the **dwaf**

DEPARTMENT OF WATER AFFAIRS AND FORESTRY

Strategy for the Waste Discharge Charge System

Version 1.9

June 2007

EXECUTIVE SUMMARY

Introduction

The Department of Water Affairs and Forestry (DWAF) is developing a Waste Discharge Charge System (WDCS) to promote waste reduction and water conservation. It forms part of the Pricing Strategy and is being established under the National Water Act (Act 36 of 1998).

The WDCS is based on the polluter-pays principle and aims to:

- Promote the sustainable development and efficient use of water resources
- Promote the internalisation of environmental costs by impactors
- Create financial incentives for dischargers to reduce waste and use water resources in a more optimal way
- Recover the costs of mitigating the impacts of waste discharge on water quality.

The development of the WDCS has followed three phases:

- Phase 1: Review of international experience and formulation of a Framework Document
- Phase 2: Development of a draft WDCS strategy
- Phase 3: Development of the strategy into a workable and implementable system that can be operated at a practical level, while ensuring that there will be sufficient resources, capacity and supporting systems to put the WDCS into practice.

Phrase 3 will conclude by the end of 2006. Phase 4 will comprise the targeted, phased implementation of the WDCS in priority catchments.

Philosophy of the WDCS

The South African Constitution, through the Bill of Rights, provides the right to an environment that is not harmful to health or well-being, and that is protected for the benefit of present and future generations. These rights are to be ensured through measures that prevent pollution and ecological degradation.

The basis of the polluter pays principle is that the costs of environmental impact should be borne by those responsible for the impact. The National Water Act specifically refers to the polluter pays principle as an economic mechanism for achieving effective and efficient water use. The introduction to Part 1 of Chapter 5 of the National Water Act states:

> *"Water use charges ... may be used ... to ensure compliance with prescribed standards and water management practices according to the user pays and polluter pays principles."*

Water resource management in South Africa links the acceptable level of impact to the concept of resource quality objectives (RQOs), which balance the need to protect water resources with the need to develop and use them. The setting of RQOs is catchment specific, based on the social, economic and political drivers for development and utilisation of a specific water resource.

RQOs are to be set as part of the classification system for water resources, through a process of consensus seeking among water users and other stakeholders, in which the government is responsible for ensuring that environmental interests are represented.

Principles of the WDCS

1. Resource quality objectives are the basis for the WDCS

   The WDCS is focused on reducing discharge load in order to achieve or maintain RQOs in a catchment.

   Accordingly, where RQOs are being met, the WDCS is not applied. However, where RQOs are exceeded or in threat of being exceeded, the WDCS may be applied as part of water quality management plan aimed at achieve water quality objectives.

2. The WDCS applies to surface water and groundwater resources

   The WDCS is applied to both surface water and groundwater resources, where RQOs have been defined and an adequate understanding of the resource supports the implementation of the system.

3. Catchment scale

   The WDCS will be applied to a particular catchment area in which a water quality problem exists. This could be a whole catchment in which a widespread water quality problem occurs or a sub-catchment within a larger water basin.

4. Downstream/upstream catchments

   Where downstream RQOs are more stringent than upstream RQOs, and downstream RQOs are exceeded or threatened, the WDCS may be applied in the upstream catchment even if the upstream RQOs are achieved.

5. Charge based on load

   The WDCS will be based on load discharged. While the WDCS does not charge for concentration, discharge standards still apply. Accordingly, high concentration effluent is managed through other mechanisms, chiefly regulations.

6. Constant charge rate

   The WDCS is based on a linear relationship between load and charge (i.e. a flat charge rate is applied). In other words, the charge increases by constant increments with an increase in discharge load.

7. Subtraction of intake

   Waste dischargers are liable only for their contribution to the water quality problem.

8. Minimum load thresholds

   Based on an assessment in any given catchment, a minimum discharge load may be identified, below which the charge is waived.

Users

The current version off the WDCS will apply to the following registered water uses in terms of Section 21 of the National Water Act:

- Section 21(e): engaging in a controlled activity
- Section 21(f): discharging waste or water containing waste into a water resource
- Section 21(g): disposing of waste in a manner which may detrimentally impact on a water resource
- Section 21(h): disposing of water which contains waste from, or which has been heated in, any industrial or power generation process

These water uses includes a number of non-point sources (NPS), where the charge will be based on an estimation of the load entering the water resource through the various diffuse pathways:

- Disposal of effluent to land or to a facility (e.g. tailings dams, irrigated effluent, evaporation ponds, treatment wetlands)
- Disposal of waste to land or to a facility (e.g. landfill, waste-rock dumps, fly ash disposal, solid waste disposal)
- Controlled land-use activities (e.g. confined animal facilities, dirty water systems).

Section 21(j) – removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people – requires another water use registration to discharge or dispose of the water (e.g. 21(f) where the water is discharged into the resource or 21(g) where the water is discharged into a waste management facility).

A number of important dischargers do not currently require registration and therefore cannot be charged under the WDCS. Included in this grouping are urban stormflow, overloaded or failing sewerage systems, peri-urban and rural settlements and developments, irrigation return-flow, dry-land agriculture and extensive animal husbandry.

Constituents

The WDCS includes, but is not limited to, the following variables:

- Salinity: electrical conductivity, chloride, sodium, sulphate (SO4)
- Nutrients: soluble phosphorus (PO4), nitrate (NO3), ammonium (NH4)
- pH
- Heavy metals: arsenic, cadmium, chromium, copper, mercury, lead, nickel, zinc
- Organics: chemical oxygen demand

Charges

The WDCS is composed of two charges: (1) Incentive Charge and (2) Mitigation Charge.

Incentive charge

The Incentive Charge seeks to change discharge behaviour by providing an incentive to reduce waste load at source. The charge rate is set at a level where sufficient dischargers are incentivised to reduce waste load at source, such that the cumulative waste load reduction within the resource (catchment) achieves the resource quality objectives. The Incentive Charge is an unrequited payment in that it does not recover

any direct costs nor is it related to a particular service received. The Incentive Charge is thus considered an environmental tax, which requires the promulgation of a Money Bill in terms of National Treasury's environmental tax policy.

Owing to its tax nature, the Incentive Charge generates surplus revenue. Surplus revenue could be used for a number of uses, through a process of implicit earmarking and budgetary allocation. Examples of such disbursement include investment in public goods to counter impacts experienced, seed funding to users to enable them to undertake capital expenditure for load reduction, initiatives to address NPS pollution and national funds to counter pollution accident events (accident fund) and/or enforce standards (litigation fund).

The Incentive Charge is based on monitored discharge load, given that the charge seeks to change actual discharge load. This also means that where dischargers are reducing waste load at source, that reduction is reflected in a reduced charge.

Mitigation Charge

The Mitigation Charge is intended to cover the costs of mitigation measures undertaken in the water resource and will be applied in cases where it is more economically efficient to reduce load within the resource than reducing discharge load at source. As such, the Mitigation Charge is a user charge to recover the costs of mitigation measures deployed in the resource.

There are four categories of Mitigation Charge:

- Mitigation through removal of load from the resource, including a regional mitigation scheme or infrastructure or a regional mitigation project
- Water resource system operation for the dilution, blending or purging of poor quality water
- Mitigation for treatment costs downstream
- Treatment at source, in order to apply the most cost-effective treatment options to a limited number of dischargers in a catchment

Institutional arrangements

WDCS is an instrument in an integrated approach to water resource management and should be viewed in an integrated fashion with other regulatory and non-regulatory measures for WRM.

The WDCS is implemented through a catchment level WDCS business plan, developed as part of the water resource management plan (WRMP) in the catchment management strategy (CMS). The business plan articulates technical, financial and management arrangement for the implementation of the WDCS and is developed by the catchment management agency (CMA), with support and oversight from DWAF.

DWAF will develop a consolidated WDCS plan, based on the catchment business plans, and will negotiate the consolidated plan with National Treasury. Revenue collected from the Incentive Charge is an environmental tax and is therefore submitted to SARS and deposited into the National Revenue Fund. Disbursements follow the usual budgetary process, with disbursement allocations submitted to DWAF from the National Revenue Fund.

Tight financial control and accounting are required for, in particular, Incentive Charge revenue and disbursement, but also for the Mitigation Charge. These are provided by audit and governance oversight by DWAF.

Economic and financial implications

The WDCS is a response to a pollution problem that is already imposing a cost on society. The WDCS endeavours to shift some of the cost back to dischargers according to the polluter pays principle. The common perception that environmental charges are a trade-off against the economy for the sake of environmental benefits is shown in the literature to be largely false. Accordingly, a pollution charge should not be viewed as an additional burden on the economy. The result of pollution charges is often that overall pollution costs are reduced while the economy as a whole is more efficient and less wasteful, and generally more attractive to investors. This is supported by economic modelling on the impact of the WDCS: an index of sustainable development was computed, which shows a positive ripple effect in the economy following improvements in water quality.

Modelling the financial impact of the WDCS in two test catchments (the upper Olifants River and the Crocodile (west) catchments) has shown that the WDCS would have a small negative impact on regional economies of less than 1%, although the costs would be larger for small businesses and certain institutions. The disbursement of WDCS revenue back to catchments to address water quality problems could result in shifting of employment and economic activity, offsetting some of the negative economic impacts.

The WDCS is waived for Section 21(i) – instream use in the current version. In addition, a discretionary waiver is applied to small dischargers discharging below an identified threshold in a particular catchment. A discretionary waiver may also be applied to dischargers that demonstrate that a process or plan, including auditable milestones, to reduce waste load is being implemented. In these cases, the waiver may be applied to the load that will be removed from the discharge.

The WDCS is not a penalty system and does not incorporate the use of spot fines. The WDCS is an economic instrument for achieving more efficient use of the resource. Separate regulations are in place for dealing with non-compliance or exceedance of standards.

Implementation

Implementation of the WDCS will follow a phased approach, targeting priority catchments in the first instance. Phase 4 of the WDCS, the implementation of the system in three priority catchments – the Upper Olifants, The Crocodile (West) and the Upper Vaal – will commence in January 2007. It is anticipated that full implementation of the WDCS in these three pilot catchments will commence in the financial year 2009/10. A parallel process identifying other priority catchments for the WDCS is underway - the system will be implemented in other priority catchments following piloting in Phase 4.

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS USED

As	Arsenic
BATZI	Best available technology leading to zero impact
Cd	Cadmium
Cl	Chloride
CMA	Catchment management agency
CMS	Catchment management strategy
COD	Chemical oxygen demand
CPCD	Central pollution control dam
Cr	Chromium (Cr)
Cu	Copper
DME	Department of Minerals and Energy
DWAF	Department of Water Affairs and Forestry
EC	Electrical conductivity
Hg	Mercury
MAR	Mean annual runoff
MTEF	Medium term expenditure framework
Na	Sodium
NH_4	Ammonium
Ni	Nickel
NO_3	Nitrate
NPS	Non-point sources
NRF	National Revenue Fund
NWA	National Water Act
Pb	Lead
PO_4	Soluble phosphorus
RO	reverse osmosis
RQO	resource quality objective
SARS	South African Revenue Service
SO_4	Sulphate
WARMS	Water Authorisation and Registration Management System
WDCS	Waste Discharge Charge System
WMA	Water management area
WMI	Water management institution
WMS	Water Management System
WRM	water resource management
WRMP	Water resource management plan
WUA	Water user association
WWTW	Wastewater treatment works
Zn	Zinc

1 INTRODUCTION

1.1 Background to the Project

The Department of Water Affairs and Forestry (DWAF) is developing a Waste Discharge Charge System (WDCS) to promote waste reduction and water conservation. It forms part of the Pricing Strategy and is being established under the National Water Act (Act 36 of 1998).

The WDCS is based on the polluter-pays principle and aims to:

- Promote the sustainable development and efficient use of water resources
- Promote the internalisation of environmental costs by impactors
- Create financial incentives for dischargers to reduce waste and use water resources in a more optimal way
- Recover the costs of mitigating water quality impacts of waste discharge.

1.1.1 Phases of the Project

The development of the WDCS has followed three phases:

- Phase 1: Review of international experience and formulation of a Framework Document
- Phase 2: Development of a draft WDCS strategy
- Phase 3: Establishment of the final strategy and implementable system.

Phase 3 is aimed at developing the strategy into a workable and implementable system that can be operated at a practical level, while ensuring that there will be sufficient resources, capacity and supporting systems to put the WDCS into practice.

Phase 4 will comprise the targeted, phased implementation of the WDCS in priority catchments, leading to the first review of the Pricing Strategy and Money Bill.

1.2 Objectives of this Document

This document serves as a synopsis of the WDCS thus far, and forms the basis for widespread stakeholder discussion and consultation on the proposed system and its implementation. As such, this document is a compilation of Phase 3 work presented to DWAF WDCS Policy Group (PG) and the WDCS Project Steering Committee (PSC). While further, detailed information is contained within those working documents (and has been discussed with the PG and PSC), this document draws out the key aspects and issues of the System.

Section 2 provides a discussion of the philosophy of the WDCS, including the polluter pays principle as the basis for the system, the legal mandate and the concept of acceptable impact.

Section 3 describes the technical elements of the WDCS, including the users and discharge constituents to be included in the System, the inclusion of non-point sources (NPS) and the charges of the System.

Section 4 discusses the institutional and organisational arrangements for the system, including the process of WDCS implementation, the systems requirements and the institutional arrangements for disbursement of WDCS revenues.

Section 4 also describes the financial and economic implications of the WDCS, and the conditions for exclusions, charge waivers and financial support.

Section 5 discusses some of the implementation considerations, including phasing of implementation and identification of priority catchments, key activities in implementation and a preliminary implementation timeline.

2 PHILOSOPHY OF THE WDCS

2.1 Polluter Pays Principle

An approach to addressing the risk of negative environmental impact is to impose liability on the party responsible for the activity resulting in such impact. This means that when an activity results in an environmental impact, the party in control of the activity (i.e. the polluter) has to pay the costs of that impact, the cost of remediating the impact, or compensate society for the impact incurred. This then is the foundation of the polluter pays principle – that the costs of environmental impact should be borne by those responsible for the impact.

2.1.1 Legal mandate

The supreme law of South Africa, the Constitution, provides through the Bill of Rights the right to an environment that is not harmful to health or well-being, and the right to an environment that is protected for the benefit of present and future generations. These rights are to be ensured through measures that prevent pollution and ecological degradation.

The National Water Act (NWA) (Act 36 of 1998) refers to the polluter pays principle and provides the mandate for using a pricing/economic mechanism to achieve effective and efficient water use. Specifically, the introduction to Part 1 of Chapter 5 of the NWA states:

> "Water use charges ... may also be used to achieve an equitable and efficient allocation of water. In addition, they may also be used to ensure compliance with prescribed standards and water management practices according to the user pays and polluter pays principles. Water use charges will be used as a means of encouraging reduction in waste, and provision is made for incentives for effective and efficient water use ...".

2.2 Acceptable Impact and Water Quality Objectives

It has been stated that "social construction of reality is a defining criterion in the creation of environmental values".[1] This implies that the acceptable level of environmental impact is necessarily subjective, as what constitutes an acceptable impact depends on the wants and needs of that society. For example, economies in transition have a real need for economic growth and development, and their comparative advantage over developed countries is often, at least in part, founded in that society's willingness to accept a higher level of environmental impact in exchange for social and economic benefits.

Five levels of acceptable risk may be identified to reflect society's acceptance of water quality impact:

Level 1: No impact (i.e. driving to zero emissions)

Level 2: Impact is incurred, but all costs associated with the impact are paid by those responsible for the impact

Level 3: Impact costs are paid by those responsible for the impact where water quality objectives are not being met and where directly quantifiable

[1] Vatn A. & Bromley D.W. 1997. Externalities - a market model failure. *Environ Resource Econ.* **9**(1): 135–151.

impacts on downstream users can be identified, even when water quality objectives are being met

Level 4: Impact costs are paid by those responsible for the impact only when water quality objectives are not being met

Level 5: All levels of impact are acceptable and no impact costs are paid.

Level 1 and 2 are most appropriate for developed economies where economic activity, levels of income and lifestyle choices are such that the cost of the impact to the individual and to society exceeds the benefits of incurring the impact.

For levels 3 and 4, the payment of impact costs is founded on the principle of acceptable impact, with water quality objectives as the measure of acceptable impact. Level 3 then requires that some impacts on downstream users are compensated, irrespective of whether environmental quality objectives are exceeded or not. Level 4 requires the payment of impact costs only where acceptable impact is exceeded.

Level 5 represents the extreme case where all degradation of the resource is accepted (i.e. all impact is acceptable).

2.3 Resource Quality Objectives

In the South African water resource management environment, the acceptable level of impact is hinged on the concept of the resource quality objectives (RQOs) as the balance between resource protection and resource development and utilisation. The setting of RQOs is catchment specific, based on the social, economic and political drivers for development and utilisation of a specific water resource, and reflects societal sanction of activities in the catchment.

Determining RQOs is an integral component of the Classification System and the development of a water resource Class. The White Paper on a National Water Policy for South Africa indicates that classification must be "through a process of consensus seeking among water users and other stakeholders", and that "the public trust places the responsibility on Government to make sure that environmental interests are represented". This reinforces the role that DWAF plays in setting the Class for water resources.

While the process of developing a Classification System is currently ongoing, the system will distinguish two further Classes, namely, a pristine water resource with high ecosystem value and extensive ecosystem services and functions, and a resource with significant social and economic activity (so-called 'workhorse' system).

Where RQOs associated with the Class are not being met, a phasing of targets (water quality objectives) will drive management of the dischargers, in order to achieve Class and RQOs over a realistic time horizon (Figure 1).

