

RESEARCH REPORT

Improving value for money on SANRAL's toll operations contracts

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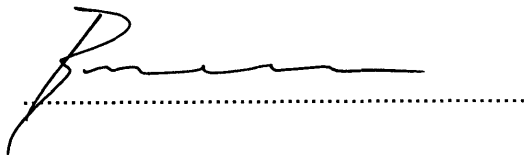
Under the leadership of Dr Gys Wessels

October 2004

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Declaration

I, Peter Suremann, herewith declare that the language of this research report has been edited by John Robert van Wyngaard of the Department of English Studies, University of KwaZulu-Natal, Pietermaritzburg Campus.



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Peter Suremann, October 2004

Executive summary

The South African National Roads Agency Ltd (SANRAL) is the custodian of the 9 208km national road network in South Africa. SANRAL's mandate is to develop, maintain and operate this national economic asset. 26,3% of the national road network consists of toll roads. The operation and maintenance of the toll facilities are let by SANRAL through a public open tender process. The successful tenderer is then appointed by SANRAL on a contract basis as the toll road operator.

The operation and management of toll facilities involve various technical and managerial disciplines, such as electrical, mechanical and civil engineering, toll collection, and operations management. Historically, toll operations contracts were fragmented into separate sub-contracts for each of the disciplines. This resulted in a substantial amount of project management input from SANRAL. In addition to SANRAL's high level of management input, it also carried the risk of fraud. SANRAL had no incentives for a toll operator to increase the toll revenues, neither did it impose any penalties for poor performance.

In order to simplify the project structure, as well as to improve on the old toll contract format, SANRAL developed a new toll operations contract model, aptly named Comprehensive Toll Road Operations and Maintenance or CTROM (C-T-ROM). Amongst others, the benefits of the new contract format are:

- That it simplifies SANRAL's management input by providing a single point of contact between SANRAL and a principal toll operator, under whose supervision all the sub-contractors reside. The toll operator therefore assumes the responsibility and accountability to manage the sub-contractors.

- The introduction of penalties that are imposed on the toll operator, should he not perform his contractually specified duties and obligations.
- The transfer of fraud risk to the toll operator.
- An increase in the toll revenue by offering the toll operator a revenue-sharing incentive.

The first contracts let under the CTROM format were the N2 North Coast Toll Road and the N2 South Coast Toll Road in July 2001. As these toll routes had been in operation for a while before the CTROM contracts were procured, comparisons could be made on the pre-CTROM and post-CTROM costs. Initial indications were, although there were some structural differences between the old and the new format, that these two CTROM contracts were between 7 and 13% more expensive than their predecessors. An extrapolation of these values to all the current CTROM contracts results in additional costs to SANRAL of between R 10m and R 20m per annum, when compared to the previously used managed contract format.

The more expensive CTROM contracts have brought about significant benefits, such as the transfer of fraud risk from SANRAL to the toll operator, as well as a simpler project structure in the form of a single point of responsibility. The intention of this research report is to determine whether the increase in cost has been worthwhile, and whether there are areas for further improvement. In other words, are the more expensive CTROM contracts providing SANRAL with an associated increase in value for its money? Not only is SANRAL concerned with the prudential expenditure of its toll revenues, but it is also under legislated obligations to ensure that funds are spent in the most appropriate and efficient ways.

In order to better understand value for money and related concepts, the author explores various academic theories in the form of a literature study. By building a platform from which to conduct further analyses, the author can then apply the newly found knowledge to test the

hypothesis that SANRAL is not achieving optimal value for money on its CTROM contracts.

Concepts and theories that are studied in the literature review include:

- The legislative and institutional framework; and
- Key terminology such as risk management, the public sector comparator, value for money, and performance penalties on contracts.

Many of the concepts have been explored worldwide, especially in developed countries such as Australia, Canada, Hong Kong and the United Kingdom, where those countries' governments actively encourage private sector investment in public infrastructure.

In the analytical part of the research report, the author explores the causes of the additional costs on two of SANRAL's toll routes, namely:

- The Mariannhill Toll Route, which is located on the N3 between Pinetown and Key Ridge in the province of KwaZulu-Natal; and
- The N17 Toll Route between Springs and Wemmer Pan in the province of Gauteng.

The analyses suggest that the operations and maintenance (O&M) costs of the N3 Mariannhill and N17 toll routes under the CTROM contracts are 46,3% and 20,4% more expensive than on the previous contracts. Some of the factors that could play a role in the increased cost of the CTROM contracts are:

- The contract duration;
- Risk transfer to the toll operator;
- Penalties applied when the toll operator does not conform to the required specifications; and
- Complex performance specifications.

The author concludes that there are a number of factors that negatively influence the cost of the CTROM contracts. The author therefore recommends that the factors that are within the control of SANRAL be changed. These improvements should bring about better value for money on SANRAL's toll operations contracts.

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List of abbreviations

Abbreviations that have been used in this research report are listed below. The meaning of the abbreviations is given in paragraph 1.2 on page 1-9.

AVC	Automatic vehicle classifier
BEE	Black economic empowerment
CTROM	Comprehensive Toll Road Operations and Maintenance
IBTTA	International Bridge Tunnel and Turnpike Association
MIS	Management Information System
O&M	Operations and maintenance
PFMA	Public Finance Management Act
PPP	Public Private Partnership
PPPFA	Preferential Procurement Policy Framework Act
PSC	Public sector comparator
RRM	Routine Road Maintenance
SANRAL	South African National Roads Agency Ltd.
SARB	South African Roads Board
VFM	Value for money

1

Introduction and problem statement

1.1 Background

1.1.1 The South African National Roads Agency Ltd.

The South African National Roads Agency Limited (SANRAL) is an independent, statutory company registered in terms of the Companies Act. The South African government, represented by the Minister of Transport, is the sole shareholder and owner of the Agency. Its mandate is to develop, maintain and manage South Africa's 9 208 kilometre national road network to fulfil South Africa's strategic and economic interests (RSA, 1998). The national road network comprises over R30 billion in assets, excluding land (SANRAL, 2003a).

The Department of Transport is South Africa's legislative institution concerning transport matters while SANRAL is the executive body in terms of managing, operating, maintaining and expanding the national road network. SANRAL was enacted and its national road network has been declared in terms of Act 7 of 1998, which is the South African National Roads Agency Limited and National Roads Act (RSA, 1998).

The national road network comprises both toll and non-toll national roads. A portion of the toll roads are let to private sector operators through 30-year toll concession contracts. The remainder of the toll roads are operated and managed by SANRAL. These are known as state toll roads. It should be noted that whether the toll roads are let to a toll road concessionaire or not, the state still has ultimate ownership of the road. Figure 1-1 shows the national road network and Table 1-1 indicates the length of routes for the various types of roads.

Table 1-1 Classification of SANRAL's road network (SANRAL, 2004)

Operating entity	Category			Proportions
	Non-toll	Toll	Total	
SANRAL	6 786	1 227	8 013	87,0%
Toll road concessions			1 195	13,0%
Bakwena Platinum Toll Concession (N4 west)		332		
N3 Toll Concession		429		
Trans African Concession (N4 east)		434		
Total	6 786	2 422	9 208	100,0%
Proportions	73,7%	26,3%	100,0%	

1.1.2 Why toll roads?

Due to social or economic needs for the development of certain roads and a simultaneous shortage of government funding (from general tax revenues), alternative avenues for the funding of the roads must be sought. One such method is to charge a user fee each time a motorist uses a certain road. This is called a toll fee, and the section of road for which the fee is applicable is termed a toll road.

The initial cost for the construction of a toll road is funded by a loan similar to a mortgage loan on a house. The repayment period is typically 20 to 30 years. As all the funding is immediately available, a great effort can be made with the construction of the toll road in order to complete it quickly. In contrast to toll funding, government budgets are typically spread over a few years, thereby slowing down the delivery of new road infrastructure.

SANRAL is authorised to levy toll fees in terms of Section 27 of its act, Act 7 of 1998.

1.1.3 Facts and myths about toll roads

There is no such thing as a free road, only non-toll roads and toll roads (IBTTA, 2004). All roads require funding to design, construct, operate and maintain them. In all likelihood, most roads will also require financing to cover the long-term debt that is incurred by the road

authority for the initial and ongoing capital expenditures. The difference between non-toll roads and toll roads is who funds them and how the funds are generated and redeemed.

In the case of non-toll roads, the government pays for the provision of the road by means of tax revenues. As everybody pays tax in South Africa, whether it is value-added tax on goods and services, personal income tax or fuel tax, everybody contributes in some degree to non-toll roads.

Toll roads, on the other hand, are funded by the toll fees charged to the motorists. Toll fees are direct user charges, which are only charged if the motorist chooses to use the toll road. It is important to understand that toll roads are self-financing and they do not rely on government taxes. The toll road customer is therefore not paying twice for the facility, as public perception often has it. The fact that toll roads sustain themselves also reduces the financial burden on the government, thus reducing the overall tax rate.

1.1.4 A brief history of toll roads in South Africa

1.1.4.1 18th and 19th century colonial South Africa

In *The Romance of Cape Mountain Passes*, Graham Ross describes that in the 1740s, a 'Cloevermaker' (the man who maintained the road) was stationed on the pass now called Sir Lowry's Pass, which is now located on the national road N2 between Somerset West and Swellendam in the Western Cape Province of South Africa. Tolls were raised to finance the Cloevermaker's maintenance efforts (Ross, 2002).

On 28 Feb 1807, a turnpike was established on Roodezand Kloof in the vicinity of Tulbagh, also in the Western Cape. Turnpike refers to the 18th century practice in England where a pole (or a pike) was mounted in the ground next to a road, preventing free passage along the road. It would be turned open by the gatekeeper after a toll fee had been paid (De Lemos et al, 2000). The tolls that were levied on the Roodezand Kloof turnpike are indicated in Table 1-2. The appointed overseer used these tolls to keep the road in a good state of repair.

Table 1-2 Toll fees levied on Roodezand Kloof in 1807

Classification	Toll fee
A chaise, a loaded wagon, every 20 oxen or cows, or every 100 sheep	4 shillings
An unloaded wagon or a cart	2 shillings
A saddle horse	1 shilling

1.1.4.2 Modern South Africa

Toll roads came to the fore again in South Africa in the late 1970s. During this time, the National Road Fund was unable to adequately finance the ambitious programme of national road construction. The obvious solution would have been to raise the allocation of funds to the National Road Fund from the fuel tax. However, other beneficiaries from the fuel tax were not prepared to forego their allocation to the National Road Fund. The next option was to increase the fuel levy. In a time of high inflation, this option was not considered favourably, as there were fears that this would increase inflation even further (Floor, 1985).

The idea of toll financing had been considered as early as 1965, especially in research circles. By the early 1970s, toll schemes were seriously considered to finance the urban freeways. In 1977 the National Transport Commission and the Division of National Roads were convinced that the high administration costs, the need for high volumes of traffic to sustain the toll schemes, and the resistance that the public would have against toll roads, would be hard to overcome.

In the early 1980s, the government considered that the levying of a toll fee would contribute less to inflation than an increase in the fuel tax would. The assumption was that the charging of a toll fee would have a local effect on prices and that the increase would be linked to an increase in local productivity or a saving in operating costs that the road user would achieve.

After detailed investigation by the National Transport Commission, Parliament approved the authority to charge tolls. This is contained in Act 79 of 1983, the Second National Roads Amendment Act. Table 1-3 indicates the first modern road projects selected for toll financing.

Table 1-3 South Africa's first roads to be funded by modern toll financing

Road	Province
The Tsitsikamma Toll Road on the N2 Garden Route	Western Cape
N3 Mariannhill Toll Road between Durban and Pietermaritzburg	KwaZulu-Natal
N3 Toll Road between Frere and Ladysmith	KwaZulu-Natal
The Du Toitskloof Tunnel between Paarl and Worcester	Western Cape
The road between Warmbaths (now Bela Bela) and Nylstroom	Limpopo Province

1.1.5 Private vs. state (SANRAL) toll roads

Some of the toll roads in South Africa have been let to consortia of private sector companies under 30-year toll concessions. To be considered as a toll concession route, the toll road must be profitable for the private sector. To this end, the potential toll revenue must exceed the mix of capital, operating and financing expenditure that is required, as well as the risk taken by the investors, such that the private sector investor receives a return on its investment. The major economic routes that provide this scenario are:

- The N3 between Durban (the largest container terminal in Africa) and the economic hub of Gauteng
- The N4 route between the harbour city of Maputo in Mozambique and Gauteng (the Maputo Corridor)
- The N4 route between Gauteng and Botswana (the Platinum Toll Highway).

By concessioning these major routes, the South African government has transferred the debt, that it incurred to finance the toll roads initially, to

the private sector consortia. This contributed to a lowering of the government's high levels of debt and allowed it to borrow money for other much needed socio-economic infrastructure projects, such as housing, social welfare, education, health care or municipal services.

Another important benefit of toll road concessions is the relatively fast delivery of the infrastructure, compared to the typically slower speed of delivery by government agencies due to the inherent bureaucratic procedures and politics.

1.1.6 SANRAL's toll operations contracts

In managing, operating, maintaining and expanding the national road network, SANRAL appoints third party contractors and operators to perform construction, maintenance and toll operations activities. The historical format of the operations contract for SANRAL's state toll roads consisted of a number of individual contracts between SANRAL and various contractors on a particular toll route for toll collection, electrical, electronic, mechanical, and civil engineering works, to operate and maintain the toll plaza as well as the toll route. Besides being a very fragmented approach towards operating each toll route, this approach required a relatively high management input from SANRAL and its engineering consultants. The lines of communication in the managed contract format are illustrated in Figure 1-2.

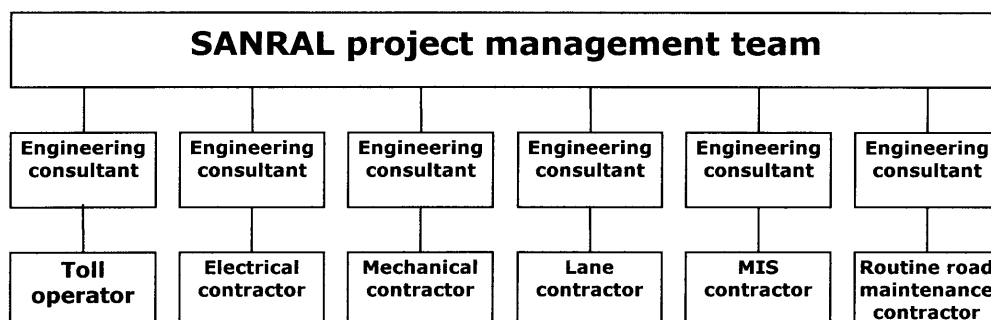


Figure 1-2 Organisational structure of managed contract

1.1.7 New format for SANRAL's toll operations

The objectives of developing a new Comprehensive Toll Road Operations and Maintenance (CTROM) contract format in 2000 were to (SANRAL, 2001a):

- Create a new remuneration and revenue sharing mechanism to incentivise the toll operator to increase toll revenues and minimise fraud
- Establish a single point of responsibility contract wherein a toll operator is responsible and accountable for all aspects relating to the operations of the toll route
- Transfer of fraud and traffic risk to the operator
- Improve customer service through route patrol services, SOS systems and marketing
- Introduce performance based outcomes through penalties and performance guarantees
- Attract new entrants into the toll industry through greater scope of work, contract value and risk optimisation.

This contract format has been used successfully on various toll routes in South Africa since July 2001. The organisational layout of the CTROM contract is illustrated in Figure 1-3.

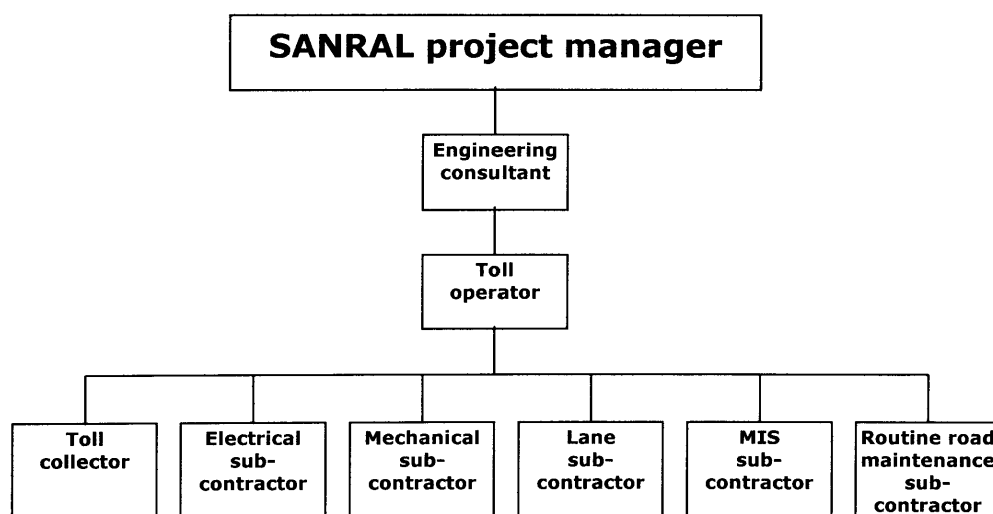


Figure 1-3 Organisational structure for CTROM contract

Note that the key difference between this business model (Figure 1-3) and the one used previously (Figure 1-2), is that the risk of integration and co-ordination has been transferred from SANRAL to the toll operator.

1.2 **Definition of terms**

Automatic vehicle classifier (AVC)	The combination of devices which detect the physical characteristics of a vehicle travelling in a toll lane, and which classify the vehicle in terms of a vehicle classification system (SANRAL, 2003c).
Bid	A bid offered by a private sector party to an institution or government agency.
Bidder	The private sector party that offers certain goods or services to an institution at a certain price, with a certain amount of risk transfer.
Black economic empowerment (BEE)	A South African government policy to redress the historical socio-economic injustices brought about by the previous apartheid regime.
Comprehensive Toll Routine Operations and Maintenance (CTROM, pronounced C-T-ROM)	The single point of responsibility contract format employed by SANRAL on its toll routes under which: (a) routine road maintenance is carried out on the road and (b) toll operations are carried out at the toll plazas and route services are delivered along the toll route.
Concession	See "Toll road concession"

Concessionaire	A private sector business entity that is granted the right by SANRAL to operate and maintain a certain portion of the national road network as a toll road, and to use the toll fees generated on that toll road to keep it in the condition required by SANRAL, and at the same time satisfying the financial needs of the private sector investors.
Cost matrix	The schedule containing the rates and prices tendered by the tenderer (SANRAL, 2003b).
Institution	A department, a constitutional institution, a public entity listed, or required to be listed in Schedules 3A, 3B, 3C or 3D to the PFMA, or any subsidiary of any such public entity (RSA, 2004).
Institutional function	(a) A service, task, assignment or other function that an institution is entitled or obliged to perform (RSA, 2004): (i) In the public interest, or (ii) On behalf of the public service generally, or (b) Any part or component of or any service, task, assignment or other function performed or to be performed in support of such service, task, assignment or other function.
Management Information System (MIS)	The information system that gathers, stores and processes data related to a toll plaza, such as the number and type of vehicles that pass through a toll plaza.

Operations and maintenance (O&M)	All activities which may be necessary for the proper operations and maintenance of the toll plaza (SANRAL, 2003c).
Public Finance Management Act, Act 1 of 1999 (PFMA)	The legislation that regulates financial management in South Africa's national and provincial governments (RSA, 1999).
PFMA Regulation 16	Regulation 16 of the PFMA, issued by the South African National Treasury. This regulation deals with Public Private Partnerships (RSA, 2004).
Public Private Partnership (PPP)	<p>A commercial transaction between an institution and a private party in terms of which the private party (RSA, 2004):</p> <ul style="list-style-type: none">(a) performs an institutional function on behalf of the institution, and/or(b) acquires the use of state property for its own commercial purposes, and(c) assumes substantial financial, technical and operational risks in connection with the performance of the institutional function and/or use of state property, and(d) receives a benefit for performing the institutional function or from utilising the state property, either by way of:<ul style="list-style-type: none">(i) consideration to be paid by the institution which derives from a revenue fund or, where the institution is a national government business enterprise or a provincial government business enterprise, from the revenues of such

	institution, or
	(ii) charges or fees to be collected by the private party from users or customers of a service provided to them, or
	(iii) a combination of such consideration and such charges or fees.
Public sector comparator	<p>A hypothetical risk-adjusted costing, by the public sector as a supplier, to an output specification produced as part of a private finance initiative procurement exercise (Treasury Task Force on Private Finance, 2004).</p> <p>A PSC is used by government to make decisions by testing whether a private investment proposal offers value for money in comparison with the most efficient form of public procurement (Economist Intelligence Unit, 2003).</p>
Risk register	<p>A comprehensive list of all the risks that may be encountered during the lifetime of a project, whether in the planning, design, construction, operational or exit stage (AS/NZS, 1999).</p>
Routine Road Maintenance (RRM)	<p>All the activities which may be necessary for the proper routine road maintenance on the toll route, such as maintenance of vegetation, repair of potholes and guardrails, the normalisation of accident scenes etc. (SANRAL, 2001b).</p>

South African National Roads Agency Ltd. (SANRAL)	The public company instituted by the South African National Roads Agency and National Roads Act, Act 7 of 1998 to operate, maintain and expand South Africa's strategic national road network. SANRAL is the successor to the SARB (RSA, 1998).
South African Roads Board (SARB)	The South African Roads Board, originally instituted by the South African Roads Board Act, Act 74 of 1988, now replaced by SANRAL's Board. The SARB advised and guided the National Department of Transport's Chief Directorate of National Roads, prior to the establishment of SANRAL on 1 April 1998. SANRAL is the legal successor to the SARB (RSA, 1983).
Tender	See "Bid"
Tenderer	See "Bidder"
Toll road concession	The letting, by SANRAL, of a specific toll route to a private sector concessionaire for a period of about 30 years, during which that concessionaire carries all costs and risks to construct, upgrade, operate and maintain the toll route to the contractual performance requirements as set out by SANRAL (SANRAL, 2004).
Toll operator	A private sector toll road contractor appointed by SANRAL through a public tender process to operate and manage a specific toll road (SANRAL, 2003b).

Value for money
(VFM)

Value for money means that the provision of the institutional function or the use of state property by a private party in terms of the PPP agreement results in a net benefit to the institution defined in terms of cost, price, quality, quantity, risk transfer or a combination thereof (RSA, 2004).

A combination of economy, efficiency and effectiveness i.e. having the right goods or services at the right quality in the right place at the right time (Department for International Development, 2004).

The combination of cost (over the whole life of a project) and quality that best meets an organisation's requirements (Comptroller and Auditor General, 1999).

Note that references to the above terms shall have the same meaning, whether written in uppercase or lowercase.

1.3 Statement of the problem

When making a direct comparison of the toll operations cost between the previously-used managed contract format and the CTROM contract format, the CTROM contract format costs significantly more in financial terms than the managed contract, as indicated in Table 1-4 below (Tolplan Consulting, 2004a & 2004b).

