THE APPLICATION OF COST-BENEFIT ANALYSIS AS A PROJECT APPRAISAL TECHNIQUE FOR LOCAL GOVERNMENT IN SOUTH AFRICA: THE CASE OF THE PROPOSED DEVELOPMENTS AT THE GARDEN ROUTE DAM

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ABSTRACT

Cost-benefit analysis (CBA) is widely applied as an appraisal technique particularly for use as an input into public decision-making processes. Done properly CBA both helps inform decision-makers and helps hold them accountable for their decisions. While it has the advantage of being systematic and rule-based, CBA has practical limitations regarding what it can reliably show; particularly in situations of limited information, data or resources. Those that commission CBAs may not be aware of these limitations, and CBAs are often requested, or required by regulations in these circumstances. These and other considerations for the use of CBA for local government decision-making in South Africa are illustrated with reference to the case study of the CBA of the proposed development at the Garden Route Dam in George.

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LIST OF ACRONYMS

AVM:	Alien vegetation management
BAR:	Basic Assessment Report
CAPM:	Capital Asset Pricing Model
BCR:	Benefit-cost ratio
CBA:	Cost-benefit analysis
CEA:	Cost-effectiveness analysis
CEAS:	Central Economic Advisory Services
CPI:	Consumer Price Index
CV:	Compensating variation
DEA&DP:	Western Cape Department of Environmental Affairs & Development Planning
DEAT:	Department of Environmental Affairs and Tourism
EIA:	Environmental Impact Assessment
EV:	Equivalent variation
GNP:	Gross National Product
HP:	Hedonic pricing
IRR:	Internal rate of return
JSE:	Johannesburg Stock Exchange
MCDA:	Multi-criteria decision analysis
MIRR:	Marginal internal rate of return
NPO:	Non-profit organisation
NPV:	Net present value
OECD:	Organisation for Economic Co-operation and Development
PV:	Present value
SDF:	Spatial Development Framework
STPR:	Social time preference rate
SOC:	Social opportunity cost
UNIDO:	United Nations International Development Organisation
UK:	United Kingdom
UN:	United Nations
USA:	United States of America
WTA:	Willingness to accept

WTP: Willingness to pay

INTRODUCTION

As in many countries, local government decision-making in South Africa is sometimes guided by cost-benefit analysis (CBA) as an appraisal technique, on occasion as part of a formal Environmental Impact Assessment (EIA). Social (or 'extended') CBA is intended to inform public decision-makers (Department of Environmental Affairs and Tourism [DEAT], 2004:4) by comparing the gains and losses experienced by all society members affected by a project or policy, recognizing both monetary and non-monetary gains and losses (Londero, 2003:1). The aim is to establish whether a project's use of resources is socially efficient (Campbell & Brown, 2003:1); i.e. efficient from a social, rather than private perspective. When considering efficiency from a societal point of view, profits may not adequately reflect the efficiency of a proposed project. Some projects may be non-profit in nature; others may operate in distorted markets, or generate externalities. Social CBA recognizes these issues when testing for economic efficiency (DEAT, 2004:2).

CBA is not without its criticisms or limitations, particularly in situations of high uncertainty. However, CBA is meant to *inform* the decision-making process, not replace it (Campbell & Brown, 2003:2). Indeed CBA has a relatively narrow focus on economic efficiency whilst decision-makers may aim to balance multiple goals through their decisions.

This dissertation considers the historical context of CBA, how it has evolved, and how local decision-makers use it in South Africa. A case study is used as an example from which lessons are drawn regarding the use of CBA in South Africa.

The dissertation consists of four chapters. The first is a literature review of the historical development, practice and economic theory behind CBA. The second chapter considers a case study; a CBA commissioned by local government decision-makers regarding a proposed development at the Garden Route Dam in George, South Africa. The third chapter investigates challenges and limitations to the use of CBA in local government decision-making in South Africa, given lessons drawn from the case study. The final chapter briefly concludes.

1. LITERATURE REVIEW OF THE HISTORICAL DEVELOPMENT OF CBA

1.1. Introduction

This chapter reviews the historical development of CBA and its theoretical foundations. Making reference to relevant literature on CBA, the practical steps generally followed in conducting a CBA are described, and related intricacies and concerns discussed.

1.2. Definition of CBA

CBA is a procedure by which the streams of gains and losses of a proposed project (or policy or programme) are identified and measured in monetary terms so as to allow for direct comparison. These are then aggregated across individuals in a defined society to establish its net social gain or loss (Pearce, 1983:3).

Incremental costs and benefits of the situation with a proposed project, as opposed to the *counterfactual* without the project, are used (Campbell & Brown, 2003:2). Benefits are classified as gains, and costs as losses, in human welfare. Benefits and costs in CBA can be measured in terms of required compensation or willingness to pay (WTP) to receive a benefit or willingness to accept (WTA) compensation in lieu of it. Similarly costs can be measured as WTA compensation for a loss, or WTP to prevent it (Pearce, 1998:87). The literature on CBA has tended to focus on WTP. There has been a general preference for WTP as the more "conservative" measure, which was the recommendation by an expert panel in the USA in 1993 (Arrow et al., 1993), which served to evaluate the contingent valuation method - sometimes used for calculating WTP or WTA (OECD, 2006:164-165).

Since project costs and benefits flow over several periods of time, they are discounted to their present values (PVs). Discounting accounts for peoples' preference of the present to the future, and the social opportunity cost of capital. PVs of costs are subtracted from PVs of benefits to calculate the Net Present Value (NPV) (Pearce, 1998:87). This positive or negative NPV is used as a guide for decision-makers regarding whether the project should go ahead or not (Omura, 2004:43).

1.3. History of CBA as an appraisal technique

The theoretical roots of CBA are found in the work of Dupuit in 1844. Dupuit's substantial contribution to the theory regarding CBA was a concept central to the idea of net social benefit, consumer's surplus. Consumer's surplus is the additional utility that a consumer enjoys when their WTP for a good is greater than the actual price they pay for it. Dupuit argued that while the minimum benefit of a project is the price multiplied by the quantity of the goods produced by it, this can be exceeded since some consumers may be willing to pay more than the price, therefore enjoying a net welfare gain (cited in Sassone & Schaffer, 1978:4).

The modern practice of CBA began with the 1936 United States Flood Control Act. This act preceded the development of the appropriate welfare economic foundations, which later provided CBA's theoretical basis. The Act required that the benefits of a flood control project should exceed its costs, regardless of their incidence (cited in Pearce, 1998:85). However, while the Act stipulated the inclusion of all benefits, in treating project costs it only referred to construction costs rather than welfare losses (Pearce, 1983:15).

Pearce (1998:87) describes how subsequent development of the ideas contained in the Act continued in the 1950s, spurred on by concern for efficiency in government spending. The subcommittee of the Federal Inter-Agency River Basin Committee issued the *Green Book* in 1950, which aimed to introduce a formal procedure for the comparison of costs and benefits (Pearce, 1983:15). In 1952, the Bureau of Budget tried to further guide project evaluation, in *Budget Circular A-47*. Both the Circular and the Green book were criticised for not considering income distribution concerns and emphasizing measurement of gains in terms of Gross National Product (GNP) whilst ignoring costs and benefits not captured by it (Sassone & Schaffer, 1978:4-5).

The application of CBA spread from the United States of America (USA) to the United Kingdom (UK), and other developed and developing countries (Dasgupta & Pearce, 1972:13). In the late 1960s and 1970s, international institutions developed guidelines for CBA, with particular focus on developing countries. Little and Mirrlees compiled the Organisation for Economic Co-operation and Development (OECD) guidelines for conducting CBA in 1969 (revised in 1974). In 1972, the United Nations International

Development Organisation (UNIDO) guidelines prepared by Marglin, Sen and Dasgupta were published, and in 1975, the World Bank guidelines by Squire and van der Tak (Pearce, 1983:18). Further, numerous textbooks regarding CBA have been written, applied to both developed and developing countries, such as those by Campbell and Brown (2003) Pearce (1983), Gittinger (1982) and Sassone and Schaffer (1978).

In South Africa, the original national guidelines for CBA, entitled *Manual for Cost-Benefit Analysis in South Africa*, were prepared by Central Economic Advisory Services (CEAS) in 1989. A revised version of this manual was published in 2002, prepared by Conningarth Economists, entitled *A Manual for Cost-Benefit Analysis in South Africa with Special Reference to Water Resource Development*. A second edition (updating the manual with 2006 prices) was produced in 2007 (Conningarth Economists, 2007:i).

1.4. Types of CBA

A social CBA normally sets out to answer the following questions in this order (van Zyl et al, 2005:27):

1. Is the project is viable for the investor, i.e. does it make financial sense to the proponent?
2. If so, does it remain viable once government (eg. taxes) and market distortions (e.g. monopoly power) are corrected for?
3. If so, does it remain viable after allowing for externalities?

A simple financial CBA answers the first question. If the next two are to be answered, efficiency prices are used and an economic CBA performed. This can incorporate wider social effects and may require the use of environmental valuation techniques (van Zyl et al, 2005:30).

1.5. Theoretical foundations of CBA

Welfare economics is based on the concept of Paretian optimality (efficiency). An allocation of resources is Pareto optimal, when no alternative allocation can make someone better off, without simultaneously making anyone else worse off (Boardman et al, 2001:26). In classical

welfare economic theory, with foundations on perfect, free-market conditions, profits on investments measure the gain in welfare from those investments (Conningarth, 2007:8).With these foundations, and since the outcomes from perfectly competitive markets (in the absence of public goods, externalities and increasing returns to scale) are Pareto optimal (Schofield, 1987:14), CBA essentially mimics a perfectly competitive market in attempts to attain efficiency (Conningarth Economists, 2007:11).

However, Pareto optima are non-unique. Multiple Pareto optima are possible, each with a different outcome determined by an initial distribution of endowments (Vickers, 1997:122). Consequently, Pareto efficiency is criticised as being necessarily dependant on the status quo distribution of endowments (Boardman et al, 2001:35). Further, without incorporating welfare somehow, Pareto optima are non-comparable and cannot be ranked (Boadway & Bruce, 1984:4). Specifically, choosing the optimum optimorum (best of the best), would require incorporating the "value judgements" implicit in a social welfare function (Winch, 1971:94).

Some of the weaknesses in the Pareto principle were addressed by the *Kaldor-Hicks hypothetical compensation principle* (Kaldor, 1939 and Hicks, 1939 & 1943). While this principle provided the necessary theoretical basis for an operable benefit-cost rule (Pearce, 1998:85), the welfare economics literature has continued to question the principles and assumptions underlying CBA. Further, though CBA practice and theory advanced in the 1940s and 1950s, this was a time in which welfare economics, the theoretical basis of CBA, suffered serious academic attacks (Pearce & Nash, 1981:3).

Although the 1936 Flood Control Act preceded the requisite welfare economic foundations of CBA, in the 1950s the gap between the practice and theoretical framework behind CBA narrowed. In 1958 three significant works in this regard, concerning water resource development were produced by Eckstein, Krutilla and Eckstein, and McKean (Pearce, 1983:15-16). The primary linkages of these works to welfare economics, identified by Pearce (1983:16) were:

a) The understanding of a "benefit as any gain in welfare (utility) and a cost as any loss in welfare";
b) The thought of costs as opportunity costs;

c) The Pareto improvement rule forming the foundation of the idea of net benefit maximization.

These 1958 works largely referred to the aforementioned Kaldor-Hicks principle (Pearce, 1983:16). Particularly for CBA, the Pareto improvement rule was not practical since projects are unlikely to fulfil the condition of no parties experiencing a loss. The Kaldor-Hicks principle offered a more practical modification of the Pareto improvement rule, by considering 'potential Pareto improvement' from compensation (Schofield, 1987:21)

This principle asserts that wellbeing is improved if the welfare gain to some members of society from a project exceeded the welfare loss by others; and the gainers would still retain some net benefit, were they to compensate the losers so that they are no worse off than before the project. Were this condition to hold and compensation made, no one would be made worse off by a project, and someone would be better off, essentially satisfying the Pareto improvement rule. However, the Kaldor-Hicks principle only requires that it is possible that compensation could occur, not that it actually occurs (Pearce, 1998:85). Further, the rule did not take into account *who* loses and gains (e.g. wealthy or poor) (Pearce, 1983:16), and has thus been criticized as ignoring equity (Conningarth Economists, 2007:121).

The hypothetical nature of the compensation led to problems regarding the principle's theoretical validity, as exposed by the *Scitovsky reversal paradox.* The paradox was that if a project satisfied the rule, and compensation was simply hypothetical and not paid, the rule could work in reverse. The movement from the status quo to after the project would be an improvement, but so would the movement back from after the project to the status quo. This is due to the transition changing the income distribution, leading to a difference in the relative prices of the two states. When losers are not actually compensated, there is a redistribution of income, suggesting that distributional consequences also needed to be included in the objective function of CBA (Dasgupta & Pearce, 1972:59,69).

Given the Scitovsky Paradox, Little (1957:101) proposed a three-part criterion (*Little's Criterio*n) for a project to be deemed desirable: the project had to satisfy the Kaldor-Hicks criterion, not lead to a Scitovsky paradox reversal, and redistribute income in a "good" way. The vagueness of the third part of Little's criterion still required a "value judgement" regarding the nature of a "good" redistribution of income (Schofield, 1987:23).

An approach that incorporated equity more explicitly was to make use of a *Bergson social welfare function* (Bergson, 1938). This type of welfare function involves the differential weighting of different groups' net benefits (Schofield, 1987:24). Referring back to the non-uniqueness of Pareto optima, a social welfare function is needed in order to find which of the possible optima is the optimum optimorum. The tangency of the locus of all possible Pareto optima (the utility frontier), and the contour of the social welfare function, would define the optimum optimorum (Winch, 1971:81).

If a Bergson social welfare function were used, finding values for the different weights would be necessary. One approach to doing so would be through a democratic process. However, *Arrow's Impossibility Theorem* showed that no social welfare function could exist under a certain set of "reasonableness" conditions[1]. This meant that there was no way to aggregate individual preferences without introducing some kind of ethical judgement (Dasgupta & Pearce, 1972:76-80,90). The process of assigning weights therefore seemed to be necessarily left to other means; perhaps to bureaucrats or the analyst themselves. Both of which could expose these weights to subjectivity (Schofield, 1987:24).

Another theoretical concern that remained in the 1960s was: how to include 'intangibles' into CBA in monetary terms, to allow direct comparison with other costs and benefits (Pearce, 1998:86)? This issue remains contentious. The literature regarding the incorporation of distributional considerations, measuring costs and benefits (including intangibles) and use of shadow pricing, is considered in more detail in the following sections 1.5.1 and 1.5.2.

Where necessary conditions for Pareto optimality do not hold, market outcomes are no longer necessarily Pareto optimal and are inefficient. In these situations there is said to be market failure. Welfare economics then attempts to evaluate and recommend "corrective" actions for identified inefficiencies (Boadway & Bruce, 1984:3), in order to move closer to a Pareto optimal outcome. However, in their generalization of the *Theory of second best*, Lipsey and Lancaster (1956-1957:12) showed that in situations of non-optimality, the piecemeal[2] correction (such as those in CBA) of market distortions would not necessarily increase social

[1] The Free Triple condition, non-negative association, independence of irrelevant alternatives, non-imposition, and non-dictatorship (Dasgupta & Pearce, 1972:76-80).

[2] Lipsey and Lancaster (1956-1957:17) were referring to applying welfare rules that would lead to Pareto optimality if they were uniformly applied *across* the economy, to only a *small section* of the economy.

welfare (and may well decrease it), if any further constraints to optimality remained. Finally, following de Villiers Graaf's (1957) criticism of various aspects of welfare economics, many academics believed welfare economics to be intellectually doomed (Pearce, 1983:20).

Since CBA is fundamentally the operational form of welfare economics (Barbier et al, 1990:1259), that it survived and gained strength in the 1950s and 1960s is puzzling considering these attacks on welfare economics of the same period. Pearce and Nash (1981:3) offer the explanation that this is probably due to the practical need for an economics-based appraisal of increasing public expenditure of the time. The alternative to CBA during this period was pure financial appraisal, having a narrower focus and thus of limited use to public project appraisal.

1.5.1. Incorporation of distributional concerns into CBA

Where CBA does not use distributional weights, some argue that it could perpetuate prevailing inequalities (Joubert et al, 1997:129). Poorer peoples' preferences have lower monetary values than those of the rich simply because of income constraints. A decision based on an un-weighted CBA is thus based on *Benthamite* utilitarianism, where a Rand of benefit or cost yields the same utility for a person, regardless of if they are rich or poor (Omura, 2004:47).

The problem of incorporating distributional effects into project appraisal became prominent in the 1970s (Curry & Weiss, 1993:227). In following with the differential weighting of net benefits in the Bergson social welfare function, some analysts used distributional weights in their CBAs (OECD, 2006:226). The presumption that social marginal utility of income falls as income rises provides the rationale for distributional weights (Johansson-Stenman, 2005:337-338). Several procedures for calculating these weights have been suggested, each with its critics and supporters (Dasgupta & Pearce, 1972:69), and substantial debate surrounds the best means of calculating such weights (OECD, 2006:227). A survey based approach, from the "Leyden school", starting with the work by van Praag (1971) attempted to measure utility of income in a cardinal sense. Such work allows for the comparison of utilities gained and lost by different income groups (van Praag & Frijters, 1999:5,10).

Distributional weights were central components of the aforementioned project appraisal guidelines of the 1970s, but became less popular over time (Johansson-Stenman, 2005:337). Pearce (1998:86) suggested this may have been due to the intense data requirements involved, but that it was more likely due to the view that distributional concerns are not best dealt with through project selection.

Critics of the incorporation of distributional effects into CBA such as Harberger (1978:S113), argue it could lead to the acceptance of projects which would otherwise be deemed inefficient. They also contend that such equity goals might be more efficiently addressed through public programmes, or fiscal instruments such as redistributive tax systems or subsidies (Sadik, 1978:223-224). However, distributional weights have remained most prominent in literature regarding developing countries, where income inequality is seen as a greater issue (Pearce, 1998:86). Proponents for the inclusion of equity considerations into CBA argue these fiscal policy instruments have been mostly ineffective in many developing countries (Sadik, 1978:223-224).

There remains no consensus about whether, or how equity should be taken into account in CBA. Recent applications of CBA by the World Bank show that it infrequently incorporates explicit distributional weights in its analyses (Johansson-Stenman, 2005:337). Further, a debate on American CBA trends at the January 1996 American Economic Association meeting yielded a consensus that distributional weights should be *not be included* in USA CBAs (Joubert et al., 1997:128). Conversely, the UK first officially endorsed the application of distributional weights, in 2003 (Johansson-Stenman, 2005:337), retaining recommendations for their use, when deemed "necessary and practical", in the 2011 revision of the Green Book (HM Treasury, 2011:91). Given South Africa's highly unequal income distribution, Conningarth Economists (2007:47,49) mention the possibility of including distributional weights when calculating project decision rules; cautioning however, that these weights are contentious and their practical use, problematic. They thus recommend that if weights are used, both weighted and un-weighted results should be presented.

Regardless of whether weights are recommended, some frameworks like the Green Book (HM Treasury, 2011:91), recommend at least assessing *how* the costs and benefits of a project are spread across different socio-economic groups. CBA can still be very valuable in

this way, by clearly showing distributional implications of a project concerning *who* gains and loses (Hanley & Barbier, 2009:33-34).

1.5.2. Measurement of costs and benefits

Since CBA essentially mimics a perfectly competitive market (Conningarth Economists, 2007:11), it basically asks the question, "would the project under consideration be put forward in a world of perfect competition, with no externalities, public goods or increasing returns to scale?" In reality of course, projects do not operate in a perfect world, and their costs and benefits may need to be adjusted to reflect this. When market imperfections exist, shadow prices are used. These are calculated to show the SOC of goods for which 1) market prices do not reflect their "scarcity value", or 2) there is no market price (Pienaar, 2008:668). A brief overview of how costs and benefits are measured in the absence of evidence of market distortions follows, after which, the use of shadow pricing is discussed.

Since resources are not limitless, using resources in a proposed project implies an opportunity cost of forgone alternative projects (Dasgupta & Pearce, 1972:97). Thus, the cost of the project should be measured at its opportunity cost, and benefits by aggregate WTP (Pearce, 1983:25).

The financial cost of the project shows the market value of resources displaced by it, thus as a first approximation, it could measure the chosen project's opportunity cost. Importantly however, these financial costs will only actually reflect forgone benefits under *certain circumstances*, and in reality the use of these prices may introduce bias to the CBA (Dasgupta & Pearce, 1972:47-50) due to imperfections in real-world markets (DEAT, 2004:9). To deal with these imperfections, shadow prices are used in CBA; discussed in further detail in the next section, 1.5.2.1.

