

# **N3 TOLL CONCESSION (PTY) LTD: Enhancing Safety, Convenience and Mobility along the N3 Toll Route**

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## **ABSTRACT**

The N3 Toll Concession (Pty) Ltd (N3TC) was established in November 1999, following an official Public Tender process, the South African National Road Agency Limited (SANRAL) appointed N3TC as the Concessionaire responsible for a portion of the N3 from Cedara in KwaZulu-Natal to Heidelberg in Gauteng for a thirty-year Concession Period. This paper presents a brief overview of the N3TC, its vision to grow road user value through enhancing safety, convenience and mobility along the N3 Toll Route. The tools and mechanisms used by N3TC in promoting this vision and the lessons learnt are discussed.

## **1. INTRODUCTION**

The N3 Toll Route is the primary corridor in South Africa connecting the Port of Durban, the busiest in Africa and the Gauteng Province, South Africa's industrial and economic hub. The movement of people and goods is essential to achieving economic growth in a country and improving the lifestyle of its citizens (Kar & Datta 2009). N3TC recognises the importance of enhancing safety, convenience and mobility in order to optimise benefits from the investments made in developing and maintaining the N3 Toll Route. The quick facts about N3TC include:-

- N3TC has a thirty-year Concession Contract with SANRAL to manage a portion of the N3 (N3 Toll Route) between Johannesburg and Durban;
- N3TC's primary obligations are to Design, Construct, Finance, Operate and Maintain the N3 Toll Route;
- The N3 Toll Route starts at Cedara in KwaZulu-Natal and ends at Heidelberg in Gauteng; the N3 Toll Route covers a total distance of 418 kilometres;
- The N3 Toll Route spans four provinces, namely: Gauteng, Mpumalanga, Free State and KwaZulu Natal;
- The N3 Toll Route incorporates four mainline toll plazas and five associated ramp plazas;
- An average of 58 million tons of freight is carried on the N3 Toll Route per annum;
- Heavy vehicles constitute more than 30% of the traffic on the N3 Toll Route.
- Current traffic volumes vary between 8500 and 13 500 vehicles per day;
- On average 50 000 toll transactions are registered daily;
- A fully operational 24/7 Route Control Centre, linked to a dedicated toll free number – 0800 N3 HELP (0800 63 4357) - is available to all N3 Toll Route users; and
- There are more than 20 tourism routes or meanders within close proximity to the N3 Toll Route.

## **2. SCOPE AND OBJECTIVES**

The scope of this paper is to introduce N3TC's vision that aims to increase road user value through enhanced safety, mobility and convenience. It is N3TC's vision to maintain and grow a sound engineering and financial platform, while refining and expanding its business model to address road user's needs – safety, convenience and mobility.

## **3. ENHANCING SAFETY**

### **3.1 Introduction**

It is known that road safety can be improved through Education, Engineering and Enforcement (The three E's). In this section it will be explained how N3TC uses tools such as an Incident Management System (IMS) and an Incident Reporting Information System (IRIS) to analyze incidents and implement safety measures.

### **3.2 Incident Management System (IMS)**

Incident Management is defined as “the pre-planned and co-ordinated response to incidents with the aim to restoring normal road capacity and safety levels as quickly as possible” (SANRAL). It is clear from this definition that an effective IMS is a key to enhance mobility. Thus when a serious accident occurs, every second counts and the rapid response to the incident scene with the right equipment and expertise can save lives and minimize delays. In this regard the N3-Route Control Centre (N3-RCC) serves as a centre of communication between the Road Traffic Inspectorate (RTI), the South African Police Services (SAPS), the N3TC Incident Management Services (N3-IMS), the Emergency Medical Services (EMS), the Clean-up companies and the Tow Vehicle operators.

The N3-IMS team consists of a Route Manager and two Regional Managers, one responsible for the southern section from Van Reenen Village to the Cedara Interchange and the other for the northern section from Van Reenen Village to the Heidelberg Interchange. This N3-IMS team is supported by the N3TC Engineers, Route Patrol Services and the N3TC Route Control Centre (N3-RCC).

The N3TC has developed IMS protocols along the route involving all stakeholders. The N3-IMS team plays an ongoing role in supporting and assisting with the co-ordination of all services to ensure effective notification, response and co-ordination amongst the various service providers. The N3-IMS is further enhanced through ongoing training of the Service Providers, Focus Group Meetings, IMS Cluster Meetings and Debriefings following incidents which provide for dynamic feedback from the members into the system.