Table 1-4 Cost comparison between managed and CTROM contracts

Toll route	Annual contract cost (Rm) ¹		% difference
	Pre-CTROM (managed contract)	CTROM	
N3 Mariannhill Toll Route ²	4,919	7,197	+ 46,3
N17 Toll Route ³	10,220	12,306	+ 20,4

Notes: ¹ Cost excludes capital expenditure on equipment and facilities, warrants discounts and violations, consultant and MIS fees

² Base date: November 2002

³ Base date: January 2001

The increased costs of the CTROM contract format could be due to numerous reasons. Amongst others, the following are suspected:

- Various forms of risk transfer to the toll operator, namely:
 - Technical risk (performance specifications)
 - Financial risk (banks not making timeous payments for credit and fleet card transactions)
 - Legal risk (contractual obligations)
 - Fraud risk (transferred to toll operator)
- Stringent performance specifications and associated penalties
- High barriers for new entrants to enter into the toll industry.

Despite a higher financial cost, the new CTROM contract format may or may not provide better value for money, which is defined in the South African Public Finance Management Act, Act 1 of 1999. A direct comparison of financial costs between the contract formats can therefore not be made. Besides comparing quantitative financial and technical measures, certain qualitative measures, such as improved quality of service and speed of delivery must also be considered.

To determine the best value for money that SANRAL can attain on its toll operations contracts, acceptable trade-offs need to be determined, e.g. between quality of service and the cost thereof, or the appropriate level of risk transfer and its concomitant cost.

1.4 Hypothesis

The researcher makes the hypothesis that SANRAL is not achieving the best value for money on its CTROM contracts. This is mainly due to the reasons mentioned in 1.3 above. More appropriate risk allocation between SANRAL and its CTROM operators and the elimination or relaxation of some of the stringent contractual performance specifications can reduce the cost of the CTROM contracts.

The researcher will identify some of the risks, specifications and other factors that SANRAL should consider changing on future CTROM projects in order to achieve better value for money.

1.5 Assumptions and delimitation

In order to make the best possible findings in this research, it is necessary to consider a few limitations. They are discussed below.

1.5.1 Elimination of variability

Although a pure financial comparison of the toll road projects before and after the implementation of the CTROM contract format may not be conducive to making good conclusions regarding value for money, the elimination of variability will facilitate the value for money analysis.

In the selection of toll projects for this research, toll projects that differ significantly between the previous managed contract format and the new CTROM contract format will be eliminated from the analysis. For example, toll projects on which new toll plazas have been added at the same time that the new CTROM contract format was implemented will therefore not be assessed.

Likewise, the routine road maintenance (RRM) portion of the CTROM contracts will be eliminated from the analysis, as the quantity of RRM that is required on a certain toll road can vary from year to year, depending on the condition of the road, the weather that influences the growth of the grass verges, the number of accidents, and a number of other unpredictable events. The RRM and toll operations portions have

quite different disciplines, the former being inclined towards civil engineering, whereas the latter has an inclination towards electrical and mechanical engineering.

1.5.2 Elimination of other factors

The first tenders for CTROM contracts had two pricing options, namely:

- A Limited Traffic Risk option, and
- A Fixed and Variable Cost option.

In addition to the toll operator being compensated for fixed and variable toll operating costs and a profit, the first option included a mechanism whereby the toll operator could share in a portion of the excess toll revenues, if that toll operator could attract more traffic to the toll route. The second option merely made provision for the toll operator to recover its fixed and variable costs, besides the usual profit.

One of the first CTROM tenders, namely on the N2 North Coast, was awarded under the Limited Traffic Risk mechanism, as it was priced more favourably. However, from there onwards, the tenders for other CTROM contracts for the Limited Traffic Risk provided no benefit over the Fixed and Variable Cost mechanism. This study will therefore not consider CTROM contracts that have been let under the Limited Traffic Risk option, as the market has indicated that this is not an attractive option.

1.5.3 CTROM projects to be researched

From the above discussion regarding the elimination of variability, there are only a few CTROM projects that are conducive to this research. The study will therefore be limited to the following CTROM contracts:

- The N3 Mariannhill Toll Route (between Pinetown and Key Ridge in the South African province of KwaZulu-Natal)
- The N17 Toll Route (between Springs and Wemmer Pan in the South African province of Gauteng).

1.5.4 Assumptions on which the research will be based

The following assumptions are made:

- That all the required information is available, including from previous management contracts,
- That suppliers of information will be co-operative, and
- That the information supplied will be correct and unbiased.

1.6 Contribution to field

The researcher will contribute to business management research in the following fields:

- How to obtain value for money for government services and the holistic / systems thinking that must be implemented to do so
- How to make trade-offs between quantitative and qualitative performance criteria, e.g. cost vs. quality of service.

The research will be company specific, as it is intended to benefit SANRAL. However, other semi-private and state institutions may benefit from this research into optimal public service delivery.

1.7 Plan of study

1.7.1 Milestones

The following key milestones for the research project are listed in Table 1-5.

Table 1-5 Key milestones for research project

Milestone	Date	Number of days
Submit proposed title of research report and name of study leader to UP Graduate School of Management	Mon 16-01-2004	0
Acceptance of proposed research report title by GSM	Mon 15-03-2004	59
Submission of study proposal to GSM	Thu 01-04-2004	76

Milestone	Date	Number of days
1 st contact session with study leader (feedback on study proposal)	Thu 10-05-2004	115
Submission of revised study proposal	Thu 21-06-2004	157
Acceptance of revised study proposal	Wed 30-06-2004	166
Submit Phase 1 to study leader (introduction, problem statement)	Mon 12-07-2004	178
Submit Phase 2 to study leader (literature review)	Mon 26-07-2004	192
2 nd contact session with study leader	Fri 30-07-2004	196
Submit Phase 3 to study leader (analytical research)	Mon 16-08-2004	213
3 rd contact session with study leader	Mon 20-08-2004	217
Submit Phase 4 to study leader (conclusions and recommendations)	Mon 30-08-2004	227
4 th contact session with study leader	Mon 06-09-2004	234
Submit manuscript of report	Mon 13-09-2004	241
Feedback from study leader	Mon 04-10-2004	262
Study leader's permission to submit report for examination	Mon 11-10-2004	269
Language editing by professional editor	Mon 11-10-2004	269
Submission of final report	Fri 22-10-2004	280

A detailed schedule of the tasks and milestones is given in Appendix A.

1.7.2 Consultation with specialists

In order to conduct the evaluation of the CTROM contract format, the researcher will consult a team of technical specialists, specifically appointed for this purpose by SANRAL. Independent specialists, not currently active in the CTROM environment, will be used.

1.7.3 Research costs

The researcher is undertaking this research for his employer, SANRAL. Any costs incurred by the researcher for the purpose of this research will be borne by SANRAL.

1.8 Research objectives

In terms of the PFMA, SANRAL is obliged to attain value for money, whether the revenues are gained from general government taxes or through direct user charges such as toll fees. Having deployed CTROM contracts for a few years now, SANRAL has sufficient information and management experience to fulfil the following research objectives:

- To determine whether the CTROM contract format provides optimal value for money
- If the CTROM contract format does not provide value for money, determine how it can be improved to obtain value for money.

To obtain value for money, a comparison of the utility of various elements of the CTROM contract could be made against each element's cost. An element of the contract that provides a high utility per unit cost is one that should receive priority for implementation over an element that provides a low utility per unit cost. This approach is indicated graphically in Figure 1-4.

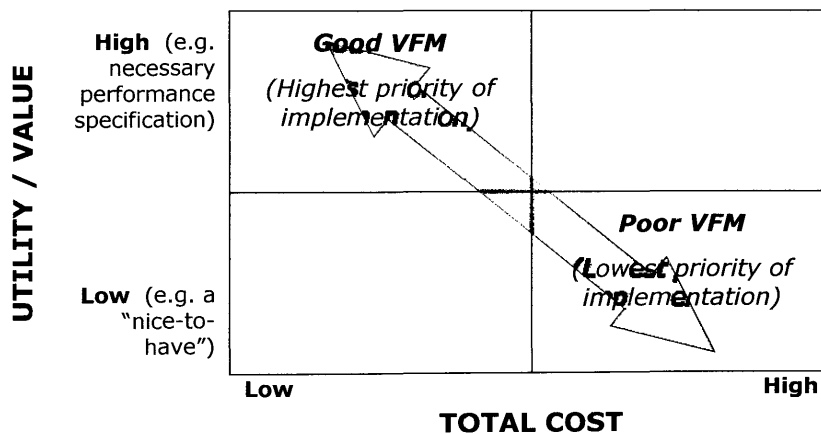


Figure 1-4 Cost vs. utility of CTROM contract elements

1.9 Significance of the research

The importance of the research is motivated in two parts. Firstly, from a corporate objective point of view, SANRAL's vision is "To be recognised as a world leader in the provision of a superior primary road

network in Southern Africa" (SANRAL, 2002). Some of the key principle objectives to attain this vision are:

- The management of a primary road network ensuring best value for money
- Promoting the "user pays" principle
- Continuously improving the efficiency of business practices
- Achieving international best practices
- Encourage innovation in knowledge and practice
- Research, discover and excel.

Secondly, the importance of this research is illustrated by means of SANRAL's expenditure on its state toll road projects. The total expenditure is made up of capital expenditure, operating expenditure and financing expenditure. These are explained as follows:

- **Capital expenditure** constitutes any expenditure to improve, expand the existing assets, such as the addition of lanes to a toll plaza, the renewal of a road pavement, or the construction of new assets such as a new section of toll road or a new interchange.
- **Operating expenditure** is made up of the day-to-day operations of the toll route, such as the cost of toll collection, toll route emergency services, routine road maintenance such as cutting of the grass verges and the repair of damaged guardrails etc.
- **Financing expenditure** is the expenditure for the repayments of SANRAL's loans that it incurred for the financing of the capital expenditure to provide the toll road facility.

SANRAL's budget for its state toll roads for the financial year 1 April 2004 to 31 March 2005 is illustrated in Figure 1-5 (SANRAL, 2004b).

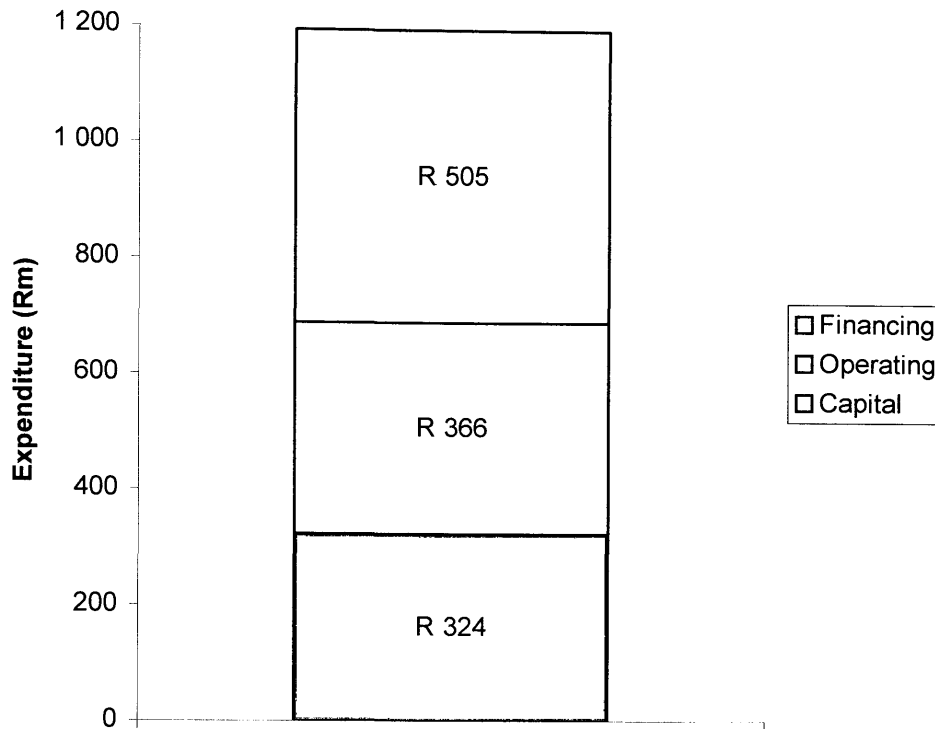


Figure 1-5 SANRAL's 2004/2005 toll road budget

From Figure 1-5 it is clear that financing expenditure makes up the greatest portion of the total toll expenditure, constituting 42,3% of the total. Operating expenditure is the second largest expenditure on toll roads on the 2004/2005 budget, constituting 30,6%. Capital expenditure makes up 27,1% of the total expenditure.

This research report focuses on the operating expenditure, which is spent in the form of the CTROM contracts. The importance of this research is thus illustrated by the financial cost of the CTROM contracts and the potential financial impact thereof. Table 1-6 below indicates the costs of the various toll routes' CTROM contracts (SANRAL, 2002-2004):

Table 1-6 Summary of CTROM contracts and associated costs

Name and limits of CTROM contract	Start date	Contract period (years)	Cost (R million) ¹	
			Tender ²	Base date ³
N1 South (Bloemfontein – Johannesburg)	01-04-2002	8	298,8	279,3
N1 North (Pietersburg – Beit Bridge)	01-04-2002	8	265,1	247,8
N2 Tsitsikamma	01-11-2001	5	35,7	35,5
N2 South Coast	01-07-2001	5	70,5	70,5
N2 North Coast	01-07-2001	8	254,0	254,0
N3 Mariannhill	01-05-2003	3	23,1	19,9
N17 Wemmer Pan – Springs	01-04-2002	8	127,7	119,4
TOTAL			1 074,9	1 026,4

- Notes: 1 Values exclude contingencies, contract price adjustment and VAT.
- 2 The tender price tabled is for toll operations and RRM costs.
- 3 Common base date is July 2001.
- 4 The total cost includes some initial capital expenditure. Annualised cost is thus merely illustrative.
- 5 The cost per vehicle is merely indicative, as vehicle classification is not accounted for in this table.

The tender prices received for the N2 North and South Coast CTROM contracts were between 7 and 13 percent more expensive in financial terms when compared to the previous toll operations contract format. If this trend is extrapolated to the other toll operations contracts, this implies that the additional annual expenditure of the CTROM contracts amounts to between R 10,30m and R 19,13m. Whilst the additional expenditure has added value to the toll operations contracts, the additional expenditure warrants a study to determine whether it provides value for money.

2

Research methodology

2.1 Introduction

In order to achieve the objectives of this research report, the approach of the research methodology is a two-step process. Firstly a comprehensive insight into the field of study must be obtained, after which the knowledge gained in the study field can be employed to carry out analyses and conduct research to gain new insights. The findings are then exposed in the conclusions, from which recommendations are made. The process therefore consists of the following steps:

- A literature review of existing documentation, reports, research etc.
- Analytical research of actual data
- Conclusions on the literature review and the analytical research
- Recommendations for the improvement of value for money on future CTROM contracts.

2.2 Literature review (historical research)

A study on relevant literature will form the historical research part of this research report. This part of the research report will form the ground work for the remainder of the research report. It will give the researcher a broad understanding of the relevant concepts, terms and relevant frameworks in order to proceed with the analytical research portion of the research. In addition to the broad concepts that the researcher needs to understand, the literature review will also reveal previous research that is relevant to this study.

2.3 Analytical research

The analytical part of the research will involve a quantitative and qualitative analysis of SANRAL's CTROM contract format compared to the previously used managed contracts. The quantitative analysis will investigate the difference in costs between the CTROM contracts compared to the previous toll operations contracts. The qualitative analysis will examine customer satisfaction.

As only two CTROM projects will be researched, this is indicative that there will be no empirical findings from the research undertaken in this study. Rather, the results will be based on an in-depth analytical research of the two cases mentioned in 1.5.2, namely

- The N3 Mariannhill Toll Route (between Pinetown and Key Ridge in the South African province of KwaZulu-Natal)
- The N17 Toll Route (between Springs and Wemmer Pan in the South African province of Gauteng).

The researcher also envisages to gaining deeper insight into and learning about the functioning of toll roads. This will be attained through the analysis process, as well as through the questioning of the CTROM contract and its systems, procedures and policies. This learning process will be of great value when the current shortcomings of the CTROM contracts are improved upon when SANRAL deploys new CTROM contracts in the future.

2.4 Making conclusions and recommendations

The researcher will draw conclusions on best practices from the literature review. From the analytical study, the researcher will highlight quantitative and qualitative insights regarding the current CTROM contracts, and what the current shortcomings of the CTROM contracts are.

From the conclusions, the researcher will recommend improvements that should be brought about to the current CTROM contracts, so that better value for money can be obtained on future CTROM contracts.

3

Review of related literature

3.1 Introduction

The objective of the literature review is for the researcher to

1. Gain an insight into and an understanding of
 - The core academic theories,
 - The legislative and institutional frameworks, and
 - The key concepts and terminology

relevant to the study. This will form a solid basis from which the researcher can proceed.

2. Add value to the research undertaken in this study by determining what has previously been researched, thus preventing a duplication of previous work by others.
3. Establish a need for the research. This is done by identifying shortcomings in the existing literature, so that further research opportunities can be identified.

To fulfil the objectives of the literature review, the researcher will identify the primary, secondary and tertiary literature that is available and that is relevant to the study topic. A broad perspective of the key theories and terms will first be obtained by the researcher from the available literature, after which the focus will be narrowed to historical research in the field of study. Having studied the available literature, the researcher must then determine whether there are deficiencies or limitations in the available literature. Further research opportunities can then be identified, if there are areas that haven't previously been covered.

3.2 Available literature

Much literature is available on the subjects mentioned above. Literature that has previously been published, and is of relevance to this research, is categorised into primary, secondary and tertiary sources of literature.

- Primary sources of literature: reports, theses, e-mails, conference reports, company reports, some government publications and unpublished manuscript sources.
- Secondary sources of literature: newspapers, books, journals, internet and some government publications.
- Tertiary sources of literature: indexes, abstracts, catalogues, encyclopaedias, dictionaries, bibliographies and citation indexes.

3.3 Core academic theories

From a business research perspective, a wide range of academic fields is of relevance to this research. The key academic theories relevant to this research are:

1. Decision and risk management
2. Financial management
3. Operations and service management
4. Project management
5. Behavioural sciences
6. Commercial law.

The core academic theories are mostly found in typical text books, which are secondary literature sources.

3.3.1 Decision and risk management

The study of decision and risk management explains how decisions can be made under conditions of uncertainty, given the decision-maker's specific preferences and beliefs (Clemen & Reilly, 2001). Of particular

relevance to this study is the identification of the appropriate portion of risk that should be retained by an organisation so that the overall value of the risk is minimised. This risk management process is described in the Australian Standards / New Zealand Standards 4360:1999 for Risk Management.

3.3.2 Financial management

Financial management principles describe how value can be added to an organisation by the appropriate allocation and expenditure of available funds (Brigham & Ehrhardt, 2002). Of particular relevance to this study are the following:

- The responsibility of accounting officers, especially in the public sector, to ensure that public funds are spent in the most effective and efficient manner (RSA, 1999)
- The measures that accounting officers can employ to measure effective and efficient expenditure of public funds (RSA, 1991).

3.3.3 Operations and service management

Operations and service management describes how systems or organisations should be operated and managed efficiently in order to achieve the goal of sustainable profit-making (Pretorius, 2003). Of particular relevance to this study are the following:

- What exactly describes adequate service delivery? This depends on whose perspective is taken into account, and even more so when there is an inclination towards a captive market, such as a toll road.
- The cost of delivering an adequate level of service then needs to be determined, so that firstly the absolutely necessary services can be delivered, and secondly that the best value for money services can be implemented.

3.3.4 Project management

Project management as an academic theory is the study of the inception, planning, development, execution and completion of a temporary endeavour to create a unique product or service (Project Management Institute, 2000). Project management needs to become part of the business, as projects are becoming more prominent in the fulfilment of strategic business goals (Gray & Larson, 2003). Of particular relevance to this study are the following:

- Organisational structures that are most suited to facilitate cost-efficient and effective project delivery
- The employment of well-trained and experienced personnel to procure and manage projects and contracts.

The Project Management Body of Knowledge (PMBOK) is a huge resource that provides guidance on best practices in the field of project management.

3.3.5 Behavioural sciences

Organisational behaviour is a field of study that draws on the behavioural science disciplines of psychology, sociology, social psychology and anthropology. Organisational behaviour is the study of individuals and groups within organisations, and the interaction between the organisation's members and their external environments (Cook & Hunsaker, 2001).

Although certain specifications or requirements may be prescribed in performance contracts, personal relationships still play a vital role in how well and how successfully that performance is executed. Those who know how to deal with adverse relationships are better equipped to respond in functional ways (Cook & Hunsaker, 2001).

3.3.6 Commercial law

Commercial law is the body of rules applied to commercial transactions. Large portions of an organisation's projects are usually outsourced to

consulting firms or contracting firms. The act of outsourcing is a commercial transaction between an employer and the contractor. In the case of the CTROM contracts, a set of rules is compiled, in the form of a contract, which apply to this outsourcing relationship.

3.4 Legislative and institutional framework

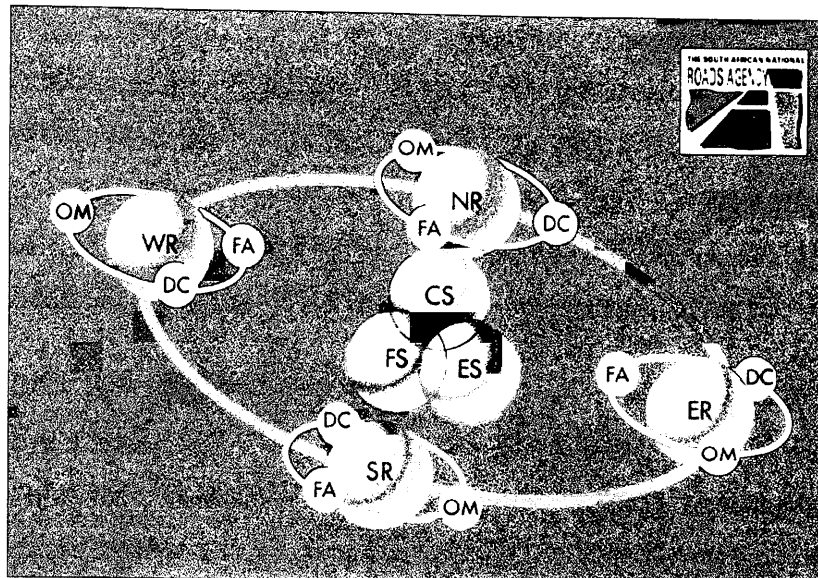
Key legislation and institutions that will be researched in this literature review include the following:

1. The South African National Roads Agency Ltd. and National Roads Act, Act 7 of 1998
2. The South African Public Finance Management Act, Act 1 of 1999
3. The Public Accountants' and Auditors' Act, Act 80 of 1991
4. The Institute of Internal Auditors of South Africa
5. The Preferential Procurement Policy Framework Act, Act 5 of 2000.

3.4.1 The South African National Roads Agency Ltd.

The South African National Roads Agency Ltd. is the legal successor to the South African Roads Board (SARB). SANRAL was instituted according to Act 7 of 1998, the South African National Roads Agency Ltd. and National Roads Act, as a public company with the South African government as the sole shareholder. In fulfilling its obligations under this act, SANRAL is accountable to the Minister of Transport.