The common approach to measuring benefits is to take consumer surplus (as a measure of welfare loss or gain) from a marginal WTP curve (Marshallian demand curve) (Pearce, 1983:27-29). This curve includes both the substitution and income effects of a price change. The income effect shows that when the price of a good changes, the real income of consumers changes, allowing them to attain a higher or lower indifference curve (Pearce & Nash, 1981:90,93). This is problematic, since utility is then read off a curve where real

income (used to measure utility), is itself changing (Pearce, 1983:28-9). To explain, demand will not equal marginal utility, since marginal utility would be drawn assuming real income is constant; so the integral of demand (the area under the Marshallian demand curve) would not be equal to total utility.

A more appropriate demand curve where quantity is related to price, but money income is varied such that the consumer stays on the same indifference curve as before the project (removing the income effect) was introduced by Hicks (1943). This is a *Hicksian compensated* demand curve, the area under which measures *compensating variation* (CV). Hicks (1943) also introduced *equivalent variation* (EV) as another alternative measure for welfare change; the area under a demand curve where money income is varied so as to keep the consumer on the same indifference curve as the one they are on after the project (Pearce, 1983:28-29). For both CV and EV then, Hicks assumed that total utility being kept constant is equivalent to real income being kept constant.

While debate continues on which measure of welfare change to use, CV has been most recommended in the theoretical literature (Pearce, 1983:30). Although theoretically Marshallian consumer's surplus is not the correct measure of welfare change, Willig (1976:589) argues that errors from using it are very small, and that generally this measure is a very close approximation of CV and EV. As a result, and due to empirical difficulties in measuring Hicksian measures, "simple" consumer surplus measures are generally used in practice in CBA (Pearce, 1983:28-30).

1.5.2.1. Shadow pricing

Since preferences are expressed in markets, as an initial approximation, market prices of outputs (inputs) could represent the correct valuation of benefits (costs) (Dasgupta & Pearce, 1972:97). However, when market distortions exist, market prices may not accurately reflect the marginal costs and benefits to society. Such market distortions include: quotas, tariffs, monopolies, minimum wages, taxes and externalities. When market distortions are evident, *shadow prices* (also called efficiency prices) should be used. These are intended to approximate the marginal opportunity costs of project inputs and outputs (DEAT, 2004:9). If market imperfections (which are particularly prevalent in developing countries), are ignored in CBAs, this could lead to misleading results (Omura, 2004:46). While a project may look

viable to a businessman because of the market distortions, from a state or social perspective, it may fail the cost-benefit test.

While in many cases it is unlikely market prices coincide with shadow prices, some economists question the worth of using shadow prices due to uncertainty regarding the accuracy of calculated shadow prices, and *second best* problems; i.e. if a number of prices affecting a project are not set at levels equal to marginal social cost, then correcting prices in one sector (e.g. the public sector) might not move the economy any closer to Pareto optimality. Indeed, it might move the economy further away (Dasgupta & Pearce, 1972:109,116-117).

Calculating *true* shadow prices is complex. As a result many economists feel that the outcomes of the exercise do not justify the effort, given the arbitrariness, and personal judgement involved. Both could introduce subjectivity into what is meant to be objective CBA (Dasgupta & Pearce, 1972:116). Practically, whilst market prices may not be perfect measures of value when there are market distortions, they might be the "most cost-effective" means of expressing value (DEAT, 2004:9). However, using market prices may not be any less subjective than using shadow pricing (Dasgupta & Pearce, 1972:116), especially in the case of highly distorted markets.

In light of differing opinions regarding shadow prices in CBA, manuals often include guidance regarding shadow pricing and calculated shadow prices (or shadow price conversion factors - ratios of the shadow price to the market price) in order to promote a uniform approach to local project appraisal (Conningarth Economists, 2007:21).

1.5.2.2. Non-market values

In CBA benefits and costs are measured using money as a common measuring rod (Omura, 2004:43). The challenge with non-traded project inputs and outputs or intangibles, such as recreational value (which is of relevance to the case study), is that many have no market since they are not sold or bought directly (Campbell & Brown, 2003:93, Pearce, 1998:86). Where markets do not exist for project inputs or outputs, non-market valuation techniques need to be used to approximate WTP (Campbell & Brown, 2003:93). The attribution of accounting prices for non-market goods has been controversial. The process involved can be very

complex, making it difficult to rebuff accusations of the sometimes seemingly arbitrariness thereof (Dasgupta & Pearce, 1972:112,114).

Common approaches to valuation of non-market goods fall under either revealed preference or stated preference techniques. Revealed preference techniques are based on people's actual behaviour in markets affected by the goods being valued, and include travel cost methods and hedonic pricing. Both hedonic pricing and travel costs can only be used to approximate use values. Travel cost techniques use the costs of accessing a site, to proxy for the non-existent market price of its use values. They are most often used for outdoor recreation modelling(Hanley & Barbier, 2009:44-113), as in du Preez et al (2011:85-87), who used a random utility model of site choice (a variant of the travel cost method) to estimate the recreational values of beaches in the Nelson Mandela Bay area. Hedonic pricing (HP) then, finds the implicit value of a characteristic of a house (e.g. proximity to recreation opportunities, or being in a 'safe' neighbourhood), by estimating the relationship between market prices and the characteristics thought to affect them (Hanley & Barbier, 2009:98-99).

Conversely, stated preference techniques involve the researcher directly asking people about their WTP or WTA reimbursement for a given change. They include choice experiments (sometimes termed conjoint analysis) and the contingent valuation method. These methods measure both use and non-use values (Hanley & Barbier, 2009:44-113).

All of these valuation methods have limitations and shortcomings, contributing to their contentious nature. Indeed previous analysts' bold attempts at valuing intangibles such as amenity or human life, left some disillusioned with CBA in general. As such, the analyst may feel that there is no way of reliably coming to values for some non-market goods in some circumstances. However, where non-market goods are not valued in a CBA, they must still be listed as '*contingencies'*. The analyst should at least show what value these contingencies would need to take on in order to swing the decision for or against the project. This allows the decision-maker to ask if the project's net benefit, i.e. its NPV is worth exchanging for the contingencies listed (Dasgupta & Pearce, 1972:15,115).

Whilst this is a practical solution in cases where it is technically or financially prohibitive to express the values of externalities in monetary terms, failure to value externalities and public goods (and bads), has been criticized. Some believe that such non-monetized impacts were

given less significance in CBAs in the past. Omitting them is especially problematic since the public cannot easily distinguish whether an effect is not investigated because of political preference, legitimate technical limitations or the opinions of the analyst (Omura, 2004:44,46).

1.6. Practical methodological steps in preparing a CBA

Most texts on CBA give an account of the process followed when preparing a CBA, which implies following a general order of steps. While these are not identical, there is sufficient commonality to suggest a general approach. The general approach follows[3], after which common approaches to external effects, discounting and decision criteria are elaborated on.

1. **Define the problem**

In the preliminary stage of the CBA process, the analyst should consult the decision-maker to discuss the purpose, scope and parameters of the analysis. Included therein is the decision-makers' definition of the society from whose perspective the analyst should prepare the CBA. During this process, the project scenario and objectives should be defined (Sassone & Schaffer, 1978:156-164), and project alternatives under consideration, specified (Boardman et al., 2001:7).

2. **Identify and measure incremental costs and benefits of the alternatives**

The alternatives are compared to a clear baseline where the project does not occur, in order to prevent double counting (Arrow et al, 1996:7). As already discussed, identification and measurement involves monetizing costs and benefits where possible (potentially involving shadow pricing or non-market valuation techniques), and qualitatively discussing non-monetized costs and benefits.

3. **Compare the costs and benefit streams of the alternatives**

Costs and benefits are incurred over the life of the project, and thus need to be discounted in order to directly compare them. Decision rules are then calculated to show and compare the economic value of the project and its alternatives (Conningarth Economists, 2007:62). This may involve differential weighting of costs and benefits to different groups of society.

[3] These steps are partly a consolidation and summary of those in Sassone and Schaffer (1978:156-173) and Boardman et al (2001:7-17).

4. **Perform a sensitivity analysis**

When there is uncertainty regarding the value of a parameter in a CBA, a range of estimates for the parameter should be used to test for the evaluation's sensitivity to the value assumed (Pearce, 1983:89).

5. **Present the results**

The results of the CBA are presented in a report, and typically contain a recommendation based on the project alternatives' NPVs and the sensitivity analysis (Boardman et al, 2001:16-17).

1.6.1. Elaboration on aspects of CBA

1.6.1.1. Incorporating external effects

Social CBA includes effects of a project to both the investing agency and others. Impacts that are classified as externalities occur when:

a) "economic activity in the form of production or consumption affects the production or utility levels of other producers or consumers; and
b) the effect is unpriced or uncompensated" (Dasgupta & Pearce, 1972:118).

External effects can be *pecuniary* or *technological*. Technological externalities involve 1) a change in the production function of an external producer, affecting the amount of output they can produce given a certain amount of input; or 2) the utility function of an external consumer, affecting the amount of utility that they achieve from a given amount of real income. Pecuniary externalities, on the other hand, do not affect the technological possibilities of production or consumption (Dasgupta & Pearce, 1972:120). These effects may feel very 'real' to the affected parties and often are the cause of genuine unhappiness with a project. However, they are not *real* effects on total welfare, but *financial* effects, represented by price or profit effects on outputs or inputs (Sassone & Schaffer, 1978:33-34). The rationale is that they are simply part of the market process. Relative price changes often occur as the economy moves forward. However there is no sense that people should be taxed or compensated for these changes.

Technological externalities are included in CBA, since they represent a real change in social welfare. However, pecuniary externalities should generally be excluded, as they are not *real* impacts and likely a mere redistribution of income. Including both pecuniary and technological externalities would constitute double counting (Sassone & Schaffer, 1978:34). However, pecuniary effects may need to be included in a CBA when distributional weights are used (where this redistribution is between parties assigned different weights) (Dasgupta & Pearce, 1972:121).

1.6.1.2. Discounting

The same cost or benefit, occurring at different points in time, may be valued by society differently. Therefore future costs and benefits must be discounted at an appropriate *real* discount rate and expressed in PV terms. This discount rate does not include inflation since costs and benefits are measured in real terms in CBAs (Pearce, 1983:38,40). Dasgupta & Pearce (1972:156) outline three proposed bases for the calculation of this social discount rate from economic theory:

- A rate based on the social time preference rate (STPR)
- A rate based on the social opportunity cost (SOC) of funds
- A *synthetic* interest rate incorporating both of the above

While in theory, the STPR and SOC of funds in a perfectly competitive market in equilibrium are equal, in practice they appear different. Market imperfections such as institutional barriers, like taxation on dividends (see Baumol, 1968), risk differentials and externalities, prevent their equivalence. Consequently, a weighted combination of STPR and SOC of capital has also been suggested as the social discount rate (du Preez, 2004:460).

Conventional discounting in CBA assumes that regardless of how far into the future the discounted event occurs, a constant discount rate applies (Hanley & Barbier, 2009:153). Some argue this is at odds with ‘sustainable development’ since it is seen as discriminating against future generations and contributing to environmental degradation. This is because future costs and benefits, once discounted at any positive discount rate have lower PVs, rendering the long-run future irrelevant (Omura, 2004:49-50). This observation has led some to advocate for very low or zero discount rates.

The lower the discount rate, the larger is the current generations' sacrifice in favour of future generations (Pearce et al, 2003:124). Therefore, a zero rate of time preference would implicitly drive consumption levels of the current generation down to survival levels; household would save all income beyond what is required for survival, for future generations (Olsen & Bailey, 1982:23). However, as Pearce et al (2003:125) point out, since this sacrifice would make the present generation the most poor, zero discounting cannot be approved under the *Rawls criterion* (that the welfare of the least well off individual should be maximized). A zero discount rate could be interpreted as a zero 'hurdle rate' for investment, i.e. the internal rate of return on a project merely has to be positive. This would encourage extremely high levels of investment (and low levels of current consumption).

Although it was initially assumed that people discount at a constant rate, a considerable amount of experimental research now indicates that people discount future outcomes at rates that fall the further into the future they occur (hyperbolic discounting) (Pearce et al, 2003:125). Such time-declining interest rates also counter the aforementioned 'sustainability' concerns of conventional discounting (Omura, 2004:50). Another rationale for time-declining interest rates, proposed by those such as Weitzman (1998) and Gollier (2002), is uncertainty regarding future elements of the economy (Pearce et al, 2003:128,132). Weitzman's (1998:7) argument centres on uncertainty regarding future interest (discount) rates, whereas Gollier's (2002:149,163) centres on society's prudence as a result of uncertainty regarding future growth rates of GNP (consumption) per capita. Though these are only some of the rationales for time-declining discount rates, their use introduces problems of "time-inconsistency" - where the plans made in one period of time are contradicted by later actions (OECD, 2006:189).

Regarding the social discount rate applicable to public investment decisions however, some economists suggest that STPR is less relevant than the SOC of funds. Since funds for capital projects are limited, investing in one project implicitly means forgoing another (Dasgupta & Pearce, 1972:145-146). Many economists thus propose that the appropriate social discount rate is the rate of return of the project displaced by the project being appraised (Markandya & Pearce, 1988:37).

This is typically thought of as a private project. The rationale is that the public project should yield a rate of return at least equivalent to an alternative investment to show that the resources

are being put to at least as good a use. Since public projects tend to be low risk (at least in advanced economies) it may be appropriate to base the discount rate on the marginal internal rate of return (MIRR) of a similarly low-risk private sector project[4] (Dasgupta & Pearce, 1972:145-146).

The expected return on a risky investment exceeds that on an investment with certain returns since private sector MIRRs typically include a risk premium - a result of individuals' risk aversion and the imperfect market facilities for pooling risks (Vickery, 1964:89). However, Vickery (1964), Samuelson (1964) and Arrow and Lind (1970), proposed that the social discount rate for public projects should be *lower* than that used for a similar project in the private sector, because it should include a lower (or zero) social risk premium (Jones, 2008:269).

Vickery (1964:89) and (Samuleson, 1964:95-96) suggested this was because the government as a large investor, undertakes many diversified projects, enabling it to pool independent risks. Since the public sector is able to pool and average risks over the whole population through the tax system, with no extra costly financial transactions, it is able to do so more cheaply than the private sector can with its limited portfolios (Vickery, 1964:89). Arrow and Lind's (1970:370,373) argument was based on public project returns being uncorrelated with national income, and the risk-bearing of public projects being spread over all taxpayers (since they finance public projects). Thus Arrow and Lind (1970:366) suggested that the discount rate for public projects should be independent of risk; and Vickery (1964:91) that including a risk premium is not appropriate for discounting of public projects.

Others suggest flaws in the arguments for excluding or using a lower risk premium for public projects. They argue that the social discount rate for the public sector should still include the same risk premium as the private sector. Bailey and Jensen (1982 cited in Jones, 2008:276), disagreed with the above arguments of Vickery, Samuelson, and Arrow and Lind. They disputed the assumption that the public sector faces better and cheaper opportunities than the private sector when trading risk. They argued that private traders are specialists in their field

[4] Since this MIRR might not incorporate social returns from the private sector, technically it would require adjustment to a "social MIRR" taking into account shadow prices, externalities and consumers surplus effects (Dasgupta & Pearce, 1972:146).

and face better profit incentives than public servants, and should therefore be more efficient at trading risk. They also disagreed with the public sector being able to diversify investments to eliminate risk, arguing that public projects are *not* uncorrelated with aggregate income (Bailey and Jensen, 1982 cited in Jones, 2008:276).

In practice, the government-borrowing rate is often used for the SOC of capital for public projects, since it shows the financial cost of government spending and is characterised as both as long-term, and risk-free. However, its use as the discount rate for public sector projects implies significant assurance of the competitiveness of capital markets (du Preez, 2004:461).

Due to ongoing debate on the applicable discount rate, and empirical difficulties in calculating this rate; national and regional guidelines often recommend a social discount rate for use in local CBAs. Further, a range of discount rates is often used in the sensitivity analysis to test how important the discount rate is to the outcomes of the analysis (Sassone & Schafer, 1978:129).

1.6.1.3. Decision-making criteria in CBA

Decision rules are calculated in the final stages of a CBA, and constitute the criteria upon which project recommendation can be made from a CBA (OECD, 2006:67). The three most common decision rules which have been calculated in CBAs are:

- **Net present value (NPV)**

NPV is the differences between the benefits and costs of the project, when discounted at the appropriate discount rate. When budget constraints are not binding and projects are independent, any project with a positive NPV is ‘acceptable’ (Gittinger, 1982:487-488).

- **Benefit-cost ratio (BCR)**

BCR is the ratio of the PV of the benefits and the PV of the costs of the project. Independent projects with a BCR of 1 or more are ‘acceptable’ (Gittinger, 1982:459-460).

- **Internal rate of return (IRR)**

The IRR is the discount rate required to make the NPV of the project equal zero. When projects are selected according to their IRR, independent projects with an IRR above a certain

cut-off rate (usually the opportunity cost of capital), are 'acceptable' (Gittinger, 1982:480-481).

Where budget constraints are not binding, the rule that should be adopted is that projects are ranked by their NPVs. Where single-period budget constraints apply, projects which pass the initial positive NPV test are ranked according to their BCR. However, the use of the BCR to rank mutually exclusive projects can result in incorrect project choice. A project with a higher NPV could be ranked lower in terms of its BCR than one with a lower NPV (OECD, 2006:70-73).

It is generally accepted that the IRR should not be used for ranking or selecting mutually exclusive projects, as it can lead to misleading results. When considering two (or more) mutually exclusive projects of equal economic life, IRR could discriminate against the larger project if it has the larger capital outlay, even if was preferred when using the NPV rule. IRR has further pitfalls. It is sensitive to the economic life of the project and the timing of the benefit flows of the project. The rule is also difficult to apply where there are time varying discount rates; or in the situation of multiple roots, where each project may display a number of calculated IRRs (OECD, 2006:73-74).

1.7. Conclusion

Despite academic concerns regarding its theoretical basis, CBA remains well-utilised; particularly by public decision-makers for the appraisal of public projects. The debates regarding discount rates, shadow prices, and distributional considerations suggest a need for a consistent approach. For this reason, regional or institutional manuals often provide guidelines for analysts preparing CBAs. These make CBA systematic and rule-based. Done properly the value judgment element can be minimized and the analysis helps make decision-makers accountable for their actions. It is worth noting that the following case study was requested by a provincial authority seeking to inform a decision.

2. CASE STUDY: THE PROPOSED DEVELOPMENTS AT THE GARDEN ROUTE DAM

2.1. Introduction

George Municipality commenced an environmental application for a proposed development of a site adjoining the Garden Route Dam in 2006. The application involves the rezoning of the property from 'Undetermined' to 'Single Residential', 'General Residential', 'Business' and 'Public Open Space' (Sharples Environmental Services, 2013:5). Following the rejection of the latest Basic Assessment Report (BAR) in the EIA, one of the requests of the decision-maker Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), was for a socio-economic CBA, to assist the Department in making an informed decision. This case study arose as a result of the CBA request.

The proposed development falls within the urban edge defined in the latest Spatial Development Framework (SDF) for George Municipality, and is in one of the areas that have been earmarked for future residential development (George Municipality Planning Department, 2013:69). Thus rejection of the application was not due to nonconformity with documented local policy on economic and spatial planning.

In the rejection letter of the latest BAR which requested the CBA (DEA&DP Land Management (Region 3), 2013), opportunity costs were asked to be investigated. As were reasons for doing the development at this point in time, and the need for the development, considering a number of available residential erven in George.

The initial CBA request included consideration of multiplier effects. However the standard format of CBA usually omits these effects (van Zyl et al, 2005:1). These multiplier effects occur in secondary markets. The reason they are generally not included in CBA, is that the first-round net benefits of the project in primary markets are already included[5] (Campbell & Brown, 2003:302). Second and third etc. rounds' impacts would follow, no matter what the original project was. All that would matter would be the size of the first round impact; subsequent rounds are necessarily dependant on the size of the first round. Their perceived

[5] If multiplier effects are investigated, they should be presented in "a separate statement of impact assessment results" (Campbell & Brown, 2003:302-303).

'need' for decision-makers is flawed, since it is based on the assumption that they are totally independent of the first round. After discussing the scoping of the CBA with the decision-maker, multiplier effects were excluded from the analysis.

The CBA was prepared to show the expected net revenue stream required for the development to be financially viable. The current financial viability of the development was a major concern for DEA&DP given numerous approved and partially developed developments within George (DEA&DP, 2013: 2). That other developments in George had recently been approved by the Department, and the Municipal development had not led to a concern by proponents of the development, that approval of the George Municipality development by DEA&DP was more contingent on financial viability, than developments by private developers (Venter, personal communication 2013, 20 August.