### **3.3 Incident Reporting Information System (IRIS)**

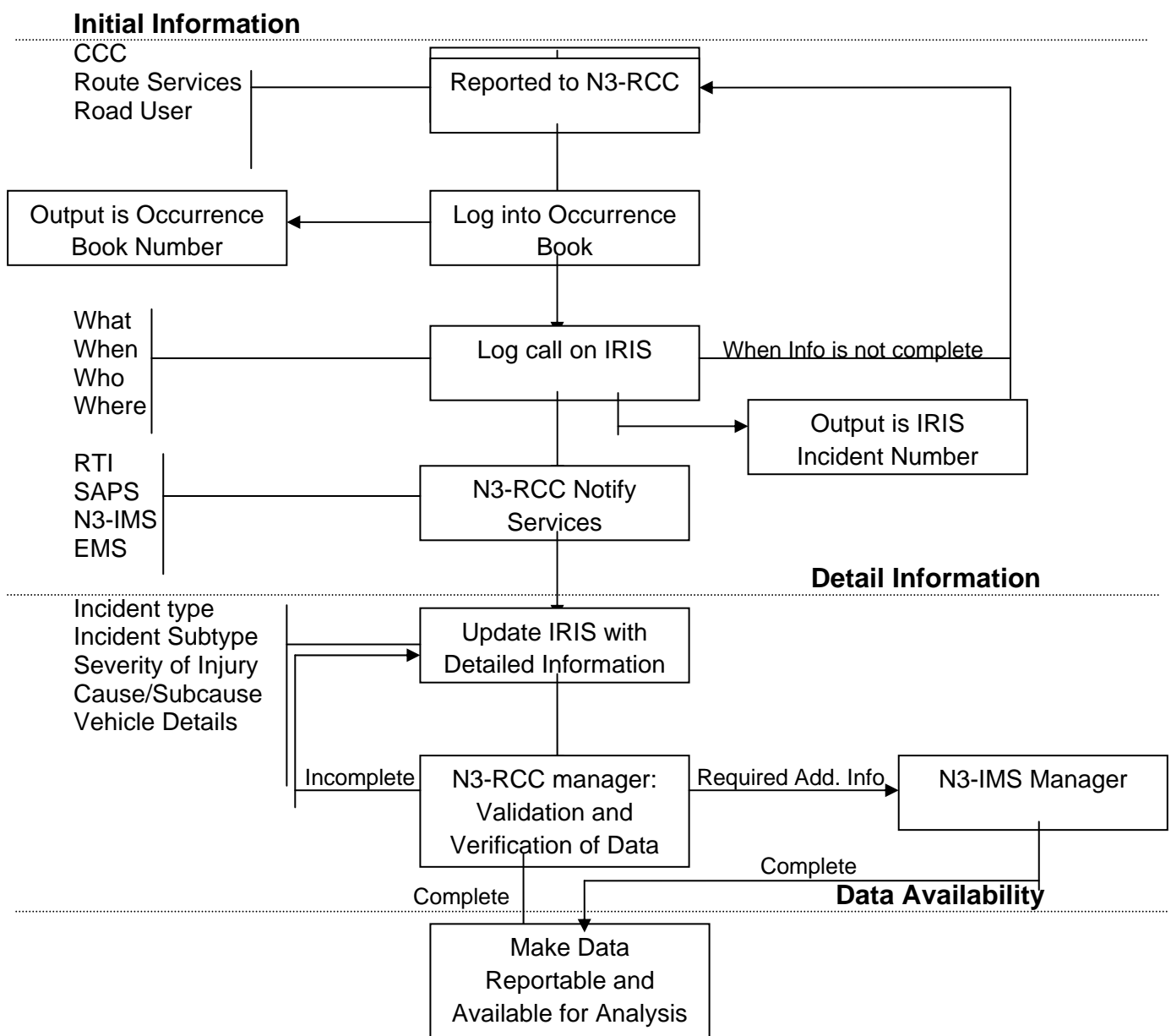
The improved access to crash data by researchers greatly benefits general research and development in the field of road safety (Labuschagne, 2008). The IRIS was developed by N3TC and it is managed and maintained by the N3TC Route Control Centre (N3-RCC) which is responsible for verifying and validating the incident data collected from the scenes. The following parameters are recorded on the IRIS database:

- Incident type (Crash, Obstruction or Fire)
- Incident subtype ( Rolled, Head tail, Head-On, Single, Multiple or Other)
- Date, time and direction of incident;
- Severity of injury (Fatal, Serious, Slight or Not Serious);

- Route and kilometer section;
- Vehicle/s details (Type, Make, Model, Driver, Owner, Loads);
- Pavement Condition;
- Weather (Clear, Mist, Overcast or Rain);
- Probable cause ( Human, Object on Road, Pedestrian, Animal, Vehicle, Construction or Weather);
- Sub cause (Alcohol, Speeding, Fatigue, Lost Control, Mechanical Failure etc) and
- Dangerous goods (Yes or No).