The primary duty of SANRAL is to operate, manage, maintain and expand South Africa's national road network. SANRAL consists of a core group of officials that carry out the functions assigned to it in terms of Act 7 of 1998. The organisational structure of SANRAL is indicated in Figure 3-1 (SANRAL, 2002).



Head Office

- CS Corporate Services
- ES Engineering Services
- FS Financial Services

Regional Offices

- ER Eastern Region
- NR Northern Region
- SR Southern Region
- WR Western Region

Regional Sections

- FA Finance & Administration
- DC Design & Construction
- OM Operations & Maintenance

Figure 3-1 SANRAL organisational structure

The Design & Construction and Operations & Maintenance sections of each SANRAL Regional Office consist of professionals skilled in engineering and project management. These sections procure the construction, operations and maintenance projects on the national road network. The procurement of these services is subject to various pieces of legislation in South Africa, amongst others the Public Finance Management Act and the Preferential Procurement Policy Framework Act.

3.4.2 The Public Finance Management Act

The purpose of the Public Finance Management Act, Act 1 of 1999, is to regulate financial management in the national and provincial governments and to ensure that all revenue, expenditure, assets and liabilities of those governments are managed efficiently and effectively. The PFMA also describes the responsibilities of persons entrusted with financial management in those governments (RSA, 1999).

The SARB is listed in Schedule 3 of the PFMA as an institution that must adhere to the provisions of the act (RSA, 1999). Being the SARB's legal successor, SANRAL must conduct its business according to the provisions of the PFMA.

Regulation 16 of the PFMA describes and defines the procedures and policies that must be adhered to when procuring the services of a private sector firm to perform an institutional function (RSA, 2004). SANRAL procures most of its services from consultants and contractors, but has been granted an exemption from the provisions of the PFMA until 2006, after which it will have to comply with the regulation.

Both the PFMA and Regulation 16 of the PFMA describe and prescribe the concept of value for money when procuring services from a service supplier. This implies that the procurement of toll operations contracts must be done in such a manner that value for money is obtained.

The South African National Treasury has a PPP Unit which gives advice, assistance and guidance to institutions that want to employ PPPs to deliver their institutional functions.

3.4.3 The Public Accountants' and Auditors' Act

The legislation that defines the roles and responsibilities of South African public accountants and auditors is the Public Accountants' and Auditors' Act, Act 80 of 1991. Section 20 of the act more specifically defines the powers and duties of auditors. This section of the act does not clearly state how an audit should be carried out, e.g. for a value for money evaluation, but rather gives a general framework of how auditors should go about their business.

3.4.4 The Institute of Internal Auditors of South Africa

The Institute of Internal Auditors of South Africa (IIASA) is related to the Institute of Internal Auditors (IIA) in Florida, USA. The IIA's definition of internal auditing (Institute of Internal Auditors, 2004) is:

Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes.

The International Standards for the Professional Practice of Internal Auditing is a guideline document that describes the basic principles for providing internal audit services (Institute of Internal Auditors, 2004). Ensuring value for money is one of the functions of an internal auditor.

3.4.5 The Preferential Procurement Policy Framework Act

The Preferential Procurement Policy Framework Act (PPPFA), Act 5 of 2000 describes that organs of state must procure their services according to a preferential procurement system (RSA, 2000). This means that for contracts with a Rand value above a certain value, a maximum of 10 points out of 100 can be scored by a bidder for specific goals. One of the major preferential procurement considerations in South Africa is black economic empowerment (BEE), which is a government policy that promotes the employment of previously disadvantaged individuals or enterprises, the enhancement of previously disadvantaged labour content etc. The lowest financial bid scores 90 points. For contracts with a Rand value below a certain value, a maximum of 20 points can be scored for the advancement of specific goals, and 80 points for the lowest acceptable bid.

The application of the preferential procurement system implies that the lowest financial bid may not necessarily end up being the bid with the highest number of preferential procurement policy points. Whilst letting a contract to the second or third lowest bidder may seem to be in conflict with the PFMA requirement of VFM, the PPPFA supersedes this PFMA requirement. The South African government is thus willing to pay a premium for the advancement of individuals or enterprises that were previously disadvantaged through unfair discrimination on the basis of race, gender and disability.

3.5 Key concepts and terminology

Key concepts and terminology that will be researched in this literature review include the following:

1. Risk management
2. The public sector comparator
3. Value for money
4. Performance penalties
5. Customer satisfaction in the roads industry.

An understanding of these concepts will assist the researcher in performing a better analysis of SANRAL's CTROM contracts in Chapter 4.

3.5.1 Risk management

Risk management is an integral part of good management practice. The process of identifying the risks is as important as dealing with the risks.

Risk can be described as the chance of something happening that will have an impact on objectives, and is measured in consequences and likelihood (AS/NZS, 1999).

In order to value risk, the financial impact of the event occurring needs to be determined. The probability of that event occurring should also be determined. The product of the two is the expected value that can be placed on that particular risk. Selecting the least risky alternatives is a choice of the alternative with the lowest expected impact, whether financial or other (Clemen & Reilly, 2001).

For contractual arrangements between an institution and a contractor, such as on SANRAL's toll operations projects, a risk management procedure will help to establish the context in which the risk could take place. The context will provide input into the next step, namely the identification of risks. Following the identification of risks, the risks can be analysed in terms of their likelihood and consequences. After an evaluation of the risks, they can either be accepted or treated (AS/NZS, 1999). This process is illustrated in Figure 3-2.

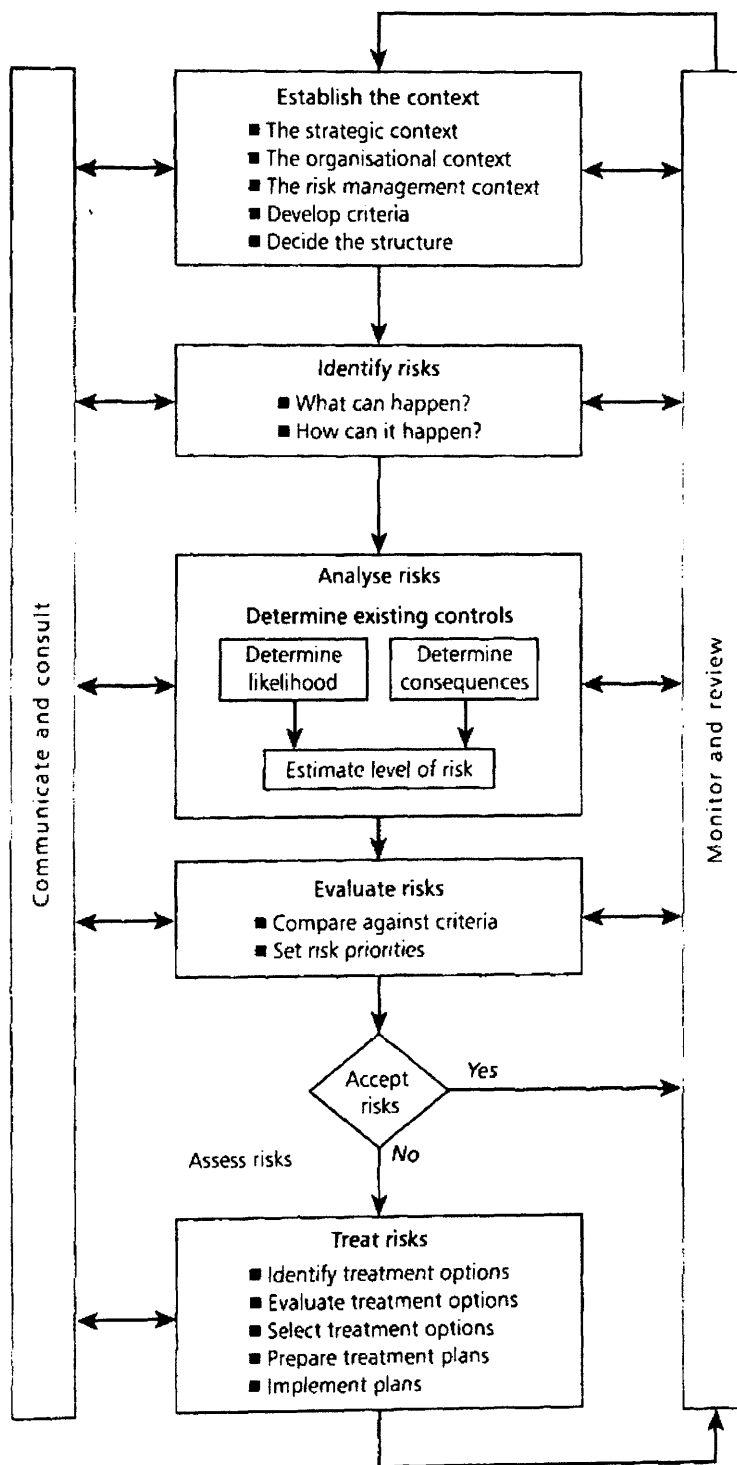


Figure 3-2 Risk management process (AS/NZS, 1999)

Risks can be treated in many different ways (AS/NZS, 1999), namely:

- Avoid the risk altogether

- Reduce the likelihood of the occurrence of the risk
 - Reduce the consequences of the risk
 - Transfer the risk to another party
 - Retain the risk.
- } Risk control

A fundamental principle is that the party that can best deal with or mitigate the risk, should carry that risk or manage it. In so doing, the overall cost of that risk should be minimised. Minimising risk does not imply that all risks are transferred to the contractor (AS/NZS, 1999). Furthermore, the greatest risks that can be dealt with at the least expensive cost should be implemented first, as indicated in Figure 3-3. Thereafter, the decrease in risk per Rand spent becomes less and less. This is similar to Figure 1-4, in which it is proposed that components of a contract that provide the greatest utility, yet cost the least to implement, should be the first to be implemented.

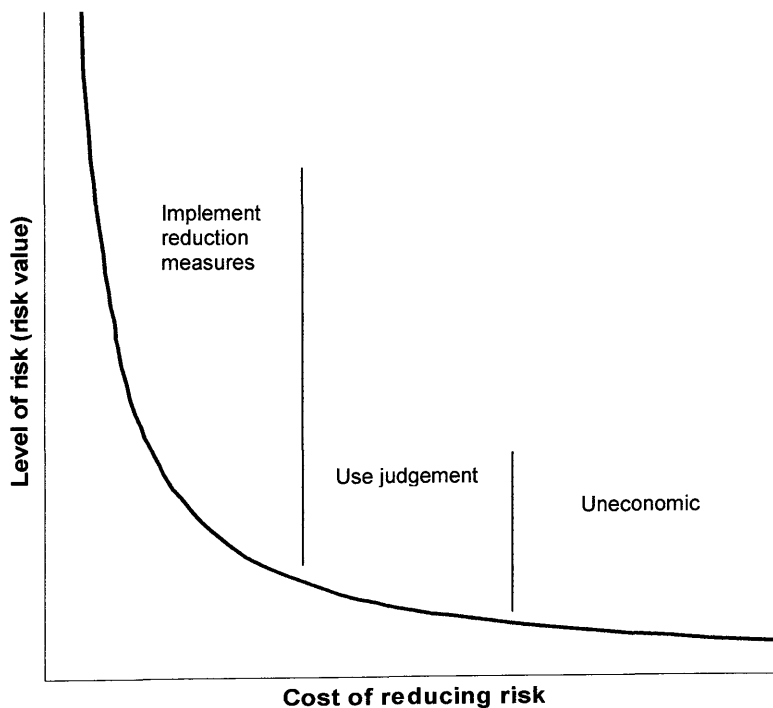


Figure 3-3 Cost of risk reduction measures (AS/NZS, 1999)

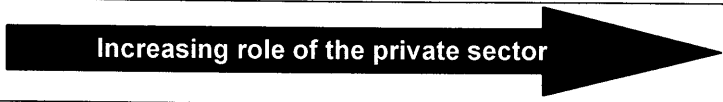
A study on the private financing of infrastructure found that good risk management, although complicated and time consuming, is the main driver of success in the delivery of private infrastructure projects.

3.5.2 The public sector comparator

In a survey of 12 governments across the world, two thirds stated that the most successful government structure in 2010 will be achieved when government focuses on policy and project / supplier management, allowing the private sector to deliver typical public services (Economist Intelligence Unit, 2003).

In order to deliver improved service to their constituents, various governments therefore make use of private-public partnerships (PPPs) to deliver their institutional functions. A competitive bidding process by the private sector improves government's choice of service provider. It also ensures value for money by specifying the performance requirements rather than specifying the means to obtain that end product. This approach enables the bidders to be innovative with their bids (Partnerships Victoria, 2001). Table 3-1 gives an indication of typical PPPs that are used by various governments around the world. The type of partnership model depends on the type of service that is required and the type of infrastructure that is required, if it is required at all.

Table 3-1 Range of partnership models (adapted from Partnerships Victoria)

					
Private party role	Delivery of services to public only (limited maintenance of public infrastructure)	Infrastructure services only	Infrastructure and ancillary services	Infrastructure and partial private-to-public service delivery	Infrastructure and service delivery to users
Government role	Provision of infrastructure and ancillary services such as statutory control	All public-to-public services	Delivery of core public services	Delivery of core public services	No operational role
Example	Toll road operations	Public buildings	Non-core hospital services, non-judicial court services	Community facilities linked to educational facilities (e.g. after-hours usage)	Roads, rail, port facilities, car parks

The challenge for the government receiving the PPP bids, is to evaluate them objectively. This is done by measuring the bids against a hypothetical benchmark project that would be managed and financed by government. The quantitative portion of this hypothetical benchmark project is called a public sector comparator (PSC) (Partnerships Victoria, 2001).

The PSC can be divided into an easily quantified financial cost of executing the works, and a not so easily identifiable cost portion that is ascribed to a number of qualitative parameters, amongst others:

- The amount of risk that has to be dealt with
- The level of management input that is required
- The benefits of the delivery of the project at an earlier date if it is delivered by the private sector under a performance contract
- Environmental and socio-economic considerations (such as BEE in South Africa).

3.5.2.1 The British approach

The British government has made substantial progress with respect to the procurement of its services according to value for money principles. In order to determine VFM, the British Treasury Task Force for Private Finance has developed a Technical Note No. 5 titled *How to Construct a Public Sector Comparator* (Treasury Taskforce on Private Finance, 2004). The British literature suggests that the PSC:

- Is expressed in net present value (NPV) terms
- Takes into account all the risks that could be encountered
- Is based on recent actual public sector methods of providing that defined output (including any reasonably foreseeable efficiencies the public sector could make).

The British refer to a PPP as a private finance initiative (PFI). The components of the British PSC are illustrated in Figure 3-4.

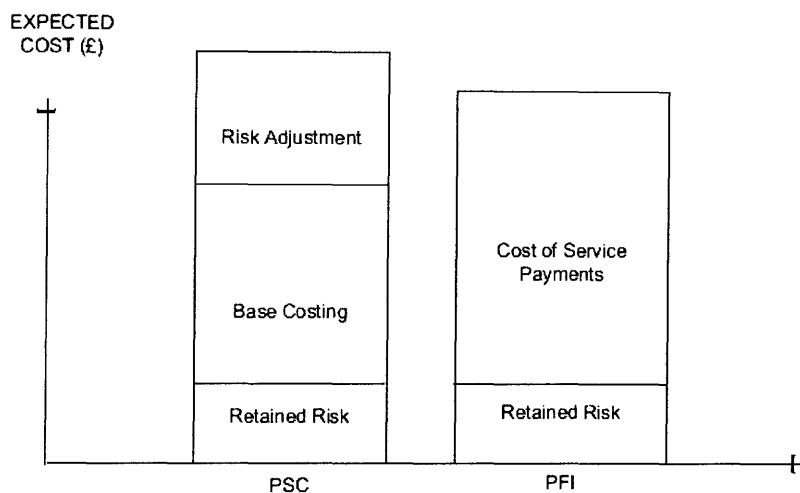


Figure 3-4 British PSC (Treasury Taskforce on Private Finance, 2004)

3.5.2.2 The Australian approach

The Australian State of Victoria compiled a series of guidance documents on how to evaluate the delivery of infrastructure services to its communities through its Partnerships Victoria government policy for PPPs. One of the documents in this series is titled *Partnerships Victoria - Public Sector Comparator Technical Note*.

The approach followed by Partnerships Victoria is very similar to the British approach. The slight difference is the explicit inclusion of a “competitive neutrality” cost in the PSC. The “competitive neutrality” cost component makes provision for the removal of any net competitive advantages that a government agency may have due to its public ownership. The Australian PSC is illustrated in Figure 3-5.

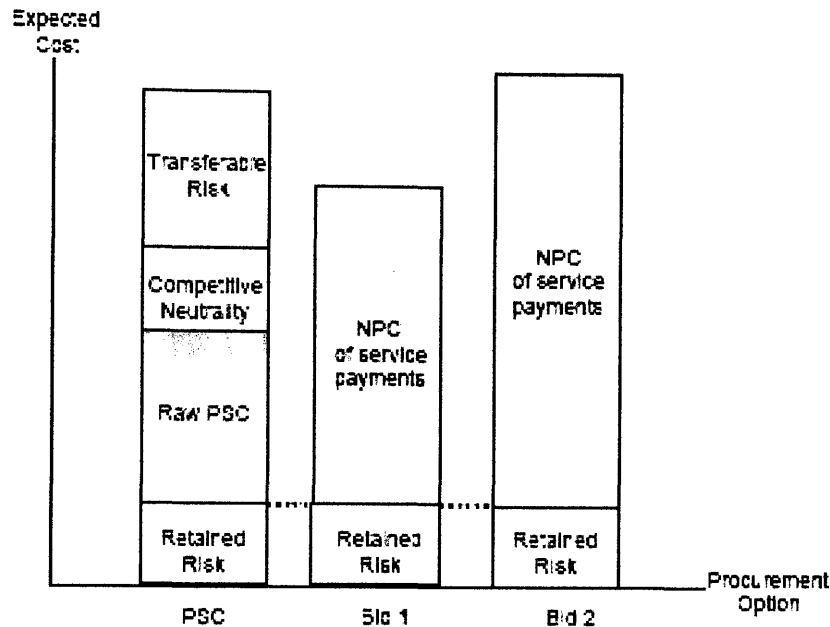


Figure 3-5 VFM and bid evaluation (Partnerships Victoria, 2001)

3.5.2.3 The Canadian approach

In May 2003, Industry Canada compiled a document titled *The Public Sector Comparator, a Canadian Best Practices Guide*. The guide was developed to evaluate and compare whether private sector investment proposals provide the Canadian taxpayer with the best value for money on new infrastructure projects or for the alternative delivery of existing public services. The guide is a compendium of best practices around the world. It draws, amongst others, on the work undertaken by the British Treasury Task Force with respect to the Private Finance Initiative, as well as on Australia’s material for Partnerships Victoria (Partnerships Victoria, 2001).

The purpose for the Canadians to calculate a PSC is to (Economist Intelligence Unit, 2003):

- Determine the affordability of the project by including life-cycle costing
- Test whether a PPP is viable and that VFM is demonstrated
- Use the PSC as a management tool during the development of the project
- Use the PSC as a means to encourage broader competition by creating greater confidence in the bidding process.

According to the Canadian PSC guide, the PSC is a risk-adjusted costing by the public sector as a supplier, of an output specification as part of a procurement exercise. The PSC therefore:

- Is based on a net present value
- Is based on the required output specifications
- Fully takes into account the risks that are involved with that specific style of procurement.

The Canadian PSC guide recognises that the PSC is a one-dimensional approach that focuses mainly on financial, investment and accounting considerations. It should therefore not be the only determinant for assessing VFM on public sector investments (Economist Intelligence Unit, 2003). Other qualitative considerations are:

- Socio-economic policies (the cost inherent in the pursuit of certain policies)
- Balancing public versus private sector interests (e.g. community benefits vs. profits)
- Environmental stewardship (the cost of adhering to environmental legislation)
- Human resources (e.g. the cost of severance packages when a PPP is implemented)
- Bridging national, regional and local considerations within the assessment process (making sure the needs of various groups are met)

- Participation of small and medium sized enterprises (SMEs) (the use of SMEs may increase risk and costs)
- Monitoring costs (the costs for measuring the specified performance metrics)
- Impacts on the partner selection process (the private sector shouldn't be expected to perform services that only a government can perform).

3.5.2.4 The Hong Kong approach

The Hong Kong government's Efficiency Unit compiled the document *Serving the Community by Using the Private Sector – A General Guide to Outsourcing*. It is a guide for decision makers who are involved in outsourcing institutional functions. The document gives guidelines for the various steps of the outsourcing process. As part of the evaluation process, the guide proposes the evaluation of bids in two broad categories, namely technical/operational and financial. The scoring of the two categories must be weighted according to the requirements of the outsourcing department, so that the highest scoring bid offers the best value for money (Hong Kong Efficiency Unit, 2003).

Once the highest scoring bidder is identified, the outsourcing department's tender board is given a report with, amongst others, a cost/benefit analysis and a risk assessment. The cost/benefit analysis should reflect the gains for the government as a whole, not only for the client department. A further consideration that must be made is whether the bid offers a saving over the in-house option.

3.5.2.5 The South African approach

The South Africa's National Treasury PPP Unit has compiled a document titled *Public Private Partnership Manual – National Treasury PPP Practice Notes issued in terms of the Public Finance Management Act* (PPP Unit, 2004). The manual provides best practice guidelines for PPP practitioners, based on the requirements of the PFMA, its regulation number 16 and the PPPFA. One of the key objectives of PPPs in South Africa is to achieve broad-based black economic empowerment, not only

in the equity and management of the contracted private parties, but also in their subcontracting and in the projects' local socio-economic impacts.

The manual describes the use of a PSC in the latter stages of the feasibility study of a PPP, if a PPP is identified as being feasible. Figure 3-6 indicates where in the PPP project life cycle the PSC is calculated. The PPP Manual describes the PSC as a life-cycle cost model of the output specifications where the public sector takes financing, construction and operating risks. A key consideration in the construction of this PSC in the South African context is that it should use the PPPFA 90:10 formula and price premium on all procured goods and services.

3.5.3 Value for money

Value for money means that the provision of the institutional function or the use of state property by a private party in terms of the PPP agreement results in a net benefit to the institution, defined in terms of cost, price, quality, quantity, or risk transfer, or a combination thereof (RSA, 2004).

VFM could also mean that the lowest total-cost option, whether it is carried out by the private or public sector, provides the same specifications for a smaller cost. The lowest total-cost option would thus offer the best VFM. This is illustrated in Figure 3-5, where Bid 1 provides the lowest total cost option. If it weren't for Bid 1, the public sector delivery method would provide the best value for money.

The Hong Kong Efficiency Unit's guideline document for outsourcing (mentioned in 3.5.2.4), also refers specifically to the achievement of VFM. Hong Kong has, as at the end of 2002, outsourced over 4 800 contracts at a value of nearly \$200 billion and an annual expenditure of \$65 billion. Given this experience, the document describes how VFM can be achieved when outsourcing institutional functions. The lessons learned are contained in Table 3-2.

