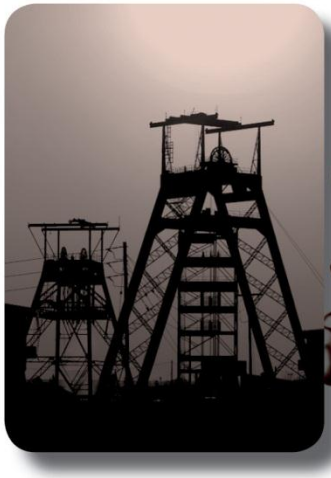
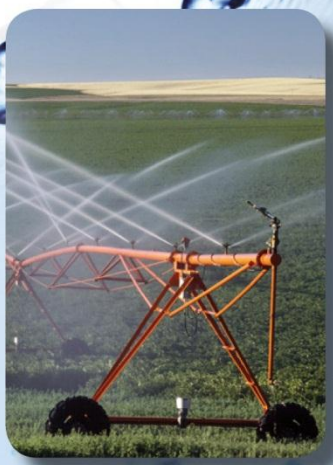


Water Resource Planning Systems Series

Water Quality Planning

Feasibility Study for a Long-Term Solution to address the Acid Mine Drainage associated with the East, Central and West Rand Underground Mining Basins



Inception Report

Study Report No. 1

P RSA 000/00/16112

March 2012

EDITION 1

water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WATER AFFAIRS

Water Resource Planning Systems Series

Feasibility Study for a Long-Term Solution to Address the Acid Mine Drainage Associated with the East, Central and West Rand Underground Mining Basins

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Study Report No. 1
[P RSA 000/00/16112]
Aurecon Report No.: 6163

March 2012

EDITION 1

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

aurecon srk consulting Turner & Townsend

Published by

The Department of Water Affairs
Private Bag X313
PRETORIA, 0001
Republic of South Africa

Tel: (012) 336 7500/ +27 12 336 7500
Fax: (012) 336 6731/ +27 12 336 6731

ISBN No. 978-0-621-41409-7

This report should be cited as:

Department of Water Affairs (DWA), 2012: Feasibility Study for a Long-Term Solution to address the Acid Mine Drainage Associated with the East, Central and West Rand Underground Mining Basins. Study Report No. 1: Inception Report - DWA Report No.: P RSA 000/00/16112

Pretoria, South Africa.

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SC: Study Component Conf: Indication of Confidentiality

 # - These reports will not be made available until the appropriate implementation process stages have been reached as they may potentially compromise future procurement and legal processes.

APPROVAL

TITLE	:	Feasibility Study for a Long-Term Solution to address the Acid Mine Drainage associated with the East, Central and West Rand Underground Mining Basins: Report No. 1: Inception Report
DATE	:	March 2012
AUTHOR	:	Fanie Vogel; Andrew Tanner; André Hindley; John Samuel; Barend Smit; Di Duthe; Hentie Viviers; Vassie Maharaj; Viren Gajathar; Walter Johannes
REVIEWER	:	Andrew Tanner
LEAD CONSULTANT	:	Aurecon South Africa (Pty) Ltd
FILE NO.	:	14/15/13/3
DWA REPORT NO.	:	P RSA 000/00/16112
AURECON REPORT NO.	:	107748/Aurecon/6163
FORMAT	:	MS Word and PDF
WEB ADDRESS	:	www.dwa.gov.za/Projects/AMDFSLTS

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ACKNOWLEDGEMENTS

The following individuals/organisations are thanked for their contributions to the report:

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As part of the study and specifically in the initial phase's key stakeholders representing NGO's, other Departments etc. were consulted and information received. The information received and the insights of such stakeholders contributed to this document.

Academic Institutions
Funding Organisations
Global Perspectives on AMD Management
Environmental and Conservation Groups
Independent Individuals in Private Capacity
Institutions, Parastatals and Research Facilities
Local, Provincial and National Government
Mining Sector
Non-Governmental Organisations
Organised Agriculture
Organised Business, Industry and Labour
Other Specialist Fields/Consultants
Tourism and Recreation
Utilities/Water Service Providers
Various Technology Providers who offered information

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Delysia Weah	South African Human Rights Commission	Alt. Member
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LIST OF ACRONYMS

AKTEX	Deeds Office Deeds Summary
AMD	Acid Mine Drainage
BBBEE	Broad Based Black Economic Empowerment
BEE	Black Economic Empowerment
CBA	Cost Benefit Analysis
CGS	Council for Geoscience
CPlan	Conservation Plan
CSIR	Council for Scientific and Industrial Research
DBOM	Design, Build, Operate and Maintain
DBOMF	Design, Build, Operate, Maintain and Finance or DBOM plus
DMR	Department of Mineral Resources
DTI	Department of Trade and Industry
DWA	Department of Water Affairs
ECL	Environmental Critical Level
EIA	Environmental Impact Assessment
FAQ	Frequently Asked Question
GDARD	Gauteng Department of Agricultural and Rural Development
GIS	Geographic Information System
GRC	Gold Reef City
HDI	Historically Disadvantaged Individual
HDS	High Density Sludge
IGTT	Intra-Governmental Task Team
IMC	Inter-Ministerial Committee
LTS	Long-Term Solution
m amsl	meters above mean sea level
Mℓ	Mega Litre
MoU	Memorandum of Understanding
NECSA	South African Nuclear Energy Corporation
NEDLAC	The National Economic Development and Labour Council
NGO	Non-Governmental Organisation
NNR	National Nuclear Regulator
NPV	Net Present Value
PEC	Project Executive Committee
PFMA (1:1999)	Public Finance Management Act, 1999 (Act No. 1 of 1999)
PPP	Public Private Partnership
P Pub P	Public-Public Partnership
PSC	Public Sector Comparator
PSCM	Public Sector Comparator Model
PSP	Professional Service Provider
RfI	Request for Information
RQO	Resource Quality Objective
RWQO	Resource Water Quality Objective
SAC	Study Administration Committee
SAHRA	South African Heritage Resources Agency
SECL	Socio-Economic Critical Level
SMC	Study Management Committee
SMME	Small, Medium, Micro Enterprises

SoW	Scope of Work
SSC	Study Stakeholder Committee
STI	Short-Term Intervention
TA 1	Treasury Approval 1
TCTA	Trans-Caledon Tunnel Authority
TOL	Target Operating Level
ToR	Terms of Reference
WBEC	Western Basin Environmental Corporation
WC&WDM	Water Conservation & Water Demand Management
WDC	Waste Discharge Charge
WESSA	Wildlife and Environment Society of South Africa
WRC	Water Research Commission
WUC	Western Utilities Corporation

GLOSSARY OF TERMS

Adit	An adit is an entrance to an underground mine which is horizontal or nearly horizontal, by which the mine can be entered, drained of water, and ventilated.
AMD	Outflow of acidic water from (usually abandoned) metal mines or coal mines.
Amphoteric	A molecule or ion that can react as an acid as well as a base.
Annexure	Documents produced by others attached to the report.
Appendix	Documents produced by the Feasibility Study attached to the report.
Aquifer	Zone below the surface capable of holding groundwater.
Brownfields	Abandoned or underused industrial and commercial facilities available for re-use.
Central Basin	Central Rand underground mining basin.
Decant (in mining)	Discharge of water from mine workings.
Discharge	Seepage of groundwater at the surface.
Dyke	Vertical, planar body of igneous rock formed by the solidification of molten rock in a crack.
Eastern Basin	East Rand Underground mining basin.
Environmental Critical Level	The level above which the water in the mine voids at the critical locations (that is where the environmental features to be protected are at the lowest elevations) should not be allowed to rise, to protect specific environmental features, including groundwater resources.
Ettringite	A hydrous calcium aluminium sulphate mineral.
Fault	Crack in the Earth along which differential movement of the rock mass has occurred.
Feasibility Study	An analysis and evaluation of a proposed project to determine if it is technically sound, socially acceptable, and economically and environmentally sustainable.
Fractured rock aquifer	A water-bearing rock mass (aquifer) in which the open spaces that accommodate the water are the result of cracks in the rock.
Freeboard	The vertical distance below the Socio Economic or Environmental Critical Level at the abstraction point, below which the water level should generally be maintained, to allow for hydraulic gradient across the basin, seasonal peak ingress, pump down time, and the like.
Greenfield	An undeveloped site, especially one being evaluated and considered for commercial development or exploitation.
Groundwater	Water occupying openings below ground.
Layout	The arrangement or configuration (site layout, pipe route, etc.) of a specific option.
Long-Term Solution	A solution that is sustainable in the long term with regards to the technical, legal, economic, environmental, financial and institutional aspects.
Mine plan	Accurate drawing showing the positions of mine excavations.
Option	One of a number of combinations of abstraction works, treatment process, and solutions for the disposal of waste and treated water
Preferred Option	The solution, or combination of solutions, for the three basins that will be selected for further investigation in the feasibility phase, and if found feasible, that would eventually be recommended

	to the Client.
Reef	Term used on the Witwatersrand mines for conglomerate.
Ramsar Convention	An international treaty for the conservation and sustainable utilization of wetlands, i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the town of Ramsar in Iran.
Request for Information	A Request for Service Providers to provide information on their product or service, e.g. technologies. It is not part of a Procurement process.
Request for Qualifications	A Request for Qualifications from Service Providers to allow a shortlist to be prepared. It is normally the first step in the Procurement process.
Request for Proposals	A request for technical and financial proposals in compliance with a defined SoW and adjudication criteria from (Pre-Qualified) bidders to allow one of the bidders to be appointed to provide an agreed service.
Scenarios	An alternative projection of the macro environment which affects AMD, such as climate change, electricity load shedding, and changes in quality or quantity of water ingress to the mine void.
Short-Term Intervention (Short-Term Solution as stated in Terms of Reference)	Measures that are being implemented to manage AMD in the short-term while the long-term Feasibility Study is undertaken.
Socio-Economic Critical Level	The level above which the water at the critical location in the mine void must not be allowed to rise, to protect specific social or economic features, such as Gold Reef City museum and active or planned mining.
Stakeholder	A person, group, or community who has an interest in or are affected by AMD and the feasibility study to address the problem.
Subsurface Decant	Subsurface flow of water from one mine compartment or geological structure to another.
Surface Decant	Discharge of water from a mine to the surface.
Target Operating Level	The level in the mine void at each abstraction point, at which the water surface should generally be maintained by pumping, or gravity flow, and is determined by the freeboard required below the ECL or SECL across the basin.
Water table	The level in an aquifer below which all voids are filled with water.
Western Basin	West Rand underground mining basin.

1. Introduction

1.1 Background to the Study

The need for urgent Government action to address the Acid Mine Drainage (AMD) challenges associated with the East, Central and West Rand Underground Mining Basins (Eastern Basin, Central Basin, and Western Basin) have been known for some time.

Gold mining commenced with the discovery of gold in 1886 which has led to the creation of mine voids in the Witwatersrand mine basin with exposed rock faces containing soluble minerals. The Witwatersrand mine void which is in three discrete basins, namely the Eastern, Central and Western Basins, collects water which is in contact with iron and sulphide containing rock. The level of the water is rising in the basins and is decanting in the Western Basin and threatening to decant in the other two. The rising level will also become a threat to the overlying dolomites, the higher level or shallow water tables and Gold Reef City (GRC) underground museum.

Historically, mines pumped the water on a continuous basis so that the workings were always dry. Since underground mining operations have considerably decreased or ceased across the three basins, pumping of the mine drainage has reduced or stopped resulting in a situation where the level of the underground water rising at a rate of about 300 mm per day. The mine water, when it decants, precipitates iron, has been very acidic and has unacceptably high sulphate content.

After an internal Department of Water Affairs (DWA) meeting held on 10 November 2008, attended by key role-players to discuss a way forward on managing AMD, it was resolved that DWA should go out on tender, as a matter of priority, with a Terms of Reference (ToR) aimed at planning the implementation of a self-sustainable long-term solution to address the existing and potential pollution from AMD.

Following increasing media attention in response to the AMD linked to the need for inter-governmental co-operation, an Inter-Ministerial Committee (IMC) on AMD, comprising the Ministers of Mineral Resources, Water and Environmental Affairs, Science and Technology and the Minister in the Presidency: National Planning Commission had been established, with the first IMC meeting taking place on 1 September 2010.

A Team of Experts was subsequently instructed by a Task Team, co-chaired by the Directors-General of Mineral Resources and Water Affairs, to advise the IMC in respect of AMD. The first Team of Experts meeting took place on 13 September 2010.

On 9 February 2011, Cabinet approved the IMC report (IMC 2010), which *inter alia,* required that a Feasibility Study be undertaken, aimed at implementing a self-sustainable Long-Term Solution (LTS) to address the management of AMD. It also recommended Short-Term Interventions (STIs).

Subsequent to Cabinet approving the recommendations of the Team of Experts on AMD, funds were allocated to DWA by National Treasury with the purpose of implementing some of the said recommendations, namely to-

- Firstly, investigate and implement measures to pump the underground mine water in order to prevent the violation of the Environmental Critical Levels (ECLs);
- Secondly, investigate and implement measures to neutralize and remove metals from the AMD; and
- Thirdly, to initiate a feasibility study to address the medium- to long-term solution.

As the implementation of STIs may potentially influence the roll-out of some options and even the desired medium- to long-term solution; it is crucial that the Feasibility Study be initiated as soon as possible.

On 6 April 2011, the Minister of Water Affairs issued a Directive to the Trans-Caledon Tunnel Authority (TCTA) to undertake “Emergency Water Works Management”.

DWA went out on tender, advertising Bid No. WP10569 for an 18-month Feasibility Study for a LTS to address the AMD associated with the East, Central and Western Rand underground mining basins (This Feasibility Study), on 29 July 2011, once again inviting proposals from prospective Professional Service Providers (PSPs), with tender closure scheduled for 1 September 2011.

Bid adjudication took place on 13, 26 September and 4 October 2011. The choice of Aurecon as the preferred bidder was subsequently approved on 8 December 2011.

A contract between DWA and Aurecon, with a contract start date of 30 January 2012 was concluded in January 2012.

It was emphasised that this study is very urgent, is in the public eye and that all related decisions must be defendable. The Feasibility Study should investigate a wide range of possible solutions and disqualify those found to be not suitable.

If the salt loading on the Vaal River System associated with discharges of AMD from mines and sewage effluent are not eliminated or suitably reduced, excessive dilution-releases from the Vaal Dam will be required to achieve the Resource Quality Objectives (RQOs) in the Vaal Barrage and downstream river. This will result in unusable surpluses developing in the Lower Vaal River, externalising the cost of pollution to the Lower Orange River. Should the AMD issue, and specifically the desalination, not be addressed appropriately by 2014/15, the acceptable levels of assurance of water supply will be threatened. This means there will be an increasing risk of water restrictions in the Vaal River Water Supply area.

Although the enquiry was for an 18-month study, which is a relatively short period for such a complex Feasibility Study, the Aurecon proposal was for a 15-month study. Due to the urgency to reduce the salt loadings on the Vaal System and the importance of the Study to allow decisions to

be made, a 13-month contract period was agreed in the contract negotiation, 5 months shorter than envisaged in the bid documents, although the Scope of Work (SoW) remained the same.

Although a longer study period would allow more information to become available and more analyses to be completed, the shorter study period is in the best interests of managing AMD and protecting the environment and water resource.

The implications of the shorter study period are that implementation decisions will have to be made on the understanding of the best information and technical analyses that can be completed by the time decisions must be made. This may lead to a conservative approach, but opportunities to refine the projects which are implemented as more information becomes available during their operation, will have to be considered.

1.2 Background to the Short-Term Intervention

In order to define the SoW for this Feasibility Study, as set out in this Inception Report, it was necessary to understand the Scope and Status of the STI with respect to the LTS.

The ToR of this Feasibility Study to address AMD associated with the Eastern Basin, Central Basin and Western Basin, notes the following:

"4.2 Short-Term Interventions

Subsequent to Cabinet approving the recommendations of the Team of Experts on AMD, funds were allocated to DWA by National Treasury with the purpose of implementing the said recommendations, namely to-

- *Firstly, investigate and implement measures to pump the underground mine water in order to prevent the violation of the ECLs;*
- *Secondly, investigate and implement measures to neutralize and remove metals from the AMD; and*
- *Thirdly, to initiate a Feasibility Study to address the medium- to long-term solution.*

As the implementation of STIs may potentially influence the roll-out of some options and even the desired medium- to long-term solution; it is crucial that the Feasibility Study be initiated as soon as possible."

On 6 April 2011, the Minister of Water Affairs issued a Directive to TCTA to undertake the "Emergency Water Works Management".

The Directive specifies a number of conditions including:

"4. The TCTA shall liaise with the DWA regarding the longer term AMD management objectives and ensure compatibility of the Project with future application of AMD."

The Directive is included as **Annexure1**.

Meetings with TCTA, attended by DWA officials, were held on 10 February and 13 February 2012 at which the scope and status of the STI were explored.

TCTA explained that their mandate to implement the STI comprises three key elements, which the Feasibility Study should consider, together with other reports being produced:

(i) Their signed Directive from the Minister of Water Affairs, dated 6 April 2011.
(ii) Their Implementing Agreement.
(iii) Their Due Diligence Report, issued as draft in June 2011 and as final in August 2011.

The SoW of this study, with respect to the STI is to:

- Understand the proposed STI in sufficient detail to:
  - Plan the LTS;
  - Determine how to integrate the STI and LTS, where appropriate and feasible;
  - Identify any potential long-term risks arising from the proposed STI, and propose prevention or mitigation measures; and
  - Assess the implications of the proposed STI on the proposed configuration and operation of the LTS, as well as for the institutional model to be proposed for the implementation, operation, maintenance and/or management of the preferred solution for the LTS.
- However, a Feasibility Study of all options, irrespective of the STIs, will be undertaken in the interest of finding the best LTS. The implications of the proposed STI will be incorporated in the assessment of the options.

The LTS will, where appropriate, use the infrastructure of the STI to abstract and neutralise the underground AMD and to maintain the water in the mine void below an agreed Critical Level to protect the environment and infrastructure.

The SoW for the Feasibility Study for the LTS does not include a review of either the status of, or the content and extent of TCTA's mandate from DWA. It is not in the SoW of the Feasibility Study to develop an alternative STI, which would meet different criteria other than those developed and adopted by TCTA.

1.3 Basis for this Report

This Inception Report is based on the proposal dated 1 September 2011, submitted by Aurecon in response to the Department of Water Affairs (DWA) invitation to tender for Bid No WP 10569.

The approach to the study described in this report, is based on the approach described in the proposal, but has been adjusted in the light of decisions made by DWA and the updated understanding of the study requirements as at the date of the report. It also discusses the implications of possible changes to the Scope of Work (SoW) that have been identified but not yet confirmed. Key elements of the proposal and where applicable, some of the verbatim text of the Proposal are included in this report.

This report is based on the status of the Study in mid-March 2012. At that time, it became clear that some of the requirements for the study, particularly some elements of the programming, as well as relative emphasis and level of detail would change. There are also indications that the scope of other components will probably change and that some components will need to start much earlier than envisaged. The known changes are described for each component while the uncertainties and possible changes are discussed for each component. .

2. Approach to the Study

In October 2011, proposals were requested for a multi-disciplinary team that could undertake a Feasibility Study of the technical options, as well as institutional, funding and procurement options available for the long-term management of AMD.

Developing a LTS to address AMD requires the careful assessment and integration of the following key elements and associated study components:

i. A sound understanding of the hydrogeology, the underground water resources, sources of surface water ingress, spatial distribution and connectivity of mined voids, the current water quality and projections of future volumes, levels and water qualities. This assessment will be based on the substantial volume of information in previous studies.

ii. Understanding the STI and how it can be integrated into the LTS, where feasible and appropriate. Currently, STIs are underway to install emergency pumping and treatment infrastructure to control the underground AMD. This study, to develop a LTS, will establish a sound understanding of the short-term measures and assess how the STIs can be incorporated into a LTS and the impact of the short-term interventions on the selection of a LTS. Initial assessments indicate that some elements of the proposed STIs may impact on the capital or operating costs of the LTS.

iii. The possibilities for the use or discharge of raw, neutralised or desalinated AMD which will meet the objective of reducing the salt load on the Vaal River System to acceptable levels and which do not have an unacceptable social or environmental impact.

iv. Suitable technologies for treating either raw AMD or the discharges from the STI, to standards that will not negatively impact on the environment and will be acceptable to a range of users.

    This requires an assessment of the technologies available for treatment of AMD, including those which can only desalinate neutralised water to gain an understanding of the viability, reliability, robustness to changes in the inflow water quality, and the potential of the technology for expansion. The expected outputs from each treatment process will be a usable flow and a “waste” flow. Each of the flows from each of the technologies will be assessed as to their acceptability to end users and the implications for safe disposal of unusable waste determined.

v. Options for use and requirements for safe disposal, of waste products from various treatment technologies.

vi. Defining the possible combinations of alternative locations for abstraction, treatment and discharge points for water and waste and the configuration of the infrastructure, including pipelines and pump stations, required to treat the AMD into a range of options.

This will require the technical assessment of the number and location of abstraction points, desalination plants, waste disposal sites and alternatives for discharging water. Initially, all technical alternatives and combinations of site locations will be assessed. The large range of alternatives will be screened at a high level to give a short list of practical technical options. The choice of options will be influenced by the robustness of the technology, the interest in receiving authorities or stakeholders in receiving the primary flow and the manageability and / or marketability of the waste products and brine flow.

The capital and operating costs of the short listed practical options will be determined to give a present value of life time cost. A social and environmental screening for fatal flaws will be carried out and possible financial benefits from sale of water or waste will be considered. The perceived reaction of the public to the options will also be considered.

vii. Identification or selection of the preferred option based on the costs, benefits and impacts. The terminology in common use to describe the preferred option, which will be assessed in the Feasibility Phase of the Study, depends on the procurement model which is adopted. In this report, the term “Preferred Option” is used to describe the following:

- The reference project which is developed if a Design, Build, Operate, Maintain (DBOM) project or a Public Private Partnership (PPP) (DBOM plus Finance, DBOMF) project is to be procured. This is simply referred to as DBOM(F) or PPP for ease of reference.
- The recommended option for further study in the Feasibility Phase of the Study if either a DBOM contract or a sequential process of procuring design followed by tenders for construction (build), followed by procuring operations and maintenance contracts, if required. This is also referred to as the Public Sector Comparator (PSC) model.