Controls within IRIS assist in minimizing errors and ensuring that all essential fields are captured. The flow diagram in the next page presents the data capturing and verification process.

All radio and telephone calls are logged for verification purposes, thereby ensuring data integrity.



**Figure 1: IRIS Data Capturing Procedure**

During 2009, 934 crashes were recorded in IRIS. As an example, the 2009 IRIS Crash data is presented in Table 1. Apart from storing data, the IRIS information is used to analyze crashes and implement improvements that are useful to enhance safety measures along the route.

**Table 1: Summary of Crashes N3 Toll Route 2009**

Accident Type	Direction			Proportion of Accidents		
	Both	North	South	Both	North	South
Head-Tail	274	148	126	29.3%	28.6%	30.3%
Vehicle Left Road	198	110	88	21.2%	21.2%	21.2%
Object /Dropped on Road	22	16	6	2.4%	3.1%	1.4%
Vehicle Rolled	225	123	102	24.1%	23.7%	24.5%
Side Swipe	45	29	16	4.8%	5.6%	3.8%
Head-On	47	25	22	5.0%	4.8%	5.3%
Multiple Pile Up	21	15	6	2.2%	2.9%	1.4%
Livestock/Pedestrian	44	26	18	4.7%	5.0%	4.3%
Other	58	26	32	6.2%	5.0%	7.7%

As can be seen from the table above, the three most common sub- types of crashes on the N3 Toll Route are head-tail (29.3%), vehicles rolling (24.1%), and vehicles leaving the road (21.2%).

Crashes can be further classified with regards to weather conditions, time of day or direction of travel (Table 2). From Table 3 it can be seen that 78.2% of 934 crashes recorded in IRIS during 2009 occurred at clear weather, 12.3% took place under wet conditions (rain and hail), 51.5% at night (18:00 PM to 06:00 AM) and 55.5% in the northbound direction.

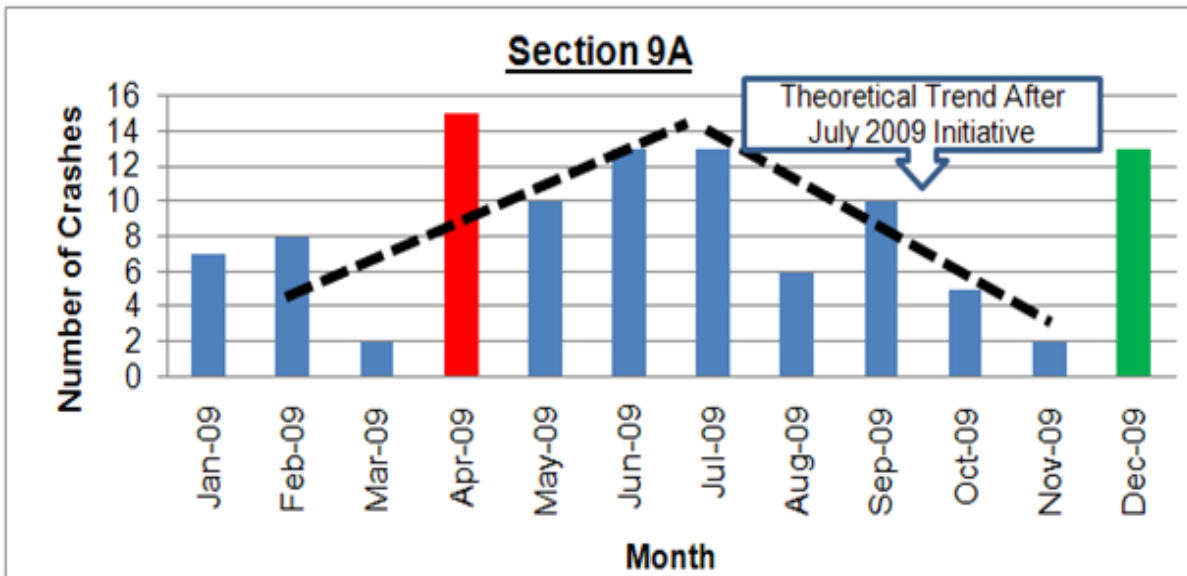
**Table 2: Summary of prevailing conditions related to all crashes 2009**