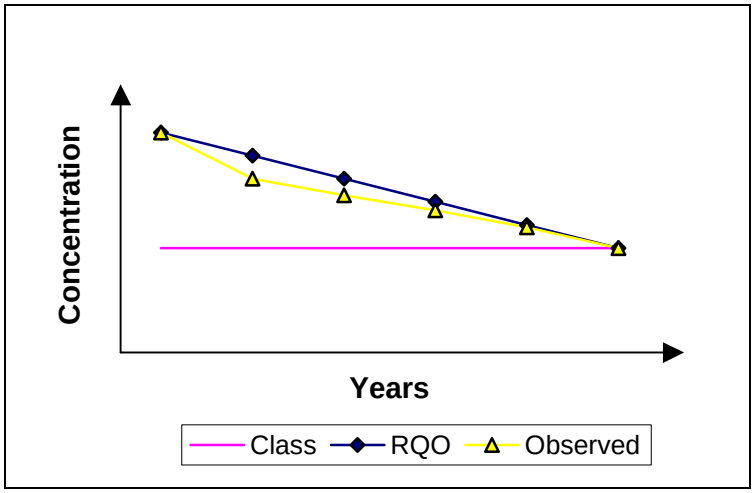

Figure 1: Proposed phasing of RQOs to achieve a defined Class over time

The Class embodies the acceptable level of impact and protection for a given water resource, and the RQOs may therefore be interpreted as representing the boundary between acceptable and unacceptable impact. Within the South African context, RQOs thus serve as the benchmark for implementing management interventions to address water quality concerns: where RQOs are being met, the level of impact to society from waste discharge is assumed to be 'acceptable', but where RQOs are being exceeded, management interventions should be deployed to achieve the RQOs. The WDCS is an economic/market-based instrument that serves as one such management intervention, to transfer the cost of the unacceptable impact to the polluters.

Since the calculation of WDCS charges is dependent on the setting of RQOS, the linkages will be reviewed should the methodology for setting RQOs change.

2.3.1 'Threatened' catchments

Certain catchments, although presently achieving RQOs, may experience growth in economic activity in the future, which will impact on the resources through: (1) increased waste load discharged and/or (2) increased water abstracted. Such growth is likely to result in RQOs being exceeded over time. These catchments are regarded as 'threatened' and represent a special category in the WDCS: in such catchments, the WDCS may be applied to ensure that RQOs are not exceeded. Charges and mitigation interventions will, under these circumstances, necessarily be significantly lower than in catchments where RQOs are already exceeded.

3 TECHNICAL ELEMENTS OF THE WDCS

3.1 Principles of the WDCS

Principle 1: RQOs are the basis for the WDCS

The WDCS is focussed on load reduction in order to achieve or maintain RQOs within a given catchment.

Following the preceding discussion on the levels of acceptable impact and owing to the economic needs of South African society (as a developing country), Level 4 is proposed for the current edition of the WDCS. This implies that the WDCS will only be applied where RQOs are not being met (or are being threatened). It may, however, be decided in time that Level 3 be adopted as the basis for implementation of the charge, or it may even be decided to move to Level 2, as the needs of society change.

The premise for this approach is:

- Where RQO are being met, the management of waste dischargers should be based on achieving specified discharge standards at minimum cost to the individual dischargers. The WDCS is not applied.
- Where RQOs are exceeded or are in danger of being exceeded, the management of waste dischargers should be based on achieving RQO, while minimising the total cost to the catchment. Under these circumstances the WDCS may be applied

As the Classification System is still in development, interim RQOs will have to be developed through the water resource planning process and the Internal Strategic Perspective (ISP). These interim RQOs will form the basis of the WDCS in the short term, while final RQOs will be determined through resource classification.

Principle 2: WDCS applies to surface water and groundwater resources

The WDCS applies to both surface and groundwater resources, where RQOs have been defined for the resource. A single approach applies to the calculation of the WDCS in both surface and groundwater.

The technical challenges of defining RQOs, identifying impact, determining required load reduction and understanding pollutant transport and assimilation, among others, are elucidated as part of the technical tools and process (modelling etc.) that support water resource management (WRM) in general and the implementation of the WDCS in particular.

Principle 3: Catchment scale

The WDCS will be applied at a catchment scale. The catchment area will be defined as those areas that have a significant impact on water quality, or are impacted by the specific water quality problem. This may, therefore, be an entire catchment in which a widespread water quality problem exists, or it may be a sub-catchment within a larger basin, which is bounded by large reservoirs and/or reaches in which RQO are being met.

Principle 4: Downstream/upstream RQOs

Where downstream RQOs are more stringent than upstream RQOs and downstream RQOs are exceeded or threatened, the WDCS may be applied in the upstream catchment even if the upstream RQOs are achieved.

Principle 5: Charge based on load

The WDCS will be based on load discharged. This approach has numerous advantages: (1) it avoids dilution of effluent to achieve cost reduction, (2) the approach is more equitable, as it does not disproportionately penalise small dischargers with relatively higher effluent concentrations and (3) it is simple to implement.

Although the load-based approach does not take cognisance of concentration-related toxic effects on the resource (through the discharge of high concentration effluents), this is not likely to be a problem as: (1) these effluents are controlled through other mechanisms, principally regulations, and (2) few industries actually produce effluents of such high concentration that significant local impacts are experienced before the effluents are diluted in the receiving resource.

Principle 6: constant charge rate

The WDCS is based on a linear relationship between load and charge, which implies a constant charge rate. This approach introduces simplicity in both the incorporation of the WDCS into DWAF information systems and in the calculation of the charge. Utilising an exponential relationship between charge and load discharged does not necessarily more closely represent the actual costs incurred by society and, as a result, may introduce significant economic inefficiencies.

Principle 7: subtraction of intake

Waste dischargers are liable for the additional load that they contribute to the resource, and discharge must accordingly be corrected for intake. This approach ensures that enterprises are not charged for the background concentration of the constituent of concern and that double accounting of load does not take place.

Where the discharger does not concentrate the effluent (i.e. discharge volume is equal to, or greater than intake volume) the intake load will be subtracted from the discharge load. Where dischargers concentrate effluent, the intake concentration is subtracted from the discharge concentration and multiplied by the discharge volume to calculate discharge load.

Principle 8: minimum load thresholds

The WDCS may identify a minimum discharge load below which the charge is waived. This principle introduces simplicity in the system and reduces management charges, as significant costs would be associated with administering the charge for small dischargers. Moreover, in many systems the small dischargers are not significant contributors to the defined water quality problem. However, this principle is not applied uniformly but is premised on an assessment of the catchment and of the small dischargers' contribution to the water quality problem.

3.2 Users Included in the WDCS

The following water uses require registration under Section 21of the NWA and impact on water quality:

- Sections 21(e): engaging in a controlled activity (of the NWA)
- Section 21(f): discharging waste or water containing waste into a water resource
- Section 21(g): disposing of waste in a manner which may detrimentally impact on a water resource

- Section 21(h): disposing of water which contains waste from, or which has been heated in, any industrial or power generation process
- Section 21(i): altering the bed, banks, course or characteristics of a watercourse

This includes a number of non-point sources (NPS):

- Disposal of effluent to land or facility (e.g. tailings dams, irrigated effluent, evaporation ponds, treatment wetlands)
- Disposal of waste to land or facility (e.g. landfill, waste-rock dumps, flyash disposal, solid waste disposal)
- Controlled land-use activities (e.g. confined animal facilities, dirty water systems).

All the water uses, with the exception of Section 21(i) use, will be charged under the WDCS. Section 21(i) is currently not charged under the WDCS, as such activities are rarely associated with significant contamination of the water resource, with the exception of the liberation of suspended solids, and as the methodology for determining load "discharged" into the resource has not yet been defined. Future versions of the WDCS may include Section 21(i) water use.

Section 21(j) water use – removing, discharging or disposing of water found underground – relates to dewatering from underground and requires another water use registration to discharge or dispose of the water e.g. Section 21(f) where the water is discharged into the resource or Section 21(g) where the water is discharged into a waste management facility. Accordingly, Section 21(j) water use is incorporated into the WDCS through the need for an associated Section 21(f) or (g) registration.

The WDCS also currently cannot change certain, important NPS, as they do not require registration under the NWA. Included in this group are: urban wash-off, overloaded, poorly maintained and failing infrastructure, wash-off from rural and peri-urban settlement and developments, pollution incidents, irrigation return-flow, dry-land agriculture and forestry, and extensive animal husbandry.

3.3 Constituents

The WDCS includes, but is not limited to, the following variables:

- Salinity: electrical conductivity (EC), chloride (Cl), sodium (Na) and/or sulphate (SO_4)
- Nutrients: soluble phosphorus (PO_4), nitrate (NO_3) and ammonium (NH_4)
- pH
- Heavy Metals: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), lead (Pb), nickel (Ni) and/or zinc (Zn)
- Organics: chemical oxygen demand (COD)

The charge will be estimated as a weighted combination of charges associated with the variables selected in a particular catchment. New constituents may be considered for inclusion where+: (1) concentration of the constituent exceeds defined RQOs, (2) the sources are identifiable and chargeable, (3) the constituent lends itself to the requisite

monitoring and evaluation, and iv) consultation with interested and affected parties on the inclusion of the constituent has taken place.

3.4 Approach to Non-Point Sources

NPS are included in the WDCS in essentially the same way as point sources: the charge is calculated based on the load discharged to the resource. However, estimating discharge load is complicated. In some circumstances, good estimates of load entering the resource from specific NPS facilities are available (following extensive monitoring, regional modelling or detailed technical research). Under such circumstances, the available estimates will be used to calculate charges.

However, estimations at that level of confidence are often not available. Under circumstances of information paucity, a desktop estimation of load entering the resource is required, based on the type and size of the facility, management practices, load disposed on to the facility and anticipated rainfall. These estimations are undertaken by the department and are developed in consultation with the affected stakeholder and the sector.

In estimating NPS contribution to waste load in a resource, two elements of NPS generation should be considered: (1) seepage of rainfall and run-off of stormwater from the facility producing the NPS discharge and (2) seepage or run-off of effluents discharged to the facility producing the NPS discharge.

Figure 2 describes the default approach to be followed in estimating NPS discharge, where information paucity precludes accurate determination of NPS discharge. Two pathways exist through which NPS pollution enters the surface water resource: (1) overland run-off and (2) subsurface seepage and groundwater flow, while aquifer contamination takes place through seepage and groundwater infiltration. In calculating the discharge estimated from each type of registered NPS, the equation articulated in the diagram (the sum of surface run-off and sub-surface flow, plus discharge to the aquifer) is deployed.

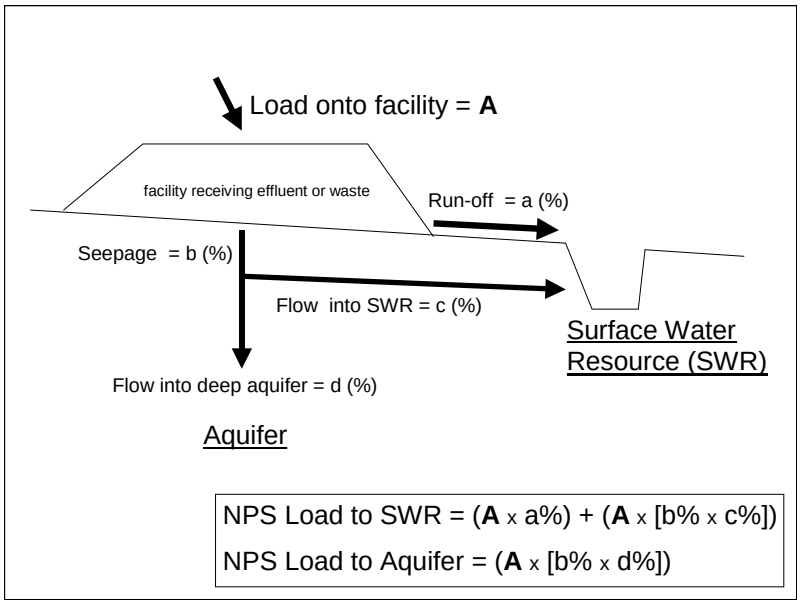

Figure 2: Approach to estimating NPS load discharged to the resource

In estimating the NPS load entering the resource, a proportion (percentage) is developed that relates the load discharged on to the facility and the volume of rainfall on to the facility to the NPS load entering the resource. This percentage varies with management practices at the facility, with three groupings distinguished: (1) best available technology leading to zero impact (BATZI), (2) standard requirements (standard practices) and (3) poor management practices.

- The facilities employing BATZI are demonstrated to have no diffuse discharge to the resource and are therefore allocated a zero percentage. The onus is on the enterprise to demonstrate BATZI, and the zero impact on the resource must be independently verified.
- It is anticipated that the majority of facilities will fall into the second management category, namely those that meet standard requirements. As these facilities are meeting the requirements developed by the Department (DWAF) to ensure minimum seepage or spillage to the resource, this category is allocated a relatively low percentage. Where minimum standards do not exist, these will be defined in consultation with the relevant sector stakeholders. Although it may, in theory, be desirable to have all facilities in the BATZI category, this is not necessarily economically, socially or politically acceptable or optimal. Accordingly, the WDCS should, in the first instance, drive enterprises towards achieving standard requirements. However, as the WDCS is benchmarked on RQOs, the WDCS will drive towards achieving better than standard practices where standard requirements are met but RQOs are still not being achieved.
- The facilities without specified management practices are allocated a significantly higher percentage, to reflect the greater proportion of discharge entering the resource from these facilities. As these facilities are not meeting standard requirements, one must distinguish between illegal activities and activities that have been granted some concessions. The WDCS is a tool in integrated water quality management and is deployed in conjunction with other regulatory and non-regulatory measures to achieve RQOs. The WDCS is not intended to control illegal activities. Accordingly, this management category relates to three conditions under which facilities are not meeting standard requirements and are granted a grace period to achieve such requirements, namely: (1) facilities granted concessions, (2) existing lawful use and (3) registered use that is not yet authorised.

An initial description of standard and poor practice for the various registered NPS is included in Appendix A. Initial (default) estimates of load entering the resource, for varying facilities and different sectors, are detailed in Appendix B. The NPS methodology outlined here, along with the estimates of load entering the resource, was developed by sector task teams.

An important principle of the inclusion of NPS in the WDCS is that this does not absolve industry from long-term liabilities (e.g. closure fund). The WDCS applies to the load entering the resource in the current year, and does not address future liabilities. Accordingly, the closure funds or similar long-term financial planning should make allowance for ongoing WDCS charges following decommission of operations and/or cessation of activities.

3.5 Charges of the WDCS

The WDCS can be conceptualised as two distinct components: (1) water use charges that provide a disincentive or deterrent to the discharge of waste, based on the use of the resource as a means of disposing waste (Incentive Charge) and (2) water use charges to cover the quantifiable costs of infrastructure or other measures undertaken in the resource for the mitigation of waste discharge-related impacts to achieve resource quality objectives within a catchment area (Mitigation Charge).

3.5.1 Incentive Charge

The main purpose of the Incentive Charge is to ensure the optimal use of the resource for discharging or disposal of waste through an economically efficient mechanism. The charge is based on charging for the use of the resource rather than directly on recovering costs and, fundamentally, seeks to change discharge behaviour. Accordingly, the Incentive Charge constitutes an environmental tax and requires the promulgation of a Money Bill.

3.5.1.1 Principles

The charge is based on the minimum charge rate required to incentivise dischargers to reduce effluent loads at source, such that RQOs are achieved in the resource. The theoretical basis for the charge assumes that when the Incentive Charge is greater than the cost of treatment for a given enterprise, and given sufficient capital resources to cover capital expenditure, the enterprise will reduce its effluent load at source rather than incur the Incentive Charge. This approach to calculating an Incentive Charge was preferred over the theoretically elegant approach of computing and internalising externalities. Comparison of the two approaches is detailed in Appendix C.

The Incentive Charge is therefore based on the charge rate at which sufficient enterprises in the catchment will reduce their effluent load at source such that the resultant cumulative load reduction within the resource achieves the RQOs.

The Incentive Charge is defined to affect discharge behaviour, rather than recover costs and, therefore, constitutes an environmental tax, which requires the promulgation of a Money Bill. The Money Bill is valid for only five years, after which it will have to be tabled again.

As the Incentive Charge is not related to costs incurred (i.e. it does not constitute cost recovery), the charge will raise surplus revenue. It is proposed that this surplus revenue be earmarked for targeted disbursement back to the catchment of origin. These institutional and financial implications of the Incentive Charge are explored in detail in the relevant sections.

As the Incentive Charge is premised on RQOs, the charge is applied at a catchment level.

Since the Incentive Charge seeks to change actual load discharge, the charge is based on the monitored discharge load.

3.5.1.2 Calculation

Methodologically, the Incentive Charge requires that the cost of reducing the load at source is quantifiable. It is acknowledged that such costs change (increase), as additional operational/technical adaptation or alternative treatment technologies are required to remove progressively more load. Accordingly, for a given industry, it is

anticipated that a range of costs can be defined, with each cost associated with an incremental reduction in effluent load.

The charge rate is calculated from an analysis of all costs of load reduction: the charge rate is set at the lowest unit cost of load reduction at source for which the cumulative load reduction in the resource achieves the RQOs (Figure 3).