There will be a preferred option for each basin, although it is possible that there could be common elements

The Study will thus establish the most appropriate abstraction and treatment regime to reduce the salt loading on the Vaal River System which will significantly reduce the amount of water to be discharged from Vaal Dam for dilution and delay the need for accelerating the development of schemes (such as Lesotho Highlands Phase II) to augment the Vaal River System.

In selecting the Preferred Option, the LTS will attempt to optimise multiple objectives at the same time. The objectives to be considered include:

- Minimise the life-cycle cost for a sustainable solution.
- Minimise the negative environmental effect of treated AMD and waste generated by treatment processes.
- Maximise the resource potential of AMD for the Vaal River System.

- Maximise the flexibility of the pumping system to allow for changes in the determined ECL and the required pumping volume.
- Maximise the flexibility of the treatment solution to allow for changes in the quality of the water abstracted from the mine voids.
- Maximise the income from the water and waste produced.

Thereafter, more detailed studies of the preferred option will proceed, including:

i. Concept Development / Feasibility Assessment:
Once the preferred option has been agreed, the infrastructure layout for treatment works, pipelines and waste discharge will be prepared and costed.

As part of the feasibility process, an environmental scoping will be undertaken of each of the identified sites that form part of the preferred option. Desktop heritage, topographical and geotechnical surveys will also be carried out for these sites. The ownership of the sites, a review of zoning, servitudes and access for roads and pipelines, as well as the availability of utilities will be assessed. Possible impacts on neighbouring erven and communities will also be considered.

ii. Assessment of alternative institutional, financial and procurement models for implementation, ranging from a "traditional" government funded and implemented solution through Public-Public Partnerships (P Pub P) to a PPP, and any combinations. This will require a detailed value assessment of the selection option, i.e. cost-benefit comparisons and assessments and risk analysis.

iii. Throughout the Study, the requirements for implementation will be considered in preparation for developing an Implementation Plan. Any actions that are required to be undertaken in parallel with the Feasibility Study will be identified. It will thus be important that the various tasks are scheduled to facilitate making early decision on implementation and identifying the necessary activities. The most appropriate and sustainable model for the LTS will be recommended, together with the Implementation Plan. Where necessary, the activities required for implementation, which must commence in parallel with this Study, will be identified. Other key components will be the assessment of liabilities and the ability of the mines to pay, and appropriate tariffing mechanisms.

iv. Although not a separate component, the identification of possible risks to the Study will be an on-going activity. Actions to mitigate the risks, both during the Study and during implementation, will be identified. This work will be consolidated in the Implementation Strategy.

Stakeholder engagement and public communications are very important components of the Study and will be on-going.

Clearly, the study comprises a number of inter-related components and key steps. In planning the Study, a project flow diagram was prepared and this is given in **Figures 2.1** and 2.**2**. The flow diagram forms the basis for the programme of the study contained in **Appendix A** and the organisation of the task descriptions in Chapter 5. As can be seen from the flow chart and programme, Component 8, Stakeholder Engagement and Communication, was started in parallel with the Inception Phase, to provide a stakeholder engagement and public communication strategy as soon as possible.

While the planning shows Phase 2 of the Study, following Phase 1 of the Study and a linear approach in Phase 2 of the Study, it is recognised that it is possible, even probable, that procurement may need to commence before this study is complete. That would require reprogramming the sequence of some components and may also change the Scope of components.

Steps (i) to (vi) on pages 7 and 8 are typical components of many planning studies and solving the technical issues is not normally the greatest challenge, although this project does have several unique aspects. However, step (vii) on page 8, recommending the most appropriate institutional, financial and procurement model for implementation, and in particular assessing the options for procurement, including the possibility of a DBOM, P Pub P or PPP, is not a common component of DWA studies and is probably the most challenging and certainly as important for a sustainable solution, as all the technical components combined. The approach to that component has therefore been expanded in the following section, in addition to the description given in the SoW for that component.

It was made clear at the Briefing and at the Study Management Committee (SMC) Meetings in the Inception Phase that National Treasury may not be in a position to fund the capital required, nor to provide funding guarantees. Therefore, the Feasibility Study must investigate the viability of using the PPP procurement methodology as one of the options for securing the infrastructure, a treatment process, and operator to manage the AMD. DWA will then submit the Feasibility Study to National Treasury for approval – Treasury Approval 1 (TA 1). This study will be compliant with the requirements of National Treasury and the team has all the experience required to deliver the required Study.

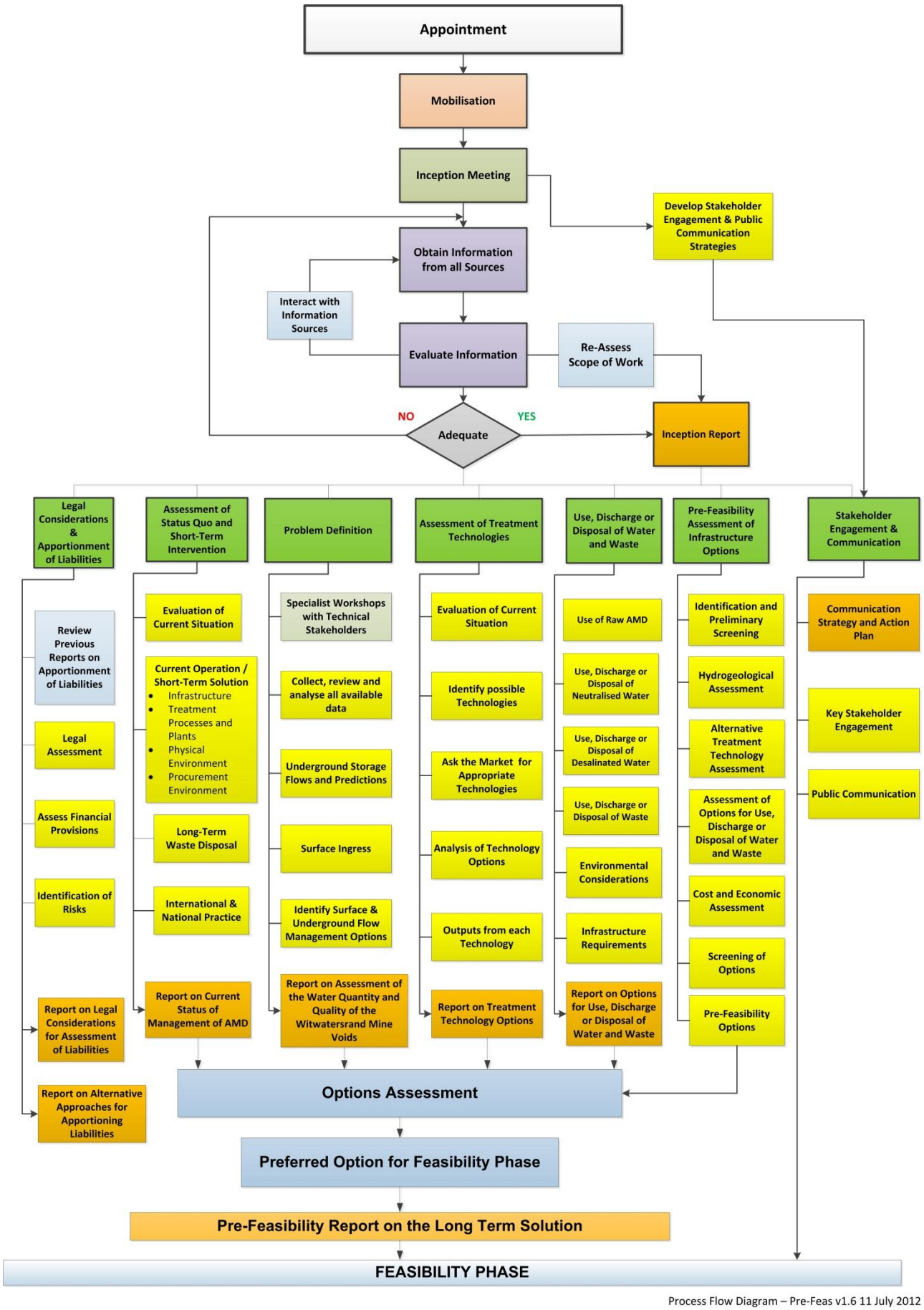


Figure 2-1: Project Flow Diagram – Pre-Feasibility Stage

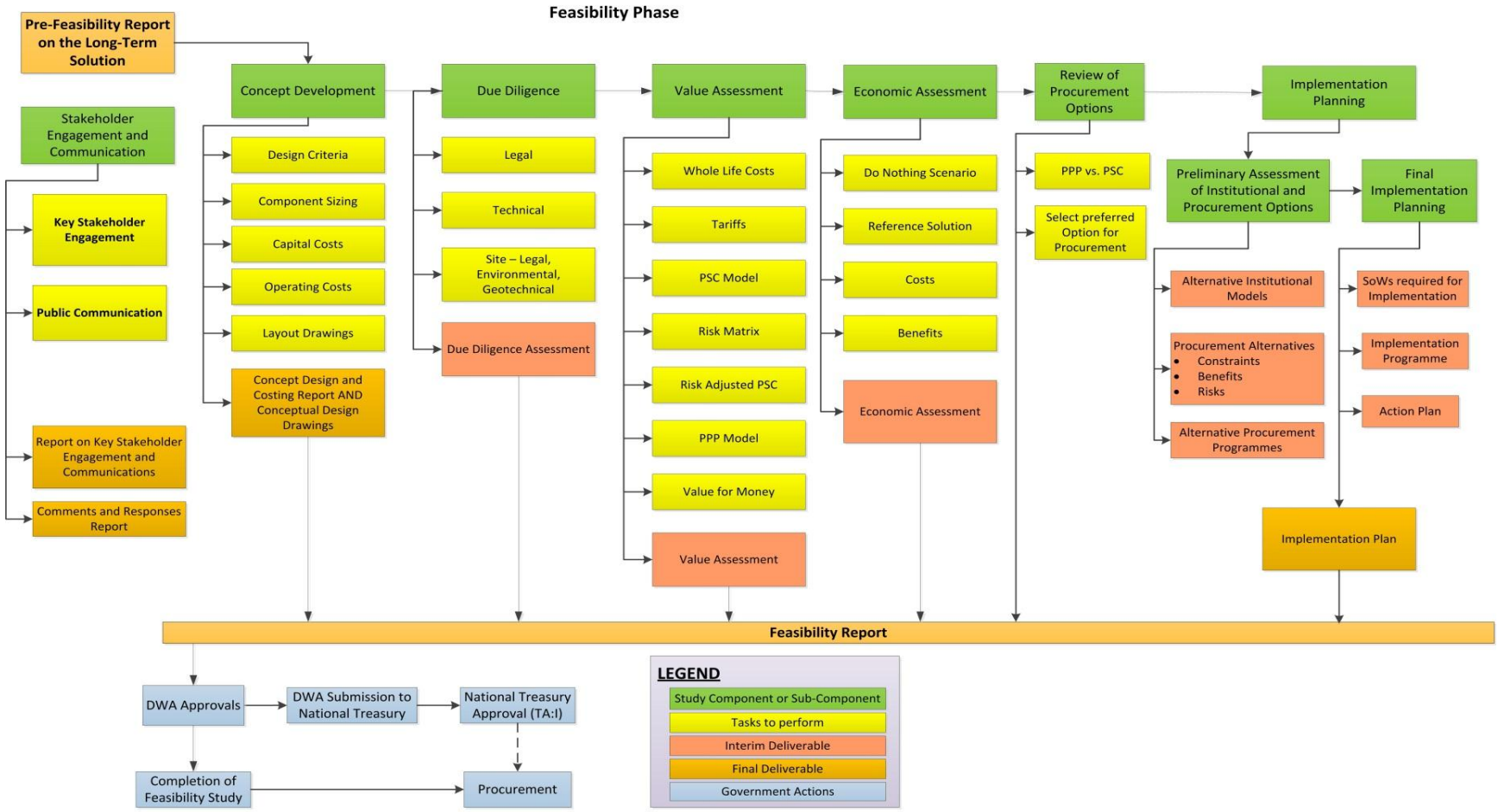


Figure 2-2: Project Flow Diagram – Feasibility Stage

The preferred option is based on:

- The present and likely future quantity and quality of the underground mine water, to be abstracted and treated.
- The options for use or discharge of the raw, neutralised or desalinated water and the user requirements.
- The options for use or disposal of the waste streams from both the STI and the LTS.

The Feasibility Study will use or establish:

- Revenue potential for the Preferred Option.
- Alternative mechanisms for funding Government's contribution to the cost of the LTS, e.g. Waste Discharge Charge System, Vaal River Tariff, etc.
- Legal, Institutional and Technical Due Diligence of the Preferred Option.
- Whole life costs.
- Quantification of the project risks for the PSC and PPP procurement models.
- Economic Assessment.
- Value for Money Analysis.
- Selection of the Preferred Procurement Model.
- Implementation and Strategy and Action Plan, including procurement process and programme.

On the basis that the AMD solution might include a PPP, a due diligence assessment will be undertaken of the potential institutional contracting parties to understand their legislative competency to contract and also to understand the associated constraints and risks. The due diligence of the completeness of the contracting institution forms part of the legal due diligence which is a key component of the Feasibility process for achieving TA1.

The Feasibility process will also include a market assessment of the appetite of the market to take on this new challenge, both as potential concessionaires and operators in a PPP and as recipients of the products (water and waste).

The preferred technical option will then be modelled as a PSC and a PPP model, both of which will be risk adjusted. The comparison of the two risk adjusted models will provide the Value for Money in terms of National Treasury's PPP Manual.

This Feasibility Study includes a viability study that tests the affordability, risk transfer and Value for Money of the preferred technical option.

The completed Feasibility Study will be submitted to DWA for approval. Since the project has been registered with National Treasury as a possible PPP project, DWA will then submit the study to National Treasury to obtain approval of the study, particularly the recommended procurement model. They will then issue National Treasury Approval (TA1) for procurement to commence or approve the funding application from DWA to National Treasury (authority for procurement to

commence) which is required for a registered project, irrespective of the procurement model which is adopted. This will enable DWA to commence procurement.

In the procurement phase of the project which follows on from achieving TA1 from National Treasury for a registered project, the recommended procurement model, PSC or PPP will be used for procurement. If the PSC model is followed the Contracting Institution (Government or its Designated Implementing Agent) will proceed with the design, tender, construction and operation and maintenance phases, some or all of which may be combined into a single phase. Government will fund or guarantee the funding for the project.

If the PPP model is to be followed, the Contracting Institution will be looking to the Private Sector to provide and fund a robust innovative solution for the management of the AMD which will meet the specifications that will have been drafted. The specifications will note the requirements that have to be achieved and look for a bid that can meet the technical requirements with limited retained risk by the Contracting Institution at that lowest cost to the Institution.

While the Preferred Option or (the Reference Project) will have been modelled, there is no guarantee that the technical option offered by a Private Party concessionaire bidding the project in the procurement phase, will in fact uses the identified technological solution or layouts identified in the Feasibility Study. It is expected that a Bidder would offer an alternative robust innovative technological solution that meets the specifications and is acceptable to the Bidder (future concessionaire) and the Funders.

3. Team Structure and Responsibilities

The following approach has been followed in structuring our team, which is shown on the Study Organisation Chart in **Appendix B**. The four key advisors: Lead, Technical, Institutional / Procurement / Financing and Legal, have formed a management team that is responsible for the satisfactory and timeous execution of the project. They were to be supported by two project administrators, but experience in the first 2 months of the study dictated that three (3) project administrators are required. We assigned a team leader for each technical area of expertise and they are supported by one or more specialists and support staff.

Each technical team is providing inputs to several of the components and their work is being coordinated by the management team.

The Lead Advisor, from Aurecon, is responsible for the overall project management and liaison with the Client, as required in the ToR. The Technical Advisor, also from Aurecon, is coordinating and integrating the work of the technical teams, including Environment and Water Quality, Situation Assessment, Hydrogeology, Treatment Technology, Infrastructure and Engineering, as well as Information Management.

The Legal Advisor is responsible for coordinating the legal inputs and opinions and the work on assessment of liabilities.

The Institutional/Procurement/Financial Advisor will work with the other advisors to integrate their outputs into the Feasibility Report.

The team members, who are leading each of the areas of expertise required for this project, are shown in **Table 3-1**.

The table also shows the specialists available in each field and the main technical support staff.

Table 3-1: Skills Profile of the Team

	Expertise Required	Lead	Specialists	Support
1	Multi-Disciplinary Project Leadership	SC Vogel	A Tanner	A Hindley / D Koekemoer
2	Water quality requirements (receiving Water Users)	Ms. M Hinsch	P Ashton	
3	Waste management	I Hammond	A Meintjies	N Mannie
4	Water purification technologies	W Johannes	W van der Merwe	A Wood / A Keuler / Ms. T Mofokeng
5	The relevant engineering competencies	JP Grobler		V Gajathar
5.1	Hydraulics	JP Grobler		V Gajathar
5.2	Structures	J Louw	H van Dalsen	I Bey
5.3	Mechanical	M Da Silva		**G Oegema**
5.4	Electrical	D du Toit		
5.5	Corrosion Protection	JP Grobler	I Solomon	
6	Water resource infrastructure project development	TD Timm		I Bey / V Gajathar
7	Water resource infrastructure financing	J Samuel	T Williams / L Mazwai	C Schmidt / S Jooste L Nkuma / P Nchodu / E Marobyane
8	Legislation	A Hindley		C van Wyk, V Letswalo
8.1	Water Law	H Thompson		
8.2	Environmental Law	JvG Botha		
8.3	Mining Law	I Sampson		
9	Structuring Contracts	J Samuel		M Renshaw / L Nkuna
9.1	Financial	T Williams		P Nchodu
9.2	Legal	L Mazwai		E Marobyane
9.3	Institutional	C Schmidt		
10	Water resource planning and management	D Koekemoer	A Tanner	
10.1	Hydrology	M Braune	V Jonker	P Shepherd
10.2	Water Resource Modelling	V Jonker		J Matole
11	Geo-hydrology of the 3 Basins	Ms D Duthe	T McCarthy / H Coetzee	M Levin / V Vermaak / C Myburgh, S De Waal/ A Mason-Apps
11.1	Dolomites	R Roux	I Venter	Peter Rosewarne
12	Project Economics	W van Zyl		D Koekemoer
13	Water pricing and tariffs	W van Zyl		D Koekemoer
14	Social economic development	T Sebego		
15	Environmental Assessment	BJH Smit	P Ashton	J Goosen
16	Stakeholder Engagement and Communication	V Maharaj	T Hart / S Manyaka	Ms. C Masogo

	Expertise Required	Lead	Specialists	Support
17	GIS	H Viviers		A Els / A de Waal / B Bothma

During the Inception Phase, DWA and National Treasury held meetings with representatives of the World Bank who offered their support. In particular, they offered the services of a number of international professionals who can peer review reports and provide other technical inputs as required. It is also noted that DWA may appoint other Peer Reviewers. Their comments on reports will be considered and, where agreed, will be taken into account in subsequent versions of the reports or subsequent reports on the study. Alternatively their comments may guide work to be done in the Implementation Phase.

4. Understanding of AMD and the present situation

4.1 Current Situation and Possible Long-Term Solutions

This Inception Report is based on our understanding at the date of the report, of:

- The current technical situation with respect to the underground AMD water and the STI. This understanding is being documented in the "Report on the Current Status of the Management on AMD."

  In terms of resourcing, programming and budget, the Inception Report is based on the understanding which will be presented in that report which will be issued in early May.

- Key elements of a probable long-term technical solution; and
- A likely institutional structure, procurement and implementation process.

The work required in Phase 2 of the Study, for Concept development or Feasibility development and drawings of layouts for the Feasibility Report, has been based on the long-term technical solution, which is outlined in **Appendix D** of this report. It differs from that envisaged and described in the proposal which is also given in **Appendix D** for comparative purposes. The proposal, resourcing and budget were based on that understanding.

However, it is recognised neither of those solutions are likely to be exactly the same as the preferred option, but they provide the basis for the budgeting, resourcing and description of tasks for this report. The impact of any changes to that solution on the Feasibility Phase tasks, such as the development of engineering concepts for the Feasibility Report (Component 5), Institutional Procurement and Financial Assessment (Component 6) or the documents required as part of the Implementation Strategy and Action Plan (Component 7), would then be assessed against the work as described, giving a clear basis for comparison and agreement of changes.

4.2 Access to Available Information

The planning for this Feasibility Study was and is based on the following assumptions:

- The project team will make use of existing digital data, where available.
- The digital GIS and attribute data required for the study, apart from that which the consultants already have access to, is to be made readily available at no additional cost by all stakeholders and Government Departments (e.g. town cadastral, hydrological and demographic data, transport, environmental and land-use related data, as well as bulk engineering services data). Although all the required information has not yet been received and, cannot yet be evaluated in most cases it appears that it will be adequate.
- The Gauteng Department of Agricultural and Rural Development (GDARD) Conservation Plan Version 3 (CPlan3), the Draft South African Heritage Resources Agency (SAHRA) and the Gauteng Provincial Database, will be the primary sources of information for the environmental assessment of the project options.

- The time and budget allocated to undertake the project is dependent on the information described above being provided by the stakeholders to allow for the completion of the project within the 13-month contract period and budget by the end of March. The delays that have been experienced have not yet had a significant impact. However, any further delay obtaining approval from DMR for CGS to release information and in receipt of reports and data from the Council for Geoscience (CGS) may have time and cost implications.

The AMD in the Witwatersrand area has been the subject of many studies and investigations over a number of years by numerous organisations. Many of those organisations were represented on the Expert Team which was appointed by the IMC to prepare a report on "Mine Water Management in the Witwatersrand" (IMC 2010).

The Proposal was based on the assumption that the work of that Committee, the technical investigations that have been carried out in the past and are currently being carried out by various organisations, including Government departments, Council for Scientific and Industrial Research (CSIR), CGS, Chamber of Mines, TCTA, and Rand Water, etc. will be freely are timeously available to the study team, in order to avoid duplication of effort.

This Inception Report is based on the situation as at the middle of March 2012. The situation then was that the Report of the Expert Team (IMC 2010), reports published by DWA, the Water Research Commission (WRC) and various other public and private sector organisations had been obtained. The data bases of spatial data and reference documents are continually updated and the list will be given in the Interim Report on Status of Available Information.

The TCTA reports have been received and good meetings were held with TCTA and their PSP team and background to the report was provided. Copies of their spatial data sets in an editable format (shape files, etc.) are awaited, but being prepared by them.

Reports, data sets, maps and Geographic Information System (GIS) coverages prepared by CGS for DMR, had been promised but not yet released. This has delayed some work although we have met with officials of CGS to gain some understanding. The impact of the delay on the programme can only be assessed when the data is received.