Prevailing Conditions	Direction			Proportion of Accidents		
	Both	North	South	Both	North	South
Day	453	255	198	48.5%	49.2%	47.4%
Night	481	263	218	51.5%	50.8%	52.2%
Clear	730	406	324	78.2%	78.4%	77.5%
Rain	105	57	48	11.2%	11.0%	11.5%
Mist	30	20	10	3.2%	3.9%	2.4%
Hail	10	5	5	1.1%	1.0%	1.2%
Overcast	35	22	13	3.7%	4.2%	3.1%
Wind	24	8	16	2.6%	1.5%	3.8%

The information obtained from IRIS can be useful in identifying the cause of the incident and assists in implementing a suitable solution. The results of IRIS are made available to the RTI, the SAPS, the EMS and the other agencies, allowing for proactive measures to be implemented.

By way of an example on N3 Section 9A, Keeversfontein Interchange to Van Reenen Village the benefits derived from IRIS is presented in Figure 2. This section includes the notorious Van Reenen's Pass. The Van Reenen's Pass has limited capacity, mountainous terrain, bad weather, steep grades, deep valleys and gorges (Olivier, 2008).

Figure 2 presents the before scenario (January to July) and after scenario (August to December) utilizing IRIS output information. The measures implemented included monthly focus group meetings with the SAPS and the RTI who in turn increased their visibility on the pass. The Variable Message Signals (VMS) on the pass were used to promote safety and a media release also highlighted the safety problems. As can be seen from Figure 2 the measures implemented yielded improved results.



**Figure 2: Monthly Trend of Crashes at N3 Section 9A during 2009**

(\*Red bar April (Easter), \*Green bar December (Festive))

## 4. ENHANCING CONVENIENCE

### 4.1 Introduction

Convenience is defined as the ease with which the road user, be it business travellers, recreational travellers or the commercial hauliers travel along the N3. This section outlines how convenience can be enhanced through the implementation of various initiatives. Convenience with regards to Heavy Vehicles (HV's) is also discussed.

### 4.2 Tourism Gateway & Route Help Centre

South Africa has seven primary transport corridors of which the N3 Corridor between Gauteng and Durban is the most strategic regarding freight movement and Tourism (National Freight Logistic Strategy, 2005).

N3TC established the N3 Gateway Tourism Association with objective of promoting and developing tourism along the N3. The tourist attractions provide the travelling public with the opportunity to break their journey which reduces driver fatigue. Fatigue is reported as one of the main contributory factors in crashes (Botha & Van der Walt, 2006).

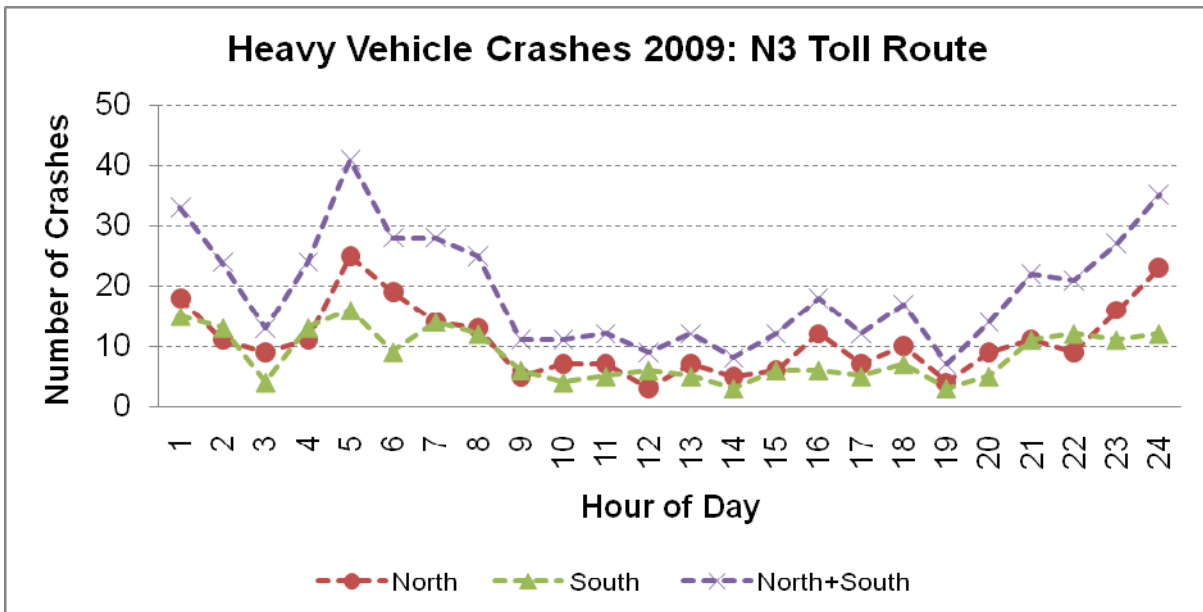
In addition to the Tourism Gateway Project, N3TC opened a Route Help Centre (RHC) in Harrismith, where road users, especially tourists are provided with information on local and regional attractions.