2.2. Project description

The 122 hectare site of the proposed development was under pine plantation until 2005-2006. It is South-West of the Garden Route Dam, and is adjacent to the suburb of Loerie Park on the eastern edge of George (Sharples Environmental Services, 2013:5,25). Following public consultation with interested local parties, the Applicant's (George Municipality's) preferred proposal is referred to as '*Alternative 3'* in the BAR. Following rezoning and subdivision this proposal would allow for the establishment of:

- 211 single residential erven (with provision for one erf to be used as a church (Erf 70), and another as a crèche (Erf 4))
- 5 group housing components, with a maximum density of 20 units/ha
- A town housing component, with a maximum density of 30 units/ha
- An apartment or flat component with a total coverage area of 1.6ha
- A hotel site with a total coverage area of 1.9ha
- A business/commercial unit to be developed as a waterfront area
- A public open space area, predominantly for recreational use (Sharples Environmental Services, 2013:8).

The development is seen as an extension of the Loerie Park suburb, and would target middle-to-high income earners (Venter, personal communication 2013, 12 August).

The following alternatives are compared in the case study:

- The no-go alternative.
- The preferred design, 'Alternative 3'.
- Opportunity cost of the land in an alternative use: if sold for agriculture, or if returned to its previous use, commercial forestry.

2.3. Methodology

The recommendations of the following documents informed the preparation of this case study and provided guidance on the methodology followed:

- The DEA&DP guideline for involving economists in EIA processes (van Zyl et al., 2005).
- The Water Research Commission's manual for CBA in South Africa (Conningarth Economists, 2007).
- DEA&DP guidelines on need and desirability (DEA&DP, 2013).

When preparing the CBA, the procedure described in section 1.6 was followed. Issues regarding the financial viability and justifiability of the project were investigated, and a financial CBA prepared. Other external costs and benefits were also investigated qualitatively to help assess whether the project may lead to a net gain or loss in societal welfare.

2.3.1. Data

Information and data are discussed in further detail in the rest of this chapter, after which a summary of the project data for the CBA is shown in Table 7. Information and data were gathered from the following sources:

- Consultations and interviews with relevant local authorities and representatives of George Municipality and the local public.
- Local planning and economic development documents.
- The BAR for the development and its supporting documents.

- The August 2013 Consumer Price Index (CPI) statistical release (Statistics South Africa, 2013).

2.3.2. Assumptions and limitations

Information and data gathered from municipal officials, official sources and specialists on the EIA team were assumed to be correct.

All monetary costs are expressed in August/September 2013 prices. Social and economic impacts were not necessarily quantified in monetary terms. Where they were not, it was either due to difficulties in attaching monetary values to intangibles such as recreational value, and/or due to uncertainty. Where this was the case, they are discussed qualitatively.

Infrastructure cost estimates for 'Alternative 3' (see figure 1 for the layout) are not yet available; these would only be finalized once the Municipality sourced funding for the development if approved. Therefore infrastructure costs are based on the second layout, 'Alternative 2' (figure 2). These layouts are very similar, with slight differences in sizes of the larger erven, and moving of erven 127-139 and a road, in 'Alternative 3', so as to mitigate the impact on *Gladiolus fourcadei* bulbs (the discovery of which, led to the third design). Due to a difference between the layout of 'Alternative 2' (for which phases were broken down) and 'Alternative 3'(for which potential revenues from municipal valuations, were calculated), erven 127-146 were assumed to be a part of phase D; since the road required to reach them, would only be built in phase D. If any costs associated with these erven are captured by the costs in a different phase, this would affect the NPV and BCR of the project. However, the difference in costs between the layouts, if any, is expected to be small (Venter, personal communication 2013, 5 September).

When the analysis was conducted there was no finality regarding the temporal phasing of the development. The municipality did, however, have a likely order of phasing, and this was used (Venter, personal communication 2013, 3 September). In the absence of a timeline, it was assumed that the phases would be spread over a thirty year time frame, with each of the six phases occurring in turn after five years. Each phase's infrastructure installation is assumed to occur in the first year of that phase. An important caveat is therefore that, should

the ordering of the phases, or the length of time between the phases change, the project NPV and BCR will be affected.

The time it takes to sell the serviced erven will depend on market conditions and how the properties are priced. For purposes of the CBA, it is assumed that the properties serviced in a phase will be sold in the years immediately after infrastructure installation. Since it is not known how long it will take to sell the properties marketed in each phase, two scenarios are computed: a cautious scenario in which stands are sold over 4 years (with the prices of stands remaining constant in real terms), and an optimistic scenario where only 1 year is needed to sell each phase. A third scenario, where 2 years are needed to sell each phase, has results falling between the 4 and 1 year scenarios and is shown in Appendix H for completeness.

Current municipal property valuations are used as initial indicators of the sales prices for the serviced properties. Due to uncertainty regarding these estimates in relation to current sales prices in George, these values are also varied by 50 per cent above these values, and 50 per cent below in the sensitivity analysis.
The detailed design (and management) of the waterfront portion of the development is not yet finalized (Sharples Environmental Services, 2013:21). In the CBA, it was assumed that the waterfront property is sold by the Municipality. If it is not sold, but kept under municipal ownership, the value of the Municipality's assets would still increase. This potential capital gain could be used in lieu of the market value of the property.

One suggestion is that the remaining open public space on the property be managed and leased long-term by a non-profit organisation (NPO), possibly linked to the running of the waterfront facility. Whether this will occur and how the lease would look, remains uncertain (Loubser, personal communication 2013, 14 August). This does not have significant bearing on the results of the CBA however, since if this option were pursued, it would probably only occur once the waterfront facility is already built and operational. The waterfront facility is part of the *last* phase of the development. Thus if the lease were pursued, this is unlikely to fall much within the time frame in the CBA, if at all.

None of the estate agents interviewed felt that the municipality was utilising monopoly power to distort the land prices in the area. Market prices of other factors in the George area are not subject to distortions. Unskilled labour constitutes a small portion of the costs, and the

calculated shadow price adjustment factor of the market wage (the ratio of the shadow and market wages of labour) for unskilled labourers in urban areas in the Western Cape (like George) is 1 in Conningarth Economists (2007:82), i.e. no adjustment to market wages is required. Therefore market prices seem to equate to shadow prices, so market prices are used.

The real discount rates used in the CBA are 1, 4, 6 and 8 per cent.

2.4. George property market

The conversion of the study site from one land use to another would lead to a change in the value of the property, which could influence property prices in the area. To assess this effect, a series of interviews with 11 estate agents from most of the major agencies in George were held. Most specialised in residential property, though some also covered commercial property. The aim was to obtain expert opinions on two issues: a) the market for the proposed sites given current market conditions, particularly whether the development would attract *new* buyers to George from elsewhere and b) the implications for local property prices in George if the site's erven were serviced and released onto the market (discussed later).

Estate agents said the George property market had shown signs of positive movement and increased activity in 2013. Most agents felt that the property market would improve slightly in the next 2 or 3 years. Importantly however, all but one of the estate agents felt the proposed development would not attract new buyers to George; i.e. sales would be to persons who would have moved to George anyway.[6] Since CBA focusses on opportunity costs, this is important as such sales would merely be *displacing* sales elsewhere in George. Given the amount of unsold property in the city, there would probably be *no net gain* in total occupancy in George.

[6] One agent felt that if the development were *heavily* marketed as catering to an 'adventure sports' market, that a maximum of 20% of sales *might* be to people who would not have moved to George otherwise.

Figure 1: Layout of 'Alternative 3'

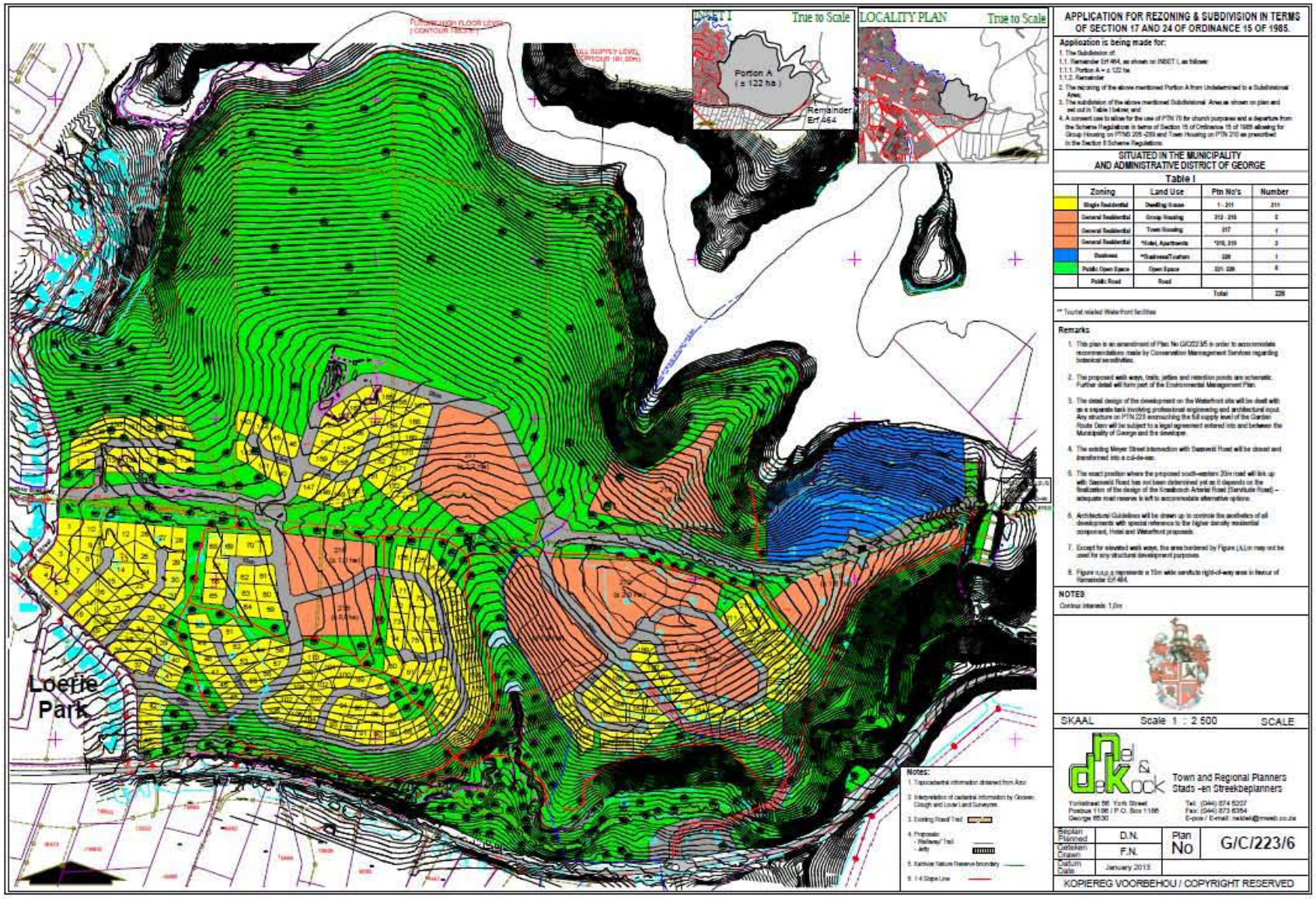
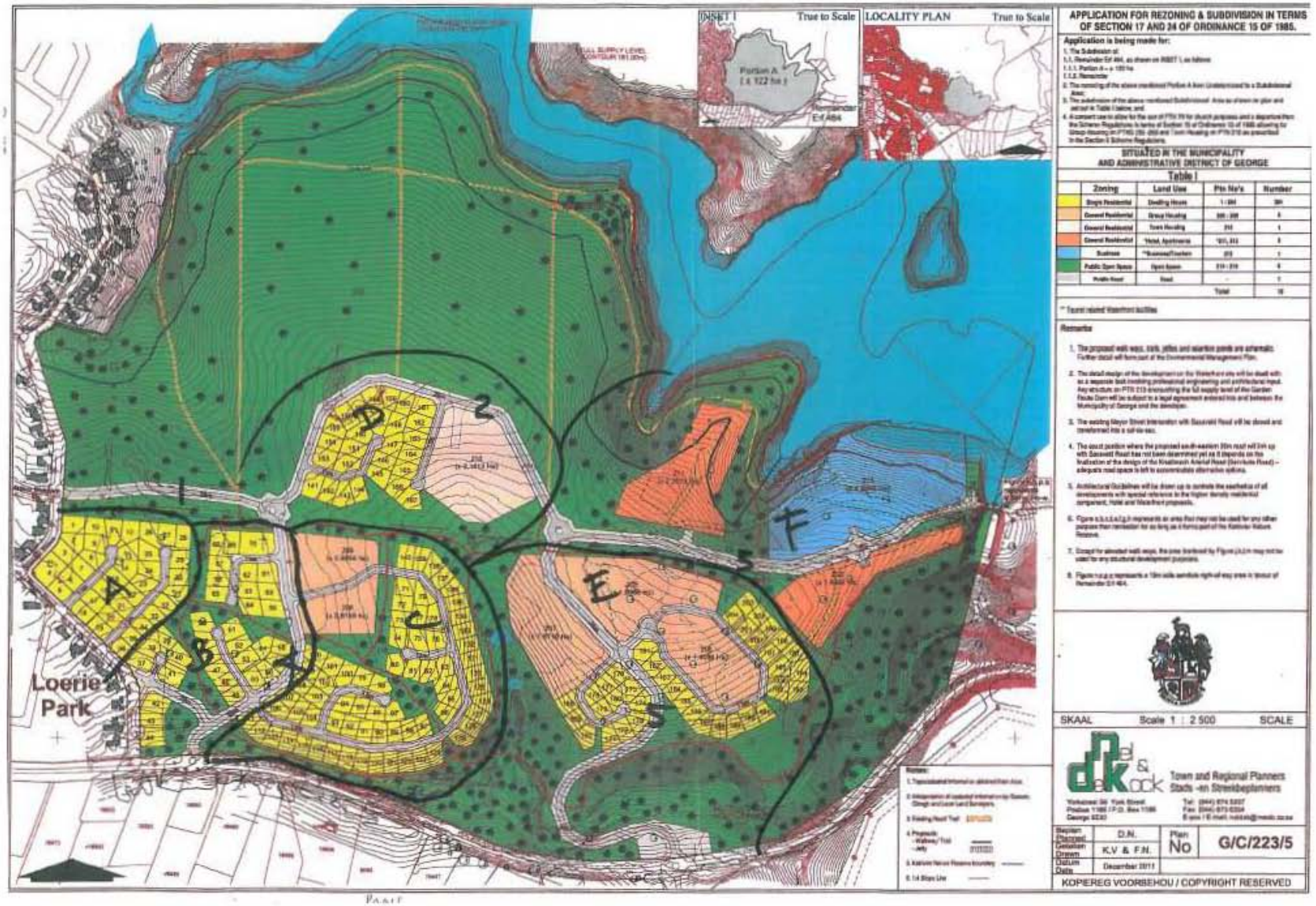


Figure 2: Phases (based on 'Alternative 2' layout)



2.5. Opportunity costs

2.5.1. Opportunity cost of funds: Discount rate

As discussed in section 1.6.1.2, there are a number of standard approaches to selecting a discount rate. The social discount rate recommended by national guidelines for CBA in South Africa (Conningarth Economists, 2007:68), is a real discount rate of 8 per cent per annum, based on 2005 data, and is more consistent with the SOC of capital approach than the STPR approach (see section 3.3. for further discussion of the 8 per cent discount rate). This 8 per cent was used in the CBA.

As a secondary discount rate, the opportunity cost of capital to the Municipality, was used. It is unknown at this stage whether the Municipality will borrow to finance the development (Venter, personal communication 2013, 20 August), but in the event that it does, it will be liable to pay interest on these funds, and if not, the opportunity cost of yielding a return on the funding invested elsewhere, still exists. The Municipality's budget office uses a fixed nominal annual interest rate of 11 per cent compounded monthly (Wallace, personal communication 2013, 26 August). This is an effective annual interest rate of 11.6 per cent per annum. The August 2013 CPI was 6.4 per cent (Statistics South Africa, 2013:2); implying a real interest rate of 5.2 per cent.[7] Thus in the sensitivity analysis, the real discount rate was also varied to 4 and 6 per cent to allow for fluctuation of this real interest rate.

Further, in light of the aforementioned arguments for low social discount rates, particularly for public projects (see section 1.6.1.2.), in the sensitivity analysis, a low discount rate, of 1 per cent, is also used.

2.5.2. Opportunity cost of the land

It is important in a CBA to consider alternative means of achieving the objective of the proposed project (Arrow et al, 1996:7). In the case of this project, it is the raising of municipal revenue through use of the study site. Therefore one needs to be aware of alternative land uses before looking at the potential returns to the municipality if the site is developed.

[7] 11.6% – 6.4% = 5.2 %

The two opportunity costs of the land investigated, using the land for forestry, or selling the land for agricultural use, are both activities that would be precluded by rezoning and development. Importantly, neither of these would cause the municipality to incur immediate costs; and both would generate a positive cash yield. However, by selling the land the municipality might be sacrificing potential future earnings.

Recreational use of the site will continue regardless of the land use selected, though the extent and nature of the recreational activities may be affected.[8] The recreational issue is discussed in more detail later in section 2.7.4.1 of this chapter.

2.5.2.1. Previous land use: forestry

The site has until recently, been used for plantation forestry. Approximately 110ha (90 per cent[9]) of the property was planted under pine (Loubser, personal communication 2013, 3 September). The trees were felled in 2005-2006 (Conservation Management Services, 2012:23). Whilst this is not a use of the land that the Municipality is currently considering, a logical opportunity cost of the land is the NPV of a further rotation of monterey pine (*Pinus radiata*), the standard species in this area.

A representative from a local timber company Cape Pine, provided an estimate for the NPV of a forestry undertaking (including the costs of clearing the land in the year prior to planting), on 110ha in the study area. Estimates of the discounted NPV at a 1, 4, 6 and 8 per cent real discount rate are shown in Table 1 for a 23 year rotation (Kanyemba, personal communication 2013, 28 August).

Table 1: Estimated NPV of a forestry operation on 110ha of the study site

Real discount rate	**1%**	**4%**	**6%**	**8%**
NPV	R5,041,051	R1,970,571	R932,197	R322,535

The assumptions underpinning the above estimates are as follows:

- Trees are felled when they are 23 years old.

[8] Recreational use *on* the property would probably be particularly affected if the land was sold for agriculture; but the dam itself would remain municipally owned, so recreation on the dam would be relatively unaffected.

[9] 110ha/122ha = 90.2%

- Trees are sold standing, so there are zero harvesting costs.
- It is assumed the forestry venture will be part of a profitable business, so tax losses on the forestry are immediately offset in the year they are incurred.
- All costs and revenues are at August 2013 prices.
- No downstream profits from sawmilling have been included. If they were, they would improve the NPVs.
- Intangible benefits of the forestry operation have not been included in the NPVs (Kanyemba, personal communication 2013, 28 August), i.e. this is a simple financial estimate.

It should be noted that the above estimates also do not include values for possible negative externalities of the forestry undertaking, for example: i) impacts on water in dam's catchment, ii) increased fire risk and iii) contribution to the spread of invasive pines outside of the site.

The results in Table 1 show the expected NPV is very sensitive to the discount rate used – varying substantially between R5,041,051 using a 1 per cent real interest rate, and R322,535 using an 8 per cent discount rate. This is because the forestry revenues only accrue far down the line. However, this should not be a concern for an institution like a municipality that is supposedly infinitely long-lived, can diversify its portfolio of risky activities, is not driven by profits, and has no need to be risk-averse, if one agrees with the arguments of Vickery (1964), Samuelson (1964) and Arrow and Lind (1970). Further, of the discount rates used, the lower discount rates of 1 and 4 per cent may be of particular relevance as they are the closest to the average real cost of capital for long-term government borrowing between 1980 and 2005 of 3.2 per cent, mentioned in the manual for CBA in South Africa (Conningarth Economists, 2007:125).

2.5.2.2. Land sold for agricultural use

Although not an option under consideration by the Municipality, another potential opportunity cost of the land, is its sale in its current state, for agricultural purposes. A representative from a local agricultural group Agri Klein Karoo, provided an estimate of the per hectare value of the site in its current condition, given current per hectare values of agricultural land in the George area. His estimate was that a fair average price of the property is R8,000/ha (Lodder, personal communication 2013, 28 August).

A local estate agent who deals with agricultural land in George, and is familiar with the current state of the property, confirmed that the values of land in different conditions which informed this estimate (see Appendix C) were realistic. He said that the overall estimate of R8,000/ha was reasonable and is perhaps on the low side, saying that his estimate could go as high as R15,000/ha. However, given the amount that would have to be spent on stumpage and other costs to improve the condition of the property to a state conducive to farming, the estimate of R8,000/ha was reasonable (Kerr, personal communication 2013, 5 September).