The key concerns, which are now impacting on the Study programme, are the non-availability of the CGS report on liabilities and Rand Water's cancellation of meetings at which it was hoped to obtain information from them.

A number of private sector organisations, including the mines, have also invested heavily in developing possible solutions to the AMD problem. While they have proprietary interests and rights over their intellectual property, it was assumed that the recommendations and enough technical background on their solutions would be made available to the study team to enable them to compare the various predictions of water levels, do the necessary conceptual comparison of treatment processes and proposals for the use or disposal of water and waste, as well as to

assess how any private sector initiatives and solutions will fit into the long-term strategy for managing AMD.

The status at the date of this report is that information has been received from and meetings were held with three of the Universities that have studied AMD. The Study Team also received, from DWA, the Western Basin Environmental Corporation (WBEC) reports, which were submitted to DWA as part of the Environmental Impact Assessment (EIA) and other processes. TCTA have also purchased some reports and information from the Western Utilities Corporation (WUC) and that data is expected to be available in April 2012.

It is assumed that the DWA will continue to assist the project team to gain access to and secure the willing co-operation of the various contact persons and officials to provide data and arrange for meetings.

4.3 Funding and Financial Provisions

A requirement of the study is to assess the financial provisions which the mining houses have made for managing AMD. There may be reluctance on the part of the mines to disclose this information without the facilitation of DWA, the Department of Mineral Resources (DMR) and Chamber of Mines, which we have assumed will be available and effective. It is still too early, to determine if there are problems related to this. However, if the delay in obtaining DMR clearance to obtain the CGS data is an indication, then delays can be expected.

The study team will review other possible sources of funding for the implementation of the LTS. These sources of funding could be, but are not limited to a capital grant or an item on the annual budget from Government, revenues from third parties for receiving water or waste products, waste discharge charges and discharge fees charged to mines and others who discharge to the water courses, an environmental levy, charging the Vaal River System water users via an increase in the raw water tariff and Private Sector funding for the construction of the infrastructure.

4.4 Vaal System Modelling

One of the potential benefits of effectively dealing with the AMD is the resulting increase in the Vaal System yield, particularly since releases from the Vaal Dam to dilute the salt load can be eliminated or substantially reduced. To quantify this benefit for one or more treatment scenarios, it requires that the water resources yield and probably planning models, including the salinity module, be run for the system. Some scenarios have already been run by DWA under their on-going project for the maintenance of the Vaal River Reconciliation Strategy. It has been agreed that any new scenarios developed under this study, will be modelled under that DWA project, at no cost to this study. This has the benefit of ensuring consistency in the modelling of the Vaal River System and confidence in the benefits of each scenario.

5. Methodology

5.1 Component 1: Study Inception

5.1.1 Purpose

The purpose of the Inception Report is to refine the general description of the Study and present the final description of SoW, methodologies deliverables, and study programme staff resource requirement, study and component budget which will then form part of the contract.

5.1.2 Methodology

The ToR: Request for Proposals of June 2011, formed the basis for the Proposal submitted by the PSP and that forms the basis for this Inception Report. The Inception Report is informed by the revised and expanded understanding gained by the DWA and the (PSP), of the requirement for a successful Feasibility Study during the Inception Phase. Any aspects that may have been overlooked or were not appreciated, either in the original study ToR, or in the PSP's Proposal, are identified and included in this Inception Report. At the date of this report there are the following uncertainties about aspects which affect the study:

- The timing and scope for implementing the STI.
- The programme for implementing the LTS which is likely to be fast tracked. If that is decided, then the following decisions, which would not normally have been required until near the end of the Feasibility Study, will probably become urgent:
  - The implementing agent: DWA, TCTA, Rand Water, etc.;
  - The funding available for implementations;
  - The procurement model to be used (PSC, DBOM, PPP); and
  - EIA.

The possible implications of these uncertainties and alternative outcomes are discussed for each component.

The approved Inception Report forms part of the Contract and define the SoW, allocation of budget between components and the programme that will govern the study. Should changes to the contract be required to accommodate further changes in the SoW, they will be negotiated between DWA and the PSP.

Component 2 (Sources of Information) started in parallel with Component 1. Additional references and data thought to be necessary for the successful completion of the study were identified and continue to be sourced throughout the study. It was assumed that all existing data and information would be made available to the PSP free of charge, and at the date of this report that was the case.

Component 8 (Stakeholder Engagement and Communication) also commenced during the Inception Phase and has developed agreed strategies, which are somewhat different from those

envisaged in the proposal and have different budget requirements which are presented in this report.

5.1.3 Deliverables

The ToR specified an Inception Report within two months from the start of the study, i.e. end of March 2012.

5.2 Component 2: Identification of Sources of Information – Collection and Evaluation

5.2.1 Purpose

- To identify, collect and evaluate all relevant existing information.
- To identify gaps in the information required for the study and propose solutions to fill the gaps.
- To collate spatial data via the GIS data base and provide an index of all reports, etc.

5.2.2 Methodology

The activities, which are on-going have or will include:

- Collection of reports that have been prepared and set up for this area covering the following topics:
  - Water quality and quantities;
  - Mine plans, mine closure plans;
  - Surface water ingress reports;
  - Geological and geotechnical data. These were obtained from the Client, TCTA and their consultants for the STI;
  - Published and unpublished geological mapping;
  - Aerial photographic interpretations, geotechnical reports carried out by various consultants;
  - Plans showing mine voids;
  - Part of the STI, construction of infrastructure at selected locations will shortly commence much information, including tender documents that have been obtained and sharing of it would be advantageous to source all the detailed geotechnical reports and data related to those sites; and
  - Data on water level depths, qualities of waters and decant rates that are currently being collected by the hydrological monitoring committee.
- Review of the reports, data and models.
- Identification of gaps in the existing data.
- A specialist workshop has been held with invited stakeholders who have researched and published reports on the hydrogeology of the mine voids, to better understand the data and conclusions drawn and the confidence limits on the data and conclusions, as well as their understanding of the current status, which may not yet have been documented.
- Future activities comprise:
  - Preparing an interim status quo report to be published in July 2012, including details of the gaps in data and proposal to address these;

- Preparing a concluding report on Information Management and the data bases of spatial data and report, as of end of October 2012;
- Sourcing information from which data must still be obtained and specific information which is still outstanding at the date of this report are described below.
  - Geo-hydrological models have yet been obtained but it is anticipated that they will not be required and the results of modelling by other will be used.
  - Organisations whose information it has not yet been possible to obtain are:
  - Department of Mineral Resources;
  - Council for Geosciences;
  - Mining Houses;
  - Rand Water; and
  - Johannesburg Metro geotechnical data bank (not yet interrogated).

- The record of available geological information will form part of the overall reference list of sources of information, and include brief descriptions of sources of available, related and relevant information.

These data sources will be followed up.

5.2.3 Deliverables

- A GIS spatial data base of all spatial data.
- A searchable electronic data base in Excel format.
- A web portal where the reference reports, which have been obtained electronically, and reports prepared by the Study, will be categorically stored and where they will be accessible to registered users.
- DVD containing a replica of the electronic information accessible through the web portal.
- An information centre for all hard copies of information will be set up and maintained throughout the study.
- The data, results and findings will be presented in the reports, which will inform the assessment of alternative technologies and management scenarios.

5.3 Component 3: Legal Considerations and Apportionment of Liabilities

5.3.1 Purpose

Paragraph 3.5 of the ToR, quoted below, is guiding this component:

“Numerous abandoned, derelict and/or ownerless mines are situated within the larger Vaal River water supply area. This implies that the State is likely to have to assume the responsibility for many of these mines, if ownership cannot be traced, or if the mines had become government responsibility in terms of the Fanie Botha Accord (agreement by DWA with the Chamber of Mines). Although the Department should scrupulously enforce all applicable water legislation, this fact underlines the necessity that government and the mining industry will have to work in close partnership. In addition, it must be noted that the issue of ownership potentially holds huge

implications for the State in respect of contributing towards the costs associated with a regional underground mine water and AMD solution."

The ToR specified the following aspects relevant to this component:

- The legal advisor must examine the legislative issues associated with AMD.
- The purpose of the component is to provide legal assistance where necessary and to confirm and agree on the apportionment of liabilities that had been done by CGS;
- The deliverables of this component are:
    - Apportionment of liabilities and the clarification of the implications of the said apportionment;
    - Legal due diligence on the technical solutions recommended in the Feasibility Study; and
    - Legal opinions on any contentious issues that may be identified.

5.3.2 Methodology

5.3.2.1 Sub-Component 1: Apportionment of liabilities

The proposal described the following methodology:

"The approach to address the specific purpose of considering the apportionment of liabilities will be approached as follows:

- *The apportionment of liabilities proposed by the Council for Geoscience will be reviewed against the **legal environment** which informs it.*
- *The specific recommendations will be considered **against the legislation on which they are based.** Any differences of opinion, cautions or alternative legal opinions will be set out in a draft report.*
- *A meeting will be held with the relevant officials of DWA, Council for Geoscience and other departments, as appropriate, to discuss our findings.*
- *A final report will then be prepared."*

At the date of this report the results of the work on "Apportionment of Liabilities" that has been done by the CGS for DMR had not been made available by DMR or CGS.
Based on the indications received from the Council's representative, the Council did not address any legal apportionment of liabilities in any reports. Reportedly, CGS provided opinions in various documents on possible technical, pragmatic approaches to apportioning possible liabilities, in some of the basins, as sub-components of various studies. No legal data and apportionment of liabilities seem to have been considered in their work.

Legal ownership and information on licensing and operation of mines are also reportedly not addressed in the CGS reports.

In the light of this situation a number of discussions were held with the Department's Study Manager and other officials to agree on the best approach to follow in this component, to ensure that value is added and the Department's requirements are met. In parallel a number of proactive steps, including research, were undertaken to attempt to obtain relevant data on the current legal

status and available options for identifying legal liabilities, because of the reported lack of any report(s) by CGS on legal liabilities. Additional budget has been allocated from specialists' time for these proactive steps. Its adequacy will be reviewed when the CGS reports are obtained.

Two distinct approaches will have to be considered in the apportionment of liabilities are:

Providing an opinion on the legal principles regarding who could be legally liable for the negative effects of AMD in the three basins. This report will be researched and developed in absence of the relevant CGS report(s). The adequacy of the available budget for this component will have to be reviewed when the relevant information, including whatever reports and data are available from CGS, have been reviewed.
Allocating specific (by way of percentage, for example) pragmatic / technical apportionment of liability to specific parties. This will entail applying technical considerations taking account of the legal principles. The technical approach will be based on extensive data / information to propose alternative apportionment between specific parties. Certain technical data and possible practical allocations of liability is reportedly contained in the CGS reports, but which was not available for review at the data of this report. It also appears that there is no single report, but a number of reports, each containing some data and technical apportionment percentages.

The latter approach, using the Council's existing reports and opinions, cannot be scoped or budgeted until the reports are received and assessed. The additional budget required will be discussed with DWA as soon as the Scope has been determined and agreed.

The following activities are being carried out to address the legal apportionment of liabilities report, in the absence of CGS reports or information:

- Execute a search of the Deeds Office Deeds Summary (AKTEX) for land and mine ownership;
- High level searches at DMR for existing available documents to attempt to ascertain mine ownership and mining rights information;
- Researching the relevant law on the matter;
- Assessing and discussing all information gathered;
- Confirming a possible legal approach(s) to legal liabilities;
- Drafting an opinion report with recommendations on who could be legally liable, based on data made available as part of the above processes and the law, without apportioning specific liability to specific parties;
- Presenting and discussing the above report and obtaining written inputs from the Study Administration Committee (SAC) and other relevant and identified DWA officials and identified and agreed upon departments; and;
- Updating and finalising the report with the inputs received and assessed.

In order to address the technical apportionment percentages as purportedly contained in CGS reports, the following steps are envisaged:

- Obtain the CGS reports and review;

- Meet CGS officials and confirm our understanding of the reports and their confidence in the data used;
- Identify the gaps in the work done by CGS; and
- Agree with the Study Manager what additional work, if any, should be undertaken and the cost of that work.

5.3.2.2 Legal due diligence on the technical solutions recommended in the Feasibility Study

This will be addressed as part of Component 6, as described under that component.

5.3.2.3 Sub-Component 2: Legal opinions on any contentious issues that may be identified

This open-ended task is subject to budgetary and time availability, taking Sub-Component 1 into account.

In light of the above, legal opinions on the study will be prioritised and before a requested opinion is addressed, the requirement, need, scope, outcome(s) and time and cost implications of the opinion will be discussed and agreed with the Lead Advisor and/or DWA Study Manager.

One of the opinions required by the ToR is to investigate the adequacy, relevance and potential utilisation of the financial provisioning made by mines for mine rehabilitation. The legal position on using or accessing the funding for managing AMD will be determined and reported. The assessment of adequacy and relevance will be carried out if it is possible to obtain details of the provisions which the mines have made.

5.3.3 Deliverables

- A report "Legal Considerations for Apportionment of Liabilities" setting out the Team's legal opinion on possible legal liabilities, including factors to be considered when the opinion is implemented. This will include:
  - Addressing the relevant law on the matter;
  - Providing an indication on who could be legally liable, applying the possible legal approach to possible liability; and
  - Addressing what legal avenues are available to the State and advised in this regard.

  This report will be for the purposes identified above and not for litigation purposes.

- A report on "Alternative Approaches for Determining Liabilities" taking cognisance of the work of CGS reportedly on technical apportionment of liabilities.
- Legal opinions on clarification or interpretations on any study-relevant legal/legislative matters that may be identified throughout the study, within budgetary and time availability, agreed upon with the Lead Advisor and/or DWA Study Manager.
- Inputs on the study's other components, as required and agreed.

5.3.4 Probable Activities during Implementation

Following the work in this component and study, it is envisaged that at least the following legal-related activities will have to be implemented by DWA during implementation:

- Engaging with, preparing and implementing agreements or legal processes with actual or possible land or land rights owners / holders or mines for access to land or rights and other legal requirements for implementation.
- If required, preparing for law enforcement and/or litigation based on extensive further research.
- Negotiations with mines on their financial liabilities and/or contributions. It is anticipated that DWA will need external legal advisors to prepare for and conduct these negotiations.

5.4 Component 4.1: Assessment of the Status Quo of Managing AMD

5.4.1 Purpose

The purpose is to summarise all relevant information as one of the deliverables that will inform Sub-Component 4.5: Identification and Assessment of Options for the Long-Term Management of AMD.

Assessing the STI being implemented by TCTA and its implications for the LTS is an important part of this sub-component. The STI will be assessed considering the following aspects:

- Proposed infrastructure – How will the proposed abstraction points and infrastructure influence the LTS?
- Treatment of AMD – How will the proposed STI treatment influence the LTS?
- Environment – What environmental issues will the STI raise in the long-term?
- Procurement Strategies – How will the STI affect procurement of a LTS?

5.4.2 Status assessment

The documentation that has been prepared for TCTA on the STI will be used as basis for the assessment to be done in this sub-component. The following documents were made available to the Study Team and are being reviewed:

- TCTA: Due Diligence Report and Appendices – Compiled by BKS in association with Golder Associates;
- TCTA: Design Criteria Memorandum. Compiled by BKS in association with Golder Associates; and
- TCTA: Construction of AMD Phase 1 Treatment Facilities, Tender Document, Volumes 1 – 7.

This component will review and comment on the STI, but no recommendations will be made at this stage. The report will assess what has been proposed and base the implications for the LTS on those proposals.

Other initiatives for the management of AMD particularly that of the CGS will be considered in other components, since those initiatives are at the planning, and not implementation stage.

5.4.3 Deliverables

A report on the "Current Status of Management of AMD" will be prepared.

5.5 Component 4.2: Assessment of the Water Quantity and Quality in the Mine Voids

5.5.1 Purpose

The purpose of this sub-component is to define the scale, quality and quantity of the problem (AMD) which the LTS will have to manage, and the possible changes in quantity and quality with time.

The objectives are:

- To agree on the locations, depths and levels (m amsl) of aquifers and any other environments which should be protected from contact with AMD, thus defining the ECL;
- To agree on the locations, depths and levels (m amsl) of any socially, culturally or economically important features of importance (e.g. the mine museum at GRC or ore bodies that are planned to be mined should be protected from AMD. This will define the Socio-Economic Critical Level (SECL);
- To predict the volumes of water that must be abstracted from various underground compartments to achieve and maintain agreed static water levels and any changes with time;
- To predict the time at which the water in each basin will reach the agreed pumping level SECL and ECL for various scenarios based on the most up to date information;
- To summarise previously identified sources of surface water ingress and any proposed measures to reduce or eliminate the ingress;
- To develop scenarios for ingress control which can be used to estimate changes in the quantities of water to be abstracted with time;
- To consider and summarise any proposals for isolating sections of the underground workings to reduce the volumes or improve the quality of the AMD.

5.5.2 Background

While this study is focused on developing a LTS for dealing with the AMD water abstracted from the mine void, it needs to consider factors that will change the quantity or quality of the AMD. Therefore, in assessing the present situation, it will also identify, but not study possible options for reducing the ingress of surface water to limit the volume of water to be treated which have been identified or are being identified by other studies.

A significant volume of AMD flows to the environment from mine waste and tailings dams and this should be addressed. This is especially a problem in the Western Basin, where it pollutes the

Wonderfonteinspruit catchment. The National Nuclear Regulator (NNR) compiled a report on this and proposed a plan of action to be taken but the status of this report is not known.

It would be appropriate if a parallel initiative addresses the detailed planning and implementation of measures to limit the volume of the underground AMD and addressed the AMD resulting from surface mining activities.

5.5.3 Methodology

The following approach is being followed:

- Identify the aquifers, environmental, social and economic features which should be protected from AMD, their levels (m amsl) and the mechanisms through which AMD may come into contact with or impact on them.
- Determine the level, at the point of interest (aquifer, GRC Museum, etc.) above which water should not rise and propose an ECL to protect aquifers or sensitive environments and a SECL to protect features of social or economic importance.
- The available data, including the monitoring data currently being collected by the Hydrological Monitoring Committee is being scrutinised. In particular, the observed rate of rise or rate of pumping or rate of decant in each basin will be reviewed.
- The volumes of water of the mine void as determined by TCTA and other sources, the observed rate of rise and predictions of ingress will be considered together to estimate future rates of rise and probable required pumping rates to maintain a static water level.
- The volumes of water that are planned to be abstracted by the STI, and the estimated volumes required to be abstracted at the various points on the Eastern, Central and Western Basins will be compared and recommended abstraction rates proposed.
- Once the ECLs and/or SECLs are determined for each basin, a Target Operating Level (TOL) will be determined. The TOL is the level which should be maintained at the abstraction point to protect the ECLs / SECL after allowing for fluctuations in water level due to external factors and hydraulic gradients across each basin. The TOL is discussed further in Component 4.5 where it will be determined.
- The published ECLs and dates for breaching the ECL will be reviewed. There are probably sufficient water level data across the Central Basin to develop reasonable predictions of when the ECL will be reached. There is limited historic information of rate of rise in the Eastern Basin, which makes it difficult to predict when the ECL will be reached.
- The degree of connectivity between mine compartments is poorly understood and this could potentially result in multiple decant sites or water levels above the ECL or SECL, particularly in areas distant from the pumping site, if connectivity is not sufficient or the TOL is not low enough. This may only be fully revealed through monitoring of several compartments after pumping is initiated. A precautionary approach will be followed and the risks identified.
- Extensive water quality monitoring has been undertaken for some locations and the underground water quality data will be compiled and statistically assessed in order to establish likely quality ranges. However, it is recommended that the Hydrological Monitory Committee extend its programme to include additional water quality sampling from previously sampled sites to provide current comparative data.

- Additional shafts for water sampling (at various depths) to obtain more representative water quality data across the basins will also be proposed. There remains a risk that shaft water qualities may differ from elsewhere in the mine void. To assess the void water quality would require sampling and analysis of water from the void via surface boreholes.
- Drawing water from shafts that are only connected to the mined void at great depth could result in very poor water quality being drawn to surface. An indication of compositional stratification in the void could therefore be of some value in trying to optimise the treatment process and refine the operating cost estimates. The implications of alternative abstraction sites will be described.

From the analysis of the available information, abstraction rates and associated water quality will be predicted along with an indication of level of confidence and predicted changes.

The risk of sinkholes forming in the dolomites, by varying the water level, is potentially of great importance. The data will be reviewed, and dolomitic bedrock depth contours will be extracted where these are available. Potential problematic areas and significant gaps in the data will be identified. The criteria, by which the impact of changing water levels is to be measured, will be defined.

The Western Basin where the dolomites are currently flooded, but will be drained, is sensitive to this risk, which will be assessed.

The problem will also be assessed for the Eastern Basin; however, the risk is probably small, as the dolomites have not been dewatered due to mining activities in this basin.

A desktop review and identification of previous studies will be carried out to identify the measures that will be required to minimise surface water ingress. The approach is:

- Diffuse runoff/seepage from waste rock dumps and other waste facilities that could enter into the underground workings and potential areas of seepage ingress from these areas will be identified, but measures to reduce this will not be addressed in this Study.
- The CGS is currently undertaking a "Strategic Water Management Project" of which Objective 1 is "Prevent Ingress of Surface and Underground Water into the Underground Workings". Extensive work on the surface water hydraulics has apparently been undertaken and this data will be used to conceptually identify surface water that is probably adding significantly to the underground water ingress.

  At the time of this report the scope and programme of the ingress control component of the CGS Project is not known, but will be established. A delay in obtaining this information may mean it is not included in the report on this component.

- Various mine closure strategies also contain relevant proposals for reducing ingress and these will be considered.

- The rates of rise of water level prior to the commencement of pumping and pumped volumes will be examined in the light of seasonal rainfall. This could potentially provide information on the manner of ingress of water into the void, i.e. direct access from river courses or via slower, groundwater flow. The control measures to limit ingress has already been identified as an area requiring further work, and their design and implementation should be a separate appointment which should be made as soon as possible.

It is understood that the analytical model currently used for modelling the water balance scenarios for the STI has been developed, using the Goldsim software. Assuming the validity/reliability of this water balance model is confirmed in discussions with the TCTA, it may be used as a management tool during implementation to provide continuity between the short-term and long-term solutions, by updating and re-calibrating with additional information as that becomes available.

However, this type of model does not replace a 3D numerical flow model which may be required in the subsequent design studies to model flow regimes for different scenarios of abstraction locations (whether via shafts or dedicated abstraction boreholes) so that the pumping layout and design can be optimised.