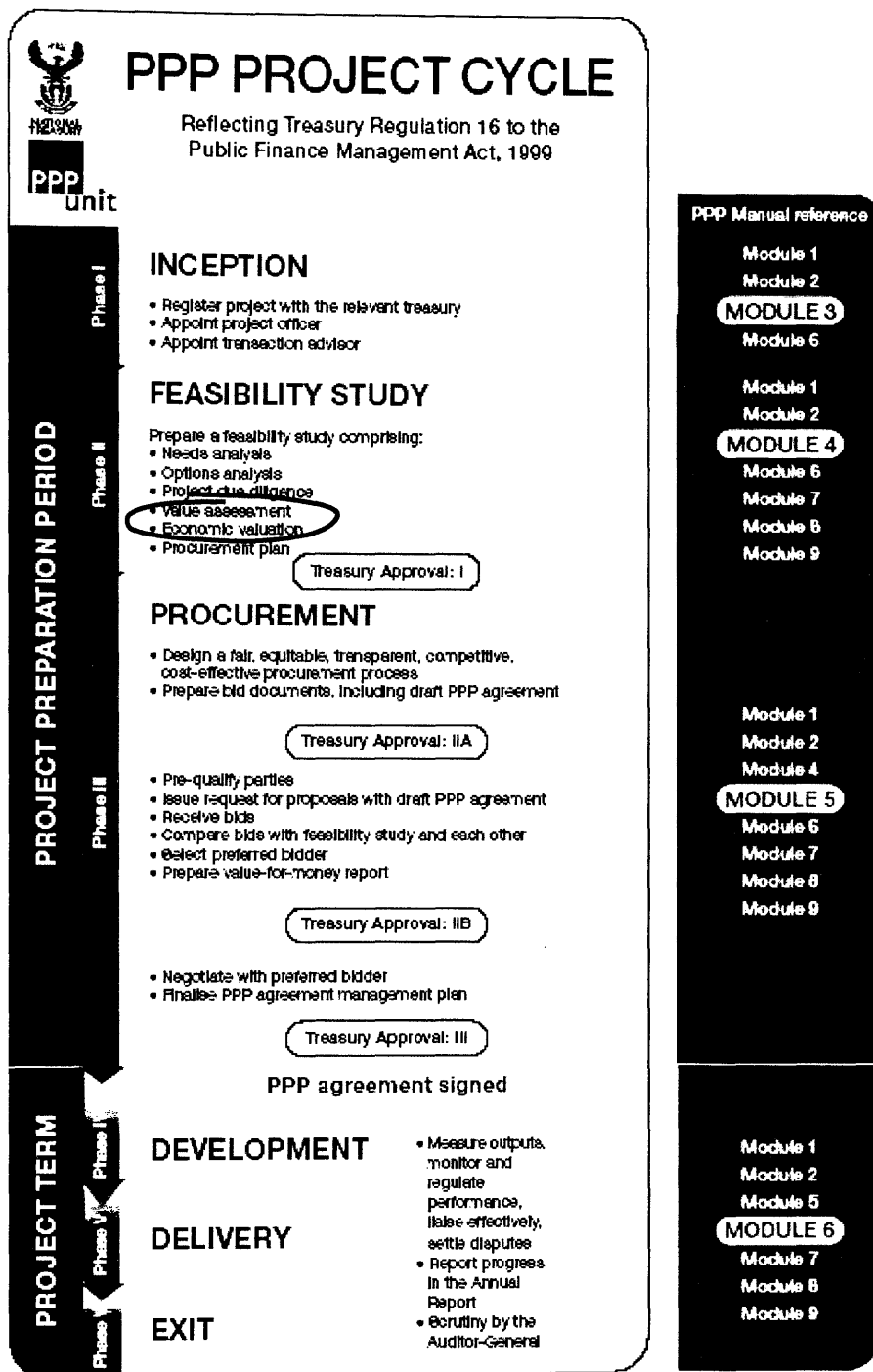


Figure 3-6 PPP project life cycle (PPP Unit, 2004)

Table 3-2 Parameters that influence VFM (Hong Kong Efficiency Unit, 2003)

Parameter	Influence
Contract size	The larger the contract, the better the economy of scale. Smaller contracts could be bundled together.
Cross-departmental co-operation	Where two or more departments are the recipients of the same service, they could benefit through the appointment of one service provider.
Contract duration	Long-term contracts encourage investment by the bidder in equipment, technology and personnel as costs can be spread over a longer time.
Outcome-based specifications	Specifications should be outcome-based, as this encourages innovation from the bidders.
Appropriate levels of service	The outsourcing department should avoid raising the required levels of service to a higher level than when the service was performed in-house, as this unnecessarily raises the price of the bid.
Optimal risk allocation	Outsourcing departments should optimise, not maximise the transfer of risks to the bidder. The bidders should only deal with risks that they can manage.
Competition	A competitive bidding process is essential to achieving good value for money bids.
Level playing field	The benefit/cost analysis should reflect the full benefit/cost to the government as a whole, rather than the client department only. This will ensure that the calculation is not distorted.
Use incentives, not penalties	Make use of incentives to encourage good performance and continuous improvements, rather than penalties.
Do not always select the lowest priced tender	The lowest priced bid must be treated with care, as it may not be sustainable, or it may be lacking in quality of service.
Ensure that projected savings are realised	Outsourcing must only be considered if it provides a saving over the cost of performing the services in-house.
Common goals and understanding	It is essential that the contractor and the client understand and share the objectives of the outsourced project.
Quality management	Minimum specification criteria must be mentioned up front in the bidding documentation.
Dispute resolution	Careful attention needs to be given to problem areas so that disputes are identified and solved early, which will prevent litigation costs.
Review existing contracts before re-use	Existing documents should be reviewed before they are re-used, to prevent outdated (possibly more expensive) specifications.

3.5.4 Performance penalties

Penalties are used in contracts to ensure that the contracted entity performs its obligations under that contract. As penalties are a risk to a contractor, the contractor may cost that risk into the cost of the contract, thereby increasing the cost to the procuring institution.

3.5.5 Customer satisfaction in the roads industry

The significance of this paragraph is to indicate that VFM is a relative concept. To illustrate this point, the example of SANRAL's toll roads is used. SANRAL pays a CTROM contractor to operate and maintain the toll route. SANRAL therefore expects VFM from the CTROM contractor for the provision of the services. On the other hand, the road user that travels on the toll road also expects VFM when that user pays the CTROM contractor a toll fee.

Whilst SANRAL may provide and maintain a road to certain service levels, this may not be what the motorist requires. For example, the motorist may not value the cutting of the grass verges along a road, whereas SANRAL cuts the verges to minimise the risk of accidents occurring when veld fires create smoke screens across a road. In order to determine whose perspective should be taken into account, one must consider who is paying for the specific service aspect from which VFM is expected.

3.6 Previous research

From the above literature review, it is evident that there is a myriad of information available on the key academic theories, legislation, institutions, concepts and terminology that are of relevance to this research report.

With specific reference to SANRAL's toll operations contract formats, no academic research has previously been undertaken. However, financial comparisons have been made between the historical toll operations contracts and the new CTROM contract formats. These analyses only relate to a total cost comparison between the two contract formats. Value for money – in which, amongst others, the value of risk transfer, increased performance specifications and penalties are analysed – wasn't accounted for in the cost comparisons. The effect of net income could also not be determined before the implementation of CTROM contracts, as this could only be determined once sufficient financial data

became available after the start of the CTROM contracts. These analyses will be presented in Chapter 4.

3.7 The development of the CTROM contract format

Although the development of the CTROM contract format did not constitute research per se, a substantial amount of preparatory work had to be done during its development. The objectives of the CTROM contract format, as mentioned earlier in paragraph 1.1.7, were to:

- Create a new remuneration and revenue sharing mechanism to incentivise the toll operator to increase toll revenues and minimise fraud
- Establish a single point of responsibility contract wherein a toll operator is responsible for all aspects relating to the operations of the toll route
- Transfer of fraud and traffic risk to the operator
- Improve customer service through route patrol services, SOS systems and marketing
- Introduce performance based outcomes through penalties and performance guarantees
- Attract new entrants into the toll industry through greater scope of work.

SANRAL engaged a consulting engineer to advise and assist with the development of the new CTROM contract. The result of the process was a suite of documents that make up the CTROM contract documentation. The documents are listed in Table 3-3.

Table 3-3 Suite of CTROM contract documents

Volume 1: Conditions of contract	
Volume 1 Book 1 (latest revision: April 2003)	Conditions of contract for toll operations and maintenance and routine road maintenance in South Africa

Volume 2: Standard specifications	
Volume 2 Book 1 (latest revision: April 2003)	Operations and maintenance fee – payments methodology
Volume 2 Book 2 (latest revision: April 2003)	Standard specifications for operations and maintenance – general
Volume 2 Book 3 (latest revision: April 2003)	Standard specifications for operations and maintenance – electrical and mechanical equipment
Volume 2 Book 4 (latest revision: April 2003)	Standard specifications for operations and maintenance – toll system and emergency communication system
Volume 2 Book 5 (latest revision: April 2003)	Standard specifications for operations and maintenance – electronic toll collection (ETC)
Volume 2 Book 6 (latest revision: October 2001)	Standard specification for routine road maintenance
Volume 3: Project documents	
Volume 3 Book 1	Project document for the operations and maintenance of toll plazas and routine road maintenance of the specific toll road
Volume 3 Book 2	Project document for the routine road maintenance for the specific toll road
Volume 4: Project information	
Volume 4 Book 1	Project information
Volume 4 Book 2	Selected contract drawings and other information provided on compact disk

3.8 Shortcomings in the reviewed literature

3.8.1 Development of the CTROM contract

The weakness of previous work carried out by SANRAL is that the cost of risk transfer or the cost of increased service quality weren't adequately quantified. In other words, acceptable trade-offs between the cost of the contract and the quality of service, and the cost and the risk that is transferred to the toll operator weren't pre-determined. Previous evaluations also didn't assess value for money, nor was an analysis undertaken of the effect of the change in contract format on the net revenue. The latter could only be determined after sufficient data was collected on the financial operations of the new contract format.

3.8.2 Critique on existing literature

The PSC (UK) does not quantify the quality of service on the two (or more) options that are being evaluated, with reference to Figure 3-4.

The Hong Kong guide does not mention the use of a public sector comparator per se to determine whether the private sector bid provides better value for money in comparison to the public sector. Although the private sector bid may offer a good benefit/cost ratio, this could also hold true for an in-house solution. The Hong Kong literature does mention that the outsourced service should offer a saving over the in-house option, but no method of analysis is offered in the literature.

3.9 Conclusions

3.9.1 General

In the field of value for money, much research and development of the concept has been carried out, especially in Britain, Australia, Canada and Hong Kong. It is a well-developed concept that is easy to understand, yet difficult to evaluate and implement.

One could say that the Australian PSC approach is fairer than the British approach, as it provides for the elimination of a government agency's competitive advantage over a private sector bid. However, if a government agency has an inherent competitive advantage over the private sector, this should be used to its advantage.

The Canadian literature highlighted that the PSC is only one of the dimensions in the evaluation of a PPP bid.

In the South African context, VFM must take into consideration the government's policy of BEE, for which the government may pay a premium of up to 10% if a 90:10 preferential procurement policy is used to evaluate private sector bids. In the search for why CTROM contracts are more expensive than the previous managed toll operations contracts, an analysis of this factor may reveal the reason.

3.9.2 Further research required

From the above, it is clear that further research is required to fulfil the objectives of this research report. Further research that is to be undertaken will include the analysis of SANRAL's toll operations contracts before and after the implementation of the CTROM contract format. To this end, the two most suited toll operations contracts, as explained in 1.5.1, will be analysed in detail in the next section of the report. The two toll operations contracts to be analysed will be:

- The N3 Mariannhill Toll Route between Pinetown and Key Ridge in KwaZulu-Natal
- The N17 Toll Route between Springs and Wemmer Pan in Gauteng.

4

Analytical research

4.1 **Introduction**

The hypothesis on which this research report is based (see paragraph 1.4), is that SANRAL is not achieving optimal value for money on its CTROM contracts. In order to determine whether VFM is achieved, a public service comparator could be constructed for each of the CTROM projects under consideration, against which the private sector bids (public open tenders) can be compared. The difference between the PSC and the private sector bid would indicate the extent of the VFM that can be achieved by engaging the private sector.

4.1.1 **Comparative analysis**

In the case of SANRAL's toll operations contracts, the cost of the new CTROM contract model is compared to the previously used managed contract model (the pre-CTROM contract model). The cost of the pre-CTROM contract model is therefore assumed to be the PSC for toll road operations, as it is a base or reference project, from which the cost of the new replacement projects (CTROM) can be compared.

As SANRAL lets all its toll operations projects to private sector companies, the comparison of costs is mainly between two private sector contractors, instead of between an in-house public sector option and a private sector option.

4.1.2 **Analysis methodology**

As indicated in Figure 3-4 and Figure 3-5, the difference between the PSC and the PPP / PFI bid indicates whether VFM is obtained. For the purpose of this research report, the researcher will carry out the following process on the N3 Mariannhill and the N17 toll routes:

- Quantify the difference in contract values between the pre-CTROM and CTROM contracts
- Analyse the difference in costs, taking into consideration that a higher cost may provide more benefits
- Determine whether the cost difference constitutes VFM
- Recommend changes that should be brought about on future CTROM contracts to achieve better VFM.

4.1.3 Background to the N3 Mariannahill toll route

4.1.3.1 Design and construction of the N3 Mariannahill toll route

The Mariannahill toll route is located between Durban and Pietermaritzburg in the province of KwaZulu-Natal in South Africa, as illustrated in Figure 4-1.

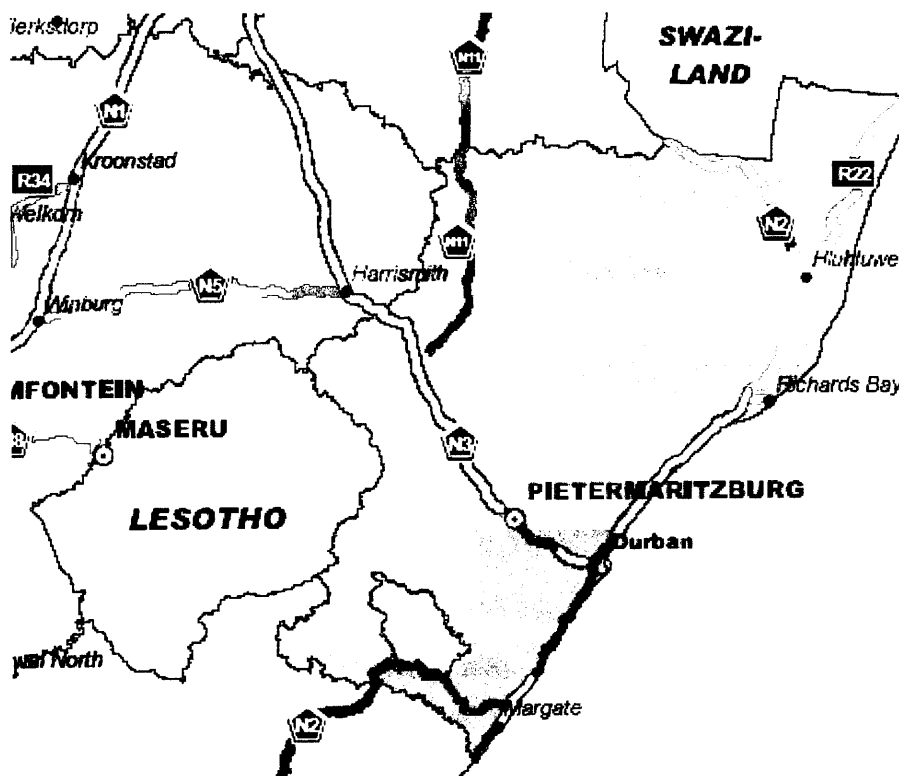


Figure 4-1 Locality of N3 Mariannahill Toll Route

The route was a replacement for the old N3 in Pinetown. It came about due to the congestion and the poor operating conditions due to the steep gradients, particularly on a section named Fields Hill (Floor,

1985). The new N3 was planned to run parallel to the old N3, which is now called the M13. The new N3 Mariannahill Toll Route was to be located between the Paradise Valley Interchange, (where the M13 turns away from the N3), up to Key Ridge, (where the M13 again joins the N3). The Mariannahill Toll Route is shown in Figure 4-2.

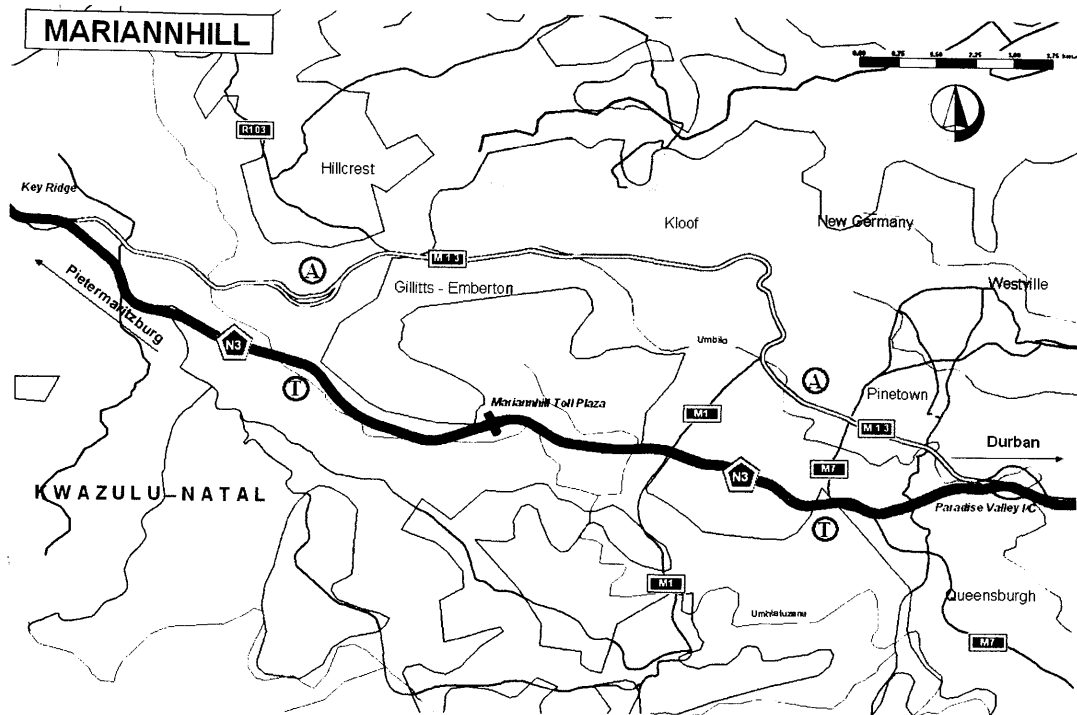


Figure 4-2 Map of N3 Mariannahill Toll Route

The new N3 would shorten the distance by almost 3 kilometres, would eliminate the steep gradients, and would bypass the congested areas of Hillcrest, Kloof and Pinetown. The new route would thereby become a rural freeway with less urban accesses and much better operating conditions.

The new section of freeway was designed as a six-lane freeway and included a major viaduct over the Umhlatuzana River Valley and five interchanges with the major crossing roads, including the two interchanges at either end of the toll route connecting it to the M13.

4.1.3.2 Operations of N3 Mariannahill toll route

The Mariannahill Toll Route was operated on the old toll operations model until 30 April 2003. There were a number of separate contracts for the

various facets of the operations and maintenance of the toll route, (refer to Figure 1-2). From 1 May 2003, the new CTROM contract was implemented on the Mariannhill toll route after a public open tender process. A slight deviation from all the other CTROM contracts was that this CTROM contract was let without the routine road maintenance (RRM) portion, as there already was a contract in place to cover this operational aspect of the toll route.

4.1.4 Background to the N17 toll route

4.1.4.1 Design and construction of the N17 toll route

The N17 is located in the south-east of the Johannesburg Metropolitan Area. It connects the heavily industrialised town of Springs, in the eastern part of Gauteng, with the centre of Johannesburg. The locality of the N17 Toll Route is indicated in Figure 4-3.

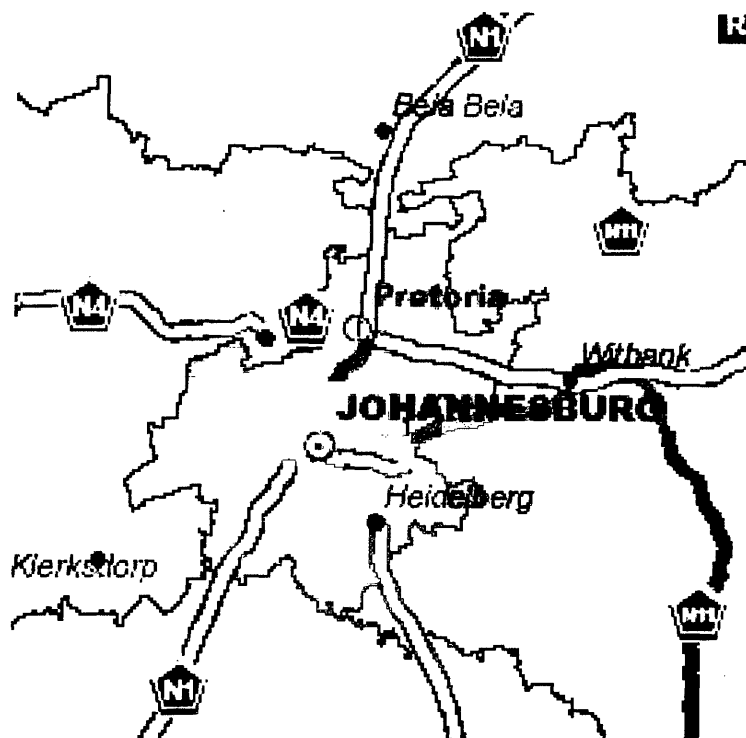


Figure 4-3 Locality of N17 Toll Route

The first sections of the N17 toll route were constructed in the late 1970s, with construction being completed in 1979 on the first section between the Rand Airport Interchange and the Wadeville Interchange. The construction of the second section between the Wadeville

Interchange and the Dalpark Interchange started in 1979. About a decade later, in the late 1980s, the easternmost section between Dalpark Interchange and Anchor Road in Springs was completed. The western end of the N17 toll route between the Rand Airport Interchange and Wemmer Pan was only completed in the mid 1990s.

The entire N17 toll route is designed as a 4, 6, or 8-lane freeway, depending on the traffic volumes on particular sections of the freeway.

The N17 toll route is illustrated in Figure 4-4 and Figure 4-5.

