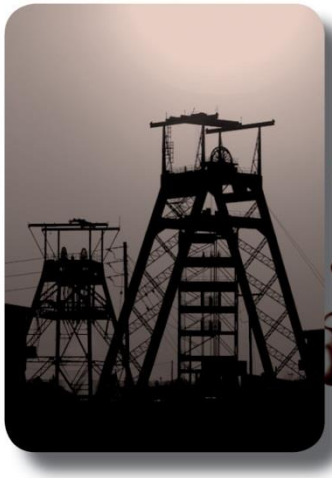
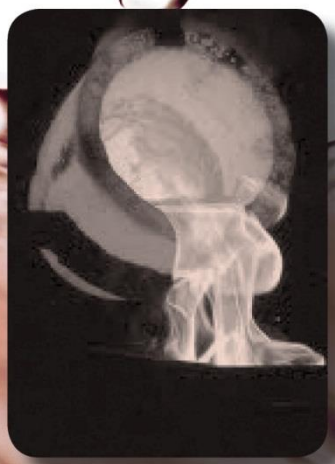


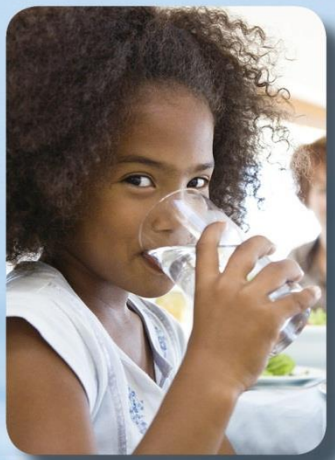
Water Resource Planning Systems Series

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



Key Stakeholder Engagement and Communications



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July 2013

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water affairs
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Water Affairs
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WATER AFFAIRS

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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.

PREFACE

1. Background to the Study

Gold mining in the East, Central and West Rand underground mining basins of the Witwatersrand goldfields (hereafter referred to as the Eastern, Central and Western Basins) started in the late 1880s. It is estimated that in the 1920s approximately 50% of the world's gold production came from the Witwatersrand mining belt, while in the 1980s South Africa was still the largest gold producer in the world. The large-scale mining in South Africa, in particular on the Witwatersrand, has decreased since the 1990s, and underground mining on the Witwatersrand essentially ceased in 2010. The mines of the Western, Central and Eastern Basins have produced a total of approximately 15 600 tons of refined gold since mining commenced. While the mines were operating, they pumped water to the surface to dewater their mine workings, but since mining stopped, the underground voids that were left after the mining have been steadily filling with water. The water in the mine voids interacts with the exposed sulphide bearing minerals in the rock formations to form Acid Mine Drainage (AMD), also known internationally as Acid Rock Drainage (ARD). AMD is characterised by a low pH and an excessive concentration of dissolved metals and sulphate salts.

In the case of the Western Basin, the AMD gradually reached the surface and started to drain out (decant) into surface streams in 2002. The water in the mine voids of the Central and Eastern Basins is rising steadily and will continue to do so until the water is pumped from the voids. It is predicted that the critical water levels will be reached in the Central Basin in late 2013 and in the Eastern Basin in mid-2014. If nothing is done, the water is predicted to reach the surface and decant at the lowest points in the Central Basin in the second half of 2015 and to reach the surface and decant in the Eastern Basin in late 2016. Decant would be uncontrolled and is likely to occur at several identified points, as well as at unexpected locations across each basin, due to varying water levels and connectivity between the near-surface aquifers and the voids.

If AMD, which has not been desalinated, is discharged into the Vaal River System, the high salt load will require large dilution releases to be made from the Vaal Dam to achieve the fitness-for-use objectives set for the Vaal Barrage and further downstream. This would result in unusable surpluses developing in the Lower Vaal River. Moreover, if dilution releases are still required after 2015, the acceptable levels of assurance of water supply from the Vaal Dam would be threatened. This will mean that there would be an increasing risk of water restrictions in the Vaal River water supply area, which will have negative economic and social implications. These negative impacts will be much greater if the catchment of the Vaal River System enters a period of lower-than-average rainfall with drought conditions. Since decant started in the Western Basin in 2002 the continuous flow of untreated AMD, and now

the salt load from the continuous flow of the neutralised AMD from the Western Basin, impact on the Crocodile (West) River System.

The importance of finding a solution to the rising AMD and the need for inter-departmental cooperation led to the establishment of an Inter-Ministerial Committee (IMC) on AMD, comprising the Ministers of Mineral Resources, Water and Environmental Affairs, and Science and Technology, and the Minister in the Presidency: National Planning Commission. The first meeting of the IMC took place in September 2010.

The IMC established a Technical Committee, co-chaired by the Directors-General of Mineral Resources and Water Affairs, which instructed a Team of Experts to prepare a report advising the IMC on solutions to control and manage AMD in the Witwatersrand goldfields. In February 2011, Cabinet considered the IMC report and instructed that the recommendations be implemented as a matter of urgency. Funds were then allocated to the Department of Water Affairs (DWA) by National Treasury with the purpose of implementing some of the IMC recommendations, namely to:

- Investigate and implement measures to pump the underground mine water in order to prevent the violation of the Environmental Critical Levels (ECLs), i.e. specific underground levels in each mining basin above which mine water should not be allowed to rise so as to prevent adverse environmental, social and economic impacts;
- Investigate and implement measures to neutralise AMD (pH correction and removal of heavy metals from AMD); and
- Initiate a Feasibility Study to address the medium- to long-term solution.

The investigations and implementation actions proposed in the first two recommendations commenced in April 2011, when the Minister of Water and Environmental Affairs issued a Directive to the Trans-Caledon Tunnel Authority (TCTA) to undertake “Emergency Works Water Management on the Witwatersrand Gold fields with special emphasis on AMD”:

When the proposed pumping and neutralisation commences in the Central and Eastern Basins the situation will be similar to that which prevailed when underground mining and dewatering of the mine voids, and partial treatment of the water, were being carried out by the active mining companies. The saline AMD will flow into the Vaal River System and specifically into the Vaal Barrage. The high salt load will have the same impact on the Vaal River System as described earlier.

The third recommendation resulted in the Terms of Reference (ToR) for this Feasibility Study (DWA 2011a) being issued in July 2011. The ToR noted that the IMC had recommended that a Feasibility Study should be initiated as soon as possible, since the Short-Term Interventions (STI) might influence the roll-out of the desired medium- to long-term solution.

In January 2012, DWA commissioned the Feasibility Study for the Long-Term Solution (LTS). The Study period was 18 months, with completion at the end of July 2013. It was

emphasised that this Study was very urgent, would be in the public eye, and that recommendations to support informed decision-making by DWA were required. The recommended solution must support the Water Resource Strategies for the Vaal and Crocodile West River Systems and take account of the costs, social and environmental implications and public reaction to the various possible solutions.

The urgency of reducing salt loading on the Vaal River System and the relatively short study period for such a complex study means that implementation decisions have to be based on the current understanding of the best available information and technical analyses that have been completed by the time the decisions must be made. Thus, a precautionary and conservative approach was adopted during the Study.

Opportunities have been identified where the solutions that are implemented can be refined, during operation, as more information becomes available.

2. Integration with the Short-Term Intervention

The final TCTA Due Diligence Report (TCTA, 2011) was submitted to DWA in August 2011, and tenders for construction in all the basins were invited in November 2011. Immediate works were implemented in the Western Basin in 2012, and construction in the Central Basin commenced in January 2013. It is anticipated that construction of the Eastern Basin will commence in the first quarter of 2014.

The Scope of Work (SoW) of this Feasibility Study, with respect to the STI, is to understand the proposed STI in sufficient detail to:

- Undertake a Feasibility Study of all options, irrespective of the STI, in the interests of finding the best LTS;
- Determine how to integrate the STI and LTS, and influence the STI as far as appropriate or practical;
- Identify any potential long-term risks associated with the proposed STI, and propose prevention or mitigation measures; and
- Assess the implications of the proposed STI for the suggested institutional model for the implementation, operation, maintenance and/or management of the preferred LTS.

3. Approach to the Study

The focus areas of the Feasibility Study comprise technical, legal, institutional, financial/economic and environmental assessments, as well as public communication and key stakeholder engagement. The Feasibility Study comprises three phases; the Initiation, Prefeasibility and Feasibility Phases. The main components and key deliverables of each phase are shown in **Figure 1**, and each phase is discussed in more detail below.

The technical assessments run in parallel with the legal assessment, and both feed into the options assessment. The component on stakeholder engagement and communication was started early in the Study so that a stakeholder engagement and public communication strategy could be developed as soon as possible and be implemented throughout the Study.

The planning showed the Feasibility Phase as following the Prefeasibility Phase, but the short study period meant that it was necessary for the Feasibility Phase components to commence during the Prefeasibility Phase and run in parallel.

In conducting the Study, it was important that each component developed key information and recommendations, which were then used in subsequent components. The logical and timeous flow of information and recommendations was essential in order to develop solutions and meet the Study programme.

Figure 2 gives an overview of the technical, institutional/financial and implementation components and the flow of information throughout the Study. It can be seen how the fixed information (e.g. ECLs, raw water quality, ingress, etc.) and the decisions to be made, or the options to be investigated (e.g. abstraction points, qualities and quantities required by potential users, locations of users, treatment technologies) feed into the options assessment and identification of the Reference Project. The Reference Project will define the option that uses proven technologies, has the least associated risk, and is used for financial modelling and budgeting. It will probably not be the same as the option that is implemented, but constitutes the benchmark against which implementation proposals will be judged.

The Concept Design is based on the Reference Project and includes the costing and land requirements. This in turn provides input for the evaluation of the institutional procurement and financing options and the Implementation Strategy and Action Plan.

The phases of the Study, the key components and their inter-relationships are described below and illustrated in **Figures 1 and 2**.

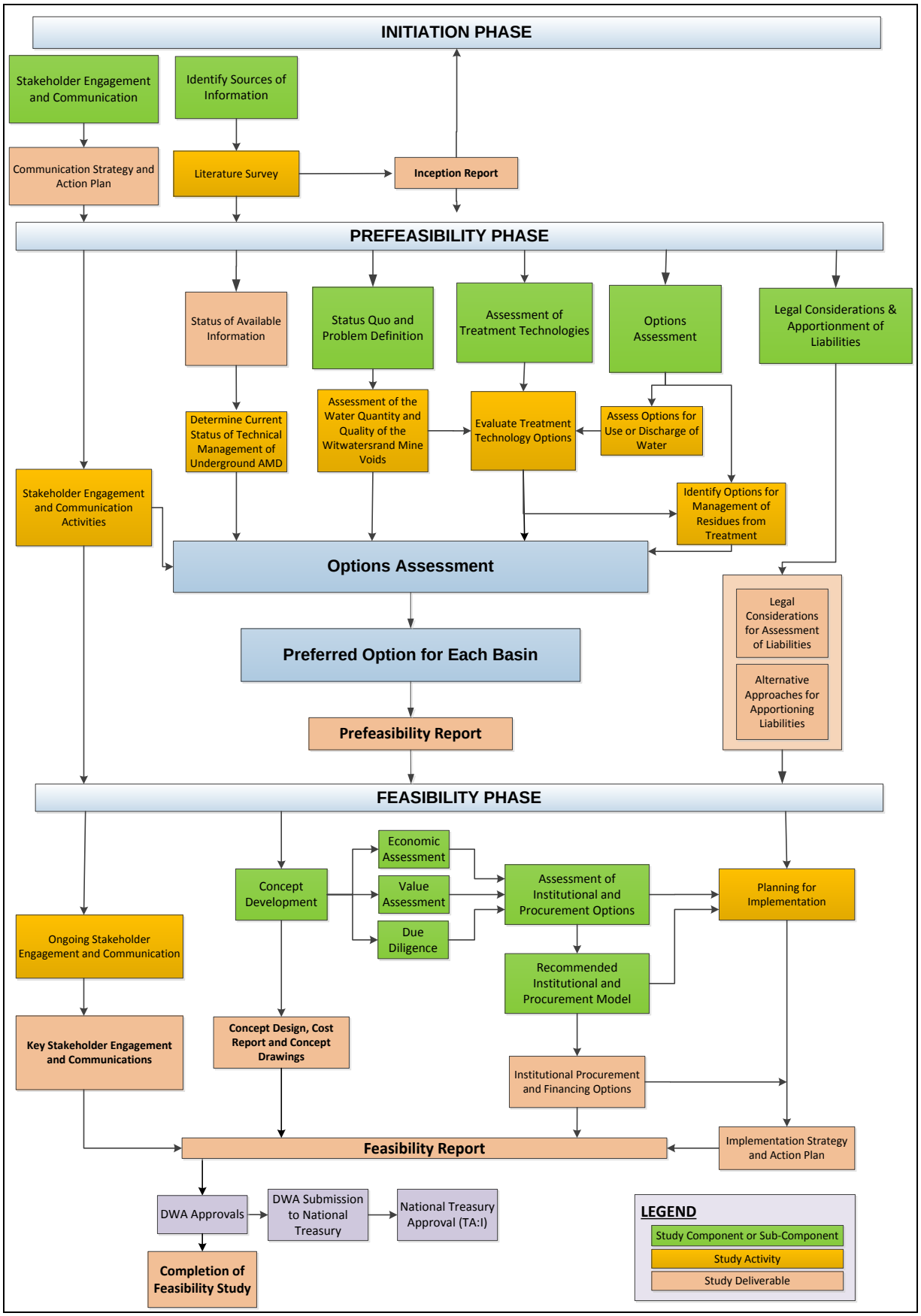

Figure 1: Study phases and components

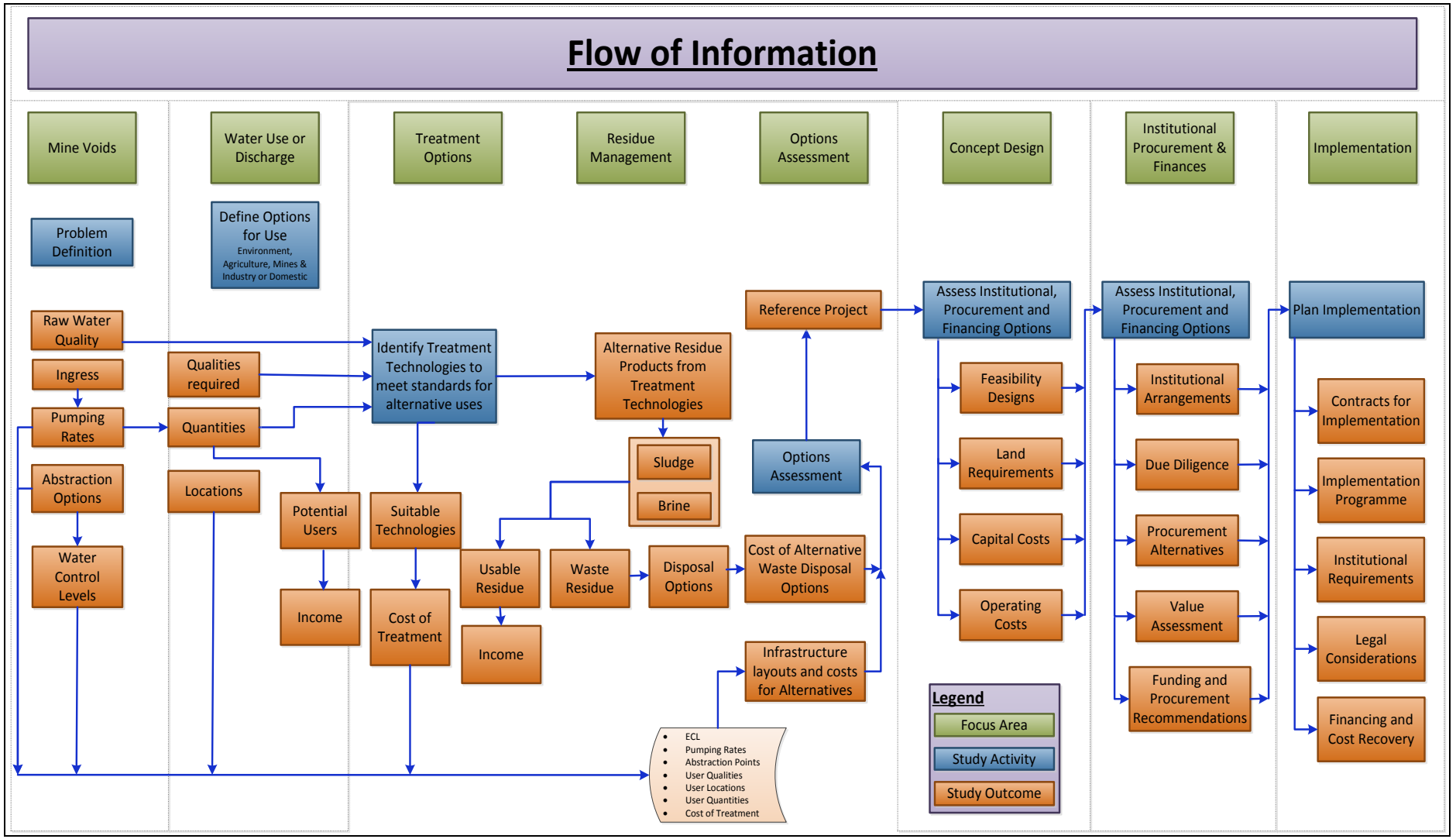

Figure 2: Flow of information throughout the Study

PHASE 1: Initiation

The objective of the Initiation Phase was to determine the approach and principles for the Study and understand the work already done by others. Numerous reports from previous studies, maps and research findings, relating to all components of the Study, were collated and reviewed. The SoW, proposed approach and the study programme were reviewed after initial consideration of the available information. The study objectives and priorities were reviewed and the results are presented in Study Report No. 1: ***"Inception Report"***.

The results of the complete literature survey, which continued after the Initiation Phase, are presented in Study Report No. 2: ***"Status of Available Information"***.

The Study Report No. 9.1: ***"Communication Strategy and Action Plan"*** was prepared so that key stakeholder engagement and communicators could commence as soon as possible and continue throughout the Study.

PHASE 2: Prefeasibility

The purpose of this phase was to understand and describe the current status and the environment for managing AMD and then to identify all apparently viable alternative solutions and, from those, identify the more feasible options, on the basis of technical feasibility, social and environmental acceptability and cost effectiveness. These were then considered in more detail, and the most feasible options were investigated in the Feasibility Phase.

The assessment of the legal liabilities and mechanisms for the apportionment of liabilities is a key stand-alone component that was commenced in the Prefeasibility Phase and finalised in the Feasibility Phase. This work is described in the confidential Study Report No. 3: ***"Legal Considerations for Apportionment of Liabilities"*** and confidential Study Report No. 4: ***"Alternative Approaches for Apportioning Liabilities"***.

The objectives of the Prefeasibility Phase were to:

- Understand the status quo;
- Define the problem;
- Understand the quantity and quality of water in the mine voids and how fast is it rising in each basin;
- Identify possible uses for the water;
- Identify treatment technologies that can treat the necessary volumes of AMD to the standard required by various users;
- Understand the residues (or waste products) produced by each process and how they can be managed;
- Define a wide range of options for possible solutions by combining alternatives for abstraction, water use, treatment and management of residues;
- Screen the alternatives to identify viable options; and

- Carry out prefeasibility costing of the most viable options and identify the most appropriate option to be used as the Reference Project.

To achieve these objectives, the Prefeasibility Phase needed to provide the team with:

i. A sound understanding of the STI, how it can be integrated into the LTS, and the impact of the STI on the selection and procurement of the LTS. This is described in Study Report No. 5.1: ***"Current Status of Technical Management of Underground AMD"***.

ii. A sound understanding of the hydrogeology, underground water resources, sources of surface water ingress, spatial distribution and connectivity of mined voids; and the current water quality and projections of future volumes, levels and water qualities. This was based on the substantial information from previous studies and is presented in Study Report No. 5.2: ***"Assessment of the Water Quantity and Quality of the Witwatersrand Mine Voids"***.

iii. An understanding of the DWA Water Resource Management Strategies for the Vaal River System and Crocodile West River System. These strategies provided the framework within which to develop a range of possibilities for the use or discharge of raw, neutralised or desalinated AMD to meet the objective of reducing the salt load in the Vaal River System and associated catchments to acceptable levels without having an unacceptable social or environmental impact. These possibilities are described in Study Report No. 5.3: ***"Options for Use or Discharge of Water"***.

iv. An assessment of 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 assessment is described in Study Report No. 5.4: ***"Treatment Technology Options"***.

v. Locality plans for the possible disposal of waste, or potential uses for residue products generated by treatment processes. These plans are described in Study Report No. 5.5: ***"Options for the Sustainable Management and Use of Residue Products from the Treatment of AMD"***.

The knowledge and data from the Prefeasibility Phase were used to combine the alternative locations for the abstraction, treatment and use or discharge of water and the disposal of waste, as well as the layouts of the infrastructure required (including pipelines and pump stations), into a large number of options. The alternatives were screened at a high level to give a short-list of practical technical options.

The capital and operating costs of the short-listed options were determined to give a present value of lifetime cost. Social and environmental screening for fatal flaws was carried out, and possible financial benefits from the sale of water or waste were considered. The anticipated public reaction to the options was also considered. The identification of the Reference Project was then completed on the basis of the costs, benefits and impacts. The costs and implications of possible alternatives were also defined. The results and an overview of all the

components of this Prefeasibility Phase are described in Study Report No. 5: ***"Technical Prefeasibility Report"***.

PHASE 3: Feasibility

The main objective of this phase was to carry out intensive feasibility level investigations and optimisation of the most feasible layouts for each basin and to select a preferred option to be used as a Reference Project for each basin. The requirements for implementation were also considered and evaluated.

The Feasibility Phase comprises a number of components that build on the results of the Prefeasibility Phase; the results of the various components are reported separately and then integrated in a Feasibility Report for the solution to AMD.

The components in this Phase comprise:

i. Concept Development:

Once the Reference Project for each basin had been agreed, the layout for the treatment works, pipelines and waste storage and disposal sites was planned and costed. Environmental screening was undertaken for each of the identified sites that form part of the Reference Project. The results are presented in the confidential Study Report No. 6: *"**Concept Design"***, the confidential Study Report No. 6.1: ***"Concept Design: Drawings"*** and the confidential Study Report No. 6.2: ***"Concept Design: Costing"***.

ii. Institutional Procurement and Financing Options:

The following alternative procurement models for implementation were evaluated:

- a 'traditional' Government-funded and a traditionally procured Employer Design, Procure, Construct and Operate solution, which is the Public Sector Comparator model (PSC);
- a Design, Build, Operate and Maintain (DBOM) scenario funded by an Implementing Agent, using Private Sector or Government funding, which is also a Public Sector Comparator model (PSC); and
- a private sector-funded Public–Private Partnership (PPP).

The approach included a detailed risk-adjusted value assessment of the PSC and PPP models for the Reference Project in each of the three basins. The possible institutional arrangements were assessed in terms of the roles and responsibilities of the responsible organisations.

A due diligence assessment was carried out to establish the legal mandates of the institutions, as well as ownership of the land required for the Reference Project. These assessments are described in the confidential Study Report No. 7: ***"Institutional, Procurement and Financing Options"***.

iii. Implementation Strategy and Action Plan:

Throughout the Study, the requirements for implementation were considered in developing an Implementation Plan. Where necessary, the activities required for implementation that must commence in parallel with this Study were identified. This included the preparation of a Request for Information (RfI), which initiated a process through which service providers could register their interest with DWA. All the requirements for implementation are described in Study Report No. 8: ***"Implementation Strategy and Action Plan"***.

iv. Key Stakeholder Engagement and Public Communication:

Engagement with key stakeholders and public communication were very important components of the Study and were on-going from the commencement of the Study to the completion of the work. Study Stakeholder Committee meetings, Focus Group meetings, a RfI, one-on-one meetings, newsletters and a website were key elements. The process and results are presented in Study Report No. 9: "***Key Stakeholder Engagement and Communications***".

The final deliverable, Study Report No. 10: ***"Feasibility Report"***, summarises the results of the Study.

The Prefeasibility Phase and Concept Development in the Feasibility Phase are typical components of many planning studies. Solving the technical issues is not normally the biggest challenge, although this project does have several unique aspects. However, the Feasibility Phase components that lead to recommendations for appropriate institutional, financial and procurement models for implementation, particularly the assessment of the options for procurement, are not common components of DWA studies and were the most challenging, and certainly as important for a sustainable solution as all the technical components combined.

4. Way Forward

Completion of the Study will provide all the information required for implementation to proceed, although DWA plans to start the preparations required for implementation in parallel with Phase 3 of this Study.

Following from the Feasibility Study, implementation should be carried out as soon as possible. The key activities required for implementation include the following:

- DWA submitting the Feasibility Study Reports to National Treasury for their review and approval. The project has been registered with National Treasury, and Treasury Approval 1 (TA 1) may be required before procurement can commence;
- Conducting an Environmental Impact Assessment (EIA); and
- The preparation of procurement documents.

If procurement is for a Design, Build, Operate and Maintain (DBOM) contract, the procurement documents will comprise:

- A Request for Qualifications (RfQ) to allow DWA to short-list suitably qualified service providers.

  This will allow any service provider, especially those with proprietary technologies that may well be more cost effective than that used as the reference technology, to submit detailed information. Those that best meet the selection criteria, which will have to be agreed, will be short-listed; and
- A Request for Proposals (RfP) to be issued to the short-listed service providers, inviting them to submit tenders to implement a project that will deliver water to the specified standards.

If procurement is to follow the traditional process (with three sequential tenders for a service provider to prepare design and tender documentation, followed by tenders for construction, and then tenders for operation and maintenance), then the two-phase RfQ and RfP route may also be followed, with appropriate requirements specified at each stage.

The Reference Project could be implemented, but may not be the most effective solution. It will provide the yardstick methodology and costing which will be used to evaluate the tenders which are submitted.

DWA will also need to source the technical and contractual expertise required to enable them to manage the implementation of the desired long-term solution in each of the three basins.

NOTE: A List of Acronyms and Glossary of Terms appear on pages "xxviii" and "xxx" respectively.

APPROVAL

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Lulama Xongwana	South African Local Government Association
Immanda Louw	South African Nuclear Energy Corporation
Solwazi Majola	Technology Innovation Agency (TIA)
Lynette du Plessis	Transvaal Agricultural Union SA
Bennie van Zyl	Transvaal Agricultural Union SA
Richard Holden	Trans-Caledon Tunnel Authority (TCTA)
Sophia Tlale	Trans-Caledon Tunnel Authority
John Annandale	University of Pretoria
Wayne Truter	University of Pretoria
Michael van der Laan	University of Pretoria / Agri Gauteng
Zain Mohamed	Vaal Barrage Reservoir, Leeuspruit and Taaibosspruit Forum/ Sasol
Phineas Malapela	Vaal Environmental Justice Forum
Jo Burgess	Water Research Commission (WRC)
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Danny Govender	West Rand District Municipality
Herina Hamer	West Rand District Municipality
Susan Stoffberg	West Rand District Municipality
Musa Zwane	West Rand District Municipality
Johnny de Araujo	Witkoppie Farm
Mike Muller	Wits University School of Public and Development Management/ National Planning Commission
Manuel Marino	World Bank
David Sislen	World Bank
Marcus Wishart	World Bank

In addition to the contributions received from the study committees mentioned above, inputs were also received from the following broad groups and sectors through focused discussions (a more comprehensive list is available on the DWA AMD website):

Academic institutions;
Funding organisations;
Global perspectives on AMD management;
Environmental and conservation groups;
Independent individuals in their 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; and
Various technology providers who offered information.

Organisations that provided considerable data and inputs for assessment and consideration, including the but not limited to, FSE, The Centre for Environmental Rights, Sasol, DST, WRC, Ekhuruleni Municipality, Rand Water, GDARD, DEA, CGS, DMR as well as various individuals in their private capacity, are thanked for their contributions.

WISA Mine Water Division, a division of the Water Institute of Southern Africa, agreed to peer review selected key reports from the Feasibility Study for the Department of Water Affairs. The Division offered to identify and carry the cost of the appointment of the independent external experts. The assistance of WISA Mine Water Division and the inputs from their experts are duly appreciated and acknowledged. The comments and suggestions by the following experts contributed significantly to the quality of the study: Achim Wurster (Private Consultant), Ingrid Dennis (North-West University), André van Niekerk (Golder and Associates) and Phil Hobbs (CSIR).

The World Bank is thanked for the provision of their international expertise on a number of the reports in the Feasibility Study as well as for funding the appointment of independent external experts to peer review selected key reports from the Prefeasibility Study for the Department of Water Affairs. The comments and suggestions by the following experts contributed

significantly to the quality of the study: Marcus Wishart, David Sislen, Manuel Marino, Joel Kolker, Wolfhart Pohl (World Bank); Christian Wolkersdorfer (International Mine Water Association) and Peter Camden-Smith (Camden Geoserve).

The firms comprising the Professional Services Provider team for this study were:
Aurecon South Africa (Pty) Ltd;
SRK Consulting (South Africa) (Pty) Ltd;
Turner & Townsend (Pty) Ltd;
Shango Solutions;
Ledwaba Mazwai Attorneys;
IGNIS Project & Finance Solutions (Pty) Ltd;
Kayamandi Development Services (Pty) Ltd;
Thompson & Thompson Consulting Engineers and Legal Services;
Shepstone & Wylie Attorneys; and
Various independent consultants, not mentioned separately.

EXECUTIVE SUMMARY

During feasibility studies, effective stakeholder engagement and communication ensures that project objectives are aligned with stakeholder priorities and that the feasibility study takes account of all relevant data and information. Stakeholders are also given the opportunity to be involved in the development of the options for implementation consideration as well as in the evaluation of those options according to requirements, determined by them, such as being technically and environmentally sound, yet cost-effective and beneficial to society, whilst adhering to legislation, and thus contribute greatly to the final outcome of the study. It is also necessary that stakeholders, who will ultimately be involved in the implementation and monitoring of the LTS, be involved in the planning stages. The management of Acid Mine Drainage (AMD) and the development of a sustainable Long-Term Solution (LTS) is a particularly complex and multifaceted challenge, involving many components and requiring inputs from a wide range of stakeholders and finding a sustainable LTS is therefore dependent on the evaluation of information about the natural, physical and social context in which AMD occurs and the implications of different management actions. Not only are quantitative valuations in terms of data collection, treatment processes and costs involved important; but qualitative information, such as the values and legal rights of affected stakeholders, and the benefits and disbenefits resulting from the various options for managing AMD, are also considered to be important aspects.

In order to identify stakeholders from sectors related to the different contexts in which AMD occur, an understanding of AMD and how it occurs was necessary. The occurrence of AMD can be summarised as follows: As the mines are worked out and abandoned, dewatering of the mine voids became the responsibility of fewer and fewer mines, until underground mining essentially ceased in 2010. The voids (tunnels, drives, stopes and shafts) are currently filling with water that ingress into the mined out workings in the Central and Eastern Basins. In the Western Basin AMD started to decant to surface in 2002. AMD is typically characterised by elevated sulphates, low pH, dissolved metals and sometimes when uranium is present, radiological properties. In terms of the natural context in which AMD occurs, stakeholders from the water and environmental management sectors should be identified to provide inputs into the study. Stakeholders from the mining and geology sectors need to be involved in the study, where the physical context of AMD is concerned. The social context relates to the affected stakeholders, socio-economic impacts upon these stakeholders and legislation which govern the society in which AMD occurs, and it is important that human rights agencies, environmental conservation organisations, business and industry, water utilities, municipalities and agencies responsible for the management of the affected areas become involved. Most importantly, the reason for the study was finding a sound and feasible LTS, which will require funding, thus, stakeholders from academic institutions, scientific research agencies (specialising in water treatment and development of technologies) and monetary support agencies, play a crucial role in providing inputs towards the guidance of the study.

After consideration of the different contexts in which AMD occur, and the identification of stakeholders from different sectors related to AMD, the approach to stakeholder engagement needed to be refined.

Since the Feasibility Study for the LTS is a planning study and not a regulatory process, it requires high level input from a technical planning perspective, rather than wide public participation. The approach to stakeholder involvement for the purpose of the Feasibility Study was thus directed at 1) focussed engagement and collaboration with identified key stakeholders and 2) communicating study progress and key outcomes to the wider stakeholder group in a transparent and accessible manner.

Key stakeholder involvement informed the Feasibility Study by means of the provision of information, data, and technical expertise and by reviewing reports and study outcomes. Key stakeholders from the various sectors related to AMD in general, as well as stakeholders from the affected areas in particular, were identified to assist in the abovementioned processes and included the various National, Provincial, Local and District Governments, Environmental Non-governmental Organisations (NGOs), organised business, mining, industry, labour, agriculture, affected water utilities, academics etc. Focussed discussions on particular aspects, with a wide range of key stakeholders on various levels, took place through:

- *Technical workshops;*
- *Individual consultation meetings;*
- *Focus group meetings;*
- *Study Stakeholder Committee (SSC) Meetings (with broad stakeholder representation to discuss common issues);*
- *Presentations by the Department of Water Affairs (DWA) at various Catchment Forum meetings and conferences;*
- *Attendance of high level Inter-departmental meetings; and*
- *Attendance of meetings on parallel initiatives and research projects.*

Inputs, comments and suggestions received during the engagement with key stakeholders, are recorded in the proceedings of the Study Stakeholder Committee (SSC) and focus group meetings, and were used to inform the Study, as were the outcomes of the technical workshops and discussions held by the various technical specialists.

In addition to the opportunities provided to SSC members and other key stakeholder groups to contribute information and provide technical input and knowledge to inform the Study, e.g. during SSC meetings and focus group meetings, they were also provided with opportunities to contribute constructive inputs to inform the Study by providing comments via a dedicated mail box (amdsainfo@srk.co.za) to the Study Team.

A Request for Information (RfI) was also published in December 2012, which was aimed at obtaining additional information from technology providers and the general public, on possible solutions that could be employed to address AMD. The RfI served to inform the public of the commencement of the study, but also provided them with an opportunity to inform the study.

Communication with the wider public, by means of information dissemination, was required in order to provide feedback on key outcomes and progress of the study at certain milestones thereby enabling the public to forumulate informed opinions and improve their understanding of government actions. As such, a stakeholder database comprising more than 900 relevant individuals and organisations, representing a wide range of sectors of society was developed, and updated on an on-going basis throughout the duration of the Feasibility Study. Progress and key outcomes of the Study, as well as feedback on parallel initiatives such as the Short-Term Interventions, Vaal River Strategy studies and other initiatives in the context of the "bigger picture" of managing the AMD challenge, were communicated to the wider stakeholder group through:

- *Newsletters;*
- *Press releases; and*
- *General information, reports, and Frequently Asked Questions (FAQ) on the DWA AMD LTS FS webpage.*

The wider stakeholder group were also provided with an opportunity to contribute constructive inputs to inform the Study by providing comments via a dedicated mail box to the Study Team.

Some of the key issues raised through communication with key stakeholders at the various meetings and written communications with the wider stakeholder group, were related to the study, while others pertained specifically to the AMD issue at large. These key issues raised, together with the outcomes of the study, provided a guiding mechanism towards the development of solutions for implementation consideration.

While the stakeholder engagement and communication activities have sufficiently achieved the objectives for the purposes of the Feasibility Study, going forward (beyond the Feasibility Study) will require an extended programme of public and stakeholder engagement, communication and awareness raising activities.

As the Department of Water Affairs is considered the sector leader in a water resources management context, functioning with input and support from other government departments, it is recommended that, in addition to the stakeholder engagement that takes place as part of the regulatory authorisation process (Environmental Impact Assessment (EIA)), the Department of Water Affairs:

- *Develops an overarching communication strategy and channel to ensure that communication activities around AMD related issues from the various initiatives are coordinated through a single entry point within the Department, with DWA Communications potentially playing a central role. This is to ensure that the messages received by the public shows the water sector speaking with "one voice" about all AMD related issues. The abovementioned could be achieved by developing and implementing a strategy which esures that AMD related communications are aligned with and are co-ordinated between government departments, by means of exchange of inputs and feedback.*
- *Undertakes a national public awareness raising and capacity building programme (including media coverage and proactive information dissemination). Awareness creation should be focussed on the "bigger picture" of AMD management – its challenges, the several initiatives by Government and others, driven by the DWA towards addressing AMD-related issues, etc.; and*
- *Continues to engage with stakeholder groups using the structures and processes that were used by the LTS Feasibility Study, such as regular newsletters, an AMD website, stakeholder committees, participation at catchment forums, as well as through newly established structures, i.e. Sector-based Liaison Forums.*

- *Reviews and regularly updates the stakeholder database used in this Study during the subsequent project phases for managing AMD in the East, Central and West Rand, in order to ensure that the correct stakeholders are involved and that new stakeholders are continually identified and engaged.*

The coordinated effort to link all AMD-related stakeholder engagement, communication, and awareness/ capacity-building activities of the various AMD-related initiatives into a single source of information sharing and communication; is intended for:

- *Providing a single channel of information and messages in context with the overall AMD approach;*
- *Presenting sufficient factual information in different forums and formats (as appropriate) to facilitate stakeholder understanding and meaningful contribution; and*
- *Providing sufficient opportunity for stakeholder input.*

This effort should be initiated and driven by the DWA, linking to existing and future communication structures and initiatives at local, provincial and national scale, and should be planned and implemented in collaboration with the relevant parties, for example, the Water Research Commission (WRC), the Water Institute of Southern Africa (WISA), the Council for Scientific and Industrial Research (CSIR), the Department of Mineral Resources (DMR), the Department of Environmental Affairs (DEA), the Department of Science and Technology (DST), Council for GeoScience (CGS), the various provincial and local organs of state, etc..

Note that if a PSP is appointed to undertake the public relations programme for AMD, DWA must ensure that it is not the same PSP involved in the regulatory public consultation process for the EIA for the LTS.

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LIST OF ACRONYMS

AMD	Acid Mine Drainage
CESA	Consulting Engineers South Africa
CGS	Council for Geoscience
CSIR	Council for Scientific and Industrial Research
DBOM	Design, Build, Operate and Maintain
DEA	Department of Environment Affairs
DMR	Department of Mineral Resources
DST	Department of Science and Technology
DTI	Department of Trade and Industry
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
ECL	Environmental Critical Level
EIA	Environmental Impact Assessment
FAQ	Frequently Asked Question
FSE	Federation for a Sustainable Environment
GDARD	Gauteng Department of Agricultural and Rural Development
IGTT	Intra-Governmental Task Team
IMC	Inter-Ministerial Committee
LTS	Long-Term Solution
NGO	Non-Governmental Organisation
PEC	Project Executive Committee
PPP	Public Private Partnership
PSC	Public Sector Comparator
PSP	Professional Service Provider
RfI	Request for Information
RfQ	Request for Qualifications
RfP	Request for Proposals
SAC	Study Administration Committee
SAHRC	South African Human Rights Commission
SECL	Socio-Economic Critical Level
SMC	Study Management Committee
SoW	Scope of Work
SRK	SRK Consulting (Pty) Ltd
SSC	Study Stakeholder Committee
STI	Short-Term Intervention
TA 1	Treasury Approval 1
TCTA	Trans-Caledon Tunnel Authority
ToR	Terms of Reference
T&T	Turner & Townsend
WISA	Water Institute of Southern Africa
WRC	Water Research Commission

GLOSSARY OF TERMS

AMD	Acid mine drainage is formed when sulphide minerals in the geological strata, are exposed through mining activities and interact with oxygen and water to form a dilute solution of sulphuric acid and iron that leaches other metals from the material in which it forms. Acid mine drainage in the Witwatersrand typically has a pH value around 3 and is enriched in sulphate, iron and a number of metals, often including uranium.
Annexure	Documents produced by others attached to the report.
Appendix	Documents produced by the Feasibility Study attached to the report.
Central Basin	Central Rand underground mining basin.
Discharge (groundwater)	Seepage of groundwater at the surface.
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.
Feasibility Study	An analysis and evaluation of a proposed project to determine if it is technically sound, socially acceptable, and economically and environmentally sustainable.
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, i.e. to provide sufficient buffer capacity.
Key stakeholder	Defined as directly affected parties, those who have a high level of negative or positive influence (in government and civil society domains, and on the direction and success of AMD long-term initiatives) and those whose input is critical to the study (for e.g., representatives of various National, Provincial, and Local and District Government, NGOs, organised business, mining, industry, labour, agriculture, affected mines, affected water utilities, community leaders, academics, etc.).
Long-Term Solution	A solution that is sustainable in the long-term with regards to the technical, legal, economic, financial and institutional aspects.
Reference Project	The option which uses proven technologies has minimum risk and which, is used for financial modelling and budgeting. It will probably not be the option which is implemented but is the benchmark against which implementation proposals will be judged.
Request for Information	A Request for Service Providers to provide information (RFI) on their product or service, e.g. technologies. It is not part of a procurement process.
Request for Qualifications	A Request for Qualifications (RFQ) 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 (RFP) in compliance with a defined Scope of Work (SoW) and adjudication criteria from (Pre-Qualified) bidders to allow one of the bidders to be appointed to provide an agreed service. Equivalent to Expression of Interest (EOI) but used in infrastructure projects
Short-Term Interventions (Short-Term Solution as stated in Terms of Reference)	Emergency measures that are being implemented by the TCTA in the short-term in all three the basins while the long-term Feasibility Study is undertaken to protect the ECL, to neutralise the AMD and to remove metals from the AMD.
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.
Target Operating Level	The level in the mine void at each abstraction point, at which the water level should generally be maintained by pumping or gravity flow to allow for hydraulic gradient across the underground mining basin, seasonal peak ingress, pump down time, and the like, i.e. to provide sufficient buffer capacity or freeboard required below the ECL or SECL across the basin.
Western Basin	West Rand underground mining basin.

1 INTRODUCTION TO THIS REPORT

The management of Acid Mine Drainage (AMD) is a complex and multifaceted challenge involving many components and requiring inputs from a wide range of stakeholders in order to ensure that a sustainable Long-Term Solution (LTS) is derived. Effective engagement and communications with stakeholders and the public is a key component of managing AMD.

While the LTS Feasibility Study will address the AMD originating from the mine voids, there are several other parallel initiatives that are being implemented in order to address the "bigger picture." These initiatives include the Short-Term Interventions (STI), monitoring of the underground mining basins, ingress control, work undertaken by the Department of Water Affairs (DWA) on the Vaal Reconciliation Strategy, and others. Most of these initiatives have their own separate communication activities with stakeholders and the public. Hence the current stakeholder engagement and communication context around AMD management related issues and projects, is fragmented and uncoordinated, leading to stakeholder confusion, mistrust, fear, media speculation and lack of confidence in Government's efforts regarding AMD management in the bigger context.

While it is recognised that the LTS Feasibility Study forms part of a bigger context, it is a planning study and not a public consultation process driven by regulatory requirements. The planning process includes activities such as information collection and verification, the pooling of collective knowledge and wisdom, deliberating the details and complexities around potential solutions and considering alternatives towards the recommended LTS for AMD. This requires high level input from a technical planning perspective, rather than wide public participation.

1.1 Stakeholder Engagement and Communication

A feasibility study, being a planning study, is aimed at developing and understanding the feasibility of various options and requires focussed consultation on a strategic and technical level. Engagement with key stakeholders, representing various sectors which may be affected by or have expertees in AMD management was thus undertaken.

Finding a sustainable LTS depends on evaluation of information about the natural, physical and social context in which AMD occurs. In terms of the natural context in which AMD occurs, stakeholders from the water and environmental management sectors were identified to provide inputs into the study and included the DWA and the DEA. Stakeholders from the mining and geology sectors, where the physical context of AMD is concerned, were also identified and included the Chamber of Mines, CGS, and DMR.

The social context relates to the affected stakeholders, socio-economic impacts upon these stakeholders, and legislation which govern the society in which AMD occurs, and it is important that human rights agencies, environmental conservation organisations, water

utilities, catchment forums, municipalities and agencies responsible for the management of the affected areas, business and industry become involved. Stakeholders from the following institutions were identified: South African Human Rights Commission (SAHRC); Federation for a Sustainable Environment (FSE); Save the Vaal, Vaal Environmental Justice Forum; Johannesburg Water; Rand Water; Trans-Caledon Tunnel Authority (TCTA); Vaal Barrage Reservoir, Leeuspruit and Taaibosspruit Forum; City of Johannesburg Metropolitan Municipality; Ekurhuleni Municipality; Mogale City Municipality; Randfontein Municipality; West Rand District Municipality; South African Local Government Association; Gauteng Department of Agriculture and Rural Development (GDARD); Gauteng Department of Local Government and Housing (GDLGH); Agri Gauteng; Transvaal Agricultural Union SA; and the National Economic Development and Labour Council (NEDLAC).

Most importantly, the reason for the study was finding a sound and feasible LTS, which will require funding. Thus, stakeholders from academic institutions, scientific research agencies (specialising in water treatment and development of technologies) and monetary support agencies, also played a crucial role in providing inputs towards the guidance of the study. Stakeholders from the following institutions were identified: University of Pretoria, Wits University School of Public and Development Management (National Planning Commission); Water Research Commission (WRC); Agricultural Research Council – Roodeplaat; Commonwealth Scientific Industrial Research Organisation (CSIRO); Council for Scientific and Industrial Research (CSIR); Department of Science and Technology (DST); Technology Innovation Agency (TIA); South African Nuclear Energy Corporation (NECSA); National Treasury; and experts on funding mechanisms from the World Bank.

Given the above, the approach to stakeholder engagement and communication for the purpose of the Feasibility Study (summarised in **Table 1.1**) consisted of 1) focussed engagement and collaboration with identified key stakeholders to inform the Study at a technical level and 2) the communication of study progress and key outcomes to the wider stakeholder group in a transparent and accessible manner.

This approach was developed as it not only allows for the discussion of common concerns, but also for focussed discussions on e.g. environmental and social considerations. In addition, it allows the Study Team to engage with a wide range of key stakeholders on various levels, e.g. through technical discussions with academics or governance discussions with Provincial Government. General communication and feedback on the Study is then given to the stakeholders who are not directly engaged in the technical components of the Study.

It was with this understanding, and taking into account the existing messages, perceptions and expectations already in the public domain, that a Communication Strategy and Action Plan (DWA AMD FS 2012, Study Report No. 9.1) was developed as the first step of the Key Stakeholder Engagement and Communication Component of the Feasibility Study for the LTS.

Table 1.1: Summary of the approach to key stakeholder engagement and communication

	KEY STAKEHOLDER ENGAGEMENT	STAKEHOLDER AND PUBLIC COMMUNICATION
PURPOSE	**Obtain inputs from key stakeholders:** • Information gathering to inform the Study (existing information, monitoring data, technical input and expertise); • To gain multiple perspectives on stakeholder salience; • To identify policy, legal, social and environmental issues; • To align project objectives with stakeholder priorities; and • Obtain inputs and comments on the Study's outcomes and reports.	**Information dissemination to the wider stakeholder group:** Communicate progress and key outcomes at certain milestones in the Study
STAKEHOLDERS	**Key Stakeholder Sectors and Groups**	**Wider Stakeholder Group** (approximately 900 stakeholders, were included in the database that was used)
METHOD OF ENGAGEMENT	• **Individual consultation meetings;** • **Focus group meetings;** • **Technical workshops;** • **Study Stakeholder Committee (SSC) Meetings** (broad stakeholder representation to discuss common issues); • **Inter-departmental meetings;** • **DWA presentations to relevant Catchment Forums and at conferences; and** • **Attendance of meetings regarding parallel initiatives and research projects.**	• **Request for Information;** • **Newsletters;** • **Press release; and** • **AMD webpage on the DWA site:** o General information and reports; and o Frequently asked Questions.

1.2 Purpose and structure of this report

This report provides a detailed record of the implementation of the Communication Strategy and Action Plan (DWA AMD FS 2013, Study Report No. 9.1), and the outcomes of the key stakeholder engagement and communication activities undertaken in this regard for the Feasibility Study for the LTS. It contains the following:

- Details of the stakeholder groups and sectors that were identified and engaged with in the study;
- Details of the engagement activities and interactions with key stakeholders;
- Details of the communication activities with the wider stakeholder group;
- Key issues raised by stakeholders; and
- Conclusion and recommendations.

2 STAKEHOLDER IDENTIFICATION PROCESS

The key stakeholders identified to inform the Feasibility Study, included both internal (DWA) and external stakeholders, representing a wide range of sectors of society. The relevant stakeholders, as individuals and organisations, were identified through discussions with the Study Team members, stakeholder lists provided by DWA, Trans-Caledon Tunnel Authority (TCTA), Federation for a Sustainable Environment (FSE) and other key stakeholders, and through a process of networking and referral as the Study progressed.

The initial full stakeholder database developed for the Study was updated on an on-going basis throughout the duration of the Feasibility Study. The current stakeholder database comprises almost more than 900 individuals and organisations (see **Appendix A**), and includes representatives from the following stakeholder sectors/ groupings:

- Academic Institutions;
- Catchment Forums;
- Funding Organizations;
- International experts with knowledge on AMD management;
- Environmental and Conservation Groups;
- Independent Individuals in their Private Capacity;
- Institutions, Parastatals and Research Facilities;
- Local Government;
- Provincial Government;
- National Government;
- Relevant Chief Directorates, Directorates, Sub-Directorates, and Regional Offices from DWA;
- Mining Sector;
- Non-Governmental Organisations;
- Organised Agriculture;
- Organised Business, Industry and Labour;
- Other Specialist Fields/Consultants;
- Tourism and Recreation;
- Utilities/Water Service Providers; and
- Various Technology Providers who offered information.

Who are key stakeholders in this Study?

Key stakeholders are defined as directly affected parties, those who have a high level of influence (in Government and civil society domains, and on the direction and success of AMD long-term initiatives) and those whose input is critical to the Study (for e.g. representatives of various National, Provincial, and Local and District Government, NGOs, organised business, mining, industry, labour, agriculture, affected mines, affected water utilities, community leaders, academics, etc.).

Representatives or spokespersons from each of the above stakeholder sectors/ groupings were selected to participate in the focussed stakeholder engagement component of the Study. The manner in which these key stakeholders were engaged with is explained in **Chapter 3**.

The full stakeholder database (**Appendix A)** served as the distribution list for all communications with the wider stakeholder group, and is described in **Chapter 4**.

2.1 Stakeholder Database Management

Stakeholders' contact details were captured on an electronic stakeholder database developed and continually updated by the team responsible for carrying out the communication component for the duration of the Feasibility Study. The database has facilities to categorise and personalise letters and e-mails to stakeholders, to capture notes linked to a person's name (e.g. comments raised, meetings attended, documentation received), thus providing an on-going record of consultation activities.

The stakeholder database will be provided to DWA at the end of the Study, and should be reviewed and updated regularly during the subsequent project phases, in order to ensure that the correct stakeholders are involved and that new stakeholders are continually identified and engaged.

3 KEY STAKEHOLDER ENGAGEMENT

The main objectives of focussed engagement with key stakeholders such as academics, technical specialists, interest groups and relevant authorities, and those involved in parallel initiatives was to:

- harness the collective wisdom towards identifying sustainable solutions, technical options and management scenarios for the AMD challenge;
- gather existing information, monitoring data, technical input and expertise to inform the Study;
- to obtain technical inputs and comment on the draft outcomes of the various study components; and
- receive feedback from, and provide input to parallel initiatives, e.g. STI and Vaal and Crocodile River Management Strategies.

Key stakeholder sectors and groups, were engaged through:

- Study Stakeholder Committee (SSC) meetings (broad stakeholder representation to discuss common issues);
- Inter-departmental meetings;
- Sector based focus group meetings;
- Individual consultation meetings and small group meetings;
- Technical workshops;
- Presentations by DWA to relevant Catchment Forums and Conferences; and
- Attendance of meetings on parallel initiatives.

Details of the various engagement activities with key stakeholders are presented in the chapters below.

3.1 Study Stakeholder Committee (SSC)

A Study Stakeholder Committee (SSC) was established by DWA to engage identified key stakeholders whose input would potentially be critical to the investigation, development and/ or implementation of the LTS. The Terms of Reference (ToR) of the SSC is included as **Appendix B**.

The SSC members were engaged with at certain milestones throughout the Study. The SSC meetings served to provide information on the study and obtain inputs and comments on the draft outcomes of various components as the Study progressed. A list of the SSC members and their alternatives is included as **Appendix C**.

3.1.1 SSC Meetings

Three meetings were held as follows:

- SSC Meeting 1 on 2 & 3 May 2012 at Aurecon Offices, Lynnwood, Pretoria. The purpose of this meeting was to induce the study, it's aims and scope, as well as the role of the SSC within the study;
- SSC Meeting 2 on 17 October 2012 at Aurecon Offices, Lynnwood, Pretoria. The purpose of this meeting was to discuss the outcomes of the Prefeasibility Phase of the study; and
- SSC Meeting 3 on 16 May 2013 at Aurecon Offices, Lynnwood, Pretoria. The purpose of this meeting was to discuss the outcomes of the Feasibility Phase of the study.

During these meetings SSC members were given an opportunity to raise their comments and suggestions, obtain clarity on technical and other aspects of the Feasibilty Study, and provide feedback on parallel initiatives.

The invitations, reminder letters, agendas and information documents distributed prior to each of the meetings are appended as:

- SSC Meeting 1: **Appendix D1**;
- SSC Meeting 2: **Appendix D2**; and
- SSC Meeting 3: **Appendix D3**.

The meetings were well attended, with good representation from the key stakeholder sectors, and many valuable sources of information, discussions and inputs were contributed towards informing the Feasibility Study. SSC Members also passed feedback on the meetings to their relevant constituencies. For photographs of the meetings held, please refer to **Appendix D4**.

The proceedings, including the attendance lists for each of the SSC meetings, were distributed to SSC members and meeting attendees, via the Aurecon AMD web portal, which was used to distribute large documents during the study. SSC members were granted access to the web portal upon registration with Aurecon to obtain login details. Please refer to the following Appendices for the SSC meeting proceedings:

- SSC Meeting 1: **Appendix D5**;
- SSC Meeting 2: **Appendix D6**; and
- SSC Meeting 3: **Appendix D7**.

3.1.2 Opportunities for SSC members to comment on reports

Notification e-mails, as appended in **Appendix E,** were sent to SSC members via a dedicated e-mail address at certain milestones during the study to inform them of the availability of reports on the Aurecon AMD web portal and the related comment periods for input on draft reports. In addition to the SSC members, selected reports were distributed to external Peer Reviewers for comment (refer to **Chapter 3.8**). Peer reviewers included

technical experts appointed by the World Bank as well as experts appointed by the Water Institute of Southern Africa (WISA): Mine Water Division. A compendium of written comments received on the various reports from this study from both the members of the various committees and the peer reviewers is appended as **Appendix F**.

3.2 Inter-Departmental meetings

3.2.1 Study Management Committee meetings.

A Study Management Committee (SMC) was established by DWA, which was responsible for providing strategic guidance to the study. It consisted of the members of the DWA, which were directly involved in the management and administration of the study (known as the Study Administration Committee), as well as members from other national Government Departments. Representatives from the numerous parallel studies such as the Council for Geoscience (CGS) and state owned entities such as Rand Water and TCTA also formed part of the SMC. The Study's deliverables were distributed to the SMC members for comment. The ToR for the SMC is included as **Appendix H**, and a list of the SMC members is included as **Appendix I.**

Five SMC meetings were held as follows:

- SMC Meeting 1 on 31 January 2012 at Aurecon Offices, Lynnwood, Pretoria;
- SMC Meeting 2 on 20 March 2012 at Aurecon Offices, Lynnwood, Pretoria;
- SMC Meeting 3 on 18 July 2012 at Aurecon Offices, Lynnwood, Pretoria;
- SMC Meeting 4 on 19 October 2012 at Aurecon Offices, Lynnwood, Pretoria; and
- SMC Meeting 5 on 16 July 2013 at Aurecon Offices, Lynnwood, Pretoria.

During these meetings SMC members were given an opportunity to provide strategic guidance and direction to the study, coordinate the actions from this study with other parallel actions and monitor the achievement of the deliverables of the Study.

There was sufficient representation from the Government Departments and parastatals, and many of the SMC members have also attended the SSC meetings. Valuable sources of information, discussions and inputs were contributed towards the steering of the Feasibility Study in this way.

3.2.2 Other Intra-Governmental Meetings

Feedback on the progress and outcomes of the AMD LTS Feasibility Study was provided throughout the study cycle to various high level governmental committees. Many of these committees included representatives from the various tiers of government and as such served as an additional mechanism for stakeholder consultation. These committees included:

- **The AMD Project Executive Committee (PEC) and the Intra-Governmental Task Team on AMD (IGTT):** Three PEC Meetings and Seven IGTT meetings were held during the course of the study, which added a further tier of engagement with those national, provincial, regional and local government departments which function in the East, Central and West Rand.
- **Inter-Ministerial Committee (IMC) Meetings**: Five IMC Meetings were held during the course of the study to provide feedback on progress and key issues surrounding the study.

Other high level meetings where feedback on the AMD LTS Feasibility Study was provided included Portfolio Committee meetings and the City of Johannesburg Mayoral Committee meetings.

3.3 Meetings on Parallel Initiatives

In order to further inform the AMD LTS Feasibility Study, the project team attended a number of meetings and workshops on parallel initiatives which included the following:

- Council for Scientific and Industrial Research (CSIR) Research Projects on AMD;
- AMD Hydrological Monitoring Committee meetings;
- AMD Short-Term Intervention meetings;
- National workshop on AMD by the SAHRC;
- Geohydrological Modelling initiative presented by the CGS;
- Strategic Water Partners Network (SWPN) meetings regarding the reuse of mine water;
- Crocodile River Reconcilliation Strategy Steering Committee Meetings; and
- Vaal River Reconcilliation Strategy Steering Committee Meetings.

3.4 Focus Group Meetings

Focus Group meetings were held in September 2012 with the following stakeholder groups:

- Affected Municipalities (Local and District Government) on 7 September 2012 at the City of Johannesburg: Infrastructure and Services Department (5th floor Boardroom), 125 Simmonds Street, Braamfontein; and
- Environmental and conservation NGOs/ interest groups/ Recreation, Tourism and others on 7 September 2012 at Kruger Kloof Lodge, Krugersdorp Game Reserve.

The purpose of the meetings was to:

- Provide key stakeholders from common sectors/ groups with an opportunity to raise issues, concerns, comments and suggestions that pertain specifically to their areas of interest; and
- Update key stakeholders on the progress of the study.

Copies of the invitation and confirmation letters distributed to meeting invitees are appended as **Appendix J**.

The proceedings, including the attendance lists of the focus group meetings, were distributed via email to the attendees of the respective meetings for their verification and information. No further comments were received. Refer to **Appendix K** for the proceedings of the focus group meeting with affected municipalities and to **Appendix L** for the proceedings of the meeting with environmental NGOs and interest groups.

3.5 Individual consultation meetings and technical workshops

Individual consultation meetings and small group meetings, as well as technical workshops were held on an ongoing basis throughout the Study, with technical specialists and/ or representatives of key stakeholder groups, sectors or individuals in their personal capacity, and potential technology providers.

The purpose of these meetings was to collect information, obtain comment, advice and inputs on the various options and scenarios being considered, in order to inform the Study towards a sustainable LTS to the AMD challenge.

A list of the engagement meetings with individual stakeholders and key stakeholder groups are included in **Appendix M**.