The N3TC website ([www.n3tc.co.za](http://www.n3tc.co.za)) provides information on the N3, construction activities, tolls, route attractions and places of rest.

### 4.3 Heavy Vehicles

The heavy vehicles on the N3 Toll Route make up about 30% of the total traffic.

Unlike light vehicle drivers, heavy vehicle drivers often drive long hours and at night. The implications of long working hours are fatigue which results in crashes involving HV's (National Road Strategy, 2005). In 2009 464 HV's crashes occurred on the N3 Toll Route. Figure 3 indicates the HV's crashes by hour of day during 2009.



**Figure 3: Time distribution of Heavy Vehicle Crashes on N3 Toll Route, 2009**

The northbound and southbound HV's crashes by hour of day showed similar pattern of time crash occurrence (Figure 3). The three critical hours for HV's crashes were identified as 05:00AM (8.8 % of all HV's crashes), 24:00 (7.5% of all HV's crashes) and 01:00 (7.1% of all HV's crashes).

Table 3 presents the type of HV's crashes during 2009. The three most common types of crashes associated with HV's during 2009 were head-tail (41.2%), rolling (17.2%), and leaving the road (15.1%).

**Table 3: Type of HV's crashes 2009**

Accident Type	Direction			Proportion of Accidents		
	Both	North	South	Both	North	South
Head-Tail	191	102	89	41.2%	39.1%	44.3%
Vehicle Left Road	70	38	32	15.1%	14.6%	15.9%
Object /Dropped on Road	11	9	2	2.4%	3.5%	1.0%
Vehicle Rolled	80	42	38	17.2%	16.1%	18.9%
Side Swipe	31	24	7	6.7%	9.2%	3.5%
Head-On	21	16	5	4.5%	6.1%	2.5%
Multiple Pile Up	14	9	5	3.0%	3.5%	2.5%
Livestock/Pedestrian	10	4	6	2.2%	1.5%	3.0%
Other	36	17	19	7.8%	6.5%	9.5%

N3TC through its subsidiary company Zimele realised the need to increase the level of convenience for heavy vehicles drivers. This was achieved by upgrading the Warden and Harrismith truck stops. In addition to these, Zimele partnered with existing service stations to increase their truck stop facilities.

In 2009 a private company developed a new 200-bay truck stop just to the north of the Vaal River along the N3.

In addition to this, night truck operations were intensified by N3-IMS with the SAPS and the RTI to remove and prosecute the trucks that park illegally alongside the roadway. Other initiatives included testing HV's roadworthiness at specific test centres and conducting the test regarding the health of drivers on Truck Wellness days along the route.