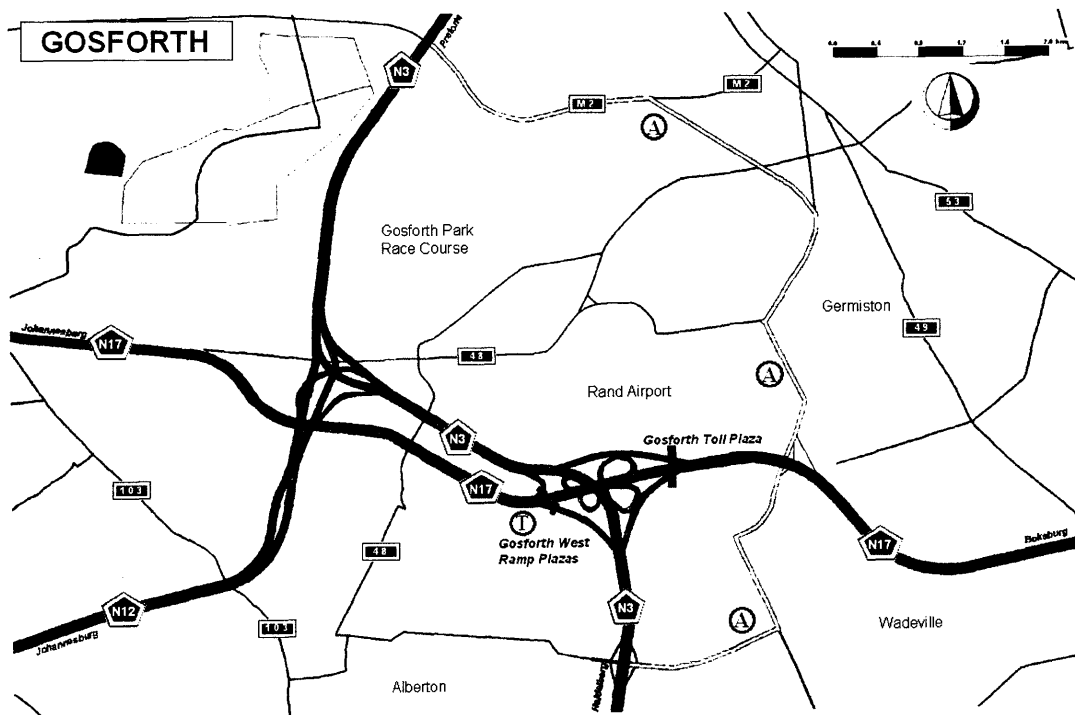


Figure 4-4 Map of N17 Toll Route (Gosforth section)

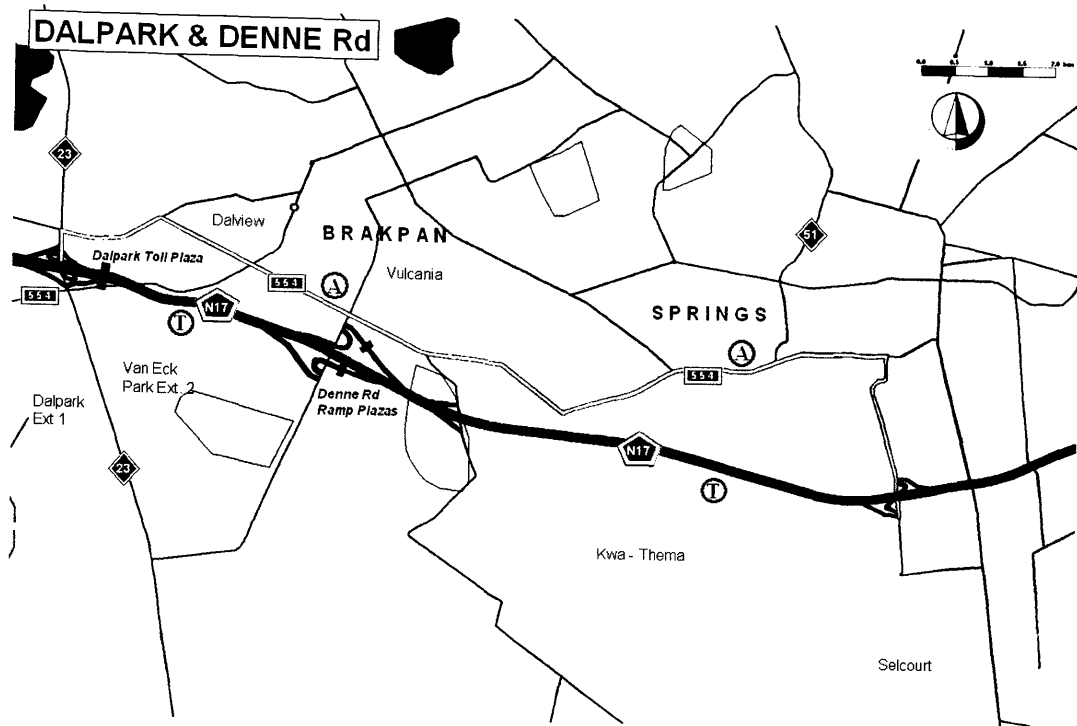


Figure 4-5 Map of N17 Toll Route (Dalpark and Denne Road sections)

4.1.4.2 Operations of the N17 toll route

The operations of the toll route include the Gosforth and Dalpark Mainline Toll Plazas, as well as the Denne Road and Gosforth West Ramp Toll Plazas. The routine road maintenance of the N17 toll route is included in this contract.

4.2 Quantification of the pre-CTROM cost vs. the CTROM costs

In the comparative analysis, the current CTROM costs are compared to the pre-CTROM costs (Tolplan Consulting, 2004a and 2004b). All costs that are compared with each other are brought to a similar basis in order to make the comparison as accurate as possible. To this end:

1. Twelve months' CTROM costs are compared to 12 months' pre-CTROM costs by adjusting all costs to a common base date. This is done by taking into account the applicable consumer price (CPI) indices as published by Statistics South Africa (Statistics South Africa, 2004).

2. All capital expenditure items are removed from the cash flows so that only toll operations costs are reflected.
3. All toll warrants and toll discounts are removed from the cash flows.
4. The cost of all services that previously weren't part of the toll operations contracts are removed from the cash flows.

The analysis of pre-CTROM and CTROM costs for the N3 Mariannhill Toll Route are carried out in Table 4-1 (Tolplan Consulting, 2004a). The results of the analysis are illustrated graphically in Figure 4-6, together with the gross income data. Similarly, the analysis of the N17 Toll Route is indicated in Table 4-2 and Figure 4-7 (Tolplan Consulting, 2004b).

Table 4-1 Comparison of cash flows on the N3 Mariannhill Toll Route

N3 Mariannhill toll route month to month comparison of toll operations and maintenance cost (CTROM with pre-CTROM contracts), where Warrants, Discounts and Violations cost is seen as part of cost (All amounts are in millions of Rands and include VAT).

Month				Raw inflated values (see notes)		Inflated values, allowing for Warrants, discounts and violations				November 2002 Rands			November 2002 Rands, allowing for Warrants, Discounts and Violations and traffic growth and excluding Capital expenditure on equipment and facilities				As in preceding columns, including lane equipment maintenance, E&M and consultant**** fees				As in preceding columns, excluding services not included in Pre-CTROM contract					
Pre-CTROM	Pre-CTROM: CPI index	CTROM	CTROM: CPI index	Pre-CTROM**	CTROM payment certificate***	Pre-CTROM: + Warrants, discounts and violations	Pre-CTROM (inc Warrants, discounts and violations)	CTROM payment certificate***	Increase	Pre-CTROM	CTROM	Increase	Pre-CTROM: Total traffic	Pre-CTROM	CTROM: Total traffic	CTROM	Increase	Pre-CTROM: + Maintenance and Consultant**** fees	Pre-CTROM: (incl maint & Consultant**** fees)	CTROM: + Consultant**** fees	CTROM (incl Consultant**** fees)	Increase	Pre-CTROM	CTROM: - Services not included in Pre-CTROM ¹	CTROM (Exc Services not included in Pre-CTROM)	Increase
May-2002	113.9	May-2003	122.8	R 0.194	R 0.937	R 0.061	R 0.244	R 0.937	284%	R 0.268	R 0.918	256%	877,443	R 0.257	867,326	R 0.918	257%	R 0.271	R 0.528	R 0.076	R 0.994	88%	R 0.528	R -0.333	R 0.661	25%
Jun-2002	114.7	Jun-2003	122.4	R 0.192	R 0.619	R 0.048	R 0.240	R 0.619	158%	R 0.261	R 0.608	142%	877,325	R 0.251	867,554	R 0.608	143%	R 0.085	R 0.336	R 0.061	R 0.669	99%	R 0.336	R -0.085	R 0.584	74%
Jul-2002	116.3	Jul-2003	122.4	R 0.188	R 0.644	R 0.052	R 0.240	R 0.644	168%	R 0.249	R 0.633	154%	926,373	R 0.248	914,513	R 0.633	155%	R 0.266	R 0.504	R 0.061	R 0.694	38%	R 0.504	R -0.090	R 0.603	20%
Aug-2002	116.9	Aug-2003	122.9	R 0.196	R 0.609	R 0.051	R 0.247	R 0.609	147%	R 0.254	R 0.596	135%	932,265	R 0.251	880,397	R 0.596	138%	R 0.154	R 0.404	R 0.076	R 0.672	66%	R 0.404	R -0.089	R 0.583	44%
Sep-2002	118.1	Sep-2003	122.5	R 0.200	R 0.611	R 0.048	R 0.248	R 0.611	147%	R 0.252	R 0.600	138%	908,218	R 0.250	872,435	R 0.600	140%	R 0.080	R 0.329	R 0.047	R 0.648	97%	R 0.329	R -0.087	R 0.561	70%
Oct-2002	119.9	Oct-2003	121.7	R 0.196	R 0.630	R 0.052	R 0.248	R 0.630	156%	R 0.248	R 0.623	151%	913,342	R 0.247	897,912	R 0.623	152%	R 0.072	R 0.320	R 0.067	R 0.690	116%	R 0.320	R -0.089	R 0.601	88%
Nov-2002	120.3	Nov-2003	120.8	R 0.199	R 0.638	R 0.051	R 0.250	R 0.638	156%	R 0.250	R 0.636	155%	888,554	R 0.249	876,797	R 0.636	156%	R 0.134	R 0.382	R 0.067	R 0.703	84%	R 0.382	R -0.088	R 0.615	61%
Dec-2002	120.5	Dec-2003	120.9	R 0.200	R 0.609	R 0.043	R 0.243	R 0.609	150%	R 0.243	R 0.606	150%	1,045,417	R 0.241	1,025,543	R 0.606	151%	R 0.088	R 0.330	R 0.067	R 0.673	104%	R 0.330	R -0.083	R 0.589	79%
Jan-2003	121.6	Jan-2004	121.8	R 0.201	R 0.595	R 0.045	R 0.246	R 0.595	142%	R 0.243	R 0.588	142%	916,638	R 0.241	889,108	R 0.588	144%	R 0.112	R 0.353	R 0.067	R 0.655	85%	R 0.353	R -0.078	R 0.577	63%
Feb-2003	121.5	Feb-2004	122.4	R 0.203	R 0.606	R 0.045	R 0.248	R 0.606	145%	R 0.245	R 0.596	143%	813,039	R 0.247	837,489	R 0.596	141%	R 0.105	R 0.352	R 0.081	R 0.677	92%	R 0.352	R -0.074	R 0.603	71%
Mar-2003	122.7	Mar-2004	123.2	R 0.229	R 0.654	R 0.111	R 0.340	R 0.654	92%	R 0.333	R 0.639	92%	876,968	R 0.337	917,043	R 0.639	89%	R 0.170	R 0.507	R 0.067	R 0.706	39%	R 0.507	R -0.075	R 0.631	24%
Apr-2003	123.1	Apr-2004	123.4	R 0.253	R 0.610	R 0.105	R 0.359	R 0.610	70%	R 0.351	R 0.595	70%	878,836	R 0.357	942,361	R 0.595	67%	R 0.215	R 0.572	R 0.067	R 0.662	16%	R 0.572	R -0.076	R 0.587	2%
Monthly average				R 0.204	R 0.647	R 0.058	R 0.263	R 0.647	146.3%	R 0.285	R 0.637	140.4%	904,534	R 0.285	899,040	R 0.637	140.4%	R 0.145	R 0.410	R 0.067	R 0.704	71.6%	R 0.410	R -0.104	R 0.600	46.3%

Pre-CTROM**: Excluding capital expenditure on equipment and facilities, warrants discounts and violations, consultant and MIS fees.

CTROM payment certificate***: As per "Adjusted toll operations and maintenance" according to the N3 operational model used to calculate monthly payments to the operator, before adjustment due to the revenue shortfall, excluding all capital and routine road maintenance expenditure (including services not included in Pre-CTROM contract, warrants, discounts and violations and MIS fees, excluding consultant fees).

Consultant****: Including MIS fees in the case of the Pre-CTROM contract. In the case of the CTROM contract, the MIS fees are included in the O&M fees.

Services not included in Pre-CTROM: Video Grabbing maintenance as well as the increased operating costs associated with the March 2003 tariff increase. Contract start-up and termination costs were also included in this amount.

VAT included

Base date:
Nov-2002 120.3

N3 MARIANHILL TOLL ROUTE

Comparison of pre- and post-CTROM revenues and income

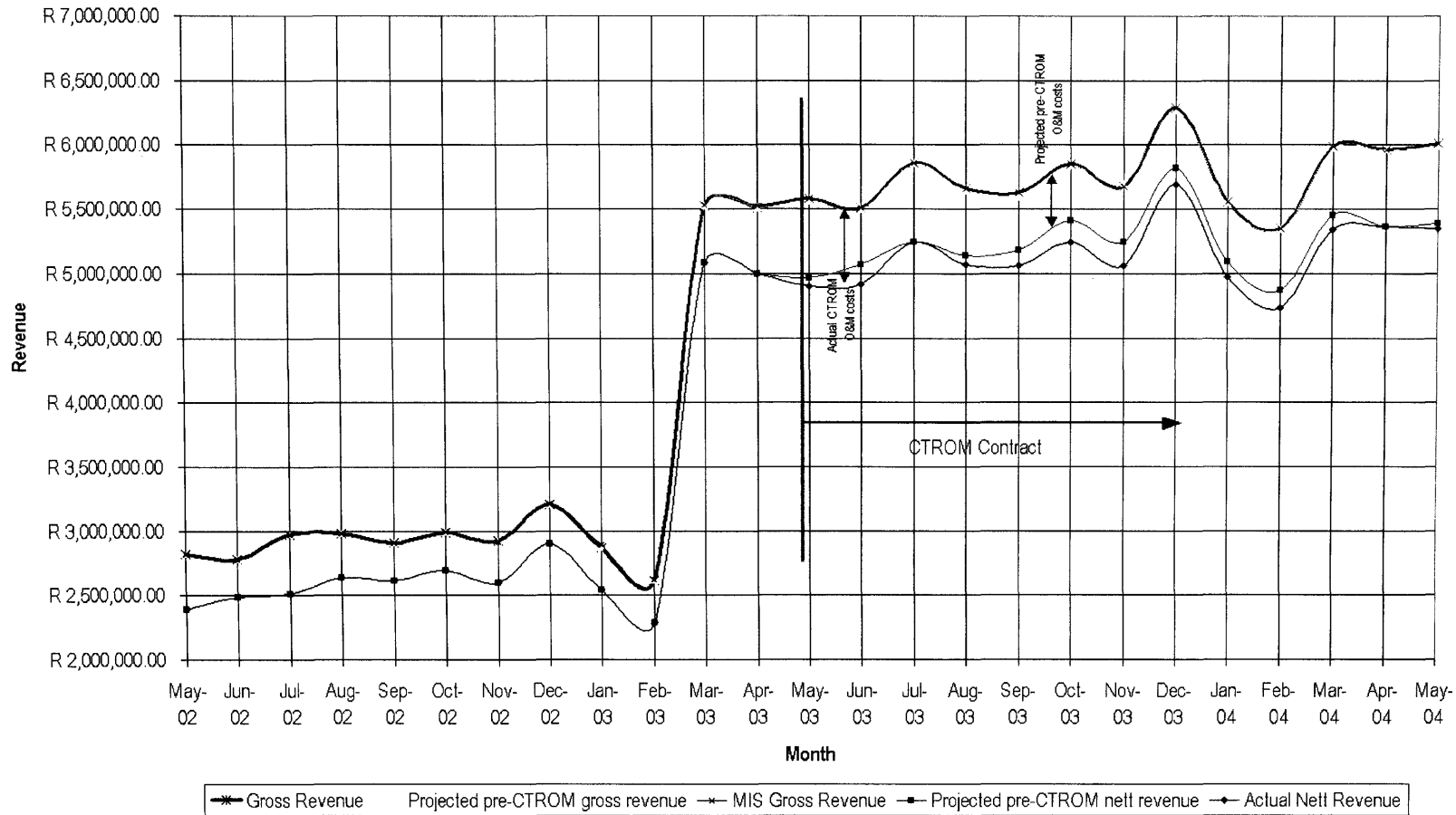


Figure 4-6 Comparison of cash flows on the N3 Mariannhill Toll Route

Table 4-2 Comparison of cash flows on the N17 Toll Route

N17 toll route month to month comparison of toll operations and maintenance cost (CTROM with pre-CTROM contracts), where Warrants, Discounts and Violations cost is seen as part of cost (All amounts are in millions of Rands and include VAT).

Month		Raw inflated values (see notes)		Inflated values, allowing for Warrants, discounts and violations					January 2001 Rands			January 2001 Rands, allowing for Warrants, Discounts and Violations and traffic growth and excluding Capital expenditure on equipment and facilities				As in preceding columns, including lane equipment maintenance, E&M and consultant**** fees				As in preceding columns, excluding services not included in Pre-CTROM contract						
Pre-CTROM	Pre-CTROM: CPI index	CTROM	CTROM: CPI index	Pre-CTROM**	CTROM payment certificate**	Pre-CTROM: + Warrants, discounts and violations	Pre-CTROM (inc Warrants, discounts and violations)	CTROM payment certificate***	Increase	Pre-CTROM	CTROM	Increase	Pre-CTROM: Total traffic	Pre-CTROM	CTROM: Total traffic	CTROM	Increase	Pre-CTROM: + Maintenance and Consultant**** fees	Pre-CTROM: (incl maint & Consultant**** fees)	CTROM: + Maint & Consultant**** fees	CTROM (incl Consultant**** fees)	Increase	Pre-CTROM	CTROM: - Services not included in Pre-CTROM ¹	CTROM (Exc Services not included in Pre-CTROM ¹)	Increase
Jan-2001	103.8	Jan-2003	121.6	R 0.480	R 1.962	R 0.046	R 0.526	R 1.962	273%	R 0.526	R 1.675	219%	1 170 653	R 0.527	1 181 000	R 1.675	218%	R 0.256	R 0.784	R 0.058	R 1.733	121%	R 0.784	R -0.642	R 1.091	39%
Feb-2001	104.1	Feb-2003	121.5	R 0.473	R 1.929	R 0.049	R 0.522	R 1.929	270%	R 0.520	R 1.648	217%	1 200 383	R 0.522	1 213 908	R 1.648	216%	R 0.266	R 0.788	R 0.041	R 1.689	114%	R 0.788	R -0.642	R 1.047	33%
Mar-2001	104.8	Mar-2003	122.7	R 0.557	R 1.924	R 0.060	R 0.617	R 1.924	212%	R 0.611	R 1.628	166%	1 287 761	R 0.612	1 289 794	R 1.628	166%	R 0.360	R 0.972	R 0.041	R 1.669	72%	R 0.972	R -0.642	R 1.026	6%
Apr-2001	105.3	Apr-2003	123.1	R 0.487	R 1.271	R 0.050	R 0.537	R 1.271	137%	R 0.530	R 1.072	102%	1 130 210	R 0.545	1 231 041	R 1.072	97%	R 0.213	R 0.758	R 0.044	R 1.116	47%	R 0.758	R -0.059	R 1.057	39%
May-2001	105.7	May-2003	122.8	R 0.498	R 1.163	R 0.059	R 0.557	R 1.163	109%	R 0.547	R 0.983	80%	1 271 171	R 0.551	1 301 070	R 0.983	78%	R 0.259	R 0.810	R 0.046	R 1.029	27%	R 0.810	R -0.059	R 0.970	20%
Jun-2001	106.2	Jun-2003	122.4	R 0.458	R 1.198	R 0.056	R 0.514	R 1.198	133%	R 0.502	R 1.016	102%	1 213 215	R 0.509	1 261 365	R 1.016	100%	R 0.402	R 0.911	R 0.046	R 1.062	17%	R 0.911	R -0.059	R 1.003	10%
Jul-2001	106.1	Jul-2003	122.4	R 0.502	R 1.217	R 0.061	R 0.563	R 1.217	116%	R 0.551	R 1.032	87%	1 253 163	R 0.568	1 368 597	R 1.032	82%	R 0.403	R 0.971	R 0.047	R 1.080	11%	R 0.971	R -0.059	R 1.021	5%
Aug-2001	105.9	Aug-2003	122.9	R 0.502	R 1.204	R 0.064	R 0.567	R 1.204	112%	R 0.555	R 1.017	83%	1 275 910	R 0.566	1 351 192	R 1.017	80%	R 0.282	R 0.848	R 0.047	R 1.064	25%	R 0.848	R -0.059	R 1.005	18%
Sep-2001	106.2	Sep-2003	122.5	R 0.506	R 1.226	R 0.059	R 0.564	R 1.226	117%	R 0.552	R 1.038	88%	1 198 024	R 0.572	1 329 957	R 1.038	82%	R 0.275	R 0.847	R 0.049	R 1.087	28%	R 0.847	R -0.059	R 1.028	21%
Oct-2001	106.1	Oct-2003	121.7	R 0.501	R 1.218	R 0.066	R 0.567	R 1.218	115%	R 0.555	R 1.039	87%	1 303 232	R 0.571	1 413 582	R 1.039	82%	R 0.239	R 0.809	R 0.047	R 1.086	34%	R 0.809	R -0.059	R 1.027	27%
Nov-2001	106.6	Nov-2003	120.8	R 0.491	R 1.181	R 0.064	R 0.555	R 1.181	113%	R 0.540	R 1.015	88%	1 299 919	R 0.548	1 352 513	R 1.015	85%	R 0.181	R 0.729	R 0.048	R 1.063	46%	R 0.729	R -0.059	R 1.004	38%
Dec-2001	107.2	Dec-2003	120.9	R 0.523	R 1.212	R 0.047	R 0.569	R 1.212	113%	R 0.551	R 1.040	89%	1 107 849	R 0.571	1 227 055	R 1.040	82%	R 0.422	R 0.994	R 0.049	R 1.089	10%	R 0.994	R -0.059	R 1.030	4%
Monthly average				R 0.498	R 1.392	R 0.057	R 0.555	R 1.392	150.9%	R 0.545	R 1.184	117.1%	1 225 958	R 0.555	1 293 423	R 1.184	113.2%	R 0.296	R 0.852	R 0.047	R 1.231	44.5%	R 0.852	R -0.205	R 1.026	20.4%

Pre-CTROM**: Excluding capital expenditure on equipment and facilities, warrants discounts and violations, consultant and MIS fees.

CTROM payment certificate***: As per "Adjusted toll operations and maintenance" according to the N17 operational model used to calculate monthly payments to the operator, before adjustment due to the revenue shortfall, excluding all capital and routine ro maintenance" according to the N17 operational model used to calcul CTROM contract, warrants, discounts and violations and MIS fees, excluding consultant fees).