3.6 Presentations by DWA at catchment forum meetings

The DWA Study Team presented on the study at the following affected and interested catchment forum meetings:

- Grootdraai Dam Forum;
- Vaal Dam Forum;
- Waterval Catchment Forum;
- Blesbokspruit and Suikerbosrant Forum;
- Klip River Forum; and
- Schoon-Spruit, Koekemoer- Spruit Catchment Forum.

3.7 Presentations by DWA at conferences

The DWA Study Team presented the AMD LTS Feasibility Study at the following conferences:

- WISA Mine Water Division Conference 2011
- WISA Mine Water Division Conference 2012
- Consulting Engineers South Africa (CESA) Young Professionals Forum, 8 May 2013
- Implementation and Maintenance (Continuation) of the Reconciliation Strategy for the Crocodile West Water Supply System – Strategy Steering Committee, 13 June 2013; and
- Various other presentations by the DWA to international delegations from, *inter alia*: Germany, the United Kingdom and Japan.

3.8 Peer Reviews

As mentioned in **Chapter 3.1.2**, in order to obtain additional input to the study, stakeholders outside of the SMC and SSC were involved in external peer reviews. Many of these reviewers were independently selected and appointed by the WISA: MWD. The World Bank also funded a number of the international experts on AMD. Peer Reviews took place as follows, and their contributions are acknowledged as they served, together with the contributions from the SSC and technical workshops etc., to greatly inform the outcomes of the AMD LTS Feasibiity Study:

- Report 1:
  - Reviewed by experts from the World Bank.
- Report 3:
  - Reviewed by representatives from DEA and DMR
- Report 4:
  - Reviewed by representatives from DEA and DMR
- Report 5:
  - Reviewed by WISA Mine Water Division, Reviewer: André van Niekerk
- Report 5.1:
  - Reviewed by WISA Mine Water Division, Reviewer: Ingrid Dennis
  - Reviewed by the TCTA
- Report 5.2:
  - Reviewed by WISA Mine Water Division, Reviewer: Phil Hobbs
  - Reviewed by World Bank, Reviewer: Peter Camden-Smith
- Report 5.3:
  - Reviewed by WISA Mine Water Division, Reviewer: Ingrid Dennis
  - Reviewed by World Bank, Reviewer: Christian Wolkersdorfer
  - Reviewed by University of Pretoria, Reviewer: John Annandale

  - Reviewed by Agricultural Specialist and former WRC employee, Meiring Du Plessis
- Report 5.4:
  - Reviewed by WISA Mine Water Division, Reviewer: Achim Wurster
  - Reviewed by World Bank, Reviewer: Christian Wolkersdorfer
  - Reviewed by Sasol
  - Reviewed by WRC
  - Reviewed by DST
- Report 5.5:
  - Reviewed by WISA Mine Water Division, Reviewer: Achim Wurster
- Report 7:
  - Aspects of the Report were reviewed by Dr. Peter van Niekerk (DWA) and experts from the TCTA.

3.9 Key Stakeholder Engagement Outcomes

Significant effort was made during the Study to ensure that key stakeholder groups and sectors were engaged with and as a result of this as well as the willingness and interest from the stakeholder groups, a clear understanding of the natural, physical and social context in which AMD occurs in the East Central and West Rand was obtained, which significantly contributed towards the outcomes of the study.

Some of the key issues that were brought forward from the interactions with the key stakeholder groups are included in **Chapter 5**. These concerns and requests, amongst others, as well as the technical feasibility, the management requirements for the larger Vaal and Crocodile River Systems, and the environmental, social and economic costs and benefits, were taken account of in the evaluation of the preffered options for the management of AMD in the long-term. The SSC, focus groups, one-on-one meetings and technical workshops were particularly beneficial in terms of obtaining relevant information, and understanding the needs and concerns of the stakeholders in the study area, with regard to the various options that were considered.

4 COMMUNICATION WITH THE WIDER STAKEHOLDER GROUP

The aim of communication to the wider stakeholder group was to:

- Inform stakeholders of the objectives, scope, progress and key outcomes of the Study; and
- Build further understanding of the AMD challenge, and the efforts by the DWA and other government departments, research institutions etc., to address it.

The wider stakeholder group was kept informed through:

- Three newsletters, distributed electronically to the full database of stakeholders, which was also posted on the AMD webpage on the DWA website (http://www.dwa.gov.za/Projects/AMDFSLTS);
- Press releases distributed to the media by DWA Communications;
- Feedback/ responses to Frequently Asked Questions (FAQs) which were updated regularly and posted on the AMD webpage on the DWA website; and
- Regular updates of information on the dedicated AMD webpage on the DWA website.

Recommendations for continued stakeholder and public engagement, in addition to the stakeholder participation that will form part of the EIA process, are provided in **Chapter 6**.

4.1 Request for Information

In December 2012, the DWA published an RfI in three National Newspapers (namely the New Age, Saturday Star and Sunday Independent), inviting interested parties and service providers to provide information on their proposed solutions, or services for the following:

- A complete LTS for managing AMD, including use or disposal of waste;
- Details of treatment options or technologies which can form part of a solution;
- Design, construction, operation and maintenance of infrastructure for treatment and distribution of water and/ or management of waste;
- Use of waste products; and
- Financing.

The stakeholders to whom the the RfI was distributed were requested to log onto the AMD RfI webpage where they were required to register their interest to provide information and download the “Guideline for the provision of information”. Interested parties were then requested to follow the guideline and send their detailed information to a dedicated e-mail address (AMDRFI@dwa.gov.za). Stakeholders were also advised that the purpose of the RfI

was to inform the Feasibiltiy Study and that it was not part of any procurement process or EIA, and that any response or non-response would have no bearing on any future procurement process.

A total number of 80 technology providers responded to the RfI with information on treatment technology options and the services they could suppy during the course the study.

The RfI invitation and related documentation is included as **Appendix N**.

4.2 Newsletters

Three newsletters (see **Appendix O** for Edition 1, **Appendix P** for Edition 2 and **Appendix Q** for Edition 3) providing information on the progress of the Feasibility Study in simple, non-technical language, and visually illustrating key concepts, were distributed to the wider stakeholder group during the study.

The newsletters included a brief update on progress on the STI and AMD Monitoring initiative, in order to provide feedback and keep stakeholders informed of the latest developments on the parallel initiatives that were taking place in the study area.

Newsletters were distributed as follows:

- Electronically to the full stakeholder database for the Study, as described earlier – the majority of whom have e-mail addresses;
- Printed copies by post to those without e-mail addresses, and at stakeholder meetings;
- Posted on the DWA website; and
- By DWA regional offices.

Stakeholders were also encouraged to further distribute copies of the newsletters to their colleagues and constituencies.

4.3 Press releases

Communications on AMD in general and not just on the Feasibility Study for the LTS was required during the Study. The Feasibility Study Team thus did not issue study specific press releases but rather provided input into the overarching press releases, which included the statement by Minister Edna Molewa on 22 March 2012 at an AMD media briefing in Randfontein on the commissioning of the study (see **Appendix R**).

4.4 Frequently Asked Questions (FAQ) Document

A Frequently Asked Questions (FAQs) document was compiled and updated at certain intervals linked to key milestones in the study to reflect stakeholder comments/ questions and provide responses/ feedback to stakeholders as the study progressed. This document is

available on the AMD webpage on the DWA website, and is included in this report as **Appendix S**.

4.5 AMD Webpage on DWA website

The Study Team provided updated information and inputs throughout the Study for the AMD LTS Feasibility Study webpage on the DWA website. This webpage was specifically designed for the study and was used to display information, including the technical reports relating to the Feasibility Study, to provide a platform for stakeholders to comment, and to provide feedback/ responses (as FAQs) on the key issues raised by stakeholders during the engagement process. At the time of the compilation of this report the website had been viewed 8 618 times. The use of a webpage for the study proved to be an extremely usefull tool for communicating with parties that were interested in the study and for providing access to information.

4.6 Feedback letters to stakeholders

A letter was distributed in April 2013 to all stakeholders on the full stakeholder database, informing them of the extension of the Study and its completion at the end of July 2013. The letter is appended as **Appendix T**.

4.7 Outcomes of Communication to the Wider Stakeholder Group

One of the regular concerns that were received from the wider stakeholder group at the beginning of the study was that they struggled to obtain reliable and timely information on the AMD problem, and Government's actions to allieviate the problem. It is believed that the use of various media to communicate the progress and key outcomes of the study succeeded in keeping the wider stakeholder group informed. Concerns from this stakeholder group also decreased as the study progressed, indicating that they had become reassured that Government was paying attention to the solutions that would be required to manage AMD in the long-term. Many of the stakeholders had noted that they had made use of the images, presentations and reports that were placed on the website. Comments commending the study and the dissemination of information on the progress of the study were also received towards the conclusion of the study (refer to **Appendix G**).

5 KEY ISSUES RAISED BY STAKEHOLDERS

Some of the key issues raised, through communication with key stakeholders at the various meetings, and written communications from the key stakeholders and wider stakeholder group, were related to the study, while others pertained specifically to the AMD issue at large. These key issues raised, together with the outcomes of the study, provided a guiding mechanism towards the establishment of feasibility requirements and the development of solutions for implementation consideration. The key issues raised also provided input for the formulation of key messages to be conveyed to stakeholders, such as explaining certain technical constructs and principles, and giving feedback on monitoring initiatives. The key issues or comments raised by stakeholders can be summarised as follows:

- The polluter pays principle should be implemented to retrieve funds for the pumping and treatment of AMD;
- Public confidence in the LTS would be improved if effective public participation is provided for in future processes;
- The DWA will need to run an intensive public relations and information process/ campaign during the implementation (in parallel with and after the EIA);
- Additional effort should be put into ingress control studies and implementation of preventative measures;
- Monitoring of surface and sub-surface water quantity and quality should be improved, in order for management action to be improved, with probable substantial savings in operating costs with time;
- The results of current quantity and quality monitoring should be made publicly available;
- The DWA should be held accountable for its actions. If this cannot be achieved, due to the fact that the DWA is exempted from conducting an EIA (for the STI), another process should be put in place that would allow for this;
- The costs of solving the AMD problem brings into question the short-term benefits derived by mining activities in South Africa;
- Rehabilitation of areas affected by AMD is a concern as it has yet to be addressed by the DWA;
- Proper long-term waste management will be essential and new waste sites should not contribute to the pollution problems in the area;
- The feasibility of the end-solution will hinge on the business case; and
- Departments other than the DWA should also actively take part in the solution and should also be present at the public participation meetings.

6 CONCLUSIONS AND RECOMMENDATIONS

While the stakeholder engagement and communication activities have sufficiently achieved the objectives for the purposes of the Feasibility Study, going forward (beyond the Feasibility Study) will require an extended programme of public and stakeholder engagement, communication and awareness raising activities.

As the DWA is considered the sector leader in a water resources management context, functioning with input and support from other government departments, it is recommended that, in addition to the stakeholder engagement that takes place as part of the regulatory authorisation process (EIA), the DWA:

- Develops an overarching communication strategy and channel to ensure that communication activities around AMD related issues from the various initiatives are coordinated through a single entry point within the Department, with DWA Communications potentially playing a central role. This is to ensure that the messages received by the public shows the water sector speaking with “one voice” about all AMD related issues. The abovementioned could be achieved by developing and implementing a strategy which esures that AMD related communications are aligned with and are co-ordinated between government departments, by means of exchange of inputs and feedback;
- Undertakes a national public awareness raising and capacity building programme (including media coverage and proactive information dissemination). Awareness creation should be focussed on the “bigger picture” of AMD management, its challenges, the various initiatives by Government and others, driven by the DWA towards addressing AMD-related issues, etc.;
- Continues to engage with stakeholder groups using the structures and processes that were used by the LTS Feasibility Study, such as regular newsletters, an AMD website, stakeholder committees, participation at catchment forums, as well as through newly established structures, i.e. Sector-based Liaison Forums; and
- Reviews and regularly updates the stakeholder database used in this Study during the subsequent project phases for managing AMD in the East, Central and West Rand, in order to ensure that the correct stakeholders are involved and that new stakeholders are continually identified and engaged.

6.1 Responsibilities

The coordinated effort to link all AMD-related stakeholder engagement, communication, and awareness/ capacity-building activities of the various AMD-related initiatives into a single source of information sharing and communication is intended for:

- Providing a single channel of information and messages in context with the overall AMD approach;

- Presenting sufficient factual information in different forums and formats (as appropriate) to facilitate stakeholder understanding and meaningful contribution; and
- Providing sufficient opportunity for stakeholder input.

It is recommended this effort be initiated and driven by the DWA, linking to existing and future communication structures and initiatives at local, provincial and national scale, and could be planned and implemented in collaboration with the relevant parties, for example, the WRC, WISA, CSIR, DMR, DEA, DST, CGS, the various provincial and local organs of state, *etc.*

If a PSP is appointed to undertake the public relations programme for AMD, the DWA must ensure that it is not the same PSP involved in the regulatory public consultation processes for the EIA for the LTS.

Appendix A

Stakeholder Database

First Name	Last Name	Company	City
Irene	Lea		Dunnottar
Mzi	Majezi		P O Dube
R H	Kendall		
Thakane	Ntholi		
Chris	Viljoen		Johannesburg
Harrison	Pienaar		
Derick	Zietsman		Johannesburg
Campbell	MacEachern		Johannesburg
C	Sutton		Johannesburg
Jan	Ratsoma		Johannesburg
Palesa	Diale		
Blondie	Buang		
S	Ntuli		Johannesburg
Pieter	Schutte		Johannesburg
S	Olivier		Edenvale
Elize	Van Der Westhuizen		Johannesburg
Henry	Badenhorst		Johannesburg
Willie	Cook		
Mandla	Mathope		
G	Kruger		Vereeniging
Pierre	Boulogne		
George	De Beer		
Delareze	Joubert		
Jaco	La Cock		
Liezl	Scheepers		
Paulina	Radebe		
Saal	De Jager		
Themba	Nkwankwa		
Thomas	Munzhelele		
Mark	Biggars		Bosmont
Sid	Sidersky		Johannesburg
Bertus	Swanepoel		Centurion
Bulelwa	Mshumpela	Action Aid	
Nicola	Liversaq	AECOM	
Stuart	Seath	AECOM	
Mike	Howard	AECOM	
Hermien	Pieterse	AECOM	Hatfield
Johan	Rossouw	AECOM	Pretoria
Carel	Van Zyl	AECOM	
Godfrey	Makomene	Affected Community Elected Representatives (Acer) & JMEEF	Johannesburg
Julius	Kleynhans	Afri Forum	Pretoria
Garfield	Kriger	African Environmental Development	
Ron	McMartin	African Products	Johannesburg
David	Loubser	African Products	
Tsietsi	Letanta	African Rainbow Minerals	Sandton
Andre	Wilkens	African Rainbow Minerals	Johannesburg
Patrice	Motsepe	African Rainbow Minerals/ Harmony	

First Name	Last Name	Company	City
Stephan	Potgieter	AGES	Vereeniging
David	Stoltz	AGES	Vereeniging
Gideon	Vosloo	Agri Envirolab	Bethal
Johnny	Moffat	Agri Gauteng	
Dirk	Hanekom	Agri Gauteng	Centurion
Piet	Nell	Agricultural Research Council	Pretoria
Yacob	Beletse	Agricultural Research Council - Roodeplaat	Pretoria
Ntsiki	Letsosa	Air Quality Mining and Energy	Johannesburg
Denesh	Thathian	Ancor Yeast	
Andrew	Barker	Andrew Barker Development Cosultant	Mondeor
Joel	Malan	Anglo Gold Ashanti	
Malcolm	Sutton	Anglo Gold Ashanti - ERGO	Johannesburg
Hennie	Geldenhuys	Anglo Gold - ERGO	Johannesburg
Eva	Masemola	Anglo American Thermal Coal	
Nicola	Torley	Anglo American Thermal Coal	
Peter	Obolensky	Aqua Dynamics Process Technology Limited	
Herman	Siebani	Aveng Water	
Lucky	Msibi	Balfour Sewage Works	
Elise	Tempelhoff	Beeld	
David	Van Wyk	Benchmarks	
Brown	Motsau	Benchmarks	
Kopano	Mokoena	Benchmarks & FSYP	
Jan	Van Den Berg	Benoni Agricultural Holdings	Ekurhuleni
Elmar	Pittendugh	Better Bond	Johannesburg
Carolyn	Ah Shene Verdoorn	BirdLife South Africa	Claremont
Pieter	Colyn	Blue Waste to Energy	
Kelly	Martin	Bohlweki	Johannesburg
Paul	Da Cruz	Bohlweki	Johannesburg
Ingrid	Snyman	Bohlweki	Pretoria
Craig	Erasmus	Bohlweki	
Oupa	Apies	Bojanala Platinum District Municipality	Rustenburg
David	Inder	Bokomo Foods	
Johan	Steyn	Boot	
Kevin	Richardson	Botjheng Water	Johannesburg
Murray	Reid	Brikkor	Johannesburg
Polla	Wolvaardt	Burger Pro	Johannesburg
Johan	Grobbler	Burnstone Gold Mine	
Philip	Lloyd	Cape Peninsula University of Technology	
Joy	Summers	Carte Blanche	
Tracy	Geddes	Central Rand Gold	
Johan	du Toit	Central Rand Gold	Johannesburg
Duduzile	Mlambo	Centre for Applied Legal Studies (Wits School of Law)	Braamfontein
Dina	Townsend	Centre for Environmental Rights	Cape Town
Mellissa	Fourie	Centre for Environmental Rights	Cape Town

First Name	Last Name	Company	City
Michael	Harris	Chamber Group	Johannesburg
Matome	Makwela	Chamber of Mines	Johannesburg
Nikisi	Lesufi	Chamber of Mines	Marshalltown
Stephina	Mudau	Chamber of Mines	Marshalltown
Eugene	Viljoen	Chamdor Group	Johannesburg
Chris	Brooker	Chris Brooker and Associates	
Jan	Erasmus	City of Johannesburg Metropolitan Municipality	Johannesburg
Lebo	Molefe	City of Johannesburg Metropolitan Municipality	Johannesburg
Nozipho	Maduse	City of Johannesburg Metropolitan Municipality	Johannesburg
Cynthia	Wentzel	City of Johannesburg Metropolitan Municipality	Johannesburg
Hezekiel	Nkosi	City of Johannesburg Metropolitan Municipality	Johannesburg
Nomvula	Mofokeng	City of Johannesburg Metropolitan Municipality	Johannesburg
Chris	Rabaji	City of Johannesburg Metropolitan Municipality	Johannesburg
Nendy	Manzini	City of Johannesburg Metropolitan Municipality	Johannesburg
P	Mkhonto	City of Johannesburg Metropolitan Municipality	Johannesburg
Tsholofelo	Phajane	City of Johannesburg Metropolitan Municipality	Johannesburg
Louis	Bastian	City of Johannesburg Metropolitan Municipality	Johannesburg
Xolani	Madlala	City of Johannesburg Metropolitan Municipality	Johannesburg
Antonino	Manus	City of Johannesburg Metropolitan Municipality	Braamfontein
Freddie	Letsoko	City of Johannesburg Metropolitan Municipality	Johannesburg
Pule	Makena	City of Johannesburg Metropolitan Municipality	Johannesburg
Dumisani	Tinghitsi	City of Johannesburg Metropolitan Municipality	Johannesburg
Daniel	Masemola	City of Johannesburg Metropolitan Municipality	Braamfontein
Mukondi	Masithi	City of Johannesburg Metropolitan Municipality	Johannesburg
Philip	Van Der Walt	City of Tshwane Metropolitan Municipality	Pretoria
Nicole	Barlow	Clean Water Foundation and Ekurhuleni Ratepayers Association	Johannesburg
Claire	Janisch	Cleaner Production	
Robert & Christene	Garbertt	Coalition Against Nuclear Energy (and various others)	Lanseria
Johanna	Smith	Coca Cola Canners	
Danita	Janse van Rensburg	Coca Cola Canners	Johannesburg
Chris	Mosing	Coca Cola Canners	Johannesburg
Rickie	van der Watt	Coca Cola Canners	Johannesburg
Lenton	van Heerden	Coffees of the World (Acid Solutions)	
Andiswa	Sibanyoni	Commission on Restitution of Land Rights: Gauteng and North West Provinces	Pretoria

First Name	Last Name	Company	City
Ilze	Hayward	Commission on Restitution of Land Rights: Gauteng and North West Provinces	Pretoria
Keith	Bristow	Commonwealth Scientific Industrial Research Organisation (CSIRO)	Clayton South VIC Australia
Dolly	Ngali	Congress of South African Trade Unions (COSATU)	
Matserane	Wa Mapena	Congress of South African Trade Unions (COSATU)	
Dominic	Tweedie	Congress of South African Trade Unions (COSATU)	Braamfontein
John	Broom	Consol Limited	Johannesburg
Haile	Mengistu	Council for Geoscience	
Fhatuwani	Ramagwede	Council for Geoscience	
Leslie	Strachan	Council for Geoscience	Pretoria
Fortress	Netili	Council for Geoscience	Pretoria
Humberto	Saeze	Council for Geoscience	Pretoria
Henk	Coetzee	Council for Geoscience	Pretoria
Nikki	Funke	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Paul	Oberholster	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
C	Moolman	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Godfrey	Mvuma	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Dave	Rogers	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Phil	Hobbs	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Benita	de Wet	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Bettina	Genthe	Council for Scientific and Industrial Research (CSIR)	Brummeria Pretoria
Lindsey	Smith	Cradle of Humankind	Johannesburg
P J	Mills	Cradle of Humankind World Heritage Site (South Africa)	
Roland	van Tonder	Crocodile West Irrigation Board	Koedoeskop
Sebastiaan	Buiseman	Crosible	Johannesburg
Deon	Grundling	Crown Gold Recoveries	Johannesburg
Louis	Kleynhans	Crown Gold Recoveries	Johannesburg
Hartmut	Ilgner	CSIR Mining	Pretoria
Mercia	Komen	Custodian Project & Chronicle Environmental News Website	Bryanston
Ed	Hardwick	Cwenga Technologies (Pty) Ltd	
Glen	Louwrens	Cymbian Enviro-Social Consulting Services	
Paula	Tolksdorff	Cymbian Enviro-Social Consulting Services	
Nicole	Bashow	Dane the Vlei Commitee	Johannesburg
David	Dorling	DD Science	
Gareth	Morgan	Democratic Alliance (DA)	Cape Town
Erol	Fransman	Denel Munition - Rheinmetall	Vereeniging
Petrus	Cloete	Denel Munition - Rheinmetall	Vereeniging
David	Klein	Department of Agriculture	Pretoria

First Name	Last Name	Company	City
Piet	Theron	Department of Agriculture, Forestry and Fisheries	Vereeniging
Puleng	Mofokeng	Department of Agriculture, Forestry and Fisheries	Silverton
Rudzani	Khameli	Department of Agriculture, Forestry and Fisheries	Silverton
R	Mashiane	Department of Agriculture, Forestry and Fisheries	Vereeniging
Thapelo	Loabile	Department of Agriculture, Forestry and Fisheries	
Zingisa	Phohlo	Department of Environmental Affairs	Pretoria
Liza	Brown	Department of Environmental Affairs	Pretoria
Francis	Craige	Department of Environmental Affairs	Pretoria
Grant	Waters	Department of Environmental Affairs	Pretoria
Vincent	Phukubje	Department of Environmental Affairs	Pretoria
Mpho	Tshitangoni	Department of Environmental Affairs	Pretoria
Pumeza	Skepe-Mngcita	Department of Environmental Affairs	Pretoria
Stanley	Tshitwamulomoni	Department of Environmental Affairs	Pretoria
Fatima	Rawjee	Department of Environmental Affairs	Pretoria
A	Naino	Department of Environmental Affairs	
F	Scheepers	Department of Environmental Affairs	
L	Ramagwede	Department of Environmental Affairs	
Nolwa	Cobbinah	Department of Environmental Affairs	Pretoria
Amanda	Britz	Department of Environmental Affairs	Pretoria
Lukas	Swanepoel	Department of Health	
Fikile	Sithole	Department of Health	Standerton
Punky	Mohale	Department of Health	Standerton
L	Sello	Department of Health	
E	Janse van Rensburg	Department of Health	
Francois	Meyer	Department of Infrastructure Services	Johannesburg
Pieter	Grobler	Department of Infrastructure Services	Johannesburg
James	Cattanach	Department of Local Government and Housing	
Neo	Kgokong	Department of Mineral Resources	Vereeniging
Nqobile	Njoko	Department of Mineral Resources	
Carol	Khanyile	Department of Mineral Resources	Pretoria
Joel	Raphela	Department of Mineral Resources	Johannesburg
M	Madikeledi	Department of Mineral Resources	
Novhe	Ntshengedzeni	Department of Mineral Resources	
Kgauta	Mokoena	Department of Mineral Resources	Pretoria
Mpho	Litlhakanyane	Department of Mineral Resources	Johannesburg
Peter	Kelly	Department of Mineral Resources	Johannesburg
D	Ray	Department of Mineral Resources	Pretoria
B	Moholo	Department of Mineral Resources	Pretoria
Gugulethu	Cuthswa	Department of Mineral Resources	Pretoria
T	Nell	Department of Mineral Resources	Pretoria
Susan	Malebe	Department of Mineral Resources	Johannesburg
Mashudu	Maduka	Department of Mineral Resources	Johannesburg
Linda	Ellis	Department of Mineral Resources	Johannesburg
Max	Madubane	Department of Mineral Resources	Johannesburg

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Nndwakhulu	Masera	Department of Mineral Resources	Vereeniging
Ethel	Sinthumule	Department of mineral Resources	Johannesburg
Umeesha	Naidoo	Department of Science and Technology (DST)	Pretoria
Shanna	Nienaber	Department of Science and Technology (DST)	Pretoria
Henry	Roman	Department of Science and Technology (DST)	Pretoria
Mahlori	Mashimbye	Department of Science and Technology (DST)	Pretoria
Candice	Willard	Department of Science and Technology (DST)	Pretoria
Allison	Hernandez-Macdonaldo	Department of Water Affairs (DWA)	Polokwane
Martha	Komape	Department of Water Affairs (DWA)	Polokwane
Barbara	Weston	Department of Water Affairs (DWA)	Pretoria
Bernie	Badenhorst	Department of Water Affairs (DWA)	Polokwane
James	Mofokeng	Department of Water Affairs (DWA)	Pretoria
Thabie	Rakgotho	Department of Water Affairs (DWA)	Pretoria
Thya	Pather	Department of Water Affairs (DWA)	Pretoria
Dragana	Ristic	Department of Water Affairs (DWA)	Pretoria
Samantha	Boshoff	Department of Water Affairs (DWA)	Pretoria
Louis	Makhubele	Department of Water Affairs (DWA)	
Dipitseng	Phaleng	Department of Water Affairs (DWA)	Pretoria
Armstrong	Simelane	Department of Water Affairs (DWA)	Pretoria
Kennedy	Mandaza	Department of Water Affairs (DWA)	Pretoria
Lebo	Mosoa	Department of Water Affairs (DWA)	Pretoria
Sanet	van Jaarsveld	Department of Water Affairs (DWA)	Pretoria
Fred	van Zyl	Department of Water Affairs (DWA)	Pretoria
Gregory	Paszczyk	Department of Water Affairs (DWA)	Pretoria
Smangele	Mgquba	Department of Water Affairs (DWA)	Pretoria
Wisani	Maluleke	Department of Water Affairs (DWA)	Pretoria
P J	Groenewald	Department of Water Affairs (DWA)	Sasolburg
Juanita	van der Berg	Department of Water Affairs (DWA)	Pretoria
Phillimon	Khwinana	Department of Water Affairs (DWA)	Pretoria
Lesiba	Mabona	Department of Water Affairs (DWA)	
Tendayi	Makombe	Department of Water Affairs (DWA)	Pretoria
Khatu	Namalili	Department of Water Affairs (DWA)	Pretoria
Nozipho	Hadebe	Department of Water Affairs (DWA)	Pretoria
Rendani	Ndou	Department of Water Affairs (DWA)	Pretoria
Trevor	Khoza	Department of Water Affairs (DWA)	
N	Madlala	Department of Water Affairs (DWA)	
Portia	Chawane	Department of Water Affairs (DWA)	
Mishelle	Govender	Department of Water Affairs (DWA)	
Helgard	Muller	Department of Water Affairs (DWA)	
Zinhle	Khumalo	Department of Water Affairs (DWA)	
Dumisani	Maluleke	Department of Water Affairs (DWA)	
Victor	Maponya	Department of Water Affairs (DWA)	
Julius	Maydell	Department of Water Affairs (DWA)	
Crystal	Ngwenya	Department of Water Affairs (DWA)	

First Name	Last Name	Company	City
Martha	Ratsela	Department of Water Affairs (DWA)	
Sekwele	Ramogale	Department of Water Affairs (DWA)	
Alice	Simelane	Department of Water Affairs (DWA)	
Sifiso	Thwala	Department of Water Affairs (DWA)	
Percy	Khoza	Department of Water Affairs (DWA)	
Tlaila	Moleseng	Department of Water Affairs (DWA)	
Leon	Caldwell	Department of Water Affairs (DWA)	Potchefstroom
Trevor	Balzer	Department of Water Affairs (DWA)	Pretoria
Phillimon	Kwinana	Department of Water Affairs (DWA)	Pretoria
Ephraim	Matseba	Department of Water Affairs (DWA)	Pretoria
Resenga	Shibambo	Department of Water Affairs (DWA)	Pretoria
Moleseng	Tlaila	Department of Water Affairs (DWA)	Pretoria
Mbangiseni	Nepfumbada	Department of Water Affairs (DWA)	Pretoria
Ockie	Van Den Berg	Department of Water Affairs (DWA)	Pretoria
Peter	Pyke	Department of Water Affairs (DWA)	Pretoria
Sputnik	Ratau	Department of Water Affairs (DWA)	Pretoria
Themba	Khumalo	Department of Water Affairs (DWA)	Pretoria
Linda	Page	Department of Water Affairs (DWA)	Pretoria
Nigel	Adams	Department of Water Affairs (DWA)	Pretoria
Marius	Keet	Department of Water Affairs (DWA)	Pretoria
Jurgo	Van Wyk	Department of Water Affairs (DWA)	Pretoria
Jacqueline	Jay	Department of Water Affairs (DWA)	Pretoria
Bashan	Govender	Department of Water Affairs (DWA)	Pretoria
Eddie	Van Wyk	Department of Water Affairs (DWA)	Pretoria
Nemataheni	Thivhafuni	Department of Water Affairs (DWA)	Pretoria
Beason	Mwaka	Department of Water Affairs (DWA)	Pretoria
Rod	Schwab	Department of Water Affairs (DWA)	Pretoria
Pieter	Viljoen	Department of Water Affairs (DWA)	Pretoria
Hennie	Smit	Department of Water Affairs (DWA)	Pretoria
Barbara	Ngoasheng	Department of Water Affairs (DWA)	Pretoria
Ntombi	Mngoma	Department of Water Affairs (DWA)	Pretoria
Takalani	Thimisha	Department of Water Affairs (DWA)	Pretoria
Ernst	Bertram	Department of Water Affairs (DWA)	Pretoria
Solly	Mabuda	Department of Water Affairs (DWA)	Pretoria
Anil	Singh	Department of Water Affairs (DWA)	Pretoria
Tendani	Nditwani	Department of Water Affairs (DWA)	Pretoria
Seef	Rademeyer	Department of Water Affairs (DWA)	Pretoria
Deborah	Mochotlhi	Department of Water Affairs (DWA)	
Nancy	Mothebe	Department of Water Affairs (DWA)	Pretoria
Herman	Keuris	Department of Water Affairs (DWA)	Pretoria
Lerato	Bapela	Department of Water Affairs (DWA)	Pretoria
Fanus	Fourie	Department of Water Affairs (DWA)	Pretoria
Sediko	Mpopetsi	Department of Water Affairs (DWA)	
Alice	Mabasa	Department of Water Affairs (DWA)	
Zacharia	Maswuma	Department of Water Affairs (DWA)	
Metsi	Metsing	Dewet Aswagen	
Sibongile	Bambisa	Digby Wells Environmental	Johannesburg

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Steve	Horak	Digby Wells Environmental	Johannesburg
Kirsten	Bradley	Digby Wells Environmental	Johannesburg
Marike	Fourie	Digby Wells: Associates	Johannesburg
Afrika	Masuku	Dihlabeng Municipality	
M	Mofokeng	Dihlabeng Municipality	
Rudi	Du Toit	Disaster Management	
Susan	Cole	Dow Southern Africa (Pty) Ltd	
Henry	Gouws	Durban Roodepoort Deep (DRD) Gold Ltd	Johannesburg
Neville	Lane	Durban Roodepoort Deep (DRD) Gold Ltd	Johannesburg
Jaco	Schoeman	Durban Roodepoort Deep (DRD) Gold Ltd	Pretoria
Kevin	Kruger	Durban Roodepoort Deep (DRD) Gold Ltd	Potchefstroom
Doug	Jenner	Durban Roodepoort Deep (DRD) Gold Ltd	
Johan	Smit	Durban Roodepoort Deep (DRD) Gold Ltd	
C	Le Rousou	Durban Roodepoort Deep (DRD) Gold Ltd	
H J	Kriel	Early Bird Farm	Standerton
Freek	Schoeman	Early Bird Farm	Standerton
Makoma	Lekalaka	Earthlife Africa	Johannesburg
Rachel	Adatia	Earthlife Africa	Johannesburg
Israel	Mosala	Earthlife Africa	Johannesburg
Ruweda	Mills	Earthlife Africa	Johannesburg
Fatima	Goondile	Earthlife Africa	Johannesburg
Rookaya	Ngwenya	Earthlife Africa	Johannesburg
Mabule	Mokhine	Earthlife Africa (Greenhouse Project)	Braamfontein
Judith	Taylor	Earthlife Africa and S A Water Caucus Gauteng	Johannesburg
Koos	Wilken	East Rand Water Care Company (ERWAT)	Johannesburg
Loura	Roode	East Rand Water Care Company (ERWAT)	Johannesburg
Dries	Louw	East Rand Water Care Company (ERWAT)	Johannesburg
Fortune	Mabunda	East Rand Water Care Company (ERWAT)	
Johan	Hendriksz	East Rand Water Care Company (ERWAT)	Johannesburg
Johan	van der Linde	East Rand Water Care Company (ERWAT)	Johannesburg
Louwtjie	Engelbrecht	East Rand Water Care Company (ERWAT)	Johannesburg
Ziboneni	Godongwana	East Rand Water Care Company (ERWAT)	Norkem Park
Bob	Symons	Eclipse Management (Pty) Ltd	
Pieter	Van Eeden	EcoMonitor cc & GO EnviroScience	Johannesburg
Charles	Fourie	EcoSat	
Lehlohonolo	Moloi	Edwareb 226 cc	Johannesburg
Annemarie	Maurizi	Ekurhuleni Metropolitan Municipality	Johannesburg
Sarah	Lebetle	Ekurhuleni Metropolitan Municipality	Johannesburg

First Name	Last Name	Company	City
Maureen	Ansett	Ekurhuleni Metropolitan Municipality	
Rubin	Nzima	Ekurhuleni Metropolitan Municipality	Johannesburg
Aubrey	Mokgosi	Ekurhuleni Metropolitan Municipality	Springs
Bernard	Williamson	Ekurhuleni Metropolitan Municipality	Springs
Ivan	Kadungure	Ekurhuleni Metropolitan Municipality	Springs
Khaya	Ngema	Ekurhuleni Metropolitan Municipality	Springs
Lusanda	Mtolo	Ekurhuleni Metropolitan Municipality	Springs
Masele	Madihlaba	Ekurhuleni Metropolitan Municipality	Springs
Molwantwa	Nkoana	Ekurhuleni Metropolitan Municipality	Germiston
Rameshlal	Sheodi	Ekurhuleni Metropolitan Municipality	Springs
Queen	Duba	Ekurhuleni Metropolitan Municipality	Germiston
Slindokuhle	Hadebe	Ekurhuleni Metropolitan Municipality	Edenvale
Sonia	Mothodini	Ekurhuleni Metropolitan Municipality	Edenvale
Vuyelwa	Mabena	Ekurhuleni Metropolitan Municipality	Germiston
Lebogang	Moffat	Ekurhuleni Metropolitan Municipality	
Nonhlanhla	Mnisi	Ekurhuleni Metropolitan Municipality	
Paul	Du Preez	Ekurhuleni Metropolitan Municipality	Johannesburg
Smuts	Marais	Ekurhuleni Metropolitan Municipality	Johannesburg
Mankoana	Elvino	Ekurhuleni Metropolitan Municipality	Springs
Bennett	Nikani	Ekurhuleni Metropolitan Municipality	Germiston
Themba	Moganseli	Ekurhuleni Metropolitan Municipality	Springs
Callie	Smith	Ekurhuleni Metropolitan Municipality	
Dumisani	Gauze	Ekurhuleni Metropolitan Municipality	
Sope	Mokgadi	Ekurhuleni Metropolitan Municipality	
Precious	Mahlangu	Ekurhuleni Metropolitan Municipality	
Chuene	Zebedius	Ekurhuleni Metropolitan Municipality	
Cecilia	Rakgoale	Ekurhuleni Metropolitan Municipality	Johannesburg
Franscois	Meyer	Ekurhuleni Metropolitan Municipality	Johannesburg
Callie	Van Der Merwe	Ekurhuleni Metropolitan Municipality	Johannesburg
Barend	Deminey	Ekurhuleni Metropolitan Municipality	Johannesburg
Danie	Van Der Merwe	Ekurhuleni Metropolitan Municipality	Johannesburg
Sekhonyana	Lerothi	Ekurhuleni Metropolitan Municipality	Edenvale Johannesburg
Elsabeth	Van Der Merwe	Ekurhuleni Metropolitan Municipality	Edenvale
Dean	Stone	Ekurhuleni Metropolitan Municipality	Springs
Pieter	De Vries	Ekurhuleni Metropolitan Municipality	
Sibusiso	Biyela	Emfuleni Local Municipality	
Henry	Claasen	Emfuleni Local Municipality	Sasolburg
Avhashoni	Nevondo	Emfuleni Local Municipality	Sasolburg
Paul	Fairall	Emifula Riverine and Wetlands Remedial Consultants and Associates	Pretoria
Mike	Howard	EMSA	
Reuben	Phiri	EMSA	Sasolburg
Bridget	Corrigan	Endangered Wildlife Trust	Johannesburg
Yolan	Friedmann	Endangered Wildlife Trust	Parkview
Elke	Bey	Energy Caucus	Johannesburg
Sue	Bellinger	Enviro Fringe Services	Johannesburg
C	van Heerden	Enviro Park Riverlea	

First Name	Last Name	Company	City
Mike	McWilliams	Enviro-Sec Limited	
Mohlahli	Letona	Environmental Health	Witsieshoek
Daniel	Sibaya	Environmental Health Project (EHP)	Sasolburg
Doreen	Khoza	Environmental Health Project (EHP) Zamdela	Sasolburg
Britz	Reinders	Enviroserv	Nelspruit
Dean	Lindecke	ERGO	Johannesburg
Dave	Rhodes	ERGO	Johannesburg
Annalize	Wentzel	Eskom	Sasolburg
Tebogo	Ndamase	Eskom	
Nandha	Govender	Eskom	Johannesburg
Meera	Mban	Eskom	
Ian	Midgley	Eskom - Megawatt Park	Johannesburg
Ben	van der Walt	Eskom Grootvlei	Standerton
Charl	van der Merwe	Exxaro	Johannesburg
Johan	Fourie	Ezulwini Mining Company (Pty) Ltd (EMC) and First Uranium	Johannesburg
Eugene	Viljoen	Federation for Sustainable Environment (FSE)	Johannesburg
Simone	Liefferink	Federation for Sustainable Environment (FSE)	Johannesburg
Mariette	Liefferink	Federation for Sustainable Environment (FSE) & Public Environmental Arbiters	Rivonia
Koos	Pretorius	Federation for Sustainable Environment, Escarpment Env Protection Group & MLDPG	Rivonia
Sam	Kotsoane	Fezile Dabi - District Municipality (NFSDC)	
André	Van Zyl	Fezile Dabi District Municipality	Sasolburg
Gerhard	Homann	Fezile Dabi District Municipality	Sasolburg
Lerato	Molaba	Fezile Dabi District Municipality (FDDM)	
Nico	Nel	Fifth Season Investments 99 (Pty) Ltd; Educated Risk, Grootvlei Homeowners Ass	Strubenvale
Stuart	Dunsmore	Fourth Element	
Miya	Modise	FPOY	
Ken	Bouch	Fraser Alexander (FAWT) & MiWaTek	
David	Gonzalez	Fresh Farmers Growers	
Gideon	Viljoen	Fry's Metals	Johannesburg
Ramodise	Mekoa	G & W Base	Johannesburg
Mike	Baynes	G B Gold	Johannesburg
Kerry	Bobbins	Gauteng City-Region Observatory (GCRO)	
Calvin	Jonhasi	Gauteng Department of Agriculture & Rural Development	Johannesburg
Junior	Nkuna	Gauteng Department of Agriculture & Rural Development	Johannesburg
Piet	Muller	Gauteng Department of Agriculture and Rural Development	Johannesburg
Itholeng	Benedict	Gauteng Department of Agriculture and Rural Development	Johannesburg
Eric	Mulibana	Gauteng Department of Agriculture	Johannesburg

First Name	Last Name	Company	City
		and Rural Development	
Felicia	Nemathanga	Gauteng Department of Agriculture and Rural Development	Johannesburg
Maryjane	Ramahlodi	Gauteng Department of Agriculture and Rural Development	Johannesburg
Malcolm	Mogotsi	Gauteng Department of Agriculture and Rural Development	Johannesburg
Dineo	Moloko	Gauteng Department of Agriculture and Rural Development	Johannesburg
Mpho	Muvhenga	Gauteng Department of Agriculture and Rural Development	Johannesburg
Phuti	Matlamela	Gauteng Department of Agriculture and Rural Development	Johannesburg
Quinton	Joshua	Gauteng Department of Agriculture and Rural Development	Johannesburg
Khayelihle	Ncuse	Gauteng Department of Agriculture and Rural Development	Johannesburg
Jabulani	Siyaya	Gauteng Department of Agriculture and Rural Development	
Christopher	Rakuambo	Gauteng Department of Agriculture and Rural Development	
Dineo	Mokolo	Gauteng Department of Agriculture and Rural Development	Johannesburg
Fhatuwani	Munyai	Gauteng Department of Agriculture and Rural Development	Johannesburg
Hlamalani	Khosa	Gauteng Department of Agriculture and Rural Development	
Jay Jay	Ncube	Gauteng Department of Agriculture and Rural Development	
Peter	Mills	Gauteng Department of Agriculture and Rural Development	Johannesburg
Thabile	Nzimande	Gauteng Department of Agriculture and Rural Development	
Willem	de Lange	Gauteng Department of Agriculture and Rural Development	
Xoliswa	Babelo	Gauteng Department of Agriculture and Rural Development	
Pirate	Ncube	Gauteng Department of Agriculture and Rural Development	Johannesburg
Rina	Taviv	Gauteng Department of Agriculture and Rural Development	Johannesburg
Keneuoe	Segele	Gauteng Department of Agriculture and Rural Development	Johannesburg
Gerson	Nethavhani	Gauteng Department of Agriculture and Rural Development	Johannesburg
Vukosi	Ndlopfu	Gauteng Department of Agriculture and Rural Development	Johannesburg
Mpfareleni	Mashau	Gauteng Department of Agriculture, Conservation and Envirionment	Johannesburg
Liesl	Mostert	Gauteng Department of Agriculture, Conservation and Envirionment	
Lydia	Muditambi	Gauteng Department of Agriculture, Conservation and Envirionment	Johannesburg
Samantha	Braid	Gauteng Department of Agriculture, Conservation and Envirionment	
Umesh	Bahadur	Gauteng Department of Agriculture, Conservation and Envirionment	Johannesburg
Elias	Sithole	Gauteng Department of Local Government and Housing	Marshalltown
Killain	Mwiinga	Gauteng Department of Local	

First Name	Last Name	Company	City
		Government and Housing	
Thomas	Walters	Gauteng Provincial Legislature	
Rachel	Masango	Gauteng Provincial Shared Services Centre	Pretoria
Fiso	Mbatha	Gauteng Tourism Authority	Newton
Caiphus	Netshishivhe	Gauteng Tourism Authority	Newton
Lance	Coogan	Gemini Environmental Group Ltd	
S	Skead	George Town	Germiston
Gerhard	Jansen van Vuuren	Germag Water Enterprises	
Jurgen	Dunn	Gert Sibande District Municipality	Pretoria
Mookgo	Nthebe	GKDF	
Danny	Ramsuchit	Gold Fields	
Wouter	Hamman	Gold One International Ltd	Springs
Loselo	Segwe	Gold One International Ltd	
Sibusiso	Sidu	Gold One International Ltd	Springs
Rex	Zorab	Gold One International Ltd	Randfontein
Johan	Moutan	Gold One International Ltd	Johannesburg
Sarel	Keller	Gold One International Ltd	Randfontein
Pierre	Kruger	Gold One International Ltd	Johannesburg
Joan	Goosen	Gold Reef City	Johannesburg
C	Grobler	Gold Reef City	Johannesburg
L	Du Preez	Gold Reef City	Johannesburg
Darrel	Phillips	Gold Reef City	Ormonde
James	Swan	Gold Reef City	Johannesburg
Sylvester	Nkwe	Goldfields	
Robert	Smith	Goldplats	Johannesburg
Sthembile	Makhombothi	Govan Mbeki Municipality	
Amos	Tshabalala	Govan Mbeki Municipality	
Thembi	Masilela	Govan Mbeki Municipality	
T	Steenkamp	Green Energy	Johannesburg
Adam	Ferrial	Greenpeace	
Ferrial	Adam	Greenpeace	
Melita	Steele	Greenpeace	
Harry	Klemp	Greens Greens	Sasolburg
Phillip	de Jager	Grootvaly / Blesbokspruit Conservation Trust	Springs
Ewald	Meyer	Grootvaly / Blesbokspruit Conservation Trust	
Mike	Hood	Grootvaly / Blesbokspruit Conservation Trust	Johannesburg
J Z	Mqanyane	Grootvlei Development Organisation	
Jan	Moshodi-Rigale	Grootvlei Development Organisation	Springs
Trevor	Myeni	Grootvlei Development Organisation	Springs
Herbie	Trouw	Grootvlei Gold Mine	
Johan	Engelbrecht	Grootvlei Gold Mine	Pretoria
Bobby	Peek	Groundwork	Pietermaritburg
Gustav	Schümann	Haggie Steel Wire Rope (Pty) Ltd	Johannesburg
Keith	Warrener	Haggie Steel Wire Rope (Pty) Ltd	Johannesburg
Len	Rootman	Harmony Gold Mining Limited	Johannesburg

First Name	Last Name	Company	City
Louis	Sithole	Harmony Gold Mining Limited	
Robert	Gilmour	Harmony Gold Mining Limited	Johannesburg
Bonnie	Docherty	Harvard Business School (Human Rights Division)	Johannesburg
M	Shah	Harvard Business School (Human Rights Division)	Johannesburg
Steven	Bunce	Henley Conservancy	
Jim	Dinkens	Henley Conservancy	Sasolburg
Mike	Whitcutt	Highveld Biological Association & Energy Caucus	Johannesburg
Steve	Lurie	Hillside Farm	Standerton
Roley	Noffke	Hydromulch (Pty) Ltd	Johannesburg
Johan	Engelbrecht	Icon Insolvency	Mooikloof
J	Du Preez	Icon Insolvency	
T	Williams	Ignis Financing	
Terry	Baker	Iliso	Pretoria
Filippus	Du Plessis	Imbewu Ventures cc	
Carina	Burger	Impala Platinum Ltd Refineries	Springs
Timothy	Spandiel	Impala Platinum Ltd Refineries	Johannesburg
Mpho	Mabokela	Impala Platinum Ltd Refineries	Springs
Arrie	Van Vuuren	Independent Consultant	Pretoria
J	Geldenhuys	Independent Consultant	
L	Mazwai	Institutional Legislative Requirements	
Anne	Mayher	International Alliance on National Resources in Africa	
Richard	Bennet	IProp (Pty) Ltd	Johannesburg
Roelof	Barnard	ITC	Johannesburg
Gerhard	de la Porter	IWT-Industry AG	
Joseph	Thubana	Jerry Moloi Community Library	Etwatwa
Phyllis	Tlatsi	JMEEF	
Cebo	Mhlongo	Johannesburg City Parks	
Amanda	Nkomo	Johannesburg Water	Johannesburg
Mmare	Tsheko	Johannesburg Water	Johannesburg
Russel	Rimmer	Johannesburg Water	Johannesburg
Tony	Pitman	Johannesburg Water	Johannesburg
Phindi	Shuping	Johannesburg Water	Johannesburg
Jones	Mnisi	Johannesburg Water	Johannesburg
Boetie	Mashigo	Johannesburg Water	Johannesburg
Nyiko	Nyathi	Johannesburg Water	Marshalltown
Johann	De Wet	Johannesburg Water	Johannesburg
Shaun	Decon	Johannesburg Water	Johannesburg
Sydney	Cyster	Johannesburg Water	Johannesburg
Ariel	Mafejane	Johannesburg Water	Marshalltown
Mthokozisi	Ncube	Johannesburg Water	Johannesburg
Jerry	Mashishi	Johannesburg Water	Johannesburg
Ntshavheni	Mukwevho	Johannesburg Water	Braamfontein
Chris	Wayhgood	Jones and Wager	
Brand	Nthako	Jubilee SA	
Sharmaine	Jansen van Vuuren	Karan Beef	Sasolburg

First Name	Last Name	Company	City
George	Thom	Karbochem	
Koos	Theunissen	Karbochem	
Marinda	van Aswegen	Karbochem	Sasolburg
Aradhana	Dasarath	Karbochem	Sasolburg
Arisha	Ramnath	Karbochem	Sasolburg
Benny	Lichaba	Khumo Bathong Holdings	
Roxy	du Toit	Klipriver Suikerbosrand Conservacy	
S	du Toit	Klipriver Suikerbosrand Conservancy	
Noleen	Hill	Kliptown Development Forum (GKDF)	Johannesburg
Feizal	Gathoo	Kliptown Environmental Reference Group (Kerf Region 11)	
John	Legoale	Kliptown Environmental Reference Group KERG	
Alwyn	Laas	Kloof Gold Mine, Gold Fields	Johannesburg
Amelia	Briel	Knight Piesold	Johannesburg
Vanessa	Vermaak	Knotion	Johannesburg
Mashau	Mpfareleni	Kromdraai, Marievale Wetland - Ramsar Site	Johannesburg
Jannie	Rykaart	Krugersdorp Game Reserve	Mogale City
L	van de Linde	L Pack	Johannesburg
Hannes	van der Walt	Lafarge Gypsum Division	
Mike	Brucher	Land Owner	Vanderbijlpark
Mitchell	Krog	Land Owners Association of Magaliesburg (LOAM)	
Emma	Algotssom	Lawyers for Human Rights	Johannesburg
Andries	Nkabinde	Layiwe Trading Enterprise	
Michael	Power	Legal Resources Centre	Johannesburg
Naseema	Fakir	Legal Resources Centre	Johannesburg
Vusi	Hlatshwayo	Lekwa Local Municipality	Standerton
Seppi	Claassen	Lekwa Local Municipality	Standerton
M	Makhatha	Lekwa Local Municipality	Standerton
J G	van Wyk	Lekwa Local Municipality	Standerton
Melini	Hariram	Lethabo Power Station	
Carl	Woodhouse	Lethabo Power Station	Sasolburg
Du Toit	Human	LHL Consulting	Bethlehem
Edward	Bramley	Lime Chem (Pty) Ltd	Irene
Pieter	de Witt	Limpopo Department of Agriculture	Polokwane
Rene	Booysen	Lonmin Platinum	Johannesburg
Manie	du Toit	Macsteel Fluid Control	
Nokukhanya	Radebe	Mafube Local Municipality	Frankfort
Z	Mofokeng	Mafube Municipality	
Roelf	le Roux	Magalies Water Board	Rustenburg
George	Fritz	Makoppa Irrigation Board	Thabazimbi
Rina	Myburgh	Malepa Holdings	
Jabu	Malungani	Maluti a Phofung Water (MAP Water)	
Tello	Mphuthi	Maluti a Phofung Water (MAP Water)	
Margot	Saner	Margot Saner & Associates (Pty) Ltd	Johannesburg
Shigeru	Yamaguchi	Marubeni Corporation	
P K	Maluleke	Member of Parliament	

First Name	Last Name	Company	City
Morne	de Jager	Menco Sedibeng Brewery	Pretoria
Dan	Sondela	Merafong Municipality	
Patrick	Ndzilane	Merafong Municipality	
Lindiwe	Nhlapho	Merafong Municipality	
Godfrey	Chauke	Merafong Municipality	
Adele	Hepburn	Metalloys	Sasolburg
Deon	du Plessis	Metalloys	
Heiko	Stoelting	Metalloys	
Riedawaan	Pillay	Metalloys	
Thokozile	Mathunzi	Metsimaholo Local Municipality	Sasolburg
D	Lubbe	Metsimaholo Local Municipality	Oranjeville
Sipho	Mosai	Mhlathuzi Water	Richards Bay
Jako	Verster	Midvaal Local Municipality	Sasolburg
Moffat	Ramabulana	Midvaal Local Municipality	Sasolburg
Franci	Hossack	Midvaal Local Municipality	Sasolburg
Jacky	Peterson	Midvaal Local Municipality	Sasolburg
Ben	Viljoen	Midvaal Local Municipality	Sasolburg
Johan	Venter	Midvaal Local Municipality	Sasolburg
Debra	Mogashoa	Midvaal Local Municipality	Sasolburg
Vicky	Henrico	Mintails SA	Mogale City
Robert	Freeman	Mintails SA (Pty) Ltd	Johannesburg
Nico	Strydom	Miracles/Ground Owner	Beckedan
Elize	Strydom	Miracles/Land Owner	Krugersdorp
Isao	Deki	Mitsubishi Heavy Industries, Ltd	
Dan	Mashitisho	Mogale City Local Municipality	Johannesburg
Samu	Mdlalose	Mogale City Local Municipality	
Johan	Labuschagne	Mogale City Local Municipality	Sasolburg
Elize	Mare	Mogale City Local Municipality	
Elize	More	Mogale City Local Municipality	Johannesburg
Johan	Esterhuizen	Mogale City Local Municipality	Mogale City
Mosele	Matlhaku	Mogale City Local Municipality	
Stephan	Du Toit	Mogale City Local Municipality	Mogale City
M C	Botha	Mogale City Local Municipality	Johannesburg
Angie	Mpshe	Mogale City Local Municipality	Mogale City
Andy	Mathibe	Mogale City Local Municipality	Mogale City
Emily	Mathe	Mogale City Local Municipality	Mogale City
Carina	Morgan	Mogale Gold Mine	
David	Mokebe	Mondi Fine Papers	Johannesburg
Guy	Butler	Mott MacDonald	
Mike	Ludick	Mpu Agriculture	Standerton
Zola	Kutsu	Mpumalanga Department of Agriculture & Land Administration	Ermelo
Dean	Muruven	MSA Group	
Thabo	Sekhobo	Mufatsanyana District Municipality	
Harry	Singleton	Murray & Roberts Limited	
Victor	Munnik	Mvula Trust	Johannesburg
Jurgen	Graupe	Nano Water Technologies Africa (Pty) Ltd (Blue Gold)	

First Name	Last Name	Company	City
Bob	Dehning	National Assoc of Conservancies (NACSA) Gauteng Conservancy Assoc (GCA)	Johannesburg
Brenda	Santon	National Council of the Society for Prevention of Cruelty to Animals (NSPCA)	
Jane	Marston	National Council of the Society for Prevention of Cruelty to Animals (NSPCA)	
Tumi	Monageng	National Economic Development and Labour Council (Nedlac)	Saxonworld
Mahandra	Naidoo	National Economic Development and Labour Council (Nedlac)	
Sharna	Johardien	National Economic Development and Labour Council (Nedlac)	
Orion	Phillips	National Nuclear Regulator	Pretoria
Patle	Mohajane	National Nuclear Regulator	Centurion
Mike	Muller	National Planning Commission (NPC) (Wits University School of Public & Dev Mgt)	Bruma Johannesburg
Tumisang	Moleke	National Treasury	Pretoria
Petrus	Matji	National Treasury	Pretoria
Strover	Maganedisa	National Treasury	Pretoria
Adam	Letshele	National Union of Mineworkers SA (NUM)	Johannesburg
Job	Matsepe	National Union of Mineworkers SA (NUM)	Johannesburg
Lennox	Mekuto	National Union of Mineworkers SA (NUM)	Johannesburg
Penny	Baabua	National Union of Mineworkers SA (NUM)	Johannesburg
Simon	Qhagi	National Union of Mineworkers SA (NUM)	Johannesburg
Ncube	Jiba	National Union of Mineworkers SA (NUM)	Johannesburg
Piet	Matosa	National Union of Mineworkers SA (NUM)	Johannesburg
Frans	Baleni	National Union of Mineworkers SA (NUM)	Johannesburg
Peter	Bailey	National Union of Mineworkers SA (NUM)	Johannesburg
Mzwakhe	Nhlapho	National Union of Mineworkers SA (NUM)	Johannesburg
Patrick	Cebekhulu	Natref	Sasolburg
Tau	Nkitseng	Natref	Sasolburg
Cindy	Fourie	Nedbank	Johannesburg
Linda	Monye	New Heights	Oranjeville
Tomas	Persson	Ngonyezi	
T	Mokoena	Ngwathe Local Municipality	
Piet	de Jager	Nketoana Municipality	
V	Mkhefa	Nketoana Municipality	
Johann	Tempelhoff	North West University	Potchefstroom
Leslie	Stoch	North West University	Potchefstroom
Elrista	Annandale	North West University	Potchefstroom
Elize	van Eeden	North West University	Potchefstroom

First Name	Last Name	Company	City
Eric	Nealer	North West University	Potchefstroom
Frans	Waanders	North West University	Potchefstroom
Leon	van Rensburg	North West University	Potchefstroom
Frank	Winde	North West University	Potchefstroom
Jean	Vos	NuWater (Pty) Ltd	
Johan	Berg	Obaro	
Alan	Klempter	OMGH	Johannesburg
Bontle	Dithebe	Omnia	Sasolburg
Hanlie	Hattingh	Omnia	Johannesburg
Ockie	van Niekerk	Optima Agrik (Pty) Ltd	
Gary	Sagiv	P2W Ltd	
Irfaan	Kahan	PD Naidoo & Associates	
Dominique	Gilbert	Pelindaba Working Group	
Ferdie	Van Deventer	People of Wildlife	
Margaret	Maome	Petra Diamonds	Johannesburg
Madoda	Besani	Phumelela Local Municipality	Vrede
Hope	Mthembu	Phumelela Local Municipality	Vrede
Itumeleng	Rametse	Phumelela Municipality	
Dawie	Beukes	Pikitup	
Neville	Smith	Pikitup	
Rene	Potgieter	Potch Petitioners and Clay Disposal	Potchefstroom
Sharon	Hayes	Potch Petitioners and Clay Disposal	
T G	Kruger	Potchefstroom City Council	Potchefstroom
Luther	Erasmus	Price Waterhouse Coopers	
Meiring	Du Plessis	Private Consultant	Faerie Glen Pretoria
Ralph	Jones	Process & Business Consultants	
John	Clayton	Project Assignments (SA) (Pty) Ltd (Projass) (Paques)	
Paolo	Balestra	PROSEP	
Delwer	Hossen	Protea Supermarket	
Henk	Beyleveld	Provincial Dept of Health	
G	Botha	Provincial Heritage Resources Authority- Gauteng	Johannesburg
M	Ramphele	Provincial Heritage Resources Authority- Gauteng	Johannesburg
Adel	Wilson	PROXA	
Lekau	Hlabolwa	Q Habitat	
T K	Gyedu-Ababio	Q Habitat	Johannesburg
Mninimuzi	Ncala	Q Habitat	
Dandet	Seke	Q Habitat	
Tshepo	Nokaneng	Q Habitat	
Solly	Mathebula	Q Habitat	
Zelna	Franken	Rand Water	Johannesburg
Molefi	Rajele	Rand Water	Johannesburg
Francois	Van Wyk	Rand Water	Johannesburg
Phyllis	Serumula	Rand Water	Johannesburg
Solomon	Mathebula	Rand Water	Johannesburg
Prinsla	Moodley	Rand Water	Sasolburg