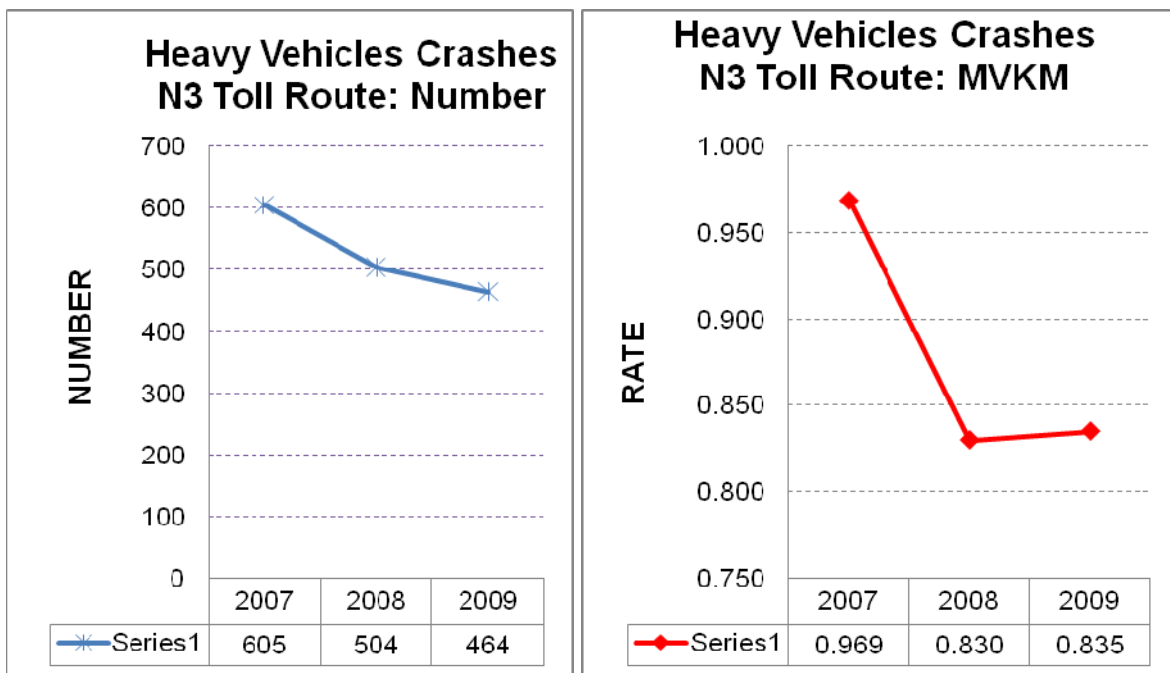
According to National Department of Transport's *Annual Freight Strategy (2005)* the prevalence of HIV/AIDS is significantly higher among long distance truck drivers than any other groups, although reliable statistics are scarce. Accordingly the health condition of truck drivers is a concern and N3TC arranged for the medical services in KZN to offer truck drivers the opportunity to have medical tests done whilst en route. The tests were done on body mass index, eye sight, blood pressure and blood sugar during Truck Wellness days. The drivers were also given the opportunity to voluntarily have their TB and HIV/AIDS status tested.

During 2009 three truck wellness days were held along the route in KZN (Table 4). It was found that out of 521 tests done for blood pressure, 29% were referred for attention, 310 done for blood sugar, 19% were referred for attention, 146 done for tuberculosis, 4.1% were referred for attention, 77 done for HIV/AIDS, 17% were referred for attention, 214 done for eye test, 13% were issued with spectacles. The results indicate that there is clearly a health problem associated with truck drivers.

**Table 4: Truck Driver Health Test Results**

Test	Mooi Plaza		Bergville Ramp Plaza		Mooi Plaza	
	May-09		Oct-09		Nov-09	
	Number Tested	Number referred for Attention	Number Tested	Number referred for Attention	Number Tested	Number referred for Attention
Blood Pressure	127	22	295	104	99	25
Blood Sugar	86	6	125	39	99	14
Tuberculosis	25	4	95	0	26	2
VCT	30	0	19	7	28	6
Eye Screening	63		95		56	
No of spec issued	15	10	10	15	10	3
Physiotherapy & occupational therapy	11	0	54	0	27	0
Audio	-	-	60	0	-	-

It can be said that the measures such as upgrading of truck stops, provision of extra truck stop, HV's roadworthiness projects, Truck Wellness days , night truck operations and other initiatives have had positive impact which resulted in decrease in number of HV's crashes and HV's crashes per million vehicle kilometre since from 2007 to 2009 (Figure 4).



**Figure 4: Heavy vehicles crashes by number and per MVKM on the N3 Toll Route**

The number of crashes decreased from 605 in 2007 to 504 in 2009 a decrease of 16.7%. From 2008 to 2009 the HV's crashes decreased from 504 in 2008 to 464 in 2009, a decrease of 7.9 %.

The HV's crash rate per MVKM, which is a true indicator of the performance of the route with regard to HV's crashes decreased from 0.969 in 2007 to 0.830 in 2008, a decrease of 14.3%. From 2008 to 2009 the HV's crash rate increased slightly from 0.830 to 0.835, an increase of 0.6%



## 5. ENHANCING MOBILITY

### 5.1 Introduction

Mobility can be defined as “undisturbed” or free flow of traffic, without congestion, along the route, through construction sites, at accident scenes and through Toll Plazas. The measures implemented by N3TC to enhance mobility are discussed in this section.