Consultant****: Including MIS fees in the case of the Pre-CTROM contract. In the case of the CTROM contract, the MIS fees are included in the O&M fees.

Services not included in Pre-CTROM: Operation and Maintenance of: Supervision of IMS, Emergency communications system and Customer service call centre, Emergency cleanup and Video Grabbing maintenance as well as the partial Supply, implementation, operation and maintenance of Routine servtenance of: Supervisi start-up and termination costs were also included in this amount.

VAT included

Base date:
Jan-2001 103.8

N17 TOLL ROUTE

Comparison of pre- and post-CTROM revenues and income

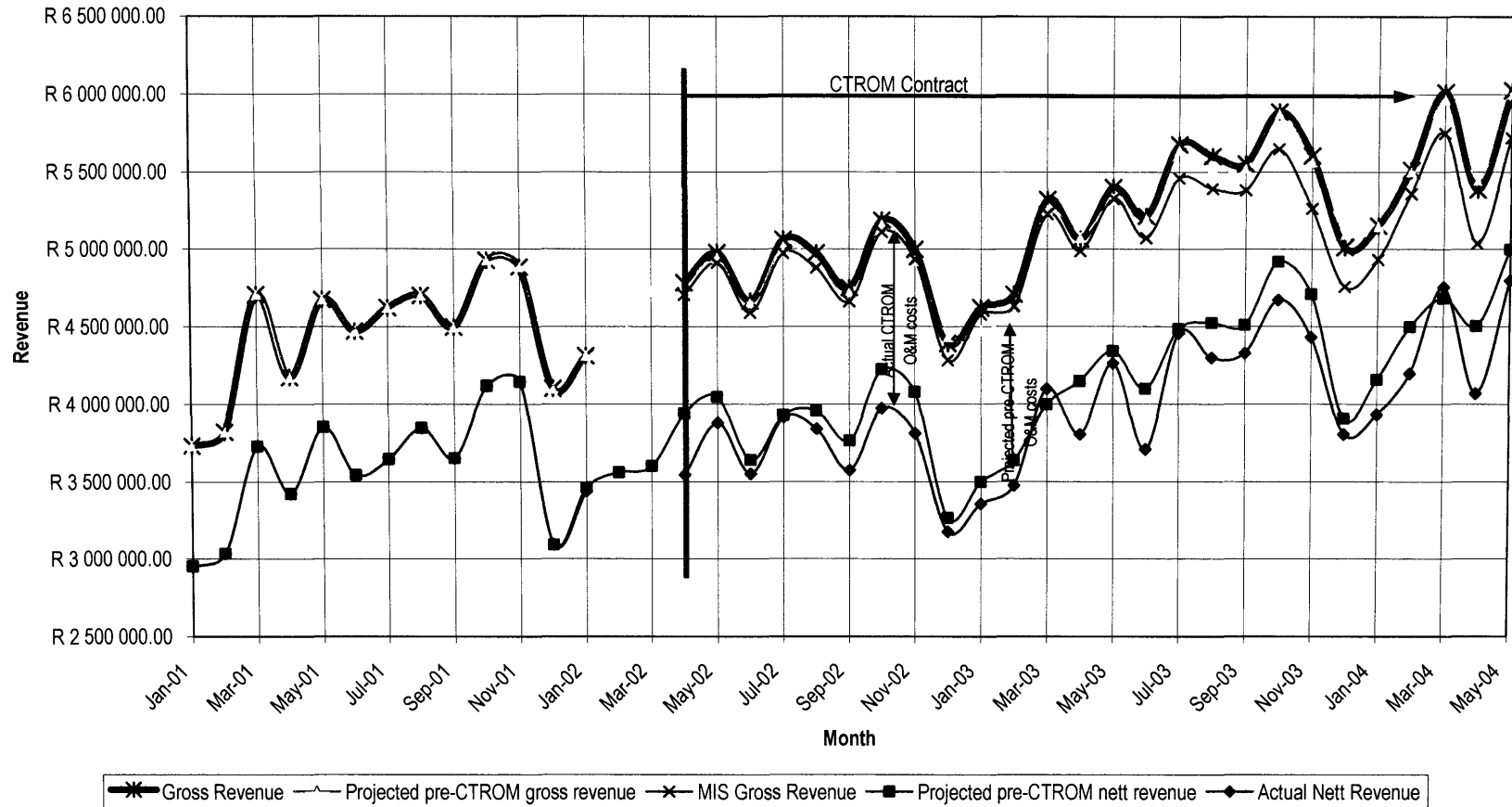


Figure 4-7 Comparison of cash flows on the N17 Toll Route

Table 4-1 and Table 4-2 indicate that the monthly operations and maintenance costs of the N3 Mariannhill and the N17 toll routes are 46,3% and 20,4% more expensive respectively with the CTROM format, when compared to the pre-CTROM contract model. Although Figure 4-6 and Figure 4-7 indicate that the net revenue has increased on both toll routes, this is attributable to the annual increase in toll fees, as well as the growth in traffic volumes using the toll routes. The above analyses imply that the net revenue could have improved even more, had the costs remained within normal inflationary increases.

In order to illustrate a comparison of the increases in gross revenue with the increases in operating costs, a summary of the analyses is presented in Table 4-3. The values presented in this table are in de-escalated Rands. In other words, the values are de-escalated to a common base date. For the gross income values, the effect of toll tariff increases is omitted, and for the O&M costs, the values are de-escalated according to the CPI indices as published by Statistics South Africa. However, this methodology does not give a true representation, as the gross income is a sum of the products of the actual traffic volumes and the actual toll tariffs for each vehicle class, as indicated in Equation 4-1 (SANRAL, 2003c).

$$\text{Gross income} = \sum_{a=1}^4 V_a T_a \quad \text{Equation 4-1}$$

Where: V_a = actual number of vehicles per toll class
 T_a = actual tariff per toll class
 a = toll class

As the annual toll tariff increase may have reduced actual traffic volumes, gross income may be underestimated in comparison to the stated O&M costs, using this approach. Nevertheless, the values are used for illustrative purposes.

Table 4-3 Summary of comparative analyses

Route	Item	Values (R million)		% change
		Pre-CTROM	CTROM	
N3 ¹	Monthly average gross income ²	2,897	2,931	1,2
	Less Monthly average O&M costs ³	0,410	0,600	46,3
	Monthly average net revenue	2,487	2,331	-6,3
N17 ⁴	Monthly average gross income ⁵	4,019	4,321	7,5
	Less Monthly average O&M costs ⁶	0,852	1,026	20,4
	Monthly average net revenue	3,167	3,295	4,0

- Notes:
- ¹ The periods of comparison are the twelve months May 2002 to April 2003 and May 2003 to April 2004
 - ² Toll fees are de-escalated and fixed at November 2002 tariffs on the N3 Mariannhill Toll Route for the purpose of the comparative analysis. This results in an obvious understatement of the actual gross income.
 - ³ From Table 4-1
 - ⁴ The periods of comparison are the twelve months January 2001 to December 2001 and January 2003 to December 2003
 - ⁵ Toll fees are de-escalated and fixed at January 2001 tariffs on the N17 Toll Route for the purpose of the comparative analysis. This results in an obvious understatement of the actual gross income.
 - ⁶ From Table 4-2

As the gross incomes in Table 4-3 have been calculated according to base toll tariffs for both toll routes, the percentage change in the average monthly gross income, before and after the implementation of the CTROM contract, is an indication of the growth in traffic volumes. It is evident that the $\pm 200\%$ increase in toll fees at the Mariannhill Toll Plaza on the N3 has suppressed traffic growth on the toll road, resulting in traffic choosing to use the alternative route. On the other hand, the traffic volumes on the N17 Toll Route have grown about 7,5% over the two-year analysis period, or about 3,7% per year.

Table 4-3 also indicates that on both toll routes, the high increase in the average monthly O&M costs has resulted in lower than expected growths in net revenues.

The differences are now the subject of further analysis to determine whether the increased cost constitutes an improvement of value for money or not.

4.3 Analysis of cost differences

Various factors can influence the cost of a toll operations contract. Some of these parameters are listed in Table 4-4.

Table 4-4 Parameters that influence the cost of a toll operations contract

Parameter	Increase in cost	Decrease in cost
1. Contract duration	Longer period	Shorter period
2. Risk transfer to toll operator	More risk to toll operator	Less risk to toll operator
3. Penalties to toll operator	More penalties to toll operator	Less risk to toll operator
4. Performance specifications (technical and service)	Stringent specifications or closely monitored by client	Relaxed specifications
5. Number of bidders	Few bidders	Many bidders
6. Other sources	Various factors obtained from bidders	

Each of the above parameters will have a “transfer function” which, simply put, is a function describing how a change in the relevant parameter will influence the project cost. Typical transfer functions are indicated in generic terms in Figure 4-8.

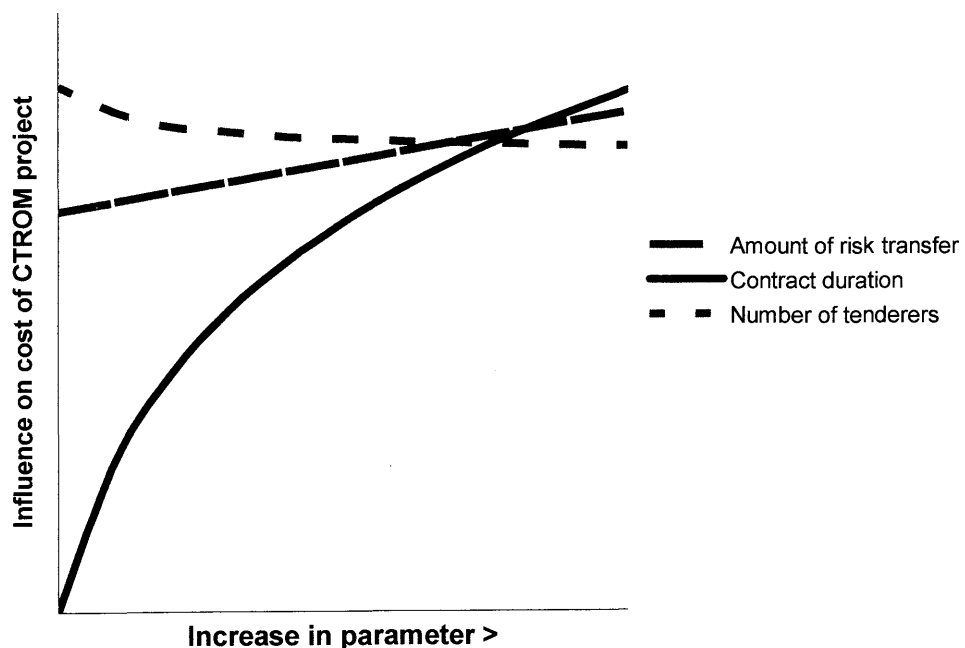


Figure 4-8 Examples of transfer functions for CTROM cost parameters

The exact shape of the individual transfer functions can be determined in theory, by the analysis of a considerable amount of empirical data, or by expert opinion obtained from specialists in the toll industry.

As a note to Table 4-4 and Figure 4-8 above, the total cost increases with a longer contract duration. However, the annual (unit) cost decreases with longer contract durations, as indicated by the flattening off of the solid blue curve in Figure 4-8.

4.3.1 Contract duration

SANRAL's CTROM contracts are formulated so that the toll operator can install its own equipment, provided that it conforms to SANRAL's functional specifications. The role that the contract duration therefore plays in the total cost of the toll operations contracts is twofold, namely:

- The longer the contract period, the more the cost of capital items and site establishment can be spread during the contract period.
- Longer contract periods provide better long-term job security for the toll operator. The operator could therefore price a longer contract more favourably.

The contract duration should not be too long, however, as it limits the entry of new technology. By limiting this aspect, an increase in the maintenance cost of the equipment that the operator is "locked" into, could result in increased total costs.

The longer the contract duration, the greater the uncertainty of future trends and events. An exceptionally long contract period would therefore increase the risk to both the operator and the client, thereby increasing the costs again.

4.3.2 Risk transfer

4.3.2.1 Risk matrices for CTROM projects

Table 4-5 is a risk register for the operations of a toll route. This table contains some of the risks that were identified in what is probably the most important of the CTROM contract documents (refer to Table 3-3),

namely the Standard Specification for Operations and Maintenance: Toll System and Emergency Communication System, April 2003 (SANRAL, 2003d).

The risk of fraud on the toll income was previously carried entirely by SANRAL. On the pre-CTROM toll operations contracts, the toll operator paid SANRAL whatever cash remained after fraudulent activities were committed. However, with the new CTROM contract, the toll operator has to pay SANRAL the revenue that should have been collected, based on the number of vehicles that passed through the toll plaza. The toll collector therefore now carries the risk of fraud.

Table 4-5 Risk register for toll operations projects (AS/NZS, 1999)

Ref	The risk: What can happen, and how can it happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
1	Political and regulatory risks							
1.1	- The operator shall comply with all laws at all times, regardless whether they change during the contract period or not. This could happen if legislation is improved or amended.			Transferred to operator	2	C	M	4
1.2	- The operator shall allow for any future modification to the ITIS interface with SANRAL. Modification could be a result of improvements or upgrades to the system.			Transferred to operator	2	C	M	5
2	Social risks N/A							
3	Economic and financial risks N/A							
4	Legal risks N/A							
5	Commercial risks							
5.1	- Credit cards offered as payment for toll fees may be fraudulent, resulting in a loss to the operator.			Transferred to operator	3	B	H	2
5.2	- The number of different credit cards that must be accepted by the operator is high, resulting in increased risk to the operator.			Transferred to operator	2	C	M	6
6	Bidding risks N/A							

Ref	The risk: What can happen, and how can it happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
7	Design risks N/A							
8.1	Construction risks - Many aspects of the technical specifications are complex and difficult to attain. Whilst seeming attainable at the bidding stage, subcontractors may not be able to achieve the specifications.			Transferred to operator	4	C	E	1
9.1	Operational and maintenance risks - The operator is liable for securing all data and communications. Data may be corrupted due to third party data service providers' negligence.			Transferred to operator	4	E	H	3
10.1	Force majeure events - The operator shall ensure that the automatic vehicle classification (AVC) system shall not be disrupted for more than 2 hours per event. A major accident could occur in which a truck crashes into the toll plaza, resulting in downtime of more than 2 hours.			Transferred to operator	2	D	L	7
11	People risks N/A							

Legend: Consequence rating: 1 – insignificant, 2 – minor, 3 – moderate, 4 – major, 5 – catastrophic

Likelihood rating: A – almost certain, B – likely, C – possible, D – unlikely, E – rare

Level of risk: E – extreme risk, H – high risk, M – moderate risk, L – low risk

The risks listed in Table 4-5 don't portray all the risks on a CTROM contract, as the other documents listed in Table 3-3 have not been analysed for the purpose of this study.

The risks identified in Table 4-5 can now be used to compile a treatment schedule and action plan. This action plan lists who is responsible for the implementation of the action plan, the resources that are to be used, the budget allocation, a timetable for implementation, and details of the mechanism and frequency of review of compliance with the treatment plan (AS/NZS, 1999).

4.3.3 Penalties

The CTROM contracts contain a host of penalties that may be instituted against the operator for non-compliance with particular contractual specifications and requirements. The penalties are contained in a compliance register, which is checked on a monthly basis. Should the operator not comply, a penalty is applied. In some cases, the operator may submit mitigating circumstances that may eliminate or at least soften the penalty.

One of the major problems that the CTROM operators are experiencing is full technical compliance of the toll system with the specifications. Another problem is the non-availability or malfunctioning of the SOS telephones along the toll routes. For these, and other items of non-compliance, the operators seem to rather pay the penalty than to rectify the situation. This implies that the penalties are not set at the correct level, or the specifications could be too challenging to attain.

4.3.3.1 Penalty registers for CTROM projects

In order to manage the penalties on the CTROM contracts, penalty registers have been compiled (Tolplan Consulting, 2004c). The N3 Mariannhill and N17 toll routes' penalty registers are indicated in Table 7-1 and Table 7-2 in Appendix B. An inspection of the penalty registers indicates that in some instances, inappropriate penalties are being charged. Incorrect allocation of penalties can result in unnecessarily high project costs.

Some examples of inappropriate levels of penalties are:

- The employment of an alternative supplier to supply video monitoring equipment and the subsequent recovery of the cost from the operator, should the operator fail to install the equipment within one month of the commencement of the contract. The problem is that an alternative supplier is not easy to source and appoint.
- Termination of the contract, should the operator not accept all methods of payment that are specified. Termination is a drastic measure for this non-compliance.
- Termination of the contract, should the operator not comply with VAT legislation. Termination is a drastic measure for this non-compliance.
- The penalty for malfunctioning toll collection equipment is too low at 0,25% of the monthly O&M fee (R 1 625 per penalty event). This is an important interface with the toll road users, and must function at all times.

4.3.4 Performance specifications

As mentioned before, the increased cost of the CTROM contracts may have brought about improved services that reflect value for money. However, in the analysis that was carried out in paragraph 4.2 to quantify the additional cost of the CTROM contracts, the services that weren't previously in toll operations contracts, were removed from the analysis. One would therefore assume that something else would be responsible for the increased costs.

In order to determine whether the performance specifications are appropriate, or whether they are too onerous, SANRAL procured the services of toll specialists in the USA to conduct an independent evaluation of the CTROM documentation. Their suggestions are contained in a marked-up set of the CTROM documents. With reference to the *Standard Specification for Operations and Maintenance: Toll*

System and Emergency Communication System, April 2003 (SANRAL, 2003d), some of the reviewers' suggestions include the following:

- SANRAL's requirement of physically separating data communication for the transfer of various types of data from the operator to SANRAL results in unnecessary duplication and therefore results in additional costs to SANRAL.
- SANRAL's requirement of having a power backup for each central processing unit for each toll lane's AVC – over and above the toll plaza's uninterruptible power supply – creates unnecessary redundancy and hence results in increased costs to SANRAL.
- The large amount of data that must be stored / archived adds costs to the CTROM contract.
- The quick response times to repair AVCs add costs to the contract. As all toll lanes are not always required, depending on traffic levels, an alternative toll lane can be used while a defective AVC is being repaired.

It is evident from the above comments that the increased costs do not directly influence the service quality to the customer. One could therefore argue that some of SANRAL's requirements are over-specified in terms of direct service delivery to the travelling public. This adds unnecessary costs to the total contract value.

4.3.5 Management input

One of the benefits of the CTROM contract has been a reduction in SANRAL's management input. This can be ascribed to the new organisational structure shown in Figure 1-3 on page 1-8, and the detailed performance specifications listed in Table 3-3 on page 3-22. As no time-sheets are available from which SANRAL's actual person-hours of management input can be obtained, an estimate of the value of the reduced management input is indicated in Table 4-6. An hourly value of R 350 is used as the total "cost to company" rate for a typical project manager.

Table 4-6 Estimated pre- and post-CTROM management input

Aspect	SANRAL management input per CTROM contract (person-hours per month)		Reduction
	Pre-CTROM	Post-CTROM	
Toll operations	8	4	-50.0%
Electrical contract	8	1	-87.5%
Mechanical contract	8	1	-87.5%
Lane contract	8	1	-87.5%
MIS contract	8	1	-87.5%
Routine road maintenance contract	16	16	0%
TOTAL	56	24	-57.1%
ANNUAL COST @ R 350/hr	R 235 200	R 100 800	R 134 400

Table 4-6 indicates that there is a saving of about R 135 000 per year per CTROM project. Considering that SANRAL has seven CTROM projects, the total annual saving brought about by the new CTROM contracts is estimated to be R 950 000.

4.3.6 Preferential procurement

The determination of the additional cost that the PPPFA adds to a tender price is not straightforward. Two values are certain, namely the low scenario and high scenario boundaries. For example, if a 90:10 evaluation policy is used, the maximum theoretical premium that SANRAL could have paid for the seven CTROM contracts is 10% of R 1 074,9m (from the total cost in Table 1-6 on page 1-23). The theoretical maximum premium thus amounts to R 107,5m. The lowest scenario would be zero. Considering that bidders must comply with minimum preferential procurement criteria, the additional cost that the PPPFA brings about could be anywhere between zero and R 107,5m.

4.3.7 Other factors

4.3.7.1 Alternative procurement system

In order to bring down the costs on future CTROM contracts, an alternative bidding system could be implemented. Scheme A would be a postulated scheme in which the bidder must comply with all of SANRAL's requirements. Bidders must also offer a second bid, Scheme B, which must be say 10% cheaper than Scheme A. It is up to the bidder to apply innovation to decide how this saving could be achieved. This could be done by relaxing or omitting specifications, by reducing penalties, by alternative risk management, or any other method.

The evaluation of the Scheme B bids would present additional effort to determine whether they offer an acceptable solution. However, this form of bidding could be effective on future CTROM contracts.

An additional benefit of this type of bidding process is that the bidders, who are the toll operations specialists, highlight the costly items in the submission of their Scheme B bid.

4.3.7.2 Project management structure

An organisational structure that is supportive of CTROM-type projects can be found by analysing the project characteristics. SANRAL will have different project characteristics when compared to the consulting engineers that act as agents for SANRAL. The toll operators will also have different project characteristics from SANRAL and the consulting engineers. SANRAL and its consulting engineers will be involved with managing the project to a fair extent. On the other hand, the toll operators' project managers will be intricately involved with the management of a specific toll route. Table 4-7 indicates how the organisational structure is influenced by the project characteristics (Project Management Institute, 2000).

Table 4-7 Organisational structure influences on projects

Project Characteristics	Organization Structure	Functional	Matrix			Projectized
			Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority	Little or None	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Percent of Performing Organization's Personnel Assigned Full Time to Project Work	Virtually None	Virtually None	0-25%	15-60%	50-95%	85-100%
Project Manager's Role	Part-time	Part-time	Part-time	Full-time	Full-time	Full-time
Common Titles for Project Manager's Role	Project Coordinator/ Project Leader	Project Coordinator/ Project Leader	Project Manager/ Project Officer	Project Manager/ Program Manager	Project Manager/ Program Manager	Project Manager/ Program Manager
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time	Full-time

According to Table 4-7, SANRAL and its consulting engineers should adopt an organisational structure with a balanced matrix. The toll operator will have a strong or even a projectised matrix. These respective organisational structures are illustrated in Figure 4-9 and Figure 4-10 (Project Management Institute, 2000).