5.5.4 Deliverables

A report on "Assessment of the Water Quantity and Quality of the Witwatersrand Mine Voids" will be prepared. It will identify:

- Implications of the abstraction points and depths of the STI for the LTS;
- Probable pumping rates and their variation with time to maintain alternative underground water levels;
- Predictions of water quality and the variability with time; and
- It will also contain a summary of the options for limiting the scale of the underground AMD, an assessment of the percentage of ingress that could be prevented and if possible from the available information, a time frame.

5.6 Component 4.3: Assessment of Options for Use, Discharge or Disposal of Water and Waste

5.6.1 Purpose

The primary purpose is to:

- Identify all the options for eliminating, or reducing to acceptable levels, the salt loadings on the Vaal River System due to the delivery of AMD from the mine voids to the surface, in a sustainable manner.
- The secondary purposes is to assess the best ways to achieve this by identifying options for:
  - The use of water, after neutralisation and removal of heavy metals (e.g. by the High Density Sludge (HDS) process), in the STI;

- The use of desalinated water that will be delivered by the LTS; and
- The use or safe disposal of the waste products from the treatment processes.

- Screening the possible options to provide a range of potentially viable and realistic options to be used in Component 4.4.

5.6.2 Methodology for Use and Discharge of Water

It has been stated by DWA National Water Resource Planning that the treated AMD water must preferably remain in the Vaal River System or be used to replace water currently supplied from the Vaal River System. An example would be to supply potable water to users in the Crocodile West Catchment that are currently supplied by Rand Water from the Vaal System.

If this statement is confirmed as a requirement of the Study, then options for other water use in the Crocodile West or Olifants River Systems, or any other catchments, will not be considered.

The "sectors" where the alternative water streams can be used or discharged and the options for waste use or disposal are as follows:

i. Neutralised Water:
   - Agriculture;
   - Industry; and
   - Mines;

ii. Desalinated Water:
   - Release to the river systems;
   - Potable use;
   - Industrial use; and
   - Mines.

iii. Disposal of waste products.
   - Industry for useable products; and
   - Disposal sites for disposal of unusable waste.

These are discussed below.

5.6.2.1 Use of Neutralised Water

Neutralised, but not desalinated water can be used by some industries or mines in the rehabilitation of waste dumps and for reworking mine waste dumps. It can also be used in agriculture. The acceptability of this water for each sector and the implications for the Vaal River System of that use will be considered.

In assessing the alternatives, particular attention will be paid to the final destination of the salts and whether or not they will, at some stage, return to the water resource. If they do then the objective

of removing salts from the system has not been achieved, but they may delay the salt loading on the system while other solutions are implemented.

5.6.2.2 Release to the River System

Considering the short time period, only available and existing information regarding the water-related natural attributes, infrastructure developments, human and ecological needs, human impacts, issues and economic development in the affected Blesbok Spruit, Klip River and Wonderfontein Spruit and Middle and Lower Vaal River Catchments will be utilised.

Should the resource planning indicate that some of the water should be discharged to the Crocodile River West System; the status quo of that catchment in terms of water quality will also be assessed. However, this may be unacceptable from a water resource management perspective if the water is required to support the Vaal River System.

Resource Water Quality Objectives (RWQOs) have not been determined for the Crocodile River West Catchment (Tweelopies Spruit). Therefore, if required, a desktop study will be undertaken to identify suitable discharge locations and the proposals for allowable discharge quality will be discussed with the relevant officials of the Department, to agree on a receiving water quality. Stakeholder engagement will be through a presentation to and discussion with the Study Stakeholder Committee (SSC).

RWQOs or RQOs, which are relevant to this study and which were set for the Vaal River Catchment, will be used as basis for the identification of suitable discharge locations with the aim of having the least impact on the river system and aquatic environment. The allocable water quality capacities at each point will guide the allowable discharge quality which will direct the treatment options for discharge. The results of this study may also inform the resource classification processes, with which it will engage.

Interaction with stakeholders may be required if the RWQO requirements of the recipients are not sustainable under the optimum solution. Renegotiation of recipient water quality requirements with stakeholders should be undertaken as part of the DWA's on-going resource classification process.

Expectations are that Lesotho Highlands Phase II, and subsequently the Tugela Transfer Scheme and DWA's water conservation and water demand management (WC&WDM) initiatives will increase the flows in some rivers feeding into the Vaal Dam and Barrage. The effect of this additional water on the future/long-term water quality in the river systems, the assimilative capacity, as well as future threats to Vaal River System water quality, will be considered, but is unlikely to have significant effect on the rivers where treated AMD could be discharged.

In the Cost Benefit Analysis (CBA) in Component 6, cost implications associated with earlier implementation of augmentation schemes to provide dilution water, compared to the cost of the LTS will be considered. Cost will also be compared with the externalised cost to down-stream users. Options and decisions will be backed by the CBA.

This assessment will also consider long-term limits for treated AMD as they may vary seasonally/climatically when there is greater or less dilution/assimilative capacity, available in specific watercourses

5.6.2.3 Potable use

The potential sites of the AMD treatment facilities all fall within the Rand Water area of supply (including its supply to users in the Crocodile West River System) and jurisdiction. Rand Water is therefore considered to be the primary stakeholder, although other options may exist. Stakeholders and the general public will also be kept informed of the options through the SSC.

Negotiations with Rand Water to identify where the water can be delivered to their system, as well as the quality of the water and the quantity of water that can be accommodated have been initiated.

In the initial discussions with Rand Water, they indicated that they would be reluctant to accept desalinated AMD for potable purposes. Rand Water currently supplies 4 000 Mℓ/day to their consumers, serving approximately 12 million people. Treated AMD is only capable of supplying about 166 Mℓ/day, which is less than 5% of their total requirements.

Rand Water is concerned that treatment of AMD to potable standards does not have a proven track record to demonstrate that the radioactivity will be or can be adequately removed from the water. They are of the opinion that the research carried out on the quality of treated AMD does not provide conclusive evidence that the radioactivity has been removed to below the required threshold. Rand Water is therefore concerned about the public perceptions of the risks and hence, the potential risk to Rand Water of a loss of confidence in Rand Water by their consumers, i.e. reputational risk, associated with using fully treated AMD, for such a small percentage of their water. They are thus averse to blending treated AMD water into their potable systems.

However, Rand Water have indicated that they may be prepared to consider isolating some of their infrastructure, which is currently used to supply industry with potable water, and using that to distribute treated AMD.

They would also consider the idea of supplying/supplementing Industrial water to the mines from treated AMD water, especially in the Western Basin, where the Rustenburg mines could benefit. These possibilities will be looked at with Rand Water on a case by case basis, considering the future life of each possible user.

Acceptable quality control protocols will be determined, to ensure that consistently acceptable quality water is delivered to Rand Water, or other distributors of potable water, whether it is for industrial or potable use.

Further meetings with Rand Water to discuss alternative solutions have been planned but have not yet taken place. Their requirements for accepting treated AMD for any of their users will be discussed and agreed with Rand Water.

5.6.2.4 Industrial and Mining use

The possible industrial use of the treated AMD would require that the following steps be executed:

- Obtain details from Rand Water of their industrial consumers and supply network to those users.
- Determine under what, if any, conditions it would be acceptable to export treated AMD water from the Eastern Basin to the Olifants River System.
- Identify industries in the areas of the treatment plants that could use industrial water rather than potable water for their processes, including the mines around the Western Basin.
- Establish the quality standards required by the industries.
- Establish the actual demand and flow patterns of the industrial water users.
- Perform a reconnaissance level design of the infrastructure required to deliver the water to the industries.
- Assess whether the industrial use of the treated AMD water is a viable option.

This Feasibility Study will determine an indicative cost of the treated water which will be an input in the discussions with the relevant industries, if it is realistic to supply them either directly or via Rand Water.

5.6.3 Background to the Use and Disposal of Waste

5.6.3.1 Background to Handling, use and disposal of Residues and Wastes [

A paradigm shift has taken place in the handling and management of treatment residues, such as sludges and brines. The recovery of useful and saleable products is now researched and actively pursued. The recovery of useful products from the treatment process waste streams may include the following:

- Metals recovery;
- Supplements for mine land rehabilitation and revegetation, such as $CaSO_4.2H_2O$;
- Alkali recovery, such as $CaCO_3$;
- Building and construction related materials, such as gypsum;
- Beneficial use of brine in the cultivation of halophilic organisms, such as algae containing high ß-carotenes and other nutritional supplements;
- Recovery of saleable products, such as sulphur and magnesium salts;
- Agricultural use (e.g., fertiliser);
- Supplement in cement manufacturing;
- Gravel from sludge;
- Metal adsorbents in used industrial wastewater treatment; and
- Pigment (ferrihydrite).

Research and development work in this area is on-going. The incentives driving the recovery of by-products include the following:

- Reduction of waste sludge and brine products, which require perpetual handling and disposal with associated long-term environmental liabilities;
- Generation of a revenue stream to partly or fully offset the on-going treatment cost; and
- Contribution to the long-term sustainability of mine water treatment projects.

The key aspects of successful by-product recovery in the treatment of AMD are as follows:

- The target by-products must be selectively removed by minimising the co-precipitation of compounds that would degrade the quality of by-products;
- By-product recovery, as a project objective, will have an impact on the mainstream treatment process in terms of unit treatment, process selection, and sequence of treatment processes; and
- Chemical (reagents) dosing to the mainstream treatment process, must take into account the impact on the potential for and composition of by-products.

5.6.3.2 Background to the Disposal of HDS from the STI

Once commissioned, the STI will neutralise the AMD using a HDS process, which will generate substantial quantities of voluminous iron rich, and potentially radio nucleotide impacted sludge, which must be safely disposed of. Historically, the mine HDS plants discharged the resultant sludge along with their tailings, to tailings dams, in a co-disposal approach. The STI proposes to continue with the disposal of waste sludge to tailings dams, or open pits. There are a number of factors which must be assessed for their long-term sustainability of these proposals, including the long-term risk, namely:

- The tailings dams, open pits and mine workings are owned by various mine groups. The conditions in the agreements with the mines prescribes, that the tailings dams, open pits or abandoned mine-workings can be used to receive the sludge, either by the facility owners, or the authorities;
- The liability for the future closure and rehabilitation of the tailings dams, open pits and abandoned mine-workings that receive sludge;
- The legislative implications (licensing, etc.) of such waste disposal practices;
- The capacity of available tailings dams, open pits or abandoned mine-workings to receive the projected sludge volumes and characteristics for an extended period;
- The engineering requirements to allow the tailings dams, open pits or abandoned mine-workings to receive and safely store the projected sludge volumes and characteristics;
- The potential long-term environmental impact of the sludge disposal to tailings dams, open pits or abandoned mine-workings; and
- The long-term liability for managing any potential environmental impact due to sludge disposal to existing tailings dams, open pits or abandoned mine workings.

The waste products from alternative technologies will be considered. The implications of the disposal of the waste streams from alternative technologies will be assessed, considering the following factors:

- Relative production in terms of volumes and masses;
- Typical characteristics in terms of chemical composition (e.g., hydroxide, sulphide, and NP) and physical properties (i.e. consistency, volatility, and dewatering ability);
- Hazardous classification and rating;
- Potential environmental impacts; and
- Disposal options.

The treatment residues can be broadly classified into the following two categories:

- Sludge, which is a slurry or dewatered cake, containing precipitates of diverse composition; and
- Brines, which contain soluble salts in high concentrations.

The handling and disposal of sludge will take the following into account:

- Dewatering and compaction ability;
- Slurry density – moisture content;
- Volume – rate of production;
- Metal stability – available alkalinity;
- Radio nucleotide presence and stability;
- Sludge composition; and
- Economics.

For the HDS from the STI, the following sludge disposal options will be considered:

- Potential for sludge dewatering, mechanically or physically, to reduce the volume to be stored:
- Engineered sludge ponds;
- Underground mine workings, especially as a backfill material;
- Opencast mine workings;
- Co-disposal with mine tailings and waste;
- Incorporation into rehabilitation covers of mine tailings and waste; and
- Landfills after amendment with a stabilising material.

For the HDS from the LTS, the following aspects will receive particular attention:

- The locations and basis for design of dedicated hazardous waste storage/disposal facilities to receive the long-term sludge;
- The opportunity to dispose waste sludge to existing land-fills or other waste disposal facilities; and
- The opportunity to beneficiate the waste sludge is discussed in Section 5.8.

HDS has, internationally, been placed in abandoned deep mines or in pits dug on surface mines, to take advantage of its excess alkalinity, but this is only appropriate if the receiving environment is

not acidic. If the sludge is exposed to sufficiently acidic water, the sludge can re-dissolve, neutralising the pH somewhat, but increasing the dissolved metal content. These options will be explored.

Brine disposal is much more challenging and the following disposal options will be considered:

- Incorporation into a mine waste or tailing stream;
- Irrigation and potential cultivation of salt resistant plants;
- Solar evaporation ponds, possibly with some wind assisted features;
- Discharge and dilution in a sanitary sewer;
- Mechanical evaporation and crystallisation; and
- Beneficial use in the cultivation of halophilic algae species of commercial value.
- If potentially economically viable products can be produced, try to identify possible users to take the waste products.
- If products are not economically viable, determine disposal options, taking into account environmental, safety and legal requirements.

5.6.4 Methodology for the Use and Disposal of Waste

All AMD treatment technologies produce some residues (e.g., sludge, brines, and spent media) or emissions (e.g., gases). These residues and emissions contain the elements and compounds removed from the AMD, as well as the additives and supplements dosed in the treatment process. The LTS treatment processes will produce waste products in the form of diluted chemical salts that could have an economic value.

The investigations for the disposal of the waste products will start with an understanding of the following:

- Identifying the chemical components in the waste from various processes.
- Determining the radio-active components of the waste.
- Determining processes to treat the waste products to render usable products.
- Determining the characteristics and volume of the unusable waste.
- Determining the cost of producing the products and compare with the market related values.
- Identify potential surface sites for long-term waste disposal.

During the Inception Phase, it became clear that the STI will provide a neutralisation process and infrastructure that can form the first phase of some of the water treatment options for the LTS, with limited additional capital expenditure. However, as described above if the disposal of the HDS is a key component of any solution and the proposals for sludge disposal in the Western and Central Basins are only STIs with a life of only about 3 to 5 years and the STI is not considering longer term solutions.

This Study is looking at all options for the LTS and the HDS plants proposed in the STI may or may not form part of the LTS. However, the implications of retaining the proposed or modified HDS

plants in the LTS must be understood. It has now been agreed that the SoW for LTS should be expanded to consider options for:

- Secondary neutralisation and separation of the sludge resulting from the STI, into two or more component parts;
- Commercial value and options for use of one or more of the waste components; and
- Long-term disposal of the waste stream.

The implications of this increased SoW on the budget have still to be determined. There may be a limited delay in producing the report.

5.6.5 Deliverables

A report on the Options for Use, Discharge or Disposal of Water and Waste: It will describe:

- The realistic options for using or discharging the water stream from the LTS.
- The options costs and benefits of disposal of usable waste.
- The options and costs for the long-term storage of the waste products from the STI and the Long-Term Treatment processes for neutralisation and desalination.

5.7 Component 4.4: Assessment of Treatment Technologies

5.7.1 Purpose

The general purpose of this task is to assess the alternative technologies that can be considered for the treatment (neutralisation and desalination) of the AMD to provide water which will be acceptable for alternative uses.

The specific purposes of this task are to:

- Understand the implications of the treatment proposed by the STI for long-term treatment and use of treated water. In particular to assess the quality and radio-activity of the water and sludge to be delivered by the STI, as well as the probable changes with time;
- Identify and assess the technologies that are being proposed by potential suppliers.
- Identify the alternative technologies that can be considered for the treatment of the AMD.
- Identify the treatment process(s) to be used in the preferred option.
- To provide information that will be used in the implementation phase during drafting of procurement documents.

The capabilities of the technologies to treat the AMD will first be compared at a conceptual level, and the costs and environmental implications will be determined to enable the evaluation of the technologies on a common basis.

The conceptually acceptable technologies will be considered further and the capital and operating costs will be estimated.

A further purpose of this task is to identify and characterise the waste products that will be generated from combinations of alternative technologies.

5.7.2 Background required

The assessment of the available technologies will require that the following information is available from preceding components:

- Quantity and Quality of AMD water, which will be abstracted in each basin and have to be treated;
- Quantity and quality of water expected to be delivered by the STI;
- The required quality of neutralised water which could be useable without desalination;
- Minimum standards to be met by the desalinated water for alternative uses;
- Minimum standards required for the disposal of the waste generated by the process; and
- Possibilities for use of the water and waste generated by the process.

Some of the information will be available from the existing studies, while the unknowns will have to be determined in this study. The standards to which the water has to be treated will depend on the subsequent uses for the water. We assume that the following standards will be applicable, but confirmation of the standards will be obtained in the study during interaction with potential users:

- Potable water: SANS 241, but it is noted that potable water supplied by Rand Water to its consumers has lower salt content than specified in SANS 241;
- Environmental release: Either General Limit Values for waste water effluent as defined in the "General Limit Values", or more likely the standards determined in Component 4.3 based on RWQOs; and
- Use by industry: Specific quality requirements assessed under Component 4.3.

The processes being implemented in the STI may affect the SoW for implementation, so an understanding of that intervention is also required. Our initial assessment is summarised and more detail given in the following sections:

5.7.3 Understanding of the STI at the Date of this Report

5.7.3.1 Short-Term Intervention pH Neutralisation

The short-term pre-treatment as designed, provides only the initial step in AMD pH neutralisation. The STI does not appear to comprehensively deal with options for recovery of by-products from the neutralised sludge, or to re-use the sludge, but simply neutralises the sludge for disposal to tailings dams or open-pits.

The LTS will therefore consider the options for enhancing the STI neutralisation process to improve the long-term sustainability of the neutralisation approach chosen for the STI, in relation to the removal of metals and potentially radio nucleotides, as well as the subsequent waste handling, re-

use and disposal options, by upgrading the STI treatment works as one of the options in the LTS. The implications, particularly, lifetime cost of alternative complete solutions, including treatment and waste disposal, will be determined.

5.7.3.2 Metals and Radio nucleotide Removal in the STI

The key considerations in selecting an appropriate reagent for metal and radio nucleotide precipitation include:

- Material handling considerations, including road/rail transport, bulk storage, make up, and dosing;
- Classification of the sludge as a hazardous material, requiring special precautions in handling and personnel safety;
- Availability and reliability of the supply and cost of the chemical reagents;
- Infrastructure and equipment investment cost of reagent handling, storage, make up, and use; and
- Treatment objectives.

The specific process arrangement for metals and radio nucleotide removal is generally the same as for neutralisation – and is often in a lime/HDS configuration with additional chemical feed and control systems. The primary differences are the potential pre-treatment requirements, operation at an elevated pH, and the possible need to reduce the treated effluent pH with acid or carbon dioxide to meet effluent discharge pH requirements.

Irrespective of the role that the STI plays in the LTS, the long-term management of the waste stream (sludge) from the STI has to be addressed if the HDS plants of the STI are to operate beyond the life of the waste disposal sites identified in the STI.

5.7.4 Identification of potential technologies

5.7.4.1 Evaluation and Selection of AMD Treatment Technologies

The evaluation of alternative AMD treatment technologies and the selection of an appropriate technology for a specific application, require consideration of at least the following factors:

Technical factors:

- Location and accessibility of the required infrastructure where treatment is to be located;
- Land requirements;
- Location within the overall mine water cycle and circuits;
- Volume of water that can be treated;
- Range of quality of raw water that can be treated:
  - i.e., what is the pre-treatment (neutralisation) if any, that is required before desalination.
- Cost sensitivity to the quality of the raw water;
- Quality of the treated water:
  - Standards that can be achieved; and

  - Cost dependency on the standards to be achieved.
- Synchronisation with the life cycle of the mine, currently only known to be relevant to the Central Basin;
- Status of technology (proven, pilot sale, embryonic);
- Reliability;
- Risks related to implementation; and
- Waste products produced.

Operational factors:

- Operations' staffing and labour requirements;
- Process control and automation;
- Utility requirements (e.g., electrical power and water);
- Chemical and reagent requirements; and
- Operational implications of waste disposal.

Maintenance:

- Logistics and communications; and
- Frequency of refurbishment and replacement of components.

Environmental factors:

- Residual impacts of treated water discharge;
- Effect of climatic conditions;
- Waste products produced in the process:
  - Quantity of waste products;
  - Quality of waste products; and
  - Disposal options:
    - Re-use potential;
    - Final disposal.
  - Cost implications – sensitivity to quality of raw water and treated water.
- Environmental impact of the technologies and disposal options;
- Land-use impacts; and
- Regulatory approvals.

Financial factors (life cycle costs):

- Capital investment;
- Capital replacement costs;
- Operational expenditure:
  - Chemicals;
  - Energy;
  - Materials;
  - Staffing;
  - Etc.

- Cost of waste disposal (see Component 4.3); and
- Routine maintenance costs.

A life cycle financial model approach is typically applied to evaluate the treatment project financial implications, including the following:

- Production and management of wastes and emissions;
- Potential for by-product recovery; and
- Sustainability during active mining and post-closure phases.

Management factors:

- Negotiating with regulators and other stakeholders;
- Defining decision process;
- Funding for all phases;
- Negotiating for unexpected resource requirements; and
- Maintaining companies' credibility and good standing.

Social Factors:

- Community acceptance and involvement.

The team will follow this approach to, in collaboration with the Client; identify technologies that can be considered for the treatment of the AMD.

Possible technologies will initially be identified from our team's knowledge and published information. In addition, the open market will probably have information and technologies that have not been identified. Therefore a Request for Information (RFI) will be issued inviting interested parties to advise the team of their technologies and, on request, submit details of their technologies to the team. The submissions by the interested parties will have to be of such a standard as to allow us to assess the processes against the criteria listed below, so that we can present the probable range of technologies that may be offered when the procurement process starts. This will allow an assessment of the risks likely to be encountered.

In the proposal, it was assumed that the water to be treated will be supplied at surface by the infrastructure provided by the STI, which is currently being implemented and will have been neutralised, as per the requirements of the ToR for the STIs. However, it is now clear that the STI may not be the most appropriate first phase of the best LTS. It has therefore been agreed to increase the scope of this task to consider all treatment options for dealing with raw AMD from each basin, as well as the neutralised AMD from the proposed STI in each basin. The impact of this increase in Scope on the programme and budget will be assessed after approval of the Inception Report.

Technology can generally be classified in three categories, i.e. embryonic, pilot scale and production technologies. Embryonic technology is typically technology that has been researched

in a laboratory only, and has not been tested on pilot scale. This type of technology is generally associated with very high risks.