### 5.2 Route Control Centre and Route Services

In 2008 N3TC launched its 24 hour N3TC Route Control Centre (N3-RCC) together with its Customer Care Line, 0800 N3 HELP. In addition to this N3TC also implemented a new Route Services Contract, which provides route patrol services and customer care to stranded road users. The N3-RCC number, 0800N3HELP, allows road users to report any matter on the N3 Toll Route. If necessary, a route patrol vehicle is dispatched to assist. These route patrol vehicles are on the road 24/7, patrolling the N3 Toll Route. The N3-RCC also uses and controls the Variable Message Signs (VMS's) to relay information to the road users, about crashes, weather conditions and construction activity. In addition to this means of communication the N3-RCC also informs registered participants via Short Message Services (SMS's). During the year 2009, the N3-RCC made 56 694 calls and received 59 557 calls (Refer to Figure 5). The issues managed by N3-RCC include:

- Mechanical Problems
- Provision of emergency Fuel
- Obstructions
- Crashes
- Bad Driving
- Complaints
- Customer safety
- Linking of Services

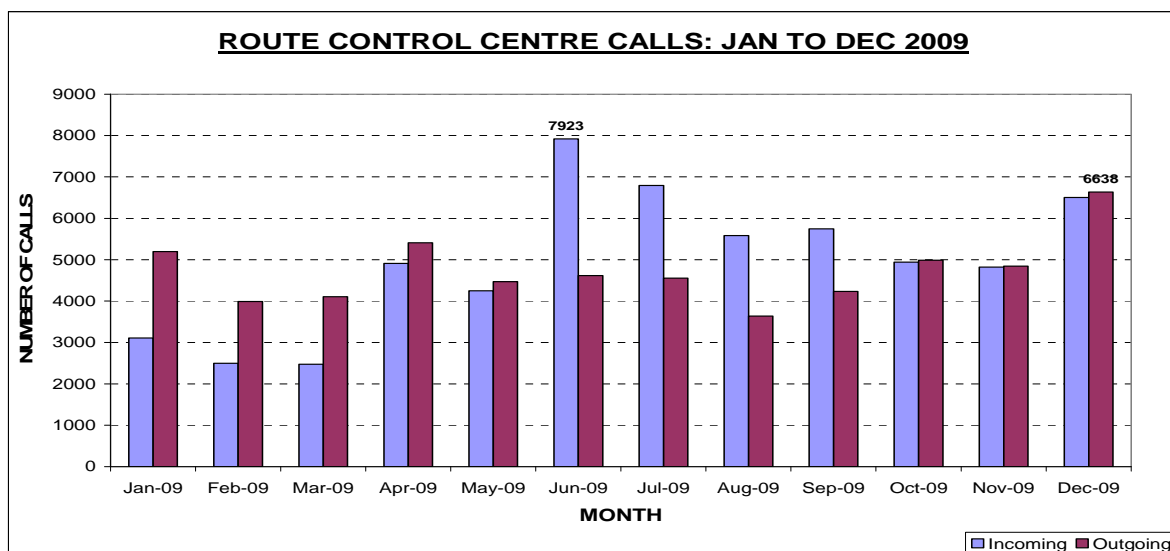
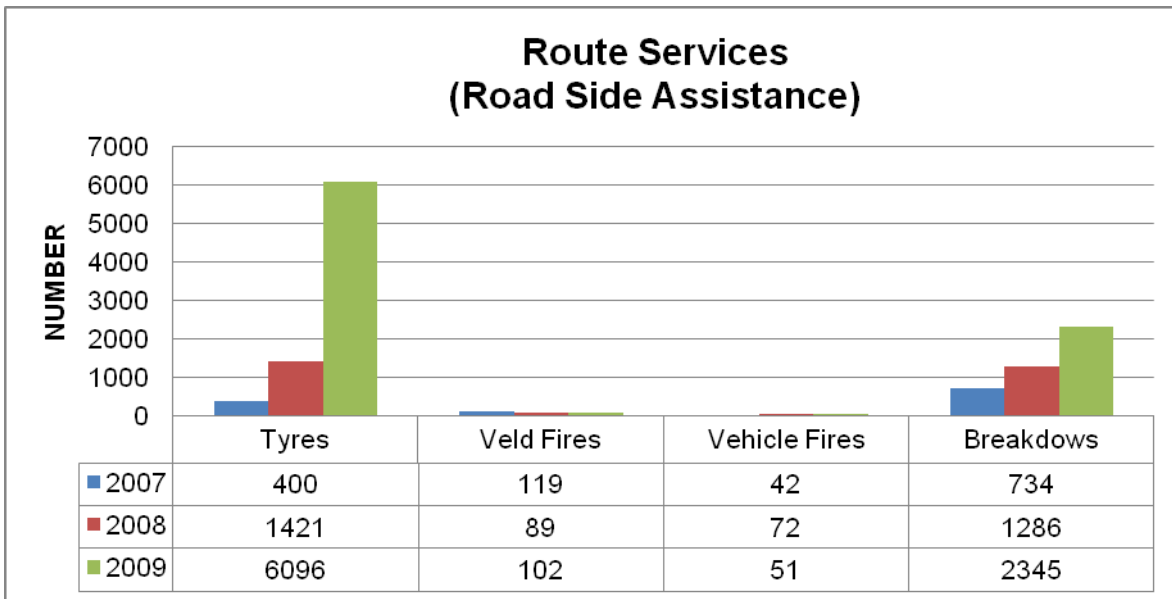