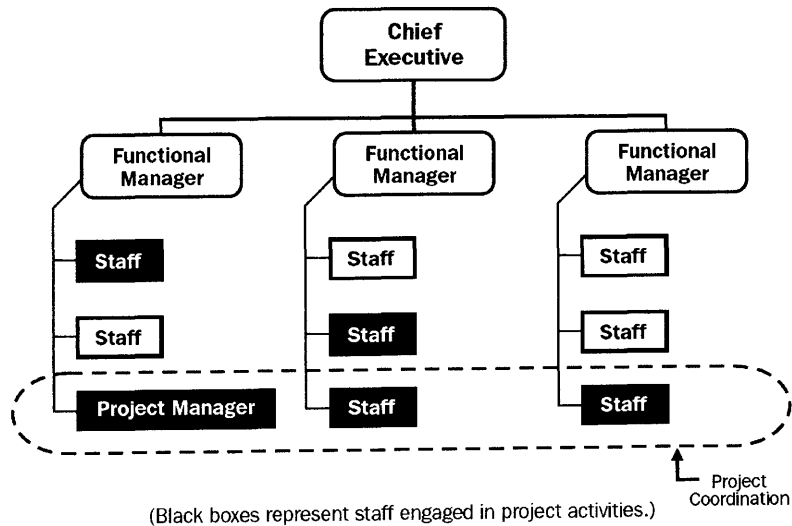


Figure 4-9 Balanced organisational matrix

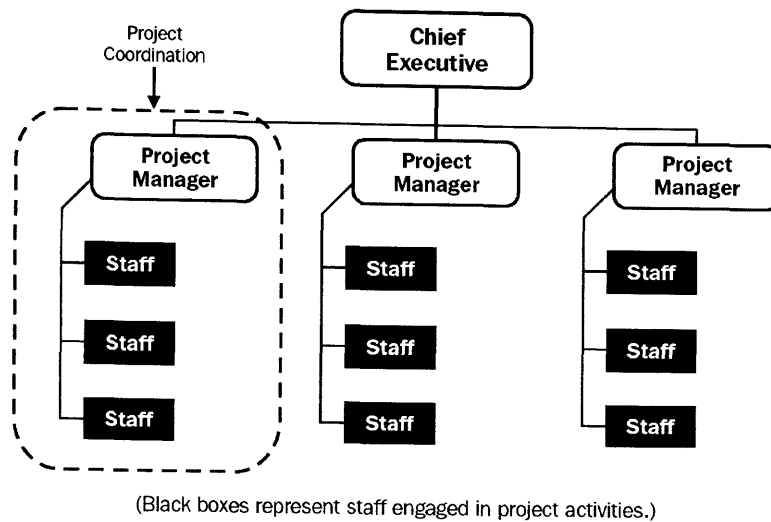


Figure 4-10 Projectised organisation

4.4 Conclusions

4.4.1 Has optimal VFM been achieved?

While many aspects of the toll operations contracts have improved with the implementation of the CTROM contracts, it is evident from the analyses that there are a number of improvements that can be brought about to achieve better value for money on the CTROM contracts. The author therefore concludes that optimal VFM has not been achieved on SANRAL's CTROM contracts.

4.4.2 Cost drivers

The author concludes that there are a number of cost drivers of the CTROM contracts. Many of these cost drivers can be influenced and managed positively by SANRAL. They are discussed in 4.5 below.

4.5 Changes that could improve VFM

SANRAL can ensure improved VFM by ensuring:

- That the duration of CTROM contracts is long enough to reduce the unit cost per year;

- That appropriate risk transfer takes place between SANRAL and its toll operator;
- That penalties are fitting of the 'crime' committed by the toll operator; and
- That performance specifications are fairly easy to achieve by the toll operator.

Furthermore, SANRAL could implement an alternative bidding process in which the bidders are forced to submit a lower bid, in addition to a postulated bid. SANRAL can also ensure that its organisational structure is supportive of its project managers that manage the CTROM contracts. This will ensure efficient management input efforts.

5

Conclusions

5.1 Literature study

The research conducted in the literature study indicates that appropriate risk management plays a fundamental role in the pricing of projects by private sector bidders. It is therefore good practice to study the inherent and implied projects risks and to manage them according to international best practice.

A shortcoming of SANRAL's tender evaluations for the CTROM contracts is that they did not take into account value for money considerations, nor did SANRAL seek to find the most cost-effective risk management options.

5.2 Cost drivers

The author concludes that a value for money comparison is not a straightforward exercise, as it is a subjective analysis. A value for money analysis also includes qualitative issues, which are difficult to quantify with a cost value.

Despite the difficulty of a value for money analysis, the author concludes that the principle cost drivers of the CTROM contracts are inappropriate risk allocation between SANRAL and the toll operator, project durations that are too short, unfair or unfitting penalties imposed on the toll operator, and technical performance specifications that the toll operator has difficulty in attaining.

5.3 Improving value for money

The CTROM contracts are a vast improvement when compared to the pre-CTROM toll operations contracts. However, the author concludes that better value for money could yet be attained.

It is evident from the research that, in addition to appropriate risk management, SANRAL can control many of the other factors that influence project costs, such as the apportioning of risks in a cost-effective manner between SANRAL and the toll operator, imposing fair penalties on the toll operator, and specifying requirements that are simple and attainable by the toll operator. By doing so, SANRAL can improve the value for money it attains on its CTROM contracts.

6

Recommendations

6.1 Achieving better value for money on CTROM projects

As this research only highlighted the problems associated with the achievement of optimal VFM on SANRAL's CTROM contracts, the author recommends that SANRAL brings about the following processes to improve the VFM on future CTROM projects:

- Compile a comprehensive risk register for future CTROM contracts, according to international best practice, (e.g. AS/NZS 4360:1999). From the risk register, a list of risks can be identified that are currently dealt with inappropriately. This should reduce risks to all parties, and hence the project costs.
- Analyse all the penalties that are applied on the CTROM contracts and re-evaluate their relevance. Some penalties may have to be increased, others decreased. A fairer allocation of penalties should reduce future CTROM contract costs.
- Conduct a critical evaluation of all specifications (technical and others), that may unnecessarily increase project costs, whilst not being of much benefit. "Nice-to-haves" should be eliminated in this process.
- Call for bids that are 10-15% cheaper than the postulated specification. By doing so, bidders can highlight which of the specifications in the suite of CTROM documents have a substantial influence on the total project cost.

6.2 Way forward for further research

In order to determine whether VFM has been obtained on SANRAL's CTROM contracts, a model could be developed that analyses the influence of the various project parameters on the total cost of the project. The combination of project parameters that provides the lowest cost project in the model can then be analysed further in terms of qualitative considerations. The latter considerations are not easily converted into a financial value, such as the influence of risk transfer. However, by analysing the various parameters that influence the cost of the CTROM contracts according to public sector comparator theory, the combination of parameters that provides the least expensive solution will be a good indicator as to whether VFM can be achieved.

This model could be particularly useful, should SANRAL in the future need to objectively evaluate and consider alternative, cheaper bids, in which the bidder has removed certain specifications, risks, or penalties.

7

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Appendix A Research programme

ID	TaskName	Duration	Start	Finish	2004		Qtr 2, 2004			Qtr 3, 2004			Qtr 4, 2004			Qtr 1, 2005			Qtr 2, 2005				
					Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr				
1	MBA research report - Peter Suremann	265 days	Mon 16-02-04	Mon 21-02-05																			
2	Submission of title	0 days	Mon 16-02-04	Mon 16-02-04																			
3	Appointment of study leader	0 days	Mon 08-03-04	Mon 08-03-04																			
4	Study proposal	64 days	Thu 01-04-04	Wed 30-06-04																			
5	Submission of study proposal	0 days	Thu 01-04-04	Thu 01-04-04																			
6	Feedback on proposal & contact session 1 with study leader	0 days	Mon 10-05-04	Mon 10-05-04																			
7	Submission of revised study proposal	0 days	Mon 21-06-04	Mon 21-06-04																			
8	Acceptance of study proposal	0 days	Wed 30-06-04	Wed 30-06-04																			
9	Phase 1 (introduction, problem statement)	76 days	Mon 29-03-04	Mon 12-07-04																			
10	Prepare Phase 1	76 days	Mon 29-03-04	Mon 12-07-04																			
11	Submit Phase 1 to study leader	0 days	Mon 12-07-04	Mon 12-07-04																			
12	Phase 2 (literature review)	34 days	Mon 14-06-04	Fri 30-07-04																			
13	Prepare Phase 2	31 days	Mon 14-06-04	Mon 26-07-04																			
14	Submit Phase 2 to study leader	0 days	Mon 26-07-04	Mon 26-07-04																			
15	Contact session 2 with study leader	0 days	Fri 30-07-04	Fri 30-07-04																			
16	Phase 3 (analytical research)	29 days	Mon 12-07-04	Fri 20-08-04																			
17	Prepare Phase 3	26 days	Mon 12-07-04	Mon 16-08-04																			
18	Submit Phase 3 to study leader	0 days	Mon 16-08-04	Mon 16-08-04																			
19	Contact session 3 with study leader	0 days	Fri 20-08-04	Fri 20-08-04																			
20	Phase 4 (conclusions and recommendations)	20 days	Mon 09-08-04	Mon 06-09-04																			
21	Prepare Phase 4	16 days	Mon 09-08-04	Mon 30-08-04																			
22	Submit Phase 4 to study leader	0 days	Mon 30-08-04	Mon 30-08-04																			
23	Contact session 4 with study leader	0 days	Mon 06-09-04	Mon 06-09-04																			
24	Submit manuscript of report	0 days	Mon 13-09-04	Mon 13-09-04																			
25	Feedback from study leader	0 days	Mon 04-10-04	Mon 04-10-04																			
26	Study leader's permission to submit report for examination	0 days	Mon 11-10-04	Mon 11-10-04																			
27	Language editing by professional editor	10 days	Mon 11-10-04	Fri 22-10-04																			
28	Submission of final report	0 days	Fri 22-10-04	Fri 22-10-04																			
29	Result of examination	0 days	Fri 28-01-05	Fri 28-01-05																			
30	Submit three final copies of report	0 days	Mon 21-02-05	Mon 21-02-05																			

Appendix B Penalty registers

Table 7-1 Evaluation of penalties on the N3 Mariannhill CTROM project

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N3 Marianhill Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
SECTION 1: PROVISION OF AVAILABLE DOCUMENTS, DRAWINGS AND SOFTWARE RELATING TO OPERATIONS AND MAINTENANCE						
7.1	Operator default for clauses 4.5 and 6 - Cl 4.3 - Operations Manuals, Procedures for operation and maint of 1 Toll Sys, 2. E&M Sys, 3. ECS Sys, 4. AVC QC sys manuals.	Manuals and licences are required to operate and maintain toll road facilities. In the event of a breach of contract whereby the Operator does not continue with the works, manuals, licenses and other documentation will be required to allow the NRA to continue with toll collection without interruption by appointing another operator. The NRA could call on the performance bond and install new toll and operational systems but possibly not without interruption.	Yes	Escalatable amount. Initial event of non-compliance and for each month thereafter	R 5,000	Penalty amount seems too low. The NRA could, however, call on the Performance Bond for all possible damages (incl loss of toll income). The value of the Bond is, however calculated based on one month's toll income)
7.2	Documentation Hand-over to Next Operator	The comment is the same as for item 7.1 but limited in the sense that this would only be a risk in the last 6 months of the contract.	Yes	Call on Performance Bond and/or Final Maintenance Bond	n/a	n/a
7.3	Asset management system non- compliance	Continuous updating of the Asset register is required to enable the NRA to accurately determine asset levels and values for insurance and tax purposes. Possible risk exists in under/over insurance and/or payment of tax.	Yes	Escalatable amount. Initial event of non-compliance and for each month thereafter	R 5,000	The penalty amount seems too low. There is a substantial amount of work involved in updating the asset register and the Operator might pay the penalty rather than do the work. The penalty would however continue which would result in a substantial amount.
SECTION 2: TOLL PLAZA EXPANSIONS AND UPGRADES, ROAD IMPROVEMENTS AND OTHER IMPROVEMENTS						
No Penalties						
SECTION 3: DAMAGE TO ASSETS						
14.1.1	Default to Cl. 12 reaction and repair times w.r.t damage to Assets. Cl. 12 Damage to Assets - Urgent Repair. [1. Immediate interim measures to restore safety. 2. Initiate repair within 12 hrs and complete repair within 14 days - for semi fixed assets]	Damage to assets may impact on general appearance, loss of income and safety. The payment mechanism should mitigate SANRAL's risk i.t.o loss of income. The most important aspect is safety. Should a motorist be injured as a result of, for instance, an impact attenuator that has not been repaired within a reasonable time, the motorist might have reason for a claim against the Operator but ultimately the NRA.	Yes, but restricted i.t.o suppliers etc. Adequate spares should be kept.	Percentage of monthly Operations and Maintenance Fee (3%). Per occurrence.	R 19,500	It would depend on the specific case whether this amount is fair or not. OM and NRA discretion is advised.
14.2.1	Default to Cl. 13 - Recording and Reporting of Damage to Semi Fixed Assets.	The non reporting of damage could result in the NRA not being aware of the damage. Risk to NRA is described under 14.1.1. Recording of details are also important in cases of claims by motorists against the NRA. By not recording the relevant details, the NRA may not be able to claim damages from the road user in cases of damage to fixed assets. This is however mitigated by the fact that the Operator shall then be responsible for the cost and that the OM conducts inspections to identify damaged assets.	Yes	Escalatable amount. Per event of non-compliance	R 5,000	The amount seems reasonable.
SECTION 4: TRAFFIC MANAGEMENT AT TOLL PLAZAS						
16.3.1	Video grabbing to be operational no later than 1 month after commencement date	Excessive queue lengths and service times at toll plazas are unacceptable. Without a queue length monitoring system that provides continuous uninterrupted data, the control by the OM and NRA would be ineffective. The risk involved revolves around public perception of inadequate service levels by the NRA and the negative publicity for the NRA and toll roads in general.	Yes	Remedy i.t.o clause 14.5 of the Agreement employing alternative supplier and recover cost from Operator.	n/a	Penalty is ineffective due to the complications involved in employing alternative supplier. Monetary penalty should be included similar to 19.1 and 19.2
19.1	Queue-length Inspection	See 16.3.1	Yes, but restricted i.t.o co-operation by motorists with defective cards, left hand steering trucks etc. Specification does, however, allow for these occurrences.	Percentage of monthly Operations and Maintenance fee (2%). Per occurrence.	R 13,000	The amounts seems adequate. The Operators do perceive this as a high risk item with associated cost. One could consider a lower amount with lower associated cost i.t.o risk.
19.2	Service-Time Inspection	See 16.3.1	Yes, but restricted i.t.o co-operation by motorists with defective cards, left hand steering trucks etc. Specification does, however, allow for these occurrences.	Percentage of monthly Operations and Maintenance fee (2%). Per occurrence.	R 13,000	The amounts seems adequate. The Operators do perceive this as a high risk item with associated cost. One could consider a lower amount with lower associated cost i.t.o risk.

Table 7-1 Evaluation of penalties on the N3 Mariannhill CTROM project (continued)

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N3 Marianhill Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
SECTION 5: FINANCIAL MANAGEMENT						
37.1	All method of payments not provided for and accepted	The risk to SANRA relates to expected service levels by the road user.	Yes.	Termination of agreement	n/a	Penalty is ineffective due to complications around termination. Monetary penalty is suggested.
37.2	Non-compliance with VAT business rules (described in Annexure 4)	The risk to SANRA relates to prosecution as a result of possible non-compliance with legislation.	Yes	Termination of agreement	n/a	Penalty is ineffective due to complications around termination. Monetary penalty is suggested.
37.3.1	Manual mode < 1 hour	Manual mode refers to a situation where the toll lane equipment is not functional and toll collection is done manually. The risk to SANRA relates to possible loss of income due to inadequate control by means of the toll system. The risk is, however, limited in the sense that TEL and historic data still provides some control by means of the payment mechanism. The risk involved to the Operator is probably higher than the NRA and no incentive exists for the Operator to operate in manual mode. Risk is also related to toll tariff.	Yes, unless the manual mode was caused by the failure of emergency power sources outside the control of the operator.	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence.	R 4,875	Penalty fits the crime. Discretion by OM and NRA required. Penalty should apply only if traffic has been processed through a lane in manual mode.
37.3.2	Manual mode 1 hour to 2 hours	See 37.3.1. The risk increases as the duration of manual mode increases.	Yes, unless the manual mode was caused by the failure of emergency power sources outside the control of the operator.	Percentage of monthly Operations and Maintenance fee (1.5%). Per occurrence.	R 9,750	Penalty can be reduced to 1%. Discretion by OM and NRA required.
37.3.3	Manual mode > 2 hour	See 37.3.1. The risk increases as the duration of manual mode increases.	Yes, unless the manual mode was caused by the failure of emergency power sources outside the control of the operator.	Percentage of monthly Operations and Maintenance fee (3%). Per occurrence.	R 19,500	Penalty can be reduced to 1.5%. Discretion by OM and NRA required.
SECTION 6: MAINTENANCE OF ASSETS						
39.8.5.1	General Maintenance Inspection: Score < 0 to -5	This item relates mostly to general appearance. The NRA's risk is probably limited to public perception of the facilities managed by the NRA. It is in the Operators' interest to maintain assets to avoid more costly repairs as a result of non-maintenance. Nevertheless, one would like to create a meaningful incentive to the Operator to maintain the facilities, especially fixed assets.	Yes	Escalatable amount. Per event of non-compliance	R 10,000	Penalty can be reduced to 0.75%. OM to conduct more inspections should the penalty amount not serve as sufficient incentive. Current mechanism ineffective as it relies on subjective opinion by OM. Checklist to be revised to place specific emphasis on more important items or penalties can be considered for individual items. Separate penalties to be included for routine, corrective and breakdown maintenance.
39.8.5.2	General Maintenance Inspection: Score < -5	See item 39.8.5.1	Yes	Escalatable amount. Per event of non-compliance	R 20,000	Penalty can be reduced to 0.75%. OM to conduct more inspections should the penalty amount not serve as sufficient incentive. Current mechanism ineffective as it relies on subjective opinion by OM. Checklist to be revised to place specific emphasis on more important items or penalties can be considered for individual items.
40.4.1	Toll system: Downtime per AVC shall not exceed 2 hours per event.	The risk to SANRA relates to the possibility of traffic being processed through a lane of which the AVC is not functional due to maintenance work taking place and the possible related loss of income in such a case of inadequate control. The risk is mitigated to some extent by the payment mechanism being used in such a case. In other words TEL and historic data would serve as external audit. Operator not supposed to use the lane. Critical error reported to ITIS.	Yes, except in cases where extended maintenance to the AVC is required.	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Penalty fits the crime. Discretion by OM and NRA required in cases where lane was not used. Penalty should rather be related to the processing of traffic through the lane of which the AVC is "down" Time period could be increased to 4 hours.
40.4.2	Toll system: Lane AVC accuracy specification. 1. Overall accuracy - 99.9% 2. C1 - 99.6% 3. C2 - 95.0% 4. C3 - 96.0% 5. C4 - 99% 6. Tot class. Acc - 99% Allowed error per 10000 vehicles 1. Overall count - 10 2. C1 - 40 3. C2 - 500 4. C3 - 400 5. C4 - 100 6. Tot class. Acc - 100	The risk relates to possible income loss associated with inaccurate counts and classifications by the AVC.s. The risk is mitigated to some extent by the payment mechanism. In other words TEL and historic data would serve as external audit	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence. Once per AVC per calendar month.	R 4,875	Penalty fits the crime. Is, however, very onerous if many lanes do not achieve spec. Suggest a sliding scale for penalties to reflect a more severe penalty if accuracy levels decrease.
40.4.3	Toll system: Not operational, not installed or functioning according to specification - receipt printers, tariff boards, lane mode boards, user fare displays, OHL.S or traffic lights > 5%.	Risk relates to inadequate traffic management and inadequate service levels due to faulty equipment. General safety may also be affected.	Yes	Escalatable amount. Per equipment type per event of non compliance, max. 10 times per month	R 2,000	Penalty amount too low. Should be increased to 1%. Redundancy should be incorporated for small plazas. In other words 1 faulty item could cause percentage to be more than 5% in such cases

Table 7-1 Evaluation of penalties on the N3 Mariannhill CTROM project (continued)

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N3 Marianhill Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
40.4.4	Toll system: MIS failures	Risk relates to a possible loss of data and subsequent income loss due to such a failure. Mitigated partially by payment mechanism.	No, but Operator can prevent data loss.	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence. Per day of failure or per day or part thereof that data loss occurred.	R 6,600	Penalty should be as a result of data loss and not MIS failure as this is an event outside the Operators control. Penalty fits the crime because this event will result in further penalties under transmission of data.
40.5.1	E&M Assets: >10% of canopy luminaires not functional	Risk relates to danger associated with inadequate lighting under canopy.	Yes	Escalatable amount. Per event of non-compliance	R 10,000	Penalty amount is adequate. Sliding scale should be considered.
40.5.2	E&M Assets: >10% of lighting mast luminaires not functional	Risk relates to danger associated with inadequate lighting at plaza.	Yes	Escalatable amount. Per event of non-compliance	R 10,000	Penalty amount is adequate. Sliding scale should be considered.
40.5.3	E&M Assets: A. 6-monthly generator status report submitted within 5 days after last day of each 6 month period - from Commencement Date. Includes oil sample test report. B. The report shall contain results of the dummy load and control panel simulation tests, oil sample test reports and general equipment condition.	Risk relates to high repair cost associated with repair of generators which is mainly a fixed asset.	Yes	Escalatable amount. Per event of non-compliance and every subsequent month thereafter	R 5,000	Penalty fits the crime.
40.5.4	E&M Assets: A. 2-monthly comprehensive UPS report within 5 (business) days of last day of each 2 month period - from Commencement date. B. Report shall contain results of battery condition, input and output voltages and frequencies and general equipment condition.	NRA risk is minimal as consequences of UPS failure and repair is borne by the Operator. If failure results in manual mode or data loss or non- availability of power, the Operator is penalised accordingly.	Yes	Escalatable amount. Per event of non-compliance and every subsequent month thereafter	R 5,000	Penalty can be reduced to 0.25% or R2000.
40.5.5	E&M Assets: A. 2-monthly UPS power quality status report within 5 (business) days of last day of each 2 month period - from Commencement date. B. The report shall contain results of UPS, emergency and primary supply status and output quality.	NRA risk is minimal as consequences of power quality is mainly borne by the Operator. If failure results in manual mode or data loss or non- availability of power, the Operator is penalised accordingly.	Yes	Escalatable amount. Per event of non-compliance and every subsequent month thereafter	R 5,000	Penalty can be reduced to 0.25% or R2000.
SECTION 7: FUNCTIONALITY AND DATA TRANSMISSION						
41	DATA TRANSMISSION					
41.4.1	AVC: AVC traffic data - unvalidated data within 4 hours after day and validated data within 24 hours after day for all AVCs for each calendar day.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.2	AVC: AVC incident/fault log data - unvalidated data within 4 hours after day and validated data within 24 hours after day for all AVCs for each calendar day.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.3	MIS: MIS traffic data - validated data within 48 hours after day for all Lanes for each calendar day.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.4	MIS: MIS traffic data - re-transmit validated data within 5 days after month end for month for all Lanes for all days of month.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.5	MIS: MIS income data - validated data for any month per CC for calendar month within 5 business days of end of month.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.