Theoretically, the price of land should be the PV of the net earnings it can generate. i.e. the post-tax profits to some reasonable time horizon. At standard discount rates this is about 25 or 30 years, which although slightly further into the future, is relatively comparable to the pine plantation time horizon. Although not strictly equivalent, the NPV under timber, and the market price if sold for agriculture, are thus somewhat comparable. At between R8,000/ha and R15,000/ha, estimates of the value of the 122ha if sold for agricultural use, range from: R976,000 to R1,830,000. This is lower than the NPV of an 110ha forestry operation, at a 1 or 4 per cent real interest rate, but higher than its NPV at a 6 or 8 per cent real interest rate.

2.5.2.3. A note on the option value of the land for other uses

The proposed development falls within the urban edge according to the latest Municipal SDF (George Municipality Planning Department, 2013:68). Thus if not developed according to Alternative 3 in the near future, the portion of the site proposed to be developed, is still likely to be developed at some point in the future.

A point to note is that ‘conservation’ is not seen by the municipality as a feasible alternative for the site. This option has been an argument apparently in the minds of some local activists who oppose the development. However the site has been earmarked for future residential use. In the event that ‘Alternative 3’ does not occur, it is unlikely that the entire 122ha area would be completely rehabilitated as a conservation area, as this has not been indicated for in the municipal spatial planning documents. In the event that ‘Alternative 3’ does occur, over half of the study site will remain undeveloped and will be zoned as public open space. This designation is non-prescriptive and will leave future generations to decide on the land use within that residual; whether to develop it, keep it as recreational zone, or set it aside as a conservation area.

2.6. Costs and benefits

2.6.1. General

As already discussed, in this CBA market prices are used, not shadow prices. This is because there is no evidence of distortions of market prices of factors and land sale prices in the George area. Furthermore, while it is possible to calculate values for intangible impacts; practically, given time, resources and informational constraints, as in this case, it is not always feasible. Thus in accordance with the guidelines in Conningarth Economists (2007:62), intangible impacts such as those on recreational values and perceptions of safety, which are difficult to express in quantitative terms, have been identified, but are treated in qualitative terms.

First, the costs and benefits of the current/status quo situation without the development are discussed, after which costs and benefits of 'Alternative 3' are discussed. Monetized costs and revenues are in late August and September 2013 prices.

2.6.2. The status quo scenario

2.6.2.1. Costs

Although the property is currently undeveloped and stands idle, keeping it undeveloped is not costless. Due to concerns regarding crime at the site, there are currently 2 guards posted. The annual expense of this security arrangement is approximately R240,000. As the landowner, the Municipality is responsible for alien vegetation management (AVM), on which the Municipality spends approximately R50,000 per annum (insufficient for proper AVM on the site (Loubser, personal communication 2013, 3 September)), depending on availability of funds. Scheduled burns take place on a rotating basis of a third of the property once every five years, at a cost of approximately R15,000 per burn. For purposes of the CBA this is presented as an annual expense of R3,000 since the precise timing of the next round in the burn cycle has not been decided (it will be affected by the development agenda set for the site and is currently in abeyance until this is resolved). A pro-rata cost of local fire services putting out veld fires, is estimated at between R10,000 and R15,000 per annum (the midpoint R12,500 is used). The Municipality also pays for 2 toilets at the site at a total cost of R16,800 per annum (Loubser, personal communication 2013, 3 September). Thus, as is shown in

Table 2, on average the site is currently maintained by the Municipality at a cost of approximately R322,300 per annum.

Table 2: Current yearly costs for maintenance of the undeveloped site

Cost	Total Cost	Direct labour costs		
		Unskilled	Semi-skilled	Skilled
Guards	R240,000	R240,000		
AVM	R50,000	R32,000	R8,000	
Controlled burns	R3,000	R600	R2,400	
Putting out veld fires	R12,500			
Toilets	R16,800			
Total	R322,300	R32,600	R250,400	R0

2.6.2.2. Benefits

Recreational use

Currently the land is used for recreational purposes by the public. Details of this use are deceptive although all vehicles entering the site have to be signed in. The entrance record shows that 486 cars entered the site in August 2013. However, several people may arrive in one car, and it was clear that people making use of the site do not only arrive by car. Some enter on foot, by cycle, or on horseback.

To gather a better approximation of the number of visits to the site per week, the guards at the gate on 14 August were asked to estimate how many people visit the site on an average weekday and weekend day for different purposes. The average of their estimates are in Table 3; however, it should be noted that these figures would be subject to recall bias and are likely to underestimate the true intensity of the site's recreational usage. Guards do not see everyone that enters or uses the site. Users can enter through other areas of the site, if not driving a vehicle. Further, guards said when people arrived in cars, it was not always clear what recreational activity they were there for. Guards were also unsure how many people entered the site for canoeing or horse riding and thus did not provide an estimate of how many people enter the site for these purposes.

Table 3: Guards' estimates of people who enter the site every week

Activity	Average weekday	One day a week	Average weekend day	Average week's total visits
Walking/hiking	15	33	4	116
Dog walking	35	10	24	231
Running	15	40	2	118
Cycling	19		2	97
Fishing	1		40	85
Total (excluding horse riding & canoeing)	84	83	72	646

Summing the average of their estimates, the average week's total visits to the site, excluding horse riders and canoeists, is estimated at approximately 646 visits (with some people visiting the site several times a week). From interviews with users of the property, approximately one or two horse riders reportedly ride to the site on a weekly basis, and a larger group of about 8 riders, once a month (Oates, personal communication 2013, 5 September) Several regular canoeists are seen on the dam on most days, with one canoeist knowing of about 8-10 regulars who canoe every second day (Botes, personal communication 2013, 2 September).

2.6.3. Effect on property values

If an undeveloped, large open space generates any externalities, these would manifest themselves in the prices of nearby properties. Development of the site would reduce the extent of these externalities and thereby affect local residents. To estimate the extent of any such externalities, estate agents familiar with the property and the market for adjacent properties were interviewed. Potential negative externalities suggested by estate agents were vagrants or criminals staying on the site. Primary positive externalities mentioned were views over open space. These are real externalities, however agents suggested their effect on prices was low. Overall, estate agents felt the effect of the site's externalities was probably neutral. Those that felt the property's externalities influenced prices slightly said this effect would be very low.

2.7. 'Alternative 3'

2.7.1. Costs

The costs involved are only those that accrue to the municipality in the provision of services to the site. This is the normal responsibility of the individual or company selling serviced

sites. In this case it is the municipality that is proposing to enter the property market as a supplier. It is not, however, going to do any development beyond supply of basic infrastructure. The CBA therefore excludes all subsequent costs (i.e. costs of construction of buildings on the properties), as these will be incurred by developers who buy the serviced erven.

Capital costs: Roads, water, sewer and electrical infrastructure costs

Municipal estimates for infrastructure costs are based on the layout of the second layout design, rather than the third, but were updated to 2013 prices[10]. The costs of installing roads, sewerage, and water are based on municipal estimates and do not include operating costs (Fivaz, personal communication 2013, 14 August). Upon reviewing what was included in the infrastructural costs in the previous socio-economic report of the EIA, it was discovered that the municipality had not included costs of electrical infrastructure in their estimate. These installation costs were provided separately, again using municipal estimates broken down into the same phases.

In the absence of a timeline, it was assumed that the phases would be spread over a thirty year time frame, with each of the six phases occurring in turn after five years. Further it was assumed that each phase of infrastructure installation occurs at the beginning of each phase and takes one year to complete - a figure which a representative from the Municipality found reasonable (Venter, personal communication 2013, 3 September).

The estimated total cost of installing roads, water, sewer and electrical infrastructure for the development is R158,385,174, of which R23,920,878 was estimated as payments to labour. The Municipality has a policy of hiring labour locally where possible (Fivaz, personal communication 2013, 14 August), so much of the labour portion of the infrastructure costs should be payable to labour within the George municipal area.

[10] Potential costs for recreational infrastructure and trails etc. in the remaining public open area of the site, are excluded since, i) if the land is leased on a long term basis, the lessee will be responsible for costs on this portion of the land; and ii) details of the recreational offerings in this area have not yet been decided.

Table 4: Roads, water and sewer infrastructure costs excl. VAT.

Phase	Roads	Water	Sewer	Electricity	Total
A	R6,238,807	R174,839	R489,466	R3,420,871	R10,323,984
B	R16,582,665	R1,181,278	R529,966	R4,044,745	R22,338,654
C	R21,937,766	R1,264,749	R1,413,865	R4,040,972	R28,657,351
D	R27,397,306	R2,563,908	R602,944	R3,992,752	R34,556,911
E	R25,964,970	R2,061,635	R914,812	R10,058,206	R38,999,624
F	R15,505,794	R815,401	R1 076,201	R6,111,254	R23,508,650
Total	R113,627,308	R8,061,811	R5,027,255	R31,668,801	R158,385,174

Table 5: Labour portion of infrastructure costs: income per skill category

Phase	Unskilled	Semi-skilled	Skilled	Total
A	R1,044,645	R558,585	R258,574	R1,861,805
B	R2,261,790	R1,148,126	R468,855	R3,878,771
C	R3,099,700	R1,485,559	R579,113	R5,164,373
D	R3,102,319	R1,491,764	R579,356	R5,173,439
E	R2,544,565	R1,346,642	R662,249	R4,553,456
F	R1,812,984	R1,020,730	R455,320	R3,289,034
Total	R13,866,005	R7,051,407	R3,003,467	R23,920,878

2.7.2. Benefits

Revenue from sales of properties

The amount the Municipality could receive for the erven once serviced, would be determined by market conditions at that time and the number of properties released to the market. It would therefore be sensitive to the timing and phasing of sales. Although provincial approval would provide some restrictions (sales would have to begin within 10 years) many imponderables remain. These include the amount that developers would be willing to pay for the larger portions (Portions 212-220), and the level of commercial activity that would be permitted at the waterfront.

Further, given that buyers may initially be slow to buying into a development, there is the possibility that the development would attain an internal momentum; i.e. that once seen to be moving, it will attract further interest. A successful first round of sales would increase the likelihood that the second will be successful and so on. Given estate agents' comments however, it is unlikely that even this momentum would bring in buyers from outside of

George who would not otherwise come; these sales would still merely be displacing sales from elsewhere in George. Putting a price on the likely selling price of serviced erven that could be released onto the market in many years' time clearly posed a major challenge.

An estimate for how municipal valuations of serviced vacant erven would currently be calculated was provided by the municipal valuation office, from which the figures in Table 6 were calculated. These values are based on average municipal valuations of similar developments in George. It should be noted that a property's final valuation would also be affected by such factors as location, views, and quality of services (Scheepers, personal communication 2013, 5 September). The site is strong on many of these features with scenic views over the dam, as well as being on the side of George which is near to both the Garden Route Mall and good schools.

The valuation figures were compared to estate agents' estimates of likely selling prices in the present market. The site is not homogeneous, and some sections would clearly sell at a premium. For this reason the valuation figures may be on the lower side of prices that could be expected for properties at the dam. The flat valuation rate of R320,000 for residential erven in the bracket of 401m² to 1200m², may also lead to an underestimation of the amount that 830m² properties could sell for, in current market conditions. However, some estate agents reported that there had been some recent "desperation sales" in George, where plots had been sold at prices well below their municipal valuations. Estate agents were of the opinion that these sorts of sales were distressed sales, largely driven by people who had bought property up during the boom, to sell on later. Following the market collapse and downward price pressure on residential property market, they have had to sell, at times at a very low price, in order to stop being liable for levies, rates and penalties. Most estate agents were unsure of likely prices for the larger serviced residential and commercial sites (portions 212-220) that would be sold to private developers.

Since estate agents suggested property prices based on recent sales, both significantly below and above those indicated by municipal valuations, the valuation figures are used as an indication of potential sales prices, but are varied in the CBA as follows: 50 per cent below and 50 per cent above the valuation figures.

Table 6: Potential valuation of serviced erven from the different phases

Zoning	Phase	A	B	C	D	E	F	Total
Single Residential [11]	**Ptn no's**	**1 – 36**	**37 - 70**	**71 - 126**	**127 - 173**	**174 - 211**		
	Value	R11,520,000	R10,880,000	R17,920,000	R15,040,000	R12,160,000		R67,520,000
General Residential [12]	Ptn no 212: 2ha					R4,080,000		R4,080,000
	Ptn no 213: 1.3ha					R 2,680,000		R2,680,000
	Ptn no 214: 1.9ha					R 3,880,000		R3,880,000
	Ptn no 215: 0.8ha			R1,680,000				R1,680,000
	Ptn no 216: 1.0ha			R2,080,000				R2,080,000
	Ptn no 217: 2.2ha				R4,480,000			R4,480,000
	Ptn no 218: 1.9ha						R3,880,000	R3,880,000
	Ptn no 219: 1.6ha						R3,280,000	R3,280,000
Business [13]	Ptn no 220:4.5ha						R22,500,000	R22,500,000
Total		R11,520,000	R10,880,000	R21,680,000	R19,520,000	R22,800,000	R29,660,000	R116,060,000

[11] Single residential erven in the development are each approximately 830m². George municipal valuations currently value similar properties in George between 401-1,200m² at approximately R320,000 each. Therefore each of the single residential erven (Portions 1-211) have the value of R320,000.

[12] Residential erven greater than 1200m² are currently valued by George municipal valuations as R320,000 plus R20,000 per additional 100m². The values of Portions 212-219 were calculated as such, since they are all greater than 1200m².

[13] Business zoned properties are valued by municipal valuations between R400/m² to R600/m². The mean of these values, R500/m², was used to calculate the value of the waterfront component (Portion 220). During the sensitivity analysis in the CBA, prices were varied to 50% above and 50% below valuations, the upper and lower bound of which includes R400/m² and R600/m².

2.7.3. Operational benefits

2.7.3.1. Reduction in costs of maintaining the remaining public open space

Once development of infrastructure commences, costs of maintaining the site to the Municipality are expected to remain effectively unchanged, with the exception two costs: putting out veld fires, and managing controlled burns.

The burning schedule will need to be amended once the development begins. It is not yet decided what burning schedule would be used, or if the veld will be cut mechanically instead (Loubser, personal communication 2013, 3 September). For purposes of the CBA, once the development is in progress, half of the current cost of burning is used, i.e. R1,500 per annum, because just over half of the property will remain open space. However this is a crude estimate; the actual cost could be driven above R1,500. Costs would be increased by using machinery, if increased fire breaks are required or if proximity to buildings in the development (and hence increased exposure to risk of high value assets that could be destroyed in a run-away fire), makes the burning schedule more expensive or labour intensive than currently. On the other hand the difficulty (and hence cost) of extinguishing veld fires should decrease as the amount of open veld decreases (Loubser, personal communication 2013, 3 September). Thus half the cost of putting out veld fires is used once the development begins, i.e. R6,250 per annum. The combined saving on burning and putting out veld fires (R7,750) is then used in the CBA.

Once the development is completed and the waterfront property developed, it is the intention of the Municipality that the area should become self-sustaining. To facilitate this, one suggestion is the open public space portion being leased long-term to an NPO. Costs to the Municipality at that stage should therefore be lower than currently, as costs for security and maintaining the open area could be incurred by the lessee (Loubser, personal communication 2013, 3 September). As already discussed, this potential cost saving is not included in the CBA, as it is not finalized that this would happen, and if it did, it would likely fall beyond the timeline under consideration in the CBA. Indeed, while this would be a saving to the municipality, it would not be a saving to the public of George, which would still have to carry the costs. This highlights a problem which appears in CBA when one focusses on the referent group too closely.

2.7.3.2. Margin on property rates and provision of services

Once the serviced land has been sold, the owners would be liable for property rates. These rates are typically based on the assessed value of the stand, and the developments on it. However, these are not included as benefits for two reasons: 1) there is anticipated to be no *net increase* in residents in George as a result of the development, and 2) rates to a middle-to-higher income suburb are determined by cost recovery and a margin which is used to cross-subsidize services to low income people in the area; i.e. more rate payers simply spread the rates over a wider base - the council is no better off.

The owners are also liable for levies to cover the provision of basic services. In order to provide these levels of services, costs will be incurred by the Municipality. These costs involve conventional operating costs, and the expense of maintaining installed infrastructure. Such maintenance is currently done on an ad hoc basis, as the need occurs (leaks in pipes, problems with wires etc.); however a municipal representative suggested the use of 3 per cent of the initial capital cost of infrastructure, as the annual financial cost of maintaining water pipes and roads (Quinot, personal communication 2013, 23 August) while 1.5 per cent of the original capital cost was suggested as the maintenance cost of electrical infrastructure (Moller, personal communication 2013, 19 September).

The recoveries of the costs of providing services as well as these maintenance costs are however *already* worked into the service charges during municipal budgeting (Wallace, personal communication 2013, 6 September).

The benefit to municipal finances of a development in the operational phase, is the difference between the revenue the Municipality receives from property rates, availability charges and service charges, less the direct costs of providing these services, and maintenance costs of the installed infrastructure for the development; *but only for the portion of that margin which would not have occurred in George without the development*. For example, if a buyer would have bought in George anyway, but bought at the dam rather than another development, they would have paid rates, availability and service levies for the other property anyway. If infrastructure was installed for that development, maintenance costs would have to be paid there anyway too, thus comparing the 'with' and 'without' development scenarios, yields no or little difference. Since the vast majority of estate agents felt it was unlikely that the

development would presently draw many new people to George who would not otherwise come, these margins are not included as 'benefits' in this CBA.[14]

2.7.4. Non-monetized potential costs and benefits

Overall, it seems that the non-monetized costs and benefits of the development could net out positive. Non-monetized costs and benefits include the recreational value of the property, effects on local property prices, tourism and conservation and environmental sustainability of the site. These are discussed qualitatively next.

2.7.4.1. Improving the total recreational value of the property

Although the area left for recreational will be 70ha instead of 122ha, it is expected that recreational utility will not decline; most recreational activities will continue unaffected by the smaller area. Although a disturbance to some recreational activity would be experienced during construction, this would be temporary and should be small relative to current use, as this would be restricted to the areas contained within the phase underway.

In discussions with recreational users of the property and local sport event organisers, it became clear that, for many, the total recreational potential of the remaining area was expected to increase with development at the site. This anticipated improvement was due to rehabilitation of the remaining 'green' area, improvements and increases in the numbers of trails, picnic areas, shower and toilet facilities, and the construction of a shop for refreshments and a small restaurant at the waterfront component. Also cited was an anticipated improvement in security due to a greater presence in the area by patrons of the waterfront facility and residents of the residential component. Importantly through these improvements, recreational users felt that *more* recreational users would be attracted to the site, thus increasing the total recreational use thereof. However, though the recreational and amenity value of the site is likely to increase for some users, it was also clear that others (for example those who enjoy the current feeling of "remoteness" the site offers) would be worse off.

[14] Potential availability charges and rates on the **vacant** erven, and maintenance costs for the infrastructure from each phase, are shown in Appendices F and G purely for completeness.

Recreational users would still have access both to the site itself, and through the site to the Eastern and Northern slopes across the dam,[15] which currently offer great recreational value to hikers, trail runners and mountain bikers. Although the area will not be as quiet as currently, these users should benefit from improved hard surfaced trails on the site (Lingenfelder, personal communication 2013, 5 September). However, these users may have to alter the routes that they use, and may not be able to use some viewpoints they currently do.

The site is within riding distance of the George Riding Club. Its proximity is important for these riders since it is the only long ride in an open area that riders can ride to from the Club. They already have to ride through a little suburbia to reach the site, and should trails and contour paths be improved, recreational value of the site for these users could increase (Oates, personal communication 2013, 5 September). The same should be true for dog walkers.

Since the carp anglers' activities are on the shore of the dam, and on the dam itself for bass fisherman, the development should not interrupt their activities. Since security should improve, so should the recreational experience of these fishermen (Luff, personal communication 2013, 3 September). Canoeists are particularly likely to benefit from the development since their activities take place on the dam itself too. Further, it is proposed that the waterfront component incorporate storage space for canoes, which would be a great improvement on available storage facilities, and starting point for canoeists in the area (a container on the Western side of the dam); as well as potentially drawing canoeists from surrounding areas (Lodder & Knobel, personal communication 2013, 5 September).

Recreational users, local sporting clubs and sporting event planners should also benefit from facilities for hosting events at the dam. The waterfront facility could house a multi-sport club, as well as host multi-sport events due to the waterfront site's unique proximity to mountains and trails for trail running and mountain biking, and the dam for canoeing. Currently the number of adventure sports events hosted in George is reportedly limited by a lack of suitable facilities. In light of a reported increase in multisport events nationally (Botes, personal communication 2013, 2 September), suitable facilities at the waterfront would have the

[15] Although not as convenient to many users these slopes are also accessible through the Saasveld campus.

potential to attract several adventure sporting events, and their associated business, to George (Lingenfelder, personal communication 2013, 5 September).