First Name	Last Name	Company	City
Heidi	Pretorius	Rand Water	Johannesburg
Kaajial	Durgapersad	Rand Water	Johannesburg
Noleen	Davis	Rand Water	Johannesburg
Alan	Campbell	Rand Water	Johannesburg
Percy	Khumalo	Rand Water	Johannesburg
Vusimuzi	Kubheka	Rand Water	Johannesburg
L	Jordan	Rand Water	Johannesburg
P T	Chitaka	Rand Water	Johannesburg
Nicolene	van der Walt	Rand Water	Johannesburg
Reveck	Hariram	Rand Water	Johannesburg
Tawanda	Nyandoro	Rand Water	Johannesburg
Marc	de Fontaine	Rand Water	Johannesburg
Angie	Phaliso	Rand Water Foundation	Johannesburg
Dira	Modimogale	Randfontein Local Municipality	Randfontein
Arthur	Sampson	Randfontein Local Municipality	Randfontein
Nthabiseng	Mogale	Randfontein Local Municipality	Randfontein
Elsie	Uckermann	Randfontein Local Municipality	Randfontein
Madiba	Ramatlhape	Randfontein Local Municipality	Randfontein
Nokwazi	Ndlala	Randfontein Local Municipality	Randfontein
Diagiso	Matlanado	Randfontein Local Municipality	Randfontein
Richard	Magwanya	Randfontein Local Municipality	Randfontein
Shan	Holmes	Real Search	
Anthony	Richard	Realsearch Environmental & Legal Services	Johannesburg
Anthony	Duigan	Rhenosterspruit Nature Conservacy & Just Environmental Action	Bryanston
Nikite	Muller	Rhodes University	Johannesburg
Andrian	van Bart	Rison Groundwater Consulting	Krugersdorp
Hein	Duyts	RNE Pumps	Johannesburg
Altus	Feenstra	Robor Galvanizers	Johannesburg
Elana	Coreejes	Rodora Agri Forum	Johannesburg
P S	Rossouw	Rossouw and Associates	
Thys	Kapp	Rowing South Africa	
Selwyn	Jackson	Rowing South Africa & Water Sports Facility Task Group	
Sandra	Botes	Royal Engineering	
Peter	Mackenzie	S&W Consulting Engineers	Polokwane
Wally	Klingenberg	Safripol (Pty) Ltd	Sasolburg
Jaco	van Wyk	Samancor	
Freddie	Viljoen	Sappi	Johannesburg
Steve	Walker	Sappi	Johannesburg
Stephen	van Staden	SAS Environmental	Johannesburg
Farai	Chamisa	Sasol	Johannesburg
Jana	Van De Linde	Sasol	Johannesburg
Ristoff	Van Zyl	Sasol	Sasolburg
Zain	Mohamed	Sasol	Sasolburg
Stephen	Mabena	Sasol	
Sudika	Ragoonandan	Sasol Corporate Affairs	Sasolburg
Ann	Naidoo	Sasol Infrachem	Sasolburg

First Name	Last Name	Company	City
Bob	Kleynjan	Sasol Infrachem	Sasolburg
Carl	Scholtz	Sasol Infrachem	Sasolburg
Pierre	Hugo	Sasol Infrachem	Sasolburg
Mosa	Vilakazi	Sasol Infrachem	Sasolburg
Robert	Stewart	Sasol Solvent and O & S	Johannesburg
Johan	Duvenhage	Sasol Solvents	
Niel	Fourie	Sasol Solvents and O & S	Johannesburg
Hans	Kruger	Sasol Technology	Sasolburg
Vierah	Hulley	Sasol Technology	Sasolburg
Neil	Paton	Sasol Technology, R & D	Sasolburg
Randal	Albertus	Sasol Technology, R & D	Sasolburg
Sheree	Béga	Saturday Star	
Bernard	Fourie	Save the Vaal	
Tom	Du Toit	Save the Vaal	
Bruce and Irene	Main	Save the Vaal	Oranjeville
Trevor	Stubbs	Save the Vaal	Zuurfontein
Coenie	Nel	Save the Vaal	Zuurfontein
Ester	Peta	Scaw Metals	Johannesburg
Hennie	van der Merwe	Scaw Metals	
C	Potgieter	Scaw Metals	
Deirdre	Lingenfelder	Scaw Metals	
Nicoletta	Pera	Scaw Metals	
Hennie	Schoeman	Scaw Metals	Johannesburg
Linda	Hall	Scaw Metals	Johannesburg
Gordon	Donaldson	Scaw Metals	
Lindy	Strever	Scaw Metals	Johannesburg
Pearl	Blommestyn	Scaw Metals	Johannesburg
Martin	Williams	Schlumberger Water Services	
Nico	Schneider	Seaton Thomson and Associates	Johannesburg
Vivian	Carver	Sedibeng Brewery	Johannesburg
Mbuyiselo	Kantso	Sedibeng District Municipality	Randfontein
Maureen	Dosoudil	Sedibeng United Business Forum	Vanderbijlpark
Marius	van Aardt	Sembcorp Utilities S A (Pty) Ltd	
Jochen	Schweitzer	Shango Solutions	Johannesburg
Wilfred	Mokoaleli	Sigma Mine	
Anna	Akano	Socio-Economic Rights Institute of South Africa (SERI)	Braamfontein Johannesburg
Jackie	Dugard	Socio-Economic Rights Institute of South Africa (SERI)	Johannesburg
Billy	Majola	Soil Classification Working Group (SCWG)	
Sarah	Manka	Soil Classification Working Group (SCWG)	
Pulane	Nthoroante	Soil Classification Working Group (SCWG)	
Evelyn	Mosia	Soil Classification Working Group (SCWG)	
Andre	van der Merwe	Solidarity	
Wayne	de Jager	Sounds Extreme	Johannesburg
Phillip	Hine	South African Heritage Resources	Cape Town

First Name	Last Name	Company	City
		Agency (SAHRA)	
Delysia	Weah	South African Human Rights Commission (SAHRC)	Braamfontein Johannesburg
Angela	Kariuki	South African Human Rights Commission (SAHRC)	Johannesburg
Janet	Love	South African Human Rights Commission (SAHRC)	Braamfontein
S	Ramohlale	South African Local Government Association (SALGA)	
Lulama	Xongwana	South African Local Government Association (SALGA)	
Jacqueline	Samson	South African Local Government Association (SALGA)	Johannesburg
William	Moraka	South African Local Government Association (SALGA)	Pretoria
Claudia	McKenzie	South African Mine Workers Union (SAMWU)	
Jeff	Rudin	South African Mine Workers Union (SAMWU)	
D	de Villiers	South African Nuclear Energy Corporation (NECSA)	
Immanda	Louw	South African Nuclear Energy Corporation (NECSA)	Pretoria
Arnaud	Faanhof	South African Nuclear Energy Corporation (NECSA)	Pretoria
Chris	Nkosi	South African Transport and Allied Workers Union (SATAWU)	
Hameda	Deedat	South African Water Caucus	
Desmond	D'Sa	South Durban Community Environmental Alliance (SDCEA)	
A N	Ngeyane	Springs Community Police Forum and Transnet Freight Rail Centre	Payneville
Heidi	Stoch	Square One Trust	
Rosemary	Anderson	Stonehaven on Vaal, Emfuleni Tourism Association & Sedibeng Interim RTO	Vanderbijlpark
Len	Jansen	Stop Mining in Magaliesburg Action Group (SMMAG)	Rivonia
Deborah	Lottering	Structured Credit & Finance Solutions Ltd UK & Strategic Int Resources RSA	
Abrie	Lottering	Structured Credit & Finance Solutions Ltd UK & Strategic Int Resources RSA	
Danie	Boshoff	Sun City	Sun City
Isa	Swart	Sun International	Sandton
Solwazi	Majola	Technology Innovation Agency (TIA)	Pretoria
Dirk	Schenk	Tenova Bateman Technologies	
John	Coetzee	Thuthuka Group Limited	Halfway House
Joseph	Gruber	Tiger Chemicals	Johannesburg
Jack	Monku	Tlokwe District Municipality	Vereeniging
Liandi	Bothma	Tlokwe District Municipality	Vereeniging
Kleintjie	Kleinhans	Tlokwe District Municipality	Vereeniging
Ray	van Rensburg	Tlokwe District Municipality	
Ben	Nell	Tlokwe District Municipality	Potchefstroom
George	Wynn	Toga Linings	Standerton
Jafta	Namo	Tongaat Hullet Starch – Klip River Mill	Johannesburg
Lorenzo	Naidoo	Tongaat Hullet Starch – Klip River Mill	Johannesburg

First Name	Last Name	Company	City
Mpho	Maditse	Tongaat Hullet Starch – Klip River Mill	
Andreas	Machinini	Tongaat Hullet Starch – Klip River Mill	Johannesburg
Jaques	Myburg	Tosa Pty Ltd	Johannesburg
Cassie	Smith	Tosas (Pty) Ltd	
Anthony	Turton	Touchstone Resources	Johannesburg
Hesmarie	Pearson	Tox Solutions	Johannesburg
Liza	van der Merwe	Trans Caledon Tunnel Authority (TCTA)	
T	Letsholo	Trans Caledon Tunnel Authority (TCTA)	
T	Mapukata	Trans Caledon Tunnel Authority (TCTA)	
Richard	Holden	Trans Caledon Tunnel Authority (TCTA)	
Nigel	Rossouw	Trans Caledon Tunnel Authority (TCTA)	Centurion
Craig	Hasenjager	Trans Caledon Tunnel Authority (TCTA)	Pretoria
Johann	Claassens	Trans Caledon Tunnel Authority (TCTA)	Centurion
Sean	O'Beirne	Trans Caledon Tunnel Authority (TCTA)	Johannesburg
Sophia	Tlale	Trans Caledon Tunnel Authority (TCTA)	
Wannie	Schribante	Transvaal Agricultural Union Gauteng	
Lynette	Du Plessis	Transvaal Agricultural Union SA	Silverton Pretoria
Bennie	Van Zyl	Transvaal Agricultural Union SA	Silverton Pretoria
Louis	Meintjies	Transvaal Agricultural Union (TAU) and National Water Forum (NWDF)	
Tanya	Goosen	Trendy Trading	
Jannie	Maree	Tshwane University of Technology (TUT	Pretoria
Errol	Hopton	TWP Projects	
Jacques	Hugo	UASA	
C E	Herold	Umfula Wempilo Consulting	
Siyabu	Manona	Umlingo Solutions	
Vuslat	Bayoglu	Umthombo Resources / Steynol (Pty) Ltd	Sandton
Luvhuwani	Mudau	Umthombo Resources / Steynol (Pty) Ltd	Johannesburg
Andre	Venter	United Association of South Africa (UASA)	
J	Hugo	United Association of South Africa (UASA)	
Antoinie	Mulaba	University of Johannesburg	Johannesburg
Francois	du Rand	University of Johannesburg	Johannesburg
Jan	Myburgh	University of Pretoria	Pretoria
Wayne	Truter	University of Pretoria	Hatfield/Pretoria
John	Annandale	University of Pretoria	Hatfield Pretoria
Michael	van der Laan	University of Pretoria / SASRI / Agri Gauteng	Pretoria
David	Roche-Kellly	University of the Witwatersrand	Johannesburg
Kate	Tissington	University of the Witwatersrand	

First Name	Last Name	Company	City
Stephan	Ekulo	University of the Witwatersrand	
Tracy	Humby	University of the Witwatersrand	
Terence	McCarthy	University of the Witwatersrand / Shango Solutions	Johannesburg
Mabutsama	Buang	Vaal Environmental Justice Alliance (VEJA)	
Setjele	Mofokeng	Vaal Environmental Justice Alliance (VEJA)	Sasolburg
Samson	Mokoena	Vaal Environmental Justice Alliance (VEJA)	Sasolburg
Veronica	Malakoane	Vaal Environmental Justice Alliance (VEJA)	
Rhona	Riet	Vaal Environmental Justice Alliance (VEJA)	
Nthabiseng	Leboha	Vaal Environmental Justice Alliance (VEJA)	
Lebohang	Mokoena	Vaal Environmental Justice Alliance (VEJA)	
Temba	Mjikane	Vaal Environmental Justice Alliance (VEJA)	Sasolburg
Booysen	Buang	Vaal Environmental Justice Alliance (VEJA)	
Dimakatso	Tsitsi	Vaal Environmental Justice Alliance (VEJA)	Nelspruit
Phineas	Malapela	Vaal Environmental Justice Forum	Excom
Jan	Jooste	Vaal University of Technology	
J	Human	Vaalchem	
Steven	Vorster	Veolia Water Solutions & Technologies (Pty) Ltd	
Shafick	Adams	Water Research Commission	Gezina Pretoria
Jo	Burgess	Water Research Commission	Gezina Pretoria
Surprise	Letlhake	Water Solutions Southern Africa (WSSA)	
Chris	Schoombee	Water Solutions Southern Africa (WSSA)	
Phil	Van Der Merwe	Watsol	
Mashwambasa	Mpondo	West Rand Agricultural Forum	Westonaria
Wiekus	Myburgh	West Rand District Municipality	Randfontein
Sylvia	Mcungeli	West Rand District Municipality	Randfontein
Herina	Hamer	West Rand District Municipality	Randfontein
Susan	Stoffberg	West Rand District Municipality	Randfontein
Estelle	Du Toit	West Rand District Municipality	Randfontein
Zakhele	Dlamini	West Rand District Municipality	Randfontein
Musa	Zwane	West Rand District Municipality	Randfontein
Louis	Roos	West Witwatersrand Gold Mines	Johannesburg
Bertie	Steytler	Western Utilities Corporation	
Lemson	Betha	Wildlife and Environment Society of South Africa (WESSA)	Bryanston Johannesburg
Garth	Barnes	Wildlife and Environment Society of South Africa (WESSA)	Johannesburg
Karin	Marx	Wildlife and Environment Society of South Africa (WESSA)	Johannesburg
John	Wesson	Wildlife and Environment Society of South Africa WESSA)	Johannesburg
Colin	Coreejes	Witfontein Action Group	Johannesburg

First Name	Last Name	Company	City
Johnny	de Araujo	Witkoppie Farm	Gillview Johannesburg
Tracy-Lynn	Field	Wits Law School	Johannesburg
Grant	Cawthorn	Wits University	Johannesburg
Maryna	Storie	Wits University GPG	Johannesburg
Thomani	Manungufala	Working for Wetlands	Pretoria
Marcus	Wijnen	World Bank	Pretoria
Cathy	Thatsa	World Bank	Lynnwood Pretoria
Manuel	Marino	World Bank	Lynnwood Pretoria
David	Sislen	World Bank	Lynnwood Pretoria
Claus	Astrup	World Bank	Lynnwood Pretoria
Wolf	Pohl	World Bank	Lynnwood Pretoria
Liz	Sherwood	World Bank	Lynnwood Pretoria
Subethri	Naidoo	World Bank	Lynnwood Pretoria
Helena	Naber	World Bank	Lynnwood Pretoria
Marcus	Wishart	World Bank	Lynnwood Pretoria
Joel	Kolker	World Bank	Lynnwood Pretoria
Michael	Webster	World Bank	Lynnwood Pretoria
Pieter	van Rooyen	WRP Consulting Engineers (Pty) Ltd	Pretoria
Gert	Steenkamp	Yeast Pro	Johannesburg
Kobus	van der Westhuizen	Yeast Pro	Johannesburg
Peter	Arderne	Yellow Fish Working Group (FOSAF)	
Charl	van der Merwe	Zincor	Springs

Appendix B

Study Stakeholder Committee Terms of Reference

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 STAKEHOLDER COMMITTEE (SSC)

TERMS OF REFERENCE

1. INTRODUCTION

Acid Mine Drainage (AMD) on the Rand Mining Areas has been a severe environmental challenge for many years. The Inter Ministerial Committee in respect of AMD, provided some direction as toward the way forward. In this regard the implementation of short-term solutions is underway on authority of a directive issued by the Minister of Water Affairs to the Trans Caledon Tunnel Authority (TCTA). Apart from the short-term interventions, long-term solutions need to be investigated. The objective of this study is to determine the most feasible long-term solution to the AMD situation in the West, Central and East Rand underground mining Basins. A feasible solution will be one that is environmentally sustainable, technically sound, economically viable, institutionally feasible and legally acceptable. As such, this study's focus is not only on the technical aspects of a long-term solution (in terms of treatment options), but also on legal, economic, financial and institutional aspects. In addition, it needs to be understood that the Study is one component of the larger picture and that other parallel actions are also in process.

The study goal is to investigate and recommend a feasible long-term solution to the AMD problems emerging in the study area, in order to ensure long-term water supply security and continuous fitness for use of Vaal River water. The study area is restricted to the Eastern, Central and West Rand Mining Basins, to be considered in the context of the Vaal River water supply area.

2. STUDY GOVERNANCE STRUCTURE

Various stakeholders need to be consulted during study execution, while study progress and outcomes also need to be communicated appropriately. As such, the study requires appropriate governance structures. The governance of the study is explained in the attached diagram.

The Minister and the Department of Water Affairs are the organs of state that take responsibility for the Study. The Minister and Department are supported in this process by other stakeholders such as other Government, Semi-Government and private institutions. The Inter-Ministerial Committee (IMC), the Intra-Government Task Team (IGTT) and the Project Executive Committee (PEC) all have specific coordination and control roles in this process. The PEC, IGTT and the IMC need to receive reports from DWA regarding the progress, issues, outcomes and recommendations of the Study.

The Chief Directorate: Integrated Water Resources Planning is supported by the members represented on the SSC. In this regard, the Department is supported by the representatives from different spheres of Government, parastatals and institutions, together with private sector, representatives from industries and non-governmental organisations representing key stakeholders. They need to assist the DWA by providing broad level inputs on impacts, principles, guidance, and direction, etc.

The SMC comprise of Governmental representatives that need to support DWA in the management of the Study on coordination with other parallel actions. Other significant and current parallel actions identified by the IMC that are relevant are for e.g.:

- The short-term intervention actions managed by TCTA;
- The ingress study by CGS;
- Environmental key study by DEA;
- Groundwater monitoring lead by DWA.

There are also other initiatives that are important such as:

- The GDARD study on the rehabilitation of mine dumps;
- CSIR studies;
- Study regarding the Cradle of Human Kind;
- CGS study on ingress, etc.

3. OBJECTIVE OF THE STUDY STAKEHOLDER COMMITTEE (SSC)

The main objective of the SSC is to provide the DWA Study Manager and the Study team with broad based stakeholder inputs to inform the Study and the Departmental actions.

4. FUNCTIONS And RESPONSIBILITIES

Noting that the Study is part of a planning process where different options, perspectives, issues and implications are debated and considered, it will be required that the SSC contribute inputs representing the broader stakeholder perspective, in accordance with the Study Terms of Reference (ToR) and the Study Inception Report.

The SSC will:

- Provide information;
- Contribute broad stakeholder needs and insights regarding all aspects of the Study;
- Provide broad technical insight;
- Provide comments on concepts, principles, and assessments of alternatives from time to time, as may be required by the Study; and
- Participate in focus group discussions.

The SSC will be supported by focus group discussions involving a wider group of representatives.

5. COMPOSITION

The SSC consists of key representatives from both government and the private sector. The intention is not to facilitate general public participation through the SSC, but rather to consult key stakeholders during the study execution. SSC members are to attend on invitation. The Study Management Committee (SMC) recommends the composition of the SSC.

6. CHAIR PERSON AND DEPUTY CHAIR PERSON

- Chair Person: The Chief Director: Integrated Water Resource Planning of the Department of Water Affairs, Mr Solly Mabuda.
- Deputy Chair Person: DWA Director: Water Resource Planning Systems (WRPS), Mr Beason Mwaka or Mr Pieter Viljoen.

7. REPRESENTATION

The institutions that should be represented on the SSC are:

- **DWA Chief Directorate: Integrated Water Resources Planning**
- **Other relevant DWA Chief Directorates, Directorates, Sub-Directorates and Regional Offices,** as required
- **National Government Departments:**
  - National Treasury;
  - Department of Environment Affairs;
  - Department of Mineral Resources
  - Department of Science and Technology
- **Provincial Government:**
  - Gauteng Department of Agriculture and Rural Development

- Gauteng Department of Local Government and Housing – Disaster Management

- **Local and District Government:**
  - South African Local Government Association (SALGA);
  - Affected Municipalities (Johannesburg Metro; Johannesburg Water; Ekurhuleni Metropolitan Municipality; Mogale City Municipality; West Rand District Municipality; Randfontein Municipality) (for inputs on community perspectives; etc.))
  - Ward Councillors and Ward Committees (for inputs on community perspective (Members Mayoral Committee)
- **Parastatals and Utilities:**
  - South African Human Rights Commission;
  - CSIR;
  - Council for Geo Science (CGS);
  - Water Research Commission (WRC);
  - Trans Caledon Tunnel Authority (TCTA)
  - Rand Water
  - World Bank
- **Organised Agriculture:**
  - Agri Gauteng;
  - Agricultural Research Council
  - Transvaal Agricultural Union SA
  - National African Farmers Union (NAFU)
- **Organised Business and Industry & Mining Sector:**
  - NEDLAC;
  - Chamber of Mines
- **Environmental NGOs and Conservation Groups:**
  - Federation for a Sustainable Environment
- **Community Representation**
- **PSP Advisory Committee (**and Team Leaders as and when required)

8. MEETINGS

The SSC will meet about three times during the course of the Study at key milestone dates.

Appendix C
List of Study Stakeholder Committee (SSC) Members

Study Stakeholder Committee for the AMD Long-term Solution Feasibility Study

First Name	Last Name	Company	City
Dirk	Hanekom	Agri Gauteng	Centurion
Yacob	Beletse	Agricultural Research Council - Roodeplaat	Pretoria
Stephina	Mudau	Chamber of Mines	Marshalltown
Antonino	Manus	City of Johannesburg Metropolitan Municipality	Braamfontein
Daniel	Masemola	City of Johannesburg Metropolitan Municipality	Braamfontein
Henk	Coetzee	Council for Geoscience	Pretoria
Phil	Hobbs	Council for Scientific and Industrial Research (CSIR)	Pretoria
Amanda	Britz	Department of Environmental Affairs (DEA)	Pretoria
Susan	Malebe	Department of Mineral Resources (DMR)	Johannesburg
Ethel	Sinthumule	Department of Mineral Resources (DMR)	Johannesburg
Pumeza	Skepe-Mngcita	Department of Environmental Affairs (DEA)	Johannesburg
Henry	Roman	Department of Science and Technology (DST)	Pretoria
Nigel	Adams	Department of Water Affairs (DWA)	Pretoria
Trevor	Balzer	Department of Water Affairs (DWA)	Pretoria
Fanus	Fourie	Department of Water Affairs (DWA)	Pretoria
Jacqueline	Jay	Department of Water Affairs (DWA)	Pretoria
Marius	Keet	Department of Water Affairs (DWA)	Pretoria
Herman	Keuris	Department of Water Affairs (DWA)	Pretoria
Solly	Mabuda	Department of Water Affairs (DWA)	Pretoria
Zacharia	Maswuma	Department of Water Affairs (DWA)	Pretoria
Nancy	Mothebe	Department of Water Affairs (DWA)	Pretoria
Beason	Mwaka	Department of Water Affairs (DWA)	Pretoria
Peter	Pyke	Department of Water Affairs (DWA)	Pretoria
Seef	Rademeyer	Department of Water Affairs (DWA)	Pretoria
Sputnik	Ratau	Department of Water Affairs (DWA)	Pretoria
Rod	Schwab	Department of Water Affairs (DWA)	Pretoria
Anil	Singh	Department of Water Affairs (DWA)	Pretoria
Nematahen i	Thivhafuni	Department of Water Affairs (DWA)	Pretoria
Jurgo	van Wyk	Department of Water Affairs (DWA)	Pretoria
Eddie	van Wyk	Department of Water Affairs (DWA)	Pretoria
Pieter	Viljoen	Department of Water Affairs (DWA)	Pretoria
Elsabeth	van der Merwe	Ekurhuleni Metropolitan Municipality	Edenvale
Mariette	Liefferink	Federation for a Sustainable Environment (FSE) & Public Environmental Arbiters	Rivonia
Koos	Pretorius	Federation for a Sustainable Environment and	Rivonia

First Name	Last Name	Company	City
		MLDPG	
Rina	Taviv	Gauteng Department of Agriculture and Rural Development	Johannesburg
Elias	Sithole	Gauteng Department of Local Government and Housing	Marshalltown
Ariel	Mafejane	Johannesburg Water	Marshalltown
Ntshavheni	Mukwevho	Johannesburg Water	Braamfontein
Stephan	du Toit	Mogale City Local Municipality	Mogale City
Emily	Mathe	Mogale City Local Municipality	Mogale City
Andy	Mathibe	Mogale City Local Municipality	Mogale City
Mahandra	Naidoo	National Economic Development and Labour Council (Nedlac)	Saxonworld
Strover	Maganedisa	National Treasury	Pretoria
Reveck	Hariram	Rand Water	Johannesburg
Tawanda	Nyandoro	Rand Water	Johannesburg
Maliba	Ramatlhape	Randfontein Local Municipality	Randfontein
Zain	Mohamed	Sasol	Sasolburg
Trevor	Stubbs	Save the Vaal	Zuurfontein
Janet	Love	South African Human Rights Commission (SAHRC)	Braamfontein
William	Moraka	South African Local Government Association (SALGA)	Pretoria
Immanda	Louw	South African Nuclear Energy Corporation (NECSA)	Pretoria
Johann	Claassens	TCTA	Centurion
Solwazi	Majola	Technology Innovation Agency (TIA)	
Bennie	van Zyl	Transvaal Agricultural Union SA	Silverton Pretoria
Jacques	Hugo	UASA	Johannesburg
Michael	van der Laan	University of Pretoria / Agri Gauteng	Pretoria
Phineas	Malapela	Vaal Environmental Justice Forum	Excom
Jo	Burgess	Water Research Commission	Gezina Pretoria
Danny	Govender	West Rand District Municipality	
Herina	Hamer	West Rand District Municipality	Randfontein
Mike	Muller	Wits University School of Public and Development Management/National Planning Commission	Bruma Johannesburg
Manuel	Marino	World Bank	Lynnwood Pretoria
Marcus	Wishart	World Bank	Lynnwood Pretoria

Appendix D1

SSC Meeting 1: Invitation Letter, Reminder Letter, Agenda and other information documents

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear

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: INVITATION TO PARTICIPATE IN THE STUDY STAKEHOLDER COMMITTEE

Background:

Acid Mine Drainage (AMD) on the Rand mining areas has become a major environmental challenge. To deal with AMD matters at a high level, an Inter-Ministerial Committee (IMC) comprising of the Ministers of Mineral Resources, Water and Environmental Affairs, Science and Technology and the Minister in the Presidency: National Planning Commission was established. Subsequently a Team of Experts was instructed by a Task Team, chaired by the Directors-General of Mineral Resources and Water Affairs to advise the IMC, in respect of AMD. On 9 February 2011 Cabinet accepted the recommendations of the Team of Experts that outlined short and long-term interventions. The Team of Experts specifically recommended the following short-term solutions, which the IMC approved for emergency implementation:

- Water must be pumped from the three priority basins to maintain water levels at least below the relevant Environmental Critical Levels (ECLs); and
- The water to be pumped will need to be treated to correct the pH and to remove heavy metals prior to it being released to surface water resources

In this regard the implementation of short-term solutions is underway on authority of a directive issued by the Minister of Water Affairs to the Trans Caledon Tunnel Authority (TCTA) for emergency works related to AMD.

Long-term solution feasibility study:

Apart from the short-term solutions, long-term solutions need to be investigated. A team of consultants, led by Aurecon in association with SRK Consulting and Turner and Townsend, and supported by specialists from different institutions, was appointed on 30 January 2012 by the Department of Water Affairs to conduct a feasibility study of the long-term solution for the treatment of the acid mine drainage in the Witwatersrand Goldfields. The team is responsible for conducting this study over a period of 13 months (ending in February 2013).

The objective of the study is to investigate and recommend a feasible long-term solution to the AMD situation emerging in the study area, in order to ensure long term water supply security and continuous fitness for use of Vaal River water. A feasible solution will be one that is technically sound, economically viable, institutionally feasible and legally acceptable. As such, this study's focus is not only on the technical aspects of a long-term solution (in terms of treatment options), but also on legal, economic, financial and institutional aspects. The study area is restricted to the Eastern, Central and West Rand Mining Basins, which will be considered in the context of the Vaal River water supply area. The study is a component of the bigger picture to address the AMD challenge, and runs in parallel with other initiatives such as the short-term interventions, monitoring of the underground mining basins, ingress studies and others.

The feasibility study will to a large extent be based on existing information and monitoring initiatives, and will be informed by technical input and expertise from key role-players in various relevant fields. The Department of Water Affairs has therefore established a Study Stakeholder Committee (SSC) to engage these role-players at certain milestones throughout the study, to obtain their input and workshop the draft outcomes of various key components. At this stage three such meetings are envisaged.

Invitation to participate in Study Stakeholder Committee (SSC):

You, in your personal capacity have been identified as a key role-player in this study. The Department of Water Affairs cordially invites you to participate in the first SSC meeting which will take place on ***2 and 3 May 2012 in Pretoria***.

The objectives of the meeting are to:

- Understand the position of this Study in the context of all AMD management initiatives;
- Introduce the SSC to the Study, its background and the role of SSC;
- Report Progress on the Feasibility Study to the SSC;
- Present the Status Quo Assessment to the SSC and receive comments;
- Discuss alternatives for the long-term treatment, use, discharge or disposal of water and waste;
- Discuss benefits and impacts of the alternatives; and
- Discuss the way forward.

Please let us know if you will attend, by completing the ***enclosed reply sheet*** and returning it to Ms Donne du Toit at email: ddutoit@srk.co.za or fax: 012 361 9912 by ***Friday, 20 April 2012.*** Following your response we will send you a confirmation letter

with the meeting details, agenda, map to venue, and information document to prepare for the meeting.

We look forward to your response and participation.

Yours sincerely

Mr M. Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Project Manager
Date: 11 April 2012

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam,

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

Postponement of Study Stakeholder Committee (SSC) Meeting scheduled for Thursday, 14 February 2013

We hereby inform you that the proposed SSC meeting that is scheduled for Thursday, 14 February 2013 is postponed and will be rescheduled.

The period for completion 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, Gauteng Province has been extended to enable the satisfactory completion of the assignment and provide for adequate time for comments and approval of deliverables.

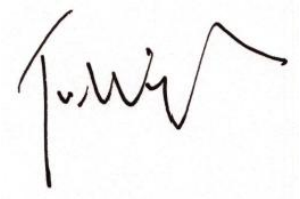
The program and schedule of meetings are under consideration and a new date for the meeting will be set.

At this stage it is suggested that the date of 15 May 2013 be provisionally reserved.

A new meeting request will be sent out shortly. Proceedings of SSC meeting No. 2, which was held in October 2012, will be distributed shortly.

We look forward to your participation.

Yours sincerely



Mr M. Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 5 February 2013

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

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

Information Document

May 2012

Background

Acid Mine Drainage (AMD) on the Rand mining areas has become a major environmental challenge.

Excessive dilution-releases from Vaal Dam will be required to curb the effects of sewage and AMD associated salt-loading on the Vaal River System and to maintain fitness for use of Vaal River water below Vaal Barrage, if these are not addressed. This will also result in unusable surpluses developing in the Lower Vaal River, externalising the cost of pollution to the Lower Orange River. Should the AMD issue not be addressed appropriately by 2014/ 15, water supply security in the Vaal river water supply area may lead to a higher risk of water restrictions.

To deal with AMD matters at a high level, an Inter-Ministerial Committee (IMC) comprising of the Ministers of Mineral Resources, Water and Environmental Affairs, Science and Technology and the Minister in the Presidency: National Planning Commission was established.

Subsequently a Team of Experts was instructed by a Task Team, chaired by the Directors-General of Mineral Resources and Water Affairs to advise the IMC, in respect of AMD. On 9 February 2011 Cabinet accepted the recommendations of the Team of Experts that outlined short and long-term interventions. The Team of Experts specifically recommended the following short-term interventions, which the IMC approved for emergency implementation:

- Water must be pumped from the three priority basins to maintain water levels at least below the relevant Environmental Critical Levels (ECLs); and
- The water to be pumped will need to be treated to correct the pH and to remove heavy metals prior to it being released to surface water resources

In this regard the implementation of short-term interventions is underway on authority of a directive issued by the Minister of Water Affairs to the Trans Caledon Tunnel Authority (TCTA) for the said works.

Long-term Solution Feasibility Study

Apart from the short-term interventions, long-term solutions need to be investigated. A team of consultants, led by Aurecon in association with SRK Consulting and Turner and Townsend, and supported by specialists from different institutions, was appointed on 30 January 2012 by the Department of Water Affairs to conduct a feasibility study of the long-term solution for the treatment of the acid mine drainage in the Witwatersrand Goldfields. The team is responsible for conducting this study over a period of 13 months (ending in February 2013).

The objective of the study is to investigate and recommend a feasible long-term solution to the AMD situation emerging in the study area, also contributing to the long term water supply security and continuous fitness for use of Vaal River water. A feasible solution will be one that is technically sound, environmentally sustainable, economically viable, institutionally feasible and legally acceptable. As such, this study's focus is not only on the technical aspects of a long-term solution (in terms of treatment options), but also on legal, social, economic, ecological, financial and institutional aspects.

The study area is restricted to the Eastern, Central and West Rand Mining Basins, which will be considered in the context of the Vaal River water supply area (see Figure 1). The study is a component of the bigger picture to address the AMD challenge, and runs in parallel with other initiatives such as the short-term interventions, monitoring of the underground mining basins, ingress studies and others.

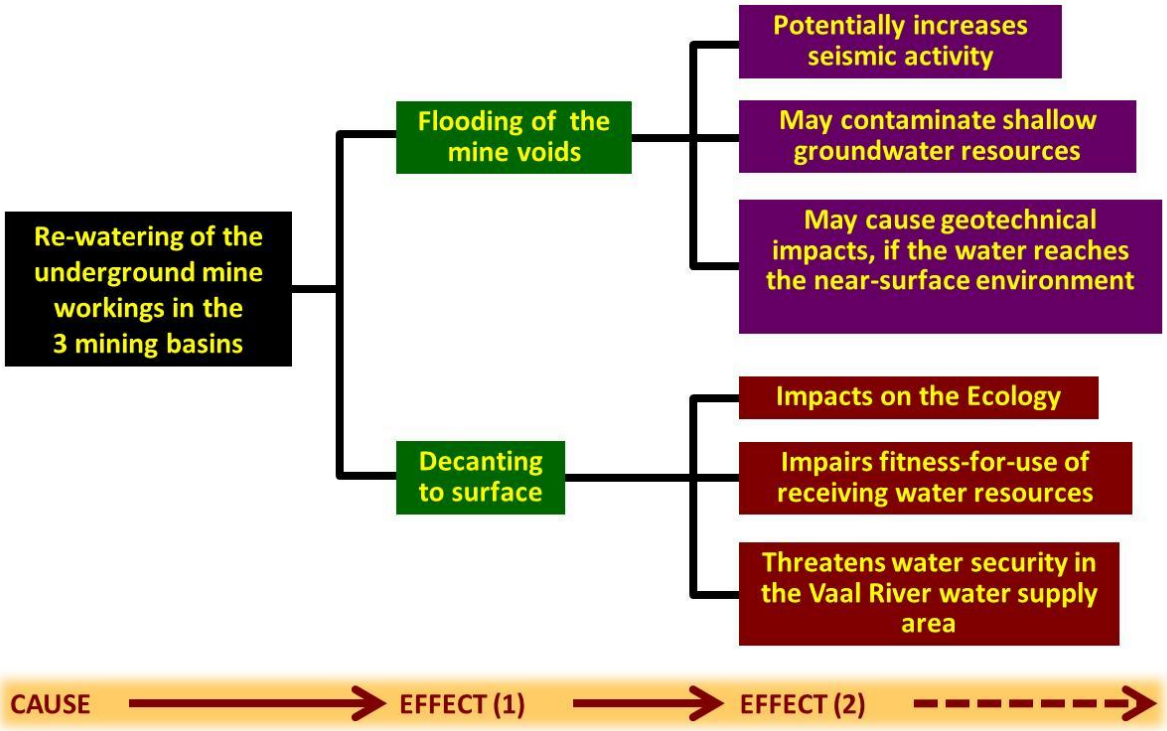
The feasibility study is a planning study and will to a large extent be based on existing information and monitoring initiatives, and will be informed by technical input and expertise from key role-players in various relevant fields. The Department of Water Affairs has therefore established a Study Stakeholder Committee (SSC) to engage these role-players at certain milestones throughout the study, to obtain their input and comments on various key study components.

Vaal River Strategy

It was agreed by the Department of Water Affairs to ensure that sufficient water is available to supply the future requirements of the Vaal River System This requires a five pillar strategy, as below. The long-term solution feasibility study forms part of this strategy:

- Eradicate unlawful water use;
- Reduce water use by 15% through Water Conservation/Water Demand Management;
- Augment water supply through a further Phase of Lesotho Highlands Water Project;
- Establish a Strategy Steering Committee to facilitate Strategy implementation co-ordination; and
- Re-use treated "effluent" (firstly, underground mine water return-flows);

The Problem



Approach and scope of feasibility study

Developing a long-term solution to address AMD requires the careful assessment and integration of the following key elements:

- A sound understanding of the geohydrology, the underground water resource, 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
- Identifying suitable technology options for treating the AMD to standards that can be accepted by the environment or will be accepted by other users.
- Assessment of the options for the location, configuration and infrastructure required to treat the AMD discharges from the short-term intervention.
- Definition of the most desirable management scenario, technical option and end user(s), followed by an analysis of the infrastructure configuration and detailed value assessment of the selection option.
- The assessment of alternative institutional models for implementation, ranging from “traditional” government funded implementation to full private sector implementation, through Private Sector ownership or a Public Private Partnership (PPP), and any combinations thereof.

The most appropriate and sustainable model will be recommended.

The abovementioned steps 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, recommending the most appropriate model for implementation, and in particular assessing the options for a PPP is not a common component of DWA studies and is probably the most challenging and certainly as important for a suitable solution, as all the technical components combined.

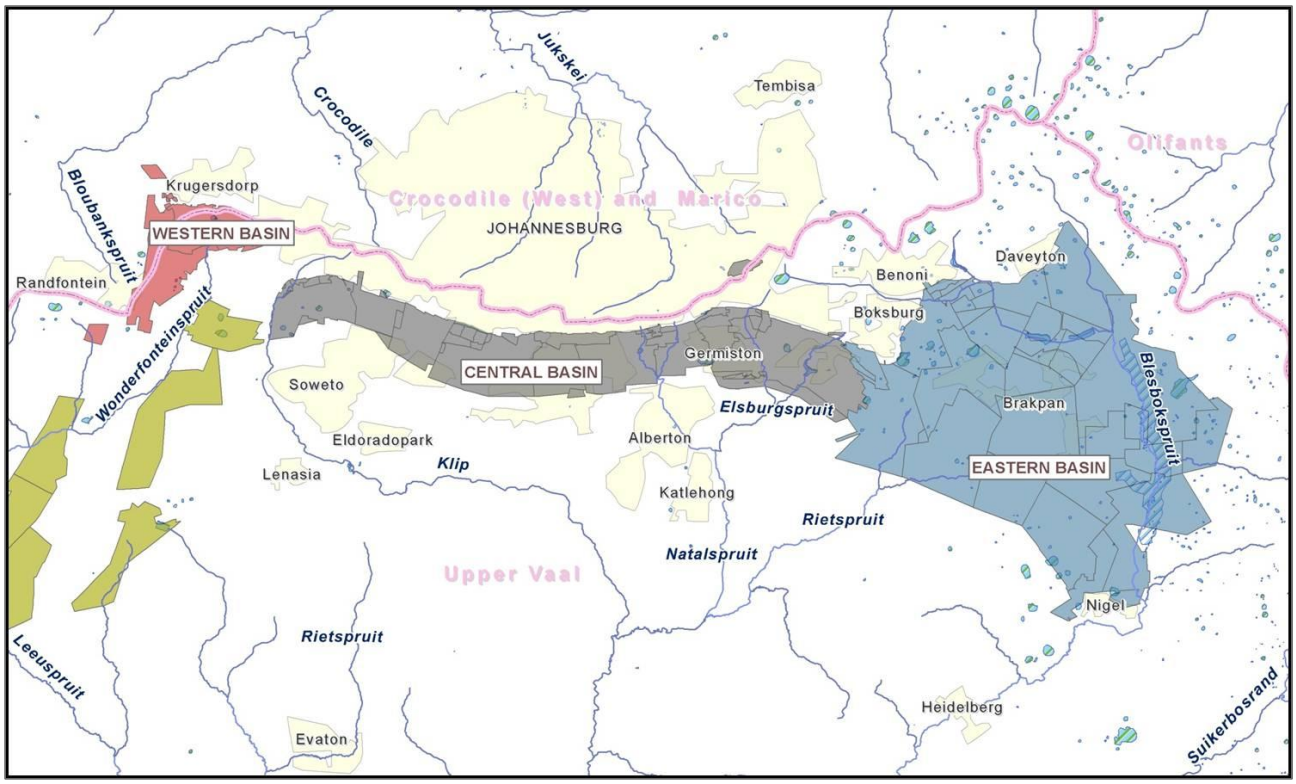


Figure 1: The long term solution study area showing the western, central and eastern mining basins

Components of the feasibility Study

The feasibility study includes the following components

- Identification of Sources of Information – Collection and Evaluation
- Legal Considerations and the identification of mines that have historically benefitted from mining in the study area
- Problem Definition and Status Quo Assessment
- Technology Assessment
- Assessment of Options for Discharge, Delivery, Disposal of Treated Water and Waste Products
- Review of surface water ingress and identify potential mitigation measures for Limiting the Scale of the Underground AMD Problem
- Analysis of Technical Options – Evaluation of Management Strategy and Infrastructure Options
- Evaluation of Alternative Management Strategies and Infrastructure Options
- Concept Development of infrastructure in the Reference Solution Configuration
- Institutional and Financial Aspects
- Implementation options
- Key Stakeholder engagement and communication

The study will be informed by inputs from the Key Stakeholders in the Focus groups and the Study Stakeholder Committee.

The Feasibility Study is scheduled to be completed by February 2013 after which implementation actions will follow. Depending on the early results during the Study, it is possible that certain implementation actions may be taken in parallel to the finalisation of the Feasibility Study.

**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 STAKEHOLDER COMMITTEE (SSC) MEETING: DRAFT AGENDA

08:30, 2 & 3 May 2012, Conference Room GR1 & GR2, Aurecon, Lynnwood, Pretoria

Chairperson: **Solly Mabuda: Chief Director, Integrated Water Resource Planning, Department of Water Affairs**

Meeting Objectives:

- Understand the position of this Study in the context of all AMD management initiatives, including the Short Term Interventions
- Introduce the SSC to the Study, its background and the role of SSC;
- Report Progress on the Feasibility Study;
- Present Study findings to date and receive comments;
- Discuss Alternatives for the Long Term Treatment Use, Discharge or Disposal of Water and Waste;
- Discuss Benefits and Impacts of the Alternatives; and
- Discuss the Way Forward.

WEDNESDAY, 2 MAY

08:30 – 09:00	**TEA & COFFEE**
09:00 – 09:15	**1. WELCOME, APOLOGIES AND INTRODUCTIONS**
09:15 – 09:25	**2. MEETING OBJECTIVES**
09:25 – 09:35	**3. STRUCTURE OF THE MEETING AND ACCEPTANCE OF THE AGENDA**
09:35 – 09:45	**4. MEETING PROCESS AND PROCEDURES**
09:45 -10:15	**5. STUDY GOVERNANCE STRUCTURE, ROLE OF SSC AND COMMUNICATIONS STRATEGY**
10:15 – 10:45	**6. INTRODUCTION TO THE FEASIBILITY STUDY FOR A LONG TERM SOLUTION (LTS)**
10:45 – 11:15	**TEA & COFFEE**
11:15 – 12:00	**7. VAAL RIVER WATER RESOURCE MANAGEMENT STRATEGIES**
	7.1 Large Bulk Water Supply Reconciliation Strategies
	7.2 Integrated Water Quality Management Strategy
	7.3 Discussion

12:00 – 13:00	**8. OVERVIEW OF FEASIBILITY STUDY SCOPE OF WORK COMPONENTS AND PROGRESS**
	8.1 Components, Scope and Status
	8.2 Discussion
13:00 – 13:45	**LUNCH**
13:45 – 15:00	**9. REPORT BACK ON PARALLEL INITIATIVES**
	9.1 Hydrological Monitoring Committee
	9.2 Council for Geo Science: Strategic Water Management Project
	9.3 CSIR: Providing an Integrated response to AMD
	9.4 CSIR: Studies on Cradle for Human Kind
	9.5 GDARD: Mine Residue Rehabilitation Strategy
	9.6 Other ongoing Studies
	9.7 Discussion
15:00 – 15:30	**10. THE SHORT TERM INTERVENTION**
	10.1 Scope, Status and Programme
	10.2 Coordination between Short Term and Long Term Solutions
	10.3 Discussion
15:30 – 15:50	**TEA & COFFEE**
15:50 – 17:00	**11. PRESENTATION AND DISCUSSIONS ON STUDY FINDINGS TO DATE**
	11.1 Introduction
	11.2 Water Quantity and Quality of the Witwatersrand Mine Voids
17:00 – 17:15	**EXPECTATIONS FOR DAY 2**

THURSDAY, 3 MAY

08:30 – 09:00	**TEA & COFFEE**
09:00 – 09:15	**Recap of Day 1**
09:15 – 10:55	**11. PRESENTATION AND DISCUSSIONS ON STUDY FINDINGS TO DATE (continued)**
	11.3 Institutional and Procurement Models
	11.4 Implementation Programme
	11.5 Options to eliminate (or suitably reduce) Underground Mine Water induced salt loading on the Vaal River system
10:55 – 11:15	**TEA & COFFEE**
11:15 – 12:00	11.6 **Alternative Treatment Processes, Products and Possible Locations**
12:00 – 12:45	11.7 **Long Term Waste Disposal**
12:45 – 13:30	**LUNCH**
13:30 – 15:30	**12. ALTERNATIVE SOLUTIONS AND THEIR IMPLICATIONS**
15:30 – 15:50	**TEA & COFFEE**
15:50 – 16:05	**13. NEXT STEPS IN THIS FEASIBILITY STUDY**
16:05 – 16:20	**14. STAKEHOLDER ISSUES AND CONCERNS**
16:20 – 16:50	**15. OTHER MATTERS**
16:50 – 17:05	**16. WAY FORWARD FOR THE SSC**
	• Stakeholder Committee Membership
	• Date of Next Meeting
17:05	**17. CLOSURE**

Abbreviations:

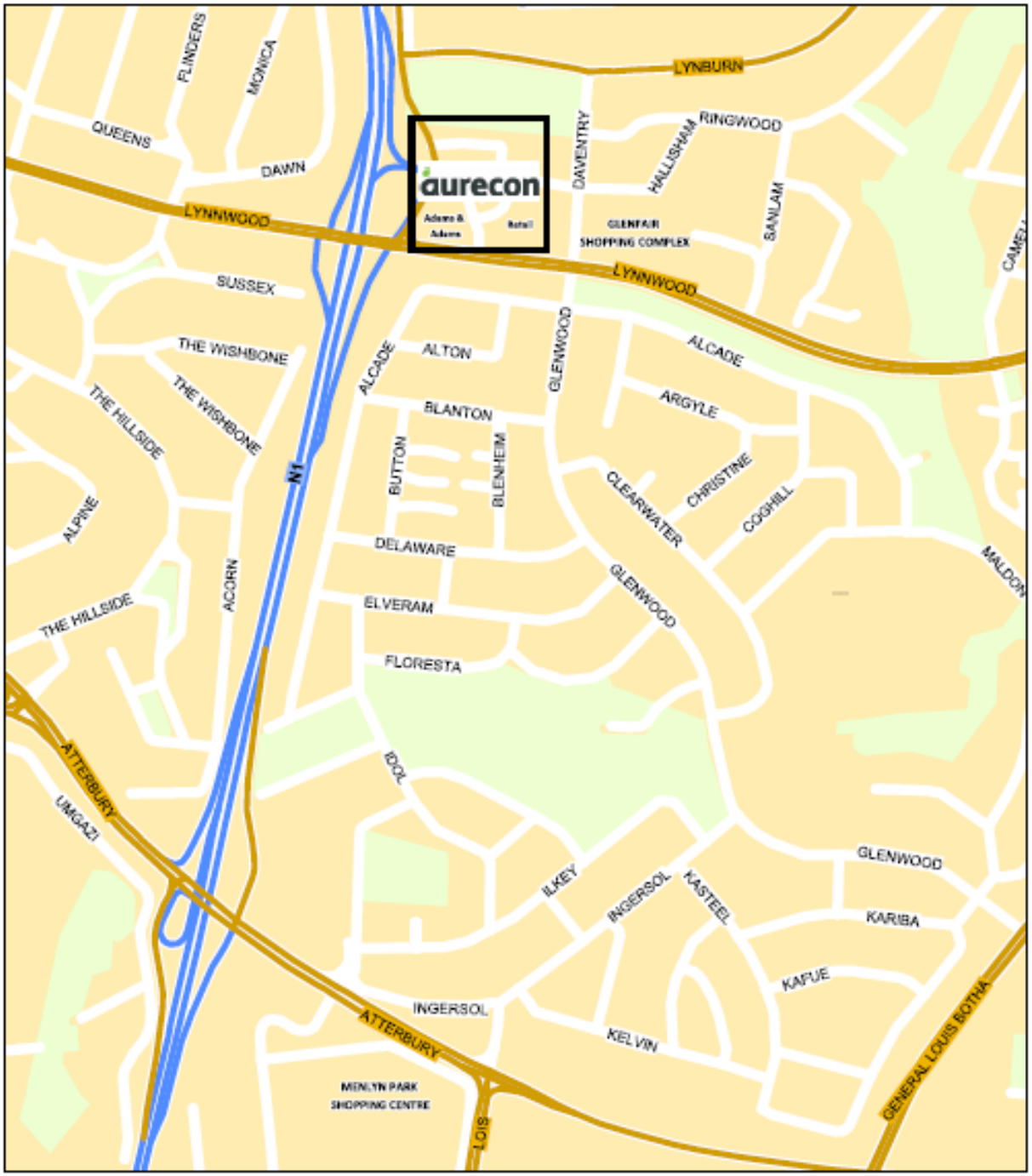
AMD	Acid Mine Drainage
ECL	Environmental Critical Level
LTS	Long Term Solution
SSC	Study Stakeholder Committee
STI	Short Term Interventions

Team Members:

AT	Andrew Tanner
AW	Andrew Wood
DD	Di Duthe
EvW	Eddie van Wyk
HC	Henk Coetzee
IH	Ian Hammond
JC	Johann Claassens
JS	John Samuel
JvW	Jurgo van Wyk
MH	Manda Hinsch
PH	Phil Hobbs
RT	Rina Taviv
SM	Solly Mabuda
SR	Seef Rademeyer
TDT	Dale Timm
TH	Tim Hart
VGB	Van Gend Botha
WJ	Walter Johannes
VG	Viren Gajathar

Distribution: SSC members

MAP TO AURECON OFFICE IN PRETORIA



aurecon

TSHWANE OFFICE

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Lynnwood Manor
0081

25°45'53.64"S 28°16'39.0"E

Appendix D2

SSC Meeting 2: Invitation Letter, Reminder Letter, Agenda and other information documents

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir/Madam,

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

Reminder to participate: Study Stakeholder Committee (SSC): Meeting No. 2

Your participation in the first SSC meeting, held on 2 and 3 May 2012, is much appreciated. At the meeting, SSC members were introduced to the feasibility study for a long-term solution, progress was reported, and comments and inputs were invited to inform the study. Many valuable inputs and sources of information were received from key role-players at the workshop and thereafter. The proceedings of the workshop are enclosed for your information.

Since then much progress has been made on the feasibility study, as outlined briefly in the sections below.

Overview of progress with the feasibility study:

- **Problem definition and status quo assessment:**
  - The first draft of the "*Report on Current Status of Management of AMD"* was submitted to the Department of Water Affairs (DWA) in mid-May 2012 and is currently being revised. The second draft of the report will be made available once completed.

- **Assessment of water quantity and quality of the Witwatersrand mine voids:**
  - The second draft of the report on *"Assessment of the water quantity and quality of the Witwatersrand Mine Voids"* was issued to DWA in August 2012, and also made available to the SSC on the Aurecon AMD web portal (http://aureconit.co.za/amd) and the DWA AMD webpage (http://www.dwa.gov.za/Projects/AMDFSLTS).
  - The existing data on measures to control ingress was summarised and included in the *"Mine Voids"* report.

- **Assessment of options for use, discharge or disposal of treated water and waste products:**
  - Potential recipients of treated water have been identified. These include recipients for potable, industrial, agricultural and environmental use.
  - Discussions with Rand Water regarding the option of Rand Water utilising the treated water for their industrial users and the associated infrastructure requirements of such an option are ongoing.
  - Alternative potential sites for waste storage facilities have been identified, conceptually designed and costed. The sites were subjected to a desk top study and the fatal flaws were identified in terms of the *"Minimum Requirements for Waste Disposal by Landfill (DWAF, 1998)"*. Operating, capital and closure costs were developed.

- The first draft of the Interim (pending further discussions with Rand Water) *"Report on Options for Use, Discharge or Disposal of Water and Waste"* was issued to DWA in early September 2012. This interim draft is being updated and will be available to SSC members shortly. The report will be fully completed once all the inputs from Rand Water and other outstanding information have been obtained and incorporated.

- **Assessment of treatment technology options:**
  - Meetings with numerous providers of a range of technologies have taken place and are still taking place from time to time.
  - The first draft of the *"Report on Treatment Technology Options"* was submitted to DWA at the end of August 2012 and will also be made available on the website shortly.

- **Pre-feasibility study (Analysis of options):**
  - A matrix of development options was developed, combining alternative abstraction points, treatment technologies, water and waste disposal alternatives, etc. Initial screening has reduced this to three to five options per basin and these are being reviewed.
  - The disposal of high density sludge (HDS) was confirmed as a major challenge and provisional costing shows that sludge disposal is the aspect with the largest costs, both capital and operational.
  - Compilation of the Pre-Feasibility Report is at an advanced stage.

- **Institutional and financial:**
  - The **alternative contractual models** have been assessed and it is important for the sustainable management of AMD that operations, design and the supply of technology is an integrated activity. It is evident that a contract in which the overall design, the technology preferred by the bidder (which will meet the specified standards), construction and the operations and maintenance (DBOM) are all combined, will be the preferred model.
  - Preparations for **rapid procurement** have commenced with the submission to DWA of a motivation in support of exemption from TA 1 that will accompany the exemption application to be submitted by DWA to National Treasury. While the exemption does not require that procurement is implemented in terms of the exemption, it does allow early commencement of procurement while complying with Regulation 16 of the Public Finance Management Act, 1999 (Act No. 1 of 1999), as amended (PFMA 1:1999). Rapid procurement will require early decision-making by DWA as to the institutional model to be used.
  - The **legal due diligence** has commenced. This due diligence will be looking at the legal competency of entities such as DWA or Rand Water to contract, the ownership of land and the availability of unencumbered access to the required land by an operator.
  - The **financial modelling** has commenced and the model is being prepared to input the costings from the Pre-Feasibility phase.
  - The economic assessment has commenced which will consider the impact of the project on the local communities in terms of temporary and permanent jobs. It will also review the impact on the economy of not executing the project. This will include the impact of water restrictions that might have to be imposed if desalination is not carried out as well as the bringing forward of major water supply projects in the region to maintain water supplies to Gauteng.

- **Legal considerations and apportionment of liabilities:**
  - The draft *"Legal Considerations for Apportionment of Liabilities"* report has been submitted to DWA for inputs and discussion. This report is confidential at this stage since releasing the information might jeopardise future negotiations with the relevant parties.

Reminder for you to participate in the Study Stakeholder Committee (SSC) Meeting No. 2

The feasibility study team will provide you with further information on the progress outlined above, and also obtain your input and comments on the draft outcomes of the various components of the study.

The Department of Water Affairs kindly reminds you that you have been invited in your personal capacity to participate in the second SSC meeting, which will take place on ***17 October 2012 in Pretoria***.

The objectives of the meeting are to:

- Understand the current position of this study in the context of all AMD management initiatives, including the Short Term Interventions;
- Report on progress of the feasibility study;
- Present technical findings to date and receive comments / inputs;
- Discuss alternative technical options for the Long Term Solution to underground AMD;
- Discuss benefits and impacts of the technical alternatives;
- Discuss alternative institutional, financial and implementation arrangements; and
- Discuss the way forward.

Please let us know if you will attend by completing the ***enclosed reply sheet*** and submitting it to Ms Leoni Lubbe at email: projectadmin@srk.co.za or fax: 012 361 9912 by ***Wednesday, 10 October 2012.*** Following your response a confirmation letter with the meeting details, agenda, and map to the venue will be forwarded to you.

Your participation is much appreciated.

Yours sincerely,

Mr M. Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 4 October 2012

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam,

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

Confirmation of details for Study Stakeholder Committee Meeting on 17 October 2012

Thank you for your response, and accepting our invitation to participate in the Study Stakeholder Committee (SSC) for the AMD long-term solution feasibility study. We trust that you understand that your participation in the SSC is part of a planning process, and that the information presented at the meeting is work in progress, which we would like to discuss with key stakeholders such as yourself, at this early stage in the study. We would therefore appreciate it if information received at this meeting is not distributed to others outside of the SSC at this stage.

We hereby confirm the details of the second SSC meeting as follows:

Date: 17 October 2012
Time: 08:30 – 16:30 ***(agenda attached***)
Venue: Aurecon Office, Lynnwood Bridge Office Park, Pretoria (***map attached***)
Ground Floor (Conference Rooms GR2 & GR3)

Special parking arrangements have been made for all confirmed attendees, as below:

- Please use intercom at the Aurecon entrance booms to contact reception (select “Aurecon” before you push the button).
- Park in Basement Level 1 and take the escalator up to reception
- Report to reception, ***and kindly present this letter***. Your contact person is Joanne Henrico or Leoni Lubbe.
- You will receive a name tag that will give you access.
- On leaving the workshop, please give your name tag to the security guard at the entrance boom to exit the parking.