Figure 5: Route Control Centre Calls by Month 2009

The N3-Route Services (N3-RS) are fulfilling a very important role in assisting stranded motorists, removing foreign objects like tyre treads and stray animals off the road, extinguishing small grass and vehicle fires, and attending to and representing N3TC at all incident scenes. During 2008 convenience was enhanced by introducing night patrol to

provide similar services to road users travelling at night as to those travelling during the day. As an example Figure 6 indicates the services provided by the Route Patrollers.



**Figure 6: Roadside Assistance**

### 5.3 Minimizing delays at Construction sites and Plazas

Construction delays are reduced by drawing up a Critical Days Calendar. The calendar identifies school holidays, public holidays and special events that influence traffic volumes along the route and the information is shared with all role players along the route. The calendar further classifies the traffic days as A, B or C traffic days; an A day can be defined as an extremely busy day, a B day as a very busy day and C day as moderately busy day. Measures are put in place to minimize construction works on A and B days thus reducing delays due to construction.

Plaza throughput is analyzed annually to determine number of lanes required to process peak and off peak volumes.

## **6. LESSONS LEARNT**

The lessons learnt by N3TC include:

- Build a sound incident statistic data collection base from inception of the contract. The output from IRIS is only as good as the input; make sure that input data is reliable and comprehensive by passing it through verification and validation tests as described above. Analysed crash statistics provides the most direct indication of the extent and nature of the road safety issues on a route. The parameters recorded on an IRIS assist in identifying the probable cause of the incidents and this helps to implement a suitable solution to the problem. The IRIS promotes timeous corrective measures to be developed and implemented as was shown with N3 Section 9A.
- Establish a Route Control Centre of which the “roads entity” is in charge of. Introduce a 24/7 customer care line which establishes a line of communication between the road user and the authorities. The N3-RCC number 0800N3HELP, allows road users to report any matter on the N3. The N3-RCC uses and controls tools such as VMS’s, Phones and SMS’s to relay information to road users, the crashes, weather conditions and construction activities. In addition to this, it serves as a reliable, effective and efficient means of communication between different

agencies. The N3-RCC is responsible for IRIS database owned by N3TC and which allows extra information to be added or data to be saved in compatible format as required by N3TC without delays or much consultation unlike when is owned by private entity.

- Introduce a route patrol and emergency response team, on duty 24/7. The N3-Route Services (N3-RS) are fulfilling a very important role in assisting stranded motorists, removing foreign objects like tyre treads and stray animals off the road, extinguishing small grass and vehicle fires, and attending to and representing N3TC at all incident scenes.
- Promote development, for example such as tourism along the route which enhances the attractiveness of the route and provides valuable information to the road user. The tourist attractions provide the travelling public with the opportunity to break their journey.
- Focus Group Meetings should be held at least once every two months. The relationship between different law enforcement agencies and other role players can be enhanced by Focus Group Meetings as they provide an opportunity for all role players to interrogate one another and to address road safety issues and ways to address areas of concern.

## 7. CONCLUSIONS

The tools, initiatives and proper planning need to be in place in order for safety, convenience and mobility to be enhanced. Safety, mobility and convenience are closely related, for example; preventing a crash enhances safety, improves the traffic flows, which enhances mobility, with reduced delays, - convenience. It was illustrated in this paper that by enhancing mobility or convenience one can enhance safety and vice versa.

## 8. REFERENCES

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