Technology that has been tested at the pilot scale is less risky to implement, as the factors for the up-scaling have been generally determined. The risk is nevertheless still high as the technology has not been applied at full-scale, and there may be variables that are not known or understood. Technology that has been used for production has fewer risks, but there may still be some risks in using it in this particular application.
These opportunities will be explored.

5.7.5 Evaluation criteria and screening of options

The analysis of the available technologies will enable the team to compile a comparison matrix where the various technologies will be assessed against the variables identified and used in the analysis. The outcome will be a series of tables that will demonstrate the boundaries of the technologies against the criteria and against each other.

The analysis and evaluation of the technologies will allow the assessment of the technologies for various discharge scenarios.

5.7.6 Deliverables

The deliverables will be a report on "Treatment Technology Options" that will include the following sections:

- Description of all the processes which were reviewed;
- List of all technologies identified or proposed by the public;
- Detailed description of the process which were assessed in detail;
- Assessment of the technologies in respect of the agreed criteria;
- Description of the waste products produced by the process; and
- Selection of the technologies to be used in the assessment of options in Component 4.5 and the preferred technologies to follow the STI, as well as technologies that can treat raw AMD.

5.8 Component 4.5: Identification and Assessment of Options for the Long-Term Management of AMD

5.8.1 Purpose

The primary purpose of this task is to integrate the work in Components 4.1 to 4.4 and identify one or two preferred options (complete solutions) for the long-term management of AMD from each basin. An option may comprise more than one phase.

In achieving this, the following secondary purposes will be met:

- To consider options in which some or all components of the STI are the first phase of the LTS, as well as options in which none of the components are the first phase of the LTS.

- To develop and screen alternative combinations of abstraction points, treatment technologies and sites, uses for water and alternatives for use or disposal of waste. The combinations for managing the AMD will include:
  - Collection and treatment in one location;
  - Treatment in three (or possibly more) locations; and
  - Each combination will be a complete solution and will be known as an option.
- To provide an assessment of the screened options, on the basis of agreed criteria.
- To evaluate the available options and select one or possibly two preferred options in each basin which will be used as the Reference Project for a DBOM or PPP project or Recommended Option for Study at the Feasibility Level in subsequent components of this Study.

5.8.2 Summary of Problem Definition and Present Status

Based on the reports from earlier sub-components, the following will be summarised as the basis on which the options are developed:

- An assessment of all the infrastructure, new and existing, to be provided as part of the STI, at the three decant locations, including brief comment on the long-term environmental suitability of the existing and proposed infrastructure.
- Implications of the predicted incoming water quality on the life of the selected materials for pipes, pumping equipment, fittings and liners for storage facilities.
- Decant/Pumping/Discharge volumes – required for initial sizing of pipes, pumping equipment and temporary storage / balancing facilities.
- The need for emergency storage facilities upstream of the proposed treatment facilities due to the proposed off peak pumping and during unscheduled downtime.
- The latest standards and guidelines for the design, management and operation of facilities handling hazardous waste material and summarising the key requirements to be met in the LTS. This will include, but may not be limited to the following:
  - Minimum Requirements of Waste Disposal by Landfill (Second Edition, 1998); and
  - Latest regulations for the classification and management of waste for landfill, as recently published for comment.
- Water quality requirements of receiving / catchments, agriculture, mines and possible domestic and industrial recipients.

5.8.3 Methodology for Identification of Options

Based on the outcome of Sub-components 4.1 to 4.4, a number of combinations of abstraction points, raw water collection system, treatment processes and facilities, users or discharge points for the treated water, distribution system for the treated water and waste management facilities for waste products from the treatment process will be developed. It is expected that for each basic combination of elements there maybe variants which are all similar in principle but vary in detail. These will be identified. This will be carried out in a holistic manner that will, among others, include the following activities:

- Based on the recommendations of Sub-Component 4.2 develop options which will utilise not only the abstraction points proposed by the STI, but any alternatives that may have merit. This will include both pumping and gravity solutions for abstraction and consider existing shafts and declines, as well as new boreholes for abstraction.
- Assessing the implications of recipient water quality requirements, including inputs from stakeholders, when discharge water quality requirements are determined.
- Consideration of preferred treatment technologies which can follow the STI process or which can treat raw AMD.
- Identify locations for the construction of treatment facilities, taking note of any benefits that may be obtained by siting the works near existing infrastructure and alternative "abstraction" points – consider a central treatment works one treatment works per basin or several regional treatment works.
- Assess alternative infrastructure requirements and possible constraints of alternative technologies.
- Identify possible pipeline corridors between the abstraction points or STI discharge points and the treatment works, as well as between treatment works and the use or discharge points for the treated water.

This activity will consider that scour from raw water pipelines will have to be restricted to contained facilities (emergency paddocks) that need to be drained, subsequent to the draining of pipelines for emergency or maintenance reasons.

- Identify potential sites for the construction of waste management facilities and infrastructure required to connect the treatment works to the disposal site(s). Alternative disposal sites will be considered for the different sites considered for the treatment facilities.
- Identify land issues, underlying geology, socio-economic aspects, environmental constraints, other services and future planning activities that may impact on the selection of sites and pipeline corridors.
- Indicative Capital and Operating cost of each option for a 50-year life time.
- The options will be summarised in a table in which the variants of basic options will also be shown.

5.8.4 Screening of Options

Based on the activities carried out during the preceding tasks, a matrix of technical options will be compiled. This list of technical options and be various some of the options will be inclusive and stakeholder input will be obtained at a SSC meeting. Once all the technical aspects, constraints and considerations of the potential technical options have been identified, the options will be screened:

This process will involve a desktop evaluation of the technical options, the environmental screening of all potential sites for fatal flaws and an initial assessment of the impact of the options on the environment. The aim of the desktop study is not to give a definitive assessment of the impacts of each option, but rather to provide a framework for the rest of the study to proceed.

- The variants of each option will be compared to select the most favourable variant for each option;

Thereafter the following will be considered to shortlist options for which capital and operating costs will be determined.

- Advantages / disadvantages and risks of alternative abstraction points;
- Advantages / disadvantages of treatment technology options;
- Advantages / disadvantages of alternative sites for treatment in supply of water or disposing of waste; and
- Land development constraints or concerns.

5.8.5 Assessment of Options

The shortlisted options will then be assessed against the following to currently one or possibly two "preferred options" per basin.

- Legal and institutional considerations / constraints;
- Environmental constraints and impacts;
- Social considerations, benefits and impacts;
- Geological constraints and implications for construction;
- Associated construction considerations / constraints;
- Operational considerations / constraints;
- Maintenance related considerations / constraints;
- Impacts of delivery / discharge requirements;
- Risk of the option;
- Lifetime cost of all phases;
- Benefits or potential income from use of water or waste; and
- Economic assessment.

This work could involve consultation with specific role players in relevant government departments and Non-Governmental Organisations (NGOs) (such as, the Federation for a Sustainable Environment and the Endangered Wildlife Trust), to ensure that the majority of environmental issues are addressed. The Public Consultation processes will follow when the EIA is undertaken as a separate project

5.8.5.1 Geological and Geotechnical Desk Study

Data collected from CGS for use in Sub-Component 4.2, as well as geological and geotechnical data obtained from as many sources as possible as described under Component 2 will be used to screen the proposed sites for geological or geotechnical risks. It will also be used in the recognition and understanding of important geological factors and problems that can influence the location or cost of infrastructure proposed in the LTS for AMD.

At this stage, the geological assessment will rely on the information gained from the desktop study, as well as the knowledge and experience of the project geologist. This information will be incorporated in decisions on the infrastructure layout configuration and feasibility designs of Component 5.

5.8.6 Deliverables

The deliverables from this component of the project will be the Pre-Feasibility Report, describing the following:

- All the possible options identified and screened.
- The options which passed the screening for fatal flaws, the selected variants and options which were assessed in more detail.
- The assessment of the potential options, based on among others, technical suitability, environmental and social acceptability and initial life cycle costing, NPV of costs and benefits and risk.
- A high level review of environmental and environmental authorisation requirements for the technical options identified.
- Guidelines on taking the environmental process forward with minimum time implications.
- Identification of the preferred technical solution or not more than two preferred solutions to be subjected to feasibility assessment.

5.9 Component 5: Concept Development of Infrastructure in the Recommended or Reference Solution Option

5.9.1 Purpose

The purpose of this component is to analyse the preferred option at feasibility level, to confirm that it is a viable solution and to provide realistic estimates of capital and operating costs as inputs to Component 6. In the case of a DBOM plus Finance (DBOMF), the reference project to be carried into this phase will be agreed with the Client at the end of the Pre-Feasibility Phase. In the case of the PSC model, the one or possibly two options to be carried forward will be agreed with the Client at the end of the Pre-Feasibility Phase. If there are two competing options, the Feasibility level work will proceed on both options until it is clear for which one the Feasibility Study should be completed in preparation for implementation and design. This will be agreed with the Client. Thereafter only that option will be developed in the Feasibility Study.

At the time of the proposal and at the date of this Inception Report the Scope of the Project (the LTS) to be studied in this Component 5 not defined.

For the Proposal a LTS was assumed and defined in **Appendix C** of the Proposal. The details of the LTS assumed for preparing the budget in the proposal as well as the current understanding of a possible LTS are discussed in **Appendix D** of this report. When the actual LTS for study in this Component is agreed, the budget implication will be discussed and agreed in accordance with the DWA procedures applicable to this Study.

5.9.2 Scope of Work

Analysis of the preferred option will include the following activities:

- Obtain feasibility level concepts, capital and operating cost estimates from technology providers, for the treatment facilities and check for consistency.
- Prepare Feasibility level concept drawings, design criteria and cost estimates of the non-treatment process infrastructure.
- Optimise routes for conveyance corridors, taking cognisance of land ownership, existing and planned land developments.
- Conduct a site walkover over one or two days, to verify the overall geological assessment gained under Task 5.7.4 to identify risks, including dolomite risks, and geotechnical investigation requirements in future stages.
- Compile capital cost estimates for all phases of the preferred option.
- Compile operation and maintenance related cost estimates for the preferred option for the 50-year life which is to be assessed.
- Identify measures and estimate costs to mitigate the environmental impacts of the preferred option.
- Identify and estimate costs of the socio-economic implications of the preferred option.
- Develop a high level, long term management strategy for the operation and maintenance of the preferred option.
- Register the various environmental authorisation applications with the Department of Environmental Affairs if not being undertaken by others.

5.9.3 Deliverables

The deliverables from this component will be a concept development report, including design criteria and an album of drawings for the preferred technical options. This will contain:

- Feasibility level development of the concept and drawings.
- Infrastructure layout configuration.
- Typical details and information on treatment technology.
- Capital cost estimate with an estimated accuracy of approximately 20%.
- Operating cost estimate with an estimated accuracy of approximately 20%.
- Indirect costs such as:
  - Design, construction and monitoring related costs;
  - Land acquisition costs;
  - Costs associated with obtaining environmental authorisation;
  - Costs associated with obtaining water use licences;
  - Costs associated with obtaining implementation approvals; and
  - Implementation costs associated with implementation such as client project team expenses and transaction advisor / employer representative related costs.

These deliverables will be compiled into a report that will serve as an input document for Component 6.

5.10 Component 6: Institutional Procurement and Financial Assessment

5.10.1 Purpose

The purpose of this Component of the Feasibility Study is to develop the best strategy to be used to procure, finance and operate the preferred option in each basin. The strategy will include the institutional model and responsibilities for implementation. DWA have registered the project with National Treasury as a possible PPP project in terms of Regulation 16 of the Public Finance Management Act, 1999 (Act No. 1 of 1999) (PFMA (1:1999)). The Feasibility Study is therefore required to meet the requirements of National Treasury to achieve National Treasury Approval TA1 for procurement to commence or for a National Treasury funding application to be approved.

5.10.2 Methodology

A Feasibility Study where a PPP might be contemplated will generally follow the format identified in Module 4 of the National Treasury PPP Manual, where such Feasibility Study requires Treasury Approval. One of the objectives of the Feasibility Study will therefore be to satisfy the requirements of National Treasury and to achieve TA1, the first approval in the PPP process, which is normally required before procurement can commence.

However, it is probable that the Government will wish to fast track the procurement process and would like procurement to commence in parallel with this study. In that case DWA will have to request National Treasury for an exemption to allow procurement to commence before TA 1 is issued. This process is discussed under Component 7.

This Feasibility Study will, as required in a National Treasury application for approval, first describe the problem or need to be satisfied, essentially as described in the ToR for the Study. This will be followed by assessment of the various solution options and preferred option for each basin. Once a preferred option has been selected and a technical and legal due diligence, as contemplated in the National Treasury PPP Manual, have been completed, the costing of the different solution options will commence.

In a Feasibility Study where a PPP is considered, there are two alternatives that are assessed. The financial model will compare a traditional procurement solution, whereby an Implementing Agent nominated by the Department, which could be the Department itself, obtains the requisite capital funding and either design the necessary infrastructure, procures and supervises construction and then procures an operator or operates the plant or procures a turnkey or DBOM contract. This Public Sector Comparator Model (PSCM) will, in compliance with the PPP Manual, both be risk adjusted; to arrive at a risk adjusted Net Present Value (NPV).

Similarly, a PPP procurement solution will be modelled to arrive at a risk adjusted NPV. The models will then be compared to assess the Value for Money that can be achieved through a particular method of procurement. The model involving the Private Sector funding would include

the criteria required by the funding institutions and typical current shareholder returns on investments.

If the procurement process is to be fast tracked and exemption from TA 1 is obtained, it is probable that some early decisions will have to be made such as possible sources of finance and whether a PPP, DBOM or PSC procurement model will be followed. If fast tracked procurement is pursued and an exemption granted, the Feasibility analysis will still be required, but it will then show the difference in value between the selected model and the alternatives.

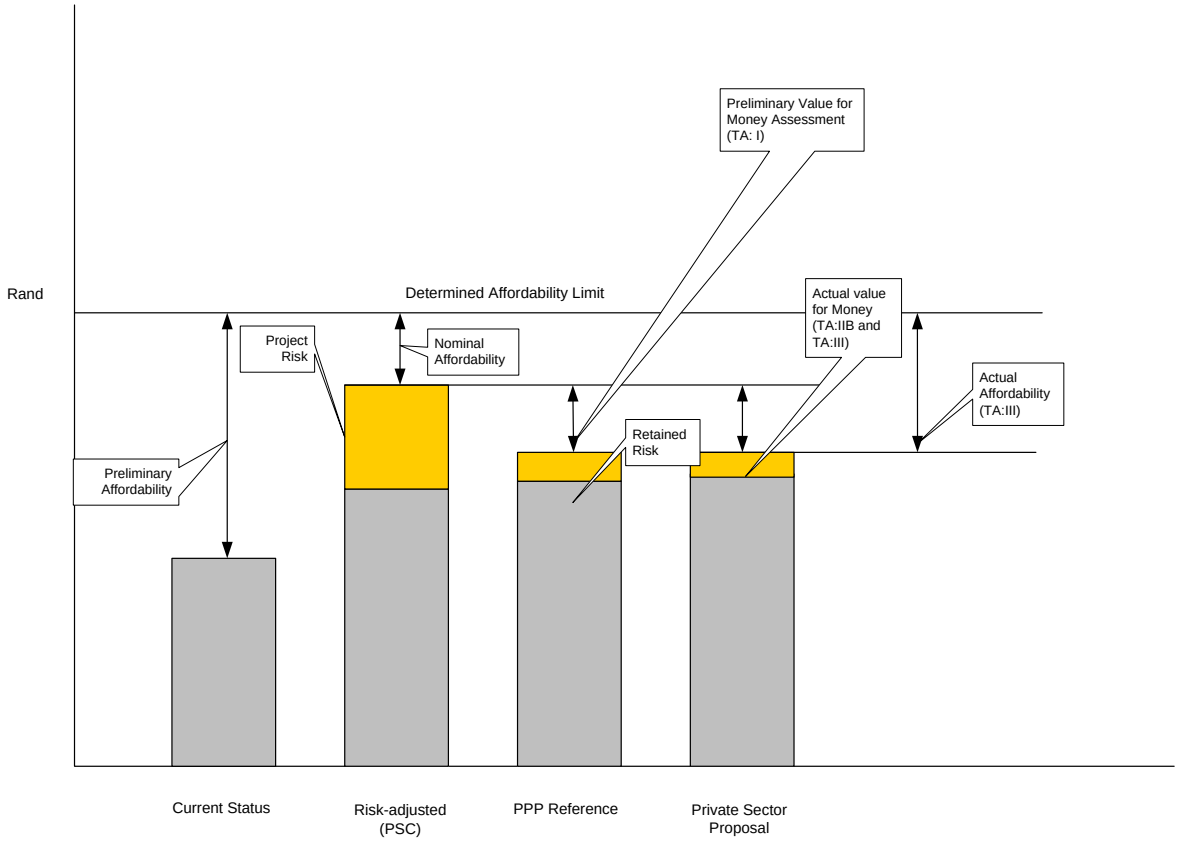


Figure 5-1: Affordability and "Value for Money"

In establishing the procurement strategies to be modelled, the preferred solution option will have first been established. The capital, operating, and lifecycle costs for the preferred solution option will be established for both the PSC and PPP procurement strategies. The revenue that can be achieved through tariffs, charges and "selling" or offsetting of costs implicit in discharging treated AMD in the Vaal River Systems or supplying to consumers who are served from that system and the sale of "waste" products, will be used as an input to the financial models.

The Revenue that can be achieved will be the output of a tariff-setting exercise and the application of Waste Discharge Charges (WDCs), as well as other contributions from mines and/or National Treasury, through the DWA. Tariff-setting which will include consideration of the Vaal River tariff, will be in conjunction with DWA and National Treasury, and will entail the setting of a price with a mix of two objectives – to recover costs incurred, or to convey a message to the payee to change

its behaviour. Other possible sources of funding such as an environmental levy will be included in the model. All tariffs together, would typically have to recover the relevant organisation's cost, which could constrain the extent to which tariffs can be differentiated on non-cost bases.

The tariff-setting process will start by determining the basic tariff principles which could include investigating price sensitivities in the target market. Cost and use data would be collected and consolidated into a tariff-setting model that will allow trade-offs and sensitivities to be tested to calibrate the tariffs. The initial policy and the proposed tariffs that result from the process will, as part of the communication planning, be tested in a forum that involves key stakeholders and decision-makers.

A detailed, quantified risk assessment, as contemplated in the PPP Manual, will be completed, in order to identify the applicable risks that could impact the project, the value of the impact of a risk event, the probability of a risk event occurring, the quantification of the risk event and the allocation of that risk event to either the Institution or the Private Party for each of the procurement strategies under consideration.

A major infrastructure development treating AMD will have socio-economic and environmental impacts on the community. Not all the impacts will be negative and it is the purpose of this Feasibility Study, to identify and recommend a preferred option that will benefit the community through the treatment of the AMD. The economic benefits to the regional and local economy will be assessed and will form part of Component 6 of the study. The economic impact assessment component of the project will assess the economic impact of the reduction of the salt load (primarily) into the Vaal River System, the provision of a useful water resource close to the centre of Gauteng, the provision of saleable products manufactured from the waste products, the skills transferred in developing and operating the project and the temporary and permanent jobs that the project will create.

The Feasibility Study will be able to identify the economic impact on the region and the local communities, as well as the ability of the project to meet the objectives of Broad Based Black Economic Empowerment (BBBEE) and Small, Medium, Micro Enterprises (SMME) development. The financial impacts of the benefits and costs will be incorporated into the financial models so that the models will realistically model the outcome that will actually be achieved.

The lifecycle costing and funding regime will be the main drivers in the financial model that will influence the decision as to the duration of any contracts that could be entered into. The lifecycle costing will identify the replacement frequency of the major items of equipment and infrastructure and the funding regime will determine the interest and redemption curve. The combination of these two inputs will provide the information required to recommend an optimal contract duration for the project. Changes in technology that could be expected to occur would be written into any contract during the procurement phase of the project and while not necessarily impacting the financial assessment, would be incorporated into the risk assessment.

The Institutional structure and the associated roles, responsibilities and resourcing will form a part of this component. The institutional arrangements required of the Institution for either of the models would have to be decided firstly to be incorporated into the Feasibility Study and to demonstrate capability to manage the resulting contract of whatever nature and secondly to have the associated costs included in the financial model for analysis. Any of the Institutional arrangements would in our experience, require that the Institution establishes the requisite contract management capability to secure that the water treatment output continually achieves the required level.

The procurement structure drives to the very essence of the feasibility process. While the procurement options are assessed, once the Value for Money assessment has been completed, the structuring of the feasibility will at all times consider that the project could be delivered by the Institution with capital funding provided through the Revenue Fund by National Treasury or could be funded using Private Sector funding in a combination of lenders and shareholders to provide the requisite funding. The willingness or otherwise, of Government to fund part of the project, will be assessed and incorporated into the models that lead to the Value Assessment.

As part of the work of this component, various stakeholders will have to be involved in establishing the bankability of the project. Potential users of the treated water will have to be identified and the concept tested with them. This process will have to assess the appetite that these potential users will have for the product and the range of costs that they would entertain. The same process of engagement would occur for the potential recipients of the waste product from the treatment process.

5.10.3 Deliverables

The deliverable will be a report on “Institutional Procurement and Financing Options” with the preferred procurement option covering institutional responsibility procurement model and financing proposals, which is the outcome of a process of analysis where the costs and potential revenues have been financially modelled for two procurement scenarios, with each one being risk adjusted. The procurement decision will be based on the final Value for Money assessment that is derived from the risk adjusted financial models.

If a fast track procurement process is to be followed then decisions on at least the funding mechanism, institutional arrangements and the model to be used for procurement (PPP or PSC or DBOM) may have to be made in parallel and before the relevant components of the Feasibility Study, including the Value Assessment are available.

In the case of fast tracked procurement, position papers describing the alternatives, the requirements, benefits, disadvantages and risks will be prepared. These are not included in the current SoW and will not all have been required if the “normal process” is followed. The budget implications will have to be determined and agreed.

5.11 Component 7: Implementation

5.11.1 Purpose

To provide a planned and systematic approach and programme to implement the desired solution, including short-, medium- and long-term actions. This will include identifying activities that are required to commence during, as well as after the Feasibility Study.

5.11.2 Implementation Plan

Practical, tailored action planning is required for the Implementation Plan of the LTS to be effective, realistic and sustainable.