2.7.4.2. Conservation and environmental sustainability

The Biodiversity Assessment of the site described the whole site is as "a highly disturbed and formerly transformed habitat". Apart from very small isolated patches of remnant forest, there is no original natural vegetation type on the site (Conservation Management Services, 2012:6).

Full rehabilitation of the entire 122ha site would be very costly, and depending on availability of funding, municipal AVM at the site, is likely to stay in the region of R50,000 per annum. Even if no more than this R50,000 is spent on the remaining area of 70ha instead of 122ha, these AVM funds concentrated in the remaining smaller area could *better address* the alien plants in that area (Loubser, personal communication 2013, 3 September). This increased AVM is required to rehabilitate what the Biodiversity Assessment (Environmental Management Services, 2012:16) identified as the "sensitive areas" of Forest/Thicket and Fynbos rehabilitation areas and the "very sensitive" *Gladiolus fourcadei* distribution in the study site. It could therefore play an important role in conserving these areas. If managed correctly, rehabilitation with local indigenous plants, and continual removal of invader plants, would see a further improvement in environmental quality on the remaining undeveloped portion of the land (Sharples Environmental Services, 2013:42).

Further, as already mentioned, it has been suggested that after development, the open public space portion be leased long-term with the aim that the lessee manage the area more intensely.[16] This is seen as a more sustainable management solution for the vegetation at the site than if managed by the Municipality, as is currently the case. In the face of future financial stringencies or other societal issues competing for financial resources in municipal budgets, funding for the Parks portfolio and maintaining the site could come under pressure. If the area was privately managed, as part of a self-sustaining operation, there would not be this risk to funding of the public area (Loubser, personal communication 2013, 3 September).

[16] No financial viability analysis has been attempted for this, but the public pressure to maintain the site for recreational purposes, has been extreme.

2.7.4.3. Effect on prices of other properties in vicinity of the dam

A simplistic view of markets dictates that an increase in supply will lower prices, all things being equal. Offering a large stock of new stands would thus be expected to lower property prices in the area. This effect could, however, be reversed if sufficient positive externalities were associated with development. In this case the possibility that recreational value of the area would be enhanced by the improved safety and recreational amenities that would accompany development; which would in turn raise the appeal of neighbouring areas in general. To investigate whether the reasons for proposed price increases to properties in the vicinity of the development were pecuniary or due to technological effects, the reasons estate agents suggested need to be discussed.

One suggestion by estate agents was that once the erven were built on, the houses in the developed area would 'modernise' the suburb. Another suggestion was that these new houses would enter the market at a premium (since newer houses are more expensive). The resulting locational effect would increase prices in Loerie Park. Further, estate agents suggested that the increased ranges of commercial activities and recreational amenities in the area already discussed, could marginally benefit property prices in the broader area (so long as the recreational area continued to be well maintained). Estate agents also felt that the development would enhance perceptions of safety in the area.

One estate agent mentioned the risk of congestion externalities. However, the layout indicates the building of new access roads, so not all traffic will access the area through one entrance/exit. Another mentioned the risk of a real visual negative externality for houses in Eden overlooking the site, because people value overlooking a natural landscape more than developed land. However, over half of the site will remain undeveloped, with Eden overlooking the side of the property to remain mostly undeveloped.

Looking at these rationales it is clear that some (such as locational effects) are fundamentally pecuniary while others (such as impacts on safety in the recreational area) are true (technical) externalities that could affect the utility functions of residents. Overall though, most estate agents agreed that the development (as long as it was seen as an extension of Loerie Park), would probably have a *low positive impact* on the prices of properties in the vicinity of the dam, a portion of which is technological and should be considered in the CBA.

Considerations for how this could be measured are discussed in further detail in section 3.2 in the next chapter.

2.7.4.4. Tourism potential

A representative of the George Tourism Office was interviewed to better understand the potential impact of the development on local tourism. Winter months are quieter in the Garden Route in general, and this is no different for George; however in the December holidays George's accommodation is reportedly approximately 90 per cent full (de Swart, personal communication 2013, 4 September).

Overall, the development should be positive to tourism in the city of George. Largely this was envisioned as a result of the development of the erven at the site, making the remaining (improved) public open space at the dam seem less remote and safer. Once the site is developed and trails and facilities such as toilets are improved, it could be an easily accessible, safe outdoor area for tourists to go with their families to cycle or canoe. Further, if picnicking areas are provided, families could picnic at the dam (currently there are limited proper picnic spots in George itself). Much of the tourism due to improvements in recreational value of the site would likely be from people within and around George, rather than from outside George. However, if marketed correctly, it has the potential to draw people to visit George from further afield; or what is more likely, is that it could keep people who are visiting George for a short stop over anyway, there for longer (de Swart, personal communication 2013, 4 September).

The proposed development also includes provision for a boutique hotel. The hotel *itself* is unlikely to be a major draw for people to George. The George tourism market does not specifically seem to warrant an additional hotel, so it may draw clientele from other accommodation in or around George. However, if the developed property attracted more people to George (or to stay there longer) as suggested it could, this effect could be neutralized. Indeed in that case, other accommodation in George could potentially experience an increase in occupancy, despite the introduction of a boutique hotel (de Swart, personal communication 2013, 4 September).

Further, if sporting events are hosted at the dam, this could help counter the seasonal nature of George's tourism. Adventure sporting events occur throughout the year and are rarely cancelled on account of weather. Some of these events could draw hundreds or potentially thousands entrants and their supporters to visiting George specifically (Lingenfelder, personal communication 2013, 5 September). They could also form a potential market for the proposed hotel, as well as already existent accommodation in George (Botes, personal communication 2013, 2 September).

2.8. Impact on municipal finances and distributional consequences

A development of this nature could make a positive net contribution to municipal finances, through profits on the sale of the serviced erven. However as already discussed, even if new entrants to George were attracted, there would still be no net benefit through city rates, as the municipality runs a balanced budget, and only effect would be the spreading of costs over a larger rates base.

Given the expectation that the development of the site will be income neutral through rates, service levies and taxes, the city will need to profit from the sale of the erven if the project is to be justified financially. The development should at least break-even on the sale of serviced erven plus savings on maintaining the open space, less the costs of installing infrastructure.

Although lower income people in George will probably not benefit directly from an increased supply of middle-to-high income housing, they could benefit indirectly. The construction and operational phases of the development, will impact on jobs and wages. Moreover, *if* there are profits from the development, municipal finances should be improved. The revenue from selling the serviced erven would fall under the Capital Replacement Reserve, from which infrastructural developments are funded (Venter, personal communication 2013, 12 August). Thus if a profit is made, it could be spent in a way which could improve welfare of the broader population of George Municipality. It would provide the Municipality with more budgetary space to address the needs of George as it sees fit, for example to upgrade infrastructure or for social housing projects. However, the converse is also true if a loss is made.

Further if the public open space were leased long-term to an NPO, it would obviate the need for municipal spending on the remaining public open space. This would have a positive impact on municipal finances, freeing budgetary room to spend on other needs, not necessarily in the Parks portfolio.

Given that the impact on municipal finances is an important consideration for this development, its financial viability is explored through a financial CBA next.

2.9. The CBA

An extended cost-benefit study is supposed to compare the PVs of all costs and benefits of a project. These include both conventional *accounting* costs and benefits, and *external* costs and benefits (or externalities), i.e. those that the project engenders on others, and which would not normally be accounted for (costs such as loss of biodiversity, and benefits such as enhanced safety for residents in adjoining areas). It is common cause, however, that one should first check the financial viability of a project, and only after confirming it should one consider the externalities. For this reason the simple economics of the proposed development is first checked, the first objective being to test the revenue stream required from the sale of serviced erven if the municipality is to break-even on its infrastructural expenditures costs. In simple financial terms the costs and benefits of 'Alternative 3' (compared to the status quo scenario) are:

Benefits

- Savings on maintenance on the public open area relative to the status quo
- Revenue from sales of properties
- Incremental rates and taxes

Costs

- Installation and maintenance costs of road, water, sewerage and electrical capital infrastructure

The reader is reminded that: a) the municipality is committed to a balanced budget, b) rates are set to meet the identified costs, and sale of new stands would merely spread them rather

than adding to the municipality's revenues, and c) the general consensus amongst estate agents was that the development would be unlikely to attract people who otherwise would not have moved to George. For these reasons, incremental revenues to the municipality from rates and service levies are expected to be zero at least in the short run. It is worth noting, however, that this could begin to change if the economy recovered and a *significant* amount of new residents were attracted to the area (since there is already a *large amount* of partially-developed land in George) (see section 2.7.3.2).

Table 7 shows a summary of the project data used in the preparation of the CBA.

2.9.1. Results and discussion of results

The potential total value of the serviced erven, using current municipal valuations as a guide, is R116,060,000. To this one can add the reduction in the cost of maintaining the open area over 30 years (estimated undiscounted value of R232,500[17]), yielding a total undiscounted revenue of R116,292,500. The estimated total undiscounted cost of installing electrical and other infrastructure is higher, at R158,385,174.[18] Therefore the municipal value of similar serviced sites in the area *does not cover* the cost of providing those services, even before accounting for discounting.

Referring to the totals in Tables 4 and 6, using current municipal valuations as a guide, only phases A and F would have property values greater than their infrastructure costs. Further, the Municipality will only receive the revenue from selling the serviced erven, *after* incurring the upfront infrastructure costs of each phase. These revenues therefore have to be discounted, reducing their PVs relative to the upfront costs. The calculated break-even mean increment on current municipal valuations indicates the percentage by which the erf prices would have to exceed current municipal valuations for the development *as a whole* to break-even.

[17] Annual saving on putting out veld fires and burning of R7,750, times 30. See section 2.9.3.1.

[18] The assumption is that prices and costs remain as they are. This simple comparison uses undiscounted figures because the timing of sales is uncertain and this makes the figure independent of assumptions regarding timing of sales and selection of discount rates.

Table 7: Project data for the CBA

ASSUMPTIONS

Life of project in years	30			
Discount rates	8%	6%	4%	1%
Timing of flows	End of the year			
Timing of phases	Every 5 years			
Time to install each phase's infrastructure	1 year			
Years to sell all properties in each phase	Scenario 1: 4 years	Scenario 2: 2 years	Scenario 3: 1 year	

Revenue from sale of land from each phase is equally divided among the above number of years after the phase.

FINANCIAL COSTS AND BENEFITS

BENEFITS

Revenue from sales of land - based on current municipal valuations of other properties in George (values here are undiscounted)

Phase	A	B	C	D	E	F	Total
Total	R 11,520,000	R 10,880,000	R 21,680,000	R 19,520,000	R 22,800,000	R 29,660,000	R 116,060,000

Annual operating benefit: Decrease in annual costs to maintain open area

Controlled burns	R 1,500
Pro-rata cost for fire services	R 6,250
Total decrease in annual costs	R 7,750

COSTS

Capital costs, excluding VAT (values here are undiscounted)

Phase	A	B	C	D	E	F	Total
Electrical infrastructure costs	R 3,420,871	R 4,044,745	R 4,040,972	R 3,992,752	R 10,058,206	R 6,111,254	R 31,668,801
Other infrastructure costs	R 6,903,113	R 18,293,908	R 24,616,380	R 30,564,158	R 28,941,418	R 17,397,396	R 126,716,373
Total infrastructure costs	R 10,323,984	R 22,338,654	R 28,657,351	R 34,556,911	R 38,999,624	R 23,508,650	R 158,385,174

Table 8 shows a summary of the NPV, BCR, and the break-even mean increment in prices, for the 4 year and 1 year scenarios outlined above. Using the mandatory 8 per cent discount rate, the mean break-even price is 49.5 per cent above the values suggested by current municipal valuations under the 1 year scenario (and 67.2 per cent in the 4 year scenario). Using a 6 per cent discount rate, this drops to 47.4 per cent higher (60.5 per cent in the 4 year scenario). At a 4 per cent discount rate, this drops again to 44.4 per cent (53 per cent in the 4 year scenario). Finally, at 1 per cent discount rate, the break-even price is 38.6 per cent higher than current valuations (40.7 per cent in the 4 year scenario).

Thus, using real discount rates of 1, 4, 6, and 8 per cent, (which were informed by an array of arguments for the applicable social discount rates for public projects) the scenarios show that the break-even price of the erven significantly exceeds values indicated by current municipal valuations. The highest NPV (smallest loss) in all the scenarios was R-18,835,648 under the scenario when all the erven from each phase were sold in the year immediately following infrastructure installation, and an 8 per cent discount rate was used. The lowest NPV (largest loss) of R-39,313,520 was under the scenario when it took 4 years to sell the erven from each phase, and a 1 per cent discount rate was used.

However, note that the scenarios used in the CBA are merely *possible* scenarios; i.e. they assume a timing of the phases in the project, and a time period needed to sell the stands offered in each phase, then estimate the BCRs and NPVs if the properties are sold at current official valuations, and the mean break-even stand prices required. This scenario based approach was adopted in order to address uncertainty as to how the development would be phased in, and how the property market would absorb the serviced erven once placed on the market.

The land involved has alternative uses. The most financially feasible use of the site appears to be the return of this land to another 23 year pine rotation, or selling the land for agricultural use (the choice would depend on the interest rate and agricultural property prices). Based on an estimate of a forestry operation on the site, from a representative from Cape Pine, the NPV of the financial opportunity cost of developing the land is between R5,041,051 (1 per cent discount rate), and R322,535 (8 per cent discount rate), for a 23 year rotation of pine. As mentioned, this estimate was based on the discounted financial profits of a forestry operation on the site, and did not include positive, or negative externalities e.g. its impact on water

Table 8: Results of CBA scenarios: 4 years or 1 year to sell each phase's erven

Scenarios		Years to sell each phase's erven	4 years			1 year		
		Property price	-50%	Current valuations	+50%	-50%	Current valuations	+50%
Real discount rate	8%	PV of benefits	R17,086,006	R34,084,764	R51,083,522	R19,095,688	R38,104,127	R57,112,567
		PV of costs	R56,939,776	R56,939,776	R56,939,776	R56,939,776	R56,939,776	R56,939,776
		NPV	R-39,853,770	R-22,855,011	R-5,856,253	R-37,844,088	R-18,835,648	R172,791
		BCR	0.30	0.60	0.90	0.34	0.67	1.00
		PV of property sales only		R33,997,516			R38,016,880	
		PV of required property sales to break-even		R56,852,528			R56,852,528	
		Break-even mean increment on current valuations		67.2%			49.5%	
	6%	PV of benefits	R22,139,956	R44,173,234	R66,206,512	R24,101,457	R48,096,237	R72,091,016
		PV of costs	R70,826,399	R70,826,399	R70,826,399	R70,826,399	R70,826,399	R70,826,399
		NPV	R-48,686,443	R-26,653,165	R-4,619,887	R-46,724,942	R-22,730,162	R1,264,618
		BCR	0.31	0.62	0.93	0.34	0.68	1.02
		PV of property sales only		R44,066,556			R47,989,559	
		PV of required property sales to break-even		R70,719,721			R70,719,721	
		Break-even mean increment on current valuations		60.5%			47.4%	
	4%	PV of benefits	R29,574,186	R59,014,359	R88,454,531	R31,328,146	R62,522,279	R93,716,411
		PV of costs	R90,240,619	R90,240,619	R90,240,619	R90,240,619	R90,240,619	R90,240,619
		NPV	R-60,666,433	R-31,226,260	R-1,786,087	R-58,912,473	R-27,718,340	R3,475,793
		BCR	0.33	0.65	0.98	0.35	0.69	1.04
		PV of property sales only		R58,880,345			R62,388,265	
		PV of required property sales to break-even		R90,106,606			R90,106,606	
		Break-even mean increment on current valuations		53.0%			44.4%	
	1%	PV of benefits	R48,552,344	R96,904,678	R145,257,012	R49,276,402	R98,352,794	R147,429,187
		PV of costs	R136,218,197	R136,218,197	R136,218,197	R136,218,197	R136,218,197	R136,218,197
		NPV	R-87,665,854	R-39,313,520	R9,038,814	R-86,941,795	R-37,865,403	R11,210,989
		BCR	0.36	0.71	1.07	0.36	0.72	1.08
		PV of property sales only		R96,704,668			R98,152,785	
		PV of required property sales to break-even		R136,018,188			R136,018,188	
		Break-even mean increment on current valuations		40.7%			38.6%	

(given that it would be within the dams catchment), or fire risk. If the land were used for a forestry operation, the downside is that once committed, the decision would be effectively irreversible until the end of the plantation cycle in two and a half decades time; whereas if the land were sold for agricultural use, the municipality would be forgoing any development options on the land in the future.

It should be noted that these sacrificed earnings from a forgone pine rotation (or selling the land for agriculture) can be added to the financial loss (negative NPV) of the project and expand these into economic losses. For example, this would expand the NPV of the economic loss to a minimum of R-19,158,183[19] and a maximum of R-44,354,571[20], under the scenarios used in the CBA.

It is important to re-stress that, since the municipality is the referent group, this analysis uses only financial costs and benefits that accrue to them. Tourism, recreation, and property price externalities, as all seem likely to yield positive net benefits, have not been included. The view has been taken that the primary constraint is that the project should at least break-even financially. These incidental features do not seem central to the decision. Rather than valuing such external benefits, one can look at the loss that would be incurred in order to provide them, and simply ask if they would be worth it.

In order for decision-makers to think the project is justified, the PV of these benefits should be worth at least R18,835,648 (R19,158,183 including a forgone pine rotation's earnings) under the scenario when erven from each phase were sold in the year following infrastructure installation, using an 8 per cent discount rate. At the other extreme, at least R39,313,520 (R44,354,571 including a forgone pine rotation's earnings) under the scenario when it takes 4 years to sell the erven from each phase, using a 1 per cent discount rate.

The central point is that, to break-even most of the serviced erven will have to be sold at prices considerably higher than those indicated by current municipal valuations. It is relevant to remember that estate agents did not report systematically higher or lower prices than prices indicated by municipal valuations. Using current municipal valuations as a guide Phase F

[19] R-18,835,648 - R322,535 = R-19,158,183 (8% discount rate, 1 year to sell each phase).

[20] R-39,313,520 - R5,041,051 = R-44,354,571 (1% discount rate, 4 years to sell each phase).

appears to make a profit, and Phase A has the potential to make a profit, depending on the time to sell erven, and the interest rate (see Appendix A). Indeed, if development were to begin at the site, it may positively influence prices in the area as suggested by estate agents, which could raise the prices of erven in the later stages of the development.

2.10. Conclusion

This chapter consisted of a case study of a CBA of a proposed development in George. The project was not financially viable using current municipal valuations as a guide. It seems that the property market would need to experience quite an improvement in order for the development as a whole to be financially viable. After consideration of the opportunity costs of the land, the most financially feasible appears to be the return of this land to another 23 year rotation of pine, or to sell the property, for example for agricultural use.

It was recognized that the development *could* provide positive externalities through impacts on tourism, recreation and local property prices. These are far from being assured and were not monetized. Instead they were discussed qualitatively. These incidental features do not seem central to the decision. Rather than the analyst valuing them, the decision-makers could look at the anticipated loss and simply ask if they would be worth it.

3. CONSIDERATIONS FOR THE USE OF CBA FOR LOCAL GOVERNMENT DECISION-MAKING: LESSONS FROM THE CASE STUDY

3.1. Introduction

Although CBA is widely applied, it is not without its criticisms or limitations. Some of these were discussed in the literature review, and more are discussed in this chapter relating to the case study. The first two considerations for the use of CBA for local government decision-making in this chapter are technical issues: dealing with externalities, and the 'correct' discount rate for the CBA. The last two are more policy relevant: the appropriateness of the CBA given decision-makers' expectations, and the use and usefulness of CBA to local government decision-makers. Some approaches to improving the usefulness of CBA to decision-makers in South Africa are then briefly discussed.

3.2. Externalities: real and pecuniary

In the case study, most of the estate agents interviewed suggested the development would probably have a low positive impact on the prices of properties in the vicinity of the dam. This anticipated effect was not monetized in the case study. Recall that from looking at the rationales for this low positive price effect, it is clear that some (such as the locational effects) were fundamentally pecuniary while others (such as impacts on safety in the recreational area), are true (technical) externalities that could affect the utility functions of residents.

As discussed, pecuniary effects are normally explicitly omitted from CBAs since they do not affect a project's *net benefits*. One pecuniary effect in the case study could be the change in the market value of local properties as a result of the increased supply of new erven. At first, decision-makers may be concerned about negative pecuniary effects on property prices and their potential effect on the profits of private developers, as a result of a public developer competing on a private market. However, as long as all the erven from the development were not released to the market simultaneously, estate agents did not think that this increased supply would lower prices in the area. Rather, they mentioned 'pecuniary' locational effects such as 'modernisation' of the suburb, could actually increase prices in the area. If the effects on prices were purely of this nature, generally one would think they should be excluded from

the CBA since they appear merely financial and not 'real'. However, this is a debatable point, depending on what public welfare is defined as.