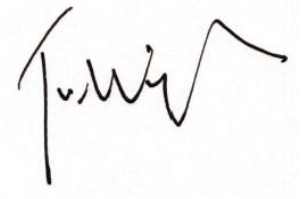
For your information and in preparation for the meeting, we enclose the following:

- Proceedings of SSC Workshop held in May 2012;
- Meeting agenda; and
- Map to Aurecon office in Pretoria.

Should you require any additional information please contact Leoni Lubbe at email: projectadmin@srk.co.za or fax 012 361 9912.

We look forward to your participation.

Yours sincerely



Mr M. Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 15 October 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 STAKEHOLDER COMMITTEE (SSC) MEETING: DRAFT AGENDA

08:30, 17 October 2012, Conference Room GR2 & GR3, Aurecon, Lynnwood, Pretoria

Chairperson: **Dr. Beason Mwaka: Department of Water Affairs**

Meeting Objectives:

- Understand the current position of this Study in the context of all AMD management initiatives, including the Short Term Interventions
- Report Progress on the Feasibility Study;
- Present Study findings to date and receive comments;
- Discuss Alternative Technical Options for the Long Term Solution to Underground AMD;
- Discuss Benefits and Impacts of the Alternatives;
- Discuss Alternative Institutional, Financial and Implementation arrangements; and
- Discuss the Way Forward.

08:30 – 09:00	**TEA & COFFEE**	
09:00 – 09:15	**1. WELCOME, APOLOGIES AND INTRODUCTIONS**	Chair
09:15 – 09:20	**2. MEETING OBJECTIVES**	Chair
09:20 – 09:30	**3. STRUCTURE OF THE MEETING AND ACCEPTANCE OF THE AGENDA**	
	3.1 Structure of the Meeting	TH
	3.2 Acceptance of the Agenda	TH
	3.3 Logistics and Safety	SCV
09:30 – 09:35	**4. MEETING PROCESS AND PROCEDURES**	TH
09:35 – 09:45	**5. STUDY GOVERNANCE STRUCTURE, ROLE OF SSC AND STAKEHOLDER ENGAGEMENT**	
	5.1 Study Governance and the SSC	JvW
	5.2 Key Stakeholder Engagement and Communication	JvW
09:45 – 10:00	**6. UPDATE ON THE VAAL RIVER WATER RESOURCE MANAGEMENT STRATEGIES**	SR
10:00 – 10:20	**7. OVERVIEW OF THE FEASIBILITY STUDY FOR A LONG-TERM SOLUTION (LTS) AND CURRENT STATUS**	
	7.1 Integrated Water Quality Management Strategy	JvW
	7.2 The Feasibility Study for the LTS	JvW
	Discussion	TH

10:20 – 10:50	**8. PARALLEL INITIATIVES**	
	8.1 Report back on the Hydrological Monitoring Committee	EvW
	8.2 Council for Geo Science: Strategic Water Management Project	HS
	8.3 Other Parallel Initiatives	TH
	• CSIR: Providing an Integrated response to AMD	
	• CSIR: Studies on Cradle for Human Kind	
	• GDARD: Mine Residue Rehabilitation Strategy	
	• Other on-going Studies	
	Discussion	TH
10:50 – 11:15	**9. REPORT BACK ON THE SHORT-TERM INTERVENTION**	JC
11:15 – 11:45	**TEA & COFFEE**	
11:45 – 13:30	**10. PRESENTATION AND DISCUSSIONS ON STUDY FINDINGS TO DATE**	
11:45– 11:50	10.1 Introduction	AT
11:50 – 12:10	10.2 Recap of the Assessment of Water Quantity and Quality in the Mine Voids and Options for Abstraction	DD
12:10 – 12:30	**Discussion**	
12:30 – 12:45	10.3 Water Use Options to eliminate (or suitably reduce) Underground Mine Water induced salt loading on the Vaal River system	AT
12:45 – 13:00	10.4 Treatment Processes and Products	WJ
13:00 – 13:10	10.5 Long Term Waste Disposal	TDT
13:10 – 13:30	**Discussion**	
13:30 – 14:00	**LUNCH**	
14:00 – 14:15	10.6 Alternative Solutions and Their Implications	TDT
14:15 – 14:30	10.7 Legal Liabilities – Apportionment of Liabilities	SCV
14:30 – 14:45	10.8 Institutional, Financial and Implementation Arrangements Models	JS
14:45 – 15:00	10.9 Implementation Planning and Programme	AT
15:00 – 15:20	**Discussion**	
15:20 – 15:35	**11. NEXT STEPS IN THIS FEASIBILITY STUDY**	AT
15:35 – 15:55	**12. STAKEHOLDER ISSUES AND CONCERNS**	TH
15:55 – 16:10	**13. OTHER MATTERS**	TH

16:10 – 16:30	**14. WAY FORWARD AND CLOSURE**	BM
	• Stakeholder Committee Membership	
	• Date of Next Meeting	

Abbreviations:

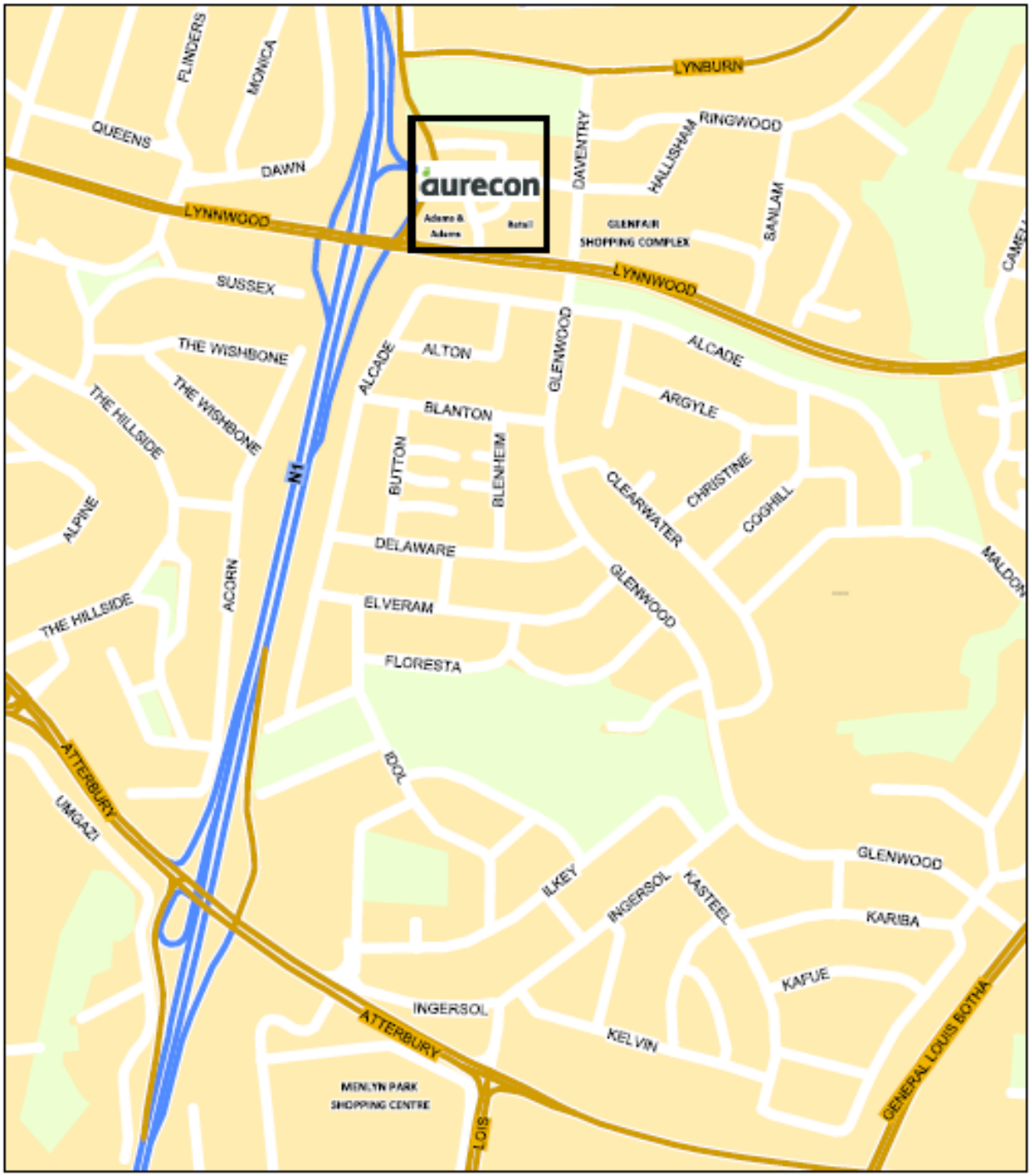
AMD	Acid Mine Drainage
ECL	Environmental Critical Level
LTS	Long Term Solution
SSC	Study Stakeholder Committee
STI	Short Term Interventions

Team Members:

AT	Andrew Tanner
AW	Andrew Wood
DD	Di Duthe
EvW	Eddie van Wyk
HC	Henk Coetzee
IH	Ian Hammond
JC	Johann Claassens
JS	John Samuel
JvW	Jurgo van Wyk
MH	Manda Hinsch
PH	Phil Hobbs
RT	Rina Taviv
SM	Solly Mabuda
SR	Seef Rademeyer
TDT	Dale Timm
TH	Tim Hart
VGB	Van Gend Botha
WJ	Walter Johannes
VG	Viren Gajathar

Distribution: SSC members

MAP TO AURECON OFFICE IN PRETORIA



aurecon

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25°45'53.64"S 28°16'39.0"E

Appendix D3

SSC Meeting 3: Invitation Letter, Reminder Letter, Agenda and other information documents

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam

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

Invitation to participate: Study Stakeholder Committee (SSC) Meeting No. 3 on 16 May 2013

Your participation in the first and second round of SSC meetings, held in May 2012 and October 2012 respectively, is much appreciated. At the meetings, SSC members were introduced to the Feasibility Study for a Long-term Solution, progress was reported and comments and inputs were invited to inform the study. Many valuable inputs and sources of information were received from key role-players at these meetings and thereafter.

Please note that the Draft Proceedings of SSC Meeting No. 2, as well as the meeting presentations, are available to SSC members only on the Aurecon AMD Web Portal. Register for access to the web portal by following the link: http://aureconit.co.za/amd/Public/Default.aspx Access to the site will not be immediate. Please email Mr Johan Van Zyl at johan.vanzyl@aurecongroup.com in order to activate your user permissions after you have registered.

The new date for **SSC Meeting No. 3** has been set for **Thursday, 16 May 2013**. A formal meeting request, invitation and reply sheet with further details will be sent to you shortly.

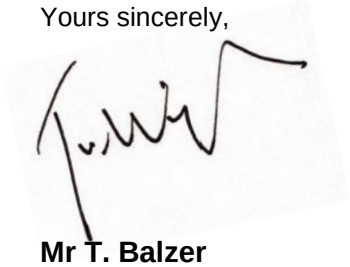
In terms of progress with the study: Phase 1 (study initiation phase) is completed, while Phase 2 (pre-feasibility phase) is in the process of being concluded. Phase 3 (feasibility phase) is the final phase of this study and has commenced. Note that the complexity of the study necessitated an extension of the study contract. The Feasibility Study is due for completion on **31 July 2013** and will, thus, be conducted over an 18 month period.

The updated versions of the AMD Voids Report (Draft 3) have been made available on the website (http://www.dwa.gov.za/Projects/AMDFSLTS).

The draft reports of Phase 2 are expected to be made available to the public in due course, while the Phase 3 reports are expected to be made available towards the end of the study.

We look forward to your participation.

Yours sincerely,



Mr T. Balzer
Acting DIRECTOR-GENERAL
Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 2 April 2013

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam,

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

Confirmation of details for Study Stakeholder Committee Meeting No. 3 on 16 May 2013

Thank you for accepting our invitation to participate in the third Study Stakeholder Committee (SSC) Meeting for the AMD Long-term Solution Feasibility Study. We hereby confirm the details of the third SSC meeting below:

Date: 16 May 2013
Time: 08:30 – 17:00 ***(agenda attached***)
Venue: Aurecon Office, Lynnwood Bridge Office Park, Pretoria
Ground Floor (Conference Rooms GR2 & GR3)

Special parking arrangements have been made for all confirmed attendees, as below:

- Please use intercom at the Aurecon entrance booms to contact reception (select “Aurecon” before you push the button).
- Park in Basement Level 1 and take the escalator up to reception.
- Report to reception, ***and kindly present this letter***. Your contact person is Joanne Henrico, Janette van Zyl or Annerine Prinsloo.
- You will receive a name tag that will give you access.
- Upon leaving the meeting, please give your name tag to the security guard at the entrance boom to exit the parking.

For your information and in preparation for the meeting, we enclose the following:

- Meeting agenda; and
- Map to Aurecon office in Pretoria.

Should you require any additional information please contact Annerine Prinsloo at projectadmin@srk.co.za or fax 012 361 9912.

We look forward to your participation.

Yours sincerely,

Mr T. Balzer
ACTING DIRECTOR-GENERAL
Letter signed by: J.J. van Wyk
Designation: StudyManager
Date: 7 May 2013

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 STAKEHOLDER COMMITTEE (SSC) MEETING – NO 3 AGENDA

08:30, 16 May 2013, Conference Room GR2 & GR3, Aurecon, Lynnwood, Pretoria

Chairperson: **Mr Solly Mabuda: Department of Water Affairs**

Meeting Objectives:

- Understand the outcome of this Study in the context of other Witwatersrand AMD management initiatives, including the Short-Term Interventions
- Describe the Reference Solution;
- Discuss alternative Institutional, Financial and Procurement arrangements;
- Discuss Procurement proposals, programme and responsibilities for implementation;
- Discuss the Way Forward

Duration	Duration		Action
08:30 – 09:00		**TEA & COFFEE**	
09:00 – 09:15	**15**	**1. WELCOME, APOLOGIES AND INTRODUCTIONS**	**CHAIR**
09:15 – 09:25	**10**	**2. MEETING OBJECTIVES**	**CHAIR**
09:25 – 09:30	**5**	**3. STRUCTURE OF THE MEETING AND ACCEPTANCE OF THE AGENDA**	**TH**
		3.1 Structure of the Meeting	
		3.2 Acceptance of the Agenda	
		3.3 Proceedings of SSC Meeting No. 2 (17 October 2012)	
		3.4 Logistics and Safety	**SCV**
09:30 – 09:35	**5**	**4. MEETING PROCESS AND PROCEDURES**	**TH**
09:35 - 09:45	**10**	**5. STUDY GOVERNANCE STRUCTURE, ROLE OF SSC AND STAKEHOLDER ENGAGEMENT**	**JvW**
09:45 – 10:00	**15**	**6. UPDATE ON THE VAAL RIVER WATER RESOURCE MANAGEMENT STRATEGIES**	**SR**
10:00 – 10:25	**25**	**7. PARALLEL INITIATIVES**	
10:00 – 10:05		7.1 Report back on the Hydrological Monitoring Committee	MK
10:05 – 10:10		7.2 Council for Geo Science: Strategic Water Management Project	
10:10 – 10:15		7.3 Other Parallel Initiatives	
10:15 – 10:25		7.4 Discussion	

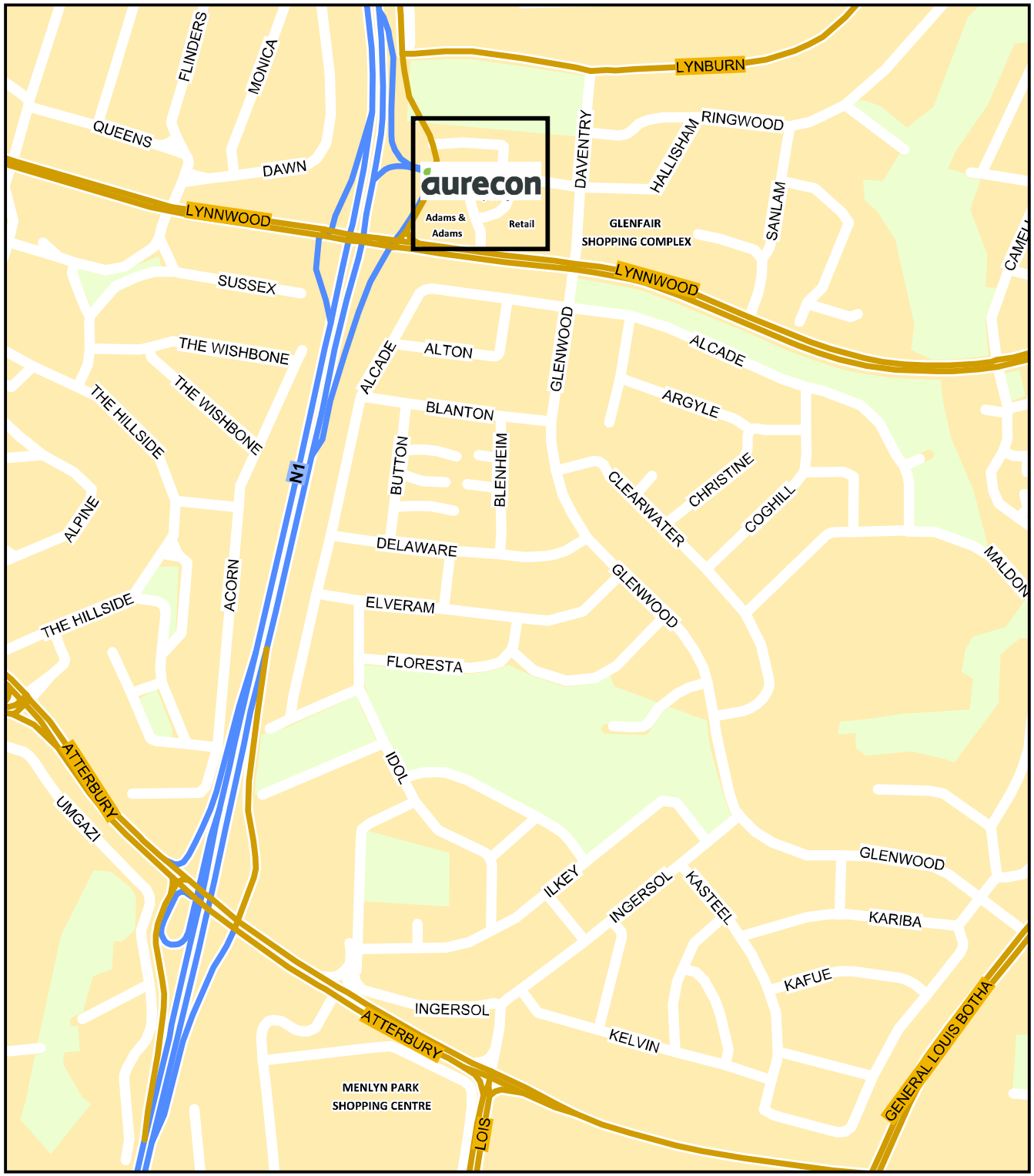
Duration	Duration		Action
10:25 – 11:00	**30**	**TEA & COFFEE**	
11:00 – 11:15	**15**	**8. THE SHORT-TERM INTERVENTION**	**JC**
		8.1 Status and Programme	
		8.2 Discussion	
11:15 – 11:30	**15**	**9. OVERVIEW OF THE FEASIBILITY STUDY FOR A LONG-TERM SOLUTION (LTS)**	**AT**
11:30 – 13:10	**1:30 hours**	**10. PRESENTATION AND DISCUSSIONS ON TECHNICAL STUDY**	**AT**
		10.1 The Reference Solution and Proposals for Implementation • Western Basin • Central Basin • Eastern Basin	
		10.2 Discussion	
13:00 – 14:00	**60**	**LUNCH**	
14:00 – 14:45	45	**11 INSTITUTIONAL, FINANCIAL AND IMPLEMENTATION ARRANGEMENTS**	**JS**
		11.1 Options for Procurement and Funding	
		11.2 Institutional Arrangements	
		11.3 Cost recovery options	AT
		11.4 Discussion	
14:45 – 15:15	**30**	**12 STUDY RECOMMENDATIONS FOR IMPLEMENTATION**	**AT**
15:15 – 15:30	**15**	**13 STUDY FINALISATION**	**AT**
15:30 – 15:45		**TEA & COFFEE**	
15:45 – 15:55	**10**	**14 STATUS OF IMPLEMENTATION ACTIVITIES**	**DWA**
15:55 – 16:25	**30**	**15 STAKEHOLDER ISSUES AND CONCERNS**	**TH**
16:25 -16:40	**15**	**16 OTHER MATTERS**	**TH**
16:40 – 16:55	**15**	**17 THE WAY FORWARD AND CLOSURE**	**CHAIR**
		• Closure	

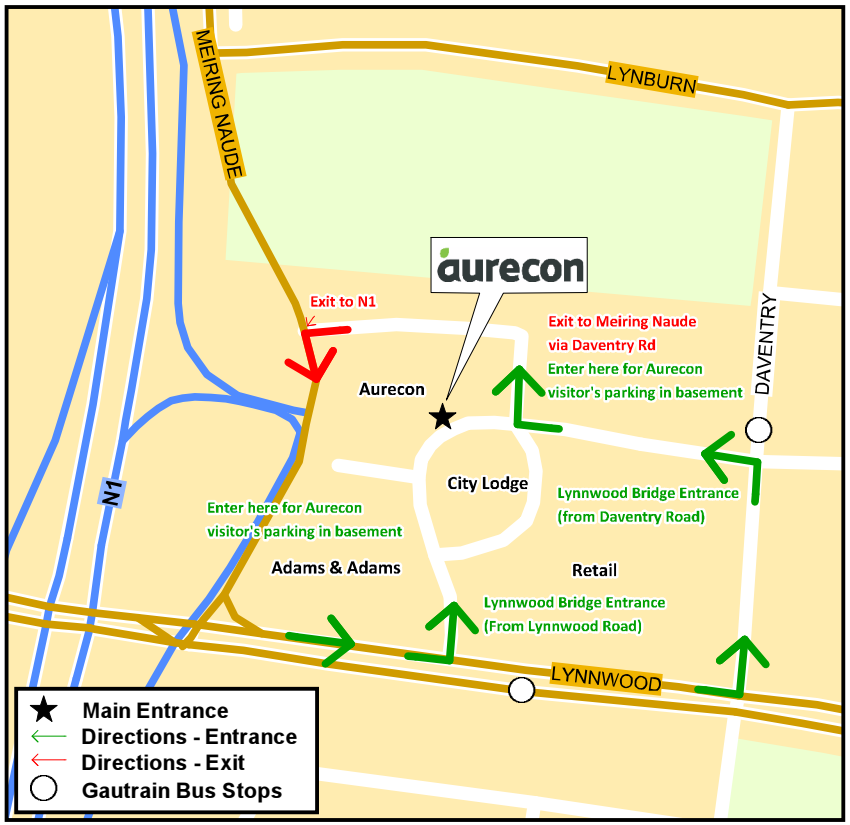
Abbreviations:

AMD	Acid Mine Drainage
ECL	Environmental Critical Level
LTS	Long Term Solution
SSC	Study Stakeholder Committee
STI	Short Term Interventions

Team Members:

AT	Andrew Tanner
JC	Johann Claassens
JS	John Samuel
JvW	Jurgo van Wyk
SCV	Fanie Vogel
SM	Solly Mabuda
SR	Seef Rademeyer
TH	Tim Hart





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Lynnwood Manor
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25°45'53.64"S 28°16'39.0"E

Appendix D4
Photographs of SSC Meetings held


Mr John Samuel


Mr Phineas Malapela

Appendix D5
SSC Meeting 1: Proceedings

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

FINAL PROCEEDINGS
OF STUDY STAKEHOLDER COMMITTEE WORKSHOP

Held on 2 and 3 May 2012

At Aurecon Offices in Lynnwood, Pretoria

Distribution: SSC Members

Table of Contents

List of Appendices

A. Introduction

This document records the proceedings in comment and response report format, of a two-day workshop with the Study Stakeholder Committee (SSC) established by the Department of Water Affairs for the AMD long term solution feasibility study.

The workshop was held on 2 and 3 May 2012 at Aurecon offices in Lynnwood in Pretoria, and attended by 68 people (see **Appendix A** for a list of the attendees). The list also includes apologies, those who declined the invitation, those who did not respond and those absent.

The workshop was facilitated by Mr Tim Hart (SRK Consulting).

Mr Fanie Vogel (Aurecon) outlined the logistical and safety aspects and arrangements for the meeting.

B. Welcome and Introductions

Dr Beason Mwaka (Director: Water Resource Planning Systems, Department of Water Affairs and SSC Deputy Chair Person) welcomed everyone on behalf of Mr Solly Mabuda (Chief Director: Integrated Water Resource Planning, Department of Water Affairs and SSC Chair Person) to the first Study Stakeholder Committee workshop. He request all present to introduce themselves.

C. Workshop Objectives

Dr Mwaka outlined the objectives of the workshop as follows:

- To understand the position of this study in the context of all AMD management initiatives, including the short-term intervention;
- To introduce the SSC to the study, its background and the role of the SSC;
- To report progress on the Feasibility Study;
- To present study findings to date and receive comments;
- To discuss alternatives for the long-term treatment, use, discharge or disposal of water and waste;
- To discuss benefits and impacts of the alternatives (long-term solutions); and
- To discuss the way forward.

D. Workshop Structure and Acceptance of Agenda

Dr Mwaka outlined the structure of the workshop as follows:

Day 1:

- Study Governance, Communications Strategy and Role of the SSC.
- Introduction to the study.
- Context for the study.
- Parallel initiatives and the short-term intervention.
- Assessment of the “Problem” by this study.

Day 2:

- The findings of the study to date.
- Possible alternative solutions identified to date.
- Discussion of implications of alternatives.
- Stakeholder involvement and the road ahead.

Dr Mwaka presented the proposed agenda for the workshop and requested comments and additions from attendees.

E. Comments and Suggestions on the Agenda

Mr Mike Muller, (National Planning Commission) pointed out that it would be important to discuss environmental obligations, monitoring, liabilities and the legal framework within the ambit of this study. Mr Andrew Tanner (Aurecon) confirmed that these items will be covered under the Components of the Study section on the agenda.

F. Workshop Process and Procedures

Mr Hart presented the workshop process and procedures. He explained the contents of the meeting documentation folder, pointing out that an SSC membership nomination form has been included for attendees to recommend additional members for the SSC. Also included is a comments form for those that do not get an opportunity to comment during the workshop.

G. Workshop Presentations and Presenters

The table below lists the presentations made at the workshop and the names of the presenter. Note that the presentations are not appended to these proceedings but will be available to SSC members on the following website your interest at http://www.dwa.gov.za/Projects/AMDFSLTS. Mr Hart pointed out that some of the content in the presentations represent work in progress and is only intended for comment and input by SSC members, at this stage. He appealed to workshop participants to exercise discretion in distributing this information to parties outside of the SSC group.

DAY 1 - WEDNESDAY, 2 MAY 2012	
Presentation	**Presenter**
1. Study governance structure, Role of SSC and Communications Strategy	Mr Jurgo van Wyk, Department of Water Affairs
2. Introduction Feasibility Study for Long-Term Solution (LTS)	
3. Vaal River Water Resource Management Strategies	
3.1 Large Bulk Water Supply Reconciliation Strategies	Mr Seef Rademeyer, Department of Water Affairs
3.2 Integrated Water Quality Management Strategy	Mr Jurgo van Wyk, Department of Water Affairs
4. Overview of Feasibility Study Scope of Work, Components and Progress	Mr Andrew Tanner, Aurecon
4.1 Components, Scope and Status	
5. Report Back on Parallel Initiatives	
5.1 Hydrological Monitoring Committee	Mr Ernst Bertram on behalf of Dr Eddie van Wyk, Department of Water Affairs
5.2 Council for Geo Science: Strategic Water Management Project	Dr Henk Coetzee, Council for Geoscience
5.3 CSIR: Providing an Integrated response to AMD	Ms Bettina Genthe, CSIR
5.4 CSIR: Studies on Cradle for Human Kind	Mr Phil Hobbs, CSIR
5.5 GDARD: Mine Residue Rehabilitation Strategy	Ms Rina Taviv, GDARD
6. The Short Term Intervention (STI)	
6.1 Scope, Status and Programme	Mr Johan Claassen, TCTA
6.2 Coordination between Short Term and Long Term Solutions	Mr Jurgo van Wyk, Department of Water Affairs
7. Presentations and Discussions on Study Findings to Date	
7.1 Water Quantity and Quality of the Witwatersrand Mine Voids	Prof Terence McCarthy, Shango Solutions

DAY 2 - THURSDAY, 3 MAY 2012		
Presentation		**Presenter**
(Presentations and Discussions on Study Findings to Date continued)		
7.2	Institutional and Procurement Models	Mr John Samuel, Turner Townsend
7.3	Implementation Programme	Mr Andrew Tanner, Aurecon
7.4	Options to eliminate (or suitably reduce) Underground Mine Water induced salt loading on the Vaal River system	Mr Andrew Tanner and Mr Viren Gajathar, Aurecon
7.5	Alternative Treatment Processes, Products and Possible Locations	Mr Walter Johannes, Aurecon
7.6	Long Term Waste Disposal	Mr Ian Hammond, SRK Consulting
8.	Alternative Solutions and their Implications	Mr Andrew Tanner and Mr Dale Timm, Aurecon
9.	Stakeholder Issues and Concerns	Mr Tim Hart, SRK Consulting

The table below lists the comments, questions, recommendations and suggestions raised by workshop participants, as well as the responses from the Study Project Team and presenters.

H. Proceedings

DAY 1 - WEDNESDAY, 2 MAY 2012			
QUESTIONS/ COMMENTS/ SUGGESTIONS	**COMMENTATOR**	**RESPONSE/ DISCUSSION**	**RESPONDENT**
1. Study Governance Structure, Role of SSC and Communications Strategy			
Expressed excitement about proposed communication initiatives and wanted to know when the AMD long term solution website would be operational.	Ms Rina Taviv, GDARD	The website is ready to be launched in the first week of May 2012 linked to a particular milestone, namely the call for registration of interest to provide information on potential treatment technologies. However, the latter first needs to be discussed with the Chief Operations Officer of DWA and communicated to the Minister of DWA, before proceeding further. Hence the delay in the launch of the website.	Mr Jurgo van Wyk, DWA
Political counterparts are crucial to this process, and consultation and communication with the political interface must be clear and strategic.	Mr Stephan du Toit, Mogale City Local Municipality	Thank you for this comment.	Mr Jurgo van Wyk, DWA
The Department of Housing and the Department of Health should also be engaged in focus group meetings.	Mr Stephan du Toit, Mogale City Local Municipality	Thank you for this comment. This will be taken into consideration in the stakeholder engagement activities.	Mr Jurgo van Wyk, DWA
Presentations to and consultation with forums is a laudable approach. Please also include the Wonderfontein Spruit and the Mooiriver Forums.	Ms Mariette Liefferink, Foundation for Sustainable Environment (FSE)	It was decided to ensure all the catchment forums in the Upper Vaal are involved to make sure that involvement is comprehensive.	Mr Jurgo van Wyk, DWA
Would it be possible for NGOs and other interested parties to attend DWA media briefings related to AMD issues?	Ms Mariette Liefferink, FSE	In principle, I do not foresee a problem, but will ensure that this request is forwarded to the relevant parties.	
The Draft Regional Mine Closure Strategy for the West Rand and far West Rand, indicated that during heavy rainfall and decant there was seepage into the Wonderfontein Spruit.	Ms Mariette Liefferink, FSE	Thank you for this comment. Issues like these are to be considered during the	Mr Jurgo van Wyk, DWA

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That seepage would then mobilise the elevated levels of heavy metals, which are adsorbed into the sediment.		pre-feasibility part of the study.	
How is communication of specific information being coordinated between the various government departments in Gauteng and the Vaal area who are working on AMD related issues?	Mr Elias Sithole, Gauteng Department of Local Government and Housing (GDLGH): Disaster Management	Strategy Steering Committee, which sits twice a year, oversees the implementation of DWA Strategies, and AMD is one of the components. All the major stakeholders responsible to implement various strategies are involved in this Committee. The Minister and various senior officials are informed of what was discussed at every meeting and also a press release and newsletter are issued after each meeting to provide information and feedback.	Mr Seef Rademeyer, DWA
2. Introduction to Feasibility Study for Long-Term Solution (LTS)			
It is assumed that the mandate of this study excludes the regulation of the already polluted areas, and the diffuse sources. It is noted however that one of the recommendations of the Inter-Ministerial Committee is to also address the diffuse sources of AMD such as the tailings disposal facilities?	Ms Mariette Liefferink, FSE	There are many AMD-related aspects that this study will not address which are being dealt with as part of the bigger picture by other parties such as GDARD, DMR, the DWA Gauteng Regional Office and/ or others. The need to address diffused sources is not included in the scope of this study.	Mr Jurgo van Wyk, DWA
If the Public Private Partnership process runs concurrently with the feasibility study because of time constraints, does it imply that the invitation for tenders will go out during that period?	Ms Mariette Liefferink, FSE	An appointed Transaction Advisor or Project Officer will oversee the tender process, which will also run concurrent with the other processes in order to fast track the process.	Mr Jurgo van Wyk, DWA
Is the apportionment of liabilities part of the mandate of this feasibility study?	Ms Mariette Liefferink, FSE	The study will attempt to identify all mines that have historically benefitted from mining in the three basins, but will not attempt to recover the funds from them. This study will seek cooperation with the private sector and land owners. The apportionment component of the Feasibility Study will enable the Department to estimate the exposure	Mr Jurgo van Wyk, DWA

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		of the State. Inviting financial contributions from the mining sector in the future cannot be excluded.	
The AMD challenges will continue for centuries according to a Water Research Commission (WRC) Report (WRC Report 1215/1/05). Will the feasibility study inform Mine Closure Strategies to address this issue?	Ms Mariette Liefferink, FSE	It is foreseen that the feasibility study will inform the Regional Mine Closure Strategies in respect of AMD handling. DWA has already requested access to the Regional Mine Closure Strategies from the Department of Mineral Resources.	Mr Jurgo van Wyk, DWA
Concerned that since this study only focuses on the three basins, and on the West Rand in particular, which does not even decant into the Vaal River, other areas such as the Upper Vaal around Ermelo are being ignored. This means that the planned long term solution will not fully address the Vaal River situation.	Dr Koos Pretorius, FSE	The three basins have been prioritised as the first step in addressing the current AMD problems. It is acknowledged that the Upper Vaal must also be addressed, and this has been included in the planning for the near future. The Terms of Reference to address the coal mining issues in the Upper Vaal areas has already been drafted.	Mr Jurgo van Wyk, DWA
It is recommend that this feasibility study also look at the Upper Vaal even if it is just to inform decision makers about activities occurring in all areas, because these activities are perpetuating the AMD challenge, and will cause even greater harm in the future. Time is running out.		The three basins which are flooding are receiving immediate attention. Mining operations in the Upper Vaal area are new mining developments, and should comply with the new mining and other regulations. The diffuse sources in the Witwatersrand are being looked at as part of the GDARD research project.	Dr Henk Coetzee, Council for Geoscience
Problems are foreseen with the Public Private Partnership financial aspects as stated in the Terms of Reference document. Financials, models etc. are very important and should not be excluded.	Dr Koos Pretorius, FSE	Noted by the team.	Mr Tim Hart, SRK Consulting
Some operational mines are dumping waste without financial provision. These must also be taken into consideration.	Dr Koos Pretorius, FSE	Abandoned coal mining operations in this area are known. Gold Mines that are operational are being monitored and liabilities are assessed.	Dr Henk Coetzee, Council for Geoscience

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		The DWA Regional Office has also budgeted for further studies on the impacts of coal mines.	Mr Marius Keet, DWA
The potential impacts and risks to infrastructure are of concern. Are these being addressed in the feasibility study?	Mr Ariel Mafejane, Johannesburg Water	The feasibility study will consider all aspects and propose a reference technology for which everything will be costed. Tender and EIA processes will then follow.	Mr Jurgo van Wyk, DWA
		The depth to infrastructure and the levels of excavation are addressed in the determination of safe water levels.	Dr Henk Coetzee, Council for Geoscience
Is there an option to discuss and perhaps change the current Environmental Critical Level (ECL) values that have been set? Will the ECL be included as part of the Terms of Reference for comments and consideration of other options that may arise?	Mr Mike Muller, National Planning Commission (NPC)	The ECLs will be addressed in discussions to follow later during the workshop. Choosing the best pumping levels is part of the Feasibility Study, since the costs associated with pumping constitutes a major component of the foreseen operational expenditure of any solution. The ECLs described in the IMC Report serve as departure point for further consideration when assessing options and solutions.	Mr Jurgo van Wyk, DWA
Rehabilitation is extremely important to discuss, especially in the context of Mogale City as it is currently a major concern for the municipality.	Mr Stephan du Toit, Mogale City Local Municipality	The DWA Regional Office will be doing an impact assessment on the impacts downstream of the decant in relation to rehabilitation issues.	Mr Marius Keet, DWA
3. Vaal River Water Resource Management Strategies			
Are Water Quality Objectives (WQOs) for the Vaal River cast in stone or are they refined from time to time in terms of the needs of the various water users?	Mr Matt Braune, SRK Consulting	The Vaal River Resource Water Quality Objectives (RWQOs) also have to be integrated with the Orange River Strategy and will therefore have to be refined in future, and even might get stricter.	Mr Jurgo van Wyk, DWA
How sensitive is the costing in terms of the WQOs to get the	Mr Matt Braune, SRK	First all the underground mine water induced salts need to be removed from the Vaal River system (probably through	Mr Jurgo van

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water treated?	Consulting	desalination of AMD from the three basins). This will be done to reduce the need for dilution releases. There will also be a reduction in salt load being sent down-stream, with less environmental cost being externalised.	Wyk, DWA
Please clarify the implications and uncertainties in using treated AMD or transfers from the Vaal River to augment water supply in the Crocodile River. Are the uncertainties related to using the stream of treated AMD, or who carries the cost?	Mr Mike Muller, NPC	In terms of the Crocodile – the uncertainty over development in the Lephalale area has an effect on the water which has to be transferred to be used by the residents in that area. It also has an effect on the water available in the Vaal itself. As far as AMD is concerned the intention is that the potable water from the long-term solution will be used by Rand Water or other users in the Vaal Supply area. Water in the central and eastern basins will be used by Rand Water. The western basin is decanting into the Crocodile at the moment, but water will have to be transferred anyway.	Mr Seef Rademeyer, DWA:
Is there an understanding at this stage of where the water which goes into the underground mine voids comes from? Grootvlei mine water was improved because of an instruction from DWA. They addressed the ingress and decreased water pumping. I would like to try and understand the relation of pumping volumes, source of water and the quality of the water which re-emerge from the workings.	Mr Mike Muller, NPC	This question was deferred to a later session in which Prof Terence McCarthy of Shango Solutions will provide answers in his presentation.	Mr Jurgo van Wyk, DWA
It is believed that, in terms of the DWA Reconciliation Strategies, that by 2014/2015 the dilution capacity in the Vaal will be lost. The Lesotho Highlands Phase II will only come on line in 2020. This will result in either water restrictions in the Upper Vaal or poor water quality in the Lower Vaal and Orange.	Ms Mariette Liefferink, FSE	The current practice is to operate the Vaal Barrage at 600 mg/l TDS. No dilution releases are currently being made, which is ascribed to the fact that no pumping is currently taking place. Once pumping resumes again, dilution releases will soon be required. Should this practice continue, water supply security will be at risk. Forecasts indicate that by 2014/ 15 this risk will become unacceptably high. The risk situation applies to the whole system,	Mr Jurgo van Wyk, DWA

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		including water from LHWP.	
There are new applications in the Crocodile River System for new prospecting licenses for gold and uranium. This area is a receptor area of AMD. Would the DWA consider withholding the issuing of water use licenses if it is aware of the implications that this might result in?	Ms Mariette Liefferink, FSE	It is not part of DWAs strategy to withhold the issuance of water use license as this impedes job creation and economic growth. Co-operation between the DWA and mining companies, and limitations around mining thereof, is achieved by using the water use license as a regulatory tool. DWA is presently trying to issue licenses only for initiatives or to institutions which will achieve water quality objectives (WQOs) set by the DWA. This however is not always possible as in some cases there are there are old mines where this practice cannot be applied. New licensing regulations will be applied to new mines so that the WQOs can be met. There are probably high-level discussions with the Minister about certain companies being allowed to mine in the Crocodile Catchment and DWA issuing water use licenses to such mines.	Mr Marius Keet, DWA
DWA's intention to eradicate unlawful water use seems to be focussed only on irrigation farmers. Why is DWA not applying this focus on the mining sector?	Ms Mariette Liefferink, FSE	Irrigation uses large amounts of water, more than any of the other water users, and DWA's focus is on saving water. In terms of the overall strategy, irrigation has to be reduced by 50 %. It will be re-assessed every six months and feedback be provided on achieving targets.	Mr Seef Rademeyer, DWA
How is it determined that 600 milligrams per litre sulphates is fit for use for example, for irrigation, for the ecology and for vending purposes since the World Health Organisation standard is 200 milligrams per litre? Who determined that 600 milligrams per litre sulphates is fit for use?	Ms Mariette Liefferink, FSE	The 600 milligrams per litre fit for use value is for the total dissolved solids (TDS) not for the sulphates alone.	Mr Seef Rademeyer, DWA
There is a grave concern from the Director of Hydrological	Mr Ernst Bertram,	Effective management requires suitable data and	Mr Jurgo van

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Services regarding the need for an extended monitoring network, to be put in place. Consideration must be given to implementing an integrated monitoring strategy.	DWA	information, and the establishment of comprehensive monitoring is supported.	Wyk, DWA
4. Overview of feasibility study scope of work components and progress			
The current South African legislation does not allow for private ownership of the water, and being a provider to either DWA or a Municipality.	Mr Richard Holden, TCTA	All options are being considered, including only infrastructure being privately owned. There are several constraints but everything is being taken into consideration in the study.	Mr Andrew Tanner, Aurecon
It seems to be the assumption that treated AMD is going into potable water supply. People do not necessarily accept that and the public needs to be consulted on that. The recent SANRAL experience being a case in point.	Mr Richard Holden, TCTA	One of the leading options for use of treated AMD is for potable use, in which case the public will be consulted and their concerns and negative perceptions addressed. Other options are also being investigated and the limitations of distribution networks are also being considered.	Mr Andrew Tanner, Aurecon
Concerned that this study is basing ingress, static water levels and ECL on existing information and am keen to see the study coming forward with a proposal for approaches to keep AMD risks in hand, based on certain assumptions. How will the risks be carried forward in the public domain, in terms of the issues related to the money planned on being spent, uncertainties if there is water to treat, what the quality of the water is going to be, and if the 15% water conservations programs elsewhere are going to further contribute to reducing the amount of water being pumped. How are we going to deal with these risks? The risks are that: • there is not enough water; • whether the quality is going to be improved; • if the amount of water available is going to decrease	Mr Mike Muller, NPC	The study is looking at the static water levels and critical levels and the study team recognizes the ingress as a risk. It is the teams aim to assess the current situation and highlight the issues. Dr Henk Coetzee, Council for Geoscience, will address these issues in his presentation. In terms of quality and quantity, the study aims to assess if the proposed solution is robust enough to cope with alternative scenarios and implications.	Mr Andrew Tanner, Aurecon

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further ; and • if water conservation measures are going to be effectively introduced.			
The scope implies that a Public Private Partnership route will be followed, please clarify.	Mr Mike Muller, NPC	No such decision had been taken at this stage, and all options are being investigated. Consideration will be given to a State owned solution, a private sector solution, a PPP solution or any combination in between.	Mr Jurgo van Wyk, DWA
In terms of the recommended or reference solution, it is essential to agree on the governing principles of best environmental options as stated in the Act. It is also important to take the social impacts into consideration, and not only focus on the economic and value assessment.	Mr Stephan du Toit, Mogale City Local Municipality	The value assessment is broad based, different to the feasibility study and the engineering feasibility study, incorporating the risk assessment and risk adjustments.	Mr Andrew Tanner, Aurecon
Why is a process such as this, subject to a confidentiality agreement, when it should be open to discussion? Does the confidentiality agreement allow for inputs from other regulators?	Mr Stephan du Toit, Mogale City Local Municipality	Confidentiality agreement only applies because the feasibility study is at a stage where work in progress is being presented and is not necessarily the final conclusions or recommendations. Also the information being discussed may, for example affect procurement processes. Once reports have been reviewed and approved they will be accessible to key stakeholders for comment and input.	Mr Andrew Tanner, Aurecon
The FSE would also like access to all reports made available from this study?	Ms Mariette Liefferink, FSE	Noted by the team.	Mr Tim Hart, SRK Consulting
Can the many water treatment specialists approaching the FSE with regards to identification and assessment of treatment options, be referred to the feasibility study team? When will the tender process start?	Ms Mariette Liefferink, FSE	Treatment options process has been started by requesting information on treatment technologies and expertise. Please email the details of the interested parties to Aurecon to follow up (amdrsainfo@aurecongroup.com).	
Why is there resistance from the Council for Geoscience in terms of sharing information and making certain reports	Ms Mariette	The Council for Geoscience has a contractual agreement with the Department of Mineral Resources in terms of	Dr Henk Coetzee, Council for

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available?	Liefferink, FSE	releasing certain reports.	Geoscience
Will the disposal of the waste from the short-term interventions be considered and addressed in the long term solutions study?	Ms Mariette Liefferink, FSE	The long term disposal of all waste, including that from the STI, is being investigated. Infrastructure lifetime can be as little as five years or as much as 50 years. We are looking at it in terms of what the life cycle costs will be and what refurbishment cost would be over a 5, 10, 15 and longer periods and what components have will to be rebuilt in the long term. The feasibility study team are looking at the infrastructure of the Short Term Intervention and will consider the integration of infrastructure into the long-term solution, also taking costs of the different options into account.	Mr Andrew Tanner, Aurecon
What happens if the long term solutions study disregards or finds a better option than that currently being implemented as the short-term interventions (STI)? Especially because the short-term interventions are being implemented at huge cost to the tax payer, and have an infrastructure life expectancy of about 30 years?	Ms Mariette Liefferink, FSE		
As the AMD water levels rise, is there potential for radioactivity and radon gas contained in the AMD water to escape and impact on informal settlements in low lying areas?	Ms Mariette Liefferink, FSE	Issues related to gases and other toxic substances are outside the scope of this study, however, the study is looking at Uranium and radioactive constituents in the water, with contact with the Nuclear Regulation and NECSA. Post meeting note: Nuclear Regulator and NECSA were invited to the SSC.	Mr Andrew Tanner, Aurecon
The National Science and Technology Forum (NSTF) has a report of the 21 July 2011 AMD workshop that was held at the Birchwood's Hotel and ORT Conference Centre, Boksburg and was organised by NSTF and South African Agency for Science and Technology Advancement (SAASTA). This report has been made available to the study team.	Mr Mahlori Mashimbye, Department of Science and Technology (DST)	The study team is in possession of the report and is considering the information.	Dr Henk Coetzee, Council for Geoscience
The study team should consider the report from the WRC on Inter Mine Flow in the Witbank Basin, for background	Mr Ernst Bertram,	The study team has looked at that WRC report and will take	Mr Andrew

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information purposes. The report identified mined out areas, areas which will still be mined, and seven points where all the water will gravitate to. This gives guidance of the strategic points where Water Treatment Plants can be constructed, and could minimise the number of Water Treatment Plants needed for AMD treatment.	DWA	into consideration.	Tanner, Aurecon
It is suggested that civil society, and not just government should participate in making the decisions after the scientists have finalised proposed costs, etc.	Mr Ernst Bertram, DWA	The study will present the options and the implications, and the onus is on DWA on how to conduct the decision-making process.	Mr Andrew Tanner, Aurecon
5. Report Back on Parallel Initiatives			
Other on-going AMD studies to be considered in the feasibility study are being undertaken by: • Harvard Law School: Human Rights Division; • Social Environmental Institute at Onderstepoort; • North West University.	Ms Mariette Liefferink, FSE	Thank you for this information	Mr Andrew Tanner, Aurecon
Note that the pH of the water exiting the mine property on the Western Basin is 2 not 5.	Ms Mariette Liefferink, FSE	Water exiting mine workings often has a very low redox potential which is consistent with a more neutral pH. When oxygen is added to this water, the redox potential will rise and the pH will drop. pH is therefore not a very good parameter for the determination of water quality unless other parameters are measured together with it. It is a result of a number of different factors and changes together with other water chemistry parameters.	Dr Henk Coetzee, Council for Geoscience
In terms of removal of tailings storage facilities on the East Rand and the stated improvement in the water quality as a result – please clarify whether in the process of removing the tailings, if the potential for pollution is increased when water and air are introduced into the tailings.	Ms Mariette Liefferink, FSE	Yes, the reaction of water and air with tailings during removal does accelerate the potential for pollution, but it also removes the source of that pollution. The CGS Ingress Study could look at assessing applications to ensure proper removal.	Dr Henk Coetzee, Council for Geoscience

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I have provided the original draft Mine Strategy Reports to Aurecon.	Ms Mariette Liefferink, FSE	Thank you for the information.	Mr Andrew Tanner, Aurecon
There is much concern about diffuse sources of pollution, mine tailings storage facilities and mine residue areas such as waste rock dumps. Funding is required to address these issues.	Ms Mariette Liefferink, FSE	Agree. More funding is required to address the diffuse sources of pollution. Post Meeting Note: Noted.	Ms Rina Taviv, GDARD
Is there confidence in the eco-systems data for the West Rand in order to draw a sound conclusion regarding the influence of AMD on groundwater?	Ms Mariette Liefferink, FSE	Yes, the data is sufficient to have confidence in the evaluation of the impact of AMD on groundwater resources in the Cradle of Humankind. It is part of a longer term monitoring project to gather further data.	Mr Phil Hobbs, CSIR
In terms of the impact of the toxicity of AMD on genes, is the impact of salinity from neutralised AMD on the eco system and humans also been considered? According to a report in 2006, sulphate levels above 650 mg/l will cause non-adaptive diarrhoea.	Ms Mariette Liefferink, FSE	The impact of salinity from neutralised AMD on the eco system and humans will have to be covered in a Human Health Risk Assessment, which is planned for future studies.	Ms Bettina Genthe, CSIR
Is the effect on genes attributable to the variation in chemical quality of the AMD?	Mr Jurgo van Wyk, DWA	This is not certain at this stage because the study has just commenced. Indications at this stage are that the effects on genes of AMD directly discharging from a mine and that of neutralised AMD vary.	Ms Bettina Genthe, CSIR
		Note that CGS is also doing a study on this.	Dr Henk Coetzee, Council for Geoscience
DWA and the Department of Environmental Affairs must work together and both contribute funding towards a solution for the AMD challenge?	Mr Phineas Malapela, Vaal Environmental	The Gauteng Department of Environmental Affairs (GDARD) is involved and has set aside approximately a million rand for rehabilitation of wetlands.	Ms Rina Taviv, GDARD

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	Justice Forum		
The water level rise in the Sterkfontein Caves area is a concern. Is this being addressed by the short term interventions?	Mr Mahlori Mashimbye, DST	The water level rise of 3 metres observed at the Sterkfontein Caves is regional, and affects the whole of that underground water compartment. This is typically the water rise seen on average across that compartment (in some places as much as 6 metres and in others much less than 3 metres). In much of the compartment the rises are natural, bearing in mind that there were two very wet seasons. Undoubtedly part of the rise is due to the mine water ingress which is artificial recharge. There are many boreholes in the area to monitor the situation.	Mr Phil Hobbs, CSIR
6. The Short Term Intervention (STI)			
Will the quality of neutralised AMD be suitable for human consumption?	Mr Phineas Malapela, Vaal Environmental Justice Forum	Anglo American has operational plants treating water from coal mines to potable standards in Mpumalanga, and that water is being used in the municipal water supply.	Mr Richard Holden, TCTA
		Note that the potable water produced in the Anglo American Emalahleni Water Treatment Plant is not neutralised AMD.	Dr Koos Pretorius, FSE
A 24 G application is required for authorisation of the Short Term Intervention. If the plant is already being commissioned then there should be an application. Has this been done?	Dr Koos Pretorius, FSE	From the outset, it was clear that a normal process cannot be followed for the short-term interventions given that these are emergency measures being implemented in extremely tight timeframes. Therefore, a parallel process is being followed. In terms of the law. the options are: • Apply to the Minister for an exemption in terms of Section 110 of the Water Act, or • Follow the 24 G route. The environmental authorities were consulted on the options available to TCTA. It was decided to go the 24G route, but at the moment TCTA is seeking legal advice on	Mr Johan Claassen, TCTA

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		the best option in this regard. The difficulties around a 24 G application are understood and will be kept in mind during the process. TCTA is also mindful of the fact that for the immediate solution, current work in the Western Basin, involves rehabilitation of an existing plant, hence this is not seen as a separate listed activity. This does not need a 24G application, but rather an application for exemption to the Minister.	
Disposal to the Wes Wits Pit is only for non-hazardous waste. Has the sludge from the neutralisation process been classified as non-hazardous for it to be disposed there?	Dr Koos Pretorius, FSE	TCTA has a conditional Directive from DWA, allowing co dispose of the sludge in the Wes Wits Pit. The due diligence review considered options available for such disposal, and disposal to the Wes Wits Pit was identified as the more viable option, contributing approximately 2% of the sludge disposed into the Wes Wits Pit. The other 98% is from the Mogale gold mining activities. The plan is eventually to seal the pit to ensure safe disposal of the sludge.	Mr Johan Claassen, TCTA
It is important to understand the risks associated with the long-term solutions taking longer than 2014/15 to implement, and having the short term interventions continuing into 2015/16/17.	Dr Koos Pretorius, FSE	Taking into consideration the TCTA design criteria the Short Term Intervention can be up to 15 years. The common ground between the processes is that the water needs to be desalinated and the Short Term Intervention could be the first part of the Long Term Solution.	Mr Johan Claassen, TCTA
		The risk highlighted by Seef Rademeyer is based on an average situation, so aspects like wet weather can prolong the process and drought can have the opposite effect. DWA is working with the 2014/15 date as the target and so is the TCTA. I would not like to commit to an implementation date at this stage.	Mr Jurgo van Wyk, DWA
The public participation process for the TCTA project does	Ms Mariette	TCTA has requested DWA to extend the date to allow for	Mr Johan

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not allow sufficiently for input from interested and affected parties to advise the decision making. It seems that decisions with regards to the short-term interventions have already been taken.	Liefferink, FSE	more input from the public. Note that TCTA has not started any disposal into the Wes Wits Pit. Those studies are still being undertaken and disposal activities will only take place once all the studies have been completed.	Claassen, TCTA
The Directive to TCTA for the disposal of the sludge into the Wes Wits Pit expired in around late 2011 or January 2012. In January 2012 a risk assessment had to be done for the radiological risk, for approval by the National Nuclear Regulator. What is the status on this?	Ms Mariette Liefferink, FSE	TCTA received a Directive from the Minister of DWA for a solution to deal with the environmental crisis. TCTA believes that it is executing the necessary actions in terms of that Directive.	Mr Johan Claassen, TCTA
The feasibility study for the Long Term Solution will only be completed in February 2013. What will be done if for example the outcomes of the feasibility study are not compatible with that the Short Term Intervention and associated infrastructure?	Ms Mariette Liefferink, FSE	TCTA is making all efforts to ensure that its project can be incorporated into or used as part of the Long Term Solution. The Long Term Solution is an independent study, done by different consultants. Should there be incompatibility, then the decision would have to be taken at the time in terms of what happens with the infrastructure.	Mr Johan Claassen, TCTA
7. Presentations and Discussions on Study Findings to Date			
• **Water Quality and Quantity of the Witwatersrand Mine Voids**			
It is useful to know that decisions on ECL are quite flexible; however this does not come through clearly in the scope of the feasibility study, which seems to be focussing on a fixed target. Using the Gold Reef City example, we seem to be locked into a process that leads to a solution. As a tax and ratepayer, and a member of the National Planning Commission, I am not sure how many hundreds of millions of Rand a year is worth spending to keep Gold Reef City going as an artificial mine. It probably attracts economic activity,	Mr Mike Muller, NPC	There are other options as well. Especially in the Central Basin there was a plan on the drawing board some years ago to actually allow water to rise to about 100 metres below surface level at ERPM and allow it to decant through a tunnel. The decant would emerge at Elsburg where there was enough elevation to avoid pumping completely, meaning that the mine water at Boksburg would then be filled to 100 metres below surface level. That is another possibility. Post Meeting Note: The recommendations regarding ECLs	Prof Terence McCarthy, Shango Solutions

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but to spend approximately R250 million a year on something that is worth a million a year, is for e.g. not justifiable. The Project Scope needs to reflect aspects such as, the kind of opportunities to consider in the ECL, the uncertainties about how flow rates will change if the water is allowed to rise a little bit further etc. Taxpayers' money could be saved just by being flexible with the ECL. Perhaps there is an opportunity to establish a new ECL now. Cost benefits must be done in a structured way and stakeholders must have input into the process.		will be made in the study.	
If water is removed from the system on the Eastern Basin, by how much is the TDS level expected to drop.	Dr Koos Pretorius, FSE	The problem is that there is little understanding of the source i.e. diffuse or pumped. The time constraints of the study prevent the required careful analysis, to obtain clarity which will ultimately set the limit for how low the water can go, because the dump discharge into the Blesbokspruit and Klipspruit is unknown at present. Mr Jurgo van Wyk has some information on this which will be used in the study.	Prof Terence McCarthy, Shango Solutions
The geothermal gradient will have hot water at the bottom, which means that the top water will not be able to be contained because the hot water will be rising from the bottom.	Mr Ernst Bertram, DWA	The water deep down in the mine is pretty hot, but from all the work that has been done on profiling down shafts there is no indication of convection: It is cool at the top and warm at the bottom. The water is chemically stratified so there does not seem to be any indication of convection. Because of the nature of the void it is doubtful whether there would be much convection. In the future research, one could investigate extracting the heat from that water.	Prof Terence McCarthy, Shango Solutions
Will chemical reactions stay the same with variations in the water temperature and pressure?	Mr Ernst Bertram, DWA	The chemical reactions down there will shut down because all of the oxygen is consumed at shallower levels. The nasty chemical reactions that have produced the problems	Prof Terence McCarthy,

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		occur because of the presence of oxygen. Once that void is filled the oxygen will be consumed and the reactions will stop. I don't think the temperature has an effect on increasing the reaction rate.	Shango Solutions
There is concern that the rapid dewatering may accelerate sinkhole formations. Have provisions been made for damages which may occur? Landowners on the far West Rand were compensated for damages resulting from dewatering.	Ms Mariette Liefferink, FSE	There is only a very small area that could be affected by sinkhole formation like some parts of the Krugersdorp Game Reserve extending upstream to just above the decant point.	Prof Terence McCarthy, Shango Solutions
Monitoring has been done in the West Rand Basin for several years and the results presented at technical forum meetings, but no action is taken about the situation, which is getting progressively worse.	Ms Mariette Liefferink, FSE	The only infrastructure that is at risk of sinkhole formation is the part close to the R24 road which crosses that area. It is important to note that no residential areas will be affected.	Mr Phil Hobbs, CSIR
		Action is now being taken with the emergency measures to pump and treat the water. The goal, being to return the status quo to the beginning of 2001, when the mines were still operational.	Prof Terence McCarthy, Shango Solutions
A team of experts looked at the option of taking the water from the Western Basin to the Central Basin from where it can be geo-hydrologically controlled and managed. Why was that option not pursued? Given the challenges of the Short Term Intervention and continuing to produce neutralised water through the Krugersdorp Game Reserve in a system that is already extremely compromised. What are the options of getting the water from the Western Basin to the Central Basin?	Mr Stephan du Toit, Mogale City Local Municipality	Decanting the partially treated water into the Wonderfontein Spruit system to the west is my favoured option. But the focus is to get the water out of the Vaal River system and reduce the salt levels. Removing the salts completely will ultimately be done as part of the LTS. Because of the sensitivity of the Vaal River System in terms of further increases in the salt-loading, the discharge will be Into the Crocodile system rather than the Vaal.	Prof Terence McCarthy, Shango Solutions
An important factor is public perception. The public, especially in the Roodepoort areas are alarmed and because	Mr Mpho Litlhakanyane,	Media reporters often do not do research, or they provide incomplete or erroneous information, and focus on	Prof Terence McCarthy,

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of reports in the media. The media however does not report on the studies and progress to set people's mind at ease that actions are being taken.	Department of Mineral Resources (DMR)	sensationalizing news. As the process progress DWA needs to be transparent and make information freely available through websites, newsletters etc. to create awareness, improve public understanding of the situation, and of the actions being taken by government to address the situation. Bear in mind that the process is still in the inception phase and DWA is aware that the current public perception issues need to be addressed.	Shango Solutions
Note that DWA set the ECL level, not TCTA.	Mr Richard Holden, TCTA	The driving forces for setting the current ECL levels are: the fact that approximately 3000 people visit Gold Reef City daily, and the desire for Central Rand Gold to mine in the affected area.	Mr Marius Keet, DWA
		Many university students are trained on underground mapping in the Gold Reef City mine and hundreds of school children visit it every day. Gold Reef City has historical significance and cannot be replicated anywhere – it just would not be the same.	Prof Terence McCarthy,
This study should also investigate the possibility of gravity decants in terms of certain declined shafts. This could be a huge cost-saving measure.	Mr Matt Braune, SRK Consulting	The potential for controlled decanting in the Eastern Basin is zero. It could be done in the Central basin – at South West Vertical with a tunnel 100 metres below surface. That would put the water at 100 metres below Boksburg and about 120 metres below Randfontein. It is also possible in the Western basin.	Prof Terence McCarthy, Shango Solutions
What would the cost of such a tunnel be?	Dr Koos Pretorius, FSE	The Council for Geosciences did that study and will most probably be able to provide those figures.	Prof Terence McCarthy, Shango Solutions

CLOSURE OF DAY 1

The facilitator, Mr Hart thanked participants for their time and valuable inputs. He said that he looked forward to their participation on Day 2 as well. The session closed at 17:00.