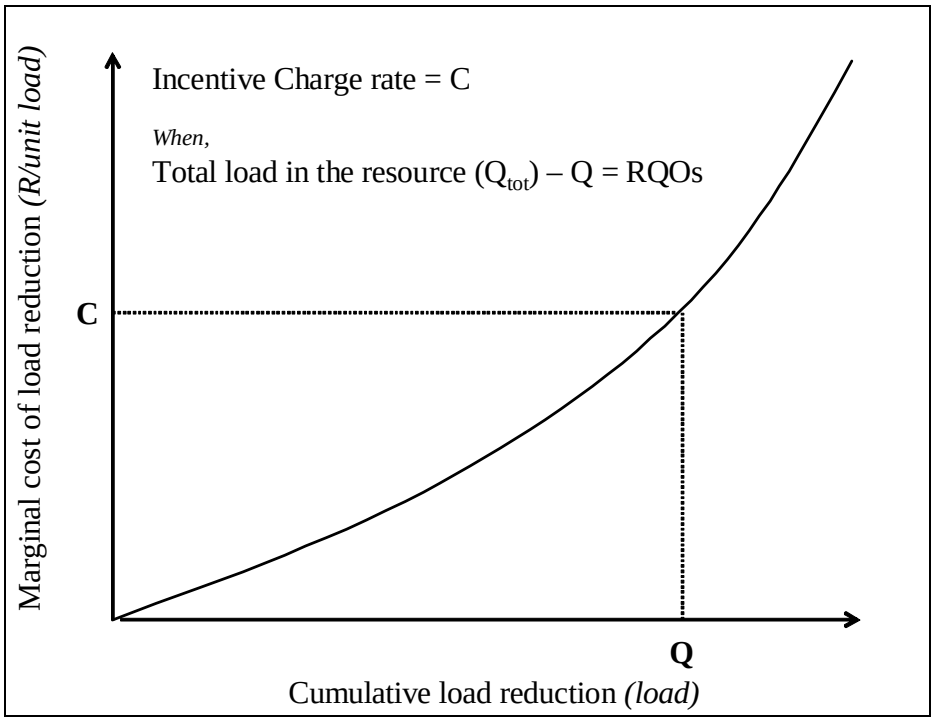

Figure 3: Relationship between marginal cost of load reduction and cumulative load within the resource

The following equation is proposed for calculating the Incentive Charge for variable i to a specific discharger (k)[2]:

$$Cl_{ik} = F.Rl_i.[(Cd_{ik} . Vd_k) – (Ca_{ik}.Va_k)]$$

where:

Cl_{ik}	=	Incentive Charge for discharger k
F	=	phasing factor
Rl_i	=	constant Incentive Charge rate
Cd_{ik}	=	discharge concentration of variable i (monitored) from discharger k
Ca_{ik}	=	abstraction concentration of variable I (monitored) for discharger k
Vd_k	=	discharge volume (monitored) from discharger k
Va_k	=	abstraction volume (monitored) for discharger k

If discharger k is concentrating effluent (i.e. $Vd_k < Va_k$), the Incentive Charge equation would read:

$$Cl_{ik} = F.Rl_i.[(Cd_{ik} – Ca_{ik}).Vd_k]$$

[2] Discharger k is NOT concentrating effluent (i.e. $Vd_k > Va_a$)

Accordingly, the Incentive Charge for a given discharger is simply the product of the Incentive Charge rate (flat rate) and the load that that discharger is contributing to the resource (Figure 4).

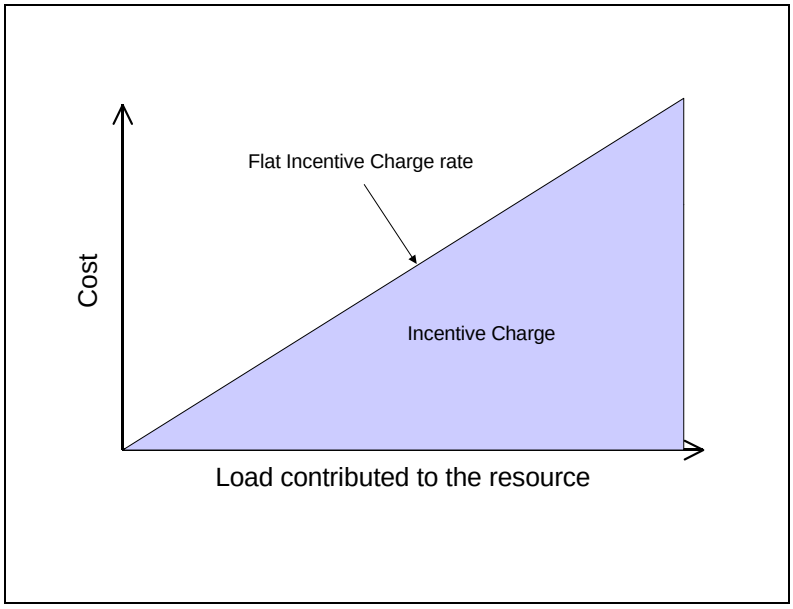

Figure 4: Relationship between Incentive Charge and load contributed (added) to the resource

3.5.2 Mitigation Charge

3.5.2.1 Principles

The Mitigation Charge is a user charge to recover the costs of mitigation measures undertake in the resource. It is intended for application where mitigation in the resource provides an economically efficient option to support the achievement of RQO in a catchment, in comparison with the costs of reducing effluent load at source (i.e. Incentive Charge).

The Mitigation Charge is a user charge that will be established in terms of the Pricing Strategy under the National Water Act (NWA), and therefore it must be focused on the recovery and disbursement of quantifiable costs incurred in the mitigation of waste discharge. Accordingly, while the mitigation charge should influence dischargers to reduce their discharge loads, it must be defined around the cost of mitigation.

As with the Incentive Charge, the Mitigation Charge is applied at a catchment level. In some cases, the catchment area will extend downstream of the location of the mitigation measure, in that an upstream measure may allow downstream dischargers to continue discharging higher loads.

Although sectors or group of dischargers may rarely collaboratively undertake a multi-stakeholder mitigation measure in the resource, a water management institution (e.g. CMA) is generally better placed to take administrative responsibility for the mitigation measure, with the costs of the measure/s transferred to the dischargers.

The Mitigation Charge will be calculated to include non-registered NPS, so as not to prejudice the registered dischargers. DWAF will cover that portion of the Mitigation Charge associated with non-registered NPS.

As the Mitigation Charge is a cost recovery measure and therefore requires stable capital flows, registered discharge is used as the basis for charge calculation.

3.5.2.2 *Calculation*

The Mitigation Charge is a requited payment and, as such, seeks to recover the costs of developing, operating and maintaining the mitigation measure. The charge is therefore simply the total cost of the mitigation measure distributed among the various waste dischargers according to the individual discharge load (i.e. a flat charge rate).

The following equation is proposed for calculating the Mitigation Charge to a specific discharger (k) for mitigation measure X and variable i:[3]

$$CM_{xik} = RM_{xi}.[(Cd_{ik} . Vd_k) – (Ca_{ik}.Va_k)]$$

where:

CM_{xik} = Mitigation Charge for discharger k, for mitigation measure x and water quality variable i

RM_{xi} = constant charge rate for mitigation measure x and variable i

Cd_{ik} = discharge concentration of variable i (registered) from discharger k

Ca_{ik} = abstraction concentration of variable i (registered) for discharger k

Vd_k = discharge volume (registered) from discharger k

Va_k = abstraction volume (registered) for discharger k

If discharger k is concentrating effluent (i.e. $Vd_k < Va_k$), the Mitigation Charge equation would read:

$$CM_{xik} = RM_{xi}.[(Cd_{ik} – Ca_{ik}).Vd_k]$$

Where mitigation measures are employed in the resource, the incentive charge rate will be reduced owing to the deployment of an economically more efficient mitigation measure in the system (Figure 5). Through the employment of the mitigation measure, the cumulative load reduction required in the resource is decreased, enabling a lower incentive charge rate. This reduction in the incentive charge rate is essential to ensure sector/enterprise buy-in to the mitigation measure in the resource, as their cumulative cost (i.e. cost of mitigation in the resource and the incentive charge) is lower than the incentive charge when mitigation in the resource is not employed.

[3] Discharger k is NOT concentrating effluent (i.e. $Vd_k > Va_a$)

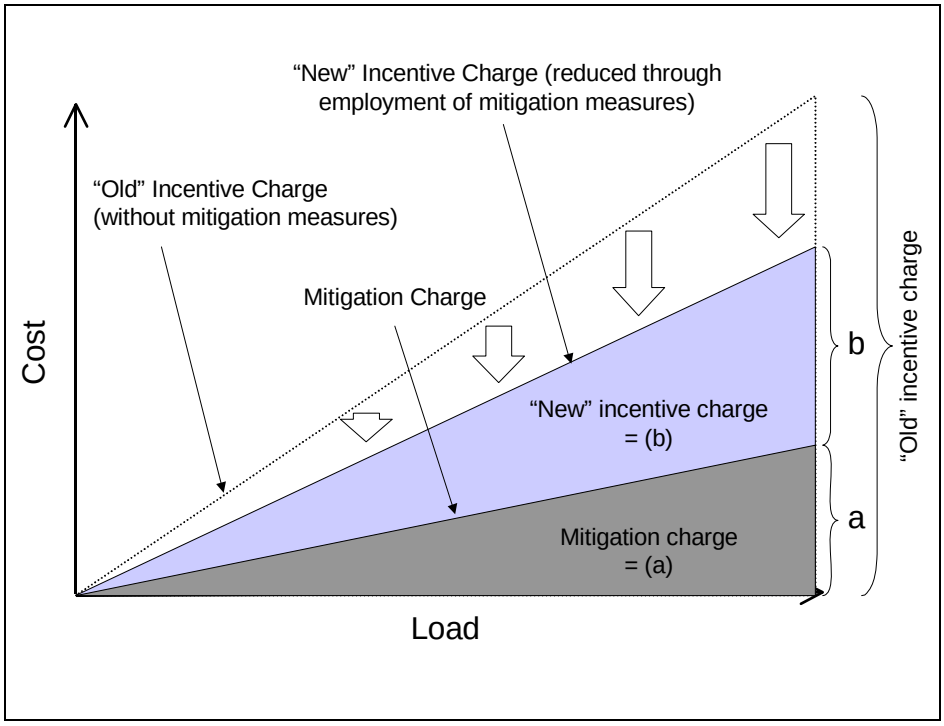

Figure 5: integrated Incentive and Mitigation Charge rate

3.5.2.3 *Types of mitigation measures*

Four categories of the mitigation charge can be identified:

Type 1: Mitigation through removal of load from the resource

- Regional mitigation scheme or infrastructure

This approach enables the recovery of costs for developing and operating regional schemes (infrastructure) for the mitigation of water quality problems within the resource, but may be extended to include regional schemes that collect and treat waste from a number of dischargers before it enters the resource. The approach is particularly relevant primarily in 'workhorse' systems, where RQOs are set low for social, economic or political reasons but where downstream user impacts need to be mitigated (to ensure 'fitness-for-use').

- Regional mitigation project (limited capital costs)

This approach is similar to the first approach, except that there is no significant capital requirement. It enables the recovery of costs associated with a regional water quality mitigation project in a catchment area, such as eutrophication management through destratification within downstream impoundments.

Type 2: Water resource system operation for water quality management

This approach enables the recovery of costs associated with the management of river-reservoir systems designed to reduce the impact of water quality problems. This may include dilution, blending or purging of poor quality water to achieve specific targets/objectives, which may result in a reduction in yield of the system or use of a more expensive source for consumptive use.

Type 3: Mitigation to downstream users through downstream treatment costs

This approach allows for the recovery of costs incurred in developing and operating additional treatment requirements for downstream users (for water quality that does not meet specified resource quality objectives), such as processes required for the treatment of water abstracted from a eutrophic water resource.

Type 4: Treatment at source

This last approach enables optimal treatment at source and would be particularly relevant where the dischargers are generally meeting discharge standards, but this is not adequate for achieving the resources quality objectives. Instead of requiring all dischargers to further reduce their discharge, this approach would propose the most cost-effective treatment options on a limited number of dischargers to meet the objectives. The cost of these options would be borne by all dischargers, as they would all benefit, which is analogous to an administrative waste load trading approach.

4 INSTITUTIONAL ARRANGEMENTS

4.1 Alignment with Water Resource Management (WRM) Systems

WRM takes place within the context of water resource planning, including development of a catchment management strategy (CMS) and a water resource management plan (WRMP). The CMS is a participatory and consensus-seeking process undertaken at the water management area (WMA) level, and defines the objectives of WRM within the WMA. Through the WRMP, the CMS articulates the water quality objectives and the measures/instruments to be deployed to achieve those objectives. The resource Class and the RQOs are determined through an iterative process with the CMS; recommendations for resource Class and RQOs come out of the CMS and the WRMP processes (Figure 6).

Where a resource quality problem is identified through the WMA assessment, the CMS and the WRMP (resource planning), a number of related and integrated measures for achieving RQOs are defined. These measures include authorisation (licensing) and various water use regulations, non-regulatory tools (e.g. awareness creation) and economic measures, such as the WDCS. These instruments are deployed in an integrated fashion to achieve RQOs over a given planning horizon, considering both present use and future needs within the WMA.

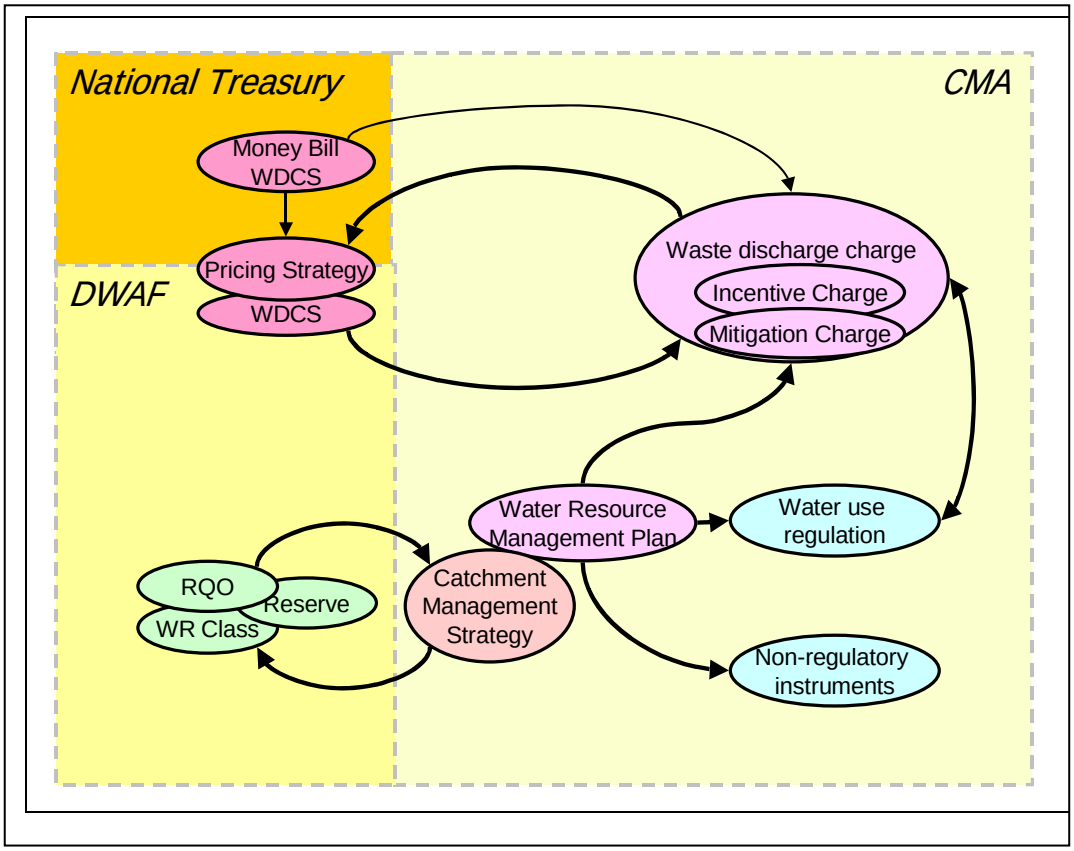

Figure 6: The WDCS within the context of WRM

Implementation of water resource management measures (including the WDCS) is monitored and evaluated, through the monitoring of the resource and of water use (abstractors and dischargers) to assess the achievement of objectives. Implementation

of the WRM measures is thereby evaluated and recommendations on improvements and alterations developed for incorporation during periodic review.

Accordingly, the WDCS is implemented in a catchment as part of a CMS and through a WRMP, and is premised on the RQOs (the Classification System) as the measure of acceptable impact. The WDCS is one instrument in an integrated approach to managing water quality problems in a catchment, and is deployed in an integrated fashion with authorisation and regulations, and non-regulatory measures.

Four conceptual phases of water resource management (WRM) can be identified: *plan*, *do* (implement), *check* (monitor and audit) and *act* (review). The WDCS is one of the instruments in an integrated WRM environment and, accordingly, all four phases of the WRM process are relevant to the WDCS (Figure 7). The WDCS and its implementation is monitored and evaluated against the defined objectives. Lessons and considerations arising from this evaluation inform the adaptation of the WDCS during the five-yearly review of the WRMP, Pricing Strategy and Money Bill.