The Implementation Plan will detail the activities and required outcomes to achieve the implementation of the preferred solution option using the selected procurement process. It will deal with:

- Setting up the selected institutional model with identified implementing agents or organisations;
- Procurement of services to implement the LTS;
- Construction, installation and commissioning of infrastructure; and
- Regulatory and environmental approvals.

The implementation plan will be quite different if the procurement model that has been selected is a DBOM/PPP or PSC. Depending on the urgency of implementation, and thus whether activities will be largely sequential or run in parallel, different implementation programmes will be required. In the Proposal and as reflected in the Study Programme, it was envisaged that the implementation activities would generally be sequential and follow the Feasibility Study.

It is now apparent that a fast track procurement process may have to be followed. It also seems likely that the selection of a procurement model, DBOM or sequential procurement and procurement process PSC or PPP may be required before Component 6 is complete. That component would normally have guided the selection. If required, assessments of the benefits and implications of the alternatives will be prepared and presented as position papers to guide the decision-making. If required to facilitate this planning and the decision-making process, alternative programmes for PPP and PSC procurement with programmes for normal or fast track processes for each can be prepared. These activities will be an increase in the SoW, the extent of which cannot yet be determined.

Based on the objectives to be achieved and the institutional and regulatory framework in which implementation will be carried out, the action planning will be practical and user friendly, outlining what needs to be done, by when, by whom and how.

The Implementation Plan will address both generic and project specific requirements, including:

- Project description and scope;
- Project organisational/institutional arrangements;

- Procurement strategy and process;
- Project legal and contractual arrangements and recommendations;
- Project construction management;
- Project implementation resources management;
- Project finance/cost management;
- Project progress management/monitoring;
- Project SHE and community management;
- Operations and maintenance;
- Effective and practical communication protocols; and
- Integration mechanisms and management.

In developing the Implementation and Action Plan, the following will be included:

- Agreed Implementation Plan, which will focus on the strategic objectives.
- Clearly defined and agreed stakeholder roles and responsibilities for action, separating primary and supporting responsibilities.
- Defined and prioritised actions, including needs for goods, civil works, consultants, training and operating costs.
- Phasing and sub-tasking of actions.
- Time frames consolidated in a programme, presented in a Gant chart developed in MS Projects and estimated budget allocations.
- Identified risks and risk management proposals.
- Procurement planning.

This task will be executed through:

- Collating all results from previous tasks and identifying pertinent component items for action planning.
- Developing the plan.
- Presenting the draft plan to the SAC for discussion and modification since a number of Government departments and parastatals will have to be involved for effective implementation it will then be presented to the SMC for their written inputs and for approval.
- As with other components this deliverable will be presented for discussion at the final SSC meeting, since they will see this as one of the most important deliverables and will be involved in some of the actions.

The plan will then be updated before submitting it to DWA for approval.

5.11.3 Monitoring and Evaluation Plans

The progress in realising the Implementation Plan will have to be monitored and proposed procedures and responsibilities for this will be provided for discussion and agreement by the SAC and SMC, where the responsible organisations should be represented.

In addition, monitoring of the downstream water quality is essential to enable assessment of the impact the project is having on the downstream water users and the aquifers that have been or could be affected by AMD. The existing DWA monitoring schedule/programme, including all monitoring points and the recommendations of the "Hydrological Monitoring Committee" for additional monitoring will be assessed and if necessary, recommendations made for additional monitoring to provide a comprehensive monitoring programme. The purpose will be to assess and evaluate the performance of the implemented system with a view to amending or improving it, if required.

5.11.4 Other measures to assist with roll-out

In addition to the implementation and monitoring plans the ToR for this Component also required:

"*7.7.3 Other measures to assist with roll-out*
This component may include the compilation of (a) Scope(s) of Work, as may be required to address further gaps, Tender Specifications, as may be required to commence with tender processes for construction, etc., as well as to recommend steps and measures, such as contracts, Mmemoranda of Understanding (MoUs), procurement plans, etc., to give momentum to the implementation of the desired solution;

7.7.4 Deliverables
Detailed programme for implementation; and

"Other measures, as may be necessary"
In the Proposal, to give a basis for the budget, it was assumed that the following would be prepared:

- SoW for one additional study.
- Procurement Plan and SoW for proceeding with the envisaged PPP contract (i.e. SoW for a Transaction Advisor or in the case of PSC procurement, the SoW for a PSP to carry out design and tender documentation); and
- Recommendations for other documents required to support implementation, such as Memorandum of Understanding (MoU) and project plans, to give momentum to the desired solution.

It is now becoming apparent that the following documentation and SoW to facilitate implementation activities may be required:

- SoW for one additional study. This could be the SoW for the PSP to carry out the EIA.
- Procurement Plan and SoW for proceeding with the envisaged PPP contract (i.e. SoW for a Transaction Advisor or in the case of PSC procurement, the SoW for a PSP to carry out design and tender documentation);
- Position papers on alternative procurement models and processes and alternative programmes for implementation;
- SoW for a team to support DWA in reaching agreements for ownership or access to the land required for implementation;

- SoW for a communications PSP to support DWA in developing holistic communications and implementing a strategy for communications on all AMD initiatives on the Witwatersrand, but possibly for the broader AMD management initiatives in the country;
- Draft request from DWA to Treasury for an exemption to start procurement before TA 1; and
- Draft Strategy for negotiating with mines on liabilities and access to land.

Depending on the level of detail required, some of these will be increases to the SoW and the budget implications will have to be determined if they are formally requested.

5.11.5 Deliverables

- A project implementation programme and plan, including an action plan, time frames, responsibilities and budgets.
- An implementation monitoring plan.
- One Agreed SoW for PSPs to carry out the required implementation activities.
- Procurement Plan and SoW for PPP procurement.
- Recommendations for other required documents to support implementation.
- Additional documents required to support procurement when Scope and budget are agreed.

5.12 Component 8: Stakeholder Engagement and Communication

5.12.1 Purpose

The key aspects of the stakeholder engagement and communication component are:

- To develop a Communication Strategy and accompanying Action Plan for communicating information to, and obtaining comments and inputs from key stakeholders and the public;
- To consult key stakeholders / key stakeholder groups and to obtain their inputs and comments, regarding recommendations for a feasible LTS to the AMD challenges in the study area;
- To communicate progress with the feasibility study to all relevant parties and the broader public; and
- To communicate information in a manner that promotes public understanding, and confidence in DWA's efforts to address the AMD challenges in the study area, as well as to promote public buy-in for the desired LTS.

5.12.2 Methodology

5.12.2.1 Development of Communication Strategy

Following the Study Inception meeting, a half-day workshop with key members of the SMC, including DWA Communications was convened on 15 February 2012. The purpose of the workshop was to:

- Ensure integration with other communication initiatives on AMD, conducted by DWA and other consultants/parties.
- Obtain key insights to inform the development of the Communication Strategy and Action Plan for the LTS Feasibility Study.

As a first step to informing the design of the Communication Strategy, workshop attendees conducted a situation analysis highlighting current views and perceptions held by stakeholders, in order to determine the nature of the messages that need to be communicated. These messages will change, based on interactions and inputs from stakeholders during the study, which is why the strategy will need to be reviewed on a regular basis, throughout the study.

Given the situation analysis, objectives were set. The key objectives in this case being to provide information, obtain key stakeholder inputs and comments, to promote trust and confidence in DWA's efforts to address the AMD problems, and to achieve broad public support for the desired LTS.

The workshop also focused on identifying target audiences, and identifying key messages that need to be developed during the course of the study, with specific attention to the principles of risk communication and perception management.

The Draft Communication Strategy, which includes an initial Action Plan, has been prepared as part of the Inception Phase of the study.

5.12.2.2 Key Stakeholder Database

An electronic database of target audiences, including both internal and external key stakeholders will be developed for this study. It will include:

- The SMC comprising representatives from:
  - DWA – various Directorates and the Gauteng Regional Office;
  - National Treasury;
  - DMR, other National Departments;
  - Gauteng Provincial Departments; and
  - Rand Water, IMC Team of Experts and consultants. The current membership is given in **Appendix D**.
- The SSC comprising all the members of the SMC and other representatives from both Government and Non-government key stakeholders, including key NGOs, Chamber of Mines, academics, relevant municipalities etc. The proposed membership is given in **Appendix D**.

External target audiences for communications will include:

- National Government, Provincial, and Local and District Authorities in the study area (DMR, Department of Environmental Affairs, Department of Agriculture, Department of Health, National Treasury, NNR, National Planning Commission), etc.;
- Mining Sector (Chamber of Mines, other mining houses);
- Organised business and industry (National Economic Development and Labour Council (NEDLAC));
- Organised Agriculture (Agri SA);
- Water Utilities (Rand Water and others;

- NGOs – Environmental, other conservation groups (e.g. Federation for a Sustainable Environment, Earthlife Africa, Legal Resources Centre, Wildlife and Environment Society of South Africa (WESSA), Save the Vaal, Centre for Environmental Rights, SA National Water Caucus);
- Catchment Forums (Blesbokspruit Forum, Leeuspruit Forum) and other existing structures (e.g. Western Basin Technical Group);
- Selected civil society groups;
- Media (newspapers, TV, radio);
- Researchers, parastatals, academia (CGS, CSIR, South African Human Rights Commission);
- Potential PPP partners;
- Consultants; and
- Others to be identified. The current Stakeholder database is given in **Appendix D**.

5.12.2.3 Key Stakeholder Consultation

Consultation with key stakeholders will be focussed through the SSC and around key milestones/ deliverables in the study, where input, feedback, comment and buy-in is required. Information on the following components will be provided to key stakeholders in the form of Discussion Documents, Technical Summaries, newsletters, etc. for their information, comment and input:

- Institutional roles and responsibilities;
- Alternative possible technical options;
- Reference treatment technology and required infrastructure;
- Institutional Procurement and Financial Models for implementation, upkeep and maintenance; and
- Implementation plans for the desired long-term and short-term solution.

It *is envisaged that* all key stakeholders whose input is critical to the investigation, development and/or implementation of the long-term solution, will be engaged at the SSC level. Three SSC meetings are planned, to be arranged in consultation with the SAC. Consultation may also *take the form of technical workshops, sector-based focus group meetings, and one-on-one interviews with key stakeholder groups, sectors and individuals* and providing material for presentations to existing forums and structures, such as the Blesbokspruit Forum and Western Basin Technical Group, *as appropriate. The* proposed *methods* will be outlined in the Draft *Communication Strategy and* Action Plan, which will be refined and updated (depending on the situation and need), as the Feasibility Study progresses.

5.12.2.4 Public communication

It is envisaged that public communication and engagement will serve the following purposes:

- To update the broader stakeholder base with new information and progress with the Feasibility Study;
- To provide the public with information at key milestones in the study; and
- To promote understanding towards support and general acceptance of the LTS.

Public communication and engagement will take place as follows:

- Three 4-page newsletters to provide information on progress with the study and obtain responses. Factsheets on specific AMD related topics. These will promote stakeholder awareness and capacity building. Four double-sided factsheets in English planned. These will be distributed by email to the stakeholder database, via Information Centres in each of the three basins (established and manned by DWA), via DWA Regional Offices, at meetings with key stakeholders, and posted on the dedicated AMD webpage on the DWA website;
- Press releases developed in close collaboration with the Feasibility Study's Study Manager and DWA Communications (four press releases linked to key milestones in the project); and
- Regular updates of the Feasibility Study progress, reports, newsletters, etc. on the dedicated AMD webpage on the DWA website.

5.12.2.5 Comment Report

All stakeholder comments, feedback, inputs, and suggestions received during the Feasibility Study in writing, telephonically and at meetings, will be collated into a single Comments Report, categorised according to technical discipline. The Comments Report will be updated after each round of engagement and forwarded to the technical team for consideration in the relevant technical studies. Responses to key categories of comments will be included in newsletters and factsheets, and distributed to stakeholders by the methods mentioned above.

5.12.3 Deliverables

The following deliverables will be prepared:

- A report on Stakeholder Engagement and Communication which will be issued in the following parts:
  - A Communication Strategy detailing the situation analysis, objectives, target audiences, key messages, defined communication activities and methodologies and an action plan for communication activities, including a schedule of activities listed against specific target audiences, as well as the responsible person/s.
  - Consolidated Comments Report recording all comments, inputs and suggestions received from stakeholders during the engagement process.
  - Other deliverables, which will be issued from time to time and consolidated into Appendices to the main report of this component will be:
    - Three Newsletters;
    - Four Fact Sheets;
    - Three Press Releases;
    - Background Information Documents for SSC meetings;
    - Proceedings of SSC meetings and PowerPoint presentations distributed after SSC meetings;
    - Updates to selected Web Page contents, e.g. Frequently Asked Questions (FAQs), etc.; and
    - An electronic database of relevant key stakeholder sectors, groups or organisations.

5.13 Component 9: Study Management and Administration

5.13.1 Purpose

For the PSP to manage, coordinate their work, provide management information required and assist the DWA in managing and administering the study to ensure effective and efficient study management.

5.13.2 Methodology

In the ToR and Proposal it was envisaged that the Study would be managed by a SMC and guided by a SSC on which stakeholders were to be represented. It has now been agreed the study will be managed by the SMC while the administration and the technical guidance will be performed by the SAC which is a sub-committee of the SMC. The SSC will provide inputs to and comments on the Study. The Governance structure ToR of the committees and the relationship between the committees is shown in **Appendix F**. The number of meetings as envisaged in the ToR, and as now envisaged, is shown in **Table 5.1**. This shows the various governance meetings which are envisaged, their frequency, expected locations, and involvement/responsibilities of the PSP, including preparation of progress reports.

Table 5-1: Meetings

Meeting	**Ad Hoc Meeting**	**SAC Meetings**	**SMC**	**SSC**
Arrangements / Logistics / Meeting Documentation	PSP	PSP	PSP	PSP
Chair	PSP/DWA	DWA	DWA	DWA
Progress Report – as per ToR	-	-	15 by PSP	4 by PSP
Progress Report – as now envisaged		11 by PSP	5 by PSP	3 by PSP
Minutes – as per ToR / proposal – as now envisaged	- PSP	- PSP	PSP	PSP
Venue			PSP	PSP
Frequency as per ToR/Proposal	Not mentioned	Not envisaged	Monthly	Approx. every 3/4 months
Frequency now envisaged	When required – may be monthly	Initially every month, then every two months	Approx. every 2-3 months	Approx. every 3-4 months
Number as per ToR/Proposal	Nil	0	15	4
Number now envisaged	15 - 20	11	5	3

It has been identified that:
In addition to the SAC/SMC/SSC meetings, several ad hoc meetings are essential to clarify various technical matters, discuss reports and coordinate with parallel initiatives as and when required.

The PSP will assume responsibility for the logistics, venues, arrangements, meeting documentation, etc.

These include

- Coordination meetings with COO
- Meetings with DWA and National Treasury
- Meetings with DWA and Rand Water
- Meetings with DWA and TCTA
- Meetings with DWA and World Bank

The PSP has now also been requested to provide the inputs for the DWA Study Manager and progress reports to the following Committees:

- Portfolio Committee
- IMC
- IGTT
- PEC
- Quarterly reports for DWA Management SMC.

These will require additional effort and the budget implications must be agreed.

Aurecon has an ISO 9001 accredited quality management system which will be used for the project. Both SRK Consulting (Pty) Ltd and Turner and Townsend (T&T) have ISO 9001 accreditation.

5.13.3 Study Management Deliverables

The deliverables shown in the ToR and Proposal as well as the deliverables now required are:

- Progress report submitted to SMC meetings (15 reports allowed in Proposal);
- Now 11 Progress Reports for SAC
- Now 5 Progress Reports for SMC
- Now 3 Progress Reports to the SSC meetings (4 allowed for Proposal);
- Presentation material for SMC, SSC meetings;
- Minutes of SAC, SMC and SSC meetings. Originally 19 meetings, now 19 meetings.
- Project scheduling and study program updates;
- Financial Reports, cost control and invoicing;
- Setting up, logistical arrangements and facilitation of meetings;
- Focus Group meetings.

The following additional deliverables are now required:

- Progress Reports for PEC / Intra-Governmental Task Team (IGTT) / Meetings;
- Input to Status Reports and presentations to Port Folio Committee meetings and Inter-Ministerial Committee; and
- Presentation material for ad-hoc meetings.

5.13.4 Deliverables from Technical Components

The full list of deliverables from all Technical Components with estimated dates for submission of drafts is given in **Table 5-2**.

The reports marked (#) in the table are confidential and will only be distributed to the SAC and relevant Government officials for review, as agreed by the SMC, in consultation with the Study Director, because of the sensitive nature of their contents. These reports may be made available when the appropriate implementation process stages have been reached.

The following process for circulating/commenting and reviewing reports was agreed at the third SAC meeting:

- Draft Report submitted to DWA;
- Reviewed by the SAC and comments received in 5 days;
- Ad hoc meeting convened, if required, to discuss comments at or near end of comments period'
- Reports discussed at SMC to obtain comments or acceptance;
- Second Draft report prepared and issued to SAC and SMC, and where appropriate, reviewers, including World Bank, for review and comment after 10 days;
- Second draft report issued to SSC for information
- Final report prepared and issued to DWA after 10 days;
- Changes discussed and agreed;
- Report Approved by DWA;
- Report signed off towards end of Study to allow for minor updates as the study proceeds.

The following copies will be provided as required by the ToR and confirmed in the proposal:

- Ten hard copies of all first draft reports and an electronic copy (MS Word) for the SMC;
- Six hard copies of all final reports (1 unbound set) and 20 electronic PDF and one electronic Word format.
- Additional electronic copies of reports will be made available on the Web Portal for the SMC and SSC members.

5.13.5 Communications Web Site

Effective communication with Stakeholders and the Public is a key component of managing AMD.

This study will develop and implement strategies for Stakeholder engagement and communication with the public on matters related to this study. The web site (refer to Appendix D2 – Proposal), managed by DWA, will be used to display all communication material relating to AMD and possibly provide a platform for comment.

Table 5-2: List of Deliverables

Deliverables						**Actual Reporting Dates**				
Study Report Number	**DWA Report Number**	**Aurecon Report Number**	**Reports**	**SC**	**Conf.**	**Date of Issue / Due Date for Issue**	**Due Date for Comments**	**Target Date/Date for Issue 2nd Draft Submitted**	**Target for Submission of Final Report**	**Final Report Approved**
1	**P RSA 000/00/16112**	**6163**	**Inception Report** - Interim Report - Concluding Report	**1**		**16-Mar-12**	**Mar-12**	**April-12**	**Aug-12**	**Aug-12**
PHASE 1										
2	**P RSA 000/00/16212**	**6164**	**Report on Status of Available Information** - Interim Report - Concluding Report	**2**		**Jul-12**	**Jul-12**			
3	**P RSA 000/00/16312**	**6165**	**Legal Considerations for Apportionment of Liabilities**	**3**	**#**	**Jun-12**	**Jul-12**	**Oct-12**		
4	**P RSA 000/00/12412**	**6166**	**Alternative Approaches for Apportioning Liabilities**		**#**	**Sep-12**	**Sep-12**	**Oct-12**	**Nov-12**	**Jan-13**
5	**P RSA 000/00/16512**	**6167**	**Prefeasibility Report on the Long Term Solution**	**4**		**Jul-12**	**Aug-12**	**Sep-12**	**Nov-12**	**Jan-13**
5.1	**P RSA 000/00/16512/1**	**6168**	**Report on the Current Status of Management of AMD**			**Apr-12**	**May-12**	**Jun-12**	**Aug-12**	**Jan-13**
5.2	**P RSA 000/00/16512/2**	**6169**	**Assessment of the Water Quantity and Quality of the Witwatersrand Mine Voids** - Interim Report - Concluding Report			**Apr-12**	**May-12**	**Jul-12**	**Sep-12**	**Jan-13**
5.3	**P RSA 000/00/16512/3**	**6170**	**Report on Options for Use, Discharge or Disposal of Water and Waste**			**01-Mar-12**	**Mar-12**	**Sept-12**	**Nov-12**	**Jan-13**
5.4	**P RSA 000/00/16512/4**	**6171**	**Report on Treatment Technology Options**			**May-12**	**May-12**	**Sept-12**	**Oct-12**	**Jan-13**
5.5 / P1			Confidential Position Paper on the Implications of the TCTA Proposed Short-Term Intervention for the Long-Term Solution		**#**	**19-Mar-12**	**26-Mar-12**	**Jul-12**	**Sep-12**	**Sep-12**
	Possible Extra Doxumwnt		Possible Comments on WUC Proposal		**#**					

PHASE 2										
6	**P RSA 000/00/16612**	**6172**	**Concept Design and Costing Report**	**5**	**#**	**Oct-12**	**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**
6.1	P RSA 000/00/16612/1	**6172**	**Conceptual Design Drawings**		**#**	**Oct-12**	**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**
7	**P RSA 000/00/16712**	**6173**	**Institutional Procurement and Financing Options Report**		**#**	**Nov-12**	**Nov-12**	**Nov-12**	**Jan-13**	**Feb-13**
7.1			Component 6.1- Due diligence		**#**	Sep-12	Sep-12			
7.2			Component 6.2 - Value Assessment		**#**	Oct-12	Oct-12			
7.3			Component 6.3 - Economic Assessment	**6**	**#**	Oct-12	Oct-12			
			Position Paper on Institutional Arrangements and Alternative Procurement Models and Contracts for the Long-Term Solution for Acid Mine Drainage in the Witwatersrand		**#**					
8	**P RSA 000/00/16812**	**6174**	**Implementation Action Plan**			**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**	**Feb-13**
	Possible Extra Document		Possible 'Position Paper on Alternative Programmes and Processes for Procurement of the Long-Term Solution							
	Possible Extra Document		Possible 'Concept Note - Requirements for Fast Track Procurement							
	Possible Extra Document		Possible Request for Exemption from TA I							
			a. PPP Option: Scope of Work for Transaction Advisor (incl. draft contract)							
			b. PSC Option: Scope of Work for PSP for tender, design and documentation (incl. draft contract)	**7**						
			Preliminary Output Specifications (PPP Option)							
	Possible Extra Document		a. Possible Draft Directive to TCTA for EIA							
			b. Scope of Work for EIA							
	Possible Extra Document		Possible Discussion Document / SoW for LLROP							
			Request for Information							
9	**P RSA 000/00/16912**	**6176**	**Report on Key Stakeholder Engagement and Communications**			**Nov-12**	**Nov-12**	**Dec-12**	**Jan-13**	**Jan-13**
9.1	**P RSA 000/00/16912/1**	**6177**	**Communication Strategy and Action Plan**			**Jun-12**	**Jun-12**	**Aug-12**	**Sep-12**	**Sep-12**
9.2	**P RSA 000/00/16912/2**	**6178**	**Comments and Responses Report**			**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**	**Jan-13**
9.3	P RSA 000/00/16912/2	6178	Appendix 1: Newsletters and Press Releases			**Ongoing**		**Dec-12**	**Jan-13**	**Jan-13**
9.3.1	P RSA 000/00/16912/2	6178	Press Release 01			**Feb-12**				
9.3.2	P RSA 000/00/16912/2	6178	Press Release 02	**8**		**Oct-12**				
9.3.3	P RSA 000/00/16912/2	6178	Newsletter 01			**Aug-12**				
9.3.4	P RSA 000/00/16912/2	6178	Newsletter 02			**Oct-12**				
9.4	P RSA 000/00/16912/2	6178	Appendix 2: Proceedings of SSC #1							
9.5	P RSA 000/00/16912/2	6178	Appendix 3: Proceedings of SSC #2							
9.6	P RSA 000/00/16912/2	6178	Appendix 4: Proceedings of SSC #3							
10	**P RSA 000/00/17012**	**6175**	**Feasibility Report**			**Nov-12**	**Dec-12**	**Jan-13**	**Jan-13**	**Feb-13**

6. Study Programme

A detailed study programme has been prepared and a summarised version is given in **Appendix A**.