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7. Presentations and Discussions on Study Findings to Date (Continued)			
• **Institutional and Procurement Models**			
It is important to note that DWA as the legally competent Department holds responsibility as well as accountability for the AMD long-term solution.	Mr Ernst Bertram, DWA	That is correct; DWA would be responsible for representing Government to contract with a private party and the delivery of the project.	Mr John Samuel, Turner Townsend
The focus seems to be on procurement. DWA is not the only responsible department, because DMR is one of the core departments responsible for the long-term solution.	Ms Rina Taviv, GDARD	Realistically there can only be one department which can contract with a private party. Other stakeholders that need to assist DWA as the legally competent department are DMR, National Treasury and potentially other departments or stakeholders. DWA will appointment the contractor and serve as the point of contact for Government.	Mr John Samuel, Turner Townsend
There have already been proposals from the mines etc., which could be utilised as a reference to aid Government to handle this type of project. Why were these not considered in the models?	Ms Rina Taviv, GDARD	The involvement of the private sector such as the mines was considered. That is, the mines partnering with DWA to provide a solution. This model is definitely still an option. There are two different models involving partnering with the mines, one, where an entity is set up to provide a solution, and then procures the actual contractors through open tender processes. The other would just partner and procure through tender processes. These options are still being considered.	Mr John Samuel, Turner Townsend
In term of risk and life cycle costs, did the study determine the latter on the life cycle of the operations or on the life cycle of the impacts over the long-term? Would the operation be based on a non-internalisation of negative externalities cost model?	Ms Mariette Liefferink, FSE	The study will look at the whole life cycle cost, being the capital operating, maintenance, refurbishment and replacement costs across the contract duration. This project is unique in that the problem life cycle runs for an undefined period. Costing will most probably be for 30 to 50 years for	Mr John Samuel, Turner Townsend

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		the life of the infrastructure, which is also the life of the contract. Two aspects are important, one being the whole life costing of the infrastructure and operations, and the other, the socio economic cost of the project (i.e., the benefits of the project, and the costs). Examples of benefits are job creation and skills development, and also the cost of what would happen if the long-term solution is not implemented.	
Since only R433 million is available and R920 million is required needed for the first four years for capital expenditure on the Short Term Intervention alone, which area/ components will be excluded to accommodate this shortfall. Importantly, why is the option of the mines contributing towards the solution and the funding optional not being considered, based on the "polluter pays" principle, which is an aspect of our environmental legislation (Section 28 of NEMA)?	Ms Mariette Liefferink, FSE	From a procurement point of view, the study will indicate the required cost to provide the infrastructure and possibly an on-going revenue stream to the fund short falls. At this stage it is not clear what revenue will be achieved from the apportionment of liabilities and when it will be available, because negotiations with the affected mines will be a lengthy process, and obtaining the revenue is not guaranteed. The solution to the AMD challenge has serious time constraints therefore; the study will put in place the solution against certain funding. If and when the uncertain funding comes in, it would be used to offset any other funding that might be required. In taking this project forward, focus must be on the certainties, and to minimise the impacts of uncertainty.	Mr John Samuel, Turner Townsend
Why were other processes and revenue sources for e.g. TCTA and Rand Water (as a public entity) not considered in the comparison of financial and procurement models?	Mr Richard Holden, TCTA	DWA will use an implementing agent, whether it was government funded or not. If the implementing agent is TCTA, it effectively means that DWA is implementing the solution. If a loan is taken out by TCTA or Rand Water directly - that would have to be signed off by the Minister of Finance. If TCTA or Rand Water does it on a project financed basis, essentially what they have set up is TCTA	Mr John Samuel, Turner Townsend

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		or Rand Water as private sector SPV with the loan underwritten by Government. In this model there is no risk transfer by government and government is essentially carrying out the work itself through a public entity.	
TCTA's experience on partnering with the mines is that they will most probably partner if there is commercial benefit in doing so. This means, firstly if they require the water, secondly if they have an interest in mining the area, if the project will allow them to do so. Thirdly if they can walk away after implementing the solution without carrying any future obligations to pay for AMD. This leans more towards the Western Utilities Corporation proposal. Regardless of what the institutional model is selected, the fundamental issue is the income stream. Success of the transaction depends on a secure income stream for a sustainable long-term solution. The State cannot be excluded from responsibility and risk to give the necessary assurances to whoever implements the project that there will be sufficient funding or income to repay the liabilities which is raised in order to support this project.	Mr Johan Claassen, TCTA	There are no absolutes in this. The income stream is necessary to offset the repayment and operating costs and to maximise the revenue stream, which means minimising other funding which needs to come in. Unfortunately there is no risk free solution. Government will always hold some risk in whatever solution is selected. It is a balance between the transfer of risk and cost, and to maximise the revenue stream to minimise the liabilities. This is part of the current feasibility process, which correctly identified that there are no absolutes.	Mr John Samuel, Turner Townsend
It is important to bear in mind that this study is about effectively cutting off the largest single source of contamination to water systems. There are also many other initiatives addressing other issues of pollution around mining. Therefore the AMD issue must be seen in the context of all these initiatives too. In terms of who owns and who accepts the risk. The proposal presented by the mining industry to the team of experts mentioned that if the State is willing to accept some of the water it would be easier for the private sector to fund it	Dr Henk Coetzee, Council for Geoscience	It is recommended that all other sources of income be included for consideration in the study. The "polluter pays" principle must also be considered as a possible income stream, to address a potential shortfall between the cost of treating the water and the cost of selling it. Also to be considered as part of this study is the possibility of an environmental levy which is being investigated by DWA and DEA.	Mr Jurgo van Wyk, DWA

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and make money from it. It is important to remember this transfer of risk aspect. At current estimates, there is no off-the-shelf technology which is going to produce potable water from AMD for less than Rand Water can supply it from the Vaal River.			
The Long Term Solution study team must take into consideration the guidance provided during earlier engagements with the Ministers of the DMR and DWA. The team is also recommended to include and design an interim step to follow the procurement of the short term solution and decide on how to take that forward. There was a request from the Ministers to put out a request for proposals at an early stage in the Long Term Solution study, which might lead back to one of the two options that were put out as solutions today, being the PSC option or the Public Private Partnership (PPP) option. Government is inundated with numerous requests and proposals from various parties, and the Long Term Solution study team needs to put out a RFP for treatment technologies as part of the procurement process, as soon as possible so that feedback can be given to the Minister within the next month or two on how that option will be taken forward.	Mr Trevor Balzer, DWA	Some of these issues will be discussed in the next section under implementation. The request for proposals is being considered as part of the normal implementation programme. Many people are offering solutions, some may or may not be viable technical solutions. The Long Term Solution study team's proposal is for DWA to issue request information (RFI) from those who are interested in participating in any part of the project, be it funding, implementing, treating, operating or constructing, to identify potential interested parties and alert the market The (RFI) documentation is ready to issue as soon as it has been approved. This is seen as a pre cursor to procurement with the objective of informing the feasibility study. It precedes the procurement process. Any subsequent procurement process will leave room for design or construction or operation contracts, or any combination to be used. Whether to start with a request for qualifications, which is preferred, or go straight to a request for proposals, which is still open to anybody, for a public private sector partnership if that route is to be followed must still be decided The request for information and understanding what the viable solutions are, will be valuable input on all the issues.	Mr Andrew Tanner, Aurecon
Going forward, AMD must be seen as a possible opportunity for a utility to implement. One of the concerns in terms of the PPP model is putting a utility service in the hands of the private sector. Also, consider whether that or the PSC model is better suited to use in one of the State owned utilities which is already in place in terms of implementation.			

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The funding model must be looked at quite early in the assessment of the procurement solutions. In the PPP, a particular funding scenario is being looked at, but other funding options must be considered too in terms of whether private funding will be used or if Government should be raising it as debt. At the end of the day, someone has to pay, whether it is the consumer, or Government recovering deficits, which will not be able to be recovered from the consumers. The funding model must include issues like what the contribution is, is there a contribution that could come from the mines, and also what is the type of contribution that might come from an environmental levy in the longer term.	Mr Trevor Balzer, DWA	Agreed and noted.	Mr Andrew Tanner, Aurecon
The Long Term Solution must not be seen as a stand-alone project. AMD must be looked at in terms of the overall Vaal system augmentation. Whatever is taken out and treated as AMD, means freeing up some of the water from the Lesotho Highlands water project, which is used for diluting poor water going into the Vaal system. This opportunity must be looked at in terms of the funding options.	Mr Trevor Balzer, DWA	Agreed and noted.	Mr Andrew Tanner, Aurecon
The RFP must be part of the procurement programme.	Mr Trevor Balzer, DWA	If an RFP has to be issued now, there must be clarity on what is required in the proposals in terms of: • the evaluation criteria, • the deliverables from the contract, • the required water quality from the treatment processes, • the users or recipients of the water, • which treatment processes are acceptable. What would the rules be to compete? Will it be a tender	Mr Andrew Tanner, Aurecon

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		process or could a single negotiated offer be accepted, which could be quicker but, which is most probably not an acceptable procurement process. The understanding is either that al; the rules are defined during the study, and the RFP process starts as soon as possible, and that could be in parallel with the study. In the implementation programmes, there are timelines, showing the possibilities of such processes.	
There is no decision taken that the PPP is the way going forward. The Long Term Solution team needs to design a process around the RFP process	Mr Trevor Balzer, DWA	More details of the expectations in this regard are required so that the Long Term Solution team can design the right vehicle for the process.	Mr Andrew Tanner, Aurecon
It is important not to confuse some of the instructions and directions given by DWA Principals. Testing the technology options out there in terms of requesting information for solutions will confuse the RFP process. For this reason, the IGTT was advised that the RFP should go out as soon as possible. That position stands.	Mr Trevor Balzer, DWA	The RFP process can run in parallel with the Feasibility Study. The RFP step is one of the key milestones in both the PPP process and under a conventional implementation scenario. The process followed will advise on the best institutional model to be recommended, and does not necessarily imply that a PPP solution is favoured at this stage. The Long Term Solution study team is not ready to go out on a RFP yet, since the specifications, forming part of such a RFP, are not available at this stage, and as the mentioned specifications are still to be informed by the outcomes of the Feasibility Study. The next presentation will show the conventional process of procuring versus the fast track process to bring the RFP process forward. It should also be noted that there are risks associated with the fast tracking options. It is recommended that certain implementation activities already be initiated to run in parallel with the Feasibility Study in order to fast track Long Term Solution roll-out. The 2014/15 date is the driver behind the Long Term Solution	Mr Jurgo van Wyk, DWA

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		Feasibility Study. The fast tracked processes may bring the RFP process forward. There are a number of steps to be taken before the RFP can go out. It will take approximately four months before the team could be in a position to go into the fast track process with the RFP. The call for registration of interest is not linked to the RFP process. It is just putting the request out there to get information on any solutions which are available in the open market to assist the team to analyse the technology and so forth.	
• **Implementation Programme**			
Does the programme included consultation and participation before decision-making.	Ms Mariette Liefferink, FSE	Key stakeholder consultation is taking place during the feasibility study. At the end of the Feasibility Study, the project goes out to design with an EIA process assessing the feasibility layout. Formal public consultation processes take place during the EIA process.	Mr Andrew Tanner, Aurecon
There is concern about the timeframes and the process extending up to 2017.	Mr Phineas Malapela, Vaal Environmental Justice Forum	The study is looking at other options to see how we can shorten the timeframes, by having parallel processes.	Mr Andrew Tanner, Aurecon
Please clarify the RFP and whether it is a specific step within the Treasury process. Is this the same as what Mr Balzer and the Minister have in mind? Are the uncertainties in this regard specific on the Long Term Solution or more on the Short Term Intervention side? As can be seen, the Long Term Solution has uncertainties for e.g. the quality of the water to be delivered. In terms of the Short Term Intervention, there are more	Mr Marius Keet, DWA	In the traditional procurement process, an RFP is issued and consultants are appointed to do the tender design and to prepare tender documents for construction. It could become an RFP for a combined design, construct and operate and maintain contract. We have not looked at the implications on the programme with that route at the moment. This RFP is not the same process Mr Balzer refers to. There is need to look at the traditional procurement process	Mr Andrew Tanner, Aurecon

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uncertainties related to issues like building a tunnel, raising the ECLs, where to pump from etc. Why can the Long Term Solution study not go out with a full RFP in November 2012? This would be in response to the Minister's instruction. It is possible to go with Mr Balzer's recommended route, but risks must be spelt out to the Minister. The risks must be managed to make this work. The Minister has to be informed if it is not possible to go with the chosen route.		(traditional being government funded) when this RFP could be for the total solution for design, construct and operate as a contract for one service provider. Again, there is need to know the deliverables required from the process and define standards, otherwise the result will be bids that cannot adjudicated and a contract that cannot be managed.	
		An RFP for a solution requires a lot of information and the defined objective of the RFP. This needs to be unpacked and understood i.e. a solution which is a RFP in a Government funded project, rather than a Public Private Partnership project. The rules are different and this issue cannot be resolved in this meeting.	
What seems to have been presented is a solution after the technology has been chosen. Please clarify.	Mr Elias Sithole, Gauteng Department of Local Government and Housing (GDLGH): Disaster Management	The feasibility study will recommend a solution in terms of abstraction points, treatment process, delivery points and provide a feasibility study level design. At that point, the consultant can start preparing designs and tender documents to go out on tender for construct and, if agreed operate the preferred solution if that is the selected procurement process. Currently technology is being assessed on the basis of performance, whole life costs and other implications. It is envisaged that in September 2012, the Long Term Solution study will have identified preferred or acceptable technologies and a reference project with the implications of each.	Mr Andrew Tanner, Aurecon
		The solution to this problem is not simply choosing the correct technology, getting it implemented and letting everything else flow from it. There are so many proposed technologies. Some make sense, some are expensive, some are experimental and some almost impossible. The concern here is that one service provider supplies an	Dr Henk Coetzee, Council for Geoscience

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		excellent financial proposal on an easy but expensive technology, while another provides a technological solution without the other supporting project components. There may be a need to bring in options from different service providers to construct an optimum solution.	
If the quality of water available from the Short Term Intervention is defined and the quality of water required is specified, then the RFP should request appropriate funding and technology model to obtain the ultimate water quality required. This is the turnkey solution Mr Balzer refers to.	Mr Johan Claassen, TCTA	The recipients of the water have not yet been agreed and waste disposal is a major issue. An EIA is also required	Mr Andrew Tanner, Aurecon
It is my understanding from previous discussions that there will be a RFP to the markets for the turnkey solution. In order to do that, there is need to stipulate what the quality of the water available would be, quality required and decide on a comprehensive solution.	Mr Marius Keet, DWA	Agree, but there is also need to know where or to whom the water is going to, and to sort out the land issues first, before the RFP goes out.	Mr Andrew Tanner, Aurecon
The traditional route should include how the technology will be procured and specify the technology. It is not included in Long Term Solution study programme. Why is a design engineer required to do the design, when the party applying the technology should be responsible for the design? That will transfer the risk to them.	Mr Craig Hasenjager, TCTA	The feasibility study would give a recommendation, and might not specify the technology, but rather the process. Agree that this has to be specified. Normally the technology supplier would design the treatment plant. The exact procurement model in either process still needs to be debated, and the options are still open.	Mr Andrew Tanner, Aurecon
When does the dilution of releases have to start? If the Short Term Intervention is delayed there will be more time, before dilution, but if the Long Term Solution is not in place by the 2014 date then significant dilution will be required. The Short Term Intervention and the Long Term Solution should be separated because the deadlines are being confused. It should be decided if the RFP is for the Short	Ms Rina Taviv, GDARD	The dilution needs to start as soon as the Short Term Intervention is implemented in mid-2013, and the neutralised water is discharged into rivers. Dilution needs to take place as this water reaches the Vaal Barrage. There is only assurance of sufficient water in the system until 2014. After that there will be a risk of not being able to meet the assurance of supply to the users and make releases for	Mr Andrew Tanner, Aurecon

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Term Intervention or the Long Term Solution.		dilution. The tenders were already issued and evaluated for the Short Term Intervention. The Short Term Intervention is ready to be awarded and this solution which neutralises the water will be implemented, construction commenced, as soon as the tenders are awarded. Construction of the Short Term Intervention in the Central Basin will be completed and ready for commissioning in July 2013. The RFP is for the Long Term Solution and will consider how the Short Term Intervention fits into it.	
The Short Term Intervention is a given, because the contracts have to be awarded. ECLs can be dealt with later. The treatment plants have to be built and if necessary pump the water from a lower level later on.	Mr Marius Keet, DWA	Whatever the Long Term Solution is, for example, if it is decide to put in a tunnel for the Western Basin, the tunnel cannot be constructed while the Basin is full of water. The water needs to be pumped, the water level dropped and the decant stopped. Before look at the tunnel option can be assessed the ECL need to be decide on. A tunnel at a low level to cover all the risks will be a long expensive tunnel. A tunnel at a higher level would be more cost effective but later on that tunnel cannot be dropped if the ECL needs to be dropped. The same applies to the other Basins. A tunnel could not have been constructed in the Short Term Intervention because the investigations and designs would take too long. It was not an option for achieving the mandate of the Short Term Intervention to prevent breaching the ECL. The feasibility study team is trying to establish how to take the Short Term Intervention forward into the Long Term Solution. The study needs to address all the implications with requests for proposals and understand all the issues	Mr Andrew Tanner, Aurecon

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		which need to be addressed so that the rules can be set before putting out proposals.	
If there is clarity on the Short Term Intervention, is it certain that money has to be spent on dilution. Is dilution really necessary and is it the most cost effective route? Was there an assessment of the cost implications of running a dilution plant for a few years?	Ms Rina Taviv, GDARD	There will be increased salt loads in the Vaal Barrage if there is no dilution.	Mr Andrew Tanner, Aurecon
		The salinity will also have implications for the water users downstream.	Mr Seef Rademeyer, DWA
• **Options to eliminate (or suitably reduce) underground Mine Water induced salt loading on the Vaal River system**			
Was consideration given during the PPP process discussions, of the possibility that the mines might contribute due to the fact that according to the MPRDA, the DMR via Minister of Mineral Resources will be able to liquidate a certain amount of trust funds in the case of an environmental emergency?	Ms Mariette Liefferink FSE	The possibility of whether that funding can be accessed was identified and is being investigated.	Mr André Hindley, SRK Consulting
		Rehabilitation Trust Funds are not arbitrary amounts of money which. They are structured around certain rehabilitation actions. If some of the money is made available for this project, other projects already planned for will not be able to happen, resulting in other environmental degradation.	Dr Henk Coetzee, Council for Geoscience
There is an appeal to all organs of State and decision-makers that all information particularly about the risks of the project should be clearly and truthfully communicated to the public. This is so that the public do not become complacent.	Ms Mariette Liefferink FSE	Communication strategies are being prepared together with DWA to communicate risks and progress to the public by various means.	Mr Andrew Tanner, Aurecon
Since neutralised acid mine water will be discharged into river systems, what mitigation or remediation measures will there be for the end users, the ecology and Rand Water using the water? If neutralised water is intended for use by Eskom, bear in mind that Eskom's water quality requirements are very high,	Ms Mariette Liefferink, FSE	If the water is released into the river systems, especially the Vaal System, it shall be treated to ensure that it meets or exceeds the RWQO and it will require monitoring of releases. Rand Water was identified as a recipient of either potable or industrial water. After the Neutralisation Process, the water will require a Desalination process, producing	Mr Viren Gajathar, Aurecon

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even better than potable water in some instances.		desalinated water. This water quality might have to be better than SANS 241 drinking water standards in some cases, depending on the intended use.	
Also bear in mind that in terms of supplying the treated water for use in some mining operations, that the mines on the far West Rand have sufficient water and would not require more water for their operations.	Ms Mariette Liefferink, FSE	Potential users were identified but this does not mean that they will necessarily be considered as recipients of the water. Some of the receiving sites are very far from the proposed treatment plants, which would make it unviable to transport the water there.	Mr Viren Gajathar, Aurecon
In terms of potable versus industrial water. If potable quality treated AMD is provided to Rand Water, who consults the public? Rand Water has a reputation to protect, and would not like to be involved in a SANRAL e-toll type situation, because the public has not been consulted. Also note that the potable water option cannot be imposed on Rand Water. Industrial water supply is not a sensitive issue as potable water supply.	Mr Adam Campbell, Rand Water	Discussions are being held with Rand Water and all the issues mentioned are being considered.	Mr Viren Gajathar, Aurecon
		The challenge/ purpose at this stage of this feasibility study is to investigate and cost all the options, and decide on the most feasible options. Hence this workshop to inform the study with inputs from key stakeholders. Rand Water's point of view is noted, and the DWA realises the importance of managing public perception in terms of possible potable water options.	Mr Jurgo van Wyk, DWA
Is the option of salt recovery for commercial opportunities also being considered?	Mr Mahlori Mashimbye, DST	That will still be covered in further presentations today. Refer to Section 7 - Waste Management/Disposal Options.	Mr Viren Gajathar, Aurecon
In terms of utilisation of the water for irrigation, please consider the Sappi Ngodwana situation where the soil is becoming saturated with pollutants.	Mr Ernst Bertram, DWA	Sappi Ngodwana is a completely different situation and should not be looked at in terms of an irrigation option for this project. The University has done 10 years of research with the WRC on sulphate water. The proposed treatment process	Prof John Annandale, University of Pretoria

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		will remove the salts from the water system and the sulphates will be precipitated into the soil profile as soon as the water is taken up by the crops. This option must be investigated as a possible Long Term Solution. The process will produce gypsum-rich water, which is very different from other saline water, and therefore it does not have to be used only for salt tolerant crops. There is a large range of crops which grow very well in this type of water. There are many scientific reports on this, which can be shared with the Long Term Solution study team.	
A study on another project showed that fast re watering of the deepest areas could eliminate various problems. Please consider using some of the AMD for the fast re-watering of those mines on the far West Rand that will soon be completely worked out.		Thank you for your suggestion.	Mr Jurgo van Wyk, DWA
Are the Resource Water Quality Objectives (RWQOs) developed or decided on without doing a Reserve Determination of the river or is there a process to redefine the RWQOs at some stage? Aquatic organisms are also water-users and it is therefore important to determine the reserve in terms of the requirements of the various species to survive in a particular system and not just focus on human end users or domestic scenarios.	Mr Stephan du Toit, Mogale City Local Municipality	The RWQO considers all water users whereas the Reserve just looks at the basic human need and environmental requirement. RWQOs for aquatic users are usually much higher than for most of the other users.	Ms Manda Hinsch, SRK Consulting
In addition to the perceptions around using the treated water as potable water, if treated AMD is used as industrial water, there will also be concern amongst workers about issues such as the safety of that water. Similarly, if the water is used for agriculture, people will perceive that their food is being	Mr Phineas Malapela, Vaal Environmental Justice Forum	Public fears and perceptions are perfectly valid, and need to be managed by means of trustworthy information communication. DWA must ensure that communication is clear and that all the interested and affected parties understand the implications of certain uses of AMD for	Dr Jo Burgess, WRC

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poisoned etc. People need to be educated and DWA must undertake an awareness campaign.		example, that mine water is like any other water, just with certain objects in it. When the water is treated and these objects are removed, this water is good quality water and safe for use.	
A suggestion for consideration is to use the neutralised water for sanitation, to replace the current potable water being used for this purpose in homes. This will require a dual system which could be very expensive, but will save potable water in the long-term.	Ms Rina Taviv, GDARD	Neutralization does not remove the salts from the system. Agreed that it will save potable water, but calculations must be done to determine the magnitude of the savings. Dual systems are very expensive and implementation, operation and educating people could be complex.	Mr Seef Rademeyer, DWA
		Note that the salts will still reach the Vaal River through the sewage system in such an instance and that dilution in the Vaal River will still be required. It does not help if the neutralised water is passed through the sewerage system.	Dr Andrew Wood, SRK Consulting
One of the advantages of using basic/passive treatments is that certain salts can be contained and the system can be flushed during high flows. Please consider that by delaying the treatment of huge amounts of AMD, at very high costs, the more time there will be to approach the bigger problem properly.	Ms Rina Taviv, GDARD	Desalination and discharge into rivers is not an ideal option, but was proposed as an interim measure, returning conditions to the status quo which existed during mining. The ultimate objective is to remove salts from the system. There are many options for use of the treated water, but cost implications must be carefully considered.	Dr Henk Coetzee, Council for Geoscience
• **Alternative Treatment Processes, Products and Possible Locations**			
With reference to management of the brine generated by a reverse osmosis process, an alternative to evaporation is being piloted in South Africa. This process, instead of producing brine, results in a solid product which can be used to produce molecule salts. The WRC has further information on this.	Dr Jo Burgess, WRC	The study team is aware that this process is under investigation in South Africa, and will definitely take it into consideration. Information will be obtained from WRC.	Mr Walter Johannes, Aurecon

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It is important to note that the Short Term Intervention high density sludge process provides the pre-treatment for any of the Long Term Solution treatment options being considered and therefore, the investment on the Short Term Intervention must not be seen as wasted money.	Dr Jo Burgess, WRC	Noted. Most processes considered up to now require HDS pre-treatment.	Mr Walter Johannes, Aurecon
The alternatives tabled presented might give the impression to some people that the HDS and the Biosure Process are competing technology, which they are not. They should be used for different types of inflow of water and different types of product effluent will be obtained.	Dr Jo Burgess, WRC	Existing and proposed STI infrastructure can be used in most processes considered so far, with the exception of perhaps the Biosure process where not all the infrastructure will be required. It must be clear that the intention is to use the HDS plant as proposed for the STI, if at all possible.	Mr Walter Johannes, Aurecon
What criteria will be used to select the reference process?	Dr Jo Burgess, WRC	The reference process has to meet all requirements for example if sludge is produced there must be a method for safe disposal. Water use has to meet the standards for potable use or environmental release.	Mr Walter Johannes, Aurecon
		The feasibility study team has developed a list of criteria by which the reference technology will be evaluated using international best practice including technology and cost considerations. These will be reflected in the report and approved by the Client.	Dr Andrew Wood, SRK Consulting
Please clarify to what extent the robustness of the HDS process is being considered for variability in quality and quantity of sludge produced over a long period.	Mr Mike Muller, NPC	All aspects of the HDS process are being considered. If the AMD quality improves, fewer chemicals will be used in the process which will become cheaper to operate. If it goes the other way, and more sludge is produced, more lime will be used and the cost will increase.	Mr Walter Johannes, Aurecon
Looking strategically at the broader problems of water management in South Africa, much more re-use and treatment will be required over time. Why, especially with the	Mr Mike Muller, NPC	It is uncertain if ERWAT owns the *Biosure* process or merely holds the license. At this stage, the link with the sewerage works has been excluded because it opens a	Mr Walter Johannes,

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Biosure process, is integration with municipal wastewater not being considered? Consideration must be given, to linking with fairly well developed institutions for example, ERWAT in the eastern basin. ERWAT must be consulted in this study.		new set of questions in terms of whether this will be acceptable to the municipalities. The municipalities have not yet been engaged on this aspect. The authorities of the required sewage works will be engaged at an appropriate stage in the study. Post meeting note: WRC indicated that they own the patent and ERWAT the license for Biosure.	Aurecon
A formal concern is that a public process developed with public intellectual property (IP) would need public objectives, and it seems that this will be side-lined because very narrow criteria are being used, excluding the broader context. Has the ownership of the IP been considered as part of the criteria for addressing this desired solution? Is there any preference for domestic technology and solutions?	Mr Mike Muller, NPC	The integration with sewage works has not been excluded. It is being considered, but it may be that there is a preference for other domestic treatment technologies, given the complexities around the municipalities and AMD. The criteria take into consideration what may well be the best option for South Africa. If there is South African technology available it must be considered and if it is demonstrated to be the best it must be applied. No potential options have been excluded at this stage. The feasibility study team is mandated to look at the technology options which are available and to evaluate them for the most beneficial solution in the South Africa context. The team is not mandated to give preference to South African technology. At the end of the day DWA or whoever pays will make that decision.	Dr Andrew Wood, SRK Consulting
		The team is currently considering South African technology, and will also consider others for example, the biological process developed in Holland.	Mr Walter Johannes, Aurecon
There is some uncertainty as far as flow and quality is concerned. It is recommended to always follow the precautionary approach rather than to have the problem of	Dr Henk Coetzee, Council for Geoscience	As the Short Term Intervention is being implemented and the water is abstracted, there will be more clarity on the situation, and hence a better indication of the specifications required. Before the final tender for the Long Term Solution	Mr Walter Johannes, Aurecon

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not being able to treat the volumes of water.		is put out, data on the variability of flow and quality will be available and potential technology providers will be able to do the calculations.	
The team is aware that the variabilities are not known, and are working on it.	Dr Henk Coetzee, Council for Geoscience	The treatment technology team requires a range of information of expected AMD from the Council of Geoscience in order to do the final calculations on the treatment variabilities, and how that influences the economics.	Mr Walter Johannes, Aurecon
There seems to be more and more uncertainties. Should the study build in the flexibility of treating the water for the eastern, western and central basins individually or should it be a combined approach? That can change the choice of technology. For example it could be cheaper to treat AMD in the eastern basin because there is less sodium and chloride, in the water. In the western basin there is more radio activity, which is an easy metal to remove, but in terms of public perspective, a challenging issue to manage. Is integrating from basin to basin being considered?	Mr Marius Keet, DWA	The centralisation of the treatment works only makes sense if the process requires the economy of scale. If centralisation is required to dilute the monovalent ions from the Eastern Basin to meet the specification, then the same can be achieved by releasing the water in the various streams, and relaxing the requirements of the stream receiving the water from the Eastern Basin. There will be no difference in the salt loading of the Vaal River System by the 2 options.	Mr Walter Johannes, Aurecon
In the Central Basin and potentially the Eastern Basin there may be multiple discharge points and multiple abstraction points may be required to deal with the problem. This is another variable for consideration.	Dr Henk Coetzee, Council for Geoscience	Noted.	
It is extremely relevant at this point to consider existing IP, especially at sewerage works which are strategically positioned. Ms Hinsch made a recommendation in her presentation that water from the western basin be channelled away from the Tweelopiesspruit to the Blougatspruit and be released at a point just below the sewage works. That particular option has been looked at, and Mogale	Mr Stephan du Toit, Mogale City Local Municipality	Noted.	

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Municipality had to invest approximately R114 million to upgrade the plant to deal with the demand. There were talks with Western Utilities Corporation at that stage, which would have contributed significantly to this outlay in costs to cater for the inflow from the western basin decant .			
Another option for consideration is that since the western basin is situated on the opposite side of the continental divide, water could have been siphoned from South Shaft directly to the Flip Human Wastewater Treatment Plant, which has got spare capacity of 30 mega litres per day.	Mr Stephan du Toit, Mogale City Local Municipality	One of the outcomes of the discussions from the team of experts is the option of diverting treated AMD from the Tweelopiespruit to the Wonderfontein Spruit. Bear in mind that measures were put in place 40 years ago to solve the ingress into the Far Western Basin, in particular the 1m pipeline, which might be overloaded, resulting in their inability to deal with the water volumes discharged, resulting in ingress into the Far Western Basin. Other discharges to the Wonderfontein Spruit have also increased, particularly given that over 40 years sewage discharges to that system have also increased. Those options were not considered by the team of experts but are still relevant and possible. Mr Hobbs perhaps has findings from his research where the AMD and the sewage contaminated water scenarios can complement each other to some extent. Agree with Mr Mike Muller in that there are some options that could be considered.	Dr Henk Coetzee, Council for Geoscience
Please include in the final proposal that a certain amount of money will have to be set aside for dedicated research in this whole process. Note that the WRC does fund such research to enhance and progress on the AMD issue.	Mr Ernst Bertram, DWA	Thank you for your comment.	Mr Tim Hart, SRK Consulting
Please clarify whether HDS is required in all active treatment processes? It was mentioned that the Biosure process is preferred which might not necessarily require a HDS plant.	Ms Mariette Liefferink, FSE	Passive treatment processes like wetlands have been considered, but there is insufficient land available to have a proper wetland with very slow flowing water and reeds etc.	Mr Walter Johannes, Aurecon

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Were only the active treatment processes and not the passive ones considered? If sewerage is used as an option to address the AMD, would an HDS plant be required?		Wetland can rather be used as polishing steps in a natural context, but RWQO must be met.	
		Much of the Gauteng and Witwatersrand areas are occupied by wetland systems. The Blesbokspruit, to which the AMD is historically discharged, is a wetland system and does not take out the salts in particular. It does reduce some of the iron hydroxides, hence the red sludge in the Grootvlei area discharge. There are several thousand passive treatment systems out there internationally, aimed at removing the iron and manganese from mine water, but not the salts. The salts are the continuous issue in the South African context and the discharge of the water into the Vaal system. Passive systems and wetlands in particular can have a role but they will not remove the majority of the salinity associated with the AMD in the available areas. The whole of Gauteng would probably need to be engineered as a wetland to attempt to treat the AMD in a wetland system. It is just not economically or environmentally viable. There are also many other reasons why passive systems cannot be the full solution in this instance.	Dr Andrew Wood, SRK Consulting
In the consideration of the different treatment alternatives, will equal consideration be given to the embryonic, innovative and proven treatment processes or will reverse osmosis eventually be the preferred option?	Ms Mariette Liefferink, FSE	We have to highlight the risks and keep in mind the risks of failure. A risk will have economic implications which will also have to be factored in the consideration of alternatives.	Mr Walter Johannes, Aurecon
The DWA Integrated Water Management series documents contain an assessment of passive and active treatment processes with a list of criteria to consider. Two of the criteria to highlight are pollution prevention and the minimisation of impacts. One of the documents is on consultation with	Ms Mariette Liefferink, FSE	Thank you for this information.	Mr Walter Johannes, Aurecon

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stakeholders, because it is stated that stakeholder consultation will ensure that the target end users are involved in the process. This will assist in containing buy in for the recommended solution.			
Is it correct that after the HDS process, the metal hydroxide, combined with the uranium and polluted gypsum, will be the end product of the HDS plant? Would that sludge be classified as hazardous or non-hazardous? This sludge produced as an end product of the Short Term Intervention process will be disposed into the West Wit Pit.	Ms Mariette Liefferink, FSE	The sludge has not been classified as yet, but the team working with NECSA radioactivity standards will have input from a radioactivity point of view. The sludge will be disposed temporarily in the West Wits Pit.	Mr Walter Johannes, Aurecon
		Note that the better the separation, the more hazardous the waste becomes, because the unwanted constituents in the water are removed and concentrated into a solid easily manageable package.	Dr Henk Coetzee, Council for Geoscience
		It must be stressed that at this stage in the feasibility study, no particular technology has been chosen. Investigations are merely aimed at obtaining a reference process on which to base costing and planning. Further processes involving public consultation will follow.	Mr Jurgo van Wyk, DWA
In terms of clarification of a previous statement – note that there is no assumption that HDS is a compulsory upstream process for all possible desalination options.	Dr Jo Burgess, WRC	Noted.	
In terms of the re-use of return-flow water – the decision had been taken to first address the salt-loading that emanates from the underground mine water and secondly from sewage discharges. Potential synergy between addressing the underground mine water problem now and sewage discharges in future need to be kept in mind during the	Mr Jurgo van Wyk, DWA	Noted.	

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Feasibility Study, as part of the bigger picture.			
• **Long Term Waste Disposal**			
There are stringent regulations on how to deposit radioactive waste, yet all mine waste is excluded in terms of radioactive waste management. If there are high volumes of uranium left in the sludge, should the Radioactive Waste Management Act be amended to include management and disposal of radioactive waste after neutralisation or desalination?	Ms Mariette Liefferink, FSE	There are 13 classifications of hazardous wastes identified in the DWA's Minimum Requirements. One of these is radioactive waste. It makes sense that if a waste is radioactive, then is it hazardous and needs to be handled as a hazardous waste. The National Radioactive Waste Disposal Institute Act, No. 53 of 2008 provides for the establishment of a National Radioactive Waste Disposal Institute in order to manage radioactive waste disposal on a national basis - specifically, to provide for its functions and for the manner in which it is to be managed; to regulate its staff matters; and to provide for matters connected therewith. The Department of Minerals and Energy - Radioactive Waste Management Policy and Strategy for the Republic of South Africa-2005 adequately caters for disposal of this type of waste, and if a waste stream is radioactive, then the disposal will need to be done in terms of this policy. In terms of whether the Radioactive Waste Management Act needs to be amended to include management and disposal of radioactive waste after neutralisation or desalination, this is not necessary as the waste types are already covered in the minimum requirements and the above policy, and disposal will need to be done accordingly.	Mr Ian Hammond, SRK Consulting

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8. Alternative Solutions and their Implications			
• **Western Basin**			
Note that once the tunnel has been built, there will be no flexibility in changing the ECL without introducing pumping. The current project programme is based on sonly requiring surface work and does not include any tunnelling options. If tunnelling options are to be investigated, the design and construction period would push the programme out by at least a year, or maybe even two.	Mr Andrew Tanner, Aurecon	The ECLs are currently set at very conservative levels. It must be borne in mind that ECL levels cannot be arbitrarily relaxed without additional information such as monitoring data and/or pumping data.	Dr Henk Coetzee, Council for Geoscience
Randfontein Wastewater Treatment Works on the West Rand drains into the Rietspruit, which loses its water into the Steenkoppies compartment. That compartment is under great stress because of over abstraction for irrigation, to the extent that Malony's Eye which drains that compartment was at one stage almost dried up. There is huge potential use for any water for agricultural purposes in the Steenkoppies compartment.	Mr Phil Hobbs, CSIR	In addition to the Flip Human wastewater treatment works mentioned, the study will look much wider at the location of other works like the Randfontein Wastewater Treatment Works.	Mr Dale Timm, Aurecon
Preferably do not refer to reverse osmosis desalination as a given. A desalination plant is being considered, but people should not get the idea that the plant has been designed for reverse osmosis. Reverse osmosis is an option.	Dr Andrew Wood, SRK Consulting	Reverse osmosis has been used as an example because it is the one that is best known and is probably the most conservative option, but it certainly has not been decided on yet.	Mr Dale Timm, Aurecon
How feasible is a controlled decants, HDS treatment, and then reverses osmosis on the West Rand. With other words, a managed status quo situation without deep pumping?	Mr Jurgo van Wyk, DWA	It requires looking at the topography in the area, how low to go, how long the tunnel will have to be etc. This was looked at approximately eight or nine years ago for the Wonderfontein Spruit. Low enough points for a practical solution are much further downstream. There may some areas in or around Krugersdorp where water could	Dr Henk Coetzee, Council for Geoscience

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		discharge at lower levels. The problem is getting the water to sufficient depth in the dolomite outlier to reverse the sub surface flow to the North. A controlled decant has to be below that level. If that sub surface flow is reversed, then there is an option for draining the AMD from the mine void through a tunnel. Any water which is released into the northern system should also be treated. One problem with gravity fed flow is that the treatment facilities have to cope with seasonally high flows which may exceed 50Ml in a single day.	
What would it take to keep the current status quo - not to pump or to lower the level in the basin?	Mr Mike Muller, NPC	We could de-water just by five or 10 metres from a single abstraction point. The feasibility study team needs a final ECL level and more information from the environmental and groundwater specialists.	Mr Dale Timm, Aurecon
How are the life cycle energy costs being considered, and what sensitivities are being used? It is critical to think about energy, particularly in the longer term.	Mr Mike Muller, NPC	The study would certainly quantify the energy requirements. So far, some very preliminary calculations have been done on the amount of energy used just on the pumping costs to raise water to the surface. These are very significant. We will be discounting future costs over 50 years to give a present value of costs to compare with additional capital cost for other options. In the end it becomes dependant on what discount rates are used, as well as the escalation in electricity cots, above normal inflation. These rates must still be decided.. In the end DWA will have to make a decision on which are the better and cheaper options.	Mr Dale Timm, Aurecon
Was hydroelectric power generation considered for the tunnel option?	Mr Ernst Bertram, DWA	The tunnel will likely be so flat that there will be no pressure available to generate electricity. The tunnel will also have to be constructed as high up as possible in the mine to decrease its length. The lower in the mine the tunnel is the	Mr Dale Timm, Aurecon

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		longer it has to be to discharge to the surface. The initial impression is that there is no chance of generating hydropower without actually damming up the water inside the mine.	
		The study team does not see any alternative abstraction points in the Western Basin that has any benefits over the existing abstraction point, except the tunnelling option which needs time, for investigations and more capital to construct.	Mr Andrew Tanner, Aurecon
In the western basin, there is an available shaft close to the headwaters of the Klip River which can be considered as an option in this study.	Dr Henk Coetzee, Council for Geoscience	Thank you for this information.	Mr Andrew Tanner, Aurecon
• **Central Basin**			
The tunnelling option has not been looked at in detail. The principle as are the, same as in the Western Basin. The tunnel could be constructed now while the water is low, and has to be kept low while the tunnel is being constructed. Once the tunnel is there the water level cannot be lowered without pumping. The inter relationships of tunnel levels and possible higher ECLs still need to be looked at. Constructing the tunnel and then realising that it is in the wrong place or that connectivity is lost and another alternative abstraction point is needed are all possible complications that need to be considered and planned around. The team still also needs to look at the options of using the neutralised water for agriculture. Suitable locations and the acceptability of issuing new licences or supplying exiting	Mr Andrew Tanner, Aurecon		

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agricultural license holders, still need to be investigated.			
Was the high rainfall season and the contribution of uncontrolled raw mine water into the Tweelopiespruit, the reason for the exacerbated Yellow Boy condition? The short term reactive measure by the former Minister of DWA to discharge lime into the point where the flow underneath it reached into the Tweelopiespruit resulted in the Hippo Dam becoming a radioactive sludge pit, and caused settlement of heavy metals on the river bed of the Spruit.	Ms Mariette Liefferink, FSE	That emergency liming exercise which resulted in that excessive sludge build up was a disaster, but that is not the situation being referred to in my presentation.	Mr Phil Hobbs, CSIR
Are the relevant DWA representatives present at the workshop to further discuss the license for irrigation? This is an important option and has not been discussed yet?	Ms Rina Taviv, GDARD	A different section in DWA which is not represented here is responsible for irrigation licenses. The issue will be forwarded to the relevant section when relevant.	Dr Beason Mwaka, DWA
Prof Annandale conducted a 10 year study in the Mpumalanga area and it had to stop because DWA did not cooperate in terms of licenses. The DWA agricultural licence application process follows a very rigid approach.	Ms Rina Taviv, GDARD	Our scope of work requires from us to look at the legal implication of permits and license requirements of anything that we propose. Should the agriculture option look viable, we will certainly go into the licensing requirements of it.	Mr Dale Timm, Aurecon
		If reference is to the Vaal system, then DWA cannot further allow water for irrigation because essentially the irrigation water is being transferred from adjacent catchments at huge cost. In general, DWA cannot allow an expansion of irrigation, because water is too expensive, unless reference is being made to the re-use of water. In which case it can be allowed as long as it does not have an impact on the amount of water that is being used. In this case it is obvious that the use of AMD in the Vaal System will help somewhat, but currently, water should not be taken out of the system.	Mr Seef Rademeyer, DWA
		Irrigation is a potential option, which could be a very cost	Mr Mike Muller,

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		effective option and therefore it should be considered. Ms Taviv's comment reinforces that sentiment. This must be recognised as a potential option, and the cost and its technical ability should be considered.	NPC
		The option of agricultural use of the water is being considered. Caution around it is that salt is the issue. Putting salt on the land does not take it out of the picture, because it will end up in the water course through run-off and add to the salt loads in the river. This option is not being discounted, but it is being considered in terms of its practicality of reducing salt loads entering the Vaal system.	Dr Andrew Wood, SRK Consulting
Prof Annandale's study found that gypsum will be precipitated into the soil profile as soon as the water is taken up by the crops. This leads to improvement of soil quality. The study team should consider Prof Annandale's reports.	Mr Ernst Bertram, DWA	Thank you for this information.	Mr Tim Hart, SRK Consulting
In the Central Basin the SWV shaft which has been identified for abstraction in the STI gives rise to some concerns, primarily around the connectivity to the rest of the basin. The option of putting pumps down additional shafts does not seem to be viable at this stage, but the investigation is not complete. The team has considered the options of using declines, or drilling boreholes into declines other mine voids and installing pumps into them, but this needs investigation to make sure if the locations will the connectivity needed. If practical, it will most probably be in combination with the shaft being used at the moment.	Mr Andrew Tanner, Aurecon		

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• **Eastern Basin**			
If the biological process of the Wastewater Treatment Works is used, the water could be discharged to the river, or could be distributed for potable use after it is treated to suitable standards.	Mr Andrew Tanner, Aurecon		
There are two mega tailings storage facilities less than 40 kilometres away from a regional source of pollution. Please consider cooperation/ partnerships with the mines for sludge disposal. This will be an exceptionally beneficial option for the entire region, instead of having to create a new sludge disposal facility within urbanised or sensitive areas.	Ms Rina Taviv, GDARD	Thank you for the suggestion.	Mr Andrew Tanner, Aurecon
In the Klerksdorp area (although it is not within the western, central or eastern basin area), it should be noted that an unlined mega tailings dam is currently being constructed within two kilometres from the Vaal River. This impacts directly on the Vaal River System. There is also no sulphuric acid plant to recover the sulphate.	Ms Mariette Liefferink, FSE	Thank you for this information.	Mr Tim Hart, SRK Consulting
The agricultural use in the Steenkoppies compartment has not received adequate attention. The Maloney's Eye is the source of the Magalies River. That particular compartment is already declared by DWA as a water stressed zone due to overuse. Irrigation is one of the largest water users in that area, and this presents the opportunity for considering the option of using partially treated AMD for irrigation.	Mr Stephan du Toit, Mogale City Local Municipality	Thank you for the suggestion.	Mr Tim Hart, SRK Consulting
The study team has noted the comments and suggestions – thank you. Going forward there is a need to look at the practicalities of making these suggestions work. This will	Mr Andrew Tanner, Aurecon		

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include consideration of ECLs, capital and operating costs, inflation, environmental impacts, viability of water use options, how to avoid unrealistic increases in the water tariffs, and the cost benefits of the options. Initially basic economics will be used to narrow all this down to a few options.			
In the Eastern Basin there is an alternative shaft at Marievale that has a lower collar level however there are no other reasons to consider it and its condition is not yet known.	Mr Andrew Tanner, Aurecon		
In summarising, • HDS plants are required in full or in part for any of the technologies considered so far. In the case where a tunnel is built to take the water out at a point somewhere else the STI plant would be in the wrong place. The latter is a fairly long-term option. • Some refinements are required to optimise the solution to link into the Short Term Intervention in all of these options. • If possible the HDS process needs to be refined to produce a more manageable sludge. • The way forward is to assess all options, screen them and do a more detailed analysis on the selected options. • Consider going from a recommended project to the feasibility study to enable for conventional (PSC) procurement. • Develop more detail before considering going into design and construct (operate) options under the conventional process.	Mr Andrew Tanner, Aurecon		

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QUESTIONS/ COMMENTS/ SUGGESTIONS	**COMMENTATOR**	**RESPONSE/ DISCUSSION**	**RESPONDANT**
9. Stakeholder Issues and Concerns			
The health related perceptions around using treated AMD must be addressed specifically in awareness and communication material and perhaps even in a focus group discussion.	Mr Phineas Malapela, Vaal Environmental Justice Forum	Thank you for your comment.	Mr Tim Hart, SRK Consulting
The NEMA section 31 makes provision for the role of NGOs, civil society, activists and whistle blowers, and states that without exhausting any remedy a person may disclose in good faith, honesty and truthfully, perceived environmental threats or risks. This disclosure may for example be to the Director Generals, Human Rights Commission, the Public Protector and to the Environmental Portfolio Committee, as well as to one or more news media. In the case of the FSE, which represents a large range of stakeholders, all remedies where exhausted and hence FSE resorted to “whistle blowing” to both the national and international media, truthfully, honestly and in good faith. This was based on the fact that AMD and its impacts were documented in 1957 by the Chamber of Mines document. There were several subsequent reports indicating the risks and hazards of the growing AMD problem but there was resistance and even suppression of evidence, to denial and ridicule when these issues were raised. This is the reason that the AMD issue was disclosed to the media, and in order for the public to understand the real risks.	Ms Mariette Liefferink, FSE	Thank you for your comment.	Mr Tim Hart, SRK Consulting
Thoughts, recommendations and suggestions for consideration in the feasibility study: • There must be recognition of needs. Communities have needs and one of the most important ones is obviously	Ms Mariette Liefferink, FSE	Thank you for your comments and suggestions.	Mr Tim Hart, SRK Consulting

DAY 2 - THURSDAY, 3 MAY 2012			
QUESTIONS/ COMMENTS/ SUGGESTIONS	**COMMENTATOR**	**RESPONSE/ DISCUSSION**	**RESPONDANT**
protection, but also the need to be heard, understood and to participate. • Do not ignore people's emotions. Fears are not in facts but in perceptions. By simply stating the facts would not address those fears. • It would have been appreciated if civil society would also have been given the opportunity to present its perception of the AMD issue at this workshop. • The only criticism for this process is the inequality in the power that exists between the government, parastatals and organs of State such as the CSIR and WRC on the one hand, and ordinary people, civil society or NGOs on the other. The latter group feel that their knowledge is viewed as an inferior source, viewed with criticism and scepticism.			
This entire process and the workshop today are commendable. The facilitator, Mr Tim Hart is especially commended for his total impartiality and open encouragement for all stakeholders, including NGOs to comment and participate.	Ms Mariette Liefferink, FSE	Thank you for your comments.	Mr Tim Hart, SRK Consulting
Having admirably discussed all the issues and the sources of the AMD etc., the problem is perpetuated because the process will help mining operations to proceed without having long-term treatment options in place for AMD, which will continue for centuries. If a mining operation is unsustainable and does not have sufficient trust funds to address the residual or later impacts, such as AMD, then the mining operation should not be allowed to proceed.	Ms Mariette Liefferink, FSE	Thank you for your comment.	Mr Tim Hart, SRK Consulting
There are certain expectations which Mogale City would	Mr Stephan du Toit,	Thank you for your comment. This will be considered in the	Mr Tim Hart, SRK

DAY 2 - THURSDAY, 3 MAY 2012			
QUESTIONS/ COMMENTS/ SUGGESTIONS	**COMMENTATOR**	**RESPONSE/ DISCUSSION**	**RESPONDANT**
have liked to see form part of the Long Term Solution. There were no alternative forums at which those issues could have been resolved and addressed. One of the expectations was the whole issue of rehabilitation. It is understood, based on the discussions at this workshop, that there are most probably other processes which will deal with these additional expectations from the Municipality, so it is proposed that if focus group meeting are going to be scheduled with Mogale City that issues outstanding since 2002, be discussed. One of those issues being the enormous financial and other losses, incurred in the Krugersdorp Game Reserve - i.e. game loss, infrastructure and damage to various equipment, due to AMD. That is a valuable resource to the Municipality and therefore this issue needs to be taken forward in terms of compensation for the said losses.	Mogale City Local Municipality	Stakeholder Engagement Process.	Consulting
The workshop was incredible – useful and very informative. The only criticism being that bottled water was served. In future, please consider serving Rand Water supply or treated AMD.	Ms Rina Taviv, GDARD	Thank you for your comment.	Mr Tim Hart, SRK Consulting
Salt reduction, diffuse sources and ingress reduction were not addressed, and is seen as a huge gap in this study. Ingress could be a contributor to AMD and unless it is addressed, the problem is actually perpetuated.	Ms Rina Taviv, GDARD	There are many activities around investigating and addressing diffuse sources, from for e.g. tailings, and their interactions with ingress and ingress management.	Dr Henk Coetzee, Council for Geoscience
Many important issues have been raised, which will also be looked at by the NPC, because the AMD issue not only relevant to Gauteng, but also involves the interaction between mining, the environment and the economy throughout the country.	Mr Mike Muller, NPC	Thank you for your comment.	Mr Tim Hart, SRK Consulting

DAY 2 - THURSDAY, 3 MAY 2012			
QUESTIONS/ COMMENTS/ SUGGESTIONS	**COMMENTATOR**	**RESPONSE/ DISCUSSION**	**RESPONDANT**
The study must not get trapped into a focus on treatment type solutions only. The 21st century is already turning into the treatment century where the mission is to treat water and to spend as much money as possible on treating water. It is suggested that construction only takes place when necessary, as in this case as well. The opportunities for Municipal cooperation, to use gypsum in agriculture, which is believed to be the source of super phosphate, must be explored. Sulphate in this study is regarded as a universally bad salt whereas calcium sulphate is actually regarded as a revolutionary product in agriculture. The team must make allowance to seek opportunities for synergy in the municipal sector where capacity needs to be built, in the agricultural sector where there are opportunities and in the environmental sector where there may still be the opportunity for passive treatment.	Mr Mike Muller, NPC	Thank you for your comment.	Mr Tim Hart, SRK Consulting
Some of the institutional issues raised are important to the NPC. Suggest that the team stands back and takes a broader view into other kinds of solutions, and to understand institutional arrangements that will help to take sensible decisions. There may be other options to achieve the same goals much cheaper and with much more social benefit.	Mr Mike Muller, NPC	Thank you for your comment.	Mr Tim Hart, SRK Consulting
I am available and request to be involved in discussions on institutional arrangements.	Mr Mike Muller, NPC	Thank you for your comment.	Mr Tim Hart, SRK Consulting
This workshop was very useful.	Mr Mike Muller, NPC	Thank you for your comment.	Mr Tim Hart, SRK Consulting
Acknowledgement and gratitude is expressed for the opportunity to participate in this informative workshop. The	Mr Mpho	Thank you for your comment.	Mr Tim Hart, SRK

DAY 2 - THURSDAY, 3 MAY 2012			
QUESTIONS/ COMMENTS/ SUGGESTIONS	**COMMENTATOR**	**RESPONSE/ DISCUSSION**	**RESPONDANT**
DMR deals with many issues, AMD being just one of these. This workshop has focussed on the relevant AMD related issues that need to be addressed.	Litlhakanyane, DMR		Consulting

I. Next Steps in this Feasibility Study

Mr Andrew Tanner briefly summarised the overview of the feasibility study scope of work, components and progress, and next steps.

He noted the following:

- The Long Term Solution team has a lot of the building blocks for the procurement options, which now must be looked at in detail. There are one or two options on the table and there is a fair idea of which way the procurement is going.
- Engagement with key stakeholders will continue in the form of focus groups and technical group meetings to refine the options.
- The approval process will follow after all the deliverables are concluded.
- The study should be concluded by February 2013.

Summary of Components and dates for delivery of first draft reports (Post meeting note: in consultation with DWA this list has been revised since the meeting and the latest list is shown here):

Component and Name		Deliverable	Date
1	Study Inception	Inception Report.	11 May 2012
2	Identification of Sources of Information	Report on Status of Available Information	23 July 2012
3	Legal Considerations & Apportionment of Liabilities	Report on Legal Considerations for Apportionment of Liabilities* Report on Alternative Approaches for Apportioning Liabilities*	26 June 2012 15 October 2012
4.1	Assessment of the Current Status of the Management of AMD	Report on Current Status of Management of AMD	18 May 2012
4.2	Water Quantity and Quality of the Witwatersrand Mine Voids	Assessment of the Water Quantity and Quality of the Witwatersrand Mine Voids	16 May 2012
4.3	Assessment of Options for Discharge, Delivery and Disposal of Treated Water & Waste Products.	Report on Options for Use, Discharge or Disposal of Water and Waste	16 July 2012
4.4	Assessment of Treatment Technologies.	Report on Treatment Technology Options	9 July 2012
4.5	Identification and Analysis for the Long-Term Management of AMD.	Pre-Feasibility Report on the Long-Term Solution	30 July 2012
5	Analysis of Optimal Infrastructure Configuration – Concept Development.	Concept Design and Costing Report* Conceptual Design Drawings*	8 October 2012 8 October 2012
6	Institutional and Financial Assessment.	Institutional Procurement and Financing Options Report*	5 November 2012
7	Implementation Plan.	Implementation Action Plan	17 October 2012

Component and Name		Deliverable	Date
8	Stakeholder Engagement and Communication.	Report on Key Stakeholder Engagement and Communication	12 November 2012
		Communication Strategy and Action Plan	15 June 2012
		Comments and Responses Report	17 October 2012
		Feasibility Report	19 November 2012

*** - 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.**

J. Summary of Key Issues and Concerns Raised

Mr Hart highlighted the key issues raised by workshop participants during Day 1, as follows:

- There were many references to the SANRAL e-toll situation, which was poorly consulted. There are strong feelings that such a situation must not be repeated in the AMD process.
- In the case of the broader stakeholder body the study team must ensure that people feel that the recommendations that are being made come from a credible and considered base and that this is communicated.
- That the recommendations from the study are not rejected for reasons of poor understanding of the process or an understanding that the process itself has been poor.
- Opportunities for synergy and that various role players should be considered i.e. DWA, the private sector, municipalities and various other stakeholders, even outside the ambit of this study.
- The study must promote comfort with the product that will be delivered out of some of the proposed solutions. This was raised by Rand Water and by others, because it is important to gain acceptance of that product in the wider consumer body.
- There needs to be a balance between urgency for rapid progress and clear understanding of the process and scope of study.