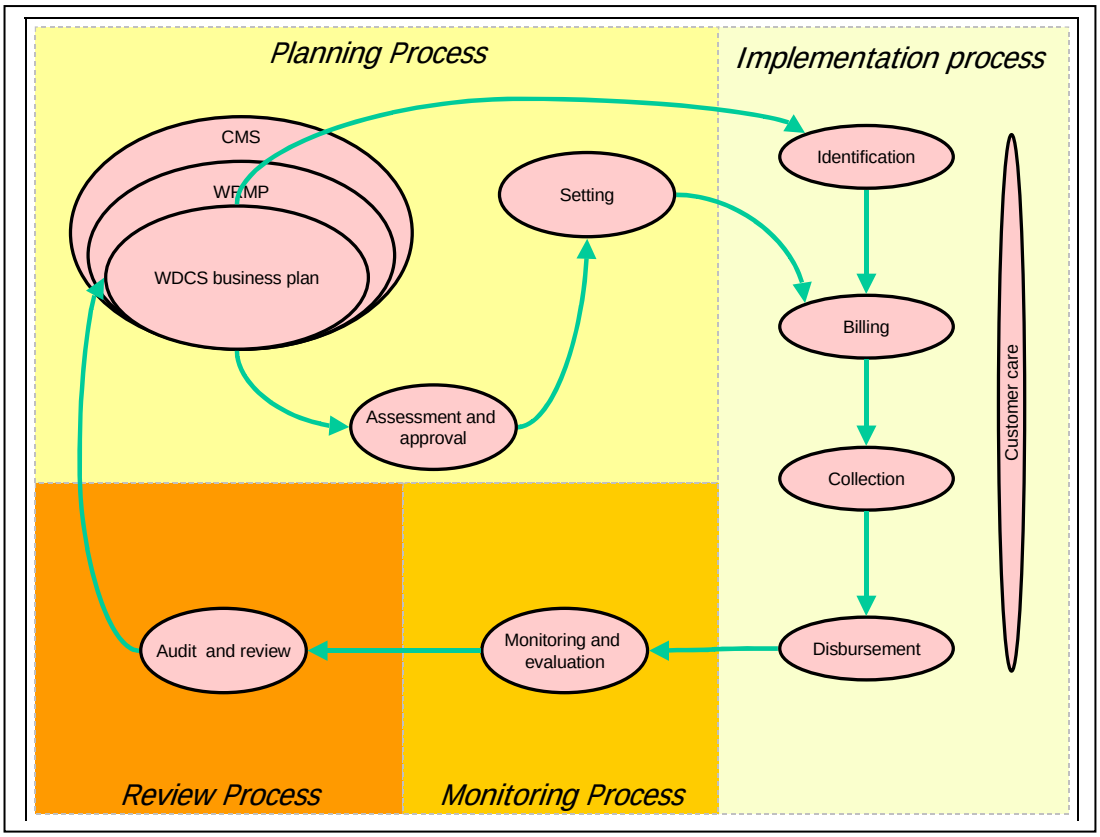

Figure 7: The WDCS planning and implementation process

4.2 WDCS business plan

Implementation of the WDCS requires the development of a WDCS business plan. The WDCS business plan details the procedures, considerations, implications and planning cycle for the implementation of the WDCS. Importantly, the plan forms the template for the implementation of the WDCS and is therefore the means by which the CMA monitors the implementation of the System, while DWAF audits and reviews the WDCS and, in part, the CMA. In particular, the WDCS business plan describes:

- Why the WDCS is being deployed (i.e. the nature and impact of the water quality problem, linked to resource Class and RQOs)
- Who will be charged (i.e. registered discharge within the target catchment/s)

- What they will be charged (i.e. the technical process of charge determination)
- How the charge will be implemented
- How the funds arising from the charge will be managed and disbursed.

The business plan has four components: (1) the technical plan, (2) the financial plan, (3) the management plan and (4) the implementation plan.

The business plan will adopt a three-year projection to coincide with the medium term expenditure framework (MTEF), but will be reviewed annually as part of the tariff-setting process.

4.2.1 Content of the Business Plan

4.2.1.1 Technical plan

The technical plan details:

- Analysis of the water quality problem, including where RQOs are exceeded or threatened and the reduction in load require to achieve RQOs
- Use of the resource – including dischargers, magnitude and location of discharges, taking future use into consideration
- Evaluation of load reduction options, including the assessment of mitigation measures in the resource and at source, and linkages with other regulatory or non-regulatory measures for reducing load in the resource
- Financial evaluation, including the unit cost of load removal for the various load - reduction options identified
- Calculation of the charge rate for the Incentive Charge and the Mitigation Charge
- Recommendations on charge rate and the development of tariff tables.

4.2.1.2 Financial plan

The financial plan articulates the financial considerations of implementing the WDCS. In particular, the plan explores the mitigation measure/s to be employed within the resource in terms of the cost of the measure, the sources of finance (debt) and the funding of the measure, including the charges to be recovered to meet operating costs and capital repayments. The plan also explores the assumptions underpinning cost-recovery on the mitigation measure. The plan details financial and revenue management for the mitigation measure, as well as the institutional arrangements to support disbursement.

Financial considerations of the Incentive Charge are articulated, specifically the anticipated revenue streams arising from the charge and the proposed disbursement for the Incentive Charge.

4.2.1.3 Management plan

The management arrangements contained in the WDCS business plan describe the management structures and systems to support implementation of the technical and financial components of the business plan, including organisational design and human resource considerations and information systems. The management arrangements also describe monitoring and evaluation of the implementation of the WDCS, detailing the

indicators and system chosen for discharge monitoring, water resource monitoring, and fiduciary and governance monitoring.

4.2.1.4 Implementation plan

The implementation plan details the proposed implementation of the WDCS in the target catchment and, in particular, the milestones to be achieved in meeting RQOs and reducing pollutant load at source.

4.2.2 Institutional responsibility for the WDCS business plan

The development of the WDCS business plan is the responsibility of the CMA, with input and technical support from DWAF (Regional Office).

The business plan is assessed by DWAF to ensure that the plan is consistent with national strategic objective, that the principles of good governance are espoused, that fiduciary responsibilities are clearly articulated, and that financial management and disbursement is appropriate. DWAF develops a consolidated WDCS business plan, comprising the key elements of the catchment WDCS business plans, to be submitted to National Treasury for assessment.

The recommended charges are considered by DWAF and National Treasury (in the form of a consolidated plan) and, if deemed appropriate, the tariffs tables are gazetted.

A business plan per catchment, rather than a business plan per water management area (WMA), is most appropriate, to accommodate the situation in which there is more than one WMA in a catchment (e.g. Vaal and Orange river catchments).

In cases where an upstream and downstream WMA can be identified and where the water quality problem potentially stretches across WMA boundaries, the WDCS business plan will be developed by DWAF in order to ensure an integrated approach and equitable representation of upstream and downstream interests. Such a business plan will comprise sub-plans devised at a WMA level. Sub-plans are implemented by the respective CMAs, with DWAF Regional Office, as the custodian of the WDCS business plan, playing an important oversight, monitoring and evaluation function to ensure consistency.

4.3 Registration and information

The current version of the WDCS applies only to registered discharge, with the Incentive Charge based on monitored load, while the Mitigation Charge is based on registered load. This implies that dischargers must be registered before the WDCS can be implemented in a given catchment.

To this effect, an extensive country-wide registration process is imminent, not only to create the database for potential implementation of the WDCS, but also to generate data on the extent of waste discharge and the nature of the discharge (e.g. sectors, point source vs non-point source).

Similarly, at a WMA and a catchment level, waste discharge information must be gathered and updated during the planning process in order to enable the identification of dischargers and the implementation of the WDCS.

4.4 Billing and debt collection

4.4.1 Invoicing

Waste discharge charges and tariff tables are developed in the WDCS business plan, reviewed and approved by DWAF, and incorporated into the information system. Together with the register of waste discharge, this information generates the WDCS invoices.

Billing will be integrated with DWAF's existing systems. From a customer-care perspective, the number of invoices issued should be limited, and invoicing should be as transparent and comprehensible as possible. Different water invoices may be raised at different frequencies of billing for different charges. This would be confusing to water users and should be avoided as far as possible. Revenues must be channelled to different accounts for different purposes. The WRM charge, water resource Infrastructure Charge, WDCS Mitigation Charge and WDCS Incentive Charge revenue streams must be differentiated:

- WRM charges are retained by the CMA to fund its activities
- The Infrastructure Charge is retained by DWAF (ultimately by the National Infrastructure Agency) to cover the costs of developing, maintaining and operating augmentation infrastructure
- The Mitigation Charge is administered for disbursement to the operators of the mitigation measure
- Incentive Charge revenue is submitted to National Treasury (National Revenue Fund).

The differentiation of the charges therefore facilitates the routing of revenue and assists in the auditing of the billing process. Moreover, in order to motivate the earmarking of the Incentive Charge, clear separation of this revenue from other revenue will have to be demonstrated, so as to ensure that these funds are not used for other purposes.

To facilitate such differentiation of revenue, while maintaining customer care, billing will be by means of a single invoice, with charges separated by line items on the invoice. As the Infrastructure Charge is administered by DWAF/National Infrastructure Agency, it will be managed through a separate invoice/collection cycle.

4.4.2 Debt collection and revenue management

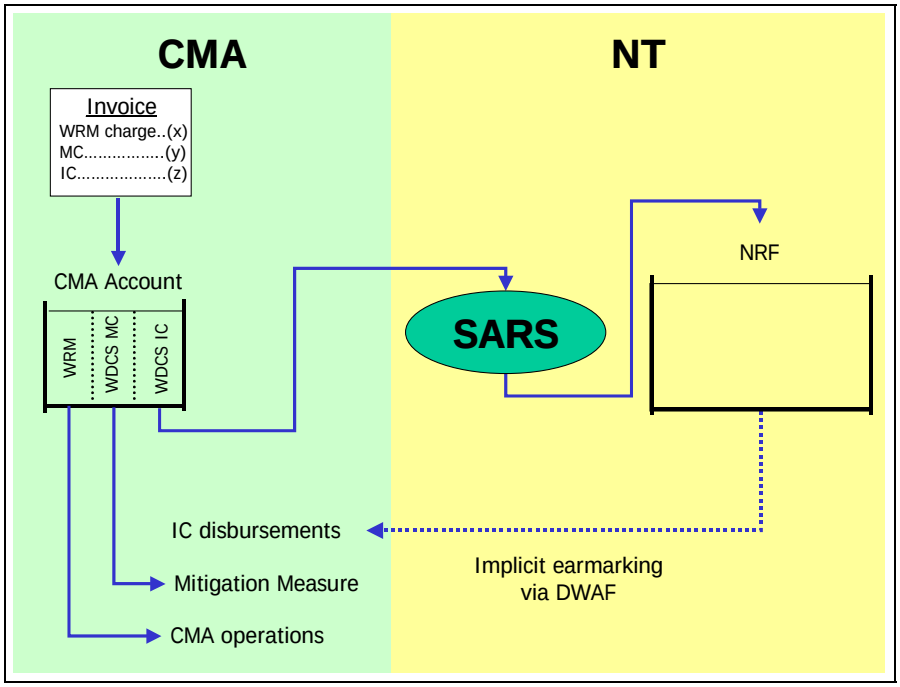

Figure 8: proposed revenue flow for the WDCS revenue (and WRM revenue), from a single invoice

Figure 8 shows the proposed revenue flow for the WDCS and WRM charge from a single invoice. The separation of line items on the single invoice will enable differentiation of the collected revenue within the 'CMA account'.[4]

The CMA assumes responsibility for charge collection and debt management. Where partial payments are encountered, the cost recovery charges are recovered first, starting with the WRM charge. The CMA must manage debt, including the calculation of interest on arrears, and must account for debt and associated interest in its financial statements.

The Incentive Charge is an environmental tax, and Incentive Charge revenue must therefore be submitted to the South African Revenue Service (SARS) along with the requisite reconciliation and verification, for deposition in the National Revenue Fund (NRF). Implicit earmarking has been agreed with National Treasury. Implicit earmarking implies that money can be allocated from the NRF for targeted disbursement based on approval by National Treasury of a consolidated disbursement plan submitted by DWAF. This allocation follows the normal budgetary process of parliamentary appropriation. Significantly, an allocation through implicit earmarking is not restricted by the amount of revenue generated through the Incentive Charge, and disbursement is not guaranteed but rather based on an appropriate motivation for disbursement.

4.5 Customer care

The WDCS planning and implementation process has some important stakeholder participation and customer care implications.

Wide consultation and stakeholder engagement is required in the planning process, including resource classification, the catchment management strategy (CMS), the

[4] While CMAs are being established, this is the DWAF Trading Account.

water resource management plan (WRMP) and the WDCS Business Plan (including WDCS tariffs).

Customer care functions are introduced into billing, collection and debt management, and the disbursement cycle. Mechanisms must be established by the implementing agent whereby customers can seek clarity on tariffs, charge calculation and disbursements. Recourse to appeal and dispute-resolution mechanisms must be developed at the CMA level, with escalation to the Water Tribunal should local resolution not be achieved. The Money Bill will have more stringent consultation requirements with respect to the setting and implementation of the Incentive Charge.

4.6 Institutional arrangements for the Mitigation Charge

The Mitigation Charge is a requited payment in that it recovers costs associated with mitigation measures undertaken in the resource. The Mitigation Charge is implemented as part of a CMS and WRMP. The mitigation measure/s and associated charge is described in the WDCS Business Plan, along with the institutional and organisational arrangements for implementation. As part of the CMS, WRMP and WDCS Business Plan process, the implementation of a mitigation measure and Mitigation Charge are extensively consulted with stakeholders.

The institutional arrangements to enable the implementation of a mitigation measure are crucial to its acceptability and sustainability. This requires:

- Effective planning and consultation of the measure, including clear budgeting and phasing in of the charge to enable dischargers to plan and budget accordingly
- Unambiguously defined institutional responsibilities of dischargers towards cost recovery, particularly where capital costs are incurred and must be recovered ('barriers to exit')
- Clear institutional roles and responsibilities for operating and maintaining the measure, which may involve existing and/or new organisations
- Clear institutional responsibilities and accountability for the financing of the mitigation measure/s, the collection of charges, and the management or disbursement of funds
- Clearly defined financial support or subsidy arrangements for the measure or particular dischargers, taking account of issues such as redress and affordability.

4.6.1 Mitigation through removal of load

This type of user charge raises a number of institutional challenges regarding the funding of the scheme and the obligation of users to contribute to the scheme over the long term. Assuming that agreement has been reached by users concerning the need to build a regional mitigation scheme, the funding model and operational arrangements also need to be agreed upon.

This type of arrangement is essentially a partnership in which private capital and expertise are utilised to provide services to users on behalf of the public sector. A water user association (WUA), another water institution (Infrastructure Agency or Local Government) or private company are likely to be the most appropriate bodies to develop and operate the scheme. The project is funded through the recovery of capital

and operating expenditure from mitigation charges over a fixed term, which matches the funding term of the project. In this regard, various models and user guidelines have been developed by National Treasury, which are applicable in this case.

The role of the CMA is critical in mobilising the dischargers in the area and obtaining their buy-in and agreement to finance the scheme. In all likelihood, the funders of the project will insist that all dischargers (and possibly the CMA) agree to be co-principal debtors (and/or provide covering security), or at the very least remain contractually bound to participate in the project (via the payment of their user charges) for a period matching the term of the loans provided. There may therefore be a range of contractual agreements put in place between the operator, the dischargers and the funders.

The generic institutional model envisaged by this type of scheme is illustrated in Figure 9. The effective and efficient operation and maintenance of this type of scheme is critical, requiring a dedicated organisational responsibility, which may be linked to the membership vehicle (particularly a WUA) or may be a contracted public or private entity. Similarly, financial accountability and responsibility must be clearly defined and should be linked to project implementation responsibility, whether this is public or private money.

Where there is limited capital expenditure required for an intervention, the same institutional arrangement may apply, but with the likely exclusion of project funders. In this case, working capital would be provided by the CMA.

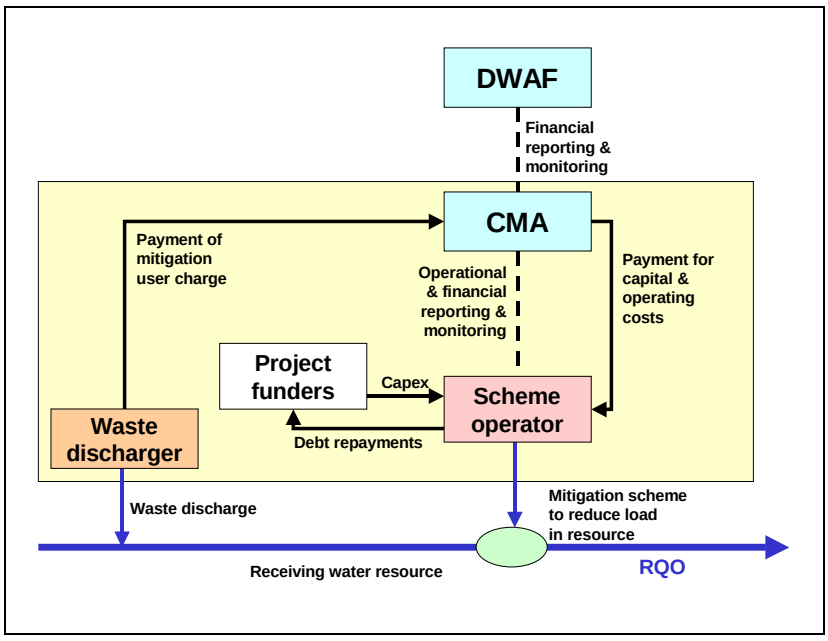

Figure 9: Institutional arrangement for mitigation to reduce load

4.6.2 Water resource system operation for water quality management

This type of project utilises mitigation charges to pay for the costs incurred in implementing specific water quality related mitigation activities. The quantifiable cost associated with reduced yield may be based on the marginal or average cost of raw water from the system, which should be recovered from the waste dischargers rather than the abstractors that are dependent on the system. This would result in an abstraction charge based on the maximum yield of the system. The shortfall in revenue associated with reduced yield would be collected from the dischargers.

The CMA has an obligation to monitor and verify the yield information and cost of supply used in the setting of a mitigation charge. A water resource infrastructure operator (DWAF, WUA, Water Board or private operator) implements the agreed mitigation activities and is reimbursed by dischargers via the CMA (which monitors the effectiveness of implementation).