Through careful programming, starting each task as early as possible and, wherever possible, running tasks in parallel, effective completion has been proposed to be at the end of November 2012, 10 months after Contract Award. Final approval of the Feasibility Report and a submission by DWA to National Treasury follows at the beginning of 2013. The contractual completion date is 28 February 2013.

The logic in the programme is based on the normal procurement programme as envisaged at the time of the Proposal. If a fast track procurement process is agreed, the programme will be revised.

This programme is dependent on:

- Timeous access to information;
- Timeous comments on reports within the periods agreed by the SAC;
- Timeous approval of documents which are to be distributed; and
- Timeous decisions by DWA on the recommendations presented to them.

7. Human Resource Utilisation

7.1 Resourcing of Components

During the Inception Phase the resourcing staff availability for all components was reviewed to accommodate staff changes in the firms and at DWA's request the composition of the proposed team was reconsidered and additional team members and specialists were added where necessary.

All components have been resourced. The required resources for key positions that have been approved as well as the ones that have been submitted for approval are reflected in the organogram, which is shown in **Appendix B**.

The breakdown of staff hours by staff category as at the time of proposal is given in **Table 7.1**.

Table 7-1: HDI Participation as Percentage of Total Study Hours as per Proposal

Project Staff Category	Billable hours	% of Total
Black Male	2 112	15,3%
Black Female	1 828	13,2%
White Female	1 480	10,7%
Disabled Person	0	0,0%
Sub Total	**5 420**	**39,2%**
White Male	8 392	60,8%
TOTAL	**13 812**	**100,0%**

7.2 BBBEE

One of Aurecon's fundamental principles is to be actively involved in the process of socio-economic transformation and the deracialisation of the South African economy. In striving to achieve this principle, 23.49% of ownership of the South African equity is in the hands of historically disadvantaged individuals (HDIs), which include black women and youth. Importantly, the exercisable voting rights held by black people are commensurate to their economic interest within the group.

In addition to the elements of ownership and Management Control, BBBEE also includes the element of Employment Equity, which focuses on bringing about the equitable representation of black people in all occupational categories and occupational levels within enterprises.

Notwithstanding the Employment Equity Act, racial and gender representation at management level in the Construction Sector is considered to be woefully unsatisfactory. For this reason, employment equity targets with the Construction Sector Charter are concerned with the representivity of black people and black women at all management levels within enterprises.

Importantly, these targets are in addition to those already contained within the Employment Equity Plans.

Aurecon is committed to the implementation of BBBEE within its South African operations. Aurecon's BBBEE initiatives are aligned with the DTI's (Department of Trade and Industry) Codes of Good Practice and geared towards the Construction Sector Transformation Charter. These initiatives focus on transformation, bringing about substantial change in the racial and gender composition of ownership, control and management within Aurecon. A further focus is the effective advancement of employment equity while adhering to the principles of non-racialism and non-sexism – skills development – accelerating the advancement of black men and women, disabled people and designated groups with the emphasis on bursaries, learner ships and technical training.

Aurecon South Africa has achieved the status of Level 2 Contributor to BBBEE. The company remains immensely proud of its progress across almost all of the Black Economic Empowerment (BEE) scorecard elements and is confident that it will continue to celebrate even further improved BEE scores in future.

Due to the group's commitment to on-going skills development, the organisation places special emphasis on addressing the backlog of HDIs in the engineering industry, and in facilitating enhanced career development of these individuals. Aurecon offer bursaries and support for further studies at universities and other institutions of higher learning. A large number of in-service training opportunities are also offered through learner ships. In addition, young professionals are all enrolled into Aurecon's formalised Mentorship Programme and are linked to a mentor for the benefit of guiding them on their career paths and boosting their performance.

Aurecon has also become the ideal proving-ground for black people and (in particular, black managers) wanting to boost their skills and experience before moving on to establish their own consulting engineering firms, or to assume senior positions in various public and private sector organisations.

8. Contractual Matters

8.1 Form of Agreement

The standard DWA Form of Agreement is the legal binding document between the Client and Consultant.

8.2 Professional Fees

Professional fees are determined according to the document Policy Guidelines on the Remuneration and Reimbursement of Consultants of DWA and are contained in the Agreement.

All fee and cost items shown in this report exclude VAT, except where otherwise indicated.

Hourly rates in excess of R830/hour will be reviewed annually on April each year and rates below R830/hour when salary increases take place, both subject to the Client's approval. This will only be relevant in the case that the study is delayed beyond April 2013.

8.3 Budget

The components (tasks of the project) given in the ToR are still relevant. The tasks in the TOR were quite broad in their Scope. In this report the tasks are now described in more detail. . The contract budget has been reallocated between components to provide for the known adjustments as described for the various components. However, as described in the methodology for various components, it is clear that the activities and magnitude of certain components is likely to increase significantly. The budget implications thereof must still be agreed.

In the proposal an amount of R440 776.56, excluding VAT, was provided for the use of unnamed specialists. The required specialists have now been identified and this amount is now distributed to specific components and reflected as fees. The breakdown of fees allocated to specialists is shown in **Appendix C.**

A breakdown of the professional fees per component is presented in **Appendix C**. The information in **Appendix C** will also form the basis of each invoice to indicate actual expenditure against the budgeted amounts. Hours and cost per person per component as well as a projected cash flow are also shown in **Appendix C**.

9. Conclusions

The Inception Report presents the understanding at the date of this report, of the Scope of the Feasibility Study for a Long-Term Solution to address the Acid Mine Drainage associated with the East, Central and West Rand underground Mining Basins and describes the present and where appropriate, possible changes to the Scope of the components.

10. References

IMC 2010 –9 February 2011, Cabinet approved the IMC report (IMC 2010), which *inter alia,* required that a Feasibility Study be undertaken, aimed at implementing a self-sustainable long-term solution (LTS) to address the management of AMD. It also recommended Short-Term Interventions (STIs).

ANNEXURE A

DIRECTIVE TO TCTA FOR SHORT TERM INTERVENTION

MINISTER
WATER AND ENVIRONMENTAL AFFAIRS
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria, 0001, 185 Schoeman Street, Sedibeng Building, Tel: +27 12 336 8733, Fax: +27 12 336 8717
Private Bag X9052, Cape Town, 8000, 120 Plein Street, Tel: +27 21 464 1500, Fax: +27 21 465 3362

Ref.: AMD-DIR-TCTA-01.03.2011

Dr Snowy Khoza
Chairperson
Trans-Caledon Tunnel Authority
PO Box 10335
CENTURION
0046

Dear Dr Khoza

EMERGENCY WORKS WATER MANAGEMENT ON THE WITWATERSRAND GOLD FIELDS WITH SPECIAL EMPHASIS ON ACID MINE DRAINAGE: DIRECTIVE IN TERMS OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998)

Following concerns about acid mine drainage (AMD) impacts on the Witwatersrand gold fields, Cabinet appointed an Inter-Ministerial-Committee (IMC) to address the serious challenges posed by the AMD. A Technical Committee, tasked by the IMC and co-chaired by the Director-General of the Department of Mineral Resources and the acting Director-General of the Department of Water Affairs (DWA), subsequently appointed a Team of Experts who presented a final draft report to Cabinet on 9 February.

The following recommendations, as emergency works, in the report (attached as **Appendix A**) were approved by the IMC and Cabinet for implementation:

I. Installation of pumps to extract water from the mines to on-site treatment plants
II. Construction of an on-site water treatment plant in each Basin with the option of refurbishing and upgrading the existing ones owned by the mines
III. Installation of infrastructure to convey treated water to nearby water courses
IV. Operation of the pump stations and treatment works

I hereby direct the TCTA in terms of section 103 (2) of the National Water Act, 1998 (Act 36 of 1998) to undertake the emergency works (hereafter referred to as the Project) subject to the following conditions:

1. Funding for the Project shall be via funds allocated by the National Treasury and made available to TCTA via the DWA. Procedures to govern the disbursements of funds between the TCTA and the DWA shall be incorporated into an Implementation Agreement.
2. Relevant current best practices, and where applicable, international standards, shall be applied for the design, construction and supervision of the Project.
3. The TCTA will lead the process of obtaining the environment al authorisations of the works from the Department of Environmental Affairs (DEA); the TCTA shall ensure that all the steps are taken to ensure compliance with environmental legislation.
4. The TCTA shall liaise with the DWA regarding the longer term AMD management objectives and ensure compatibility of the Project with future application of AMD.

5. An Implementing Agreement for the Project must be concluded within three (3) months of the date of the directive between the DWA and the TCTA setting out clear lines of responsibility and accountability.
6. The Project must be implemented in the most efficient manner with due regards to cost, timing and reliability.
7. Available DWA and TCTA organisational resources shall be pooled in a manner that will build capacity for the management, development and delivery of the Project.
8. The TCTA shall establish institutional arrangements and process to ensure meaningful participation by all the relevant stakeholders of the project.
9. All Projects implementation actions shall comply with the applicable South African legislation and codes of conduct.
10. The TCTA shall include the facilitation of the best model, which shall be proposed to (the DWA) and decided upon by the DWA for the operations of the pumping stations and the treatment works.
11. The TCTA's communication strategy on the Project needs to reflect the representative roles and responsibilities of the DWA with the relevant stakeholders.
12. Land rights for the Project shall be acquired in accordance with South African statutes.
13. Progress reports on the Project shall be submitted to me every month, as well as on ad hoc issues that require my attention and intervention.
14. After completion of the project, the DWA shall assume responsibility for the operations and maintenance.
15. I may direct the TCTA to undertake further works.

In terms of section 64(1) of the said National Water Act, 1998, I hereby authorise the TCTA to expropriate property required to implement the Project.

I wish you success in executing this important assignment.

Yours sincerely

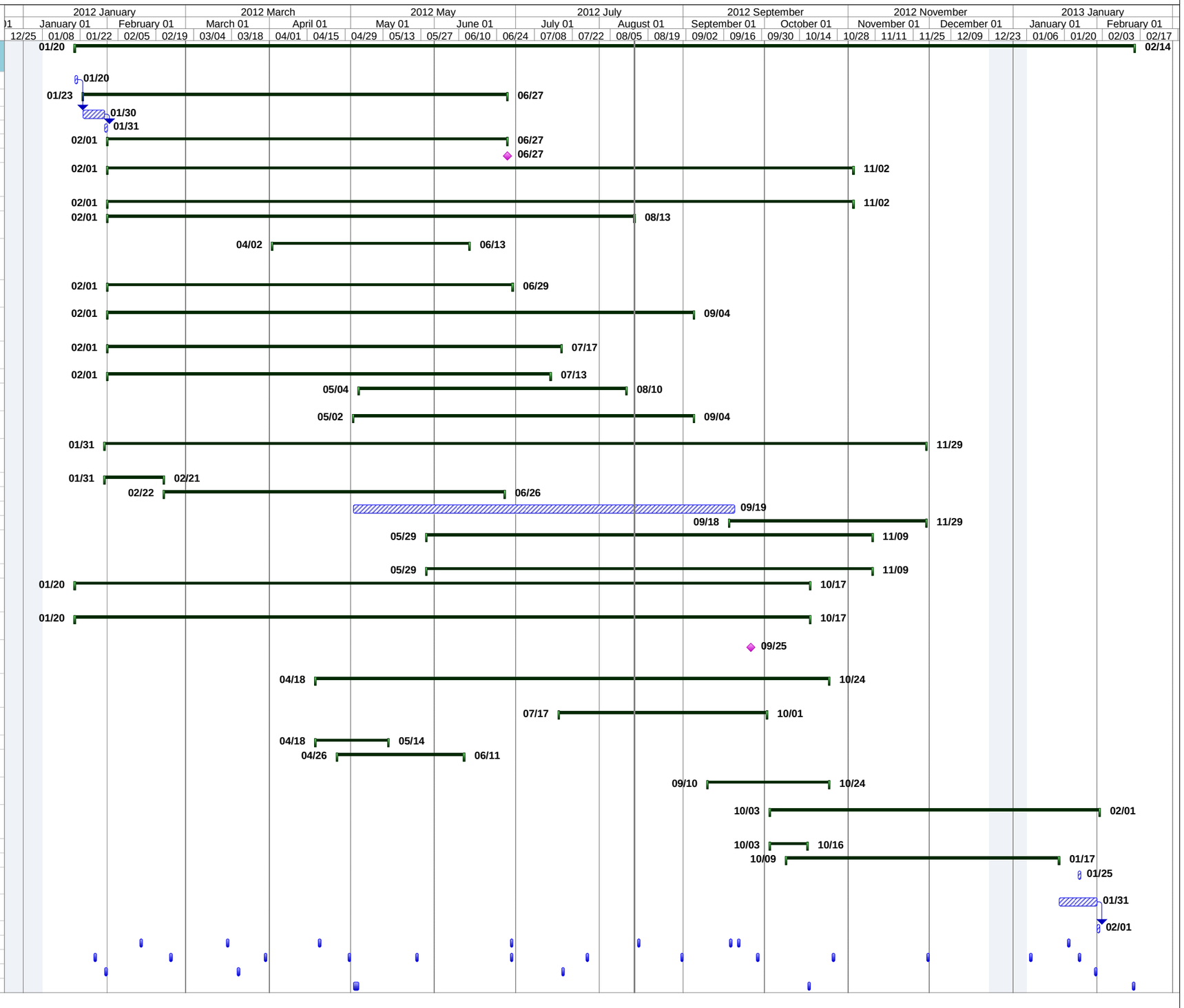
MRS B E E MOLEWA MP
MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS
DATE: 06·04·2011

Cc – CEO: Trans-Caledon Tunnel Authority

APPENDIX A

STUDY PROGRAMME

ID	WBS	Task Name	Duration	Start
33		**2 Long Term Feasibility Study - Inception Report Programme: Signing of Contract**	**258 days**	**Fri 12/01/20**
34	**2.1**	**Signing of Contract**	**1 day**	**Fri 12/01/20**
35	**2.2**	**Component 1 - Project Inception**	**108 days**	**Mon 12/01/23**
36	2.2.1	Mobilisation	6 days	Mon 12/01/23
37	2.2.2	Initial Client Meeting PMC#1 & Project Briefing & Scoping	1 day	Tue 12/01/31
38	**2.2.3**	**Reporting**	**101 days**	**Wed 12/02/01**
48	**2.2.4**	**Component 1 Complete**	0 days	Wed 12/06/27
49	**2.3**	**Phase 1: Pre feasibility Study: Needs and Status**	**191 days**	**Wed 12/02/01**
50	**2.3.1**	**Component 2: Information Sourcing**	**191 days**	**Wed 12/02/01**
77	***2.3.2***	***Component 3: Legal Considerations and Apportionment of Liabilities***	**133 days**	**Wed 12/02/01**
99	**2.3.3**	**Component 4: Evaluation of Management Scenarios and Analysis of Technical Options**	**49 days**	**Mon 12/04/02**
113	**2.3.4**	**Assessment of the Water Quantity and Quality of the Witwatersrand Mine Voids**	**103 days**	**Wed 12/02/01**
136	**2.4**	**Phase 1: Pre feasibility Study: Options Assessment**	**149 days**	**Wed 12/02/01**
137	**2.4.1**	**Options for Use or Disposal of Water and Waste**	**115 days**	**Wed 12/02/01**
169	**2.4.2**	**Technology Options Analysis**	**113 days**	**Wed 12/02/01**
198	**2.4.3**	**Identification of Alternative Options for the Long Term Solution**	**70 days**	**Fri 12/05/04**
216	**2.4.4**	**Assessment of long term solutions and Pre feasibility report**	**89 days**	**Wed 12/05/02**
236	**2.5**	**Component 8: Stakeholder and Public Communication Planning**	**211 days**	**Tue 12/01/31**
237	**2.5.1**	**Planning**	**16 days**	**Tue 12/01/31**
246	**2.5.2**	**reporting**	**85 days**	**Wed 12/02/22**
256	**2.5.3**	**Implementation of the Strategy and plan**	100 days	Wed 12/05/02
257	**2.5.4**	**Comment Report on Communications**	**52 days**	**Tue 12/09/18**
267	**2.6**	**Phase 2: Feasibility Study: Concept Development**	**117 days**	**Tue 12/05/29**
268	**2.6.1**	**Concept Development and Preliminary Design**	**117 days**	**Tue 12/05/29**
288	**2.7**	**Phase 2: Feasibility Study: Due Diligence And Value Assessment**	**187 days**	**Fri 12/01/20**
289	**2.7.1**	**Component 6: Institutional and Financial**	**187 days**	**Fri 12/01/20**
397	**2.7.2**	**Input to Medium Term Expenditure Framework (MTEF)**	**0 days**	**Tue 12/09/25**
398	**2.8**	**Phase 2: Feasibility Study: Implementation Plan (Component 7)**	**132 days**	**Wed 12/04/18**
399	***2.8.1***	***Preliminary Output Specifications (PPP Option)***	**53 days**	**Tue 12/07/17**
411	***2.8.2***	**Scope of Work for Transaction Advisor**	**17 days**	**Wed 12/04/18**
417	**2.8.3**	**Prepare and Compile Scope of Work for one additional study expand**	**31 days**	**Thu 12/04/26**
424	***2.8.4***	***Implementation Plan and Procurement Plan***	**32 days**	**Mon 12/09/10**
435	**2.9**	**Phase 2: Feasibility Study: Decisions and Approvals by Client**	**73 days**	**Wed 12/10/03**
436	**2.9.1**	**Verify Information and Sign Off**	**10 days**	**Wed 12/10/03**
440	**2.9.2**	**Reporting**	**58 days**	**Tue 12/10/09**
449	**2.9.3**	**Presentation of Final Feasibility Study Report by DWA to National Treasury**	1 day	Fri 13/01/25
450	**2.9.4**	**Review Period Allowance for a Decision by National Treasury in Respect of TA:I**	10 days	Fri 13/01/18
451	**2.9.5**	**Receipt of National Treasury TA:I**	1 day	Fri 13/02/01
452	**2.10**	**SAC Meetings**	**224 days**	**Mon 12/02/13**
461	**2.11**	**Monthly Progress Reports to SAC**	**239 days**	**Fri 12/01/27**
475	**2.12**	**SMC Meetings**	**241 days**	**Tue 12/01/31**
481	**2.13**	**SSC Meetings**	**190 days**	**Wed 12/05/02**



Project: AMD Programme Inception re
Date: Tue 12/08/14

Task	Rolled Up Critical Task	Project Summary	Manual Task	Finish-only
Critical Task	Rolled Up Milestone	Group By Summary	Duration-only	Critical
Milestone	Rolled Up Progress	Inactive Task	Manual Summary Rollup	Critical Split
Summary	Split	Inactive Milestone	Manual Summary	Progress
Rolled Up Task	External Tasks	Inactive Summary	Start-only	Deadline

APPENDIX B

STUDY ORGANISATIONAL CHART

ANNEXURE.: ORGANOGRAM

FEASIBILITY STUDY TO ADDRESS THE ACID MINE DRAINAGE IN THE EAST CENTRAL & WEST RAND MINING BASINS

AME	**Aurecon - AME (RSA)**
APAC	**Aurecon - APAC (Australia)**
SRK	**SRK Consulting (Pty) Ltd**
SS	**Shango Solutions**
NECSA	**NECSA Research & Development**
WSM	**WSM Leshika**
Ind	**Independent**
TT	**Turner Townsend (Pty) Ltd**

LEAD ADVISOR
Fanie Vogel (AME)

TECHNICAL ADVISOR - Andrew Tanner (AME)
LEGAL ADVISOR - Andre Hindley (SRK)

PROJECT MANAGEMENT SUPPORT
JS Henrico (AME)
I Harmse (AME)
J Labuschagne (AME)
DJ Koekemoer (AME)
J Pugh (SRK) Financial Administration
N Visagie (SRK) Project Administration
Y Bailey (SRK) Project Administration