K. Way Forward for the SSC

Mr Hart reiterated that that there is a Comments Form and a Suggestions Form in the workshop hand out pack. The Suggestions Form in specifically for recommending additional members for the SSC. He also encouraged participants to comment on the Terms of Reference for the SSC, as handed out during the workshop.

He summarised the functions and responsibilities of this committee as follows:

- It is a Stakeholder Engagement Forum to provide and share information with key stakeholders whose input is critical to inform the study, with contextual technical and scientific insights;
- To provide comments on concepts, principles, and assessments of alternatives, from time to time as may be required by the Study; and
- Participate in focus group discussions, where appropriate.
- **Dates of SSC meetings at key milestones during the course of the study:**
  - 2-3 May 2012 (this Workshop);
  - Late October 2012; and
  - Late January 2013.

Focus group discussions, technical workshops and individual consultation meetings will take place in the interim period.

Dr Jo Burgess, WRC, Water Research Commission, thanked everyone for the workshop and added that the agenda was well formulated. She also said that she wishes this had been done for the Short Term Intervention because the project would have been in a much better position than currently.

L. Closure

Mr Hart thanked everybody for their attendance, comments and contributions and the presenters for their time and discipline exercised during presentations. He called upon Dr Beason Mwaka of DWA to formally close the workshop.

Dr Mwaka expressed his heartfelt gratitude to the following:

- All attendees for their attendance and contributions,
- The presenters,
- Ms Vassie Maharaj of SRK Consulting and the rest of her team for organising the workshop,
- Aurecon for providing the facilities for the workshop and catering.

Dr Mwaka added that it is clear that the workshop provided much value in that strategies, experiences, lessons learned and information were shared. He urged attendees to suggest more members for the SSC who would be able to contribute to the study.

He noted that this is an on-going process and stakeholder input and suggestions are encouraged, because AMD and finding a long-term solution is a national issue. He also pointed out that the Study Management Committee is committed about being open to comments and transparency. All stakeholders are urged to utilise the AMD webpage on the DWA website as it will provide information and feedback on progress, respond to questions and concerns and provide a channel for stakeholders to contribute there their comment and input.

Appendix A:

Present, Apologies, Declined Invitation and Absent/No Response

Present:

Agricultural Research Council - Roodeplaat	Dr	Yacob	Beletse
Commonwealth Scientific Industrial Research Organisation (CSIRO)	Prof	Keith	Bristow
Council for Geoscience	Dr	Henk	Coetzee
CSIR	Ms	Bettina	Genthe
CSIR	Mr	Phil	Hobbs
Department of Mineral Resources (DMR)	Mr	Mpho	Litlhakanyane
Department of Science and Technology	Mr	Mahlori	Mashimbye
Department of Water Affairs	Mr	Trevor	Balzer
Department of Water Affairs	Mr	Ernst	Bertram
Department of Water Affairs	Mr	Fanus	Fourie
Department of Water Affairs	Mr	Bashan	Govender
Department of Water Affairs	Mr	Solly	Mabuda
Department of Water Affairs	Ms	Mohora	Malebatja
Department of Water Affairs	Dr	Beason	Mwaka
Department of Water Affairs	Mr	Sputnik	Ratau
Department of Water Affairs	Mr	Rod	Schwab
Department of Water Affairs	Mr	Jurgo	van Wyk
Department of Water Affairs	Mr	Pieter	Viljoen
Department of Water Affairs	Mr	Marius	Keet
Department of Water Affairs: NWRP	Mr	Seef	Rademeyer
Ekurhuleni Metropolitan Municipality	Mr	Sekhonyana	Lerothi
Federation for Sustainable Environment	Ms	Mariette	Liefferink
Federation for Sustainable Environment	Dr	Koos	Pretorius
Gauteng Department of Agriculture and Rural Development	Ms	Rina	Taviv
Gauteng Department of Local Government and Housing	Mr	Elias	Sithole
Johannesburg Water	Mr	Ariel	Mafejane
Mogale City Local Municipality	Mr	Stephan	du Toit
Mogale City Local Municipality	Cllr	Andy	Mathibe
National Treasury	Mr	Strover	Maganedisa
Rand Water	Mr	Alan	Campbell
Rand Water	Mr	Solomon	Mathebula
Save the Vaal	Mr	Coenie	Nel
Save the Vaal	Mr	Trevor	Stubbs
South African Human Rights Commission	Mr	Angela	Kariuki
TCTA	Mr	Johan	Claassen
TCTA	Mr	Craig	Hasenjager
TCTA	Mr	Richard	Holden
University of Pretoria	Prof	John	Annandale
Vaal Environmental Justice Forum	Mr	Phineas	Malapela

Water Research Commission	Dr	Jo	Burgess
West Rand District Municipality	Mr	Zakhele	Dlamini
West Rand District Municipality	Ms	Susan	Stoffberg
Wits University School of Public and Development Management	Mr	Mike	Muller
World Bank	Mr	Manuel	Marino
World Bank	Mr	Marcus	Wishart

Present (Project Team/Consultants):

Aurecon	Mr	Hannes	Botha
Aurecon	Mr	Viren	Gajathar
Aurecon	Mr	Johan	Goosen
Aurecon	Ms	Joanne	Henrico
Aurecon	Mr	Walter	Johannes
Aurecon	Mr	Andrew	Tanner
Aurecon	Mr	Dale	Timm
Aurecon	Mr	Johan	van Zyl
Aurecon	Mr	Fanie	Vogel
SRK Consulting	Mr	André	Hindley
SRK Consulting	Mr	Matt	Braune
SRK Consulting	Ms	Donne	du Toit
SRK Consulting	Mrs	Dianne	Duthe
SRK Consulting	Mr	Ian	Hammond
SRK Consulting	Mr	Tim	Hart
SRK Consulting	Ms	Manda	Hinsch
SRK Consulting	Ms	Leoni	Lubbe
SRK Consulting	Ms	Vassie	Maharaj
SRK Consulting	Mr	Peter	Shepherd
SRK Consulting	Dr	Andrew	Wood
Turner Townsend	Mr	John	Samuel
University of the Witwatersrand/Shango Solutions	Prof	Terence	McCarthy

Apologies:

Agri Gauteng	Mr	Johnny	Moffat
Department of Water Affairs	Mr	Nigel	Adams
Department of Water Affairs	Ms	Jacqueline	Jay

Declined Invitation:

Aurecon	Mr	Hentie	Viviers
Department of Environmental Affairs	Ms	Amanda	Britz
Department of Mineral Resources	Mr	Max	Madubane
Department of Mineral Resources	Adv	Susan	Malebe
Department of Water Affairs	Mr	Peter	Pyke
Department of Water Affairs	Dr	Eddie	van Wyk
Ekurhuleni Metropolitan Municipality	Ms	Elsabeth	van der Merwe
NECSA	Ms	Immanda	Louw
Rand Water	Mr	Tawanda	Nyandoro

Randfontein Local Municipality	Ms	Nokwazi	Ndlala
South African Human Rights Commission	Ms	Janet	Love
SRK Consulting	Ms	Amina	Ismail
West Rand District Municipality	Mr	Danny	Govender
World Bank	Mr	David	Sislen

Absent/No Response:

Agri Gauteng	Mr	Dirk	Hanekom
Chamber of Mines	Ms	Stephina	Mudau
CSIR: Department of Science and Technology	Ms	Umeesha	Naidoo
Department of Science and Technology	Ms	Candice	Willard
Department of Water Affairs	Ms	Nancy	Mothebe
Department of Water Affairs	Mr	Mbangiseni	Nepfumbada
Department of Water Affairs	Mr	Anil	Singh
Department of Water Affairs	Mr	Nemataheni	Thivhafuni
Johannesburg Metro	Mr	Ntshavheni	Mukwevho
Mogale City Local Municipality	Cllr	Emily	Mathe
National Economic Development and Labour Council (Nedlac)	Ms	Tumi	Monageng
Private Consultant	Mr	Meiring	du Plessis
Rand Water	Mr	Reveck	Hariram
Randfontein Local Municipality	Ms	Maliba	Ramatlhape
Sasol	Mr	Zain	Mohamed
South African Human Rights Commission	Ms	Delysia	Weah
South African Local Government Association (SALGA)	Mr	William	Moraka
Transvaal Agricultural Union SA	Ms	Lynette	du Plessis
Transvaal Agricultural Union SA	Mr	Bennie	van Zyl
University of Pretoria	Dr	Wayne	Truter
Witkoppie Farm	Mr	Johnny	de Araujo

Appendix D6
SSC Meeting 2: Proceedings

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

FINAL PROCEEDINGS OF THE STUDY STAKEHOLDER COMMITTEE MEETING 2

Held on 17 October 2012

at Aurecon offices in Lynnwood Pretoria

Distribution: SSC Meeting Invitees, Acceptances and Attendees

Table of Contents

List of Appendices

A. Introduction

This document records the proceedings in comment and response report format, of a one-day meeting with the Study Stakeholder Committee (SSC) established by the Department of Water Affairs for the AMD Long-Term Solution Feasibility Study (LTS-FS).

The meeting was held on 17 October 2012 at the Aurecon offices in Lynnwood Pretoria and attended by 53 people (see **Appendix A** for a list of the attendees). The list also includes apologies, those who declined the invitation, those who did not respond and those absent.

B. Welcome, Apologies and Introductions

Mr Pieter Viljoen (Scientist Manager: Water Quality Planning (National), Department of Water Affairs and Study Deputy Director) welcomed everyone to the Study Stakeholder Committee Meeting on behalf of Mr Solly Mabuda (Chief Director: Integrated Water Resource Planning, Department of Water Affairs and SSC Chair Person). He introduced Mr Tim Hart (SRK Consulting) as facilitator of the meeting.

C. Meeting Objectives

Mr Viljoen outlined the objectives of the meeting as follows:

- To understand the current position of the Study in the context of all Acid Mine Drainage (AMD) related initiatives, including the Short-Term Intervention (STI);
- Report progress on the feasibility study;
- Present study findings to date and receive comments;
- Discuss alternative technical options for the Long-Term Solution (LTS) to underground AMD;
- Discuss benefits and impacts of the alternatives;
- Discuss alternative institutional, financial and implementation arrangements; and
- Discuss the way forward.

D. Structure of the Meeting and Acceptance of the Agenda

Mr Hart outlined the structure of the meeting, presented the proposed agenda for the meeting and requested comments and additions from attendees. The agenda was accepted.

Mr Fanie Vogel outlined the logistics and safety aspects.

E. Meeting Process and Procedures

Mr Hart outlined the workshop process and procedures. He explained the contents of the meeting documentation folder, pointing out that it included a comments form for those who would like to contribute further comments after the meeting.

F. Workshop Presentations and Presenters

The table below lists the presentations made at the meeting and the names of the presenters. Note that the presentations are not appended to these proceedings, but are available to Study Stakeholder Committee attendees on the following website.

Indicate your interest at http://www.dwa.gov.za/Projects/AMDFSLTS to register for access to the website.

Mr Hart appealed to meeting participants to exercise discretion when distributing this information to parties outside of the SSC group.

Presentation		Presenter
1.	Study Governance Structure, Role of SSC and Stakeholder Engagement	
2.1	Study Governance and the SSC	Mr Jurgo van Wyk, Department of Water Affairs (DWA)
2.2	Key Stakeholder Engagement and Communication	

Presentation		Presenter
2.	Update on the Vaal River Water Resource Management Strategies	Mr Seef Rademeyer, DWA
3.	Overview of the Feasibility Study for a LTS and Current Status	
3.1	Integrated Water Quality Management Strategy	Mr Jurgo van Wyk, DWA
3.2	The Feasibility Study for the LTS	
4.	Parallel Initiatives	
4.1	Report back on the Hydrological Monitoring Committee	Dr Eddy van Wyk, DWA
4.2	Council for Geo Science: Strategic Water Management Project	Mr Humberto Saeze, CGS
4.3	Other Parallel Initiatives	Mr Tim Hart, SRK Consulting
	• CSIR: Providing an Integrated response to AMD	
	• CSIR: Studies on Cradle for Human Kind	
	• GDARD: Mine Residue Rehabilitation Strategy	
	• Other on-going Studies	
5.	Report back on the Short-Term Intervention (STI)	Mr Johann Claassens, TCTA
6.	Presentation and Discussions on Study findings to date	
6.1	Introduction	Mr Andrew Tanner, Aurecon
6.2	Recap of the Assessment of Water Quantity and Quality in the Mine Voids and Options for Abstraction	Ms Di Duthe, SRK Consulting
6.3	Water Use Options to eliminate (or suitably reduce) Underground Mine Water induced salt loading on the Vaal River system	Mr Andrew Tanner, Aurecon
6.4	Treatment Processes and Products	Mr Walter Johannes, Aurecon
6.5	Long Term Waste Disposal	Mr Dale Timm, Aurecon
6.6	Alternative Solutions and Their Implications	
6.7	Legal Liabilities – Apportionment of Liabilities	Mr Fanie Vogel, Aurecon
6.8	Institutional, Financial and Implementation Arrangements Models	Mr John Samuel, Turner Townsend
6.9	Implementation Planning and Programme	Mr Andrew Tanner, Aurecon

The table below lists the comments, questions, recommendations and suggestions raised by meeting participants, as well as the responses from the Study Project Team.

G. Proceedings

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
1. Vaal River Water Resource Management Strategies			
Please clarify if the scenarios outlined are based on the existing use profiles, and new mining operations been taken into account?	Ms Janet Love, South African Human Rights Commission (SAHRC)	Urban use is driving the growth in the study area and is also the biggest water user in this area. The DWA follows the 80/20 principle and does not update the growth allowed for the smaller users every time the Vaal River Strategy is updated, but instead focuses on shifts in use where big users such as urban, Sasol and Eskom are concerned.	Mr Seef Rademeyer, DWA
Is the transfer to Lephalale from the Vaal River System still a possibility?	Ms Janet Love, SAHRC	There is still a possibility to transfer to Lephalale from the Vaal River System albeit a small amount at present.	Mr Seef Rademeyer, DWA
With reference to the uncertainties around the Vaal, Crocodile and Olifants River Systems. What are the uncertainties related to the Olifants River System?	Ms Janet Love, SAHRC	DWA developed a strategy for the Olifants River System, highlighting that the best option is for the system to develop a solution in its own catchment area. The possibility to transfer from the Vaal to the Olifants system is very slim because it will be too expensive.	Mr Seef Rademeyer, DWA
The Minister of Water Affairs announced that the STI will continue for five years, assuming until 2018. Are contingency measures in place if desalination is not implemented by 2015? What will be the consequences if the Vaal loses its capacity in 2015 and the Lesotho Highlands Water Project only comes into effect in 2021? What are the contingency measures and what are the implications on the economy and water users?	Ms Mariette Liefferink, Federation for Sustainable Environment (FSE)	It is not just the timeous implementation of desalination that puts the Vaal River System at risk, but also the implementation of WC/WDM measures as well as the eradication of the unlawful water use. There are many possibilities of what can happen or be done. Good rains like the last 10 years would enable management of salt loading because there is enough water to dilute. There is also the possibility to temporary borrow water from irrigators, where irrigators will sacrifice their water allocation for a period and be compensated for it. During a drought period, restrictions will have to be implemented earlier if we are not successful with the implementation of these strategies in good time.	Mr Seef Rademeyer, DWA
Given that the feasibility study will be complete in February 2015 and an Environmental Impact Assessment (EIA) including public participation still needs to be conducted, is it reasonable to assume that the desalination in the LTS will be implemented by 2015?	Ms Mariette Liefferink, FSE	This question is deferred to a later point on the agenda where Implementation will be discussed (See Section 6.9).	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
2. Feasibility Study for a Long-Term Solution and Current Status			
Are the figures used in the feasibility study for the mine voids volumes the same as those used in the TCTA study?	Mr Trevor Balzer, DWA	Yes, the same volumes of the mine voids have been used. The water volumes are similar.	Mr Seef Rademeyer, DWA
The feasibility study schedule must reflect the date/ timeframe for the request for proposal (RFP).	Mr Trevor Balzer, DWA	Noted.	
The information provided reinforces that the decision is to go for desalination and that the option of reducing flows of AMD is not a consideration. There has been repeated assurance that this is not the case. What is the role of the committee if this is the case?	Mr Mike Muller, National Planning Commission (NPC)	The role of the Feasibility Study is to ultimately address the underground mine water induced salt-loading of major river systems. In this regard, the underground mine water return flows to the Vaal River System (and other river systems) is to be addressed first. Sewerage return-flows to the Vaal River System will in all probability also have to be addressed in future. Ingress control is being studied by DMR and the CGS, and is being addressed as a priority. The matter is a standing point on the agenda of the Inter-departmental Government Task Team (IGTT) that deals with AMD.	Mr Jurgo van Wyk, DWA
Is the set of proposals coherent with the National Water Resource Strategy? Presentation shows decision was made to focus on mine water desalination because it is easy. National Water Resource Strategy Draft focuses extensively on water re-use from existing services such as sewerage. There is incoherence in this.	Mr Mike Muller, NPC	Water re-use from for instance Waste Water Treatment Works (WWTW) is part of a separate initiative. The alternative uses of saline water will be discussed in a later presentation.	Mr Andrew Tanner, Aurecon
Please provide cost benefits for sewerage treatment options vs AMD treatment options to take into account uncertainties of future AMD water supply.	Mr Mike Muller, NPC	Desalination costs are in proportion to the amount of salts in the water. It is cheaper to desalinate AMD than sea water, and cheaper to treat treated wastewater from a waste water plant than AMD. Direct potable use of wastewater is not costed in this Study, but social acceptance related to social and health risks is a problem. Treated wastewater can be used for industrial uses. These issues will be addressed in the Vaal River Integrated Water Quality Strategy.	Mr Pieter Viljoen, DWA
Is it possible as part of the economic study to do a cost analysis on different options such as desalination versus the rest, similar to what was done with the climate change issue? For example, analysing production of salt and costs per option. The scenarios	Ms Rina Taviv, Gauteng Department of Agriculture and	The Feasibility Study has done an options analysis which is inter alia supported by cost comparisons and environmental considerations. The Study has also looked at the implications of bringing forward the next augmentation	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
planned at the moment are broad and do not provide an optimisation tool.	Rural Development (GDARD)	schemes vs. desalination of underground mine water, vs. releasing water for dilution purposes, vs. the cost to receiving water users under a do-nothing scenario. The selection of options is based on that information and will be covered in later presentations.	
Also consider the pricing of water - if the price factor becomes strong enough the projection will have to be changed.	Ms Rina Taviv, GDARD	DWA is giving attention to the pricing of water.	Mr Jurgo van Wyk, DWA
When presenting the various contributors to salt loads and concentrations, separate the diffuse sources from the mine void issue. Combining the two would suppress the contribution from diffuse sources and present a misleading picture.	Ms Rina Taviv, GDARD	The regulation of diffuse pollution and the implementation of best management practice should receive ongoing attention. From the Feasibility Study's perspective, the main focus is on suitably reducing salt-loading from underground mine water to ensure long-term water supply security in the Vaal River water supply area and related catchments.	Mr Jurgo van Wyk, DWA
Agree that the various contributors to salt loads should be presented separately to be identified as an issue that needs to be addressed.	Ms Janet Love, SAHRC	The suggestion to separate the respective contributions would be possible if more data was available. It is acknowledged that a total solution is needed, which also links with salt contributions from slimes dams, stormwater wash off, atmospheric deposition, etc. These are not being disregarded and are part of the bigger picture.	Mr Jurgo van Wyk, DWA
Diffuse sources should also be addressed as part of the LTS.	Ms Mariette Liefferink, FSE	They will be addressed by DWA, but not as part of this Feasibility Study.	Mr Jurgo van Wyk, DWA
The problem with AMD is more the salt loads than the quantity of water to be treated. Therefore there is also the option of other alternatives to remove the salts, not only treatment.	Mr Meiring du Plessis, Retired WRC Research Manager	Valid comment, thank you.	Mr Seef Rademeyer, DWA
Apportionment of liability is not currently covered in the STI and LTS. Where will this be addressed?	Ms Mariette Liefferink, FSE	Apportionment of liability will be discussed in a later presentation and is part of the LTS-FS.	Mr Jurgo van Wyk, DWA
Are new mining applications and the contribution of sources of pollution from the new mines being taken into account in the feasibility study?	Ms Mariette Liefferink, FSE	Another directorate within DWA focuses on mining related aspects, including the new mines and DWA is committed to resolving the problems especially in the Upper Vaal area. This study focuses on mine water in the underground mine	Mr Jurgo van Wyk, DWA

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		voids in the three mining basins in Gauteng.	
The understanding is that DWA has allocated R18 million for the LTS feasibility study. Would it be possible for stakeholders to have access to the financial report?	Ms Mariette Liefferink, FSE	The Inception Report detailing the Scope of the Study is available to the SSC.	Mr Fanie Vogel, Aurecon
The assumption being made in the study is that the source of AMD will not grow, and that there will not be additional sources of AMD other that in the underground mine voids.	Ms Janet Love, SAHRC	DWA has taken variables such as future mining scenarios, changes in population growth, etc. into account in the modelling studies undertaken for the establishment of the Integrated Vaal River Strategies. This was done to enable reliable forecasts, to ensure that the strategies are aligned with reality, and to be prepared for all foreseeable eventualities.	Mr Jurgo van Wyk, DWA
		DWA Regional Offices already have several instruments for eg. a series of best practice guidelines, water quality policies, various Acts, compliance monitoring, regulatory licence and authorisation processes etc. are constantly being used to manage and find a solution to the AMD challenge.	Mr Pieter Viljoen, DWA
The enforcement of pollution control at mines must also be considered.	Ms Rina Taviv, GDARD	Agreed, thank you.	Mr Jurgo van Wyk, DWA
3. Parallel Initiatives			
In terms of the statement that the water quality in the Tweelopies Spruit is improving after neutralisation, would it be possible to receive the monitoring data as this is no longer available at Western Basin Technical Working Committee (WBTWC). Note that pH is not the only indicator of water quality. Is there data available to show what might have contributed to the historic pollution of the Tweelopies Spruit. Is there any initiative to remediate the Tweelopies Spruit?	Ms Mariette Liefferink, FSE	Having personally measured the water quality in the Tweelopies Spruit, an improvement in the acidity level has been observed since the treated water is being discharged. pH levels have increased from approximately 2.95 to 6, which was also confirmed by Mr Phil Hobbs. This data will be provided to the WBTWC on request. The possible remediation is not part of the LTS-FS.	Dr Eddy van Wyk, DWA
Has the ingress from the West Wits Pit been taken into consideration? Mintails is currently disposing of its sludge into that pit, displacing significant volumes of water. It appears as if the decant volumes have not been reduced even though this winter was dry.	Ms Mariette Liefferink, FSE	Monitoring of ingress into the West Wits Pit is part of the Western Basin monitoring group's mandate.	Dr Eddy van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
It is concerning that there is no funding available for monitoring.	Ms Mariette Liefferink, FSE	Comment noted.	Mr Tim Hart, SRK Consulting
Water cannons for tailings reclamation on the West Rand should be taken into consideration, especially in terms of potential increases in water contamination.	Ms Mariette Liefferink, FSE	Comment noted.	Mr Tim Hart, SRK Consulting
The presentation shows that the socio-economic critical level (SECL) for Gold Reef City will be breached by 29 September 2013, but the ECL in the Central Basin will be breached in Aug 2013.	Ms Mariette Liefferink, FSE	The SECL sits at a higher elevation (1474 m amsl) as L5 in Gold Reef City which is at 1484 m amsl. Thus L5 will be 10 m under water when the SECL is breached. Now, the short-term ECL is on 1467 m amsl, which means when the short-term ECL is reached, the water level will be 17 (seventeen) metres below Level 5 – the Gold Reef City Mine Museum. This distance is but critical as if there is sudden water ingress in to the void, or a pump failure, L5 will be flooded in less than two months (53 days).	Dr Eddy van Wyk, DWA
It is recommendation that there must be a database of monitoring data to enable data sharing.	Ms Rina Taviv, GDARD	There is a database available on the DWA website which was specifically formulated for this study. There is, however, a limitation on the availability of the full data for public interest as the interpretation of the data is quite complex and dependant on time series evaluations. Any data user can apply to DWA to have access to the information prepared from the data set.	Dr Eddy van Wyk, DWA
Refer to other parallel initiatives. WRC has 10 programmes and 3 projects dealing with AMD related issues. Six of these deal with treatment methods, three are looking at risk criteria and one looking at ecology. WRC will make available a list of these initiatives and a short synopsis of each of these to this committee**.** See appendices B and C.	Dr Jo Burgess, Water Research Commission (WRC)	It is suggested that Mr Walter Johannes makes further contact with Dr Burgess. Offer noted with thanks. *Post meeting note: Received from Dr Burgess.*	Mr Jurgo van Wyk, DWA
The information presented shows that the rate of rise depends on the size of the voids. The rate of rise will slow down, closer to the top. From the information presented, there is no indication of that, or the improvement of the quality of decanted water.	Mr Mike Muller, NPC	It is extremely difficult to estimate the volume of mine water present and the rate of recharge into the basins due to a high level of uncertainty regarding the actual mine void volumes and the origin of water ingress into the mine void itself. Looking at the water level elevation data (mine void water table elevation in metres above mean sea level versus time); identifying the contribution of annual rainfall recharge to the	Dr Eddy van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		mine void water volume is quite difficult; thus meaning that there is another source constantly recharging the mine void (surface water ingress). A sectional (10m interval) mine-void volume assessment was done by Golder Associates some years ago based on the information from mine stakeholder plans. This is the best data set we have currently in terms of mine-void volumes. The issue is that if there are still mines interested in mining reefs down to 400 below ground level in the Central Basin (such as Central Rand Gold – CRG), it means that there are areas in the upper levels of the basin which are not mined (viz. solid reefs); thus indicating that with a constant water ingress, the daily water level elevation rise could increase; this has not been observed yet. There is, however, a possibility that the shallower portions of mine void, consisting of pre-1935 mined reefs could still be open and probably presenting a larger mine void volume than currently shown in the Golder mine void volume assessment. Continuous mine void water elevation monitoring is therefore crucial to support risk management in this regard.	
Ekurhuleni Municipality is developing a nature reserve around a pan which is a significant source of AMD. It is therefore not a good idea to protect this area as a stormwater solution and nature reserve if it will increase the AMD flows. The study team is however unaware of this and it is of concern that there is no liaison between the team and municipalities in finding a solution to the AMD issue.	Mr Mike Muller, NPC	Municipalities are represented on this committee and Focus Groups. Sources of Ingress are being addressed by CGS for DMR and this comment should be addressed by CGS.	Tim Hart
Mogale City has already indicated, based on investigations, surveys and research conducted in the Western Basin, that here are significant water losses through the Wonderfontein Spruit into the Western Basin mine void. This does not seem to be addressed. It was highlighted that there are several localities in the jurisdiction areas of the municipalities where storm water is released from suburbs and released into some of the old abandoned mine workings. This relates to ingress control which is part of the mandate of the Council for Geosciences.	Mr Stephan du Toit, Mogale City Local Municipality (MCLM)	Leaking pipeline systems form part of Project 15%, and progress in addressing the matter is reported at the Vaal River Strategy Steering Committee on a regular basis. Ingress of water emanating from such leaking water infrastructure should be considered and can be reported at the Vaal River Strategy Steering Committee. The Chief Directorate Integrated Water Resources Planning of DWA would like to be involved in the ingress studies conducted by DMR/ CGS to ensure that relevant studies align and compliment each other.	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		It is not wise not to assume that the rising water table in the mine voids is going to level out at one stage. During the re-watering of the Western Basin it started to decant at approximately 65 metres below surface into the overlying, highly porous dolomitic aquifer system. There is good storage capacity in that aquifer system; thus resulting in a significant decrease in the daily water table rise observed a few months before decanting started in the Western Basin. That is why the rise in the water level actually levelled off, but once this aquifer system was full it started decanting through a borehole and then through a shaft and so forth (remember that the first AMD was observed in the Hippo Pool right at the discharge area of the so-called dolomitic outlier. Also bear in mind that especially the Witwatersrand Mine Voids are not perfectly horizontal systems; they are significantly inclined laterally. They are at a gradient, for example, there is a 90 metre elevation difference in ground level between the western and eastern boundaries of the Central Basin.	Dr Eddy van Wyk, DWA
In terms of progress on the passive treatment project, GDARD realised the need for capacity building, and combined the TOR for the proposed two projects (awareness project and passive treatment project) so that it includes aspects that enable communities that will deal with passive treatment to be capacitated to do monitoring or contributing to rehabilitation of wetlands. The only issue being that the project is now too big and GDARD needs to go through a tendering process which makes the procurement much longer so the project is being delayed. The GDARD MEC feels very strongly about institutional arrangements and instructed the set up a provincial committee to address both AMD and mine residue issues as one. GDARD has already started discussions with the Department of Local Government and Housing. Economic Development and major municipalities such as Ekurhuleni, West Rand and CoJ. This Provincial type of an arrangement should happen next year.	Ms Rina Taviv, GDARD	Thank you. Noted.	Mr Tim Hart, SRK Consulting

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4. Report back on the Short-Term Intervention (STI)			
Correction of Mr Claassen's mention of Section 110 of the National Water Act (NWA). It is Section 110.2 of the NWA.	Mr Trevor Balzer, DWA	Noted. The only aspect preventing implementation of the STI, is the NEMA exemption.	Mr Johann Claassens, TCTA
		Agree with Mr Claassens that it makes sense to run with the temporary works for as long as possible to allow the Feasibility Study to table recommendations for the LTS prior to establishing more permanent infrastructure.	Mr Jurgo van Wyk, DWA
5. Presentation and discussions on study findings to date			
5.1 Assessment of water quality and quantity in mine voids			
Correction to the mine void assessment presentations: • Change Robertsons to Robinsons. • Refer to Swartkranz Compartment rather that Sterkfontein dolomite.	Mr Phil Hobbs, Council for Scientific and Industrial Research (CSIR)	Thank you, noted. Noted. Meta data for the data set will be provided.	Ms Di Duthe, SRK Consulting
In all the tables on water quality in the Western Basin there is a disparity between those of the TCTA and the values of this study. There should be reference to data population size which goes with each set of data and the time periods. Since the data from the mine void assessment is more recent, it proves that the water quality is improving in the WB.	Mr Phil Hobbs, CSIR	To seek and monitor sustainable solutions the necessary funding is required for adequate monitoring.	Mr Jurgo van Wyk, DWA
		Improved infrastructure for monitoring was included in the budget submission by the TCTA, and has been approved by DWA. Monitoring infrastructure will probably be upgraded now.	Mr Marius Keet, DWA
How was input from tailings dams estimated? Reclamation of tailings dams increases ingress because the process exposes a larger surface area and the use of the water cannon adds additional sources of ingress. This also leaves behind polluted soil and another few years of continual input. It is important to ascertain if reclamation of mine dumps creates an additional source of AMD.	Ms Rina Taviv, GDARD	It is believed that removal of the tailings dams will reduce surface water runoff and contaminated water from that source if there are proper closure provisions after reclamation. However, will ingress be prevented completely with rehabilitation?	Ms Di Duthe, SRK Consulting
		Reclamation of tailing would have a negative impact in the short-term, and the surface could be rehabilitated afterwards for the long term.	Mr Andrew Tanner, Aurecon
Differences in data presented are important, and might start	Mr Mike Muller,	The Net Present Value of total costs includes that of pumping	Mr Andrew

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
showing a trend in quality over time due to reduction in flows though the workings. Less flow through the workings means there would be less pick up of salts. The goal is to reduce flows through the workings. There must be assistance to municipalities to focus more on the ingress, perhaps by putting the savings in ingress control in present value terms. For example, over 20 years Ekurhuleni Municipality could save R100 billion - this could be used as justification for seeking budget for ingress works.	NPC	and treatment in order to present the whole picture. Operating costs will be presented in a later presentation. The cost of ingress control will be more than offset by reduced operating costs.	Tanner, Aurecon
		Having the benefit of improving water quality over time will not happen if you are sucking it at 1000 metres from the shaft. The water quality will initially be variable. In the immediate/mid-term, when looking at temporary desalination plants, it has been demonstrated at the Emalahleni and Optimum RO plants that having a stable water quality is of utmost importance for firstly the operation and secondly the design of the plant. It will be difficult for any operator to put up a temporary plant and desalinate water which has variable water quality. The LTS will have to try and manage this when taking over from the STI.	Mr Pieter Viljoen, DWA
City of Johannesburg is currently considering green stormwater management, which consists of making sure stormwater infiltrate the site where it falls. City of Johannesburg and municilpalities should be made aware that what is fashionable outside South Africa, could be a very costly, bad idea around the AMD situation. This message must be included in the feasibility study report.	Mr Mike Muller, NPC	Comment noted, thank you.	Mr Tim Hart, SRK Consulting
The new Mintails open cast mine plans to have a channel to divert additional stormwater run-off into the Western Basin? Is this being taken account of?	Mr Stephan du Toit, MCLM	Although study teams are aware of those plans, it is not certain if any work has gone in to looking at the impact of it on the Western Basin.	Mr Phil Hobbs, CSIR
		A pulse in the monitoring data (mine void water level elevation) has been observed at a certain time of the month, but there is no clarity at this stage on what could be causing that, and it could be related to the type of mining or pumping of water at Mintails. Flush dumping in the West Wits Pit or elsewhere (old mine shafts) could also initiate short-term	Dr Eddy van Wyk, DWA

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		pulses as those observed currently.	
The geo-hydrological study report states that passive solutions allowing natural surface decant at preferred ECLs rather than pumping will be further investigated in the options analysis. The options analysis did not include passive solutions allowing natural decant.	Ms Rina Taviv, GDARD	Surface decant or near surface abstraction without any controls has too many environmental impacts. A tunnel option to intersect the Central Vertical Shaft at ERPM allowing Central Basin water to decant naturally with gravity to the Elsburgspruit where a treatment plant could be installed, has been looked at. The report also comments on other passive solutions.	Mr Andrew Tanner, Aurecon
5.2 Water use options			
With regards to the supply of neutralised water to agriculture, and irrigation with saline water consideration must not only be focussed on crop suitability, but also on potential of crops for bio-accumulation of heavy metals.	Mr Phil Hobbs, CSIR	Comment noted, thank you.	Mr Tim Hart, SRK Consulting
There seems to be the assumption that potable water will be supplied to industry. Consideration must be given to compatibility with DWA policy regarding water re use. The National Water Resource Strategy guides the re-use issue, and this study needs guidance on that from DWA.	Mr Mike Muller, NPC	Unfortunately Rand Water is not present, although they were invited. It is one of the frustrations that need to be dealt with in this study. Direct re-use of potable mine water is currently taking place in South Africa. Sensitivity of water re -use is often around wastewater effluent plants. Rand Water stated that they are not willing to risk the perception that they would be contaminating their drinking water with 5% of treated AMD possibly being added to the system. Rand Water currently sells potable water to industry at about R8 per m^3 and to domestic users at about R5 per m^3. Obviously there is more money for them to sell the water to industry and this seems to be another motivation for their argument. More discussions are needed with Rand Water.	Mr Pieter Viljoen, DWA
5.3 Long-term waste disposal			
Will the sludge from the treatment process be classified before being disposed?	Mr Phineas Malapela, Vaal Environmental Justcie Forum (VEJF)	Yes, the sludge will have to be classified by a government department before construction is of a disposal facility is allowed. Detailed information of the sludge will have to be submitted with the permit applications for the disposal facility.	Mr Dale Timm, Aurecon

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How would it be assured that a proper EIA is conducted and proper municipality planning mechanisms and processes are in place? Information needs to be in the public domain and people including municipalities and those living near the mines and waste disposal facilities, need to be consulted.	Ms Janet Love, SAHRC	All these comments are very valid and will be put into an implementation plan to develop and undertake an EIA process. The team also needs to try and better estimates of probable sludge qualities.	Mr Andrew Tanner, Aurecon
		It is important to use controlled dumps which, if controlled by DWA, will solve one of the problems mentioned. The EIA process will start in parallel with this.	Mr Dale Timm, Aurecon
There is not a lot of comfort for people that a national department will be controlling for e.g. sludge disposal dumps, once the decisions have been made. Local residents will be directly impacted if the LTS is implemented, and the municipality will have to manage, whilst the national department (DWA) are very far from the problem.	Ms Janet Love, SAHRC	Comment noted, thank you.	Mr Tim Hart, SRK Consulting
The current EIA processes are confused between three departments, and must be clarified before the EIA for the LTS proceeds to avoid the situation being experienced in the TCTA impact assessment and the work that is now being done.	Ms Janet Love, SAHRC	Comment noted, thank you.	Mr Tim Hart, SRK Consulting
Township applications have already been received by the Ekurhuleni Metropolitan Municipality for one of the waste sites identified for tailings dams in the Central Basin. There is a lot of controversy around that site in terms of the existing slimes dam.	Ms Elsabeth van der Merwe, Ekurhuleni Metropolitan Municipality	Thank you for this information. Review of the proposed sites is part of the Feasibility phase and sites will be re-looked at.	Mr Dale Timm, Aurecon
		Local municipalities would need to be involved in the site identification, planning and engagement processes.	Mr Andrew Tanner, Aurecon
		Another potential problem is the issue of liability and future reclamation and who would be responsible if waste is added on top of the existing tailings facility.	Mr Jurgo van Wyk, DWA
Please provide details on the possible use of a pipeline to the sea for the brine.	Mr Jurgo van Wyk, DWA	A suggestion was to use an existing Transnet pipeline from Durban to Johannesburg, to dispose of the brine in the ocean. The pipeline is routed via Kroonstad and the section from Johannesburg to Kroonstad will continue to be used. If this is to be an option, a pipeline will need to be built to Kroonstad, or directly to Harrismith. Another disadvantage is that the volumes of brine will be relatively small, so it would	Mr Dale Timm, Aurecon

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		not be very economical. Also, the water cannot be gravity fed to Durban and would have to be pumped to Harrismith from where it will be able to gravitate. This has not been included in the cost estimates, and was only looked at as a possibility. The study has provided costs for disposing of the brine with the sludge, although it is now considered more likely that separate evaporation pans will be used.	
Is there an opportunity for deep level disposal of the brine underneath the AMD?	Mr Trevor Balzer, DWA	The team has considered and debated this possibility and there a number of concerns which are mentioned in the report. The biggest concern is the re-mobilisation of the salts, especially not being sure of the flows and physical geometry of the void. Although deep level brine disposal is done elsewhere on the world, it is not under the conditions being faced in this country.	Mr Andrew Tanner, Aurecon
Have co-disposal options for sludge disposal at existing mine tailing dams been considered. This could delay the need for the building new sludge disposal facilities.	Mr Trevor Balzer, DWA	There are two issues with co-disposal, one being liability and the other, cost. The Ergo slimes dam being used for the STI is a viable option for 20 years. The costs of constructing the tailings facility nearer to the Central Basin or taking the sludge across the basin will be compared. The team also needs to look at the use of other well-constructed and well maintained tailings facilities, as well as why were not included in the STI.	Mr Andrew Tanner, Aurecon
The amount of sludge is really minute compared with tailings, and should be put into perspective. Liability is complex, but when considering that mining is the source of this problem there should be more pressure from regulators to share that liability.	Ms Rina Taviv, GDARD	Comment noted, thank you.	Mr Andrew Tanner, Aurecon
5.4 Treatment processes and product			
There does not seem to be any efforts to link treatment sites with existing wastewater works. There is technical and institutional potential for it and the team should aim for a coordinated and structured wastewater works including the AMD treatment process rather than separating it out when looking at sighting the shafts and disposal sites.	Mr Mike Muller, NPC	The STI sites, as well as alternatives of possible extraction boreholes were considered. The location of the users and a combined approach of where the desalination works will also be considered. Neutralised water could also be taken to a treatment works which is one of the options being looked at. There are a number of combinations in the options.	Mr Andrew Tanner, Aurecon

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Have the costs of the various treatment options been calculated?	Mr Johann Claassens, TCTA	Some of the costs have been calculated, especially for the more likely options which are proven. Costs for innovative and embryonic technologies are not available because there are no moderate scale plants. The model will have to be refined for a proper comparison.	Mr Walter Johannes, Aurecon
Does the team have enough information to compare the costs of package plants for use in an interim period? There are many uncertainties around volumes and quality, specifically in the 50 km length of the Central Basin. It would be a waste of time and money to construct a desalination plant without enough information.	Mr Marius Keet, DWA	A 5 mega litre (Ml) per day plant is considered a plant and not a packaged plant. Such a plant would be similar to a 20 Ml/d plant where solids and brine have to be handled in the correct way. Package plants, usually up to 2 Ml/d, are mobile units that are designed to be transported. The disposal of brine and solids is expected to pose a potential handling problem for packaged plants.	Mr Walter Johannes, Aurecon
Some suppliers can design a plant to treat any type of water to pure quality, with almost no brine being produced. This however is very costly.	Mr Marius Keet, DWA	If a 97.5% recovery is achieved, then about 2.5% waste products (salts and gypsum) will still be produced.	Mr Walter Johannes, Aurecon
		Task team has been put together to look at the immediate and short term as soon as possible, including package and temporary plants and various other technologies.	Mr Andrew Tanner, Aurecon
In terms of the use of water for the mining industry, the figure quoted is 30 Ml per day just for DRD. The total for all three basins is 77 Ml per day, which means that almost half of the water can be used by mining. This leads to the conclusion that this option was completely dismissed. It seems that the assumption made is that the moment when the RO process is finished, water is not needed anymore. This is not correct. Closure processes with proper rehabilitation requires water. This option has not been given proper thought and mining experts must give input and be involved in discussions.	Ms Rina Taviv, GDARD	Thank you. Noted.	Mr Andrew Tanner, Aurecon
When looking at the mine residue areas of 300 kms^2 which are already sterilised areas, keep potential for evaporation in mind.	Ms Rina Taviv, GDARD	Thank you. Noted.	Mr Tim Hart, SRK Consulting
Johannesburg Water and the municipalities have plans in terms of investment and infrastructure etc. When assessments are done the team needs to understand this in terms of strategic locations. It will assist with planning in terms of some of the options being	Mr Jones Mnisi, Johannesburg Water	A Focus Group meeting was held in September 2012 with the affected local authorities including Johannesburg Water where the planning and current thinking around the various components of the study was presented. Johannesburg	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
considered.		Water was represented at the meeting although many of the municipalities that confirmed attendance did not attend on the day. No comments on planning initiatives were received. *Post meeting note: Mr Ntshavheni Mukwevho from Johannesburg Water attended the Focus Group meeting on 7 September 2012.*	
In terms of this study it must be assumed that treatment is to potable standard, regardless of Rand Water's view on it. One of the options in the costing models, which plans to take the water to Secunda is at an industrial supply level.	Mr Trevor Balzer, DWA	Some users have indicated a need for water to better than potable standard with even fewer salts in it. The team is aware that industrial users prefer better quality water than potable water. All costings so far are based on treating it to potable standards.	Mr Andrew Tanner, Aurecon
5.5 Institutional, Financial and Implementation Arrangement Models			
The presentations pre-suppose the Public Private Partnership (PPP) route. Even though the project is registered with Treasury, the normal tender route has not been excluded.	Mr Trevor Balzer, DWA	Noted. The project is registered and would need approval no matter which route is chosen.	Mr John Samuel , Turner Townsend
Where does this arrangement fit in once the Feasibility Study is complete and government gives it to an entity (State-owned or other) to implement? It is then not a Special Purpose Vehicle (SPV) and therefore needs to be shown in the model as one of the options.	Mr Trevor Balzer, DWA	Noted. The model will be corrected to show the entity, which would be seen as government, since the entity would carry out the procurement and the management for DWA.	Mr John Samuel , Turner Townsend
What would prevent a government entity from using the income streams to raise funding? One should keep in mind that DWA cannot borrow money. There needs to be an entity with the powers to borrow funds. It is worthwhile to configure that because it shows currently that PPP or government can raise the money. There is a hybrid in between, similar to TCTA's model where there is no direct government guarantee but an implied guarantee. Government's risk is effectively minimised.	Mr Johann Claassens, TCTA	It would be the same as government raising the funding. A government entity and government is effectively the same. It would require approval from the Minister of Finance. At the end of the day the entity which is going to borrow the funds is going to need approval from the Minister of Finance, and a guarantee to cover the correct level of funding unless the funding is going to take pure project risk. Then the question would be how that is separated as a loan to government that is guaranteed by government as opposed to a project risk arrangement. That would end up in some form of PPP. The project risk vs. guarantee debate as to where the risk is seen needs to be taken further, in a separate meeting.	Mr John Samuel , Turner Townsend

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It is important to highlight the implications of this interim arrangement for the immediate solution where TCTA is the borrower/financier of the project. It could be underpinned with the users like Rand Water and City of Johannesburg rather than by government. It has an important impact on who takes responsibility and project implementation. If those stakeholders are likely to lose money they will have a different attitude to the project. This model should be put forward as an intermediate option.	Mr Mike Muller, NPC	Comment noted, thank you.	Mr Tim Hart, SRK Consulting
The mining industry needs to understand its role in this process, the apportionment of the liability, and what that liability entails. Is there an option of forming a PPP with the mining industry? If not successful in the tender process, will the industry be excluded?	Ms Stephina Mudau, Chamber of Mines	The mining industry is being looked at for a revenue resource based on liabilities. If the project goes out to tender, the mining industry may be interested in putting up a solution as a private sector party, and will be measured as anyone else. If successful, the mining sector would come in as a construction, design and technology supplier. This would not necessary effect their liability.	Mr John Samuel , Turner Townsend
It is expected that the long-term solution will be aimed at fostering a possible partnership and not just based on involving the mining sector as a revenues source in the apportionment of liabilities. Such a partnership will also assist with environmental problems the Chamber is facing with some mining operations.	Ms Stephina Mudau, Chamber of Mines	Note that the engagement with the Chamber of Mines and the mining industry in this process must still happen. There will be an opportunity to discuss these issues with the Chamber of Mines shortly.	Mr Fanie Vogel, Aurecon
Messrs Claassens and Muller's comments are endorsed. These must be explained and documented clearly and comprehensively. That done, the team should be in a better position to provide answers to the Chamber of Mines on how mining responsibility gets apportioned. There is a need to ensure that responsibility and liability is apportioned. This is the mechanics of making this an institutional arrangement that will ensure the buy in of the necessary parties. Currently there seems to be a sense that decisions are being taken without all parties being aware and without a proper consultation process.	Ms Janet Love, SAHRC	Thank you. Noted. More consultation is required.	Mr John Samuel, Turner Townsend
Given that the treatment plants for the STI are all situated on mine properties, using mine infrastructure, adds up to a substantial capital contribution. It is either a cost that somebody is going to refuse to pay, give it for free or try to offset it against a possible future claim against them. This contribution should be covered in	Mr Johann Claassens, TCTA	Thank you. Noted.	Mr John Samuel, Turner Townsend

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
the model.			
The possible use of the TCTA funding model or Rand Water with a borrowing limit and balance sheet, etc. must be shown in the models, and not assumed that everyone understand the options in between the DBOM, DBOMF and PPP models.	Mr Trevor Balzer, DWA	Thank you. Noted.	Mr John Samuel, Turner Townsend
In terms of the macro-economic assessment, the study assumes that a quality intervention will be compared with a quantity intervention. The zero action/ no intervention option must be outlined clearly.	Mr Mike Muller, NPC	Thank you. Noted. This will be rephrased.	Mr Andrew Tanner, Aurecon
5.6 Legal liabilities – apportionment of liabilities			
What is envisaged in terms of the environmental levy as a source of funding and what is the status of the process to determine the levy?	Ms Stephina Mudau, Chamber of Mines	It is more realistic to substitute the “environmental levy” with the “Waste Discharge Charge System” (WDCS) in the particular diagram. The polluter-pays principle would justify such a reference to the WDCS, theoretically requiring all contributing to salt-loading of the Vaal River System to contribute towards the solution. The “environmental levy” is still an idea at this stage. Although the matter should be investigated, it is not part of this Study. It should be removed from the presentation material at this stge.	Mr Jurgo van Wyk, DWA
What is the timeline for the apportionment of liabilities component and at what stage will the mining companies will be consulted about apportionment of liabilities?	Ms Stephina Mudau, Chamber of Mines	It is difficult to commit to a time line at this stage, but it can be assured that the Polluter Pays Principle will be applied. In addition to the liabilities matter, the implementation of a LTS may also require Government to engage with mines in due course about various implementation aspects, such as access to land and infrastructure, potential partnering, etc.	Mr Jurgo van Wyk, DWA
		The report with this information is being discussed with the legal entities within DWA and DMR. The outcome of that will be presented to the IMC and direction in this regard is expected from the relevant Ministers possibly within a month.	Mr Trevor Balzer, DWA
		A meeting with the Chamber of Mines should happen within a month’s time.	Mr Fanie Vogel, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
5.7 Implementation planning and programme			
The study only highlights the value of gold produced. The value of uranium produced should be added too because more uranium than gold is produced from the Western Basin.	Mr Phil Hobbs, CSIR	Thank you. Noted.	Mr Tim Hart, SRK Consulting
Is geotechnical work being included in the feasibility study?	Mr Craig Hasenjager, TCTA	The feasibility study includes surface mapping to assess site suitability. There is no sub surface exploration in the feasibility study. It would be desirable to do geotechnical work before design. Thank you. Noted.	Mr Andrew Tanner, Aurecon
		Options are to do geotechnical work before RFP or each of the tenderers could do it themselves. Alternative routes would be for Government to facilitate a single Geotechnical advisor to do the work for the Bidders, which work would then be for their own cost.	Mr John Samuel , Turner Townsend
The shaft stability of the STI shafts or other shafts is not included. The Scope depends on where pumping will take place.	Mr Jurgo van Wyk, DWA	Thank you. Noted.	Mr Andrew Tanner, Aurecon
To clarify - This study is very focused on dealing with the AMD and certainly the issue of direct recycling of effluent is part of the Water Resource Strategy and will be taken forward. The DWA has a project which is included in the TICC basket of projects which is intended to do that.	Mr Trevor Balzer, DWA	Thank you. Noted.	Mr Mike Muller, NPC
6. Stakeholder Issues and Concerns			
Many Mayoral Committees and Mayors in the AMD receiving environment have approached the FSE for information and presentations. Gratitude is expressed to Messrs Phil Hobbs and Stephan du Toit for their presentations to municipality management.	Ms Mariette Liefferink, FSE	Thank you.	Mr Tim Hart, SRK Consulting
More focus must be placed on strengthening the interactions with the relevant entities in local government for example with Ekurhuleni Metropolitan Municipality.	Mr Mike Muller, NPC	This needs to be addressed in the engagement strategy going forward. *Post meeting note: Designated representatives from Ekurhuleni Metropolitan Municipality confirmed attendance prior to both, the SSC meeting in May 2012 and the Focus*	Mr Tim Hart, SRK Consulting

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		Group meeting in September 2012, but did not attend either of the meetings.	
The SRK Consulting team is acknowledged for its efforts to involve political counterparts from all the relevant local and district municipalities. It must however be pointed out that some of the relevant officials are in recess and have not been able to attend this meeting. In other cases, it often happens that officials confirm attendance prior to meetings, but then do not attend the meeting.	Mr Stephan du Toit, MCLM	Thank you. Noted.	Mr Tim Hart, SRK Consulting
There is a definite need for one-on-one and small group meetings between political level municipality officials and DWA to specifically discuss the issues affecting the Mogale City Municipality. A written request will be submitted.	Mr Stephan du Toit, MCLM	Thank you. Noted.	Mr Tim Hart, SRK Consulting
It is highly recommended that GDARD set up a provincial engagement forum at political level to discuss important matters such as AMD. I volunteer to assist in driving the establishment of such a forum.	Ms Rina Taviv, GDARD	Thank you. Offer accepted.	Mr Tim Hart, SRK Consulting
		One of the recommendations being considered by DWA is to have an Indaba early next year to get a wider audience together to discuss AMD. How to go about that is still under consideration.	Mr Jurgo van Wyk, DWA

H. Next Steps in this Feasibility Study

Mr Andrew Tanner presented the next steps in this Feasibility Study:

I. The Way Forward and Closure

Mr Viljoen thanked participants for their attendance, comments and contributions and the presenters for their time and efforts. He pointed out that the next Study Stakeholder Committee meeting will be held on 14 February 2013.

The meeting closed at 16:00.

Appendix A:

Present, Apologies, Declined Invitation and maximize Absent/No Response

Present:

Chamber of Mines	Mr	Matome	Makwela
Chamber of Mines	Ms	Stephina	Mudau
City of Johannesburg Metropolitan Municipality	Mr	Pule	Makena
City of Johannesburg Metropolitan Municipality	Ms	Mukondi	Masithi
City of Johannesburg Metropolitan Municipality	Mr	Dumisani	Tinghitsi
Council for Geoscience	Mr	Humberto	Saeze
Council for Scientific and Industrial Research (CSIR)	Mr	Phil	Hobbs
Department of Mineral Resources (DMR)	Mr	Mashudu	Maduka
Department of Science and Technology (DST)	Dr	Henry	Roman
Department of Water Affairs (DWA)	Mr	Nigel	Adams
Department of Water Affairs (DWA)	Mr	Trevor	Balzer
Department of Water Affairs (DWA)	Mr	Fanus	Fourie
Department of Water Affairs (DWA)	Mr	Bashan	Govender
Department of Water Affairs (DWA)	Ms	Jacqueline	Jay
Department of Water Affairs (DWA)	Mr	Marius	Keet
Department of Water Affairs (DWA)	Mr	Seef	Rademeyer
Department of Water Affairs (DWA)	Mr	Rod	Schwab
Department of Water Affairs (DWA)	Dr	Eddie	van Wyk
Department of Water Affairs (DWA)	Mr	Jurgo	van Wyk
Department of Water Affairs (DWA)	Mr	Pieter	Viljoen
Ekurhuleni Metropolitan Municipality	Ms	Elsabeth	van der Merwe
Federation for Sustainable Environment (FSE) & Public Environmental Arbiters	Ms	Mariette	Liefferink
Gauteng Department of Agriculture and Rural Development	Ms	Rina	Taviv
Gauteng Department of Local Government and Housing	Mr	Elias	Sithole
Johannesburg Water	Mr	Ariel	Mafejane
Johannesburg Water	Mr	Jones	Mnisi
Mogale City Local Municipality	Mr	Stephan	du Toit
Private Consultant	Mr	Meiring	du Plessis
South African Human Rights Commission (SAHRC)	Ms	Janet	Love

South African Nuclear Energy Corporation (NECSA)	Ms	Immanda	Louw
Trans Caledon Tunnel Authority (TCTA)	Mr	Johann	Claassens
Trans Caledon Tunnel Authority (TCTA)	Mr	Craig	Hasenjager
Trans Caledon Tunnel Authority (TCTA)	Mr	Richard	Holden
Trans Caledon Tunnel Authority (TCTA)	Mr	Sean	O'Beirne
Transvaal Agricultural Union SA	Ms	Lynette	du Plessis
University of Pretoria	Prof	John	Annandale
Vaal Environmental Justice Forum	Mr	Phineas	Malapela
Water Research Commission	Dr	Jo	Burgess
West Rand District Municipality	Ms	Susan	Stoffberg
National Planning Commission (NPC) (Wits University School of Public and Development Management)	Mr	Mike	Muller

Present (Project Team/Consultants):

Aurecon	Mr	Johan	Goosen
Aurecon	Ms	Joanne	Henrico
Aurecon	Mr	Walter	Johannes
Aurecon	Mr	Andrew	Tanner
Aurecon	Mr	Dale	Timm
Aurecon	Mr	Johan	van Zyl
Aurecon	Mr	Fanie	Vogel
SRK Consulting	Mrs	Dianne	Duthe
SRK Consulting	Mr	Tim	Hart
SRK Consulting	Ms	Leoni	Lubbe
SRK Consulting	Ms	Vassie	Maharaj
Turner Townsend	Mr	John	Samuel

Apologies:

Department of Water Affairs (DWA)	Dr	Beason	Mwaka

Declined Invitation:

Agricultural Research Council - Roodeplaat	Dr	Yacob	Beletse
Council for Geoscience	Dr	Henk	Coetzee
Council for Geoscience	Mr	Fortress	Netili
Department of Environmental Affairs	Ms	Amanda	Britz
Department of Mineral Resources (DMR)	Adv	Susan	Malebe
Department of Science and Technology (DST)	Ms	Umeesha	Naidoo
Department of Science and Technology (DST)	Ms	Candice	Willard

Department of Water Affairs (DWA)	Mr	Solly	Mabuda
Department of Water Affairs (DWA)	Ms	Nancy	Mothebe
Department of Water Affairs (DWA)	Mr	Peter	Pyke
Federation for Sustainable Environment and MLDPG	Dr	Koos	Pretorius
Johannesburg Water	Mr	Ntshavheni	Mukwevho
Mogale City Local Municipality	Cllr	Emily	Mathe
National Treasury	Mr	Strover	Maganedisa
Rand Water	Mr	Tawanda	Nyandoro
Sasol	Mr	Zain	Mohamed
Transvaal Agricultural Union SA	Mr	Bennie	van Zyl
West Rand District Municipality	Ms	Herina	Hamer

Absent/No Response:

Agri Gauteng	Mr	Dirk	Hanekom
Chamber of Mines	Mr	Nikisi	Lesufi
City of Johannesburg Metropolitan Municipality	Mr	Freddie	Letsoko
City of Johannesburg Metropolitan Municipality	Mr	Daniel	Masemola
Council for Scientific and Industrial Research (CSIR)	Ms	Bettina	Genthe
Department of Water Affairs (DWA)	Mr	Herman	Keuris
Department of Water Affairs (DWA)	Mr	Mbangiseni	Nepfumbada
Department of Water Affairs (DWA)	Mr	Sputnik	Ratau
Department of Water Affairs (DWA)	Mr	Anil	Singh
Department of Water Affairs (DWA)	Mr	Nemataheni	Thivhafuni
Johannesburg Water	Mr	Nyiko	Nyathi
Mogale City Local Municipality	Cllr	Andy	Mathibe
National Economic Development and Labour Council (Nedlac)	Ms	Tumi	Monageng
National Treasury	Mr	Tumisang	Moleke
North West University	Prof	Frank	Winde
Rand Water	Mr	Reveck	Hariram
Rand Water	Mr	Percy	Khumalo
Rand Water	Mr	Vusumuzi	Kubheka
Rand Water	Mr	Sipho	Mosai
Randfontein Local Municipality	Ms	Maliba	Ramatlhape
Save the Vaal	Mr	Trevor	Stubbs
South African Local Government Association (SALGA)	Mr	William	Moraka
World Bank	Mr	Manuel	Marino
World Bank	Mr	Marcus	Wishart

Appendix B:

WRC Mine Water Activities 2012

WRC Key Strategic Area 3: Water Use and Waste Management

Thrusts and Programmes

Thrust 1: Water Services – Institutional and Management Issues

Thrust 2: Water Supply and Treatment Technology

Thrust 3: Sustainable Municipal Wastewater and Sanitation

Thrust 4: Sustainable and Integrated Industrial Water Management (new)

Thrust 5: Mine Water Treatment and Management (new)

Thrust 6: Watersmart Fund

Overview and explanation of programmes

THRUST 5: MINE WATER TREATMENT AND MANAGEMENT	
***Scope**:* The usage of water in mining and mineral processing/refining produces high volumes of solid wastes and liquid effluents. Some mining activities generate acid mine drainage (AMD) or other mining-impacted waters. This thrust aims to provide appropriate, innovative and integrated solutions to water use and waste management in the mining sector. Future operations will almost exclusively take place in water scarce regions (e.g. Waterberg, Eastern Limb) and their development will require reallocation of already stretched resources through e.g. improved water demand and water conservation management. Additional priorities will include brine handling, biological sulphur compound transformation and aversion of future impacts.	
Programme 1: ***Water use and waste production***	***Scope*:** This programme focuses on investigations into quantification of water used and waste produced by the sector currently, and into predicting and quantifying the short, medium and especially long term impacts the wastes generated will have. The environmental consequences of mining activity are almost always long term in nature, with impacts that last for centuries. These long lasting effects were often not fully understood in the past, and consequently not properly considered. In the present regulatory environment it is increasingly expected of waste producers to quantify the present and future environmental impacts of their past and present operations and to indicate how these will be remedied, as well as how such consequences can be avoided when planning future operations.
Programme 2: ***Regulatory, management and institutional arrangements***	***Scope*:** The creation of sustainable arrangements (e.g. public-private partnerships) that enable the mitigation and prevention of the environmental, social and economic legacies of the mining and minerals industries is complex. Priorities include addressing the treatment and supply of bulk water using acid mine drainage (AMD), a realistic estimate of non point source pollution relating to the waste discharge charge system and determining the price elasticity for water use of the sector (determine the potential to decrease water use through tariff increases). This programme interrogates such aspects from the perspective of the mining sector (note: Policy Development falls under KSA1).