For example: if the development had a reputational effect, say making the existing Loerie Park suburb, a 'trendier' area. In that case, valuations there would rise without adding any real service, and hence the portion of George's rates paid by that suburb would too. Were this effect on rates anticipated, this would still be a pecuniary effect: from the municipality's perspective only the *spread* of rates in George would be affected, not the total amount collected. However, the price increases would be debatable, as this 'trendier' nature of the suburb could be seen as a 'real' effect in terms of welfare for residents – it depends on what is included in public welfare. This raises an interesting issue regarding what should and should not feature in the definition of public welfare.

If an underlying impact of the development were clearly technological however, it should be included in the CBA. Using the logic underlying hedonic pricing (HP), WTP for characteristics of houses (or technological changes thereto) cause variations in their price. Therefore if post-development, the value of safety and recreation improvements (a technological effect) to nearby households was estimated; the analyst might choose to use the variation in house prices in the area from before to after the development, after controlling for general property market trends.

However, anything else changing over the same period which would also influence prices, would need to be controlled for in order to net out the effect of improved safety and recreation of the site. Since a new stock of stands would have entered the market at the *same time* as improved recreation and safety, it would be difficult to control for any resultant pecuniary price changes. Indeed, omitted variable bias is a problem with HP. When a variable which significantly affects house prices, is not controlled for and is correlated with an included variable, it will lead to a bias on the coefficient of the included variable (in this case improved safety and recreation) (Hanley & Barbier, 2009:107).

If it were possible to control for everything else that would affect local house prices over the same period, implicit *use* values of improved safety and recreation, to households near the dam, could be calculated. However, any pecuniary effects on prices *must* be controlled for. Further, this value would only indicate the value of these improvements for households in

vicinity of the dam, and not people who travel to the dam for recreation from elsewhere. In order to capture the use values for *all* the people who use the site, the analyst could make use of travel cost methods. Like HP this would also be time and resource intensive, especially since a pre and post-development travel cost study would be needed to calculate the difference in use values.

Since the case study was a pre-project assessment, the above information was not available. Monetization of increased safety and recreational values was not attempted, as a result of several imponderables regarding this valuation. Firstly estate agents were unsure how much property prices would change as a result of the development and what portion of any change would be attributable to technological effects. Further, even if the baseline value of the property in its current form were calculated, it would be difficult to forecast by how much the number of people who make use of the property would increase. This is confounded further when considering that the management of the property (which is as yet undecided) could have significant bearing on recreational effects of the development. However, it is important to note that these effects were not ignored. They were still identified and discussed qualitatively so as to enlighten the decision-maker of all the implications of the development.

3.3. Discount rate

The discount rate in the CBA had implications for the sign of the NPV of Phase A (see appendix A). The discount rates used were the 8 per cent as recommended in Conningarth Economists (2007:68), as well as 4 and 6 per cent, between which falls the real financial discount rate used by the municipality. Further, 1 per cent was also used in the sensitivity analysis, given arguments for low discount rates, particularly for public projects. Since the real interest rate used by the municipality is below 8 per cent, as is the real rate at which the private sector can probably borrow, one might ask whether the recommended 8 per cent is useful.

As discussed in the literature review, regarding the social discount rate, economic theory concentrates on three rates: the SOC of capital, the STPR, or a composite interest rate incorporating both of these (Dasgupta & Pearce, 1972:156). Conningarth Economists (2007:128-129) reviewed the applicability of their recommended 8 per cent discount rate considering both an STPR approach and an SOC approach.

Recognising that it is difficult and controversial to calculate STPR they suggested that it is likely that 8 per cent is much higher than the STPR for South Africa. Their reasoning referred to empirical estimates of STPR generally being in the region of 1 to 5 per cent (Kirkpatrick & Weiss, 1996 cited in Conningarth Economists, 2007:128); and to Walshe & Daffern's (1990 cited in Conningarth Economists, 2007:128) calculation that the STPR is slightly higher than the growth rate of an economy (given that South Africa's real long-term growth has been in the region of 2.5 to 5 per cent).

However, as Conningarth Economists (2007:127-128) point out, discount rates recommended by other national guidelines are often higher than those that would be suggested by both STPR and long-term interest rates (showing the cost of financing to the government). Besides for calculating a social discount rate based on long-term interest rates or STPR, some countries calculate their discount rate on the basis of the Capital Asset Pricing Model (CAPM). CAPM seeks to estimate the return equal to the yield on a risk-free investment augmented by a market-related risk premium associated with projects in the private sector. The difference between the private sector benchmark market return, and the risk-free investment, then gives the market-related risk premium (Conningarth Economists (2007:128).

Conningarth Economists (2007:128-129) calculated that the average yield on the Johannesburg Stock Exchange (JSE) All-share index (acting as a proxy for a private sector benchmark market return), from 1980 to 2005 was 9.5 per cent. They concluded that this implies that the 8 per cent discount rate was not too high. However, they noted that comparing this average JSE All-share index yield to South African government bonds over the same period would imply a "high" risk premium of 6.1 per cent. Overall, given international benchmarks and their "marginal return on capital approach", they concluded that the 8 per cent discount rate in South Africa still seemed applicable (Conningarth Economists, 2007:67).

Closer inspection of their method shows that whilst Conningarth Economists' approach is a potential means of checking the applicability of their recommended discount rate, it is probably an upwardly biased one. Unfortunately, Conningarth Economists did not provide reasoning for the range of dates (1980 to 2005) that they used for the CAPM analysis. Indeed, considering that public entities in particular, have the potential to be infinitely long-lived, a longer time frame would seem more appropriate. Investing in the JSE is relatively high-risk,

compared to many private sector investments. Conningarth Economists (2007:128) themselves remarked that the 6.1 per cent risk premium implied by their calculation was "high". If one then considers that only those companies that did not go insolvent would remain in the All-share index, there is a clear upward bias to their result.

Furthermore, as Samuelson (1964:96) argued, if an investor can better pool risks (like the government), it should not face the same risk premium as those who cannot. It was already noted that economists are split over whether public projects should include a risk premium at all. Even if they should, it is still likely that a portion of this "high" 6.1 per cent risk premium is not applicable to a public sector development project, such as the one under consideration.

Another approach to investigating the applicability of the 8 per cent discount rate, in terms of it showing the SOC of capital, would be to compare it to the rate of return of the project 'displaced' by the project being appraised (Markandya & Pearce, 1988:5). Since George Municipality is acting as though it is a private developer, it might be useful if the CBA could investigate whether a private developer would undertake the development in a competitive market; particularly since DEA&DP expressed concern regarding the development's financial viability. This would require a discount rate based on the social MIRR of a *similar* private development. A starting point for such a discount rate would be the interest rate that a private developer would face as their cost of capital.

To gain some insight into the required MIRR for private developers, a professional who deals with property developers in South Africa was telephonically interviewed. He was asked what figures private developers incorporate in their cost of capital and when calculating what return is necessary for a development to be worthwhile. He reported that of recent times, bank financial costs (interest) for developers were around 10 to 12 nominal per cent, but that banks also charge transaction fees and often take a profit share in these developers' companies of between 3 to 5 per cent. He also indicated that banks currently appear "risk-averse" when considering financing these developers since some have recently lost money on such developers. When "holding costs" are factored in by developers, they use a hurdle rate of around 20 or 22 per cent nominal. These "holding costs" are only applicable when the development takes longer than anticipated and factor in a basket of costs including finance costs and profits (Roux, personal communication 2013, 12 December).

CBA can be used to check whether a project's apparent financial viability is a consequence of implicit subsidies, and to correct for them (van Zyl et al, 2005:26). If the municipality somehow faces lower costs than private developers, these could reflect implicit subsidies; e.g. if it borrows at lower interest rates than private developers. The effects of this subsidization should be removed when considering an economic CBA.

Considering that the pure interest faced by private developers was suggested to be between 10 to 12 per cent nominal, this is in a similar range to that used by the municipality for budgeting, 11.6 per cent. Deducting the aforementioned inflation rate of 6.4 per cent, means private developers face real interest rates of between 3.6 and 5.6 per cent, in between which lies the effective 5.2 per cent used by the George municipality. However, if banks take a share of the profits of the business of private developers of between 3 and 5 per cent, then this would increase the costs faced by the developers. In effect this would raise the MIRR required by private developers relative to the municipality, for the development to be cover its costs (and even more to make a profit), perhaps closer to 8 per cent.

Further research into the finance costs faced by developers compared to the municipality, as well as standard profit margins for private developers, would be required in order to properly test if this is indeed the case. Further, since these developers currently seem to be perceived as "risky" investments by banks, while this might reflect a rate for a *similar* private sector project, it is not clear that this is a *low-risk* rate, if that is what is suitable for the public sector.

The rationale for a high discount rate is that it prevents the public sector from approving projects that the private sector would reject; or the public sector crowding out a potentially more efficient private sector project. It seems that the 8 per cent discount rate probably achieves this. However, considering CBA is attempting to replicate perfect competition, the specific requirement of discounting at 8 per cent, is poorly justified by Conningarth Economists (2007). Their sole rationale is that 8 per cent is in the *right range*, being slightly lower than returns on the JSE, and in a similar range to discount rates used elsewhere.

3.4. Appropriateness of the CBA given decision-makers' expectations

The case study arose because a CBA was specifically requested by the decision-makers (DEA&DP) for input into an EIA. Incorporation of a CBA into an EIA can provide a useful

consolidation of the information regarding the proposed project. However those that request/commission a CBA may misunderstand what CBA is designed to achieve. Further, their expectations of what a CBA might achieve may be misaligned with what CBA under the circumstances could reliably achieve. These could impact on the appropriateness of CBA given decision-makers' expectations.

Throughout the preparation of a CBA, Conningarth Economists (2007:59) recommend that the analyst maintains interaction with the principal (for whom they are preparing the CBA) to consider refinements to the analysis. However, they rightly suggest that this interaction is only useful if the principals themselves know about the scope and limitations of CBA, as well as potential complications regarding obtainability of data. Further, that the principal should understand that the CBA should be an *input* into the decision-making process, with the aim of encouraging "*rational* decision-making".

When applying CBA techniques into an EIA in the Western Cape, the national CBA manual (Conningarth Economists, 2007), is complemented by provincial EIA guidelines, such as the DEA&DP *Guideline on need and desirability* (DEA&DP, 2013), and the DEA&DP *Guideline for involving economists in EIA processes* (van Zyl et al, 2005). The latter (van Zyl et al, 2005:iii), is "directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes". It includes explanations for non-economists regarding when and how economists should become involved in EIAs, and how to review economic specialist input. Guidelines like these can help bridge the gap between how economic analysis is used in EIAs, and how it should be used. However, as will be discussed, the existence of the guidelines does not mean that decision-makers necessarily understand or recall the details therein.

Although, as Arrow et al (1996:8) pointed out, the analyst has a duty to quantify as many effects as possible, accompanied by their uncertainties; it is the decision-makers who ultimately need to weigh these quantified effects against the unquantified effects of a proposed project when making their decision. This could lead to the analyst feeling pressured to provide quantified or monetized estimates for more effects than they are confident they can reliably estimate.

However, when dealing with poor data circumstances, the DEA&DP guidelines (van Zyl et al, 2005:25) caution economic analysts "Do not be pressurised by EIA practitioners, proponents or decision-makers to make predictions and pronouncements when levels of uncertainty are uncomfortably high. The primary role of the specialist is the provision of information as objectively as possible, not the making of decisions". Indeed in the case study, there was an expectation of monetization of impacts like recreation values by both project proponents and decision-makers. It appeared that they were unaware that no reliable estimate could be calculated in the timeframe or budget, given available information. The referent group seemed unaware of the limitations facing a CBA, and what it could reliably show under the circumstances.

The method employed in the case study was simply the identification and qualitative discussion of external effects, leaving it to the decision-maker to ask whether these would justify the projected financial losses. While this exposes the study to the criticism mentioned by Omura (2004:44) that these effects may be ignored in the decision-making process; given time, information and resource constraints, it was clear that valuations would produce unreliable results and thus diminish the integrity of the study as a whole. Given that the primary concern was the financial viability of the project, and that monetary values would not provide reliable useful information for the decision-maker, it seemed sensible to omit them.

The terms of reference for the CBA were set by the decision-makers (DEA&DP), and prescribed that it should abide by the aforementioned CBA and EIA guidelines (O'Neil, personal communication 2013, 8 July). However, initial scoping of the CBA suggested that the decision-makers themselves might be unfamiliar with the details contained in these guidelines which include guidance for non-economists involved in EIAs and what is typically included and not included in a CBA.

An example of this problem in the initial scoping was requiring consideration of multiplier effects, despite the *first page* of the guidelines mentioning that the standard format of CBA usually *omits* multiplier effects (van Zyl et al, 2005:1). In the rejection letter for the BAR for the development, the decision-makers questioned why operational-phase jobs, profits, tourism potential, and multiplier effects had not been quantified in the first economic specialist report on the development by van Zyl (2005), and believed that without this information "it is not possible to measure or weigh the cost and benefits of the proposed

development" (DEA&DP Land Management (Region 3), 2013:2). The logic that gave rise to this view was fundamentally flawed (as explained in section 2.1).

The analyst who compiled the first economic report in the EIA (which did not include multiplier effects) argued that, "The quantification of indirect and induced impacts is a far less certain exercise due to uncertainty surrounding accurate multipliers particularly at a local and regional level. This uncertainty makes it inadvisable to quantify indirect employment unless an in-depth analysis is required" (van Zyl, 2008:16). The analyst also added that, "While spending injections are often positive, bear in mind that the mis-use of the economic analysis of expenditure impacts (including multiplier analysis) to justify developments that either fail to pass the societal cost benefit test and/or do not fit with spatial planning in the past has been criticized in the academic literature (see, for e.g., Noll & Zimbalist, 1997)" (van Zyl, 2008:16).

Conversely the latest socio-economic report in the EIA included multiplier effects on new business sales, regional GGP and employment as a result of the development (Urban-Econ, 2012:41-42). Given this report's estimation of these effects, decision-makers appeared to expect these to be included in the CBA, perhaps not realising that they are typically excluded from CBA, and that the quantification of such estimates may be at the expense of reliability of estimates.

Including multiplier effects in a CBA framework is misrepresentative, and fundamentally flawed. Even in the aforementioned socio-economic impact analysis, it was not really warranted given the nature and extent of the project. Any similar development or civil engineering projects of the same magnitude elsewhere in George, such as building roads or providing water and electricity services, will have similar linkages and would yield effectively identical multipliers. This was not explained in the report. Including second and third round effects would misrepresent the effect of the project to non-economist readers. Furthermore, only a portion of the total impact would accrue to the George municipal area. Estimating this component would require significant assumptions. The authors of the terms of reference seemed unaware of these issues.

Given the decision-makers' expectations of what the analysis should achieve, one might ask whether they were sensible to choose a CBA. For example, the CBA found that the

development would not break-even on undiscounted infrastructural costs and undiscounted potential revenues indicated by current municipal valuations. This loss was still large, but less in magnitude once discounting was accounted for. Given this finding, it could be argued that a neutral feasibility study by a property development specialist would have done just as well.

A simple feasibility study may well have been useful to decision-makers, by making use of a property market analyst's specific expertise and knowledge of developments; but CBA uses more information than a pure financial appraisal. The broader effects to the welfare of George included in the CBA (even if qualitatively) should be relevant to the provincial government which should be concerned with the *broader* welfare of the society of its province, of which George forms a part. If the project's financial losses were low, decision-makers might find externalities relevant to their decision, as they could render the project socially justifiable. Further, some of the difficulties in performing a reliable CBA would likely affect other forms of appraisal as well. For example, the municipality did not know how the project would be financed – whether by borrowing, or not. Nor did it know how the phasing would be undertaken, or the time horizon of the project. The resulting need to make extensive assumptions would also have been a feature of other appraisal techniques too.

Considering the appropriateness of CBA in the case study, it should be noted that in addition to CBA, numerous decision-aiding procedures have been developed. Of these, CBA is often compared to multi-criteria decision analysis (MCDA) and cost-effectiveness analysis (CEA). Both impose a wider view of the implications of a project on decision-makers, and show alternatives for achieving the same goal. However, these techniques are not perfect substitutes for one another, and the choice of technique should depend on which is best suited to helping with the decision at hand (OECD, 2006:35,276).

CEA is only applicable where the same set of benefits can be achieved by alternative projects. Because of this the benefits do not need to be valued or monetized; allowing the analysis to focus solely on the costs of different alternatives (van Zyl et al, 2005:31). MCDA is based on the ranking of alternatives according to the preference scales of stakeholders (or experts), and the weights that they attach to project selection criteria (Joubert et al, 1997:126-127). Of other decision-making procedures, only MCDA is as "comprehensive" as CBA (regarding incorporated costs and benefits). Indeed where the accomplishment of goals other than efficiency and distribution are the aim, MCDA can prove more "comprehensive"

(OECD, 2006:27). Furthermore, being based on preference scales, rather than monetary values, MCDA removes the theoretical and technical difficulty of monetization of external effects (Joubert et al, 1997:127) associated with CBA.

However, unlike CEA and MCDA (since they do not show costs and benefits in common units), CBA can show the "optimal scale" of a project, at which net benefits are maximised. For the same reason, CEA and MCDA can only show which project alternative of those under consideration, should be chosen, whereas CBA can show whether any option should be chosen *at all* (OECD, 2006:35). This was the decision under consideration in the case study, suggesting that of these procedures, CBA was the most appropriate. Further, as Pearce (1998:94) points out, where multiple objectives are the aim of a decision, a CBA can be supplemented by analysis of certain broader effects which are not typically included in a CBA framework.

Although the CBA in the case study did not monetize external effects, it clearly laid out the costs and benefits of the development and its opportunity costs, in one report. External effects were identified and qualitatively discussed, together with the distribution of their impacts. Discussions with representatives of both the provincial government and the municipality had made it clear that the primary point at issue was the financial viability of the proposed project. Given that financial viability was the primary concern, the CBA provided useful information. The findings do not show a straightforward answer for decision-makers on whether the project will lead to a net gain or loss in ***welfare***, but did indicate the financial status of the project, and the additional factors that seemed likely to impact on welfare.

It is important to remember that it is not up to the analyst to make the final decision, or for the decision to be made solely on the CBA. The ultimate decision taking into account the CBA will require decision-makers to weigh up non-monetized costs and benefits, against the financial NPV of the project, and any other decision-making goals.

The CBA has been presented in a way that can be useful to decision-makers. Whether they will use it as such is less clear. There is a sense that some of the call for a CBA in the case study was based on 'box-ticking' by the authorities, and that the debate was one between contending personalities. It does seem clear that the George market is not desperate for new property and that many developers have unsold sites on the market at present. It is reassuring

that the decision was queried by local representatives of the province. Less reassuring was the nature of the initial terms of reference.

3.5. Use and usefulness of CBA to decision-makers

Supporters of CBA often claim that the systematic, rule-based structure of CBA can decrease the likelihood of politically biased decisions. However, as already discussed, CBA is not necessarily the best decision-guiding procedure in all situations; and there is an array of alternative decision-aiding techniques. Moreover, the existence of a CBA does not prevent political manipulation or bias in the final decision. For example: a) the CBA itself may be influenced by those commissioning the study; b) results of the CBA may not show a clear welfare gain or loss (leaving it up to the decision-maker, who may not be a neutral arbiter); or c) decision-makers may disregard the CBA's findings. These issues are now discussed.

As Richardson (2000:998) observes, CBAs themselves are not free from influence by those who commission them. He notes that in the USA, with regard to most substantial regulatory questions, CBAs are often commissioned by parties on either side of an issue. The resulting CBAs often show contrasting results. Clearly, CBA has to be carefully conducted by neutral analysts, to be truly objective and useful to decision-makers. Boardman et al. (2001:474) mention that strategic biases can enter into CBA through systematic overestimation of benefits and underestimation of costs by project managers, but one should not expect these errors in CBAs by independent analysts. Since analysts often receive estimates of project costs and benefits from those wishing to undertake the project, the data's integrity should be checked to ensure that no bias (intentional or otherwise) is introduced into the analysis by project proponents. An example of this from the case study follows.

The environmental application in the case study began in 2006, and the CBA appeared to be the first time that the revenues and costs expected by the municipality were fully compared. This at very least had not yet been included in the expert reports accompanying the EIA, which had only included estimated costs of the development, not potential revenues. Probing what was included in the municipal estimates of infrastructure costs in the previous socio-economic report, revealed that electrical infrastructure costs had also been excluded. These

costs were significant, contributing nearly 20 per cent of total infrastructure costs[21]. Had these costs not been uncovered and included, the development would have falsely seemed much closer to meeting its costs. Their inclusion provided important information regarding the development's financial viability.