TEAM LEADERS	**Water Quality and Environmental Management**		**Underground Mine Water Geohydrology and Ingress**				**Water and Waste Water Management and Purification Technologies**		**Technical Options Identification, Annalysis Design and Costing and Implementation Planning**					**Legal Responsbility of Stakeholders**	**Institutional and Financial models**				**Public and Stakeholder Communication**		**Implementation Plan**	**Information Management**
	BHJ Smit - AME		**D Duthe - SRK**				**W Johannes - AME**		**P Grobler - AME**					**A Hindley - SRK**	**J Samuel- TT**				**Vassie Maharaj - SRK**		**SC Vogel - AME**	**JM Viviers - AME**
TASKS AND TASK LEADERS	Environmental Impacts & Screening Processes	Requirement for Environment	Mine Water Quantity	Mine Water Quality	Dolomites	Surface Water Management / Ingress of Stormwater	Water Treatment	Waste Management	Hydrology &Water Resources Planning	Water Treatment & Waste Handling Works	Pipelines & Pump stations	Surface Geotechnical	Surface Containment Structures	Regulation & Environmental Law	Institutional Legislative Requirements	Economics & Tariffs	Financing	Institutional Structuring	Stakeholder Liaison	Communications		GIS
	BHJ Smit *(AME)*	M Hinsch *(SRK)*	J Schweitzer *(SS)*	J Schweizer *(SS)*	R Roux *(AME)*	M Braune *(SRK)*	W Johannes *(AME)*	A Wood *(SRK)*	D. Koekemoer *(AME)*	J Louw *(AME)*	V Gajathar *(AME)*	S Ngubelanga *(SRK)*	I Hammond *(SRK)*	Van Gend Botha *(AME)* - *Environmental*	L Mazwai *(LMZ)*	W van Zyl *(AME)*	T Williams *(IGNIS)*	CH Schmidt *(AME)*	A Ismael *(SRK)*	S Manyaka *(SRK)*	A Hindley *(SRK)* A Tanner *(AME)*	B Bothma *(AME)*
SUPPORTING STAFF	JJ Goosen *(AME)*	I Nel (*SRK)*	K Sami *(WSM)* - *Modelling*	S de Waal *(SS)*	IS Venter *(AME)*	D Mahlangu *(SRK)*	W Kelly *(PROXA)*	A Human *(PROXA)*	JP Botha *(AME)*	I E Bey *(AME)*	E van der Merwe *(AME)*	MR Wynne (SRK) REPLACED	L Tshabalala *(SRK)*	VMM Letswalo *(AME)*	E Marobyane *(LMZ)*		P Nchodu *(IGNIS)*	S Jooste *(AME)*	MC Masogo *(AME)*	M Kunene *(SS)*	BHJ Smit *(AME)*	SH Meyer *(AME)*
	J Strydom *(AME)*		C Myburgh *(SS)*	V Vermaak *(SS)*		J Mathole *(SRK)*	TDN Mofokeng *(AME)*	DA Keuler *(PROXA)*	F Smuts *(AME)*		D Sibanda *(AME)*			CE van Wyk *(AME)*	T Dlulane *(LMZ)*			L Nkuna *(TT)*	T Kunene *(SS)*	D Chetty *(SRK)*	DJ Koekemoer *(AME)*	A Els *(SRK)*
			A De Waal *(SS)*				J Geldenhuys *(AME)*	C Ferreira *(PROXA)*	C Nunes *(AME)*		J Strydom *(AME)*			D Macfarlane *(AME)*	K Galeforolwe *(LMZ)*			M Renshaw (T&T)	E de Beer *(SRK)*		J Samuel *(TT)*	
							D Sibanda *(AME)*	JG Potgieter (PROXA)	DJ Louw *(AME)*		W Blersch *(AME)*				S Maseko *(LMZ)*			M Erasmus *(AME)*			JD van Zyl *(AME)*	
SPECIALIST ADVISORS	T Sebego *(AME)*	P Ashton *(Ind)*	P Wade *(Ind)*	Dr A Faanhof *(NECSA)*		P Shepherd *(SRK)*	W van der Merwe *(PROXA)*		V Jonker *(AME)*	IS Venter *(AME)*				Specialist Practitioners						T Hart *(SRK)*		
			F Winde *(NWU)*	I Louw *(NECSA)*			J Cowan *(SRK)*		K Sami *(WSM)*	WJ Schutte (AME)				**H Thompson (T&T) - *Water Law***								
			E Erasmus *(NWU)*	T McCarthy *(SS)*						D Du Toit (AME) - M & E				I Sampson *(SRK)* - *Mining*								
			G Steyl *(FSU)*	M Levin *(AME)*						L Cortreras (SRK)												
										J Perkins (Specialist Reviewer) (Ind)												
			G Muller *(Ind)*	H Coetzee *(CGS)*						I. Solomon (Corrosion Protection) APAC												
			L Stoch *(NWU)*	A Mason-Apps *(SS)*						D Timm *(AME)*												

APPENDIX C

FINANCIAL INFORMATION

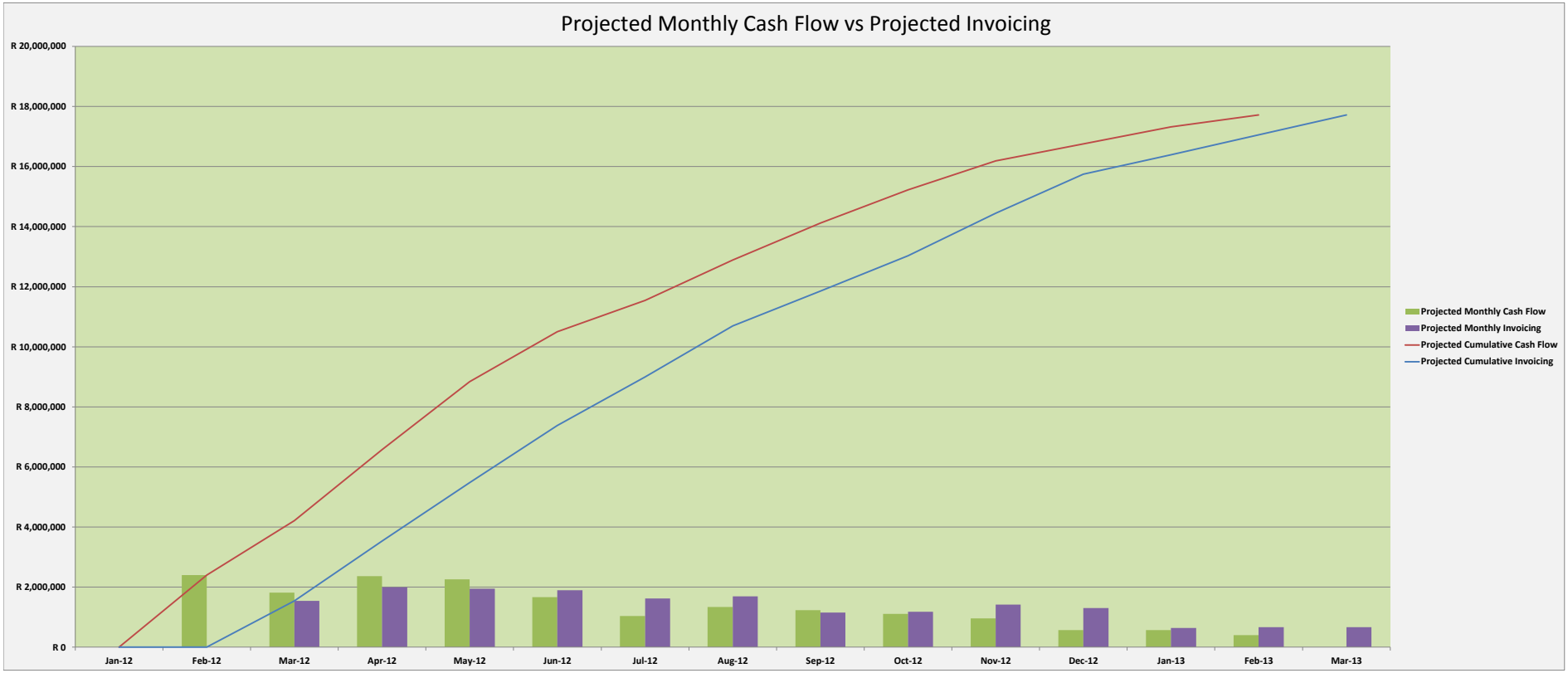
Professional Fees Summary

PROFESSIONAL FEES TOTALS			
Component Description		**Proposal Budget Amount (R)**	**Inception Budget Amount (R)**
1	Study Inception	R420,860.00	R567,618.00
2	Identification of Sources of Information - Collection and Evaluation	R713,800.00	R703,860.00
3	Legal Considerations and Apportionment of Liabilities	R1,334,900.00	R1,064,545.00
4	Evaluation of Management Scenarios	R4,118,132.00	R3,701,188.00
5	Analysis of Optimal Infrastructure Configuration	R1,680,400.00	R1,643,094.40
6	Institutional and Financial Models	R2,107,240.00	R2,121,120.00
7	Implementation	R1,893,420.00	R1,956,230.00
8	Key Stakeholder and Communication	R716,920.00	R884,240.00
9	Study Management and Administration	R1,706,880.00	R2,396,791.48
	Component: Sub Total	**R14,692,552.00**	**R15,038,686.88**

SUMMARY		
Component Description	**Budget Amount (R)**	
Aurecon Professional Fees Total:	R6,411,325.00	R6,473,027.00
Disbursements:	R411,391.46	R506,033.14
Unallocated Specialists:	R440,776.56	
Subconsultants/Contractors:	R8,281,227.00	R8,565,659.88
Total VAT exclusive:	**R15,544,720.02**	**R15,544,720.02**
VAT:	R2,176,260.80	R2,176,260.80
Sum of Non VAT Items:	R 0.00	R 0.00
Total VAT Inclusive:	**R17,720,980.82**	**R17,720,980.82**

Projected Cashflow vs Projected Invoicing (Incl VAT)

Month	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13
Projected Monthly Cash Flow	R 0.00	R2,402,368.87	R1,815,481.75	R 2,360,897	R 2,256,059	R 1,667,184	R 1,041,626	R 1,342,620	R 1,233,693	R 1,107,086	R 962,325	R 566,995	R 567,192	R 397,453	
Projected Cumulative Cash Flow	R 0.00	R2,402,368.87	R4,217,850.62	R 6,578,748	R 8,834,807	R 10,501,991	R 11,543,617	R 12,886,237	R 14,119,930	R 15,227,016	R 16,189,341	R 16,756,336	R 17,323,528	R 17,720,981	
Projected Monthly Invoicing	R 0.00	R0.00	R1,540,593.49	R 1,993,590	R 1,945,611	R 1,895,795	R 1,625,687	R 1,697,281	R 1,152,328	R 1,181,139	R 1,416,370	R 1,301,095	R 643,930	R 663,780	R 663,780
Projected Cumulative Invoicing	R0.00	R0.00	R1,540,593.49	R3,534,183.50	R 5,479,795	R 7,375,590	R 9,001,277	R 10,698,558	R 11,850,886	R 13,032,025	R 14,448,396	R 15,749,490	R 16,393,420	R 17,057,201	R 17,720,981



*** Amounts will be invoiced 30 days later than service provided**

APPENDIX D
THE SOLUTION TO BE STUDIED AT FEASIBILITY LEVEL

D1: Assumed Long-Term Technical and Institutional Solutions to be studied at Feasibility Level in Component 5 of the Study

D1.1 Introduction

The long-term solution may entail the establishment of water management and treatment capacity for the three basins.

The Scope of the LTS selected for study of Component 5 will affect the budget for that Component. The budget in the proposal was based on an assumed LTS as described in Appendix C of the Proposal. Based on the work done at the date of this report that LTS may no longer be applicable, but the LTS to be studied in Component 5 is still being determined in Component 4.

Depending on the LTS adopted for Component 5 and any changes to the SoW, the budget for that Component may have to be revised. This will be discussed when the LTS has been agreed.

The LTS as described in Appendix C of the proposal and as now contemplated is summarised in Table D1.

Table D1: Assumed LTS

Component	At time of Proposal	At date of Inception Report	Comments
Abstraction	At shafts used by STI	Either at shafts by STI or possible alternative sites.	Budget implications if alternatives are selected for Study in Component 5.
Neutralisation	HDS plant by STI	HDS plant by STI, alternatives may be considered.	Budget implications if alternatives are selected for Study in Component 5.
Infrastructure for Neutralisation	Suitable for LTS	Probably suitable for LTS	No impact
Disposal of HDS Sludge	By STI, no work required.	Disposal of all waste to be planned by LTS	This has budget implications for Components 4.3 and 5.
De-Salination	RO plant adjacent (within 0.5km) of HDS.	RO adjacent to STI or possible alternative sites. Alternative technologies may be preferred	Budget implications if alternatives are selected for Study in Component 5.
Waste Disposal	Waste from RO process will be less than 1% of inflow stream. Will temporarily be stored on site before removal by new user.	Under investigation.	This has budget implications for Components 4.3 and 5.
Water Discharge	To environment within 0.5km of treatment works.	To Rand Water network or environment some distance from Treatment Works.	This has budget implications for Components 5.
Power Supply and Services	Adequate for LTS.	Under investigation.	This may have budget implications for Component 5.
Procurement Model	Turnkey (DBOM)	DBOM or DBOMF/PPP may have to be decided before Component 6 is complete.	This may have budget implications for Component 6.

APPENDIX E

STAKEHOLDER DATABASE

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Feasibility Study for a Long Term Solution to address the Acid Mine Drainage (AMD) associated with the East, Central and West Rand Underground Mining Basins in the Gauteng Province

AMD FS Stakeholder Committee Membership

Category	Institution/Organisation	Current Representation	Position/Designation	Alternative
1. National Government				
	Department of Environmental Affairs	Amanda Britz	Director: Environmental Impact Managent	
	Department of Mineral Resources: Mine Health and Safety Inspectorate	Susan Malebe	Regional Manager: DMR (Gauteng)	Mpho Litlhakanyane, Max Madubane and Peter Kelly
	Department of Science and Technology	Umeesha Naidoo		Mahlori Mashimbye (Director: Chemical Industries and Related Services) and Candice Willard
	Relevant DWA Chief Directorates, Directorates, Sub-Directorates, and Regional Offices			
	DWA: Communication Services	Sputnik Ratau	Director: External Communications	Linda Page
	DWA: Compliance Monitoring and Enforcement	Nigel Adams		
	DWA: Gauteng Regional Office	Marius Keet	Deputy Director Gauteng Regional Office	Bashan Govender (Assistant Director: Water Quality Management)
	DWA: Hydrological Services	Eddie van Wyk	Scientific Manager and Chairman of the AMD Monitoring Committee	Ernst Bertram (Production Scientist)
	DWA: Integrated Water Resource Planning	Solly Mabuda	Chairperson AMD FS SSC	
	DWA: Legal Services	Anil Singh	Chief Director	

Category	Institution/Organisation	Current Representation	Position/Designation	Alternative
	DWA: Options Analysis - Central	Peter Pyke	Chief Engineer: Options Analysis	
	DWA: Resource Protection and Waste: Mines	Nematheheni Thivhafuni	Mines Specialist	
	DWA: Reserve Requirements: Groundwater	Nancy Mothebe	Scientific Manager	
	DWA: Water Resources Information Management	Mbangiseni Nepfumbada	Chief Director: Water Resources Information Management	
	DWA: Water Resources Management	Trevor Balzer	COO	
	DWA: Water Resource Planning Systems (WRPS)	Beason Mwaka	Director: Water Resource Planning Systems and AMD Study Director and SSC Chair Person	
	DWA: Water Quality Planning - Central	Jurgo van Wyk	Scientific Manager and Study Manager	
	DWA: Water Quality Planning	Jacqueline Jay	Scientist: Production – Water Quality Planning and Study C00rdinator	
	DWA: Water Resource Planning - Integrated Hydrological Planning	Fanus Fourie	Geo hydrological Resource Analyst	
	DWA: Water Resource Planning National - Central	Seef Rademeyer	Chief Engineer	
	DWA: Water Resources Planning Systems: Water Quality Planning	Pieter Viljoen	Deputy Director: Water Quality Planning and Study Deputy Director	
	DWA: Water Resources Planning Systems	Rod Schwab		
	Other:			
	National Nuclear Regulator	Immanda Louw	Senior Scientist	
	National Planning Commission	Mike Muller	Commissioner	
	National Treasury	Strover Maganedisa	Director	Tumisang Moleke and Petrus Matji
2. Provincial Government				
	Relevant DWA Chief Directorates, Directorates, Sub-Directorates, and Regional Offices			
	Gauteng Department of Agriculture and Rural Development	Rina Taviv	Director: Mining and Energy	
	Gauteng Department of Local Government and Housing - Disaster Management	Elias Sithole	Chief Director: Gauteng Department of Housing	
3. Local and District Government				
	South African Local Government Association (SALGA)	Willam Moraka		Jacky Sampson

Category	Institution/Organisation	Current Representation	Position/Designation	Alternative
	Affected Municipalities:			
	Ekurhuleni Metropolitan Municipality	Elsabeth van der Merwe	Acting Director: Policy and Planning for the Environment	Sekhanyana Lerothi
	Johannesburg Metro	Ntshavheni Mukwevho		
	Johannesburg Water	Ariel Mafejane	Divisional Manager	
	Mogale City Local Municipality	Stephan du Toit	Environmental Manager	
	Randfontein Municipality	Maliba Ramatlhape	Environmental and Waste Manager	Nokwazi Ndlala (Director: Infrastructure)
	Ward Councillors and Ward Committees (for inputs on community perspective) (Members Mayoral Committee)	Andy Mathibe	Portfolio Head: Integrated Environmental Management	
		Emily Mathe	Portfolio Head: Social Services	
	West Rand District Municipality	Danny Govender		Susan Stoffberg (Environmental Officer) and Zakhele Dlamini (Environmental Manager)
4. Mining Sector				
	Chamber of Mines	Stephina Mudau	Head: Environmental Division	
5. Organised Business, Industry and Labour				
	NEDLAC	Tumi Monageng	Coordinator	
6. Organised Agriculture				
	Agri Gauteng	Dirk Hanekom	General Manager	Johnny de Araujo (Witkoppie Farm), Meiring du Plessis (Ex WRC Research Manager), Prof Keith Bristow (CSIRO Water Scientist) and Wayne Truter (Rangeland and Forage Specialist)
	Agricultural Research Council – Roodeplaat	Yacob Beletse	Senior Researcher	
	National African Farmer Union (NAFU)	?????		
	Transvaal Agricultural Union SA	Bennie van Zyl	Head of TAU SA	Lynette du Plessis and John Annandale (Head of Pta Univ Dept of Plant Production and Soil Science)
7. Utilities (Water and Electricity)				

Category	Institution/Organisation	Current Representation	Position/Designation	Alternative
	Rand Water	Tawanda Nyandoro	Financial Economic Planner	Solomon Mathebula
8. Environmental NGOs and conservation groups				
	Federation for a Sustainable Environment	Mariette Liefferink	CEO	
	Federation for a Sustainable Environment	Koos Pretorius	Chairman of the Board	
	Save the Vaal	Coenie Nel	Committee Member	Mr Trevor Stubbs (Chairman)
	Vaal Environmental Justice Forum	Phineas Malapela	Chairperson and Trade Union Organiser	
9. Forums other existing structures				
	Vaal Dam Forum	Reveck Hariram (from Rand Water)	Chairperson	
	Vaal Barrage Forum	Zain Mohamed (from Sasol Infrachem)	Chairperson	
10. Institutions and Parastatals				
	Council for Geoscience	Henk Coetzee	Specialist Scientist	
	CSIR	Phil Hobbs		Bettina Genthe
	South African Human Rights Commission	Janet Love	Commissioner	Angela Kariuki (Research Associate) and Delysia Weah
	TCTA	Johan Claassen	Head of Capital Investments	Craig Hasenjager and Richard Holden
	Water Research Commission	Jo Burgess	Research Manager	
	World Bank	Manuel Marito		
		Marcus Wishart		David Sislen

Study Project Team:

Institution/Organisation	Current Representation	Position/Designation	Alternative
Aurecon	Joanne Henrico	Project Management Support	
Aurecon	Andrew Tanner	Technical Advisor & Specialist	
Aurecon	Fanie Vogel	Lead Advisor	
Shango Solutions	Terence McCarthy	School of Geosciences Specialist	
SRK Consulting	Di Duthe	Team Leader	

Institution/Organisation	Current Representation	Position/Designation	Alternative
SRK Consulting	Andre Hindley	Legal Advisor	
SRK Consulting	Vassie Maharaj	Team Leader	
Turner Townsend	John Samuel	Advisor	

Study Management Committee:

Institution/Organisation	Current Representation	Position/Designation	Alternative
WRP: Integrated Hydrological Planning	Fanus Fourie	Geo hydrological Resource Analyst	
DWA: Gauteng Regional Office	Bashan Govender	Assistant Director: Water Quality Management	
TCTA	Craig Hasenjager	Project Manager	
DWA: Water Quality Planning	Jacqueline Jay	Scientist: Production – Water Quality Planning and Study C00rdinator	
DWA: Gauteng Regional Office	Marius Keet	Deputy Director Gauteng Regional Office	
DMR: Mine Health and Safety Inspectorate	Peter Kelly		
National Treasury	Strover Maganedisa	Director	
National Treasury: Public Finance: Urban Development & Infrastructure	Petrus Matji		
National Treasury	Tumisang Moleke		
DWA: Reserve Requirements: Groundwater Reserve Requirements	Nancy Motebe	Scientific Manager	
DWA: Water Resource Planning Systems (WRPS)	Beason Mwaka	Chair Person	
DWA: Resource Protection and Waste: Mines	Nemataheni Thivhafuni		
DWA: Options Analysis - Central	Peter Pyke		
DWA: National Water Resource Planning - Central	Seef Rademeyer		
DWA: Hydrological Services	Eddie Van Wyk	Chairman of the AMD Monitoring Committee	
DWA: Water Quality Planning - Central	Jurgo Van Wyk	Scientific Manager and Study Manager	
DWA: WRPS: Water Quality Planning	Pieter Viljoen	Deputy Director: Water Quality Planning and Study Deputy Director	

APPENDIX F

RESPONSIBILITIES OF STUDY COMMITTEES

ACID MINE DRAINAGE FEASIBILITY STUDY (AMD)
Governance Structure

Minister of Water Affairs

Inter Ministerial Committee (IMC)

Intra Goverrntment Task Team (IGTT)

Project Exec committee (PEC)

Chief Directorate Integrated Water Resource Planning

Study Stakeholder Committee (SSC)

Study Management Committee (SMC)

Directorate: Water Resource Planning Systems

Sub Directorate: Water Quality Planning

Study Administration Committee (SAC)

Functions:
1. Strategic guidance and direction to study
2. Co-ordinate with other actions
3. Sanction deliverables
4. Make decisions on recommendations from SAC.

Composition
Chair: Study Director / Deputy Director
Government Departments, e.g. DWA, Treasury, DMR
Relevant Parastatals, i.e TCTA, Rand Water, CGS etc.

Technical Working / Focus Groups as and when required

Study Manager
Jurgo van Wyk

Study Support
J Jay

DWA Chief-Directorate: Integrated Water Resource Planning
Members:
S Rademeyer
R Schwab
P Viljoen
P Pyke

Study Leader
Fanie Vogel

Study Management Team: A Tanner
A Hindley
J Sameuls
J Henrico

Focus Groups / Existing Forums as and when required

Functions:
1. Study Management and Administration
2. Finalise Draft Reports
3. Make decisions on issues, some of which to be forwarded to the SMC for sanction/decisions.

Functions:
1. Key Stakeholder Input
2. Provide insight and advice
3. Provide comments and guidance on concepts and principles

Composition
Chair: DWA Chief-Director: IWRP / Study Director
National Departments
Provincial Departments
Local Government; Municipalities; SALGA
Sector representatives i.e. Agriculture, Mining and Industry
Institutions, i.e. SAHRC, TCTA; CGS, Rand Water, NGOs
Stakeholder groups