Programme 3: ***Minimising waste production***	***Scope*****:** This programme focuses on investigations into developing technologies and methods to decrease / minimise the generation of waste products in the mining sector, either through cleaner production, by-product generation, life cycle analysis or through applying other risk assessment methodologies. The programme incorporates novel mining methods and mining-impacted water prevention strategies. Waste minimisation at the national, regional, (catchment), complex or single site scale is considered. Identification of opportunities to convert liabilities into assets and holistic, long term research into the beneficial use and recovery of brines, their solutes, and other waste products are also included.
Programme 4: ***Mining in the 21st century***	***Scope*****:** The emerging challenges related to avoiding recreating the legacies of past operations call for emerging solutions. Programme 4 will investigate the prediction and avoidance of long-term water impacts and implications associated with establishing new operations within different geographical areas. It will also actively pursue beneficiation initiatives, remining of wastes, etc. (especially innovative ideas and piloting / scale-up).
Programme 5: ***Low volume mined products***	***Scope:*** Much research attention has been paid to coal and gold mining, however other quarried or mined products such as radionuclides and platinum group metals also require consideration and in some cases they present unique challenges. Water use and demand management, water-conserving metallurgical and extraction processes and investigation of the impacts and amelioration of mine discards specific to these products will be addressed in this programme.

Appendix C:

WRC Mine Water Projects 2012-13

Project No.	Title	Contractor	Term	Summary
2011	Application of emulsion liquid membranes in the recovery of platinum group metals from precious metal refinery wastewaters and mining effluents.	Rhodes University	01/04/10 - 31/03/12	Growing attention has been paid to the environmental implications of liquid effluents from mines and metals refineries. At the same time, water demand of the mining/metal refinery operations and values of precious metals have been increasing while the known reserves have decreased. This led to intense research into the recovery of precious metals from wastewaters. Methods studied include solvent extraction, biosorption, precipitation, ion exchange, electrochemical techniques, cementation, and membrane-based separations. Applicability of a particular method will depend on the speciation and the concentratrion of the metal in question, as well as on the chemical composition of the effluent in question. These factors can limit the efficacy of individual processes. Solvent extraction with emulsion liquid membranes (ELMs) reduces energy and financial costs, the kinetics of extraction is generally faster, and the extraction yields are higher in comparison with diluent-extractant mixtures. The disadvantages of ELMs include the instability of emulsion globules against shear fluid stress, and the resulting decreases in the rates of mass transfer. These drawbacks can be eliminated by increasing the stability of the ELM through the application of non-Newtonian ELMs, and the application of the Taylor-vortex column instead of the continuously stirred tank. After a design of an efficient extraction system at laboratory scale, the scale-up can be achieved by a simple constancy of the Taylor number, thus reducing the process development costs. The application of this process to precious and platinum group metals (PGMs) has not been investigated. The aim of this project is to fill this knowledge gap, and to examine the chemical changes and toxicological implications of the proposed process.

Project No.	Title	Contractor	Term	Summary
2012	Extended Investigations into Recovery of Water and Salts from Multi-component Hypersaline Brines using Eutectic Freeze Crystallization	UCT	01/04/10 - 31/03/12	South African water users are facing challenges in terms of the declining availability of sufficient quantities of water and the deterioration of the quality of the available water. In addition, with the increasing use of water treatment, the result has been an increased generation of inorganic brines and concentrates. Treating these brines, either for the recovery of the salt, or for the reduction of waste streams via a concentration process, is energy intensive and thus costly. The standard design approach for inland desalination plants is one of bulk softening and subsequent concentration of mono-valent salts. This results in mixed brines and sludges of low (or even negative) value, often containing hazardous substances. As a result, brine and sludge disposal occur mainly through forced evaporation and crystallisation of mixed (and often hazardous) salts. The extremely large energy requirements to evaporate the water can be prohibitive and the salt product is still a waste that must be disposed of. Eutectic freeze crystallisation (EFC) is an alternative technology for the separation of highly concentrated aqueous streams. EFC is a technique that is capable of separating aqueous solutions into pure water and pure, solidified solutes and that is highly energy efficient, without the introduction of any solvents. A modelling and experimental programme focussing on the use of EFC has already been undertaken (WRC project K5/1727, which has shown proof of concept for EFC as a feasible treatment for hypersaline brines. However, as for any novel technology, there are still many aspects that need to be investigated and these are the focus of this proposal.
2013	Development of an analytical sensor for the identification, quantification and detection of heavy metal pollution associated with precious metal refinery wastewater.	CSIR	01/04/10 -	The main aim of this project is the development of an electrochemical sensor for the detection of Pb, Zn, As, Cd, Ni, Al, Pt and Pd in precious metal mining wastewaters. The data will be used to determine the effect and extent of the pollution on the aquatic environment. The development of the electrochemical sensor will involve the incorporation and optimisation of chemical materials (e.g. ion exchange material) for low level detection of these metal ions in precious metal mining wastewaters. The secondary objective is the determination, collection and optimisation of the chemical precipitation parameters for the precipitation and speciation of Pb, Zn, As, Cd, Ni, Pt and Pd metals from precious metal mining wastewaters under different chemical conditions. It is envisaged that the research undertaken in this project will contribute to the further development of South Africa's capacity in trace metal pollution assessment. The development of electrochemical sensors will ensure that South Africa is a key player in the development and application of this technology.

Project No.	Title	Contractor	Term	Summary
2014	Preparation of magnetic nano composite beads and their application to remediation of mine wastewaters	Wits	01/04/10 - 31/03/12	The potential of magnetic nano composite beads to remediate water environments such as those from mine wastewaters and acid mine drainage water will be known. Molecularly imprinted polymer (MIP) beads have been used extensively for selective extraction of pollutants from various environmental compartments as part of environmental monitoring. Very little work has been focused on using the same materials for environmental remediation. This project will therefore give valuable information in this direction using magnetic nano composite beads as potential novel materials for remediation of pollutants such as chromium (VI) and uranium (VI) in mine wastewater and acid mine drainage water under laboratory controlled experiments. The possibility of incorporation of magnetic properties into MIP beads is a new and novel idea that makes it easier to separate them from the wastewater.
2015	Evaluating approaches to and benefits of minimising the formation of acid mine drainage through management of the disposal of sulphidic waste rock and tailings	UCT CeBER	01/04/10 - 31/03/12	One of the major environmental issues in the mining industry is that of Acid Rock Drainage (ARD), caused by the disposal of voluminous sulphide-bearing wastes. The legacy of the ongoing generation of ARD from the disposal of low grade dump rock, of tailings and from the mine site itself may continue for decades following active metal extraction. Changes in legislation have put the burden of responsibility for perpetuity on mining companies. This has led to a change in process thinking in order to reduce potentially harmful emissions from deposits and thus reduce long-term costs of tailings management and ARD remediation and the re-examination of the manner in which waste materials are disposed from the mineral processing and extraction stages of metal recovery in order to relieve the environmental burden created and reduce the time frame of risk. Particularly, the delay in the time of ARD formation is no longer acceptable and the need to remove the risk completely accepted. In this project, previous work in WRC project K5/1831/3 will be extended to address aspects of disposal of dump rock and tailings from mining operations processing mineral sulphides (especially pyrite), specifically with the focus of reducing capacity to form ARD and thereby the ongoing risk associated with the disposal of sulphidic mineral ore wastes, through removal of the sulphidic component of the waste. In this project, we seek to use the understanding of the factors governing ARD generation from dump rock and tailings (similar to those governing mineral bioleaching) with the view to the improvement in planned disposal of its components to mitigate ARD generation. Having identified components responsible for ARD generation and characteristics of the waste for disposal to ensure minimisation and control of this generation in our previous project, this project will focus on the methodologies used to minimise and control ARD formation and will provide an approach

Project No.	Title	Contractor	Term	Summary
				to evaluate the relative cost of ARD prevention based on treatments up front of disposal and ARD treatment following its generation.
2107	Toxicity evaluation of metals and metal oxides nanoparticles to aquatic invertebrates and algal species	CSIR	01/04/2011-31/03/2014	Since the beginning of the 1990s, nanotechnology has matured from a laboratory-based research and development phase into full commercialisation of nanoproducts. For example, there are numerous novel consumer products and industrial applications of nanotechnology including: nanoelectronics, molecular assemblies, tissue engineering, biomedicine, nanocomposites, cosmetics, paints, pesticides and water purification modules. Among the nanomaterials, used in the nanoproducts reported above, with high potential of release in large quantities into aquatic environments are metals and metal oxides. In view of the rapidly increasing quantities of nanomaterials released into different environmental compartments – especially water and sediments – it is imperative that the potential risks that may be associated with nanomaterials attract attention, to ensure long-term safe, responsible, and sustainable development of this novel technology for optimal benefit of society. Due to the limited data, on potential risks of nanomaterials to aquatic organisms, which could support practical risk assessment and risk management after entry into the environment, this project will investigate the effects of nanomaterials on organisms at different trophic levels. Secondly, the mechanism by which nanomaterials cause toxic effects to the receptor organisms will be explored through use of DNA, reactive oxygen species (ROS) generation techniques.
2108	Removal of metal ions from industrial effluents and acid mine drainage by metal sulphide precipitation	UCT	01/04/2011-31/03/2013	The main aim of this research is to further the understanding of the precipitation of metal sulphides in the treatment of acid mine drainage via sulphate reduction and metal precipitation. The project will characterise the effect of operating conditions on the physical characteristics of the formed metal sulphide precipitate by investigating the effect of metal to sulphide ratio on precipitation behaviour, the effect of the operating pH on the precipitation process and using a technique based on moment transformations of the number density function n(L) to make inferences about the mechanisms involved in the particle formation processes. The project will also investigate the factors affecting the solid-liquid separation characteristics of the formed particles. The effects of the processing

Project No.	Title	Contractor	Term	Summary
				conditions on solid-liquid separation characteristics of the formed precipitates will be quantified using particle size distribution measurements, settling characteristics and zeta potential measurements for surface charge determination. These studies will be carried out on a number of model metal systems. Finally, the project will investigate factors that potentially influence the solid-liquid separation characteristics of the formed particles. As a result of the investigations carried out, it should be possible to identify a number of factors, possibly different additives, which would influence the separation characteristics of the formed precipitates. Thus the effect of these ions (as well as other additives) on the coagulation and aggregation phenomenon will be quantified by measuring their effect on particle size distribution, surface charge and settling characteristics of the precipitate
2109	Development of a toolkit to enable quantitative microbial ecology studies of sulphate-reducing and sulphide-oxidising systems	UCT	01/04/2011-31/12/2013	The catastrophic effects of untreated mine-water discharges are well known and several high profile events have been documented. Mine-water has traditionally been treated using oxidation-neutralisation-precipitation which effectively removes metal, but the treated stream still contains sulphate. Biological treatment systems, based on the activity of sulphate-reducing bacteria have received considerable attention. Their widespread application has been constrained by the provision of a carbon source/electron donor and the management of the sulphide-containing effluent. Both these issues are addressed in the Integrated Passive Treatment System (IMPI) technology which makes use of a mixture of complex, lignocellulosic carbon sources and incorporates a sulphide oxidation step. Both the sulphide oxidation and sulphate reduction processes are catalysed by a consortium of different microorganisms. Different components of the consortium have different tolerances to sulphate, sulphide and heavy metals. As a consequence, changes in feedstock can lead to major changes in the microbial community. This may have catastrophic effects on system performance. Until recently these changes were poorly understood and system management was based on empirical rules of thumb. The advent of molecular biology techniques has facilitated qualitative microbial ecology studies. While these have been useful in confirming the presence or absence of species or groups of species they provide limited information on dynamic changes in population structure, which could be extremely useful in predicting the response of a system to specific perturbations. This project will develop a molecular toolkit for performing quantitative microbial ecology work in sulphate-reducing and sulphide-oxidising systems. The toolkit will initially be used to characterise the microbial populations in the IMPI demonstration plant at Middleburg Mine. This technology has the potential to treat mine-water effectively and economically over a sustained period of time.

Project No.	Title	Contractor	Term	Summary
2110	Addressing the challenges facing biological sulphate reduction as a strategy for AMD treatment through analysis of the reactor stage: raw materials, products and process kinetics	UCT	01/04/2011-31/03/2014	Mine-waters generated during active mining or resulting from groundwater rebound at abandoned sites have major environmental and economic implications. Active chemical treatment of the waters is the most widely employed technology. Recently there has been increasing interest in active and passive biological treatment processes. These systems rely on naturally-occurring biological and geochemical processes to improve water quality with minimal operational and maintenance requirements. Biological sulphate reduction is a well understood and efficient process that has been frequently demonstrated at laboratory and pilot scale. However, its full-scale implementation has been limited. The challenges facing sulphate reduction systems have been identified as: provision of a cost-effective carbon source; enhancing reaction kinetics when complex carbon sources are used; and management of the resulting sulphide. This study will undertake a critical review of existing technologies, from a technological and economic perspective. Furthermore the feasibility of using microalgal biomass as a carbon source/electron donor will be investigated. The study will also evaluate the requirements for algal cultivation at the scale required to sustain the SRB process. To address the issue of enhanced reaction kinetics the effect of decoupling the hydrolysis and acidogenesis reactions from the sulphate reduction will be investigated. The study will include a review of available technologies and investigate the application of cross-flow microfiltration membranes to recover and recycle biomass to both the hydrolysis/acidogensis and sulphate reduction reactors.
2127	Development of Risk Criteria for water management aspects of mine closure	Golder Associates Africa	01/04/2012 31/03/2014	The DWA recently produced a series of Best Practice Guidelines that give specific guidance on procedures to be adopted in the development of mine closure plans (BPG G5) and in the prediction of future impacts that are associated with mine closure (BPG G4). While the BPGs provide clear methodologies for undertaking the assessments required to support a mine closure application, they do not provide any practical guidance on how issues such as agreement on the acceptable levels of confidence for the prediction that will limit the State's liability to acceptable levels; statistical representivity of the datasets used in the prediction and their suitability for addressing the issues that pertain to the particular closure application; the definition and descriptions of uncertainty inherent in the predictions and acceptance that the defined uncertainity meets the requirements of the regulator; and the suitability and adequacy of financial provisions to cater for uncertainties and risks for post-closure water management and treatment. This project will address the above issues through review of international best practice on these topics and engagement with all stakeholders (DWA, DEA, DMR, mining industry and consultants) in order to provide guidance on how to address these issues when

Project No.	Title	Contractor	Term	Summary
				considering impact predictions and mine closure applications
2129	Treatment of mine water using a combination of coal fly ash and flocculants in a jetloop reactor system	University of the Western Cape	01/04/2012 31/03/2015	The generation of contaminated high sulphate mine water and waste coal fly ash are undesired by-products in coal mining and coal-fired power stations respectively. Mine water is contaminated by contact with oxygen and pyrite bearing rock, or leaches from mine tailings due to infiltrating rain. Mine water produced in coal mines could be acidic, neutral or alkaline depending on the geology of the mines. Acidic mine water, often termed acid mine drainage (AMD) is produced when rock that contains more acid producing minerals than acid neutralizing minerals was disturbed during mining. Prior work has been done on the fly ash neutralization process and stability of solid resides formed during neutralization as is recorded under 'general information' section. This study will optimize the jetloop reactor system which will make this system using fly ash for remediation viable in an industrial environment and thus be a serious contender for low cost mine water treatment and recovery.
2139	Investigation of carbon flux and sulphide oxidation kinetics during passive biotreatment of mine water	University of Cape Town	01/04/2012 31/03/2013	Mine wastewaters generated during active operations or resulting from groundwater rebound at abandoned sites will have major environmental and economic implications for South Africa in the medium and longer term, particularly as active dewatering of some underground basins ceases. Active treatment of the wastewaters, involving oxidation, neutralisation and sedimentation, is the most widely employed technology. However, active systems are not appropriate for all scenarios, particularly lower volume discharges in remote areas. For these waters there has been increasing interest in biological treatment processes, particularly passive or semi-passive systems. These rely on naturally occurring biological and geochemical processes to improve water quality with minimal operational and maintenance requirements. In order to understand and therefore apply such systems, this project will (1) characterise the packing of lignocellulosic material in the degrading packed bed reactor (DPBR) to facilitate estimation of void volume, flow patterns and hydraulic retention time, (2) investigate carbon flux through the DPBR and linear flow channel reactor (LFCR), where sulphide oxidation takes place, to determine

Project No.	Title	Contractor	Term	Summary
				whether additional supplementation with readily accessible carbon (eg molasses) is required and if so, at what rate, (3) determine the rate of release of phenolic compounds from lignocellulosic material in the DPBR and evaluate potential inhibition of sulphate reducing bacteria (SRB) (4) develop a one-dimensional unsteady-state mass transport model to describe the upward diffusion of sulphide and downward diffusion of oxygen through the biofilm, and (5) refine the existing oxygen requirement model to account for impeded diffusion as a result of the biofilm.
2142	A detailed acid-base accounting study of the Karoo formations in the Waterberg coalfield	University of the Free State -IGS	01/04/2012 31/07/2014	Coal mining has a pronounced impact on surface and groundwater quality and quantity. Local experience indicates that the influx of water may be as low as 1% of rainfall for deep bord and pillar mines with no subsidence, to as much as 20% for some opencast mines. Such differences have significant impacts on the quantity and quality of surface and groundwater resources in a local area and further afield. The Waterberg is the only remaining large area with proven coal reserves in South Africa and they are being targeted for large scale mining in the foreseeable future. Most of this will be opencast mining, resulting in large volumes of spoils and also discards (due to the fact that a number of coal seams will be mined with approximately 50 m of interburden between the coal layers) being handled on surface. This project will provide detailed in-depth acid base potential study in the area in order to determine how spoils should be handled in future by the mining companies, due to the complexity and volume of the spoils and discards. If handled correctly, acid generation can be minimized. This study will consolidate the existing information, and obtain new information regarding the possibility of acid generation of the overburden, interburden and discards.
2229	Continuous Eutectic Freeze Crystallization	University of Cape Town	01/04/2013 30/09/2018	While treating coal mining-impacted waters using reverse osmosis, facilities such as the Emalahleni Water Reclamation Plant and the Optimum Water Reclamation Plant produce large volumes of hypersaline brines. These brines are disposed of in evaporation ponds, and thus are lost to the usable water pool. With increasing use of desalination, and hence brine production, the loss of water is predicted to increase exponentially. The total combined brine production rates for the coal and gold mining industries in South Africa are projected to be ±17 000 m3/day in the next 20 years from current values of ±3000 m3/day. Conventional treatment methods, such as concentration in evaporation ponds, have many disadvantages including extensive land use and low productivity. In addition, evaporation ponds recover neither the water nor the salt. Eutectic Freeze Crystallisation (EFC) is able to reduce the volume of brines by as much as 97% and concurrently produce pure salts

Project No.	Title	Contractor	Term	Summary
				as well as potable water. For example, pure calcium sulphate, pure sodium sulphate and potable water, in the form of ice, can be produced. Eutectic Freeze Crystallisation works on the principle that when brine is cooled to the eutectic temperature, both ice and salt crystallise out of solution. The ice, being less dense than water, will float, and the salt, because it is denser than water, will sink, thus effecting gravity separation. There is a major misconception that any freezing process is expensive but, thermodynamically, it is cheaper to freeze one kilogram of water (333 kJ) than to evaporate one (2300 kJ). Energy savings of 85% have been reported when comparing EFC to evaporative crystallisation. An extensive experimental programme focussing on the use of EFC has been undertaken over the last 6 years and proven the concept of EFC as a feasible treatment for multi-component hypersaline brines. Firstly, it was shown that thermodynamic modelling can accurately predict the identities of the recovered salts, as well as their recovery temperatures. Secondly, it was shown that EFC can be used for the treatment of hypersaline brines and inorganic effluents produced by major South African industries. Thirdly, it was shown that EFC can be used to recover multiple salts from multicomponent brines. Lastly, it was shown that EFC can produce almost pure salts and ice. However, all of the work so far has been done in batch mode, an essential mode for testing proof of concept and initial feasibility. Although the batch mode has provided crucial information, it has not been sufficient to showcase the potential of the technology. The next challenge is to develop EFC to the point that it can be used in continuous mode. In this project, important knowledge about operational considerations for continuous EFC, including residence time, degree of undercooling, crystalliser solids content and operating limits will be generated. This knowledge is crucial for making the transition between batch and continuous, as well as to be able to design an EFC plant on both a pilot and industrial scale. This is the essential focus of this project.
2230	Limiting and mitigating the impact of coal mines on wetlands	CSIR	01/04/2013 30/12/2015	By virtue of their positions in the landscape and relationship to drainage networks, wetlands are frequently impacted by coal mining activities, especially opencast methods. These impacts will be ongoing, since coal is a strategic resource and will continue to be mined extensively to support the country's development. At the same time, however, regulatory authorities and the public now have an improved understanding of the range of economic, social, ecological and hydrological costs of wetland loss and degradation. The rules of the game have changed, with regulators increasingly insisting that mines avoid, minimise and mitigate their impacts on wetlands, and internalise the true costs of wetland loss into their balance sheets. Many mining proposals entailing large-scale wetland loss

Project No.	Title	Contractor	Term	Summary
				have encountered delays in licence approvals, unrealistic rehabilitation commitments and unwelcome public and media attention. As a result, the coal mining sector has realised that it needs to proactively and systematically address the business risk posed by its impact on wetlands. Thus, in 2011 the CSIR and SANBI embarked on a three year cooperative applied research project, funded by the Coaltech Research Association. Supplementary funding is also being provided by the SANBI Grasslands Programme and Working for Wetlands, for particular components of the work. The project's focus is on developing mechanisms for limiting and mitigating the impact of coal mining on wetlands, and providing guidelines to the coal mining industry and regulators in this regard. Based on interest expressed by the WRC in supporting this project to expand on its original scope and thereby improve its impact, this proposal has been prepared. It highlights areas where DMR and WRC resources can add further value to the work already underway, by allowing further work to be undertaken that was not part of the original scope of the funding. The project aims to compile an atlas to guide both mining companies and regulators with regard to high risk wetland identification and offsite mitigation principles and methods. The sensitive wetlands atlas will identify key wetlands or subcatchments in the grassland biome of Mpumalanga that are particularly important or irreplaceable in terms of biodiversity, water resource management and other ecosystem services. The atlas that will be produced will guide both mining companies and regulators in their planning and decision-making. The project will pilot the mainstreaming, into the coal mining sector, of information generated through the National Freshwater Ecosystem Priority Areas (NFEPA) project. The aims of the project are fourfold: • To improve planning and decision-making around coal mining by developing products, for both regulators and mining companies, that highlight high risk wetlands and ecosystem services. • To improve the science and practice of wetland rehabilitation in a coal mining context, by improving current wetland rehabilitation guidelines with particular focus on post-mining landscapes and mitigating mining pollutants. • To enhance the quality of planning and regulatory processes by providing improved data on resource economics and risk assessment with respect to wetlands and coal mining. • To compensate for unavoidable residual loss of wetlands due to coal mining by developing, and testing a systematic framework for wetland offsite mitigation, as well as identifying wetland offset receiving areas.

Project No.	Title	Contractor	Term	Summary
2231	An industrial ecology approach to sulphide containing mineral wastes to minimise ARD formation: characterising potential for ARD, design for disposal and extraction of products with value.	University of Cape Town	01/04/2013 30/12/2015	While treating coal mining-impacted waters using reverse osmosis, facilities such as the Emalahleni Water Reclamation Plant and the Optimum Water Reclamation Plant produce large volumes of hypersaline brines. These brines are disposed of in evaporation ponds, and thus are lost to the usable water pool. With increasing use of desalination, and hence brine production, the loss of water is predicted to increase exponentially. The total combined brine production rates for the coal and gold mining industries in South Africa are projected to be ±17 000 m3/day in the next 20 years from current values of ±3000 m3/day. Conventional treatment methods, such as concentration in evaporation ponds, have many disadvantages including extensive land use and low productivity. In addition, evaporation ponds recover neither the water nor the salt. Eutectic Freeze Crystallisation (EFC) is able to reduce the volume of brines by as much as 97% and concurrently produce pure salts as well as potable water. For example, pure calcium sulphate, pure sodium sulphate and potable water, in the form of ice, can be produced. Eutectic Freeze Crystallisation works on the principle that when brine is cooled to the eutectic temperature, both ice and salt crystallise out of solution. The ice, being less dense than water, will float, and the salt, because it is denser than water, will sink, thus effecting gravity separation. There is a major misconception that any freezing process is expensive but, thermodynamically, it is cheaper to freeze one kilogram of water (333 kJ) than to evaporate one (2300 kJ). Energy savings of 85% have been reported when comparing EFC to evaporative crystallisation. An extensive experimental programme focussing on the use of EFC has been undertaken over the last 6 years and proven the concept of EFC as a feasible treatment for multi-component hypersaline brines. Firstly, it was shown that thermodynamic modelling can accurately predict the identities of the recovered salts, as well as their recovery temperatures. Secondly, it was shown that EFC can be used for the treatment of hypersaline brines and inorganic effluents produced by major South African industries. Thirdly, it was shown that EFC can be used to recover multiple salts from multicomponent brines. Lastly, it was shown that EFC can produce almost pure salts and ice. However, all of the work so far has been done in batch mode, an essential mode for testing proof of concept and initial feasibility. Although the batch mode has provided crucial information, it has not been sufficient to showcase the potential of the technology. The next challenge is to develop EFC to the point that it can be used in continuous mode. In this project, important knowledge about operational considerations for continuous EFC, including residence time, degree of undercooling, crystalliser solids content and operating limits will be generated. This knowledge is crucial for making the transition between batch and

Project No.	Title	Contractor	Term	Summary
				continuous, as well as to be able to design an EFC plant on both a pilot and industrial scale. This is the essential focus of this project.
2232	The BIOSURE PROCESS: A sustainable, long term treatment option for acid mine drainage treatment	VitaOne8 (Pty) Ltd	01/04/2013 30/12/2015	The BioSURE Process was identified as one of few treatment options suitable for the treatment of AMD in the Witwatersrand and elsewhere. However, it has been rejected as a viable option for the long term treatment of AMD by Aurecon in their feasibility study for the Witwatersrand, the reason cited being a lack of full or demonstration scale operating data. The full-scale operation undertaken by the East Rand Water Care Company (ERWAT) has in fact demonstrated that the BioSURE Process can be used as a cost-effective treatment technology for AMD. The process is attractive because it makes use of primary sewage sludge or other sources of organic wastes as substrate and produces a good quality effluent. Since it converts permanent hardness into temporary hardness, conventional cold-lime softening processes can be used to desalinate the water while valuable by-products may be recovered. The effluent quality after desalination is suitable for consumption in various industries as a substitute for high quality potable water. ERWAT, with its role as a service provider is very well positioned with its access to sources of primary sewage sludge and biodegradable organic waste. As an operating company and with the past experience of operating a 10Ml/day plant, it can play a significant role in the treatment of AMD. A survey of the industries indicated that there are reliable and consistent sources of waste, other than primary sewage sludge, from various industries to treat approximately 20-30 Ml/day of AMD in the Central and Eastern Basins. This waste is currently being disposed of on landfill sites at high costs. Considering the quantity of primary sewage sludge generated by ERWAT and Johannesburg Water's wastewater treatment plants that can practically be used, a significant volume of AMD can be treated in the Witwatersrand. Co treatment with industrial waste and recovering costs for treatment of industrial waste will reduce the overall treatment cost of AMD. It is therefore important that more aspects should be considered than only the need to treat AMD. These aspects include the requirements to treat and to dispose of sewage sludge and the urgent need to provide additional capacity to process biodegradable organic solids. This project is required in order to improve the BioSURE Process and to properly

Project No.	Title	Contractor	Term	Summary
				document its operating philosophy and limits to applicability in order to make it truly available for implementation. It is planned to: • Compare the performance of the biological sulphate reducing reactors using primary sewage sludge and carbohydrates such as silage and combinations thereof; • Test the performance of the process using a feed of high acidity, low pH AMD; • Investigate the removal of hydrogen sulphide using a process to regenerate iron hydroxide with a biological iron oxidising process integrated with the recovery of valuable magnesium sulphate using a eutectic freeze unit; • Investigate the integration of the effluent treatment process with the so-called SANI process for COD and nitrogen removal.
2233	Feasibility study on the use of irrigation as part of a long-term neutralised acid mine drainage management strategy in the Vaal Basin	University of Pretoria	01/04/2013 30/09/2014	Water resource planners within DWA foresee that the salt load associated with the AMD from the Witwatersrand gold mines will have to be reduced significantly or prevented from contaminating existing supplies. Otherwise large quantities of good quality water will be required (in essence wasted) to dilute the salinity to an acceptable level within the Vaal River system. The water quality decanting from these mines can be highly acidic or alkaline, very saline, and dominated by calcium sulphate, sodium sulphate, magnesium sulphate or sodium bicarbonate. Technologies exist to neutralise and remove these salts from water, preventing environmental degradation following its release, but the techniques are expensive and energy intensive, and create high volumes of brine. Work done in the early 1980s showed that when calcium sulphate-rich mine water is used in irrigation a significant quantity of gypsum precipitates (becomes insoluble) in the soil, effectively reducing salt loads in the irrigation return flows. The more soluble sodium-based salts do not precipitate. In subsequent WRC-supported research, this gypsum precipitation mechanism was confirmed in commercial scale systems under pivot irrigation with coal mine water. Multiple crop species grown under sprinkler did not show foliar injury symptoms and yields were higher than for dryland production. Furthermore, gypsum precipitation did not result in any observable physical or chemical changes that would adversely affect soil productivity. Following these findings, the team concluded that there are four components to consider in managing irrigation with saline water: the chemical quality of the irrigation water, the hydrological setting of the irrigated area, the management of the leaching fraction, and the fate of the AMD. The AMD issue in the western, central and eastern basins has now reached a critical point requiring short- and long-term mitigation measures. Issues of a similar nature in the Mpumalanga coal fields and elsewhere are anticipated in the near future. This project aims to build on previous WRC research on the feasibility of using irrigation to remove salts from neutralised AMD

Project No.	Title	Contractor	Term	Summary
				through gypsum precipitation in soil, by assessing whether irrigation can be a feasible component in an integrated AMD management plan, as a cost-effective and sustainable method to prevent a significant salt load from neutralised AMD from ending up in the Vaal River System, while also utilising the water in an economically productive way. This work will assist in indentifying whether irrigation can be part of an integrated solution to the AMD problem in the Vaal Basin as well as other basins with AMD issues. Decision makers will be provided with better information on the feasibility of using a potentially more cost-effective and environmentally sustainable way of reducing the salt loads from AMD. The use of irrigation to remove salts from neutralised AMD will potentially reduce the financial and environmental burden resulting from other treatment options, for example reverse osmosis plants. Using neutralised AMD productively will result in income for farmers, job opportunities and increased agricultural production in the region, which will be especially beneficial in regions with scarce irrigation water resources.
2234	Mine water atlas of South Africa	Golder Associates Africa (Pty) Ltd (Midrand)	01/04/2013 30/09/2015	Large volumes of water are used by the mining and other industrial sectors for extraction and concentration of metals and non-metallic minerals, and generation of the electricity required for crushing ore, on-site processing, smelting, refining and other aspects of treating resources to improve their properties. Demand for water by the mining industry is limited and localized but becomes high when associated refining, smelting and manufacturing operations are considered. Mining has been an integral part of South African history and economy. In 2007, the South African mining industry employed 493,000 workers and represented 18% of South Africa's $588 billion USD Gross Domestic Product. Mines are most heavily concentrated in the eastern half of the country. While most mines are designed as closed systems, water pollution can result from problems in the mining, or milling processes and aquatic ecosystems can be affected. In discussions with mining and/or water stakeholders in South Africa, it has emerged that a national Mine Water Atlas would be extremely valuable as a tool for water management planners and as an educational resource for water users, legislators, and the public. The Mine Water Atlas of South Africa is thus intended to be a comprehensive reference of extent of the influence of acid rock drainage (ARD) on the country’s surface and ground water resources: summarizing the location, geography, geology, water quality and hydrologic characteristics. The information shall be presented in a graphical format supported by descriptive narratives and tables to better facilitate the reader's understanding of the material. The information, maps, and tables in the Atlas will portray general, regional conditions. The Atlas will be a significant and timely contribution that can inform the

Project No.	Title	Contractor	Term	Summary
				implementation of commitments made in the past two years. Decision makers can also look to the Atlas for background information and tools to assist in fulfilling commitments made in other recent events and declarations.

Appendix D7
SSC Meeting 3: Proceedings

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

FINAL PROCEEDINGS OF THE STUDY STAKEHOLDER COMMITTEE MEETING 3

Held on 16 May 2013

at Aurecon offices in Lynnwood Pretoria

Distribution: SSC Meeting Invitees, Acceptances and Attendees

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A. Introduction

This document records the proceedings in comment and response report format, of a one-day meeting with the Study Stakeholder Committee (SSC) established by the Department of Water Affairs for the AMD Long-Term Solution Feasibility Study (LTS-FS).

The meeting was held on 16 May 2013 at the Aurecon offices in Lynnwood, Pretoria and attended by 54 people (see **Appendix A** for a list of the attendees). The list in **Appendix A** also includes apologies, those who have declined the invitation, those who have not responded to the invitation, and those absent.

B. Welcome, Apologies and Introductions

Mr Tim Hart introduced himself as the facilitator of the meeting before handing over to the Study Deputy Director, Mr Pieter Viljoen of the Department of Water Affairs. Mr Viljoen welcomed participants to the third Study Stakeholder Committee (SSC) Meeting on behalf of Mr Solly Mabuda, the Chief Director: Integrated Water Resource Planning of the Department of Water Affairs, and SSC Chairperson, who was not able to attend the meeting.

This was followed by a round of introductions, and noting of apologies from Mr Zacharia Maswuma, Department of Water Affairs, Mr Koos Pretorius, Federation for Sustainable Environment, and Ms Candice Willard, Department of Science and Technology (also refer to Appendix A for full list of apologies). Mr Mike Muller, National Planning Commission, and representatives of World Bank indicated that they would join the meeting later.

C. Meeting Objectives

Mr Viljoen outlined the objectives of the meeting as follows:

- To understand the current position of the Study in the context of all Acid Mine Drainage (AMD) related initiatives, including the Short-Term Intervention (STI);
- Describe the reference solution;
- Discuss alternative institutional, financial and procurement arrangements;
- Discuss procurement proposals; programme and responsibilities for implementation; and
- Discuss the way forward.

D. Structure of the Meeting and Acceptance of the Agenda

Mr Hart outlined the structure of the meeting, presented the proposed agenda for the meeting and requested comments and additions from attendees. The agenda was accepted.

Mr Fanie Vogel outlined the logistical arrangements and safety aspects to be followed.

E. Meeting Process and Procedures

Mr Hart outlined the meeting process and procedures. He explained the contents of the meeting documentation folder, pointing out that it included a comment form for those who would like to contribute further comments after the meeting.

F. Meeting Presentations and Presenters

The table below lists the presentations made at the meeting and the names of the presenters. Note that the presentations are not appended to these proceedings, but are available to SSC members on the Aurecon AMD web portal (http://aureconit.co.za/amd/Public/Default.aspx). SSC Members need to register on the web portal and afterwards contact Mr Johan van Zyl (johan.vanzyl@aurecongroup.com) for their user permissions to be set, which will enable them to access the documents available to the SSC group.

Mr Hart appealed to meeting participants to exercise discretion when distributing this information to parties outside of the SSC group.

Presentation	Presenter
1. Study Governance Structure, Role of SSC and Stakeholder Engagement	Mr Jurgo van Wyk, Department of Water Affairs (DWA)
2. Update on the Vaal River Water Resource Management Strategies	Mr Seef Rademeyer, DWA
3. Parallel Initiatives	
3.1 Report back on the Hydrological Monitoring Committee	Mr Marius Keet, DWA
3.2 Department of Mineral Resources (DMR) and Council for Geoscience (CGS): Strategic Mine Water Management Project	Ms Ethel Sinthumule, Department of Mineral Resources (DMR)
3.3 Other Parallel Initiatives	Verbal feedback from representatives of the various organisations
3.3.1 Department of Agriculture and Rural Development (GDARD)	
3.3.2 Water Research Commission (WRC)	
3.3.3 Cradle of Humankind	
3.3.4 Other on-going studies of the Council for Geoscience	
3.3.5 Federation for a Sustainable Environment (FSE)	
4. Short-Term Intervention (STI) Status and Programme	Mr Johann Claassens, TCTA
5. Overview of the Feasibility Study for a Long-term Solution (LTS)	Mr Andrew Tanner, Aurecon
6. Presentation and Discussions on Technical Study	Mr Andrew Tanner, Aurecon
6.1 The Reference Solution and Proposals for Implementation • Western Basin • Central Basin • Eastern Basin	
7. Institutional, Financial and Implementation Arrangements	Mr John Samuel, Turner & Townsend
7.1 Options for Procurement and Funding	
7.2 Institutional Arrangements	
7.3 Cost Recovery Options	Mr Andrew Tanner, Aurecon
8. Study Recommendations for Implementation	Mr Andrew Tanner, Aurecon
9. Study Finalisation	Mr Andrew Tanner, Aurecon
10. Status of Implementation Activities	Mr Jurgo van Wyk, DWA

The table below lists the comments, questions, recommendations and suggestions raised by meeting participants, as well as the responses from the Study Project Team.

F. Proceedings

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
1. Study Governance Structure, Role of SSC and Stakeholder Engagement			
Please clarify how the Study Team will manage the impact of the study extension on the budget originally allocated for the study. Is the matter still pending or has it been resolved?	Mr Strover Maganedisa, National Treasury	The matter has been resolved. Study extension would not have been approved if there was no budget available for it. The responsible Chief Financial Officer has supported the request for additional time and budget.	Mr Jurgo van Wyk, DWA
Note that the Request for Information (RFI) was also sent to the people who contacted the Team of Experts at the beginning of the process. A list of these people was provided to the feasibility study team.	Dr Henk Coetzee, Council for Geoscience (CGS)	Thank you, the DWA has been in contact with those people.	Mr Jurgo van Wyk, DWA
2. Update on the Vaal River Water Resource Management Strategies			
The focus of DWA's Vaal River Water Resource Management Strategies is on the impact of AMD from the gold fields on the Vaal River system - but what consideration is being given to the potential impacts and risks from other mining activities in the catchment for eg. the Free State coal fields around Vereeniging and Sasolburg, and coal fields in other areas upward in the catchment, as well as affected areas in Carolina where Council for Geosciences is involved in some initiatives	Mr Phil Hobbs, Council for Scientific and Industrial Research (CSIR)	In terms of the planning, DWA is aware of the potential impacts of the coal mining sector in the area, and recognises that timeously action is required, especially in the Upper Vaal. Resource Water Quality Objectives have been set for the entire Vaal River, and DWA must ensure that there is compliance. There are already initiatives, especially in the Upper Vaal, where there are still pristine areas that DWA would like to conserve and has started collaborating with others in this regard.	Mr Seef Rademeyer, DWA
It is important for the studies to take into consideration that the migration into Gauteng is now estimated at 20 000 people per month (STATS SA website), especially in terms of the implications on water demand.	Mr Stephan Du Toit Mogale City Local Municipality	It is recognised and acknowledged that migration to Gauteng is inevitable based on economic reasons. The challenge however is with people who retire/ or no longer work, still live in the area and cannot afford to pay for their water usage. This is not reflected in the statistics. Census 2011 data will assist to quantify some of the dynamics.	Mr Seef Rademeyer, DWA
Have the predictions and scenarios in the strategies been adjusted from the initial high demand scenario of a 1.9 % population growth, to the 2.8% growth rate reflected in the 2011 Census?	Ms Mariette Liefferink, Federation for a Sustainable Environment (FSE)	As far as the population projections are concerned, DWA is in the process of interrogating the latest statics to understand the dynamics and its implications, and will adjust the calculations as necessary.	Mr Seef Rademeyer, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
Since the strategies already take other mining activities in the Upper Vaal, into consideration, it is assumed that these are new mining applications. Is consideration also being given to the historical impacts such as the decant due to mine closure and other closure related impacts?	Ms Mariette Liefferink, FSE	DWA is aware of the old mines and has already incorporated them into the strategy. The challenge now is to manage the applications for new mines.	Mr Seef Rademeyer, DWA
DWA should prioritise water licensing, in order to alleviate the current situation where mining rights are granted before water licenses?	Dr Henk Coetzee (CGS)	Comment noted.	Mr Seef Rademeyer, DWA
The existing regulations do not seem to be very effective against water quality issues due to historical mining, and in future, more mines will reach their end of life and also contribute to water management related issues.	Dr Henk Coetzee (CGS)	Comment noted.	Mr Seef Rademeyer, DWA
3. Parallel Initiatives			
3.1 Report back on the Hydrological Monitoring Committee			
How will the new prospecting right applications by Gold One for the Grootvlei mine impact upon on the hydrological monitoring results?	Ms Mariette Liefferink, FSE	DWA is currently not aware of the new prospecting rights applications for Grootvlei, but is in contact with Gold One and will probably receive that information soon. If the application for the mining right is on the northern side of the site, it is not likely to have an impact on the Eastern Basin.	Mr Marius Keet, DWA
Can the monitoring devices used for monitoring in the underground mine voids, also be used to monitor water quality in the Vaal River?	Mr Phineas Malapela, Vaal Environmental Justice Forum.	The monitoring device cannot be used to monitor water quality of the Vaal River, as it is designed for usage in mine shafts. However, the water quality monitoring system in the Vaal River is very comprehensive and efficient. Currently, monitoring results are available from 11 different monitoring stations that were installed earlier in 2013, and there is sufficient water quality information in the Vaal River system. This system will be extended to include up to 20 or 25 monitoring points.	Mr Marius Keet, DWA
With regard to the monitoring results, consideration must be given to the fact that the data is sourced from a quasi-stationary column of water, which is constantly rising. Even though the monitoring data may seem good currently, there is no certainty as to how it	Mr Phil Hobbs, CSIR	Thank you, comment noted.	Mr Marius Keet, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
might represent the long-term situation.			
With regard to the availability of surface water flow monitoring downstream of the activities in the Central Basin, there is a reasonable understanding of the flow in the Vaal River, but not in some of the tributaries which are affected. Although there is a good record for water use north of the Western Basin, there is no good baseline for water use south of the Central Basin.	Dr Henk Coetzee, CGS	DWA has made major improvements to the surface water flow monitoring system, but it seems that there will never be enough monitoring stations. DWA also has a flow monitoring system and task team in collaboration with Rand Water, to cover areas in the Vaal River system not monitored by DWA.	Mr Marius Keet, DWA
3.2 Department of Mineral Resources and Council for Geoscience: Strategic Mine Water Management Project			
The Department of Mineral Resources (DMR) is currently conducting a research project on strategic mine water management in the Central, Eastern and Western Basins of the Witwatersrand. The main focus of the project is to prevent ingress of water into the mines. In terms of the recommendations from the research, the DMR is in the process of constructing the Florida Canal from the Central Basin When the canal construction is completed, it will be handed over to the City of Johannesburg Metropolitan Municipality.	Ms Ethel Sinthumule, Department of Mineral Resources (DMR)	Thank you for this information.	Mr Tim Hart, SRK Consulting
3.3 Other Parallel Initiatives			
3.3.1 Department of Agriculture and Rural Development (GDARD)			
GDARD undertook a successful AMD education and awareness exercise in the West Rand, in which over 500 people participated. There was very positive cooperation from the mining sector in this exercise. On the negative side, GDARD advertised a tender opportunity for a pilot study, and only received one proposal. As this was not an acceptable response, the project was closed, and the process will be re-visited.	Ms Rina Taviv, Gauteng Department of Agriculture and Rural Development (GDARD)	Thank you for this information.	Mr Tim Hart, SRK Consulting
3.3.2 Water Research Commission (WRC)			
Six new WRC funded projects were commissioned in April 2013. There are also three additional WRC activities in conjunction with other organisations, related to AMD – please refer to Appendix B for a complete list and explanation of projects and activities.	Dr Jo Burgess, WRC	Thank you for this information.	Mr Tim Hart, SRK Consulting

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
3.3.3 Cradle of Humankind			
In terms of the Western Basin, the Management Authority of the Cradle of Humankind World Heritage Site has renewed its contract for another year for the water resources monitoring in that area, which includes a detailed look at the upstream impacting forces, such as AMD. By March 2014, this programme will have been running for five years. Documentation generated by this project is available in the public domain, and has been used in this Feasibility Study. That initiative is on-going and is being supported by Gauteng Tourism.	Mr Phil Hobbs, CSIR	Thank you for this information.	Mr Tim Hart, SRK Consulting
3.3.4 Other on-going studies of the Council for Geoscience (CGS)			
CGS is conducting laboratory simulations of flooded and unsaturated mine voids. The project is still in its early stages, but interesting evolutions of water quality over time are already evident. Some of the results are likely to be presented soon. The next phase in the monitoring in the underground basins seems to be progressing and further information can be obtained from Mr Fortress Netili and Mr Humberto Saeze, who should also be invited to report back at SSC meetings.	Dr Henk Coetzee, CGS	Thank you for this information.	Mr Tim Hart, SRK Consulting.
3.3.5 Federation for a Sustainable Environment (FSE)			
The FSE is involved in multi-disciplinary research projects with the World Health Organisation, Lancet Research Group, and two studies in North West Province on the impact of mine water on human and eco health.	Ms Mariette Liefferink, FSE	Thank you for this information.	Mr Tim Hart, SRK Consulting
4. Short-Term Intervention (STI) Status and Programme			
FSE agrees that there was a need for emergency measures to be taken; however, the EIA process should have been run concurrently. There should not have been an exemption and the FSE has brought an appeal against it. According to Regulation 66,	Ms Mariette Liefferink, FSE	None of us here will be able to answer for the Minister. We should allow for the process to take its due course and for the Minister to respond when she has to.	Mr Sputnik Ratau, DWA

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Subsection 2 of NEMA, the Minister has to respond by law, within 90 days after submission of the appeal. Is there feedback on whether the Minister will respond?		The Department of Environmental Affairs (DEA) has received the appeal, and it is in process. Yes, the Minister will respond.	Ms Pumeza Skepe-Mngcita, (DEA)
Is there a document defining the process that the TCTA has followed, and the plan for going forward?	Dr Henk Coetzee, CGS	The process is documented in the Scoping Report. TCTA has experienced an environmental authorisation journey, with many lessons learned. These will be documented at the end of the project and shared with other parties.	Mr Johann Claassens, Trans Caledon Tunnel Authority (TCTA)
It has been alleged that the money donated by Central Rand Gold (CRG) for the pumps, has been set off against their obligations in terms of their social and labour planning. The affected communities are now aggrieved that the benefits intended for them have been sacrificed for the pumps. Are their concerns valid?	Ms Mariette Liefferink, FSE	TCTA has raised this issue with CRG, and cannot comment on their behalf, but can say that CRG has presented its plans to DMR, and understands that they have been accepted. The issue regarding donation of pumps is not only related to TCTA's work.	Mr Johann Claassens, TCTA
How long will it take from the pumps arriving from Germany, to it being assembled and commissioned?	Ms Mariette Liefferink, FSE	The pumps were tested in Germany during May 2013. They will be re-assembled and shipped in July to arrive in South Africa September 2013. The supplier will be responsible for the installation. The ownership of the pumps was transferred from CRG to TCTA when the agreement was signed.	Mr Johann Claassens, TCTA
Is there any better way of discharging the water in the Western Basin, as the current method could contribute to erosion and migration of silt into the river system?	Freddie Letsoko, City of Johannesburg Metropolitan Municipality	This will be discussed and investigated with the TCTA technical team to ascertain if it could pose a potential problem.	Mr Johann Claassens, TCTA
There is concern from the stormwater engineers and emergency services teams at Ekurhuleni Metropolitan Municipality about the amount of water that will be discharged into the Elsburgspruit and Blesbokspruit, and the effect that it will have on the floodline determination. There are formal and informal settlements relatively close to the spruit and the impacts of flooding are a major concern, given that flooding related problems are already being experienced.	Ms Elsabeth Van Der Merwe, Ekurhuleni Metropolitan Municipality	Comment noted. The presentations to follow will address some of these concerns.	Mr Andrew Tanner, Aurecon

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5. Overview of the Feasibility Study for a Long-Term Solution (LTS)			
Please note that the e-mail notification sent to SSC members regarding availability of reports for comment did not include the direct link to the report, only reference to the Aurecon AMD Web Portal.	Ms Elsabeth Van Der Merwe, Ekurhuleni Metropolitan Municipality	SSC members are requested to e-mail Johan van Zyl at Aurecon (johan.vanzyl@aurecongroup.com), to obtain login details and a password for access to the Aurecon AMD Web Portal. The link will be included in all notifications.	Mr Andrew Tanner, Aurecon
6. Presentation and Discussion on Technical Study			
Is it possible for the public to receive a status report on the management of the ingress or ingress control projects in which CGS is involved?	Ms Mariette Liefferink, FSE	FSE would make a direct request to DMR in this regard.	Dr Henk Coetzee, CGS
Has provision been made for the remediation of contaminated receptor dams or river systems in either the short-term or long-term AMD management solutions?	Ms Mariette Liefferink, FSE	The remediation of rivers is not part of the LTS-FS or the STI, but the Implementation Strategy and Action Plan produced in the feasibility study will include a chapter on recommendations and requirements for the remediation of rivers and receptor areas.	Mr Andrew Tanner, Aurecon
There have been reports that with the neutralisation, the yellow boy, the iron hydroxide that precipitates with other heavy metals, is no longer precipitating in the Tweelopiespruit. Does this mean that these heavy metals are no longer mobilized in the stream?	Ms Mariette Liefferink, FSE	The yellow boy is actually the sludge. In the past, that sludge was not properly contained within the plant. It was being deposited in the river systems. Now that the plants are running well, the sludge is being properly contained.	Dr Henk Coetzee, CGS
		Yellow Boy is the iron (III) hydroxide crust that forms on the river beds, and encloses some of the vegetation, which in the Tweelopiespruit can be seen migrating upstream from the bottom end of the system. Since the commissioning of the short-term (immediate) intervention by TCTA, a positive impact is starting to show because neutralised water is now entering the system. Because Yellow Boy is insoluble, its disappearance is attributed to mechanical abrasion or erosion as a result of neutralised water being released, breaking up the crust and causing the particles to migrate downstream and distribute themselves in the stream bed, as grains, and not as sludge. It is hoped that if the current conditions continue, that the improvement will gradually migrate upstream as time proceeds.	Mr Phil Hobbs, CSIR

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Has DWA and Rand Water also considered Eskom, Medupi and Kusile, as potential industrial water users, as they require water that contains 15 to 40 milligrams sulphites per litre?	Ms Mariette Liefferink, FSE	There are industrial users closer to the basins that Rand Water will be considering, and other potential users who have requested industrial water, and are in close proximity to the basins. This will avoid the need for long pipelines. Eskom and Sasol are also potential users, although they are situated further from the basins.	Mr Andrew Tanner, Aurecon
FSE is concerned about the process regarding the EIA exemption to Mogale Gold, and the reason cited that it falls within the short-term intervention. Will there be an adequate investigation done, to ensure that there are no long-term impacts, given the already poor environmental management at the Mogale Gold and Mintails operations in the Randfontein and Krugersdorp area.	Ms Mariette Liefferink, FSE	The feasibility study team cannot respond on behalf of Mogale Gold and Mintails.	Mr Andrew Tanner, Aurecon
Has the study considered chemical recycling of the high density sludge and the salts, and the potential value thereof?	Mr Mahlori Mashimbye, Department of Science and Technology (DST)	The study has to some extent considered the cost implications of reworking the sludge. Given that it is very costly, the study has assumed that it is not useable and proposes to treat it and store it forever, which is not the desirable situation. There are possibilities like refining and enhancing the HDS process or a post-treatment process, to actually get better quality sludge, but the cost-effectiveness of this is doubtful. Gypsum users and the cement industry are also not willing to pay. The costing models propose in the procurement process to invite people, who will be able to make money by improving the treatment or implementing a secondary treatment, to do the recycling, because it is cost-effective for them to generate an income. The study proposes this an incentive to the private sector to take that step.	Mr Andrew Tanner, Aurecon
Will it be possible to distinguish between salts emanating from the present AMD in the river and the salts which are pumped in by the current operations?	Phineas Malapela, Vaal Environmental Justice Forum	Currently, only in the Western Basin where the AMD is being neutralised, is it discharged into the river system, firstly into the Tweelopiespruit, which consequently flows to the Hartebeespoort Dam. There is nowhere else where neutralised AMD is being pumped from. In future the desalination process, reverse osmosis, will remove the salts, and the salts removed will become brine, which is a very concentrated salt solution. The proposal in the reference project is to construct an evaporation plant, which results in a crystallized salt.	Mr Andrew Tanner, Aurecon

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It is important to have mitigation and rehabilitation measures for the existing contaminated streams. Gradual removal of some of the crusts mentioned earlier has been noticed in the Tweelopiespruit, but the sludge accumulated within the dam, for example the Hippo Dam in the game reserve, has not been removed and is in fact increasing at this stage. Two thirds of the Hippo Dam has already been sludged up and it has to be removed and addressed at some point in time. Mogale City has undertaken research and based on aquatic bio-monitoring, the system has definitely improved, to the extent that aquatic organisms that were not found in previous surveys are now being found. For the first time in decades, antelope population are observed drinking water directly from the water sources. It is a positive development, although neutralisation is a concern, as all the salts have not been removed, some behavioural adaptations and improvement in the ecological systems are evident.	Stephan Du Toit, Mogale City Local Municipality	These are issues to be considered by government that is not part of the study. They will however be mentioned in the Implementation Report. If there are more issues or impacts that you would like to list, like the Hippo Dam, the study team can be informed to ensure that we are aware of all of them.	Mr Andrew Tanner, Aurecon
How are risks, especially in terms of floodlines and disaster management, being determined? This is a function of probability, impact and duration, and based on that one can determine an acceptable risk and an unacceptable risk. The quantity of neutralised water being released is an example of one of the risks, particularly in Western Basin where streams that used to be predominantly driven by seasonal rainfall patterns now have a continual stream, even during dry periods	Mr Stephan Du Toit, Mogale City Local Municipality	There are the physical risks in terms of whether the processes are reliable or not, such as accidents or malfunction in the treatment works. Therefore the reference project includes systems to detect that if the water is not properly treated, there is an option for it to go back into the void, rather than be released into the environment. Some processes were discarded because their risk profiles were too high, particularly those involving too many hazardous chemicals. The technologies being recommending in this study are proven and fairly low in risks. Financial risks were also considered.	Mr Andrew Tanner, Aurecon
		In the Eastern and Central Basin, not so much the Western Basin, the volume of water being put back into the system, is the same amount that used to be discharged into the system since the 1890's. It is not a case of entirely new water. It is water that has not been discharged for a couple of years, which will start to be discharged again, but of much better quality. In the Eastern Basin, there is a problem in the Blesbokspruit with flooding, because of large return flows from both urban areas and mines. Grootvlei's discharge contributed to this problem and will start to do so again after	Dr Henk Coetzee, CGS

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		pumping commences.	
Financial reports being classified as confidential, means that National Treasury's involvement in the SSC is being restricted, and may not justify attendance of this forum. Reports from this feasibility study will acknowledge National Treasury's involvement throughout this process, but it must be noted that constructive, meaningful input cannot be provided in the absence of financial reports. A separate meeting before the end of the study is proposed between National Treasury and the feasibility study team to discuss the financial aspects.	Mr Strover Maganedisa, National Treasury	The capital costs have been broken down to some level of detail and are included in the available information. There is agreement that DWA and National Treasury should have a discussion prior to the end of the study.	Mr Andrew Tanner, Aurecon
		The reports with the relevant information are now available and a meeting with National Treasury is to be arranged in due course.	Mr Jurgo van Wyk, DWA
If the water is removed from the system and the water level in the mine void is dropped down to the ECL, the system will be dried out in the upper reaches, which means that the sludge in the Hippo Dam will dry out as well, and the chemical composition of the dried sludge may be unknown. This may result in the same situation in the Tweelopiespruit as previously in the Wonderfonteinspruit with the Coetzee Dam.	Mr Phil Hobbs, CSIR	Comment noted.	Mr Andrew Tanner, Aurecon
Are there any financial incentives for industrial user willing to change their current water supply from potable to treated AMD?	Ms Sophia Tlale, TCTA	The current understanding is that Rand Water will receive AMD treated to potable water standard and supply that to industrial users at the same tariff as for any other water. The shortfall between what is charged and the cost of treatment will be recovered from government. Industrial users will in such a case be expected to pay the same for treated AMD than they would pay for any other water from the Vaal River system as per the Rand Water pricing policy.	Mr Andrew Tanner, Aurecon
Are there any quality requirements for industrial use of treated AMD, and would industries be required to upgrade their own systems to meet those requirements? Similarly, are there effluent quality requirements for processes using treated AMD?	Ms Sophia Tlale, TCTA	Some industries were already engaged to inform the study and hence water treatment costs have been included. These entail costs for removing salts effectively to a standard where the treated AMD can be used directly in their highest quality processes. If Vaal River or Vaal Dam water is used, these industries have a process to remove salts, but they would rather use water without the salts to avoid this process. The aim is to provide industries with the water quality they	Mr Andrew Tanner, Aurecon.