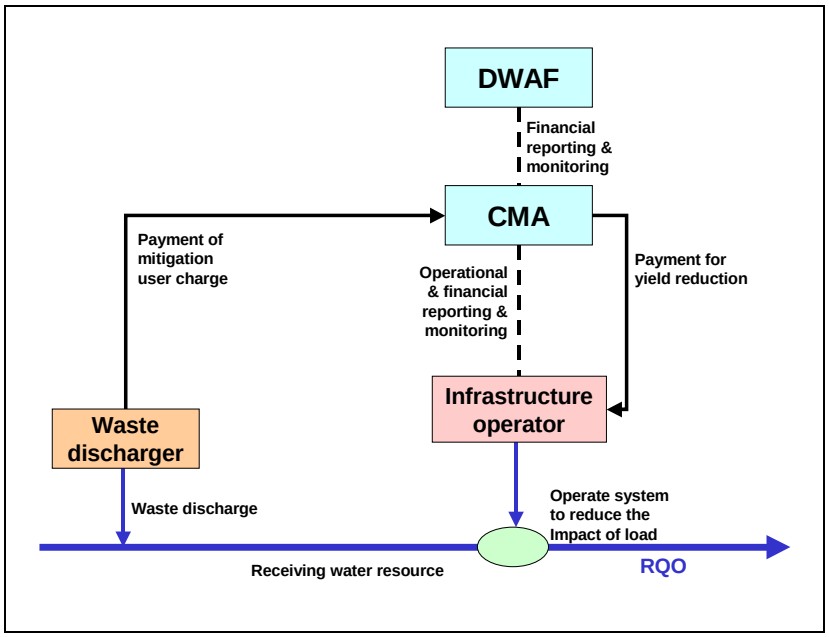

Figure 10: Institutional arrangement for water resource system operation for water quality management

4.6.3 Mitigation to downstream users (treatment costs)

Mitigation to downstream users may include capital and operating costs on the observed and expected water quality, some or all of which may be recovered through discharge-based charges. The additional capital costs for treatment beyond the specified RQOs would be recovered over the design life of the treatment facility.

In this scenario, the operating responsibility for any treatment facility would remain with the downstream water user or service provider, but this approach would be implemented through a financial transfer to the operator and/or capital repayment budget of the relevant organisation responsible for treatment. In this case, the responsibility for raising any capital for the facility would remain with the water user/service provider, but with an expectation of income from upstream dischargers.

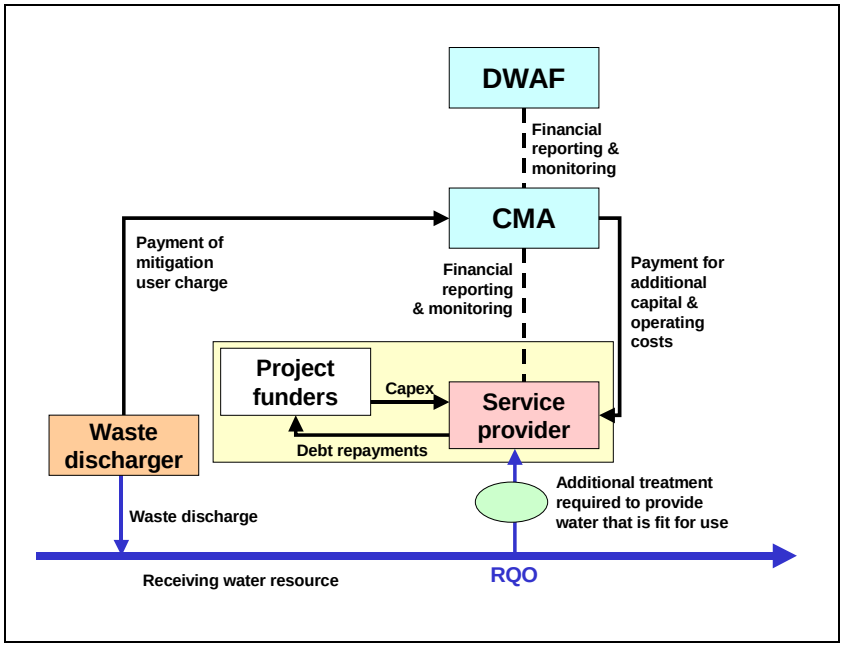

Figure 11: Institutional arrangement for downstream treatment

4.6.4 Treatment at source

Dischargers will implement source load reduction are fully responsible for the development and operation of the technology and/or systems. The CMA provides the funding stream to ensure that the discharger that develops the source treatment facility recovers at least some of the capital and operating costs from the other dischargers over an agreed design life.

The source treatment facility may be funded by the principal discharger via debt financing. In order to access such funding, the other dischargers (and possibly the CMA) will in all likelihood be required to (1) act as co-principal debtors and/or (2) provide additional security and (3) agree to be contractually bound to participate in the project (via the payment of user charges) for a period matching the term of the loans provided.

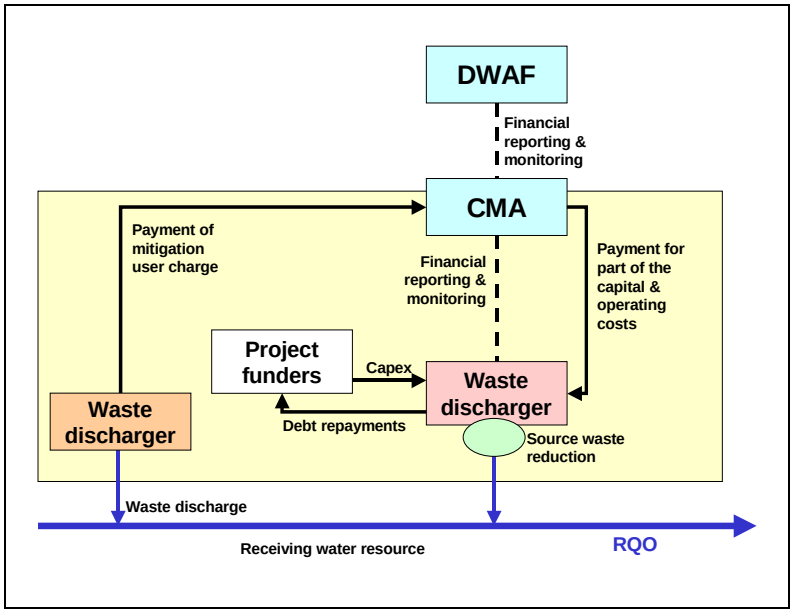

Figure 12: Institutional arrangement for mitigation to reduce load at source

4.7 Disbursement of the Incentive Charge revenue

The Incentive Charge is an unrequited payment, which therefore has the potential to raise a significant amount of surplus revenue. It has been agreed with National Treasury that this revenue is earmarked (through implicit earmarking) for targeted disbursement, so as to address some of the impacts arising from the discharge of waste.

Implicit earmarking of environmental tax revenue is gaining widespread support within the environmental tax community. The Double Dividend hypothesis is the strongest argument supporting earmarking of Incentive Charge revenue. The first dividend is realised through the progressive reduction in pollution load and the concomitant protection of environmental goods and services that is achieved by taxing pollution (on the basis of the polluter pays principle). The second dividend is achieved through the disbursement of collected revenue in the catchment of origin for investment in public goods or in measures to support further environmental protection.

The flow of Incentive Charge revenue is outlined in Figure 8. The principles of implicit earmarking imply that the allocation of tax revenue for targeted disbursement is not constrained by the revenue collected in that catchment, nor is the allocation guaranteed. Instead, where a clear case can be established for targeted disbursement to address some of the impacts arising through the discharge of waste, a specific allocation will be granted through the normal budgeting process.

Accordingly, in the WDCS business case, CMAs will develop motivations for targeted disbursement of tax revenue. These motivations will include a needs analysis and detailed descriptions of financial and management arrangements. DWAF will collate all proposals for the allocation of tax revenue into a consolidated disbursement plan, which is presented to National Treasury. Funding allocations through the budgeting process are made over an MTEF planning horizon. Funds are allocated to DWAF for transfer to approved disbursements. Where such monies are transferred to the CMA, the CMA is audited on the expenditure of funds, based on the agreed financial and management plans developed in the WDCS business case and disbursement motivation (Figure 13).

National Treasury will monitor and evaluate, over time, whether the Incentive Charge is achieving its objectives of persuading dischargers to reduce effluent load and/or internalise externalities.

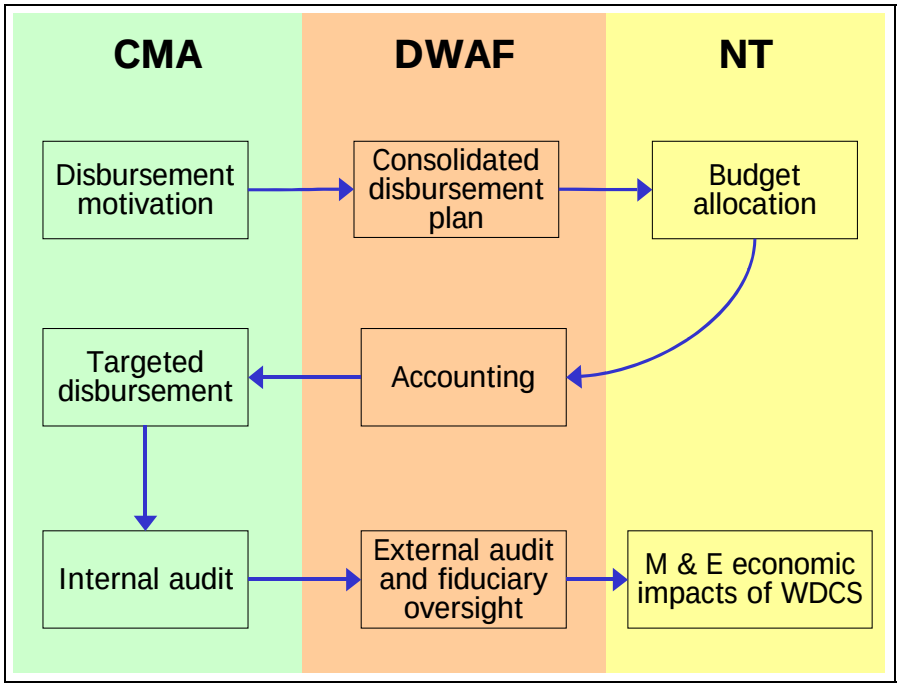

Figure 13: Targeted disbursement and implicit earmarking of Incentive Charge revenue

It is proposed that funds may be disbursed within the WMA to:

1. Invest in public goods to compensate society for the impact incurred, in terms of providing alternatives or remediation of the impacts
2. Provide financial support (e.g. seed funding) for registered dischargers to reduce loads where this is cost effective but there are institutional constraints
3. Initiatives by DWAF to reduce the load entering the resource, particularly from non-registered NPS (e.g. awareness creation, education campaigns)
4. Contribution to DWAF payment of Mitigation Charges associated with non-registered NPS
5. A national fund to clean-up or mitigate pollution from 'accident events' (National Pollution Accident Fund)
6. A fund to cover the costs of litigation in the enforcement of water quality standards (Pollution Litigation Fund)

4.7.1 Institutional arrangements for public investment disbursement

Waste discharge has certain negative impacts on downstream activities and users that are not compensated by the benefits associated with increased load discharge or the benefits of cross-subsidisation of water costs. Examples of such impacts include:

- Damage to submerged property
- Public health effects
- Reduced value of water resources for recreational purposes
- Nuisance effects
- Ecological damage.

The Incentive Charge generates revenue for investment in public goods to counter the impacts incurred by society as a result of the discharge of waste. Such investment may be once-off or ongoing in nature:

- Supply of alternative services, including alternative recreational services
- Conservation of associated or analogous areas for maintenance of biodiversity
- Rehabilitation of impacted areas to restore biodiversity
- Replacement or maintenance of property
- Rehabilitation or screening of contaminated resources.

As disbursement of the Incentive Charge is an unrequited payment, close oversight and tight control are required. Institutional separation in the disbursement process supports such control and oversight (Figure 14).

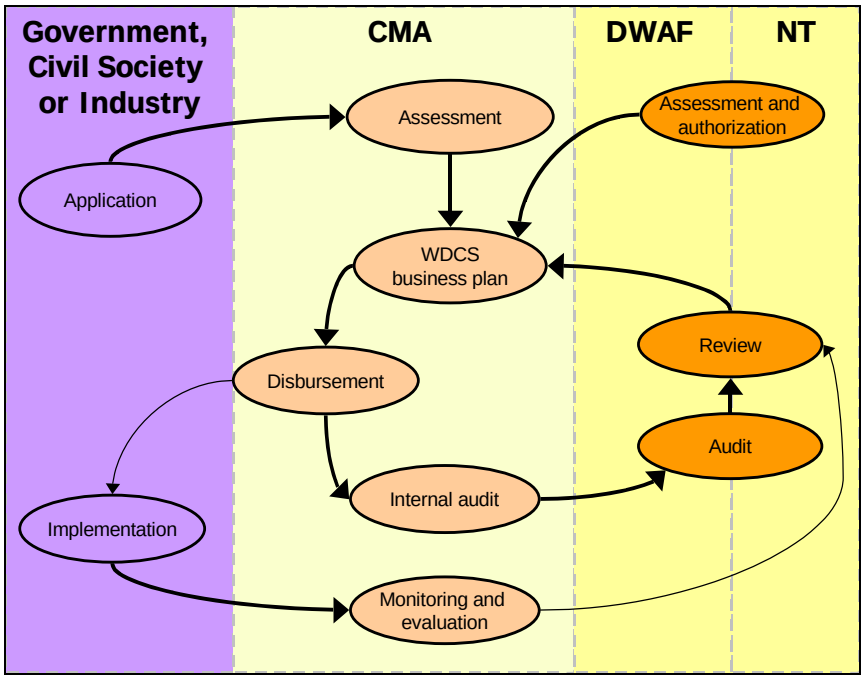

Figure 14: Process and institutional differentiation for disbursement of Incentive Charge revenue

Disbursement of Incentive Charge revenue follows a process (Figure 14):

1. An application is lodged for Incentive Charge disbursement (by government, civil society or industry).
2. Application is assessed against a set of rules and criteria.
3. Successful applications are developed into a disbursement plan and incorporated into the WDCS business plan.
4. The WDCS Business Plan and Incentive Charge disbursement plan are assessed and authorised by DWAF and National Treasury.
5. Revenue is disbursed according to the WDCS Business Plan.

6. Incentive Charge disbursements are audited by the CMA (internal audit).
7. Incentive Charge disbursements are audited against the WDCS Business Plan by DWAF and National Treasury as part of the general audit of the CMA.
8. Implementation of the disbursements is monitored and evaluated by the CMA.
9. The audit by DWAF and National Treasury, as well as the monitoring and evaluation of disbursement implementation by the CMA, feed into the review of the WDCS Business Plan by DWAF and National Treasury.

4.7.2 Institutional arrangements for financial support disbursement

Institutional arrangements for financial support are similar to those for public investment (Figure 14) in that: (1) an entity or a service provider applies to the CMA for financial support; (2) this application is assessed against a set of rules and criteria; (3) successful applications are incorporated into the disbursement plan that is authorised by DWAF with support from National Treasury; (4) support is provided; (5) the measures implemented as a condition of the support are monitored and evaluated by the CMA; and (6) provision of financial support by the CMA is audited and reviewed by DWAF with support from National Treasury.

Seed-funding is considered where changing operations or technology to reduce load are an economically efficient option, but institutional or capital constraints prevent this. Seed-funding may take the form of a grant or a loan. The WDCS Business Plan describes the rules and criteria for seed-funding. In addition, the plan describes the management of seed-funding, including the amount and timeframe of funding, the nature of funding (grant vs loan) and the repayment requirements in the case of a loan.

Where financial support is considered, the entity receiving support enters into a contractual arrangement with DWAF (or the CMA), in which milestones for achieving certain reductions in load are articulated and the institutional and financial conditions of the support are defined.

4.8 Monitoring and evaluation

Four types of monitoring and evaluation can be distinguished:

- Discharge monitoring: waste discharge and registered use is monitored to ensure that all dischargers that should be registered are, in fact, registered and that new dischargers register. The CMA monitors compliance with discharge standards and evaluates the monitored use reported by the discharger to ensure that reported values represent actual values (spot checks).
- Discharge evaluation assesses the extent of behaviour change induced by the Incentive Charge, the reduction in waste load achieved by the mitigation measure/s and the extent to which the WDCS is achieving its objective of waste load reduction.
- Water resource monitoring is undertaken to assess the success of the WDCS in achieving RQOs within the resource. Defined milestones in water quality improvement in the resource (progressive achievement of RQOs) are monitored.
- Water resource evaluation assesses the changes and improvement in water quality and the extent to which the WDCS is achieving its objective of sustainable utilisation of the resource and resource protection.

- Financial monitoring and evaluation is conducted by the audit committee of the CMA Governing Board (GB), once debt collection and disbursement responsibilities are delegated to the CMA. Prior to such delegation, DWAF is responsible for financial monitoring. The financial status of the implementation of the charge is monitored, such that revenue collection, cost recovery, debt management and disbursement are assessed and audited.
- Disbursement monitoring and evaluation involves the monitoring and evaluation of disbursement monies (financial monitoring), the effectiveness of disbursements, particularly disbursements of the Incentive Charge (resource monitoring), and the attainment of agreed milestones by recipients of disbursement or dischargers granted charge reductions (contract monitoring).
- Economic evaluation of the WDCS over time is undertaken by National Treasury to determine the economic impacts of the WDCS and assess the extent to which the system is achieving its objective of internalising externalities.

4.9 Audit and review

Two levels of audit can be distinguished: WDCS implementation audit and an audit of the WDCS Business Plan (and the WRMP/CMS).