Table 7-1 Evaluation of penalties on the N3 Mariannhill CTROM project (continued)

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N3 Marianhill Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
42	EQUIPMENT FUNCTIONALITY					
42.2.1	Non-compliance - AVC/NRA interface requirements (Annex 4) from Commencement Date or other date as stipulated by OM	Risk related to items 42.2.1 to 42.2.4 relates to toll system non-compliance to spec, in other words payment decision tree for AVC category 1, which is the "more accurate" decision tree can not be used. There is a potential loss of income related to the toll system not being compliant although the Operator probably carries more risk than the NRA in this regard.	Yes, technical specifications to be re-evaluated to eliminate areas where Operators seems unable to achieve requirements without increasing NRA risk.	Contract termination	n/a	Penalty ineffective as a result of complications associated with termination. Monetary penalty to be applied in these cases. Two penalties should be applicable. Firstly for initial system non-compliance after the deadline has expired and secondly for subsequent system non-compliance after initial certification. A sliding scale could also be introduced.
42.2.2	Non-compliance - Toll collection lane equipment requirements for UFD, receipts/lane tax invoice, tariff boards, lane mode boards, OHLs and Traffic Lights (user interface).			Percentage of monthly Operations and Maintenance fee (3%). Per equipment type for each month of non-compliance.	R 19,500	
42.2.3	Non-Compliance - equipment interfaces with NRA from all other equipment (other than AVC) from Commencement Date or other date as stipulated by OM.			Percentage of monthly Operations and Maintenance fee (1%). Per month of non-compliance.	R 6,500	
42.2.4	Non-Compliance - ETC specification requirements			Percentage of monthly Operations and Maintenance fee (3%). Per month of non-compliance.	R 19,500	
	SECTION 8: UTILITIES, SERVICES AND LEVIES					
43	UTILITIES, SERVICES and LEVIES					
50.1.1	Default in the provision of utilities other than electricity supply i.e. supply of fuel, potable water, sewage and wastewater removal, refuse removal and telecommunications services.	NRA risk i.t.o this item is limited. It is in the Operator's own interest to ensure uninterrupted supply of services in order to operate the toll facilities effectively.	Yes	Escalatable amount. Per event of non-compliance	R 7,000	Penalty not required. NRA could call on performance bond i.t.o settling outstanding accounts in cases of termination
50.2.1	Events of UPS or Emergency power interruptions to the Toll Plaza of < 1hour	NRA risk i.t.o possible income loss already covered. Remaining risk relates to safety concerns associated with power interruptions.	In most cases.	Escalatable amount. Per event of non-compliance	R 5,000	Amount seems adequate. OM and NRA discretion required
50.2.2	Events of UPS or Emergency power interruptions to the Toll Plaza of > 1hour	NRA risk i.t.o possible income loss already covered. Remaining risk relates to safety concerns associated with power interruptions.	In most cases.	Escalatable amount. Per event of non-compliance	R 15,000	Amount seems adequate. OM and NRA discretion required
	SECTION 9: TOLL ROAD SERVICES					
	INCIDENT MANAGEMENT SYSTEM					
55.3	Non-compliance to specification	Risk associated with inadequate management of IMS.	Yes	n/a	n/a	n/a
	EMERGENCY COMMUNICATION SYSTEM					
55.2	Non-compliance to specification	Risk associated with inadequate service levels to road users and complications related thereto.	Yes	n/a	n/a	n/a
	ROUTE PATROL SERVICES					
55.1	Non-compliance to specification	Risk associated with inadequate service levels to road users and complications related thereto.	Yes	n/a	n/a	n/a
	SECTION 10: REPORTING					
	REPORTING					
63.1	Operator Reporting: Penalty i.r.o report submission dates and report content.	Risk associated with reporting relates to the consequences of non-reaction or no reaction on reporting by the OM and NRA where applicable.	Yes	Escalatable amount. Per event of non-compliance	R 5,000	Amount seems adequate. Reporting structure and formats to be reviewed.
	SECTION 11: SAFETY AND SECURITY AT TOLL PLAZAS					
68.1	Penalty for non compliance with obligations for Safety and Security at Toll Plazas	Risk associated with safety is self explanatory and very important.	Yes	Escalatable amount. Per event of non-compliance	R 7,000	Amount can be increased to 3% or R20 000.
	SECTION 12: QUALITY ASSURANCE SYSTEM					
72	Operator to meet specification i.t.o audits and submission of audit reports.	Risk to the NRA is limited as performance i.t.o. quality is monitored individually.	Yes	Escalatable amount. Per event of non-compliance	R 7,000	Amount can be reduced to 0.5% or R3000.

Notes:
 All penalty amounts are calculated per control centre
 N17 penalty amounts are estimated for Gosforth control centre and based on an average operating cost of R 650 000 per month (excluding capital expenditure)
 Penalty amounts that are not fixed for Marianhill control centre are based on an average operating cost of R 650 000 per month (excluding capital expenditure)

Table 7-2 Evaluation of penalties on the N17 CTROM project

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N17 Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
SECTION 1: PROVISION OF AVAILABLE DOCUMENTS, DRAWINGS AND SOFTWARE RELATING TO OPERATIONS AND MAINTENANCE						
7.1	Operator default for clauses 4.5 and 6. CI 4.3 - Operations Manuals, Procedures for operation and maint of 1. Toll Sys, 2. E&M Sys, 3. ECS Sys, 4. AVC DC sys manuals.	Manuals and licences are required to operate and maintain toll road facilities. In the event of a breach of contract whereby the Operator does not continue with the works, manuals, licenses and other documentation will be required to allow the NRA to continue with toll collection without interruption by appointing another operator. The NRA could call on the performance bond and install new toll and operational systems but possibly not without interruption.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Initial event of non-compliance and for each month thereafter	R 4,875	Penalty amount seems too low. The NRA could, however, call on the Performance Bond for all possible damages (incl loss of toll income). The value of the Bond is, however, calculated based on one month's toll income)
7.2	Documentation Hand-over to Next Operator	The comment is the same as for item 7.1 but limited in the sense that this would only be a risk in the last 6 months of the contract.	Yes	Call on Performance Bond and/or Final Maintenance Bond	n/a	n/a
7.3	Asset management system non-compliance	Continuous updating of the Asset register is required to enable the NRA to accurately determine asset levels and values for insurance and tax purposes. Possible risk exists in under/over insurance and/or payment of tax.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Initial event of non-compliance and for each month thereafter	R 4,875	The penalty amount seems too low. There is a substantial amount of work involved in updating the asset register and the Operator might pay the penalty rather than do the work. The penalty would however continue which would result in a substantial amount.
SECTION 2: TOLL PLAZA EXPANSIONS AND UPGRADES, ROAD IMPROVEMENTS AND OTHER IMPROVEMENTS						
No Penalties						
SECTION 3: DAMAGE TO ASSETS						
14.1.1	Default to Cl. 12 reaction and repair times w.r.t damage to Assets. Cl. 12 Damage to Assets - Urgent Repair. [1. Immediate interim measures to restore safety. 2. Initiate repair within 12 hrs and complete repair within 14 days - for semi fixed assets]	Damage to assets may impact on general appearance, loss of income and safety. The payment mechanism should mitigate SANRAL's risk i.t.o loss of income. The most important aspect is safety. Should a motorist be injured as a result of, for instance, an impact attenuator that has not been repaired within a reasonable time, the motorist might have reason for a claim against the Operator but ultimately the NRA.	Yes, but restricted i.t.o suppliers etc. Adequate spares should be kept.	Percentage of monthly Operations and Maintenance Fee (3%). Per occurrence.	R 19,500	It would depend on the specific case whether this amount is fair or not. OM and NRA discretion is advised.
14.2.1	Default to Cl. 13 - Recording and Reporting of Damage to Semi Fixed Assets.	The non reporting of damage could result in the NRA not being aware of the damage. Risk to NRA is described under 14.1.1. Recording of details are also important in cases of claims by motorists against the NRA. By not recording the relevant details, the NRA may not be able to claim damages from the road user in cases of damage to fixed assets. This is however mitigated by the fact that the Operator shall then be responsible for the cost and that the OM conducts inspections to identify damaged assets.	Yes	Percentage of monthly Operations and Maintenance Fee (0.75%). Per occurrence.	R 4,875	The amount seems reasonable.
SECTION 4: TRAFFIC MANAGEMENT AT TOLL PLAZAS						
16.3.1	Video grabbing to be operational no later than 1 month after commencement date	Excessive queue lengths and service times at toll plazas are unacceptable. Without a queue length monitoring system that provides continuous uninterrupted data, the control by the OM and NRA would be ineffective. The risk involved revolves around public perception of inadequate service levels by the NRA and the negative publicity for the NRA and toll roads in general.	Yes	Remedy i.t.o clause 14.5 of the Agreement employing alternative supplier and recover cost from Operator.	n/a	Penalty is ineffective due to the complications involved in employing alternative supplier. Monetary penalty should be included similar to 19.1 and 19.2
19.1	Queue-length Inspection	See 16.3.1	Yes, but restricted i.t.o co-operation by motorists with defective cards, left hand steering trucks etc. Specification does, however, allow for these occurrences.	Percentage of monthly Operations and Maintenance fee (2%). Per occurrence.	R 13,000	The amounts seems adequate. The Operators do perceive this as a high risk item with associated cost. One could consider a lower amount with lower associated cost i.t.o risk.
19.2	Service-Time Inspection	See 16.3.1	Yes, but restricted i.t.o co-operation by motorists with defective cards, left hand steering trucks etc. Specification does, however, allow for these occurrences.	Percentage of monthly Operations and Maintenance fee (2%). Per occurrence.	R 13,000	The amounts seems adequate. The Operators do perceive this as a high risk item with associated cost. One could consider a lower amount with lower associated cost i.t.o risk.

Table 7-2 Evaluation of penalties on the N17 CTROM project (continued)

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N17 Toll Route		
				Unit	Penalty amount	Comment on amount (Does It fit the crime)
SECTION 5: FINANCIAL MANAGEMENT						
37.1	All method of payments not provided for and accepted	The risk to SANRA relates to expected service levels by the road user.	Yes.	Termination of agreement	n/a	Penalty is ineffective due to complications around termination. Monetary penalty is suggested.
37.2	Non-compliance with VAT business rules (described in Annexure 4)	The risk to SANRA relates to prosecution as a result of possible non-compliance with legislation.	Yes	Termination of agreement	n/a	Penalty is ineffective due to complications around termination. Monetary penalty is suggested.
37.3.1	Manual mode < 1 hour	Manual mode refers to a situation where the toll lane equipment is not functional and toll collection is done manually. The risk to SANRA relates to possible loss of income due to inadequate control by means of the toll system. The risk is, however, limited in the sense that TEL and historic data still provides some control by means of the payment mechanism. The risk involved to the Operator is probably higher than the NRA and no incentive exists for the Operator to operate in manual mode. Risk is also related to toll tariff.	Yes, unless the manual mode was caused by the failure of emergency power sources outside the control of the operator.	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence.	R 4,875	Penalty fits the crime. Discretion by OM and NRA required. Penalty should apply only if traffic has been processed through a lane in manual mode.
37.3.2	Manual mode 1 hour to 2 hours	See 37.3.1. The risk increases as the duration of manual mode increases.	Yes, unless the manual mode was caused by the failure of emergency power sources outside the control of the operator.	Percentage of monthly Operations and Maintenance fee (1.5%). Per occurrence.	R 9,750	Penalty can be reduced to 1%. Discretion by OM and NRA required.
37.3.3	Manual mode > 2 hour	See 37.3.1. The risk increases as the duration of manual mode increases.	Yes, unless the manual mode was caused by the failure of emergency power sources outside the control of the operator.	Percentage of monthly Operations and Maintenance fee (3%). Per occurrence.	R 19,500	Penalty can be reduced to 1.5%. Discretion by OM and NRA required.
SECTION 6: MAINTENANCE OF ASSETS						
39.8.5.1	General Maintenance Inspection: Score < 0 to -5	This item relates mostly to general appearance. The NRA's risk is probably limited to public perception of the facilities managed by the NRA. It is in the Operators' interest to maintain assets to avoid more costly repairs as a result of non-maintenance. Nevertheless, one would like to create a meaningful incentive to the Operator to maintain the facilities, especially fixed assets.	Yes	Percentage of monthly Operations and Maintenance fee (1.5%). Per occurrence.	R 9,750	Penalty can be reduced to 0.75%. OM to conduct more inspections should the penalty amount not serve as sufficient incentive. Current mechanism ineffective as it relies on subjective opinion by OM. Checklist to be revised to place specific emphasis on more important items or penalties can be considered for individual items. Separate penalties to be included for routine, corrective and breakdown maintenance.
39.8.5.2	General Maintenance Inspection: Score < -5	See item 39.8.5.1	Yes	Percentage of monthly Operations and Maintenance fee (3%). Per occurrence.	R 19,500	Penalty can be reduced to 0.75%. OM to conduct more inspections should the penalty amount not serve as sufficient incentive. Current mechanism ineffective as it relies on subjective opinion by OM. Checklist to be revised to place specific emphasis on more important items or penalties can be considered for individual items.
40.4.1	Toll system: Downtime per AVC shall not exceed 2 hours per event.	The risk to SANRA relates to the possibility of traffic being processed through a lane of which the AVC is not functional due to maintenance work taking place and the possible related loss of income in such a case of inadequate control. The risk is mitigated to some extent by the payment mechanism being used in such a case. In other words TEL and historic data would serve as external audit. Operator not supposed to use the lane. Critical error reported to ITIS.	Yes, except in cases where extended maintenance to the AVC is required.	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Penalty fits the crime. Discretion by OM and NRA required in cases where lane was not used. Penalty should rather be related to the processing of traffic through the lane of which the AVC is "down" Time period could be increased to 4 hours.
40.4.2	Toll system: Lane AVC accuracy specification. 1. Overall accuracy - 99.9% 2. C1 - 99.6% 3. C2 - 95.0% 4. C3 - 96.0% 5. C4 - 99% 6. Tot class. Acc - 99% Allowed error per 10000 vehicles 1. Overall count - 10 2. C1 - 40 3. C2 - 500 4. C3 - 400 5. C4 - 100 6. Tot class. Acc - 100	The risk relates to possible income loss associated with inaccurate counts and classifications by the AVC.s. The risk is mitigated to some extent by the payment mechanism. In other words TEL and historic data would serve as external audit	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence. Once per AVC per calendar month.	R 4,875	Penalty fits the crime. Is, however, very onerous if many lanes do not achieve spec. Suggest a sliding scale for penalties to reflect a more severe penalty if accuracy levels decrease.
40.4.3	Toll system: Not operational, not installed or functioning according to specification - receipt printers, tariff boards, lane mode boards, user fare displays, OHLS or traffic lights > 5%.	Risk relates to inadequate traffic management and inadequate service levels due to faulty equipment. General safety may also be affected.	Yes	Percentage of monthly Operations and Maintenance fee (0.25%). Per equipment type per occurrence. Max 10 times per calendar month.	R 1,625	Penalty amount too low. Should be increased to 1%. Redundancy should be incorporated for small plazas. In other words 1 faulty item could cause percentage to be more than 5% in such cases

Table 7-2 Evaluation of penalties on the N17 CTROM project (continued)

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N17 Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
40.4.4	Toll system: MIS failures	Risk relates to a possible loss of data and subsequent income loss due to such a failure. Mitigated partially by payment mechanism.	No, but Operator can prevent data loss.	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence. Per day of failure or per day or part thereof that data loss occurred.	R 6,500	Penalty should be as a result of data loss and not MIS failure as this is an event outside the Operators control. Penalty fits the crime because this event will result in further penalties under transmission of data.
40.5.1	E&M Assets: >10% of canopy luminaires not functional	Risk relates to danger associated with inadequate lighting under canopy.	Yes	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Penalty can be increased to 1.5% as this is a routine maintenance item which impacts on road safety. Sliding scale should be considered.
40.5.2	E&M Assets: >10% of lighting mast luminaires not functional	Risk relates to danger associated with inadequate lighting at plaza.	Yes	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Penalty can be increased to 1.5% as this is a routine maintenance item which impacts on road safety. Sliding scale should be considered.
40.5.3	E&M Assets: A. 6-monthly generator status report submitted within 5 days after last day of each 6 month period - from Commencement Date. Includes oil sample test report. B. The report shall contain results of the dummy load and control panel simulation tests, oil sample test reports and general equipment condition.	Risk relates to high repair cost associated with repair of generators which is mainly a fixed asset.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Initial event of non-compliance and for each month thereafter	R 4,875	Penalty fits the crime.
40.5.4	E&M Assets: A. 2-monthly comprehensive UPS report within 5 (business) days of last day of each 2 month period - from Commencement date. B. Report shall contain results of battery condition, input and output voltages and frequencies and general equipment condition.	NRA risk is minimal as consequences of UPS failure and repair is borne by the Operator. If failure results in manual mode or data loss or non-availability of power, the Operator is penalised accordingly.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Initial event of non-compliance and for each month thereafter	R 4,875	Penalty can be reduced to 0.25%
40.5.5	E&M Assets: A. 2-monthly UPS power quality status report within 5 (business) days of last day of each 2 month period - from Commencement date. B. The report shall contain results of UPS, emergency and primary supply status and output quality.	NRA risk is minimal as consequences of power quality is mainly borne by the Operator. If failure results in manual mode or data loss or non-availability of power, the Operator is penalised accordingly.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Initial event of non-compliance and for each month thereafter	R 4,875	Penalty can be reduced to 0.25%
SECTION 7: FUNCTIONALITY AND DATA TRANSMISSION						
41 DATA TRANSMISSION						
41.4.1	AVC: AVC traffic data - unvalidated data within 4 hours after day and validated data within 24 hours after day for all AVCs for each calendar day.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.2	AVC: AVC incident/fault log data - unvalidated data within 4 hours after day and validated data within 24 hours after day for all AVCs for each calendar day.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.3	MIS: MIS traffic data - validated data within 48 hours after day for all Lanes for each calendar day.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.4	MIS: MIS traffic data - re-transmit validated data within 5 days after month end for month for all Lanes for all days of month.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.
41.4.5	MIS: MIS income data - validated data for any month per CC for calendar month within 5 business days of end of month.	Risk relates to non availability of data to IT IS and associated increased risk of data manipulation as a result of Operator having access to TEL data.	Yes, contingency actions described in cases of non availability of data lines etc.	Percentage of monthly Operations and Maintenance fee (0.5%). Per day or part thereof that data is delayed.	R 3,250	Penalty seems adequate. Can result in substantial amounts if data is not transmitted for a number of days.

Table 7-2 Evaluation of penalties on the N17 CTROM project(continued)

Clause (Annexure 2)	Description of Penalty	SANRAL risk exposure	Does Operator have control over compliance?	Penalties for N17 Toll Route		
				Unit	Penalty amount	Comment on amount (Does it fit the crime)
EQUIPMENT FUNCTIONALITY						
42						
42.2.1	Non-compliance - AVC/NRA interface requirements (Annex 4) from Commencement Date or other date as stipulated by OM.	Risk related to items 42.2.1 to 42.2.4 relates to toll system non-compliance to spec, in other words payment decision tree for AVC category 1, which is the "more accurate" decision tree can not be used. There is a potential loss of income related to the toll system not being compliant although the Operator probably carries more risk than the NRA in this regard.	Yes, technical specifications to be re-evaluated to eliminate areas where Operators seems unable to achieve requirements without increasing NRA risk.	Contract termination	n/a	Penalty ineffective as a result of complications associated with termination. Monetary penalty to be applied in these cases. Two penalties should be applicable. Firstly for initial system non-compliance after the deadline has expired and secondly for subsequent system non-compliance after initial certification. A sliding scale could also be introduced.
42.2.2	Non-compliance - Toll collection lane equipment requirements for UFD, receipts/lane tax invoice, tariff boards, lane mode boards, OHLS and Traffic Lights (user interface).			Percentage of monthly Operations and Maintenance fee (3%). Per equipment type for each month of non-compliance.	R 19,500	
42.2.3	Non-Compliance - equipment interfaces with NRA from all other equipment (other than AVC) from Commencement Date or other date as stipulated by OM.			Percentage of monthly Operations and Maintenance fee (1%). Per month of non-compliance	R 6,500	
42.2.4	Non-Compliance - ETC specification requirements			n/a	n/a	
SECTION 8: UTILITIES, SERVICES AND LEVIES						
UTILITIES, SERVICES AND LEVIES						
50.1.1	Default in the provision of utilities other than electricity supply i.e. supply of fuel, potable water, sewage and wastewater removal, refuse removal and telecommunications services.	NRA risk I.t.o this item is limited. It is in the Operator's own interest to ensure uninterrupted supply of services in order to operate the toll facilities effectively.	Yes	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Penalty not required. NRA could call on performance bond I.t.o settling outstanding accounts in cases of termination
50.2.1	Events of UPS or Emergency power interruptions to the Toll Plaza of < 1hour	NRA risk I.t.o possible income loss already covered. Remaining risk relates to safety concerns associated with power interruptions.	In most cases.	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Amount seems adequate. OM and NRA discretion required.
50.2.2	Events of UPS or Emergency power interruptions to the Toll Plaza of > 1hour	NRA risk I.t.o possible income loss already covered. Remaining risk relates to safety concerns associated with power interruptions.	In most cases.	Percentage of monthly Operations and Maintenance fee (2%). Per occurrence.	R 13,000	Amount seems adequate. OM and NRA discretion required.
SECTION 9: TOLL ROAD SERVICES						
INCIDENT MANAGEMENT SYSTEM						
55.3	Non-compliance to specification	Risk associated with inadequate management of IMS.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence.	R 4,875	Amount seems adequate because this usually affects all control centres.
EMERGENCY COMMUNICATION SYSTEM						
55.2	Non-compliance to specification	Risk associated with inadequate service levels to road users and complications related thereto.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence.	R 4,875	Amount seems adequate. Can be increased by more frequent inspections. Should, however be limited to max of 1 per week. Penalty description to be reviewed to clarify meaning of "inadequate communication links." Specific percentage of 5% suggested.
ROUTE PATROL SERVICES						
55.1	Non-compliance to specification	Risk associated with inadequate service levels to road users and complications related thereto.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence.	R 4,875	Amount seems adequate. Can be increased by more frequent inspections. Should, however be limited to max of 1 per week.
SECTION 10: REPORTING						
REPORTING						
63.1	Operator Reporting: Penalty i.r.o report submission dates and report content.	Risk associated with reporting relates to the consequences of non-reaction or no reaction on reporting by the OM and NRA where applicable.	Yes	Percentage of monthly Operations and Maintenance fee (0.75%). Per occurrence.	R 4,875	Amount seems adequate. Reporting structure and formats to be reviewed.
SECTION 11: SAFETY AND SECURITY AT TOLL PLAZAS						
68.1	Penalty for non-compliance with obligations for Safety and Security at Toll Plazas	Risk associated with safety is self explanatory and very important.	Yes	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Amount can be increased to 3%.
SECTION 12: QUALITY ASSURANCE SYSTEM						
72	Operator to meet specification i.t.o audits and submission of audit reports.	Risk to the NRA is limited as performance i.t.o. quality is monitored individually.	Yes	Percentage of monthly Operations and Maintenance fee (1%). Per occurrence.	R 6,500	Amount can be reduced to 0.5%.

Notes:

All penalty amounts are calculated per control centre

N17 penalty amounts are estimated for Gosforth control centre and based on an average operating cost of R 650 000 per month (excluding capital expenditure)

Penalty amounts that are not fixed for Marianhill control centre are based on an average operating cost of R 650 000 per month (excluding capital expenditure)