Ultimately the practical application of CBA (and thus the information a CBA can reliably provide the decision-maker with) is still limited since the quantification and monetization of many environmental costs and benefits remain difficult and/or costly. This problem is not new, with Omura (2004:55) pointing out that situations with these difficult to value effects (due to missing or distorted markets), are also where CBA would be recommended. As noted by Arrow et al (1996:3), given these and other limits in information, data, time and resources, in many applications of CBA, it is not possible to *prove* that the economic benefits are greater or less than the costs of a project; since there is simply too much uncertainty in the analysis. This was true of the case study. Clearly in these circumstances, the analyst should use best estimates, state reasoned assumptions and any uncertainties (Arrow et al, 1996:8), and test the implications of these through a sensitivity analysis.

An analyst can often go a step further too. As in the case study, 'swing' values for parameters can be calculated i.e. the values of non-monetized or uncertain parameters that would swing the outcome of the CBA one way or the other. Examples of these from the case study were the increment in property prices required for the project to break-even, and the NPV of externalities required to justify the expected loss from the project. Such values, and careful sensitivity analyses, allow CBAs to better aid decision-makers in comprehending the issue at hand, in situations of significant uncertainty.

Pearce (1998:95) comments that despite CBA being applied extensively, actual final decisions do not appear to be "heavily influenced" by CBAs. He adds that this is hardly surprising though, since decision-makers face multiple pressures and objectives other than efficiency. It makes sense then that CBA should form *part* of the decision-making process, rather than replacing it, as is often emphasized (e.g. Campbell & Brown, 2003:2), leaving room for the consideration of objectives other than efficiency.

[21] R31,668,801/R158,385,174 = 19.998%

However, if CBA cannot always prove whether or not a project is welfare improving; and only forms part of the decision-making process; does this not leave room for politically biased choices? There is merit to this question, though this is true of any decision-aiding procedure forming only *part* of a decision-making process. Indeed, a small survey of politicians in Norway about their use of CBAs (BCRs specifically) when treating a road investment plan, revealed that there was an array of differing opinions amongst these politicians regarding how CBAs should and did influence their decisions. While most respondents said that they found BCRs from CBAs useful, none said that they automatically made a decision based solely these. Some explained that they used BCRs as screening devices to determine if projects require a closer look. Some respondents however, expressed scepticism regarding CBAs which lead to their distrust of any results from them; the author contending that this indicated CBAs were unlikely to play a significant role to those specific politicians' decisions (Nyborg, 1998:381,386-389).

However, having a CBA systematically performed by an independent analyst, at very least identifying and presenting all costs and benefits in one report, helps hold these decision-makers more accountable for their decisions.

In arguing for a greater role of CBA in the USA, Sunstein (2002:22) suggests that government agencies should have to show that the benefits justify the costs of a proposal in most cases, and where they do not, give a "reasonable explanation" why the project should go ahead anyway. Arrow et al. (1996:5) share a similar view and suggest that government agencies should be required to *consider* the findings of available CBAs; and where costs much exceed benefits "present a clear explanation justifying the reasons for their decision". i.e. both argue that officials should not be bound by a cost-benefit test. However, Abramowicz (2002:1717) contends that unless the use of CBA imposes a "binding constraint" on officials, it may not necessarily change their behaviour, but merely act as a small "hurdle" to making their decision anyway. Still others, such as Richardson (2000:971) are opposed to cost-benefit tests forming the standard basis of government choices. Clearly there is an array of opinions on the matter.

Perhaps in the South African context, the middle ground is best. This is one where government decision-makers should have to take any commissioned CBAs into consideration, thus not being able to claim that they were not aware of aspects of the project

shown by the CBA. If the findings of the CBA were negative and the project was approved, there would be an implicit need for them to justify why, if their decision were later reviewed. This would still be useful at a local government level to somewhat discourage politically biased decisions. *Consideration* of 'costs and benefits' should naturally apply to every decision, however extending the procedural requirement of a CBA for *every* local government decision does not appear to be sensible, considering CBA is not best suited to every situation. Further, given theoretical flaws in how CBA is practically undertaken, binding officials to a cost-benefit test in many instances seems inappropriate. This is especially so in a developing country like South Africa, given resource constraints (skills and finances); and practical issues (distorted markets etc.) leading to many applications of CBA not being able to definitively show a net welfare gain or loss.

3.6. Improving the usefulness of CBA to decision-makers

As with all specialist reports, to be a useful tool for decision-makers, CBAs need to be reliable and of good quality. They also need to be understandable to the decision-makers. Guidelines can contribute to improving the quality of CBA by providing a consistent framework for their preparation, as well as helping (especially non-economist) decision-makers understand what is entailed in the analysis and how to interpret the results. In the South African context the manual by Conningarth Economists (2007) and the guidelines by van Zyl et al. (2005) provide guidance for both the analyst, and for other stakeholders in the EIA process. Analysts and commissioners of CBAs currently rely on the *same* guidebooks. Observations from the case study suggest that those commissioning or using results from CBAs are not necessarily familiar with the contents of these guidelines.

As already discussed, this was observed in the case study as the initial terms of reference that drove the case study required the estimation of multiplier effects and required that the provincial guidelines be followed; despite the fact that the *first page* of the guideline stipulates that CBA usually *omits* multiplier effects (van Zyl et al, 2005:1). Furthermore, neither the proponents nor the decision-makers seem to have realized the practical limitations of CBA. Both parties, it was observed, expected the monetization of recreational values of the property in an unfeasibly short period of time, considering the informational and budgetary constraints.

Clearly, there is need for these users to be more aware of the practical limitations of CBA as well as the standard scope of CBA. Though these are covered in guidelines to a degree, the guidelines may be too long and insufficiently tailored for those commissioning CBAs. Because they are aimed at both CBA users and practitioners, most of the information they contain is not specifically relevant to those who commission CBA. A brief, practical, separate guide for CBA users could be useful. This guide could cover the typical scope and practical limitations of CBA, and compare CBA to alternative appraisal techniques.

As Arrow et al. (1996:9) note, one way to improve the general quality of CBA reports is to require external independent reviews; further, lessons drawn from these reviews can be used to update guidelines in order to address any identified common discrepancies. While the review of every CBA in South Africa may not be feasible, this review could be both especially important and more feasible for 'significant' projects. Where projects involve environmental effects, they are subject to EIAs. Many EIAs in South Africa are subject to external review, and as in the case study, CBAs often form part of EIAs. They would therefore be covered by these reviews. Observations from these reviews could also feed into a manual specifically for non-economist users of CBAs.

Indeed, although the 2007 edition of Conningarth Economists' CBA guidelines updated prices from their 2002 manual, perhaps it is time for another review. As already discussed, the specific requirement for an 8 per cent discount rate should be usefully revisited. Discount rates can have significant bearing on CBA results (although a sensitivity analysis should always be conducted), and the recommended rate in the manual has remained at 8 per cent since the CEAS handbook appeared in 1989 (Conningarth Economists, 2007:127).

3.7. Conclusion

This chapter discussed considerations for the use of CBA for local government decision-making by drawing lessons from the case study. CBA preparation can present a number of challenges to the analyst. The treatment of externalities may not be immediately obvious to the analyst, but technological externalities should be included. The reliable monetization of non-market goods is not straightforward, and sometimes not feasible given available time, resources or information. Further, the choice of the correct discount rate is not always straightforward, highlighting the need for its inclusion in sensitivity analyses.

The party that commissions a CBA may misunderstand what CBA is designed to achieve, and/or be unaware of its practical limitations, particularly in situations where there is much uncertainty. While this limits the information that a CBA can reliably show, as long as these limitations are recognised, CBA can still be useful to inform decision-making. In order to improve the usefulness of CBA in South Africa, separate, concise up-to-date guidelines for the analyst and for the non-economist users of CBA, would probably help.

4. CONCLUDING REMARKS

This dissertation considered the historical context of CBA, how it has evolved and how it is used in South Africa by local government decision-makers, using a case study as an example. Lessons were drawn from the case study regarding difficulties and limitations for the use and usefulness of CBA in South Africa.

Academic and practical debates linger around the conduct of CBA. Major concerns remain regarding the selection of appropriate discount rates, incorporation of shadow prices, distributional concerns, and assigning values to non-market goods. However, by considering both the internal and external effects of projects, CBA remains a common and useful aid to public decision-making internationally. However a range of alternatives are available. Decision-makers may face a multiplicity of objectives other than economic efficiency. This explains the growing popularity of procedures such as MCDA. CEA has been proposed for situations where a given benefit can be achieved through different alternatives, allowing the analysis to focus on costs alone. However, MCDA and CEA also have their limitations, and the same uncertainties that restrict the information CBA can reliably provide, similarly restrict these techniques.

Many imponderables constrained the CBA in the case study. Regardless of uncertainties regarding the temporal distribution of phases and assumptions regarding discount rates, one finding of the CBA was clear. Even before accounting for discounting, the costs of providing the services for the development are not covered by the revenues from selling the resultant serviced stands, when using current municipal valuations of similar properties in George as a guide. Once discounting was taken into consideration, the results indicated that in order to be financially viable, considerable improvement in the George property market would be needed. Under the scenarios used in the CBA, the lowest NPV (largest loss) was R-39,313,520 (1 per cent discount rate, 4 years to sell each phase), and the highest NPV (smallest loss) was R-18,835,648 (8 per cent discount rate, 1 year to sell each phase). Therefore, given decision-makers were primarily concerned about the financial viability of the development, these results will definitely provide further insight.

Tourism, recreation and property price externalities of the development, may all yield positive net benefits. The uncertainties in these however, were profound, and these potential externalities were not monetized for inclusion in the CBA. They were discussed qualitatively instead. Rather than the analyst valuing them, the decision-makers could look at the projected financial loss on the development, and ask whether it would be worth risking it on the basis that these external benefits might accrue.

CBA conventionally treats a project by comparing it to a base-case situation: either do nothing, or take the next best option. In the case of the Garden Route Dam development the primary aim appeared to be the raising of municipal revenue through responsible use of the site. Alternative uses of the land that development of the property would preclude were investigated to identify the project's opportunity costs. After consideration of these, the most financially feasible use of the site to the Municipality appeared to be the return of this land to another 23 year rotation of pine, or the selling of the property for agricultural use (the choice depending on assumed agricultural land prices and interest rates), rather than the loss-making development. These potential profits were estimated at between R5,041,051 using a 1 per cent real interest rate, and R322,535 using an 8 per cent discount rate. These sacrificed earnings can be added to the financial losses of the project and expand these into economic losses.

Intuitively, choosing whether to commission a CBA should depend on whether the ultimate decision informed by the CBA would be improved given available information, relative to the financial, resource and time costs of the CBA. In reality however, many CBA are required by local regulation; while those commissioning CBAs may not realise their practical limitations. Indeed in many applications, informational constraints mean that it is difficult to show definitively whether a project will lead to a net gain or loss in welfare.

To be a useful input to the decision-making process, CBAs need to be reliable and have integrity. Guidelines can go a long way to improve the quality of CBAs, as well as helping decision-makers understand what is entailed in the analysis and how to interpret the results. The experience drawn from the case study suggests that there is room for shorter separate guidelines for those who commission CBAs in South Africa. The current handbook is intended for practitioners and is apparently poorly understood by those commissioning studies.

By design, CBA focusses on the economic efficiency of a proposal. Its focus can be extended to include equity by incorporating distributional weights, although their use and derivation is contentious. Equally, CBA can be complemented by separate reports which investigate the implications of a project. Indeed, it is often emphasized that CBA is only *part* of the decision-making process. Ultimately the decision-maker will need to take into account both the quantitative and qualitative effects covered in the CBA, and other supplementary analyses.

While decisions ultimately rest with the authorities, CBAs and supplementary reports exist to inform them. Though they serve a function, requiring CBAs or the passing of cost-benefit tests for every local government decision seems unwarranted.

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APPENDICES

Appendix A: NPVs of the two potentially profitable phases using current valuations

Phase A	Years to sell properties from each phase		
Real discount rate	**4 years**	**2 years**	**1 year**
8%	R-695,963	R-17,556	R348,242
6%	R-292,335	R255,625	R545,797
4%	R159,611	R553,657	R758,481
1%	R942,244	R1,052,952	R1,108,858

Phase F	Years to sell properties from each phase		
Real discount rate	**4 years**	**2 years**	**1 year**
8%	R1,003,879	R2,750,542	R3,692,345
6%	R2,094,069	R3,504,875	R4,251,969
4%	R3,310,486	R4,325,015	R4,852,368
1%	R5,408,332	R5,693,365	R5,837,304

At current valuations, phase A makes a profit under all three scenarios (4, 2 or 1 year to sell the properties from each phase), when 4 or 1 per cent discount rate was used. At a 6 per cent discount rate, phase A makes a profit when it is assumed that it takes 2 years or 1 year to sell the erven from phase A, but not 4 years. Phase A makes a profit at an 8 per cent discount rate only when it takes 1 year to sell the serviced erven from each phase, and makes a loss when it is assumed that it takes 2 or 4 years to sell the serviced erven. At current valuations, phase F makes a profit under each of the scenarios.

Note: The above NPVs are calculated taking into account the financial benefits and costs as outlined in Section 2.9: The CBA. **Current** municipal valuations are used as an indication of the price of the serviced erven. The NPVs have been calculated by discounting the costs and benefits from the phase, to the beginning of each phase, rather than discounted over the whole 30 year project time-line. This essentially thus looks at the NPV of the two phases, as if they were in isolation. At current municipal valuations, phases B, C, D, and E, **do not** make a profit, regardless of the interest rate or how long it takes to sell the phases, as these phase's infrastructure costs are greater than their revenues, even when these figures are not discounted.

Appendix B: CBA spreadsheets

Scenario 1: Phases of Infrastructure are spaced to be every 5th year, properties sell out in the 4 years that follow infrastructure

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
A) Erven sold for what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R2880000	R2880000	R2880000	R2880000	R0	R2720000	R2720000	R2720000	R2720000	R0	R5420000	R5420000	R5420000	R5420000
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R2887750	R2887750	R2887750	R2887750	R7750	R2727750	R2727750	R2727750	R2727750	R7750	R5427750	R5427750	R5427750	R5427750
Costs															
Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0
B) Erven sold at 50 per cent below what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R1440000	R1440000	R1440000	R1440000	R0	R1360000	R1360000	R1360000	R1360000	R0	R2710000	R2710000	R2710000	R2710000
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R1447750	R1447750	R1447750	R1447750	R7750	R1367750	R1367750	R1367750	R1367750	R7750	R2717750	R2717750	R2717750	R2717750
Costs															
Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0
C) Erven sold at 50 per cent above what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R4320000	R4320000	R4320000	R4320000	R0	R4080000	R4080000	R4080000	R4080000	R0	R8130000	R8130000	R8130000	R8130000
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R4327750	R4327750	R4327750	R4327750	R7750	R4087750	R4087750	R4087750	R4087750	R7750	R8137750	R8137750	R8137750	R8137750
Costs															
Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A) Erven sold for what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R4880000	R4880000	R4880000	R4880000	R0	R5700000	R5700000	R5700000	R5700000	R0	R7415000	R7415000	R7415000	R7415000
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R4887750	R4887750	R4887750	R4887750	R7750	R5707750	R5707750	R5707750	R5707750	R7750	R7422750	R7422750	R7422750	R7422750
Costs															
Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0
B) Erven sold at 50 per cent below what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R2440000	R2440000	R2440000	R2440000	R0	R2850000	R2850000	R2850000	R2850000	R0	R3707500	R3707500	R3707500	R3707500
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R2447750	R2447750	R2447750	R2447750	R7750	R2857750	R2857750	R2857750	R2857750	R7750	R3715250	R3715250	R3715250	R3715250
Costs															
Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0
C) Erven sold at 50 per cent above what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R7320000	R7320000	R7320000	R7320000	R0	R8550000	R8550000	R8550000	R8550000	R0	R11122500	R11122500	R11122500	R11122500
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R7327750	R7327750	R7327750	R7327750	R7750	R8557750	R8557750	R8557750	R8557750	R7750	R11130250	R11130250	R11130250	R11130250
Costs															
Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

Scenario 2: Phases of Infrastructure are spaced to be every 5th year, properties sell out in the 2 years that follow infrastructure

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
A) Erven sold for what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R5760000	R5760000	R0	R0	R0	R5440000	R5440000	R0	R0	R0	R10840000	R10840000	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R5767750	R5767750	R7750	R7750	R7750	R5447750	R5447750	R7750	R7750	R7750	R10847750	R10847750	R7750	R7750
Costs															
Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0
B) Erven sold at 50 per cent below what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R2880000	R2880000	R0	R0	R0	R2720000	R2720000	R0	R0	R0	R5420000	R5420000	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R2887750	R2887750	R7750	R7750	R7750	R2727750	R2727750	R7750	R7750	R7750	R5427750	R5427750	R7750	R7750
Costs															
Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0
C) Erven sold at 50 per cent above what current municipal valuations would value serviced land at.															
Benefits															
Revenue from properties	R0	R8640000	R8640000	R0	R0	R0	R8160000	R8160000	R0	R0	R0	R16260000	R16260000	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R8647750	R8647750	R7750	R7750	R7750	R8167750	R8167750	R7750	R7750	R7750	R16267750	R16267750	R7750	R7750
Costs															
Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

A) Erven sold for what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R9760000	R9760000	R0	R0	R0	R11400000	R11400000	R0	R0	R0	R14830000	R14830000	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R9767750	R9767750	R7750	R7750	R7750	R11407750	R11407750	R7750	R7750	R7750	R14837750	R14837750	R7750	R7750

Costs

Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

B) Erven sold at 50 per cent below what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R4880000	R4880000	R0	R0	R0	R5700000	R5700000	R0	R0	R0	R7415000	R7415000	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R4887750	R4887750	R7750	R7750	R7750	R5707750	R5707750	R7750	R7750	R7750	R7422750	R7422750	R7750	R7750

Costs

Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

C) Erven sold at 50 per cent above what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R14640000	R14640000	R0	R0	R0	R17100000	R17100000	R0	R0	R0	R22245000	R22245000	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R14647750	R14647750	R7750	R7750	R7750	R17107750	R17107750	R7750	R7750	R7750	R22252750	R22252750	R7750	R7750

Costs

Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

Scenario 3: Phases of Infrastructure are spaced to be every 5th year, properties sell out in the year that follows infrastructure

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**

A) Erven sold for what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R11520000	R0	R0	R0	R0	R10880000	R0	R0	R0	R0	R21680000	R0	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R11527750	R7750	R7750	R7750	R7750	R10887750	R7750	R7750	R7750	R7750	R21687750	R7750	R7750	R7750

Costs

Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0

B) Erven sold at 50 per cent below what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R5760000	R0	R0	R0	R0	R5440000	R0	R0	R0	R0	R10840000	R0	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R5767750	R7750	R7750	R7750	R7750	R5447750	R7750	R7750	R7750	R7750	R10847750	R7750	R7750	R7750

Costs

Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0

C) Erven are sold at 50 per cent above what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R17280000	R0	R0	R0	R0	R16320000	R0	R0	R0	R0	R32520000	R0	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R17287750	R7750	R7750	R7750	R7750	R16327750	R7750	R7750	R7750	R7750	R32527750	R7750	R7750	R7750

Costs

Infrastructure costs	R10323984	R0	R0	R0	R0	R22338654	R0	R0	R0	R0	R28657351	R0	R0	R0	R0

Year	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

A**) Erven sold for what current municipal valuations would value serviced land at.**

Benefits

Revenue from properties	R0	R19520000	R0	R0	R0	R0	R22800000	R0	R0	R0	R0	R29660000	R0	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R19527750	R7750	R7750	R7750	R7750	R22807750	R7750	R7750	R7750	R7750	R29667750	R7750	R7750	R7750

Costs

Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

B) Erven sold at 50 per cent below what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R9760000	R0	R0	R0	R0	R11400000	R0	R0	R0	R0	R14830000	R0	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R9767750	R7750	R7750	R7750	R7750	R11407750	R7750	R7750	R7750	R7750	R14837750	R7750	R7750	R7750

Costs

Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

C) Erven are sold at 50 per cent above what current municipal valuations would value serviced land at.

Benefits

Revenue from properties	R0	R29280000	R0	R0	R0	R0	R34200000	R0	R0	R0	R0	R44490000	R0	R0	R0
Decrease costs green area	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750	R7750
Total benefits	R7750	R29287750	R7750	R7750	R7750	R7750	R34207750	R7750	R7750	R7750	R7750	R44497750	R7750	R7750	R7750

Costs

Infrastructure costs	R34556911	R0	R0	R0	R0	R38999624	R0	R0	R0	R0	R23508650	R0	R0	R0	R0

Appendix C: Estimate of value of land in current state if sold for agricultural use

AGRI KLEIN KAROO
Posbus/PO Box 745
Inligtingsentrum/Info Centre
Voortrekkerstraat/Voortrekker Rd
Oudtshoorn 6620
Tel: 044 272 8304
Faks/Fax: 086 699 4158
e-pos/email: info@agrikleinkaroo.com

AGRI KLEIN KAROO

28 August 2013

Dear Kim

I aknowledge receipt of your mail and would like to respond as follows:

Assumptions:

This property will not have water rights or a license to extract water from the dam. Was this the case someone would have started to produce cash crops as this is a highly lucrative farming possibility.