4.9.1 Implementation audit

The WDCS Business Plan is used as the basis for the audit of the implementation of the WDCS. DWAF assumes responsibility for the audit, with input from National Treasury with respect to the disbursement of funds, and assesses the business plan against performance. The financial audit assesses the flow of capital, compares anticipated revenue with funds collected and audits the allocation and disbursement of funds. As such, the financial audit comments on the fiduciary management of WDCS implementation. The governance audit assesses whether national strategic objectives are supported, whether objectives and milestones as outlined in the business plan are achieved, whether the principles of good governance apply in the administration of the charge, and whether duties are performed as required by the delegation of roles and responsibilities to committees, bodies or individuals.

4.9.2 WDCS business plan audit

The CMA performs an internal audit of the WDCS Business Plan as part of a process of assessing implementation of the WDCS, and the CMS and WRMP. This audit assesses the WDCS business plan efficiency and effectiveness in achieving the objectives of the CMS and WRMP. In particular, the audit considers the WDCS tariffs, billing and collection management arrangements, management arrangements for the administration of the Mitigation Charge, and Incentive Charge disbursements.

4.9.3 Review

Two levels of review can be distinguished, namely, review of the WDCS undertaken by DWAF and review of the WDCS Business Plan as part of a review of the CMS and WRMP, undertaken by the CMA.

Review of the WDCS is achieved through the Money Bill process (the Money Bill is established for a period of five years) and the five-yearly review of the Pricing Strategy. The assessment of the effectiveness and appropriateness of the Incentive Charge and the Mitigation Charge through monitoring, evaluation and audit of the implementation of the WDCS feeds into a review of the system. This review is undertaken by DWAF.

The WDCS business plan is reviewed by the CMA (with support from DWAF), as part of a review of the WRMP and the CMS. Waste discharge monitoring and evaluation, resource monitoring and evaluation, and the audit of the WDCS business plan provide the necessary input for the review of the business plan.

4.10 Information systems

4.10.1 Waste discharge and water quality

The WDCS is premised on RQOs as the WRM objectives articulated in the CMS and WRMP. The WDCS is applied to registered dischargers only, and uses both registered discharge (Mitigation Charge) and monitored discharge (Incentive Charge) in charge calculation. Accordingly, the WDCS is premised on an information system that provides both discharge data and resource data.

The Water Authorisation and Registration Management System (WARMS) will be used to register dischargers, while the Water Management System (WMS) is the database for resource data. These information systems (WMS and WARMS) must be updated and aligned so that an appropriate interface is built into WARMS to enable the capture and processing of adequate and appropriate waste discharge information and so that the water quality data already contained within WMS are incorporated into WARMS.

4.10.2 Invoicing and financial management

Invoicing and financial management will be achieved through SAP and FSAP in the first instance. WARMS provides the waste discharge register, which becomes the information base upon which invoices are raised. Accordingly, SAP and WARMS must be linked and interfaces must be established. Tariff tables arising from the WDCS business plan must be incorporated into SAP to provide the charge rates for invoice calculation.

The information system arrangements are significantly complicated through the delegation of functions from DWAF to the CMA. DWAF maintains the national register (WARMS), and the billing and financial management system (SAP/FSAP). However, the CMA must access these databases and information systems, and user interfaces for WARMS and for SAP must therefore be created to enable the CMA to upload waste discharge and water resource data to the national register, and to access billing information, manage debt and provide customer care services. This implies complex information system arrangements.

4.11 Institutional responsibility for WDCS implementation

Various aspects of the institutional split between the CMA, DWAF and National Treasury in the implementation of the WDCS, to ensure good governance and tight fiduciary control, have been discussed in preceding sections.

Broadly, DWAF is responsible for the national role-out of the WDCS and retains oversight and support functions in the implementation of the WDCS. National Treasury, together

with DWAF, retains oversight to ensure good governance and appropriate fiduciary management. These functions of DWAF and National Treasury are reflected in the assessment and approval of the WDCS Business Plan, audit of the WDCS Business Plan, and review of the WDCS (Pricing Strategy) and the Incentive Charge Money Bill.

The CMA assumes the key responsibility for implementation, including planning (WDCS Business Plan), identifying dischargers, invoicing, debt collection and financial management, and disbursement. The CMA also performs monitoring and evaluation of WDCS implementation, an internal audit of revenue and financial management and disbursement, and review of the WDCS Business Plan.

4.11.1 Organisational and HR implications

The WDCS imposes some specific organisational requirements on DWAF. It is anticipated that at least one additional position will need to be created, to enable DWAF to retain oversight of WDCS implementation (assess and approve the WDCS Business Plan), manage the disbursement of incentive revenue, and review and adapt the WDCS as part of the five-yearly review of the Pricing Strategy and Money Bill.

The most significant organisational and human resources implications of the WDCS are associated with implementation of the system, and are therefore at the level of the implementing agent (CMA). It is important to note that the WDCS is just one of the instruments in an integrated approach to managing water resources in a WMA. Most elements of WDCS implementation are therefore undertaken as part of a larger process and form a part of the designated functions of the existing capacity. Accordingly, the WDCS will probably not require dedicated divisions, as implementation of the WDCS will form part of the CMA's 'day-to-day' business, where it is applied. Nevertheless, the system does impose specific additional technical, financial, governance and contract management capacity requirements, which may be contracted in during the planning process.

4.11.2 Administrative systems

The WDCS does not impose the specific need for additional or different administrative systems of fiduciary management and good governance beyond those systems already required by the CMA.

Nevertheless, implementation of the WDCS, and particularly disbursement of Incentive Charge revenue, introduces significant complexity and risk to the management of the organisation. This risk requires careful management, close oversight and tight control within the organisation.

While DWAF and National Treasury will provide support in this regard, and will monitor and audit governance and fiduciary management, the particular requirements of implementing the WDCS should be reflected in the organisational systems of the CMA and should be key elements of the performance management of executive staff. They should also be key considerations in the evaluation of the performance of the board.

4.12 WRM institutional change and the WDCS

As described, the institutional responsibilities for the WDCS process are split between DWAF and the CMA, with National Treasury supporting DWAF in oversight and control. However, the principles of the National Water Act guide reform and transformation in

resource management, and the legal requirements of decentralisation and subsidiarity contained with the Act imply a process of institutional change in the management of water resources. This implies shifting roles and responsibilities in the short to medium term, which also manifest in the imminent implementation of the WDCS.

Throughout the process of restructuring, DWAF remains the custodian of the WDCS and the Classification System, as both systems are applied nationally and are strategic in nature and therefore of national significance. The institutional change process within DWAF, and the resultant delegation of water use and authorisation functions to the CMAs, imply a process of transition during which the responsibility for implementation of the WDCS shifts from DWAF to the CMA.

Importantly, the process of decentralisation is unevenly distributed across the 19 WMAs, and the process of shifting responsibilities and delegating functions is accordingly geographically and temporally uneven.

4.12.1 WRM decentralisation process

The **proto CMA stage** begins with the initial decentralisation of functions from DWAF, and the delegation of roles and responsibilities from DWAF Head Office to the proto CMA within the Regional Office (RO) while DWAF is acting as the CMA. The proto CMA takes on water use management and coordination functions and implements most WRM responsibilities (except Authorisation and Resource Directed Measures).

The first stage following the *establishment of the CMA* entails establishing **credibility** and **legitimacy** within the WMA. During this stage, relationships are developed between the CMA, other water management institutions (WMIs) and stakeholders in the WMA. The CMA assumes a number of initial functions[5] and undertakes the critical role of advising on and coordinating WRM, and developing the CMS.

Following the legitimisation phase, the CMA undergoes **consolidation** during which the focus is on building capacity and strengthening the organisation to undertake its WRM functions. This implies strengthening systems within the organisation, including fiduciary management and governance of the CMA. Additional water use management functions are delegated to the CMA.

The final phase during the evolution of the CMA is the progression to a fully functional CMA and the delegation of **responsible authority** functions, as contained within the National Water Act. Most water resource management and implementation roles and responsibilities are now seated in the CMA; the most significant of these are the powers and duties related to authorisation of water use and the issuing, review and amendment of licences. The relationship between the CMA, DWAF Regional Office and DWAF Head Office (Policy and Regulation Branch) are well established, and the systems and processes within and between these institutions are stable.

4.12.2 Institutional Development Implications for the WDCS

As already noted, DWAF is, and remains, the custodian of the WDCS and the Classification System.

While DWAF is acting as the CMA (in the form of the proto CMA), and while the CMA is being established, DWAF will necessarily assume all functions relating to the implementation of the WDCS. This implies that DWAF will assume the technical, financial

[5] As defined in Section 80 of the National Water Act.

and management responsibilities for the implementation of the System, including developing the business plan, billing, collection and debt risk.

Once the CMA is established, initial functions are taken up by the CMA, including water resource assessment, development of the CMS and stakeholder engagement. The early CMA therefore develops the WDCS Business Plan through consultation with stakeholders, and assumes responsibility for customer -care functions.

During the consolidation of the CMA, the CMA assumes full responsibility for the implementation of the System, including developing the business plan, billing, collection and debt management, disbursement, monitoring and evaluation, and internal audit. At this point, DWAF assumes important functions of oversight (audit and review) and support to the CMA in the implementation of the WDCS.

Once the CMA assumes the responsible authority functions, the CMA will be registering and licensing new dischargers, for inclusion in the WDCS, in addition to the full implementation of the WDCS. DWAF (and National Treasury) retain critical oversight and support functions, while DWAF remains responsible for finally compiling and submitting the Business Plan.

FINANCIAL AND ECONOMIC IMPLICATIONS

4.13 Financial and economic impact of the WDCS

In considering the financial and economic impact of the WDCS, it is important to remember that pollution imposes a cost on the catchment and that the WDCS is implemented where this cost is deemed unacceptable by society (through the RQO process). Accordingly, the WDCS is a response to a pollution problem that is already imposing a cost on society. This cost is, however, often not imposed directly on dischargers but rather on downstream users and society at large. Hence, the WDCS seeks to shift some of the cost back to the discharger according to the polluter pays principle.

The economic theory that the internalisation of externalities (polluter pays principle) brings about greater economic prosperity is supported by numerous studies from around the world, conducted by the World Bank and others. The common perception that environmental charges are a trade-off against the economy for the sake of environmental benefits is shown to be largely false. Accordingly, a pollution charge should not be viewed as an additional burden on the economy. Because dischargers are rational economic actors, they will seek, through increased efficiency, to minimise the waste discharge charges incurred. As a result, overall pollution costs are reduced, while the economy becomes more efficient and less wasteful, and generally more attractive to investors.

The direct impacts of the WDCS were tested through economical and financial modelling in the two test catchments – the upper Olifants River catchment and the Crocodile (West) River catchment. The modelling shows that the WDCS will have a proportionately small negative impact on regional economies (of less than 1%), although the financial impacts would be larger in the case of smaller businesses and certain institutions. These direct impacts would possibly have some negative economic implications as a result of cost impacts on dischargers. However, the earmarking of the funds for disbursement in the catchment of origin will offset many of the direct impacts, resulting in shifting of jobs and economic activity as earmarked funds are spent to address water quality problems.

Significantly, the economic modelling undertaken as part of Phase 3 of the WDCS project did not consider indirect impacts associated with improved environmental quality, as these impacts are often difficult to quantify. However, an index on sustainable development was computed. This shows a positive ripple effect in the economy as a result of improvements in the environment.

4.14 Exclusions, waivers and financial support

4.14.1 Exclusions and waivers

The WDCS applies only to registered water use. A number of important dischargers do not currently require registrations and can therefore not be charged under the WDCS. Included in this category are the NPS from urban stormflow, overloaded or failing sewerage infrastructure, peri-urban and rural settlements and developments, irrigation return flow, dry-land agriculture and extensive animal husbandry.

One of the principles of the WDCS is that minimum load discharge thresholds may be identified and that the waste discharge charge for discharge below that threshold will

be waived. The principle intends that small dischargers do not pay. These dischargers are not excluded or exempt from the WDCS, but are charged a zero charge in the current system. Many generally authorised waste dischargers fall into this category.

Where a discharger can demonstrate that a process has been initiated to reduce waste load at source (through treatment or through adaptation of operations), and where a detailed plan is presented that outlines waste load reduction milestones that can be audited, the waste discharge for that discharger may be reduced to reflect the projected discharge load. Accordingly, the discharger would not be charged on actual discharge loads, but on what they intend to discharge once improvements have been implemented. Should the milestones not be attained, the implementing agent (CMA) may impose the full charge. Significantly, waiving the WDCS under these circumstances is at the discretion of DWAF, based on a case-specific assessment of the particular circumstances.

Water use requiring registration under Section 21(i) of the NWA[6] is also allocated a zero charge in the current version of the WDCS. This is because Section 21(i) water use activities are rarely associated with significant contamination of the water resource, with the exception of the liberation of suspended solids, and as the methodology for determining load 'discharged' into the resource has not yet been defined. Future versions of the WDCS may include the application of WDCS charges to Section 21(i) water use.

4.14.2 Financial support

Financial support in the form of seed funding from the Incentive Charge revenue is available, where reducing waste load at source is economically efficient but institutional or financial (sunk capital) barriers prevent expenditure. Seed funding is granted based on an application that clearly details the measures to be taken, costs involved and anticipated reductions in discharge load. A contract based on a business plan detailing milestones in waste load reduction (and capital expenditure) is formulated, and is audited.

Support for black economic empowerment (BEE) industrial and mining dischargers would be provided through the support package of the Department of Trade and Industry, rather than as exemptions on the payment under the WDCS.

4.15 Cost of implementing the WDCS

The CMA incurs some additional costs as a result of the implementation of the WDCS. For instance, the invoicing–collection–disbursement cycle for new waste dischargers increases the administrative demand, and hence the cost of the CMA. Similarly, administering the Mitigation Charge and the disbursement of the Incentive Charge revenue requires additional resources. However, these discharge charges will be invoiced on the same cycle as the waste discharge-related WRM charges, so the marginal cost may be relatively small.

Where the CMA incurs costs owing to administration of the Mitigation Charge, these costs should be recovered from the Mitigation Charge. The remaining costs of implementing the WDCS are consistent with the CMA's WRM functions and should be recovered through the waste discharge-related WRM charge.

[6] Altering the bed, banks, course or characteristics of a watercourse.

4.16 Tax implications

Discussions are ongoing with National Treasury as to which elements of the WDCS may be considered as tax-deductible expenses. The general approach espoused by National Treasury is that costs incurred in the normal course of business may be deducted from income. Where an environmental tax is levied, that tax may be considered for deduction where it represents the internalisation of an externality (i.e. it represents a 'cost of doing business'). However, where an environmental tax is levied to change behaviour, this would not be tax deductible.

Accordingly, as the Incentive Charge seeks to change discharge behaviour and thereby achieve RQOs, the Incentive Charge would not be tax deductible. However, it is probable that the Mitigation Charge would be considered as a tax-deductible expenditure.

4.17 Penalties and spot fines

The WDCS is not a penalty and does not incorporate the use of spot fines. The WDCS is an economic instrument to achieve more efficient utilisation of the resource. As such, the WDCS is one element of an integrated approach to WRM. Issues of non-compliance or exceedance of standards are dealt with through the regulatory framework, which may include penalties or spot fines. Such measures (recovery of cost, penalties and spot fines) are specifically dealt with in Sections 19, 69 and 151 of the National Water Act.

Where such a measure is deployed, the load against which the measure is deployed is not exempt from the WDCS. Accordingly, a discharger may be charge a penalty/fine for pollution and may also be levied an Incentive and/or Mitigation Charge (WDCS) for that pollution load.

It should be noted that the WDCS applies uniformly and without discrimination between compliant and non-compliant users (although this approach may be reviewed in subsequent versions of the WDCS).

5 IMPLEMENTATION PLAN

5.1 Phasing of Implementation

A key consideration for the implementation of the WDCS is that the institutional environment for WRM will change dramatically over the next ten years, with the establishment and delegation of functions to CMAs (and the associated restructuring of DWAF). This means that the institutional arrangements for the implementation of the WDCS will evolve during this period, noting that DWAF Regional Offices act as the CMA until the CMA is functional.

Furthermore, the WDCS itself may be implemented in a phased manner nationally, in order to allow capacity and experience to be built over the medium term, as well as to possibly incorporate additional users (such as diffuse sources) in the longer term.

Finally, phasing of RQOs in a given catchment may be pursued, such that RQOs are achieved over the medium term, but progressively stringent objectives are set in the short term. This will enable dischargers to plan, budget and respond to the charges, and increase acceptability and compliance.

5.2 Implementing the WDCS at a Catchment Level

There are a number of steps involved in the technical implementation of the WDCS in a given catchment, which are outlined here:

1. *Data collection*

   A range of data is required for the implementation of the WDCS, including an initial catchment assessment identifying water resource problems, RQOs, waste discharge data, remediation data and financial data.

2. *Modelling*

   The data must be organised in such a manner that meaningful conclusions can be drawn regarding the state of the resource, load reduction required, waste discharge charges and the financial/economic implications of such chargers. This implies developing/running a catchment water resource model (to assess the resource and required load reduction), a waste discharge model (to calculate charges) and an economic model (to assess the financial/economic impact).

3. *Establishing stable information systems*

   Information systems to support the WDCS implementation (WARMS, WMS and SAP) must be adapted to the WDCS, and the interfaces between these systems must be stable.

4. *Building appropriate institutional arrangements*

   In order to implement the WDCS, appropriate institutional arrangements and organisational structures must be established. Broadly, this implies that the necessary organisational systems and capacity are in place, that clarity on the financial arrangements has been attained, and that the institutional relationships supporting the implementation are established (relationships between CMA, DWAF Regional Offices, DWAF Policy and Regulation and National Treasury).

