as heritage sites, national parks, mines, forests etc.	• Route Numbering – These streets are usually not numbered – Street names are usually displayed at intersections • Traffic – Urban - Volumes lower than 5 000 veh/day – Commercial / Industrial – Volumes lower than 15 000 veh/day • Access Spacing – Urban Area – 0,2 to 0,3 km intersection spacing – Direct access is permitted • Geometric – Single carriageway with single lanes per direction – On-street parking permissible – Loading facilities permissible • Public Transport – Serve public transport, however not normally primary routes • Pedestrian – Pedestrians and cyclists widespread – Paved footpaths provided with mid-block pedestrian crossings permitted on busier roads • Traffic Calming – Traffic calming may be found

A	B	C	D
Road Class	**RISFSA Strategic Function**	**Nature of Roads**	**Road Characteristics**
6. Non motorized access ways	Public rights of ways for non-motorized transport providing the basic and dedicated movement	Public right of way: To provide safe access and mobility for pedestrians, cyclists and animal drawn transport. For social, recreational and economic access.	• Route Numbering – These routes are normally not numbered • Traffic – Vehicular traffic absent as designated exclusively for pedestrian and cyclist use • Access Spacing – Intersection spacing is not relevant • Geometric – Designed as per applicable design standards • Public Transport – These routes often lead to public transport nodes • Pedestrian – High pedestrians and cyclists is prevalent • Traffic Calming – Not Applicable

ANNEXURE B

KZN SUBSETS TO THE RISFSA CLASSIFICATION SYSTEM

The RISFSA classification system consists of 6 different classes of public roads. However, to facilitate future analyses on the road network within KwaZulu-Natal, certain subsets have been introduced as described in the following procedure. In addition, roads and tracks that are considered to be 'private' have been grouped into an additional class 7 category. Although this is not a category within the RISFSA system, it does ensure that all identified roads, tracks and footpaths are assigned a classification for record purposes.

Where "Land Use Area" numbers are used in the Subset Criteria column, these refer to the identified land use as recorded in the KZN Province Land Cover Database (see the attached appendix 4):

Road Class	RISFSA Strategic Function	Nature of Roads	Subsets	
			Description	Criteria
4. District collector	High levels of access and lower levels of mobility for lower traffic volumes of people, raw materials, manufactured goods, agricultural produce in rural and urban areas of local importance	Public roads: - Between villages, farming areas and scattered rural settlements and communities, which primarily serve local social services as well as access to markets. Within a commercial, residential, industrial areas. Linking Class 3 roads.	4A Urban district collectors	Collector roads and major public transport routes within built-up commercial, residential, or industrial areas
			4B Rural district collectors	All Areas • Major public transport routes • Roads with several 'tributary' Access Roads (class 5 roads) turning off them • Significant links between Class 3 roads and/or Class 2 roads and/or Class 1 roads • Links to villages, significant rural settlements, or rural communities Tribal Authority Areas • Roads serving 3 or more social services (schools, clinics, pension payouts, etc), or cultivated land in excess of 1,000 Ha. • Significant access to markets Commercial Farming Areas • Roads serving 5 or more separate agricultural holdings totalling 1,000 Ha or more.

Road Class	RISFSA Strategic Function	Nature of Roads	Subsets	
			Description	Criteria
5. Access roads	High access and very low mobility routes for the movement of people and goods within urban and rural areas.	Public roads: Within a residential community. From a Class 3 or 4 to a residential community. To provide direct access to industries and businesses. To provide access to specific destinations such as heritage sites, national parks, mines, forests etc.	5A Urban access roads	Public roads and streets in urban areas that comply with the RISFSA criteria. In this context 'urban areas' include formal urbanized areas, as well as built up areas in villages and medium to large communal settlements.
			5B Major rural access roads	All Areas • Roads serving public facilities and social services, including schools, clinics, pension payouts, railway stations, etc. • Public roads leading to and serving housing clusters, rural settlements and communities • Public roads within villages, significant rural settlements and communities Tribal areas: • Roads serving cultivated lands in excess of 500 Ha (2,2 Km X 2,2 Km) • Well trafficked roads serving the community or 10 or more households Commercial Farming Areas Criteria to be applied in commercial farming areas are: • Roads serving 5 or more separate agricultural holdings totalling more than 500 Ha (2,2 Km X 2,2 Km)
			5C Minor rural access roads	Rural roads that do not qualify as Major Rural Access Roads, but serve 2 or more separate properties. These roads will be maintained by local users, but the public has the right to use them. **Note:** 5C roads will only occur outside of traditional authority areas.
6. Non motorized access ways	Public rights of ways for non-motorized transport providing the basic and dedicated movement	Public right of way: To provide safe access and mobility for pedestrians, cyclists and animal drawn transport. For social, recreational and economic access.	6A Public rights of ways for non-motorised transport	Public tracks, lanes and paths outside of traditional authority areas that are used predominantly by pedestrians, bicycles or other non-motorised vehicles. **Note:** paths and tracks within the road reserve of a public road are considered to form part of that public road and are not classified separately.
			6B Footpaths and tracks in Tribal	All minor roads, tracks and footpaths within traditional authority areas that have not been given a higher classification

Road Class	RISFSA Strategic Function	Nature of Roads	Subsets	
			Description	Criteria
			Areas	
7 Private roads and tracks		Roads and tracks that the public does not have the right to use. These include: Roads and tracks within a gated area or beyond a control point. Roads and tracks contained within 1 or 2 adjoining properties.	7A Private streets	All streets within gated areas. These will normally be identified through liaison with the Municipalities
			7B Game reserves, game farms and nature reserves	Roads contained within the boundaries of game reserves, game farms and nature reserves
			7C Private rights of ways	Either private roads leading to landlocked properties on private roads, or the section of road through the last property at the end of a class 5 road
			7D Plantations	Roads contained within 1 or 2 adjoining properties in land use areas 2, 3, 25 outside of tribal areas
			7E Sugarcane	Roads contained within 1 or 2 adjoining properties in land use areas 9, 10 outside of tribal areas
			7F Commercial crops	Roads contained within 1 or 2 adjoining properties in land use areas 6, 7, 8, 16, and 17 outside of tribal areas
			7G Other	Roads contained within 1 or 2 adjoining properties in land use areas 4, 5, 11, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33 outside of tribal areas