The Minister of Water Affairs recently commented on the possibility of water rights being extended to farms bordering dams but as yet this is not applicable.
Should my assumptions not be correct I doubt whether the full 122 Ha would have water rights.

I will therefore give an estimate based on the value per ha based on different cenarios.

Value:

The value could be calculated as follows:

- Fully equiped irregation system installed with ample water supply but no crop = R 60 000.00 per ha.
- Fully equiped irregation system installed with ample water supply with a crop = R 130 00.00 to R 180 000.00/ha.
- Dry arrable land prepaired soil R 10 000.00 to R15 000.00/ha.
- Dry veld land no soil preperation = R 5000.00/ha.
- The valleys and slopes = R 2000.00/ha

My estimate, based on the details submitted in the (Extract from: Conservation Management Services 2012) and the area of its location, I would take an average value of R 8 000.00 /ha to be a fair price for the land.

Kind Agricultural Regards

Piet Lodder

HUB/CEO: Piet Lodder

Appendix D: Breakdown of electrical infrastructure costs

Tuinroete Dam Ontwikkeling

		Phased					
Description	**cost**	**Phase A**	**Phase B**	**Phase C**	**Phase D**	**Phase E**	**Phase F**
External MV Works							
Extension of the existing 70mm Cable From MS AB to New SS	914 200,00	478 606,00	0,00	0,00	435 594,00	0,00	0,00
Extension of the existing 95mm Cable From Pole TRF to New SS	1 106 200,00	517 240,00	316 566,00	0,00	272 394,00	0,00	0,00
185mm Cable from New SS to Water pumpstation	1 010 300,00	0,00	0,00	0,00	0,00	0,00	1 010 300,00
185mm Cable from New SS to Sewerage pumpstation	840 000,00	0,00	0,00	0,00	0,00	840 000,00	0,00
185mm Cable from New SS to SS Glenwood	2 381 000,00	0,00	0,00	0,00	0,00	2 381 000,00	0,00
Switching Substation	3 190 000,00	870 000,00	767 500,00	0,00	517 500,00	517 500,00	517 500,00
Miniature substations	2 750 000,00	305 555,56	611 111,11	305 555,56	305 555,56	611 111,11	611 111,11
Internal MV Cable Works	2 498 400,00	0,00	1 124 280,00	624 600,00	0,00	249 840,00	499 680,00
LV reticulation	6 456 154,76	359 785,71	279 833,33	1 369 184,52	999 404,76	2 088 755,95	1 359 190,48
Service Connections	1 450 423,81	80 828,57	62 866,67	307 597,62	224 523,81	469 254,76	305 352,38
Streetlighting	1 715 745,24	95 614,29	74 366,67	363 865,48	265 595,24	555 094,05	361 209,52
Telkom Network	1 556 552,38	86 742,86	67 466,67	330 104,76	240 952,38	503 590,48	327 695,24
Sub Total 1	**25 868 976,19**	**2 794 372,98**	**3 303 990,44**	**3 300 907,94**	**3 261 519,75**	**8 216 146,35**	**4 992 038,73**
10% contingencies	2 586 897,62	279 437,30	330 399,04	330 090,79	326 151,97	821 614,63	499 203,87
Professional fees	3 104 277,14	335 324,76	396 478,85	396 108,95	391 382,37	985 937,56	599 044,65
Estimated disbursements	108 649,70	11 736,37	13 876,76	13 863,81	13 698,38	34 507,81	20 966,56
Sub Total 2	**31 668 800,65**	**3 420 871,41**	**4 044 745,10**	**4 040 971,50**	**3 992 752,47**	**10 058 206,36**	**6 111 253,81**
14% VAT	4 433 632,09	478 922,00	566 264,31	565 736,01	558 985,35	1 408 148,89	855 575,53
Total, VAT included	**36 102 432,74**	**3 899 793,40**	**4 611 009,42**	**4 606 707,51**	**4 551 737,82**	**11 466 355,25**	**6 966 829,35**

Total Labour component (estimated at 20%)	5 173 795,24	558 874,60	660 798,09	660 181,59	652 303,95	1 643 229,27	998 407,75
Skilled (estimated at 5%)	1 293 448,81	139 718,65	165 199,52	165 045,40	163 075,99	410 807,32	249 601,94
Semi-Skilled (Estimated at 7%)	1 810 828,33	195 606,11	231 279,33	231 063,56	228 306,38	575 130,24	349 442,71
Unskilled (estimated at 8%)	2 069 518,10	223 549,84	264 319,24	264 072,63	260 921,58	657 291,71	399 363,10

Appendix E: Breakdown of other infrastructure costs

TUINROETEDAM ONTWIKKELING

	12/2010	06/2013
Assumptions		
CPA - Labour	112.9	129.5
CPA - Plant	185.8	201.2
CPA - Materials	213.1	238.3
CPA - Fuel	301.5	428.2
Price adjustment		1.11
P&G's		20%
Cont.		10%
Fees		10%

Fase	Paaie	Water	Sewer	Kostes
A	R 6,238,806.95	R 174,839.39	R 489,466.47	R 6,903,112.80
B	R 16,582,664.74	R 1,181,277.94	R 529,965.77	R 18,293,908.45
C	R 21,937,765.61	R 1,264,748.92	R 1,413,865.25	R 24,616,379.78
D	R 27,397,305.94	R 2,563,908.06	R 602,944.45	R 30,564,158.45
E	R 25,964,970.37	R 2,061,634.86	R 914,812.27	R 28,941,417.51
F	R 15,505,794.02	R 815,401.38	R 1,076,200.62	R 17,397,396.02
Total	**R 113,627,307.62**	**R 8,061,810.55**	**R 5,027,254.84**	**R 126,716,373.00**

Labour	Semi Skilled	Skilled
R 821,095.64	R 362,979.32	R 118,855.25
R 1,997,471.09	R 916,846.40	R 303,655.76
R 2,835,627.65	R 1,254,495.92	R 414,067.74
R 2,841,397.43	R 1,263,457.78	R 416,280.25
R 1,887,273.39	R 771,512.05	R 251,441.42
R 1,413,621.22	R 671,287.08	R 205,717.81
R 11,796,486.40	**R 5,240,578.55**	**R 1,710,018.22**
		R 18,747,083.17

FASE A

Item	Aantal	Lengte	Area	Tarrief (2010)	Koste	Paaie	Water	Sewer	Total + Adjustment
5,5m Pad		306	1683	R 2,300.00	R 4,296,699.00				
6,0m Pad			0	R 2,300.00	R -				
Sirkel	0			R 500,000.00	R -				
110d WPyp		296		R 240.00	R 78,854.40				
160d Wpyp		0		R 330.00	R -				
300d Wpyp		0		R 809.00	R -				
110d Valves				R 44,000.00	R -				
160d Valves				R 47,000.00	R -				
300d Valves				R 56,200.00	R -				
Wateraansl	36			R 1,040.00	R 41,558.40				
160ø Riool	641			R 412.00	R 293,142.12				
R/Aansl	36			R 1,100.00	R 43,956.00				
						R 4,296,699.00	R 120,412.80	R 337,098.12	**R 6,903,112.80**

Labour		Semi Skilled		Skilled	
%	Amount	%	Amount	%	Amount
30%	644504.85	15%	322252.425	5%	R 107,417.48
80%	31541.76	15%	5914.08	5%	R 1,971.36
65%	13506.48	30%	6233.76	5%	R 1,038.96
80%	117256.848	15%	21985.659	5%	R 7,328.55
65%	14285.7	30%	6593.4	5%	R 1,098.90
	821095.638		362979.324		118855.249

FASE B

Item	Aantal	Lengte	Area	Tarrief	Koste	Paaie	Water	Sewer	Total + Adjustment
5,5m Pad		320	1760	R 2,300.00	R 4,493,280.00				
6,0m Pad		416	2496	R 2,300.00	R 6,372,288.00				
Sirkel	1			R 500,000.00	R 555,000.00				
110d WPyp		500		R 240.00	R 133,200.00				
160d Wpyp		517		R 330.00	R 189,377.10				
300d Wpyp		0		R 809.00	R -				
110d Valves		5		R 44,000.00	R 244,200.00				
160d Valves		4		R 47,000.00	R 208,680.00				
300d Valves				R 56,200.00	R -				
Wateraansl	33			R 1,040.00	R 38,095.20				
160ø Riool	710			R 412.00	R 324,697.20				
R/Aansl	33			R 1,100.00	R 40,293.00				
						R 11,420,568.00	R 813,552.30	R 364,990.20	**R 18,293,908.45**

Labour		Semi Skilled		Skilled	
%	Amount	%	Amount	%	Amount
30%	673992	15%	336996	5%	R 112,332.00
30%	955843.2	15%	477921.6	5%	R 159,307.20
30%	83250	15%	41625	5%	R 13,875.00
80%	53280	15%	9990	5%	R 3,330.00
80%	75750.84	15%	14203.2825	5%	R 4,734.43
80%	0	15%	0	5%	R -
65%	12380.94	30%	5714.28	5%	R 952.38
80%	129878.88	15%	24352.29	5%	R 8,117.43
65%	13095.225	30%	6043.95	5%	R 1,007.33
	1997471.085		916846.4025		303655.7625

FASE C									
Item	Aantal	Lengte	Area	Tarrief	Koste	Paaie	Water	Sewer	Total + Adjustment
5,5m Pad		1076	5918	R 2,300.00	R 15,108,654.00				
6,0m Pad		0	0	R 2,300.00	R -				
Sirkel	0			R 500,000.00	R -				
110d WPyp		1504		R 240.00	R 400,665.60				
160d Wpyp		0		R 330.00	R -				
300d Wpyp		0		R 809.00	R -				
110d Valves		8		R 44,000.00	R 390,720.00				
160d Valves		0		R 47,000.00	R -				
300d Valves				R 56,200.00	R -				
Wateraansl	69			R 1,040.00	R 79,653.60				
160ø Riool	1945			R 412.00	R 889,487.40				
R/Aansl	69			R 1,100.00	R 84,249.00				
						R 15,108,654.00	R 871,039.20	R 973,736.40	**R 24,616,379.78**

	Labour		Semi Skilled		Skilled
%	Amount	%	Amount	%	Amount
30%	2266298.1	15%	1133149.05	5%	R 377,716.35
80%	160266.24	15%	30049.92	5%	R 10,016.64
65%	25887.42	30%	11948.04	5%	R 1,991.34
80%	355794.96	15%	66711.555	5%	R 22,237.19
65%	27380.925	30%	12637.35	5%	R 2,106.23
	2835627.645		1254495.915		414067.74

FASE D									
Item	Aantal	Lengte	Area	Tarrief	Koste	Paaie	Water	Sewer	Total + Adjustment
5,5m Pad		260	1430	R 2,300.00	R 3,650,790.00				
6,0m Pad		921	5526	R 2,300.00	R 14,107,878.00				
Sirkel	2			R 500,000.00	R 1,110,000.00				
110d WPyp		320		R 240.00	R 85,248.00				
160d Wpyp		770		R 330.00	R 282,051.00				
300d Wpyp		690		R 809.00	R 619,613.10				
110d Valves		4		R 44,000.00	R 195,360.00				
160d Valves		7		R 47,000.00	R 365,190.00				
300d Valves		3		R 56,200.00	R 187,146.00				
Wateraansl	27			R 1,040.00	R 31,168.80				
160ø Riool	550			R 412.00	R 251,526.00				
R/Aansl	27			R 1,100.00	R 32,967.00				
Riool bulk					R 130,758.00				
						R 18,868,668.00	R 1,765,776.90	R 415,251.00	**R 30,564,158.45**

	Labour		Semi Skilled		Skilled
%	Amount	%	Amount	%	Amount
30%	547618.5	15%	273809.25	5%	R 91,269.75
30%	2116181.7	15%	1058090.85	5%	R 352,696.95
30%	166500	15%	83250	5%	R 27,750.00
80%	34099.2	15%	6393.6	5%	R 2,131.20
80%	112820.4	15%	21153.825	5%	R 7,051.28
80%	247845.24	15%	46470.9825	5%	R 15,490.33
65%	10129.86	30%	4675.32	5%	R 779.22
80%	100610.4	15%	18864.45	5%	R 6,288.15
65%	10714.275	30%	4945.05	5%	R 824.18
65%	42496.35	30%	19613.7	5%	R 3,268.95
	2841397.425		1263457.778		416280.2475

FASE E									
Item	Aantal	Lengte	Area	Tarrief	Koste	Paaie	Water	Sewer	Total + Adjustment
5,5m Pad		670	3685	R 2,300.00	R 9,407,805.00				
6,0m Pad		517	3102	R 2,300.00	R 7,919,406.00				
Sirkel	1			R 500,000.00	R 555,000.00				
110d WPyp		1090		R 240.00	R 290,376.00				
160d Wpyp		0		R 330.00	R -				
300d Wpyp		688		R 809.00	R 617,817.12				
110d Valves		7		R 44,000.00	R 341,880.00				
160d Valves		0		R 47,000.00	R -				
300d Valves		2		R 56,200.00	R 124,764.00				
Wateraansl	39			R 1,040.00	R 45,021.60				
160ø Riool	975			R 412.00	R 445,887.00				
R/Aansl	39			R 1,100.00	R 47,619.00				
Riool bulk					R 136,530.00				
						R 17,882,211.00	R 1,419,858.72	R 630,036.00	**R 28,941,417.51**

	Labour		Semi Skilled		Skilled
%	Amount	%	Amount	%	Amount
30%	1411170.75	15%	705585.375	5%	R 235,195.13
30%	1187910.9	15%	593955.45	5%	R 197,985.15
30%	83250	15%	41625	5%	R 13,875.00
80%	116150.4	15%	21778.2	5%	R 7,259.40
80%	0	15%	0	5%	R -
80%	247126.848	15%	46336.284	5%	R 15,445.43
65%	14632.02	30%	6753.24	5%	R 1,125.54
80%	178354.8	15%	33441.525	5%	R 11,147.18
65%	15476.175	30%	7142.85	5%	R 1,190.48
65%	44372.25	30%	20479.5	5%	R 3,413.25
	1887273.393		771512.049		251441.418

FASE F									
Item	Aantal	Lengte	Area	Tarrief	Koste	Paaie	Water	Sewer	Total + Adjustment
5,5m Pad		241	1325.5	R 2,300.00	R 3,384,001.50				
6,0m Pad		440	2640	R 2,300.00	R 6,739,920.00				
Sirkel	1			R 500,000.00	R 555,000.00				
110d WPyp		710		R 240.00	R 189,144.00				
160d Wpyp		0		R 330.00	R -				
300d Wpyp		0		R 809.00	R -				
110d Valves		5		R 44,000.00	R 244,200.00				
160d Valves		0		R 47,000.00	R -				
300d Valves		2		R 56,200.00	R 124,764.00				
Wateraansl	3			R 1,040.00	R 3,463.20				
160ø Riool	50			R 412.00	R 22,866.00				
R/Aansl	3			R 1,100.00	R 3,663.00				
Riool bulk					R 714,656.00				
						R 10,678,921.50	R 561,571.20	R 741,185.00	**R 17,397,396.02**

	Labour		Semi Skilled		Skilled
%	Amount	%	Amount	%	Amount
30%	507600.225	15%	253800.1125	5%	R 84,600.04
30%	1010988	15%	505494	5%	R 168,498.00
30%	83250	15%	41625	5%	R 13,875.00
80%	75657.6	15%	14185.8	5%	R 4,728.60
80%	0	15%	0	5%	R -
80%	0	15%	0	5%	R -
65%	1125.54	30%	519.48	5%	R 86.58
80%	9146.4	15%	1714.95	5%	R 571.65
65%	1190.475	30%	549.45	5%	R 91.58
65%	232263.2	30%	107198.4	5%	R 17,866.40
	1413621.215		671287.08		205717.805

Appendix F: Potential rates and availability charges on vacant serviced land

Zoning	Portion number	Rates	Sewer	Water availability	Electricity availability	Total
Single residential erven	211 erven @ 830m² each	R493,107	R352,370	R208,679	R332,747	R1,386,903
General Residential	Ptn no 212: 2ha	R22,093	R3,133	R3,860	R902	R29,988
	Ptn no 213: 1.3ha	R14,512	R2,754	R2,938	R271	R20,474
	Ptn no 214: 1.9ha	R21,010	R3,079	R3,728	R812	R28,629
	Ptn no 215: 0.8ha	R9,097	R2,376	R2,279	R271	R14,023
	Ptn no 216: 1.0ha	R11,263	R2,591	R2,543	R451	R16,848
	Ptn no 217: 2.2ha	R24,259	R3,133	R3,860	R902	R32,154
	Ptn no 218: 1.9ha	R21,010	R3,079	R3,728	R812	R28,629
	Ptn no 219: 1.6ha	R17,761	R2,917	R3,333	R541	R24,552
Business	Ptn no 220: 4.5ha	R146,318	R3,133	R3,860	R902	R154,212
Total		R780,431	R378,566	R238,806	R338,610	R1,736,413

Note: These are charges on **vacant** erven, using current municipal service levies, rates and current municipal valuations. Charges on erven with improvements would be higher - service charges would be based on a basic charge plus consumption; owners would also become liable for refuse removal charges. Property rates would also be higher as improvements would add to the value of rateable property.

Appendix G: Estimated financial costs of yearly maintenance on electrical and other infrastructure from each phase

Phase	Electrical infrastructure	Other infrastructure
A	R51,313	R207,093
B	R60,671	R548,817
C	R60,615	R738,491
D	R59,891	R916,925
E	R150,873	R868,243
F	R91,669	R521,922
Total	R475,032	R3,801,491

Electrical infrastructure

The maintenance costs for electrical infrastructure are based on 1.5 per cent of the initial capital investment, per annum (Moller, personal communication 2013, 19 September). A flat rate like this from year one probably overstates the cost of maintenance in the initial few years following installation of infrastructure.

Other infrastructure

Maintenance on other infrastructure is currently done by the Municipality in an ad hoc manner, and thus the calculation of these costs is based on "the recommendation from national guidelines which indicate using around 3 per cent of the initial cost per annum" (Quinot, personal communication 2013, 23 August). A flat rate like this from year one probably overstates the cost of maintenance in the initial few years following installation of infrastructure.

Appendix H: Results of the CBA assuming erven from each phase are sold in 2 years

Scenarios		Years to sell each phase's erven	2 years		
		Property price	-50%	Current valuations	+50%
Real discount rate	8%	PV of benefits	R18,391,671	R36,696,095	R55,000,518
		PV of costs	R56,939,776	R56,939,776	R56,939,776
		NPV	R-38,548,104	R-20,243,681	R-1,939,257
		BCR	0.32	0.64	0.97
		PV of property sales only		R 36,608,847	
		PV of required property sales to break-even		R 56,852,528	
		Break-even mean increment on current valuations		55.3%	
	6%	PV of benefits	R23,422,360	R46,738,042	R70,053,724
		PV of costs	R70,826,399	R70,826,399	R70,826,399
		NPV	R-47,404,039	R-24,088,357	R-772,675
		BCR	0.33	0.66	0.99
		PV of property sales only		R46,631,364	
		PV of required property sales to break-even		R70,719,721	
		Break-even mean increment on current valuations		51.7%	
	4%	PV of benefits	R30,728,259	R61,322,504	R91,916,750
		PV of costs	R90,240,619	R90,240,619	R90,240,619
		NPV	R-59,512,360	R-28,918,114	R1,676,131
		BCR	0.34	0.68	1.02
		PV of property sales only		R61,188,491	
		PV of required property sales to break-even		R90,106,606	
		Break-even mean increment on current valuations		47.3%	
	1%	PV of benefits	R49,033,450	R97,866,889	R146,700,329
		PV of costs	R136,218,197	R136,218,197	R136,218,197
		NPV	R-87,184,748	R-38,351,308	R10,482,132
		BCR	0.36	0.72	1.08
		PV of property sales only		R97,666,880	
		PV of required property sales to break-even		R136,018,188	
		Break-even mean increment on current valuations		39.3%	

The above table shows results from the CBA when the serviced erven are assumed to be sold in the two years following the installation of infrastructure from each phase. These results show that at an 8 per cent real interest rate, the break-even price is 55.3 per cent above the values for the erven suggested by current municipal valuations. At a 6 per cent real interest rate, the mean break-even price is 51.7 per cent above those suggested by current municipal valuations. At a 4 per cent interest rate, this drops to 47.3 per cent. Finally, at a 1 per cent real interest rate, this mean break-even price is 39.3 per cent higher than prices suggested by current municipal valuations.