5. *Developing a catchment WRMP and WDCS Business Plan*

As part of a CMS, a WRMP must be established detailing the water resource problems, the objectives, the instruments to achieve those objectives and the implementation plan. Where the WRMP identifies the WDCS as an appropriate instrument, a WDCS Business Plan must be developed highlighting who will be charged, what they will be charged, how the charge will be implemented, and how the funds arising from the charge will be managed and disbursed.

6. *Stakeholder engagement and consultation*

Stakeholder participation and consultation is a constant theme through out the implementation of the WDCS, from the development of the CMS to the consultation on the waste discharge charges and review of the WDCS.

5.3 Implementation activities by DWAF

In order to enable the implementation of the WDCS, DWAF must have completed a number of activities, including:

- Establish stable system

  Before implementation of the WDCS can commence, the WDCS must be stable and supported by the requisite policy and legislation, as well as the endorsement of the institutional arrangements. To this effect, the National Water Act must be amended to enable DWAF to levy the Incentive Charge, and the Money Bill must be promulgated as the legal establishment of the Incentive Charge.

- Build relevant organisational structure

  The institutional and organisational implications of the WDCS discussed here must internalised by DWAF, such that appropriate structures are created within DWAF and the CMA, and requisite staff are recruited and outsourcing arrangements undertaken.

- Information, governance and financial systems

  The WDCS is premised on the interfacing of functional WRM systems and financial management systems. Moreover, owing to the nature of the Incentive Charge and Mitigation Charge, sounds governance and financial management systems must be established to enable tight control and clear oversight of the planning and implementation of the WDCS in priority catchments (in conjunction with National Treasury).

- Capacity building

  A key element to the successful implementation of the WDCS is ensuring sufficient capacity to undertake the various tasks in the planning, implementation, monitoring and review of the system. A number of elements should be considered to ensure appropriate capacity building:

  - Early appointment of appropriate staff to ensure adequate time for training and capacity building
  - Phased implementation of the WDCS to allow experience to be built and to enable the transfer of knowledge
  - Maintenance of institutional memory and continuity in the planning and implementation of the WDCS

- Strategic support to the implementation of the WDCS by service providers, particularly with respect to the calculation of charges and the development of the WDCS business plan.

5.4 Priority Catchments for WDCS Implementation

5.4.1 Prioritisation

5.4.1.1 Existing water quality problem

The process of identifying priority catchments for the implementation of the WDCS begins with an assessment of the water quality problem. The WDCS is applied only where RQOs are exceeded or threatened. In the absence of RQOs, a clear water quality problem must exist within a catchment/area for consideration as a priority catchment for implementation of the WDCS. Initial prioritisation will be done as part of the WDCS Implementation Strategy.

5.4.1.2 Criteria for prioritisation

Criteria for prioritisation have been developed and are included in Appendix E.

5.4.1.3 Implementability

Following the prioritisation of catchments, based on the criteria listed in Appendix E, an assessment of the implementability of the WDCS in those catchments must be undertaken. Specifically, the nature of the sources should be considered – where water quality problems are primarily the result of contamination from non-point sources that do not require registration under the National Water Act or National Environmental Management Act, these sources are excluded from the WDCS.

Other considerations in assigning priority to catchments for the implementation of the WDCS should include:

- The availability of data
- Institutional capacity to implement the WDCS
- Issues of cooperative governance and 'ability to pay' (where, for example, the sources are primarily municipal in origin).

5.4.2 Priority catchments

While a preliminary list of priority catchments has been identified, DWAF should engage a quantitative and qualitative process that leads to management decisions on the priority catchments for the implementation of the WDCS.

APPENDIX A: NPS MANAGEMENT PRACTICES

Category	Sub-type	Management practice	
		Standard practice	Poor practice
MINING AND POWER SECTORS			
		All mine infrastructure and practices must comply with Regulation 704, which includes conditions on the separation of clean and dirty water, placement of facilities outside of the 1:50 (open cast void) and 1:100 (all other facilities listed below) year floodlines and capacity to handle the 1:50 year storm event. Only additional requirements and specific practices required to comply with the conditions of Regulation 704 are described below.	Non-compliance with Regulation 704
Disposal of effluent	Tailings dams	Operation, inspection, monitoring and maintenance according to a tailings dam management manual, which must comply with the specifications in the Department of Minerals and Energy (DME) (Mine Health and Safety Inspectorate) Guideline for the Compilation of a Mandatory Code of Practice on Mine Residue Deposits. This should include: Covering of side slopes with soil during the operational phase to assist in reducing any contact of rainfall runoff with the tailings; Vegetation of side slopes to minimise erosion; Collection of rainfall runoff into the dirty water storage facility (return water dam); After decommissioning, the top surface of the tailings dams should be shaped to suit drainage requirements and re-vegetated; Implementation of under drainage systems to collect seepage for re-use as process water	Non-compliance with the tailings dam management manual including: Poor soil and vegetation cover No collection of dirty water runoff or seepage
	Evaporation pond	Lined facility (synthetic or clay liners) of sufficiently large size to ensure that full evaporation of effluent water is achieved.	A facility that is not lined, is of insufficient size to enable full evaporation of effluent water and does not have seepage drains or stormwater collection drains
	Effluent dams	Lined facility (synthetic or clay liners) with seepage drains. Splitting of facility into two separate compartments for the purposes of cleaning and management.	A facility that is not lined and does not have seepage drains.

Category	Sub-type	Management practice	
		Standard practice	Poor practice
	Return Water Dam	Operation, inspection, monitoring and maintenance according to a tailings dam management manual (must include the return water dam), which must comply with the specifications in the Dame's (Mine Health and Safety Inspectorate) Guideline for the Compilation of a Mandatory Code of Practice on Mine Residue Deposits. This should include: Sizing to accept seepage from the under drainage systems and decant systems for up to the 1:50 year rainfall event, over and above normal operating conditions.	Non-compliance with the tailings dam management manual.
	Forced Evaporation	Evaporation only with wind speeds less than 2m/sec. No evaporate pre-dawn as humidity is too high.	Evaporation during wind speeds exceeding 2m/sec and pre-dawn.
Disposal of waste	Fly ash disposal	As per Waste Rock Dump	As per Waste Rock Dump
	Final Open Cast Voids	Diversion of upslope storm water around the void Prevention of water flowing into the void by using highball drains where necessary. Ensure any water within the void is contained	Upstream diversion berms or management measures to prevent inflow of water into the void are absent.
	Waste Rock Dump	Stabilisation of side slopes to minimise erosion Rainfall runoff should be collected into a dirty water storage facility. Covering of terraces or step-ins with a soil layer, followed by paddocking and vegetation, as soon as practical after dumping, to minimise the ingress of water into the dump. Collection of percolated storm water via under drains into collection sumps, which should pump the water to a dirty water storage facilities.	A dump that has not had its side slopes stabilized, its step-ins covered with soil and vegetated and does not have a dirty water collection system.
Authorised land-use activity	Dirty water stormwater dams	Lined facility (synthetic or clay liners). Splitting of facility into two separate compartments for the purposes of cleaning and management.	A facility that is not lined.
INDUSTRIAL SECTOR			
Disposal of effluent	Irrigated effluent	Effluent irrigated on to the facility/land meets general authorisation standards in terms of disposal volume, concentration of contaminants etc. Large area are deployed with continuous shift of the irrigation, to enable adequate evaporation/evapotranspiration of the effluent water	Any other practice
	Evaporation ponds	Lined facility (synthetic or clay liners) of sufficiently large size to ensure that full evaporation of effluent water is achieved.	A facility that is not lined, is of insufficient size to enable full evaporation of effluent water and does not have seepage drains or stormwater collection drains

Category	Sub-type	Management practice	
		Standard practice	Poor practice
	Co-disposal of effluent and waste	Lined facility (synthetic or clay liners) of sufficiently large size and with adequate structures to ensure capture of a 1:50 year storm event. Seepage drains and stormwater drains in place and connected to the polluted stormwater system.	A facility that is not lined, is of insufficient size to receive the volume of effluent discharged and does not have seepage drains or stormwater collection drains
	Maturation ponds	These facilities are generally not lined, but are designed to ensure at least five days' retention time. Stormwater and seepage drains are generally not in place	
Disposal of waste	Solid waste disposal e.g. ash disposal, lime disposal, gypsum disposal, organics disposal and tarpits	Lined facility (synthetic or clay liners). For mounds, seepage drains and stormwater drains in place and connected to the polluted stormwater system. For pits, ingress of water is prevented.	A facility that is not lined, does not have seepage drains or stormwater collection drains (mounds) or does not prevent ingress of water (pits)
Authorised land-use activity	Coal dams	Lined facility (synthetic or clay liners). Seepage drains and stormwater drains in place and connected to the polluted stormwater system. Water/effluent used in the dam is not of acid pH. Dam is covered to prevent contact with oxygen.	A facility that is not lined, does not have seepage drains or stormwater collection drains and that does not maintain anaerobic conditions.
	Polluted stormwater	Collection system incorporating the plant, raw material stockpiles and waste disposal facilities. Should separate clean stormwater from stormwater raining "dirty" sites or facilities. Polluted stormwater collected and stored in dams.	No system or an inadequately functioning system, in terms of design, construction, maintenance or operation (e.g. system that spills 1: 2 years, 1: 5 years, etc.).
URBAN SECTOR			
Disposal of effluent	Irrigated effluent	Effluent must meet the licensed standards. Irrigation must be controlled and limited to safe quantities. Lands must be properly sited to minimize run-off and ingress of external storm water Effluent irrigated on to the facility/land Large area is deployed with continuous shift of the irrigation, to enable adequate evaporation/evapotranspiration of the effluent water. Application of effluent follows principles of "beneficial-use"[7]	Over irrigation of sub-standard effluent and irrigation on unsuitable land
	Oxidation ponds	Lined facility (synthetic or clay liners) of sufficiently large size and with adequate structures to ensure capture of a 1:50 year storm event. Seepage drains and stormwater drains in place and connected to the polluted stormwater system.	A facility that is not lined, is of insufficient size to receive the volume of effluent discharged and does not have seepage drains or stormwater collection drains
	Artificial	These facilities are generally lined (clay liners typically), and are designed to receive 120l/m^2/d at a depth of 30cm. Stormwater and seepage drains are generally not in place	A facility that is not lined and where load rates exceed the standard requirements.
Disposal of waste	Solid waste disposal	If land disposal is done, the site must be licensed as a hazardous landfill. Facility must be lined (synthetic or clay liners). For mounds, seepage drains and stormwater drains in place and	A facility that is not lined, does not have seepage drains or stormwater collection drains (mounds) or does not prevent ingress of water (pits). Site not licensed as a hazardous landfill.

[7] 'Beneficial-use' implies that the effluent is applied to pastures or crops at a rate that allows for the utilisation of the water and nutrients for plant growth.

Category	Sub-type	Management practice	
		Standard practice	Poor practice
		connected to the polluted stormwater system. For pits, ingress of water is prevented.	
		For irrigation of waste - must be an approved site with the relevant engineering design to ensure it meets the requirements for safe irrigation.	Over irrigation on unsuitable land.
Authorised land-use activity	Polluted stormwater	Collection system incorporating the plant and waste disposal facilities. Should separate clean stormwater from stormwater draining "dirty" sites or facilities. Polluted stormwater collected and stored in dams.	No system or an inadequately functioning system, in terms of design, construction, maintenance or operation (e.g. system that spills 1: 2 years, 1: 5 years, etc.).
AGRICULTURAL SECTOR			
Disposal of effluent	Irrigated effluent	Effluent irrigated on to the facility/land meets general authorisation standards in terms of disposal volume, concentration of contaminants, etc. Large area is deployed with continuous shift of the irrigation, to enable adequate evaporation/evapotranspiration of the effluent water. Application of effluent follows principles of "beneficial-use"[8]	Any other practice
	Oxidation ponds	Lined facility (synthetic or clay liners) of sufficiently large size and with adequate structures to ensure capture of a 1:50 year storm event. Seepage drains and stormwater drains in place and connected to the polluted stormwater system.	A facility that is not lined, is of insufficient size to receive the volume of effluent discharged and does not have seepage drains or stormwater collection drains
	Artificial wetlands	These facilities are generally lined (clay liners typically), and are designed to receive 120l/m^2/d at a depth of 30cm. Stormwater and seepage drains are generally not in place	A facility that is not lined and where load rates exceed the standard requirements.
Disposal of waste	Solid waste disposal sites	Lined facility (synthetic or clay liners). For mounds, seepage drains and stormwater drains in place and connected to the polluted stormwater system. For pits, ingress of water is prevented.	A facility that is not lined, does not have seepage drains or stormwater collection drains (mounds) or does not prevent ingress of water (pits)
Authorised land-use activity	Polluted stormwater	Standard storm-water system is one designed for convenience, not for pollution control. Accordingly, stormwater is discharged directly to the resource.	

[8] 'Beneficial-use' implies that the effluent is applied to pastures or crops at a rate that allows for the utilisation of the water and nutrients for plant growth.

APPENDIX B: NPS LOAD DISCHARGE PROPORTIONS

Category	Sub-type	Constituent	Proportion[9]		
			Best practice leading to zero impact	Standard requirements	Poor practice
MINING AND POWER SECTOR[10]					
Disposal of effluent	Tailings dams	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%	1.5%[26]
	Evaporation pond	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
	Effluent dams	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
	Return Water Dam	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
	Forced Evaporation	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
Disposal of waste	Fly ash disposal	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
	Final Open Cast Voids	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
	Waste Rock dump	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
Authorised land-use activity	Dirty water stormwater dams	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	0.75%[26]	1.5%[26]
INDUSTRIAL SECTOR					
Disposal of effluent	Irrigated effluent	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	10%	70-100%
	Evaporation ponds	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%
	Co-disposal of effluent and waste	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%
	Maturation ponds	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	10%	
Disposal of waste[a]	Solid waste disposal e.g. ash disposal, lime disposal, gypsum disposal, organics disposal and	Salinity, SO_4, Cl, Na, Ca, heavy metals, organics	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%

[9] A measure of the amount of load applied to the facility that enters the resource (NPS), expressed as a percentage of load discharged to land or facility.

[10] The mining and power sectors adopted a conservative approach in estimating the proportion of seepage from the facility that enters the resource. This explains the relatively low percentages in the table, compared with the industrial, agricultural and urban sectors.

Category	Sub-type	Constituent	Proportion[9]		
			Best practice leading to zero impact	Standard requirements	Poor practice
	tarpits				
Authorised land-use activity	Coal dams	Salinity, pH, SO_4, heavy metals	0%	1% *(clay liner and seepage drains)*	10%
	Polluted stormwater[a]	Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(collection and containment facilities)* 1% *(system captures 1: 100 year storm-event)*	100% *(no system)* 60-80% *(systems overflows 1: 2 to 1:5 years)*
URBAN SECTOR					
Disposal of effluent	Irrigated effluent	Nutrients, COD, pathogens	0%	10%	50-70%
		Salinity, pH, SO_4, Cl, Na, heavy metals	Move to other technologies/practices	10%	70-100%
	Oxidation ponds	Nutrients, COD, pathogens	0%	0.5% *(synthetic liner)* 1% *(clay liner)*	7.5%
		Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%
	Artificial wetlands	Nutrients, COD, pathogens	0%	0.5% *(synthetic liner)* 1% *(clay liner)*	7.5%
		Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%
Disposal of waste	Solid waste disposal sites	Nutrients, COD, pathogens	0%	0.5% *(synthetic liner)* 1% *(clay liner)*	7.5%
Authorised land-use activity	Polluted stormwater[a]	Nutrients, COD, pathogens Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(collection and containment facilities, system captures 1: 100 year storm-event)*	100% *(no system)* 60-80% *(systems overflows 1: 2 to 1:5 years)*
AGRICULTURAL SECTOR					
Disposal of effluent	Irrigated effluent	Nutrients, COD, pathogens	0%	10%	50-70%
		Salinity, pH, SO_4, Cl, Na, heavy metals	Move to other technologies/practices	10%	70-100%
	Oxidation ponds	Nutrients, COD, pathogens	0%	0.5% *(synthetic liner)* 1% *(clay liner)*	7.5%
		Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%
	Artificial wetlands	Nutrients, COD, pathogens	0%	0.5% *(synthetic liner)* 1% *(clay liner)*	7.5%
		Salinity, pH, SO_4, Cl, Na, heavy metals	0%	1% *(synthetic liner)* 2.5% *(clay liner)*	10%

Category	Sub-type	Constituent	Proportion[9]		
			Best practice leading to zero impact	Standard requirements	Poor practice
Disposal of waste	Solid waste disposal sites	Nutrients, COD, pathogens	0%	0.5% *(synthetic liner)* 1% *(clay liner)*	7.5%
Authorised land-use activity	Polluted stormwater[a]	Nutrients, COD, pathogens	0%	100%	
		Salinity, pH, SO_4, Cl, Na, heavy metals	0%	100%	

[a] For the disposal of waste and the polluted stormwater, the discharge load to the resource will be calculated from the rainfall volume on to the site, the concentration of contaminant measured in the seepage drains and the relevant percentage band in the table above.

APPENDIX C: COMPARISON OF APPROACHES: COST OF LOAD REDUCTION VS. INTERNALISING EXTERNALITIES

While the concept of internalising externalities is a sound economic basis for the WDCS, there are practical problems with its implementation. Furthermore, in a developing country context, there may be situations in which externalities are socially acceptable. The proposed approach is compared to the approach of internalising externalities in the following Table.

	Comparison of approaches		Proposed approach	
	Cost of load reduction	***Internalise externalities***	***Advantage***	***Disadvantage***
1. Calculation	Based on unit cost of load reduction – easy to access data	Based on calculating and pricing externalities – complicated calculation methodology	Easy to calculate	Load approach does not take cognisance of concentration. Requires good data
2. Implementation	Routine implementation	More complicated implementation potentially requiring calculation and monitoring of externalities	Routine – simple to implement and review	Dependent on availability of various water resource, discharge and financial data
3. Capacity implications	Implementable within the institutional capacity context of WRM in South Africa	Complex approach with significant capacity implications, probably unrealistic within the South African WRM context	Executable given adequate capacity built within WMIs to perform WRM functions. Approach is accessible to stakeholders	Although executable, still requires that WMIs are well capacitated
4. Integration	Approach uses a common approach throughout, thereby integrating incentive charge, mitigation charge and NPS	Approach does not integrate incentive charge and mitigation charge. Approach for NPS was not developed	Simple, single approach incorporating all components of WDCS	
5. Economic efficiency	Efficient, if RQOs set correctly	Economically efficient, if acceptable threshold set correctly	Drives towards load reduction at minimum cost	Economically inefficient if RQOs set incorrectly
6. Acceptable impact	Uses RQOs as measure of acceptable impact on environment and society	Determines externalities and internalises externalities in excess of an acceptable threshold	Efficient and integrated with Classification System	Charge rates will be wrong if RQOs are set incorrectly
7. Theoretical rigour	Based on a pragmatic approach, which is nevertheless theoretically sound	Based on economically rigorous methodology	Pragmatic	Dependence on RQOs as reflection of acceptable impact
8. Defensibility	Simple, rigour approach premised on RQOs	Complicated approach premised on calculation of externalities	Easily defensible, particularly in legal setting	Dependence on correct setting of RQOs
9. Consistency with WRM approach	Consistent with the WRM cycle and adopts the Class and CMS as a basis	Not necessarily consistent with decisions made at other stages in the cycle	Uses and supports WRM approaches, and assists in achieving RQO	

APPENDIX D: TESTING THE WDCS

As part of the development of the System, the conceptual basis of the WDCS was tested in two study catchments: (1) the Crocodile (West) River catchment up to and including the Hartebeespoort Dam and (2) the Upper Olifants River Catchment up to and including the Witbank Dam.

The Crocodile (West) River catchment was chosen to represent an urban catchment dominated by phosphate (PO_4)-related eutrophication water quality problems. The Upper Olifants River Catchment was chosen to represent a mining-dominated catchment with salinity and sulphate (SO_4)-related water quality problems.

Included here is a summary of the WDCS testing, including an assessment of the impact of the WDCS on two municipalities – Johannesburg City and Mogale City.

D.1 Crocodile (West) River Catchment

The catchment includes the Crocodile (West) River, the Magalies River and all their tributaries, up to and including the Hartebeespoort Dam. Annual run-off in this catchment is dominated by returnflow from wastewater works, and the key water quality concern is nutrient enrichment of the reservoir and resultant algal overgrowth (eutrophication). Total annual PO_4 load to the reservoir is approximately 270 tons.

This study shows that Hartebeespoort Dam is presently hypertrophic. For significant, perceptible improvement in water quality, the PO_4 concentrations in Hartebeespoort Dam must decrease to mesotrophic levels. This implies an annual reduction in PO_4 load entering Hartebeespoort Dam of 72%, or 192 tons.

85%, or 230 tons, of the annual load to Hartebeespoort Dam comes from wastewater works. Most notable among these are Johannesburg Northern Works (100 tons), Percy Stewart (50 tons), Olifantsfontein (30 tons), Randfontein (20 tons) and Sunderland Ridge (20 tons). Two of these works – Percy Stewart and Randfontein – are discharging PO_4 well in excess of the 1 mg/l special PO_4 standard. About 36 tons of annual PO_4 load come from non-point sources.

A number of opportunities are identified through which the required reduction in PO_4 load could be achieved. These opportunities include upgrading of certain works, chemical precipitation of PO_4 at JHB Northern Works, in-stream precipitation, food-web manipulation (biomanipulation) within Hartebeespoort Dam and reduction of domestic PO_4 through the use of phosphate-free detergents.

The most significant annual load reductions that could be achieved are:

- 45 tons through upgrading of the Percy Stewart works
- 18 tons through upgrading of the Randfontein works
- 67 tons through biomanipulation
- 70 tons through in-stream chemical precipitation in the Crocodile (West) River
- 80 tons through chemical precipitation (polishing) of effluent at JHB Northern Works
- 67 tons through the use of phosphate-free soaps and detergents

The order of costs, from cheapest to most expensive, for these options is: biomanipulation < in-stream precipitation < upgrading of Percy Stewart < upgrading of Randfontein < chemical precipitation at JHB Northern Works < P-free detergents.

Accordingly, the most cost-effective options for achieving the mesotrophic RQOs are biomanipulation, in-stream precipitation and upgrading of Percy Stewart and Randfontein. In order to achieve oligotrophic PO_4 concentrations in Hartebeespoort Dam, chemical precipitation at JHB Northern Works will be required in addition to the above measures.

Given these data, computation of waste discharge charges shows five scenarios:

1. Incentive Charge only, with an Incentive Charge of **R90/kg PO_4/annum**. This scenario generates significant Incentive Charge revenue, which could be used for targeted disbursement including bio-manipulation, seed-funding, awareness, promotion of P-free detergents, etc.

2. Incentive and Mitigation Charge, with a total charge of **R70/kg PO_4/annum** made up of an Incentive Charge of R45/kg PO_4/annum and a Mitigation Charge of R25/kg PO_4/annum. The Mitigation Charge is for in-stream precipitation and bio-manipulation. Some Incentive Charge revenue is generated, which could be used for various targeted disbursements as in (1) above.

3. Mitigation Charge only, where all waste dischargers collectively upgrade Percy Stewart and Randfontein works, in addition to funding bio-manipulation and in-stream precipitation. This scenario would cost **R47.50/kg PO_4/annum**.

4. Integrated scenario – Mitigation Charge and compliance, where compliance with the 1mg/l PO_4 standard is ensured at Percy Stewart and Randfontein through other water resource management measures (e.g. control and command). The Mitigation Charge is for bio-manipulation and in-stream precipitation only, and costs **R25/kg PO_4/annum**.

5. Integrated scenario – Mitigation Charge and Incentive Charge to ensure compliance. Here the Mitigation Charge is deploy, as in (4) above, for bio-manipulation and in-stream precipitation. In addition, the Incentive Charge in (1) is used to incentivise compliance with the 1mg/l standard. Accordingly, for those wastewater works *not complying* with the 1mg/l standard, the waste discharge charge would be **R90/kg PO_4/annum** (Incentive Charge R65 and Mitigation Charge R25/kg PO_4/annum). Those dischargers *achieving* the 1mg/l standard would only be charged the Mitigation Charge, as in (4) above – **R25/kg PO_4/annum**. Incentive Charge revenue in this case would be used as seed-funding, in the first instance, to further incentivise compliance.

Testing the WDCS in the Crocodile (West) River catchment demonstrates the integrated nature of the charge and the importance of deploying the charge in an integrated fashion with other instruments and measures for water quality management. The final option (Mitigation Charge, with Incentive Charge to ensure compliance) is the cheapest and the most equitable option, as those dischargers that are achieving PO_4 discharge standards contribute only to the cost of treatment that is required when all dischargers are achieving the PO_4 discharge standard. Although deployment of the Mitigation Charge introduces institutional complexity and additional administrative costs, the cost savings to dischargers that the Mitigation Charge options introduce are sufficiently large to encourage dischargers to enter into the necessary institutional arrangements and to cooperate and collaborate in order to collectively achieve the RQOs.

The benefits of earmarking Incentive Charge revenue for targeted disbursements are also demonstrated, as it is shown that the targeted deployment of this revenue will

hasten compliance with the PO_4 standard and will further reduce the PO_4 load to Hartebeespoort Dam, even to levels where oligotrophic conditions in the impoundment are restored.

D.2 Upper Olifants River Catchment

The catchment includes the Klein Olifants River, the Noupoortspruit and the Boesmankraansspruit and all their tributaries, up to and including the Witbank Dam. Mean annual runoff (MAR) is 120 Mm^3, with a long-term range (85-year) of 15 Mm^3 – 750 Mm^3, demonstrating the marked variability in rainfall and run-off. Total annual SO_4 load to the reservoir is ranges between 10 000 – 20 000 tons.

This study shows that Witbank Dam has high salinity and, in particular, high concentrations of SO_4. The SO_4 water quality objective for Witbank Dam is 155 mg/l. To achieve this objective 90% of the time, SO_4 load entering Witbank Dam must decrease by 60%.

On average, 90% of the annual SO_4 load to Witbank Dam comes from the mines as non-point source (NPS). The remaining 10% of SO_4 entering Witbank Dam comes from background sources, and from point-source and NPS discharge from power, industry, agriculture and wastewater works.

Common mining-related sources of SO_4 include seepage from waste-rock and overburden dumps, diffuse run-off from the mine site and spillage from central pollution control dam (CPCD). Notably, three mines (106, 118 and 495) each individually discharge more than 10% of the total annual SO_4 load to Witbank Dam, while collectively these mines account for about 50% of SO_4 entering the dam.

A number of opportunities are identified through which the required reduction in SO_4 load could be achieved. These opportunities are either land management options to reduce NPS or treatment of effluent through desalination. Land management includes rehabilitating dumps, capturing diffuse run-off, increasing the capacity of CPCD and piping effluent to Eskom for co-disposal with fly-ash. Desalination, using reverse osmosis (RO) technology, could either be undertaken to treat effluent at source (individual sources or collective multiple sources) or could be deployed in the resource. Water treated in this manner could be sold to Witbank Municipality for domestic and industrial use, thereby off-setting some of the costs of treatment.

The most significant annual load reductions that could be achieved are:

- 2574 tons through desalination at Mine 106
- 818 tons through desalination of Mine 118
- 3769 tons through collective desalination of Mines 106 and 118
- 1853 tons through desalination at Mine 495
- 1214 tons through piping effluent from Mine 127 to Eskom, for co-disposal
- 565 tons through increasing the capacity of CPCD at Mine 214
- 462 tons through rehabilitation of dump at Mine 201

The order of marginal costs, from cheapest to most expensive, for these options is: rehabilitate dump < pipe effluent to Eskom < increase capacity of CPCD < desalination at Mine 118 < desalinate at Mine 106 < desalinate at Mine 495 < desalinate collectively Mine 118 and Mine 106.

Given these data, computation of waste discharge charges shows three scenarios:

1. Incentive Charge only, to incentivise various dischargers to reduce load at source. The Incentive Charge rate is **R10 250/ton SO_4/annum**. This scenario generates significant Incentive Charge revenue (R115 000 000), which could be used for seed - funding initiatives to reduce the SO_4 load from abandoned and decommissioned mines, societal compensation or towards funding a national Water Pollution Accident Fund and/or a National Water Pollution Litigation Fund.

2. Incentive and Mitigation Charge, with a total charge of **R4 100/ton SO_4/annum**, made up of a Mitigation Charge of R2 600/ton SO_4/annum and an Incentive Charge of R1 500/ton SO_4/annum. The Mitigation Charge is deployed for desalination at Mines 106 and 495 (Option 4 of the Mitigation Charge), while the Incentive Charge is levied to incentivise the other mines to reduce NPS through land-management options.

Some Incentive Charge revenue is generated, which could be disbursed as in 1 above.

3. Mitigation Charge only, with a total cost of **R3 000/ton SO_4/annum**. Under this scenario, a combination of source load reduction options are chosen based on cost effectiveness, and these options are implemented collectively (Option 4 of the Mitigation Charge):

- Piping water to Eskom
- Rehabilitate dump at Mine 201
- Upgrade capacity of CPCD at Mine 214
- Desalination at Mine 106
- Desalination at Mine 118
- Desalination at Mine 495

Under this scenario, there would be no Incentive Charge and, therefore, no Incentive Charge revenue for targeted disbursements.

Testing the WDCS in the Upper Olifants River catchment demonstrates that the most cost effective option for the SO_4 dischargers is to collectively reduce SO_4 load at source, through a range of land management and desalination options. However, deployment of the Mitigation Charge in this manner introduces institutional complexity and imposes significant administrative cost. Nevertheless, the alternative option of Incentive Charge only, or mixed Incentive Charge and Mitigation Charge, imposes a significantly higher cost on polluters. This cost increment is sufficient that it should incentivise polluters to cooperate with the authority (CMA), enter the institutional arrangements of the Mitigation Charge and collaborate with each other to collectively achieve the RQOs at lowest cost.

D.3 Financial Implications of the WDCS

City of Johannesburg

Provided available data, the WDCS financial impacts were calculated only with regards to the annual loads registered at Wastewater Treatment Plants affecting the Upper Crocodile River Catchment Area. These include the Northern WWTW and the Modderfontein WWTW. Although the latter was decommissioned in 2004, its flows were diverted to the Northern WWTW and are therefore still relevant.

The financial implications of the WDCS charges are indicated in the Table below.

Table: Financial Implications of the WDCS charges on the City of Johannesburg Water Service Providers (2006 prices)

Charge	Unit Costs (Rand)		Additional Financial Requirements (Rand)		Total
WRM Charge					**2,003,000.00**
WDCS Charges	**Incentive**	**Mitigation**	**Incentive**	**Mitigation**	
Scenario 1	90.00	-	9,027,000.00	-	**9,027,000.00**
Scenario 2	45.00	25.00	4,513,500.00	2,507,500.00	**7,021,000.00**
Scenario 3	-	47.50	-	4,764,250.00	**4,764,250.00**
Scenario 4	-	25.00	-	2,507,500.00	**2,507,500.00**
Scenario 5	65.00	25.00	6,519,500.00	2,507,500.00	**9,027,000.00**

Source: I/O Model derived for the WDCS, 2006

The implementation of these charges will be added to the tariffs already being paid by Johannesburg Water and influence the total expenditure of the municipal entity. It was indicated that the organisation already depends to a large extent on external funding sources and municipal grants to remain financially viable and it is envisaged that this will increase once the WDCS becomes effective.

Based on information obtained with regards to annual discharges and loads, it is evident that the Johannesburg Northern WWTW contributes significantly to the PO_4 levels in the Upper Crocodile Catchment area. Mitigation costs envisaged for the WWTW (based on mitigable loads) amounts to between R950,000 to upgrade existing infrastructure and R14 million for new infrastructure. The bio-filtration polishing option will amount to approximately R20 million. This will put additional pressure on the already tight capital budget of Johannesburg Water and will require contribution from the Mitigation Charge or Incentive Charge income to assist in funding the upgrading of the works.

Mogale City

Provided available data, the WDCS financial impacts were calculated with regards to the annual loads registered at two Wastewater Treatment Plants in Mogale City affecting the Upper Crocodile River Catchment Area. These include the Percy Stewart WWTW and the Magalies WWTW.

Table: Financial Implications of the WDCS charges on the Mogale City Local Municipality as Water Service Authority (2006 prices)

Charge	Unit Costs (Rand)		Additional Financial Requirements (Rand)		Total
WRM Charge					**69,700.00**
WDCS Charges	**Incentive**	**Mitigation**	**Incentive**	**Mitigation**	
Scenario 1	90.00	-	4,545,000.00	-	**4,545,000.00**
Scenario 2	45.00	25.00	2,272,500.00	1,262,500.00	**3,535,000.00**
Scenario 3	-	47.50	-	2,398,750.00	**2,398,750.00**
Scenario 4	-	25.00	-	1,262,500.00	**1,262,500.00**
Scenario 5	65.00	25.00	3,282,500.00	1,262,500.00	**4,545,000.00**

Source: I/O Model derived for the WDCS, 2006

The WDCS will clearly have a significant impact on the financial status of the Mogale City Local Municipality, especially the Water and Sanitation Directorate. It was indicated in the scenario formulation that a large portion of the income derived from the Mitigation and Incentive Charges would be used to upgrade the Percy Stewart wastewater treatment works. It is therefore crucial that this income be earmarked for this purpose, as the municipality will not be able to fund the upgrading in total without external assistance.

APPENDIX E: CRITERIA FOR IDENTIFYING PRIORITY CATCHMENTS FOR IMPLEMENTATION OF THE WDCS

Criterion	Description	Weighting	Categories
1. Human health impacts	Human health impacts are experienced as a result of water contamination	30	10 – slight health risk 20 – moderate health risk 30 – high health risk
2. Water stressed catchment	The available water resources are stressed owing to over-allocation and over-use of the resource – including both over-abstraction and excessive discharge	15	5 – slightly stressed/over-allocated 10 – moderate stressed/over-allocated 15 – high stressed/over-allocated
3. Economically important catchment	Catchments that support extensive economic activity and host to significant economic development, including strategic industry, mining, bulk industry, large-scale agriculture and urban centres	15	5 – slight economic importance 10 – moderate economic importance 15 – high economic importance
4. Social and economic impacts on domestic users	Catchments in which domestic and small-scale productive water users experience significant impact on quality of life and livelihood owing to contamination of the resource	15	5 – slight impact experienced 10 – moderate impact experienced 15 – extensive impact experienced
5. Environmental impacts in a catchment of high environmental significance	The water resource is part of a catchment of high environmental significance, and impacts in that environment are being experienced	15	5 – slight impacts experienced 10 – moderate impacts experienced 15 – extensive impacts experienced
6. International river basin	The impacted resource is part of an international river basin, and the water quality problems are in contravention of water quality requirements contained in the international treaty / agreement governing the resource.	5	0 – not part of an international river basin or international treaty requirements not threatened/exceeded 5 – international river basin and international treaty requirements threatened of exceeded
7. Constituents of relevance to WDCS	Catchments in which the water quality problem is caused by constituents that lend themselves to inclusion under the WDCS. Some bacteriological contamination or organic (hydrocarbon) contamination is not well suited to charging under the WDCS owing to catchment assessment and monitoring cost considerations.	5	0 – constituent not suitable 5 – constituent suitable
TOTAL		100	30 - 100