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		require, which might be slightly better than their current supply, and therefore there might be a small premium, but the detail has not been worked out yet.	
		Effluent resulting from any process using treated AMD, will have to comply with current effluent quality requirements i.e. to treat the effluent to an acceptable standard prior to it being discharged.	Mr Jurgo van Wyk, DWA
What is the magnitude of potential demand from industry?	Mr Michael Van Der Laan, Agri Gauteng / University of Pretoria (UP)	The demand in the Central and Eastern Basin is in excess of the volumes of AMD that will be available. In the Western Basin there is sufficient demand, but it seems to be from industry at more remote locations.	Mr Andrew Tanner, Aurecon
Co-disposal of sludge has been approved, but yet disposing the sludge underground, is viewed as a risk. Is there currently a research project to determine the risks of the partial disposal of sludge to underground at the West Wits Pit?	Ms Rina Taviv, GDARD	The co-disposal of sludge means it is in a tailings storage facility, one that is properly designed and secured. The West Wits Pit is just a temporary option at the moment, although it is not an acceptable option, and it is not included in the long-term planning.	Mr Andrew Tanner, Aurecon
The ECLs are set conservatively, and there is no calibration data for those models, they are conceptual models, which cannot be calibrated until pumping starts. There is some scope for raising ECLs, once this data is available. However, the risk of doing this too quickly means duplicating some of the capital cost within a short period of time, which becomes extremely costly. With regard to the West Wits Pit, when pumping starts,it is important to consider that with the lowering of the water level, the quality of water coming out of the void may be negatively affected, which fortunately will not enter the environment. Once a gradient is established towards the pumping shaft, the water flows down towards the pumping shaft, and will create problems if not properly managed. But the problems will be treatment related and not affect the outside environment.	Dr Henk Coetzee, CGS	The West Wits Pit where the sludge is currently being disposed does connect to the void, so sludge does go back into the void. However, it comes back to the pumping shaft in a diluted form, so there is some recycling, but it does not get into the environment.	Mr Andrew Tanner, Aurecon
At the moment the sludge is not disposed in the West Wits Pit, it is disposed in the CPS Pit.	Ms Mariette Liefferink, FSE	The CPS Pit serves as a clarifier. Once the water is treated at the Rand Uranium Plant, it is pumped to the CPS Pit for clarification. The neutralised water then runs from the CPS Pit to the canal, which runs to the Tweelopiespruit. The	Mr Johann Claassens, TCTA

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		sludge is pumped out of the CPS Pit into the West Wits Pit. The CPS Pit is only a clarification facility, not a sludge disposal facility.	
		The CPS Pit is in effect a transit point.	Mr Andrew Tanner, Aurecon
What is the rationale behind the time intervals for the different phases?	Mr Strover Maganedisa, National Treasury	In the reference project, the basis of this is that in the financial modelling it is to give a design to operate and maintain the contract. The capital investment is such that anything less than ten years is too short. Within fifteen years it should be clear whether piloted new technologies are suitable and if they are a cheaper whole life solution for the long-term. A large portion of the operational costs will go towards waste disposal.	Mr Andrew Tanner, Aurecon
		The anticipated high operational cost associated with the reference solution is also part of the rationale. The initial phases, specifically for the Western Basin, aim to find innovative/ better solutions with lower operating costs to potentially be implemented in the later phases.	Mr Jurgo van Wyk, DWA
The discharges from Grootvlei have ceased a few years ago – note that this was discharge, not pumping of water. In the interim other factors have come into play, with new informal settlements and other developments increasing the stormwater discharges as well. In the Blesbokspruit there was a catchment management project to remove the reeds, and this exacerbates the slower flow to the downstream area. This year, ERWAT experienced water pushing up into the waste disposal site. All of the abovementioned should be taken into consideration in the calculations, especially in the short-term, from 2013 onwards and for as long as necessary. But how long is necessary?	Ms Elsabeth Van Der Merwe, Ekurhuleni Metropolitan Municipality	Management of urban rivers in this area need serious attention. DWA has spoken to some of the Metro's earlier and there are still major gaps between who is responsible and who is accountable for managing the various aspects associated with these urban rivers. There should be more discussion between the Metro's and DWA in this regard, since this has been a problem since 1992. New legislation requires this collaboration to resolve issues like these.	Mr Pieter Viljoen, DWA
With regard to Blesbokspruit, and the programme for removal of the reeds, GDARD tried to raise funds for managing the reeds, but due to certain constraints, were unable to carry on. In addition to the reed problem, there are other problems related to poor construction of some of the infrastructure, like the bridge on	Mr Vukosi Ndlopfu, GDARD	It is a river planning issue, and there are two other bridges that are of immediately concern, and have a much more direct impact from this study's perspective. The whole river management system is critical.	Mr Andrew Tanner, Aurecon

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the R42, which has 20 calverts, but water only flows through 4. Hence water dams up in the system.			
It is important to understand that the ECLs set in the STI process are based on where the water would decant if the water level were to rise for example, in the Central Basin, the decant point would be Cinderella Dam.	Mr Marius Keet, DWA	The level of the decant point at Cinderella is 1 620 metres above mean sea level (m amsl). The ECLs has been set 100 m below that, in order to protect the near surface aquifers, so in this case it will be 1 520 m amsl. The STI and the Inter-Ministerial Committee (IMC) allowed a buffer of 50 m below the ECL, so the target operating level for the STI was set at 1 470 m amsl. The LTS proposes a 20 m buffer for the long-term, hence a TOL of 1500 m amsl. To protect the Gold Reef City Museum the TOL would be 1 454 m amsl.	Mr Andrew Tanner, Aurecon
In terms of the options, consider that instead of pumping water from Southwest Vertical, drilling boreholes will control the AMD. The study has identified many options for each of the basins, and after the study, DWA will have to implement the recommendations. How sound and specific will these recommendations for each of the basins be and will there be indications of how long they will continue after 2013?	Mr Marius Keet, DWA	What is planned to be implemented now is part of the Long-term Solution. The options like the deep boreholes or the tunnel are for the future or Plan B, if in the Central Basin there is a problem with connectivity, or the void does not behave as expected, and if the water level rises and action needs to be taken. The planning and recommendations are shown on the site plans, which link to the HDS of the STI. In the Western Basin it will be a pilot plant, and in the other two basins, potentially Reverse Osmosis and waste disposal facilities, subject to discussion with Ergo, and this will be included in final details.	Mr Andrew Tanner, Aurecon
		By the end of the study, the best and most sound solutions will be recommended. This, amongst others, includes recommending specific pumping locations, water control levels for all the basins, and the best phasing of such solutions.	Mr Jurgo van Wyk, DWA
In terms of pollution of the Vaal River, the study indicates that the co-disposal of brine to existing tailings facilities may impact on the river system. Many existing tailings facilities are already affecting river systems and this need to be considered as another area of pollution to the Vaal system. This however, should not be part of this process, as it adds another level of complexity and variables, but it should not be forgotten when considering the recommendations.	Dr Henk Coetzee, CGS	The only tailings storage facility currently being considered for co-disposal is the Ergo mega dump, which is adequately controlled, licenced and properly constructed and maintained.	Mr Andrew Tanner, Aurecon

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Will the reverse osmosis or desalination process start in 2017.	Ms Mariette Liefferink, FSE	According to the current programme, it is possible to be commissioned in 2017.	Mr Andrew Tanner, Aurecon
According to DWA's Reconciliation Strategy, the Vaal system will have lost its dilution capacity by 2014/2015, but Lesotho Highlands phase 2 will only come on stream in 2020. Is it correct to assume that because of the high salt loads, due to the neutralisation, there will be severe water restrictions in the Upper Vaal and alternatively poor water quality in the Lower Vaal and Orange River Systems?	Ms Mariette Liefferink, FSE	Yes, the assumption is correct and all the options in this regard are presented in the following presentations.	Mr Andrew Tanner, Aurecon
Will there also be an EIA exemption application for the Long-term Solution, due to time constraints?	Ms Mariette Liefferink, FSE	The proposed programme indicates that there will be enough time to complete an EIA process before implementation or construction of the Long-term Solution.	Mr Andrew Tanner, Aurecon
What is your base date for the costing?	Mr Strover Maganedisa, National Treasury	March 2012.	Mr Andrew Tanner, Aurecon
Mogale Gold Mintails is planning to deposit tailings from their re-mining of historical tailings dams, on top of the West Wits Pit, and this must be noted as it will introduce a new set of environmental risks.	Ms Mariette Liefferink, FSE	Thank you for this information.	Mr Andrew Tanner Aurecon
7. Institutional, Financial and Implementation Arrangements			
In all arrangements presented, the Design, Build, Operate and Maintain (DBOM) route seems to be used because through that the design and the effectiveness of the technical solution is transferred back to the operational contractor. With regard to decision-making, the question is: Should the risk be transferred? If the choice in not to transfer risk, then government does it. If the choice is to transfer risk then the Public Private Partnership route should be followed. It is not as simple as that. If DBOM is used in both cases, the issue turns to funding. One needs to clearly understand the level of risk transfer involved in planning in terms of a PPP, compared to the level of risk transfer that is done through government and through a fund-raising agent. Also mentioned, is that one of the key benefit of doing it on a PPP basis is that there is rigorous oversight by the funders, but it depends on who the funders are. If the government is involved in the fund raising exercise, bilateral sources will be involved, for	Mr Johann Claassens, TCTA	If a public entity is used as an implementing agent, it must be clear that this is effectively Government. The public entity is not from the private sector. On the due diligence side and the involvement of the funders, commercial banks are considered. Some commercial banks are stricter than others, but generally if the commercial banks and shareholders invest their money, they take a very direct interest. Through their commercial credit committees they make sure that they have due diligence covered, by putting their own legal, technical and environmental advisors in place to manage their exposure. Whether government institutions will carry out that same level of due diligence is debateable. Certainly the private sector carry out a rigorous and on-going due diligence of the project when they carry out the funding. Not only do they monitor during the capital expense period (construction), but on-going on an annual basis. They monitor the maintenance reserve account, to ensure that the major	Mr John Samuel, Turner & Townsend

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example the World Bank. I do not agree that if the State, through an agent, raises the funding, that the rigorous funder oversight will be eliminated - it depends on who the funders are. The decision-makers need to have a very clear understanding of the risk transfer on one side and whether it is a complete risk transfer. In the case of AMD, a PPP is unlikely to result in full risk transfer to the private sector as suggested by the decision matrix presented. If the revenue streams are looked at, they are the same even on the PPP side. The funders would surely like to hedge their risk as well. They would require some sort of explicit or implied undertaking from Government to make sure that those income streams do realize. If the water quantity is half of what has been planned for, that means the income stream is also halved. All those undertakings and risks, even if it is a PPP, will need to be transferred back to government. The picture is not that clear on what the real risk transfers are for the different options.		maintenance is carried out, but that expenditure is more than was planned. The LTA monitoring also is to ensure that liabilities into the future due to maintenance not being carried out are not incurred. The DBOM is about achieving an integrated solution. If government funded directly, that is the cheapest form of capital. If government decides to use a public entity as an implementing agent, that body is going to raise the funding, it will be more expensive than government funding directly, but cheaper than a PPP, because of the explicit or implicit contingent guarantees. Government still holds the risk, so it is a cascade. As more risk is transferred over, the cost goes up. The Feasibility Study will investigate all of the options and DWA will make the appropriate decision	
There is comfort in the fact that there are a lot of details still to work through, but in all the options, has affordability been considered? That step seems to have been skipped.	Mr Strover Maganedisa, National Treasury	Available budgets were looked at, but the concept has not been provided to the study team yet. There will be a discussion between DWA and National Treasury at a later stage on affordability.	Mr John Samuel, Turner & Townsend
Has exemption from procurement been obtained, or applied for?	Mr Strover Maganedisa	The exemption has not been applied for, so currently the conventional process is being followed and procurement will not commence until Treasury Approval I (TA I) has been achieved. Exemption has not been secured at this stage.	Mr John Samuel, Turner & Townsend
Since there is a desire to accelerate the desalination process and the public would for example, accept exemption from an EIA process, will the funders not see this as a high risk? Would potential funders such as the National Treasury, Development Bank of South Africa, commercial lenders and capital funders not require a full EIA before they consider funding?	Ms Mariette Liefferink, FSE	When you look at commercial funders and the Development Bank, one of the first questions will be asked about the EIA and if the environmental approvals are in place. It is not in the proposal for the Long-term Solution to apply for an exemption from an EIA, but if it was to be applied for, it would have to be done in terms of legislation so that funders could be assured that there was legal compliance. A commercially funded project that is not legally robust cannot be put forward to potential funders. This applies to all legislation, not just an EIA. One of the reasons for undertaking a due diligence is to ensure that all the legal bases are covered. At the moment	Mr John Samuel, Turner & Townsend

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		the full EIA is in the programme, but if it was to be short-circuited, it would have to be done in terms of legislation.	
Would the same the 24M exemption process that was followed for the STI, satisfy commercial lenders?	Ms Mariette Liefferink, FSE	On the basis that the process that has been followed is legally compliant, it will probably meet the commercial banks' requirements.	Mr John Samuel, Turner & Townsend
It seems evident that in the proposals that mitigation of risks, particularly for the private sector, but also for other potential funders, is through the upstream due diligence. However, the downstream or outward mechanisms for mitigating risks seem to be missing. In terms of the sale of water and the sale of sludge, mentioned, the private sector or others can also mitigate the risk by locking in some sort of a unit price, which would lock in government. Was the risk mitigation structures considered in terms of the off-taking - who those off-takers will be and is it a competitive market or some sort of forced structure?	Mr Marcus Wishart, World Bank	In terms of the sale of water, it will likely go to Rand Water, it will go through a forced version. Other alternatives were also considered, but no competitive type arrangement is evident at this stage. There are some large industrial users looking at off-takes, but this might have to be an upfront negotiated deal. On the risk side, the private sector would be incentivised to produce water to the specified quality. If they do not supply water to the specified quality, they will not get paid. It is important in the procurement and not the feasibility that if they do not produce water of adequate quality, they would have to dispose of the water, other than back into the void, and there will be a penalty, as they have created pollution.	Mr John Samuel, Turner & Townsend
Has any analysis been done to try and come up with reference values for each of the scenarios to allow for some sort of relevant comparison for the end user tariff?	Mr Marcus Wishart, World Bank	Other than Capex and Opex models, three other financial models were run, which brings up the unitary fee, which is then adjusted and taken back to look at the tariff and how it would be recovered.	Mr John Samuel, Turner & Townsend
If for example, someone possesses the technology and has raised the funding, but does not know what the amount of water or the quality of the water will be until the plant is operating, and are penalised for not producing water of the required quality, which could not have been predicted beforehand, and they go bankrupt – how is this being dealt with? All of these technical risks create uncertainty. How is the amount of risk brought on by that uncertainty, taken into account? If water will be produced at between R10 and R20 per litre, which can only be sold for R5 - how will these losses be recuperated in a privately funded model?	Dr Henk Coetzee, CGS	Point taken about the uncertainty, which will impact on operating costs, like chemicals and electricity too. It is part of the uncertainty that the private sector will face in designing their plant. There is a possibility that they will leave or disappear, but they also stand to lose a lot, from having invested their own money in the project. This will be the case if it is a PPP. In the case of a straight DBOM the investor will not have invested a significant amount of their own money. One of the advantages of the PPP is that people have put their own money in, so one of the benefits of the PPP is that the private sector shareholders will have 10% of their own money (equity) in the project. If someone brings in innovative	Mr John Samuel Turner & Townsend

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		technology, which then does not work, which is probably less likely to happen, there are two bodies watching, namely the equity partners and the commercial lenders. If the technology is innovative, commercial funding will not be obtained. When commercial lenders go to their technical advisors they will not approve it. Technical advisors to commercial banks are very careful, because if you provide bad advice to the bank they will have an investigation. The abovementioned does not remove the risk, but it plays it down. The reference model proposed is conservative that will get through the commercial risk approval hoops.	
How does the proposed tariff and model compare to the current tariff charged? And how does inflation link into it?	Mr Solwazi Majola, Technology Innovation Agency (TIA)	The cost of desalination is R15 per m^3, but the current tariff charged is R5 to R8 per m^3. There is a big shortfall at the moment.	Mr Andrew Tanner, Aurecon
		Regarding the sale of the water, it is not only a question of producing the water at R15 per m^3 and then selling it at R5/ m^3 and government must pay the difference. The fact that water is treated and the salts removed, saves additional water from being used in the Vaal for dilution. This water could have been sold for R5/m^3 The quantum of the benefit is different from the quantum of the treatment. In other words, a certain amount of water is being treated, but much more water is saved in the Vaal River System. The water that is then saved in the Vaal River System has a value of about R5 per m^3 as well.	Mr Fanie Vogel, Aurecon
		The Vaal River user is actually paying for the release of more water for the dilution. It is approximately 200 million m^3 per annum at roughly R2 per m^3. This amounts to approximately R400 million per annum, which is equal to the operational and maintenance cost to treat the AMD after neutralisation. The Vaal River user will thus either have to pay for the dilutions in the Vaal or for the treatment of AMD, which saves more water. The shortfall will be recovered in this way.	Mr Seef Rademeyer, DWA
It seems unlikely that all the funding issues related to the proposed options, will be resolved before end July 2013, when the study is	Mr Strover Maganedisa,	The consultant feasibility study team will make the recommendations from the study by the end of July 2013. DWA will potentially implement the recommendations	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
due to be completed. Some of the options might require a change to the Water Service Act, which has to go to Parliament for a decision. If it is an incentive tax issue it will be even more complex than that.	National Treasury	thereafter and will have to negotiate with Rand Water to reach agreement on tariffs. The legal liabilities will take time to negotiate and will not happen by the deadline of 31 July 2013. A discussion will be needed to see how the Vaal River Tariff might be applied. The timeline for implementation would be several months after completion of the study. The waste discharge charge system may change according to legislation and the liabilities aspects may still come in, but these do not fit into the immediate planning. The only cost recovery options that the study team currently has any control over and can put a timeline to, are the treated water and the Vaal River Tariff.	
The delivery risk in terms of the AMD issue is not the biggest risk on the project, as there is no tested and proven technology. As far as funding is concerned, there seems to be no problem. If lenders are presented with a security structure that gives them the necessary assurance that they will get their money back, it will not be a problem to raise sufficient funding. The positive environmental impact of the project will attract a lot of development funding or concession funding, or even funding between governments. The challenge on this project is for government to find enough money to repay the balance. The risk remains with government. If the treated water is produced at R15 per m^3 and it can only be sold for R5 per m^3, where is government going to find the other R10? That risk cannot be transferred to someone through a PPP. Incurring cost or raising loans is not a problem, but repaying the loans is an issue. What will the contribution from the mines be and how will equity be factored into it? The Vaal System is benefitting from the treatment of AMD and thus the base source to repay the loans should be Vaal Tariff System. If there is an income stream to repay the debt, it will make the project viable or sustainable.	Mr Johann Claassens, TCTA	The Vaal River Tariff System is the best “safety net” to have in place. The currently available calculations seem to indicate that this may not be unreasonable or unacceptable to anyone.	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
In terms of the apportionment of liability of the mines, mines in the Western Basin were all held liable together, which resulted in a tribunal, with the mines eventually being exonerated. Will there be success when the apportionment of liability is applied, especially in the retrospective application of the Polluter Pays Principle? Will JCI or Anglo American be considered in this light? Have the trust funds of the mines been considered as well?	Ms Mariette Liefferink, FSE	The reports on this are confidential. DWA, however, has considered what is possible when apportioning liability in terms of NEMA, the National Water Act and the MPRDA. Based on that, the fairest strategy is formulated. Government will strategize on how to take the matter forward. The intention is to apply the Polluter Pays Principle to recover some funds.	Mr Jurgo van Wyk, DWA
		The trust funds of the mines, in terms of MPRDA, are linked to specific rehabilitation actions. When the necessary rehabilitation has been done, those funds go back to the mining company and it is often used for extension of the mine itself or other investments. It is not a fund that government can take money from. Many of the mines in the Witwatersrand do not have trust funds because they ceased operations before the current legislation which mandates trust funds was passed.	Dr Henk Coetzee, CGS
The option of PPP is unattractive at the moment. Who would want to buy into a system that starts off with a shortfall of R10? Later on this option might become attractive. Is it not possible to first try for a DBOM, and let it go on for approximately ten years, providing an opportunity for uncertainties to be resolved during that time? In ten years' time there will be certainty about the volumes and the quality, which will make a PPP more attractive.	Mr Marius Keet, DWA	When the risk analysis was completed, the study team looked at the risks of variable water quality and how much of the risk can be transferred. A number of assumptions were made and details will be explained in the reports.	Mr Andrew Tanner, Aurecon
It seems that we are losing track in terms of why we are doing the study. The study should answer all the questions. We should not have a recommendation that suggests further consultation. All the approvals need to be obtained before you conclude the study, whether it is a PPP or not.	Mr Strover Maganedisa, National Treasury	One has to distinguish between the terms of reference for the study and what has to be done within the study period, and implementation. The negotiations between DWA and National Treasury are not part of the terms of reference for the study and it does not have to be done within the study period.	Mr Andrew Tanner, Aurecon
		This study will not lead to recommendations for another study. The recommendations are being made in order to move towards refinement of the most practical solutions. At the moment the options are being discussed with the persons and institutions present to inform the recommendations.	Dr Beason Mwaka, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
8. Study Recommendations for Implementation			
It is noted with concern that there is lack of funding for monitoring. With regard to the STI, was funding received? Is there a re-prioritisation with regard to implementation of the STI? This will provide an indication on whether there will be funding available for the desalination.	Ms Mariette Liefferink, FSE	There definitely are funds available for monitoring, and DWA is in the process of negotiating with National Treasury.	Mr Marius Keet, DWA
		The funding of the monitoring is currently not included in cost estimates for the long-term solution. There is however concern about the resources to interrogate the results of the monitoring.	Mr Andrew Tanner, Aurecon.
There seems to be a parallel process of procuring the solutions. Is it possible to run those processes parallel with an EIA?	Dr Henk Coetzee, CGS	There are risks to running them in parallel. For example, if the DBOM route is followed, and for example the contractor proposes an alternative pipeline route, because of cost efficiency and by that time two thirds of the EIA has already been conducted, there will need to be adjustments, leading to delays. Also, if the EIA process has to be substantially repeated because of major changes, it will result in a year's delay. One needs the design before some of the aspects of an EIA can be completed. The treatment sites are not likely to change, but the pipeline routes and waste disposal options might.	Mr Andrew Tanner, Aurecon
If the Vaal River user is going to pay for a large part of the costs involved, and it looks like 66% when using the R15 per m^3 production cost and R5 per m^3 sale price, it is critical that consultation should be conducted with the Vaal system users as soon as possible. One would not want to end up with the same situation that is now prevailing with SANRAL's toll roads for instance. It might not be a listed activity for the EIA, but it should be a high priority to sell the concept to the water users.	Mr Johann Claassens, TCTA	Comment noted, thank you.	Mr Andrew Tanner, Aurecon
9. Study Finalisation			
No comments			

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
10. Status of Implementation Activities			
No comments			
11. Stakeholder Issues and Concerns			
We are thankful that DWA, TCTA and Aurecon and the consultant teams provided civil society the opportunity to participate actively during the study.	Ms Mariette Liefferink, FSE	Thank you.	Mr Jurgo van Wyk, DWA
Is there support from political role players to see that the desalination will be implemented?	Ms Mariette Liefferink, FSE	Minister Molelwa is sincere and committed to solving the problem and to see progress.	Mr Jurgo van Wyk, DWA
In terms of roles and responsibilities, there is no mention of the roles of Provincial and Local Government in this process, and responsibility seems to be focussed on National Government only. Is there some recommendation on this aspect?	Ms Rina Taviv, GDARD	There is a section in the Implementation Strategy on the responsibilities of national, provincial and local government where this is explained.	Mr Andrew Tanner, Aurecon

G. The Way Forward and Closure

Mr Viljoen thanked participants for their attendance, comments and contributions, and the presenters for their time and efforts.

The meeting closed at 17:00.

Appendix A:

Present, Apologies, Declined Invitation and Absent/No Response

Present:

Agri Gauteng & University of Pretoria	Mr	Michael	Van Der Laan
City of Johannesburg Metropolitan Municipality	Mr	Freddie	Letsoko
City of Johannesburg Metropolitan Municipality	Ms	Pule	Makena
City of Johannesburg Metropolitan Municipality	Ms	Antonino	Manus
Council for Geoscience (CGS)	Dr	Henk	Coetzee
Council for Geoscience (CGS)	Mr	Humberto	Saeze
Council for Scientific and Industrial Research (CSIR)	Mr	Phil	Hobbs
Department of Environmental Affairs (DEA)	Ms	Pumeza	Skepe-Mngcita
Department of Mineral Resources (DMR)	Ms	Munyadziwa Ethel	Sinthumule
Department of Science and Technology (DST)	Mr	Mahlori	Mashimbye
Department of Water Affairs (DWA)	Mr	Nico	De Meillon
Department of Water Affairs (DWA)	Mr	Fanus	Fourie
Department of Water Affairs (DWA)	Mr	Bashan	Govender
Department of Water Affairs (DWA)	Ms	Jacqueline	Jay
Department of Water Affairs (DWA)	Mr	Marius	Keet
Department of Water Affairs (DWA)	Ms	Alice	Mabasa

Department of Water Affairs (DWA)	Dr	Beason	Mwaka
Department of Water Affairs (DWA)	Mr	Peter	Pyke
Department of Water Affairs (DWA)	Mr	Seef	Rademeyer
Department of Water Affairs (DWA)	Mr	Sputnik	Ratau
Department of Water Affairs (DWA)	Mr	Rod	Schwab
Department of Water Affairs (DWA)	Mr	Jurgo	Van Wyk
Department of Water Affairs (DWA)	Mr	Pieter	Viljoen
Ekurhuleni Metropolitan Municipality	Ms	Elsabeth	Van Der Merwe
Ekurhuleni Metropolitan Municipality	Mr	Pieter	De Vries
Federation for Sustainable Environment (FSE) & Public Environmental Arbiters	Ms	Mariette	Liefferink
Gauteng Department of Agriculture and Rural Development (GDARD)	Ms	Rina	Taviv
Gauteng Department of Agriculture and Rural Development (GDARD)	Mr	Vukosi	Ndlopfu
Gauteng Department of Local Government and Housing	Mr	Elias	Sithole
Johannesburg Water	Mr	Ariel	Mafejane
Mogale City Local Municipality	Mr	Stephan	Du Toit
Mogale City Local Municipality	Cllr	Andy	Mathibe
National Economic Development and Labour Council (Nedlac)	Ms	Sharna	Johardien
National Treasury	Mr	Strover	Maganedisa
Rand Water & Vaal Dam Forum	Mr	Reveck	Hariram
South African Human Rights Commission (SAHRC)	Ms	Angela	Kariuki
South African Local Government Association (SALGA)	Ms	Jacqueline	Samson
South African Nuclear Energy Corporation (NECSA)	Ms	Immanda	Louw

Technology Innovation Agency (TIA)	Mr	Solwazi	Majola
Trans Caledon Tunnel Authority (TCTA)	Mr	Johann	Claassens
Trans Caledon Tunnel Authority (TCTA)	Ms	Sophia	Tlale
UASA	Mr	Jacques	Hugo
Vaal Environmental Justice Forum	Mr	Phineas	Malapela
Water Research Commission	Dr	Jo	Burgess
West Rand District Municipality	Mr	Musa	Zwane
World Bank	Mr	Marcus	Wishart

Present (Project Team/Consultants):

Aurecon	Mr	Andrew	Tanner
Aurecon	Ms	Janette	Van Zyl
Aurecon	Mr	Johan	Van Zyl
Aurecon	Mr	Fanie	Vogel
SRK Consulting	Mr	Tim	Hart
SRK Consulting	Ms	Vassie	Maharaj
SRK Consulting	Ms	Annerine	Prinsloo
Turner & Townsend	Mr	John	Samuel

Apologies:

Aurecon	Ms	Joanne	Henrico
Department of Water Affairs (DWA)	Mr	Solly	Mabuda

National Planning Commission (NPC) (Wits University School of Public and Development Management)	Mr	Mike	Muller

Declined Invitation:

Agricultural Research Council – Roodeplaat	Dr	Yacob	Beletse
Agri Gauteng	Mr	Dirk	Hanekom
City of Johannesburg Metropolitan Municipality	Mr	Daniel	Masemola
Department of Mineral Resources (DMR)	Adv	Susan	Malebe
Department of Science and Technology (DST)	Dr	Henry	Roman
Department of Science and Technology (DST)	Ms	Shanna	Nienaber
Department of Science and Technology (DST)	Ms	Candice	Willard
Department of Water Affairs (DWA)	Mr	Herman	Keuris
Department of Water Affairs (DWA)	Ms	Nancy	Mothebe
Department of Water Affairs (DWA)	Ms	Nemataheni	Thivhafuni
Federation for Sustainable Environment and MLDPG	Dr	Koos	Pretorius
Johannesburg Water	Mr	Ntshavheni	Mukwevho
Mogale City Local Municipality	Cllr	Emily	Mathe
National Economic Development and Labour Council (Nedlac)	Mr	Mahandra	Naidoo
Agri Gauteng/ Private Consultant	Mr	Meiring	Du Plessis
Rand Water	Mr	Tawanda	Nyandoro
Sasol & Vaal Barrage Reservoir, Leeuspruit and Taaibosspruit Forum	Mr	Zain	Mohamed
South African Human Rights Commission (SAHRC)	Ms	Janet	Love

South African Local Government Association (SALGA)	Mr	William	Moraka
Transvaal Agricultural Union SA	Ms	Lynette	Du Plessis
Transvaal Agricultural Union SA	Mr	Bennie	van Zyl
West Rand District Municipality	Ms	Herina	Hamer

Absent/No Response:

Chamber of Mines	Ms	Stephina	Mudau
Department of Environmental Affairs (DEA)	Mr	Mark	Gordon
Department of Environmental Affairs (DEA)	Ms	Milicent	Solomons
Department of Mineral Resources (DMR)	Mr	Rudzani	Mabogo
Department of Water Affairs (DWA)	Mr	Nigel	Adams
Department of Water Affairs (DWA)	Mr	Zacharia	Maswuma
Department of Water Affairs (DWA)	Mr	Anil	Singh
Ekurhuleni Metropolitan Municipality	Mr	Barend	Deminey
Ekurhuleni Metropolitan Municipality	Mr	Francois	Meyer
Ekurhuleni Metropolitan Municipality	Ms	Cecilia	Rakgoale
Ekurhuleni Metropolitan Municipality	Mr	Callie	Van Der Merwe
Ekurhuleni Metropolitan Municipality	Mr	Danie	Van Der Merwe
Johannesburg Water	Mr	Jones	Mnisi
Randfontein Local Municipality	Ms	Madiba	Ramatlhape
Save the Vaal	Mr	Trevor	Stubbs
South African Local Government Association (SALGA)	Ms	Lulama	Xongwana

Trans Caledon Tunnel Authority (TCTA)	Mr	Craig	Hasenjager
Trans Caledon Tunnel Authority (TCTA)	Mr	Richard	Holden
West Rand District Municipality	Ms	Susan	Stoffberg
World Bank	Mr	Manuel	Marino

Appendix B:

New WRC Mine Water Projects and Activities for 2013

Title	Contractor	Summary
Using Membrane Distillation Crystallization for the treatment of industrial wastewater	University of Cape Town	The sustainable treatment of acid mine drainage and idustrial wastewaters is necessary if sustainable growth and responsible management of water is to be achieved in South Africa. Membrane Distillation Crystallization offers a sustainable wastewater treatment process because it can utilise excess heat from processes, produce pure water as well as salt(s) products thus converting waste material into something of value. Membrane Distillation Crystallization is also an attractive wastewater treatment technique because it requires low operating temperatures (40-60 deg C), the hydrostatic pressure encountered in the process is lower than in Reverse Osmosis and less expensive material like plastics can be used in the process. Another major advantage of MDC to the application of AMD is that the process is able to operate in very acidic or basic streams and thus the AMD streams would not need to be pre-treated or neutralized beforehand. This project therefore aims to investigate the applicability of MDC for the treatment of industrial wastewater with a specific focus on the treatment of mine wastewater. The project also aims to contribute to the field by investigating concentration polarisation and its effect on the process while at the same time developing better crystallizer control strategies. Ultimately, this project could offer a more energy efficient and sustainable industrial wastewater treatment process that reduces wastewater production.
Limiting and mitigating the impact of coal mines on wetlands	CSIR (Council for Scientific and Industrial Research)	By virtue of their positions in the landscape and relationship to drainage networks, wetlands are frequently impacted by coal mining activities, especially opencast methods. These impacts will be ongoing, since coal is a strategic resource and will continue to be mined extensively to support the country's development. At the same time, however, regulatory authorities and the public now have an improved understanding of the range of economic, social, ecological and hydrological costs of wetland loss and degradation. The rules of the game have changed, with regulators increasingly insisting that mines avoid, minimise and mitigate their impacts on wetlands, and internalise the true costs of wetland loss into their balance sheets. Many mining proposals entailing large-scale wetland loss have encountered delays in licence approvals, unrealistic rehabilitation commitments and unwelcome public and media attention. As a result, the coal mining sector has realised that it needs to proactively and systematically address the business risk posed by its impact on wetlands. Thus, in 2011 the CSIR and SANBI embarked on a three year cooperative applied research project, funded by the Coaltech Research Association. Supplementary funding is also being provided by the SANBI Grasslands Programme and Working for Wetlands, for particular components of the work. The project's focus is on developing mechanisms for limiting and mitigating the impact of coal mining on wetlands, and providing guidelines to the coal mining industry and regulators in this

Title	Contractor	Summary
		regard. Based on interest expressed by the WRC in supporting this project to expand on its original scope and thereby improve its impact, this proposal has been prepared. It highlights areas where DMR and WRC resources can add further value to the work already underway, by allowing further work to be undertaken that was not part of the original scope of the funding. The project aims to compile an atlas to guide both mining companies and regulators with regard to high risk wetland identification and offsite mitigation principles and methods. The sensitive wetlands atlas will identify key wetlands or subcatchments in the grassland biome of Mpumalanga that are particularly important or irreplaceable in terms of biodiversity, water resource management and other ecosystem services. The atlas that will be produced will guide both mining companies and regulators in their planning and decision-making. The project will pilot the mainstreaming, into the coal mining sector, of information generated through the National Freshwater Ecosystem Priority Areas (NFEPA) project. The aims of the project are fourfold: • To improve planning and decision-making around coal mining by developing products, for both regulators and mining companies, that highlight high risk wetlands and ecosystem services. • To improve the science and practice of wetland rehabilitation in a coal mining context, by improving current wetland rehabilitation guidelines with particular focus on post-mining landscapes and mitigating mining pollutants. • To enhance the quality of planning and regulatory processes by providing improved data on resource economics and risk assessment with respect to wetlands and coal mining. • To compensate for unavoidable residual loss of wetlands due to coal mining by developing, and testing a systematic framework for wetland offsite mitigation, as well as identifying wetland offset receiving areas.
An industrial ecology approach to sulphide containing mineral wastes to minimise ARD formation: characterising potential for ARD, design for disposal and extraction of products with value.	University of Cape Town	While treating coal mining-impacted waters using reverse osmosis, facilities such as the Emalahleni Water Reclamation Plant and the Optimum Water Reclamation Plant produce large volumes of hypersaline brines. These brines are disposed of in evaporation ponds, and thus are lost to the usable water pool. With increasing use of desalination, and hence brine production, the loss of water is predicted to increase exponentially. The total combined brine production rates for the coal and gold mining industries in South Africa are projected to be ±17 000 m^3/day in the next 20 years from current values of ±3000 m^3/day. Conventional treatment methods, such as concentration in evaporation ponds, have many disadvantages including extensive land use and low productivity. In addition, evaporation ponds recover neither the water nor the salt. Eutectic Freeze Crystallisation (EFC) is able to reduce the volume of brines by as much as 97% and concurrently produce pure salts as well as potable water. For example, pure calcium sulphate, pure sodium sulphate and potable water, in the form of ice, can be produced. Eutectic Freeze Crystallisation works on the principle that when brine is cooled to the eutectic temperature, both ice and salt crystallise out of solution. The ice, being less dense than water, will float, and the salt, because it is denser than water, will sink, thus effecting gravity separation. There is a major misconception that any freezing process is expensive but, thermodynamically, it is cheaper to freeze one kilogram of water (333 kJ) than to evaporate one (2300 kJ). Energy savings of 85% have been reported when comparing EFC to

Title	Contractor	Summary
		evaporative crystallisation. An extensive experimental programme focussing on the use of EFC has been undertaken over the last 6 years and proven the concept of EFC as a feasible treatment for multi-component hypersaline brines. Firstly, it was shown that thermodynamic modelling can accurately predict the identities of the recovered salts, as well as their recovery temperatures. Secondly, it was shown that EFC can be used for the treatment of hypersaline brines and inorganic effluents produced by major South African industries. Thirdly, it was shown that EFC can be used to recover multiple salts from multicomponent brines. Lastly, it was shown that EFC can produce almost pure salts and ice. However, all of the work so far has been done in batch mode, an essential mode for testing proof of concept and initial feasibility. Although the batch mode has provided crucial information, it has not been sufficient to showcase the potential of the technology. The next challenge is to develop EFC to the point that it can be used in continuous mode. In this project, important knowledge about operational considerations for continuous EFC, including residence time, degree of undercooling, crystalliser solids content and operating limits will be generated. This knowledge is crucial for making the transition between batch and continuous, as well as to be able to design an EFC plant on both a pilot and industrial scale. This is the essential focus of this project.
The BIOSURE PROCESS: A sustainable, long term treatment option for acid mine drainage treatment	VitaOne8 (Pty) Ltd	The BioSURE Process was identified as one of few treatment options suitable for the treatment of AMD in the Witwatersrand and elsewhere. However, it has been rejected as a viable option for the long term treatment of AMD by Aurecon in their feasibility study for the Witwatersrand, the reason cited being a lack of full or demonstration scale operating data. The full-scale operation undertaken by the East Rand Water Care Company (ERWAT) has in fact demonstrated that the BioSURE Process can be used as a cost-effective treatment technology for AMD. The process is attractive because it makes use of primary sewage sludge or other sources of organic wastes as substrate and produces a good quality effluent. Since it converts permanent hardness into temporary hardness, conventional cold-lime softening processes can be used to desalinate the water while valuable by-products may be recovered. The effluent quality after desalination is suitable for consumption in various industries as a substitute for high quality potable water. ERWAT, with its role as a service provider is very well positioned with its access to sources of primary sewage sludge and biodegradable organic waste. As an operating company and with the past experience of operating a 10Ml/day plant, it can play a significant role in the treatment of AMD. A survey of the industries indicated that there are reliable and consistent sources of waste, other than primary sewage sludge, from various industries to treat approximately 20-30 Ml/day of AMD in the Central and Eastern Basins. This waste is currently being disposed of on landfill sites at high costs. Considering the quantity of primary sewage sludge generated by ERWAT and Johannesburg Water's wastewater treatment plants that can practically be used, a significant volume of AMD can be treated in the Witwatersrand. Co treatment with industrial waste and recovering costs for treatment of industrial waste will reduce the overall treatment cost of AMD. It is therefore important that more aspects should be considered than only the need to treat AMD. These aspects include the requirements to treat and to dispose of sewage sludge and the urgent need to provide additional capacity to process biodegradable organic solids. This project is required in order to improve the BioSURE Process and to properly document its

Title	Contractor	Summary
		operating philosophy and limits to applicability in order to make it truly available for implementation. It is planned to: • Compare the performance of the biological sulphate reducing reactors using primary sewage sludge and carbohydrates such as silage and combinations thereof; • Test the performance of the process using a feed of high acidity, low pH AMD; • Investigate the removal of hydrogen sulphide using a process to regenerate iron hydroxide with a biological iron oxidising process integrated with the recovery of valuable magnesium sulphate using a eutectic freeze unit; • Investigate the integration of the effluent treatment process with the so-called SANI process for COD and nitrogen removal.
Feasibility study on the use of irrigation as part of a long-term neutralised acid mine drainage management strategy in the Vaal Basin	University of Pretoria	Water resource planners within DWA foresee that the salt load associated with the AMD from the Witwatersrand gold mines will have to be reduced significantly or prevented from contaminating existing supplies. Otherwise large quantities of good quality water will be required (in essence wasted) to dilute the salinity to an acceptable level within the Vaal River system. The water quality decanting from these mines can be highly acidic or alkaline, very saline, and dominated by calcium sulphate, sodium sulphate, magnesium sulphate or sodium bicarbonate. Technologies exist to neutralise and remove these salts from water, preventing environmental degradation following its release, but the techniques are expensive and energy intensive, and create high volumes of brine. Work done in the early 1980s showed that when calcium sulphate-rich mine water is used in irrigation a significant quantity of gypsum precipitates (becomes insoluble) in the soil, effectively reducing salt loads in the irrigation return flows. The more soluble sodium-based salts do not precipitate. In subsequent WRC-supported research, this gypsum precipitation mechanism was confirmed in commercial scale systems under pivot irrigation with coal mine water. Multiple crop species grown under sprinkler did not show foliar injury symptoms and yields were higher than for dryland production. Furthermore, gypsum precipitation did not result in any observable physical or chemical changes that would adversely affect soil productivity. Following these findings, the team concluded that there are four components to consider in managing irrigation with saline water: the chemical quality of the irrigation water, the hydrological setting of the irrigated area, the management of the leaching fraction, and the fate of the AMD. The AMD issue in the western, central and eastern basins has now reached a critical point requiring short- and long-term mitigation measures. Issues of a similar nature in the Mpumalanga coal fields and elsewhere are anticipated in the near future. This project aims to build on previous WRC research on the feasibility of using irrigation to remove salts from neutralised AMD through gypsum precipitation in soil, by assessing whether irrigation can be a feasible component in an integrated AMD management plan, as a cost-effective and sustainable method to prevent a significant salt load from neutralised AMD from ending up in the Vaal River System, while also utilising the water in an economically productive way. This work will assist in indentifying whether irrigation can be part of an integrated solution to the AMD problem in the Vaal Basin as well as other basins with AMD issues. Decision makers will be provided with better information on the feasibility of using a potentially more cost-effective and environmentally sustainable way of reducing the salt loads from AMD. The use of irrigation to remove salts

Title	Contractor	Summary
		from neutralised AMD will potentially reduce the financial and environmental burden resulting from other treatment options, for example reverse osmosis plants. Using neutralised AMD productively will result in income for farmers, job opportunities and increased agricultural production in the region, which will be especially beneficial in regions with scarce irrigation water resources.
Mine water atlas of South Africa	Golder Associates Africa (Pty) Ltd (Midrand)	Large volumes of water are used by the mining and other industrial sectors for extraction and concentration of metals and nonmetallic minerals, and generation of the electricity required for crushing ore, on-site processing, smelting, refining and other aspects of treating resources to improve their properties. Demand for water by the mining industry is limited and localized but becomes high when associated refining, smelting and manufacturing operations are considered. Mining has been an integral part of South African history and economy. In 2007, the South African mining industry employed 493,000 workers and represented 18% of South Africa's $588 billion USD Gross Domestic Product. Mines are most heavily concentrated in the eastern half of the country. While most mines are designed as closed systems, water pollution can result from problems in the mining, or milling processes and aquatic ecosystems can be affected. In discussions with mining and/or water stakeholders in South Africa, it has emerged that a national Mine Water Atlas would be extremely valuable as a tool for water management planners and as an educational resource for water users, legislators, and the public. The Mine Water Atlas of South Africa is thus intended to be a comprehensive reference of extent of the influence of acid rock drainage (ARD) on the country's surface and ground water resources: summarizing the location, geography, geology, water quality and hydrologic characteristics. The information shall be presented in a graphical format supported by descriptive narratives and tables to better facilitate the reader's understanding of the material. The information, maps, and tables in the Atlas will portray general, regional conditions. The Atlas will be a significant and timely contribution that can inform the implementation of commitments made in the past two years. Decision makers can also look to the Atlas for background information and tools to assist in fulfilling commitments made in other recent events and declarations.
Continuous Eutectic Freeze Crystallization	University of Cape Town	While treating coal mining-impacted waters using reverse osmosis, facilities such as the Emalahleni Water Reclamation Plant and the Optimum Water Reclamation Plant produce large volumes of hypersaline brines. These brines are disposed of in evaporation ponds, and thus are lost to the usable water pool. With increasing use of desalination, and hence brine production, the loss of water is predicted to increase exponentially. The total combined brine production rates for the coal and gold mining industries in South Africa are projected to be ±17 000 m3/day in the next 20 years from current values of ±3000 m3/day. Conventional treatment methods, such as concentration in evaporation ponds, have many disadvantages including extensive land use and low productivity. In addition, evaporation ponds recover neither the water nor the salt. Eutectic Freeze Crystallisation (EFC) is able to reduce the volume of brines by as much as 97% and concurrently produce pure salts as well as potable water. For example, pure calcium sulphate, pure sodium sulphate and potable water, in the form of ice, can be produced. Eutectic Freeze Crystallisation works on the principle that when brine is cooled to the eutectic temperature, both

Title	Contractor	Summary
		ice and salt crystallise out of solution. The ice, being less dense than water, will float, and the salt, because it is denser than water, will sink, thus effecting gravity separation. There is a major misconception that any freezing process is expensive but, thermodynamically, it is cheaper to freeze one kilogram of water (333 kJ) than to evaporate one (2300 kJ). Energy savings of 85% have been reported when comparing EFC to evaporative crystallisation. An extensive experimental programme focussing on the use of EFC has been undertaken over the last 6 years and proven the concept of EFC as a feasible treatment for multi-component hypersaline brines. Firstly, it was shown that thermodynamic modelling can accurately predict the identities of the recovered salts, as well as their recovery temperatures. Secondly, it was shown that EFC can be used for the treatment of hypersaline brines and inorganic effluents produced by major South African industries. Thirdly, it was shown that EFC can be used to recover multiple salts from multicomponent brines. Lastly, it was shown that EFC can produce almost pure salts and ice. However, all of the work so far has been done in batch mode, an essential mode for testing proof of concept and initial feasibility. Although the batch mode has provided crucial information, it has not been sufficient to showcase the potential of the technology. The next challenge is to develop EFC to the point that it can be used in continuous mode. In this project, important knowledge about operational considerations for continuous EFC, including residence time, degree of undercooling, crystalliser solids content and operating limits will be generated. This knowledge is crucial for making the transition between batch and continuous, as well as to be able to design an EFC plant on both a pilot and industrial scale. This is the essential focus of this project.

Other WRC activities:

- Coaltech project to pilot Eutectic Freeze Crystallisation in Witbank. Being paid for by Coaltech's members and the pilot plant will run on real RO brine from treating mine water at EWRP.
- Water technologies assessment centre / network under development with DST. Due for lauch in September 2013.

Joint proposal with DWA, DST, and Aurecon for testing of pilot plants in the Western Basin as described in the *Report on Treatment Technology Options*, page 81. The proposal is for the WRC to manage the pilot trials as a special project, funded via DWA.

Appendix E
Notification E-mails: Reports Available for Comment

From: Project Admin
Sent: 24 June 2013 12:53 PM
To: "Jo Burgess"
Cc:
Subject: AMD-FS_Presentations_SSC Meeting No. 3

Dr Jo Burgess

Water Research Commission

Dear Dr Burgess

Feasibility Study for a Long-term Solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins in the Gauteng Province.

Please be advised that the presentations of the third, and last, Study Stakeholder Committee (SSC) Meeting are now available on the Aurecon AMD web portal (http://aureconit.co.za/amd/Public/Default.aspx).

If you have not yet registered on the Aurecon AMD web portal in order to access documents available to the SSC, please follow the link given above to register and afterwards contact Mr Johan Van Zyl (johan.vanzyl@aurecongroup.com) to receive your password.

We kindly remind SSC members that documents on the Aurecon AMD web portal are not to be distributed outside of the SSC, unless approved by the Department.

Thank you for your continued interest and participation in the study.

Sincerely,

Feasibility Study Team

Long-term Solution to address AMD in Gauteng Province.

From: amdsainfo
Sent: 29 May 2013 2:41 PM
To: "Jo Burgess"
Cc:
Subject: AMD-FS_Report 5.3: Options for Use or Discharge of Water_Available for Comment.

Dr Jo Burgess

Water Research Commission

Dear Dr Burgess

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.

Please be advised that a draft of Report 5.3: *Options for the Use and Discharge of Water*, is available for comment on the DWA AMD website: (http://www.dwa.gov.za/Projects/AMDFSLTS/documents.aspx).

SSC Members are welcome to submit their comments on the report to amdsainfo@aurecongroup.com by **12 June 2013**.

Your inputs are greatly appreciated.

Sincerely,

Feasibility Study Team

Long-term Solution to address AMD in Gauteng Province

amdsainfo

From: amdsainfo
Sent: 17 July 2013 12:24 PM
To: 'Jo Burgess'
Subject: AMD-FS_Study Report No. 8: Implementation Strategy and Action Plan_Available for comment

Dr Jo Burgess

Water Research Commission

Dear Dr Burgess

Please be advised that the first draft of Study Report No. 8: *Implementation Strategy and Action Plan* is now available for your review and comment on the Aurecon AMD web portal (http://aureconit.co.za/amd/Public/Default.aspx).

This report is one of the deliverables of the Feasibility Study for a Long-term Solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins.

If you have not yet registered on the Aurecon AMD web portal in order to access documents available to the SSC, please follow the link given above to register, and afterwards contact Mr Johan Van Zyl (johan.vanzyl@aurecongroup.com) in order for him to set your user permissions.

Given that this is a first draft of the report and that the Department of Water Affairs is still busy incorporating inputs from key stakeholders and expert reviewers, it would be appreciated if the report is not distributed to others outside of the organisations/ departments represented on the SSC. This draft of the report also does not include any of the appendices, which will be issued as a separate document later. The final draft of this report will be made available to the public on the DWA AMD webpage as soon as it becomes available.

You are welcome to send your comments to amdsainfo@aurecongroup.com by **22 July 2013**. The Feasibility Study is concluding at the end of July 2013, which unfortunately does not permit for an extended comment period.

Your inputs are greatly appreciated.

Sincerely,

Feasibility Study Team

Long-term Solution to address AMD in Gauteng Province

amdsainfo

From: amdsainfo
Sent: 25 July 2013 11:16 AM
To: 'Jo Burgess'
Subject: AMD-FS_Study Report No. 10: Feasibility Report_Available for comment

Dr Jo Burgess

Water Research Commission

Dear Dr Burgess,

Please be advised that the first draft of Study Report No. 10: *Feasibility Report*, is now available for your review and comment on the Aurecon AMD web portal (http://aureconit.co.za/amd/Public/Default.aspx).

This report is one of the deliverables of the Feasibility Study for a Long-term Solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins.

NB - If you have not yet registered on the Aurecon AMD web portal in order to access documents available to the SSC and SMC, please follow the link given above to register, and afterwards contact Mr Johan van Zyl (johan.vanzyl@aurecongroup.com) in order for him to set your user permissions.

Given that this is a first draft of the report and that the Department of Water Affairs is still busy incorporating inputs from key stakeholders and expert reviewers, it would be appreciated if the report is not distributed to anyone besides yourself. You are welcome to send your comments to amdsainfo@aurecongroup.com by **29 July 2013**. The Feasibility Study is concluding at the end of July 2013, which unfortunately does not permit for an extended comment period.

Your inputs are greatly appreciated.

Sincerely,

Feasibility Study Team

Long-term Solution to address AMD in Gauteng Province

From: amdsainfo
Sent: 15 May 2013 1:21 PM
To: "Jo Burgess"
Cc:
Subject: AMD-FS_Technical Prefeasibility Report Available for Comment - Feasibility Study for a Long-term Solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins.

Dr Jo Burgess

Water Research Commission

Dear Dr Burgess

Please be advised that the first draft of the Technical Prefeasibility Report is now available for your review and comment on the Aurecon AMD Web Portal. This report is one of the deliverables of the Feasibility Study for a Long-term Solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins.

You are welcome to send your comments to amdsainfo@aurecongroup.com by **29 May 2013**. Comments from external peer reviewers have also been received and are being incorporated into the next version of the report.

Your inputs are greatly appreciated.

Sincerely,

Feasibility Study Team

Long-term Solution to address AMD in Gauteng Province

From: amdsainfo
Sent: 2 May 2013 10:26 AM
To: "Jo Burgess"
Cc:
Subject: AMD-FS_Treatment Technologies Report_Available for Comment

Dr Jo Burgess

Water Research Commission

Dear Dr Burgess

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.

Please be advised that the Treatment Technologies Report is available for comment on the DWA website (http://www.dwa.gov.za/Projects/AMDFSLTS).

SSC Members have until 16 May 2013 to submit their comments on the abovementioned report.

Sincerely,

Feasibility Study Team

Long-term Solution to address AMD in Gauteng Province

Appendix F
Compendium of Written Comments Received on Reports

Report 5

Golder Associates

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Prefeasibility Report, First Draft V1.0	**Introduction** It is explained that the focus of the Prefeasibility Report was to develop the long-term solutions incorporating technical, legal, economical, financial and institutional aspects. The document reports on the technical solutions and some economic analysis of these technical solutions, based on economic analyses at a Prefeasibility Study level of detail **Comment:** The title of the report should probably refer to Technical Solutions and not to Solutions in general.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Hydro-Geological Assessment** The Prefeasibility Study develops the approach with respect to mine void water level control by definition of the following concepts: □ Environmental Critical Level (ECL). □ Socio – Economic Critical Level (SECL). □ Target Operating Level (TOR). While describing these concepts is of use, without a clear protocol for defining and quantifying these levels, the concepts remain of limited use. The STI definition of the Environmental Critical Level in this Central Basin takes the Gold Reef City aspect into account, and could therefore be redefined in terms of a Socio – Economic Critical Level. The economic analysis of the gravity flow options draining from the underground workings via tunnels may be flawed by the consideration of: □ Savings related to mine void dewatering pumping cost which do not recognizing that the treated AMD may have to be pumped to a higher elevation for use in any case (refer to some of project options).	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Pumping Rates** The possible savings, Table 2.4 contains the total operating cost estimates which are not realistic based on offer reference projects in South Africa. For example, referring to the Western Basin: R 6.1 million/annum associated with treating a Ml/day of AMD = R 16.7 per m3 treated. This O & M unit cost is at least two times higher than currently proven on full-scale AMD treatment plants in South Africa. No economic analysis of the water ingress measures was done (some cost benefit analysis of ingress control), leaving the report without a conclusion on the viability and financial justification for further investigation into water ingress control measures. The original Inter-Ministerial Report on Witwatersrand AMD suffered from the same limitation.	Andre van Niekerk	Addressed	Dale Timm
General	Prefeasibility Report, First Draft V1.0	**Environmental and Socio – Economic Critical Levels** The work done by STI is reviewed and commented on. Apart from defining some further concepts, no new insights or refinements on the work done by the STI ECL methodology are proposed. The proposal is made to collectively decide on the TOL. No mention is made of the fact that the STI dewatering pumping arrangements and installations have substantial flexibility to operate at different flows and levels. The STI approach was to be conservative and by on-going groundwater monitoring to refine the selection of an ECL. The STI team should also be approached to confirm that the Long Term Study proposed ECL and TOL can be accommodated by the proposed STI mine void dewatering installations currently in detail design and under construction in the Central Basin.	Andre van Niekerk	Addressed	Dale Timm

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Prefeasibility Report, First Draft V1.0	**Water quality** Table 2.6: Summary of the chemical data, comments: □ Reported TDS concentrations show no relationship with the ionic species, in fact one of the ionic concentrations [S04] exceeds the reported TDS concentrations. □ The reported uranium concentrations progressively increase from the West Basin to the Central Basin to the East Basin, which does not reflect the known geochemistry of the different mining basins. □ Central Basin water quality indicates an alkalinity in mine water with a pH equal to 3.2, which is not chemically possible. The water quality fingerprint plotted on Figure 2.5 does not use well-established geochemical protocols/plots for evaluating AMD quality fingerprints. The indicated plot is not routinely used in the mining industry for geochemistry work related to AMD. We do not find any indication of further work done to better understand the progressive change in mine water quality depending on the mechanism of flushing the underground workings over time. The STI work simply used the limited historical data and did not attempt to understand the water quality variation over time, which is a critical aspect of finding an appropriate long term solution.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Capacity of pumps and treatment works** Why is the ratio between the Average Ingress: Peak Ingress so different between the three mining basins, was this based on some geo-hydrological modelling work?	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Options for use, discharge or disposal of water and waste** Use by the Mining Sector The reclamation and re-mining of old tailings dams on the Witwatersrand continue with several companies projecting a long remaining life for such operations at the current gold and uranium prices. These operations use large quantities of process water. This must be a significant potential neutralized AMD water user. This aspect is not reflected in the report.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Use of Neutralized and Desalinated Water** Domestic water use – It is not clear, given the small quantity of reclaimed AMD, why negotiations cannot be undertaken with the individual Metro Municipalities or District Municipalities, to take the water as a supplement to the Rand Water supply. Industrial water use – Why would Sasol Secunda be interested in a larger water supply when they would have access to the VRESAP Scheme with high quality water directly from the Vaal River and which can in future be expanded.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Discharge to the Environment** Recommendations related to alternative discharge points should be based on a comprehensive environmental impact study, followed by an economic evaluation to justify the additional capital investment cost to install and operate long discharge pipelines.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**High Density Sludge (HDS)** The statement that co-disposal with tailings is not a truly long-term solution, since the mine tailings may not be available over the long-term, requires further investigation. If reclamation of tailings discontinues, the decommissioned tailings dams could still be available to receive the HDS sludge. Underground HDS sludge disposal is mentioned, but does not receive any serious attention. Many course tailings backfill operations are in place on active underground gold mines in South Africa. Backfill operations have accumulated years of experience and this may be extrapolated to the underground disposal of HDS sludge. This disposal option cannot be discounted without scientific, environmental and engineering investigation.	Andre van Niekerk	Addressed	Dale Timm

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Prefeasibility Report, First Draft V1.0	**Brine** It is not a general truth to state that AMD desalination produces brine, it depends on the treatment technology and on the target treated water quality. This section makes no reference to the brine reduction technologies currently being investigated and piloted by the mining industry.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**AMD treatment technologies** The statement that nowhere in the world is AMD treated or plan to be treated on the scale of the Witwatersrand [approximately 150 ML per day] is not entirely true. On the Highveld Coalfields, operational and AMD treatment plants under construction approach a treatment capacity of 100 ML per day, quite comparable to the Witwatersrand Goldfields. The grouping of AMD desalination treatment technologies is not aligned with internationally accepted technology groupings, which typically reflect: □ Biological treatment □ Membrane-based treatment □ Chemical/precipitation-based treatment.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	Table 5.1 – it is not clear how the HDS waste sludge production between the Western Basin and the Central Basin can be so similar [5.5 - 6.1 tons dry solids per ML of water] when the metal contents of the basin feed waters are so different Table 2.6]. Table 5.1 – the inference that the conventional RO mine water treatment process always involves three successive treatment stages is not correct. Table 5.1 – the statement that SAVMIN is an unproven technology is not true. Several significant scale demonstration plants have been successfully operated in the past. This technology is at least an emerging technology, if not already proven. Table 5.1 – the summary of the Biosure process does not refer to the fact that the production of elemental sulphur as a by-product and the desalination aspects of the process were never successfully demonstrated on a significant scale. This technology should be considered embryonic and may be moving towards emerging as an integrated AMD desalination technology. Table 5.1 – I am not aware of any full-scale Paques treatment plant using sewage sludge as a carbon source. This is a proven biological treatment technology, with several full-scale plants operational in the world, including one in South Africa.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	General comment that the only known solution that can be implemented with acceptable risk is HDS followed by conventional RO is not accurate. I am of the opinion that if the procurement process is opened up to other technologies, that large reputable water companies will also offer solutions with appropriate process guarantees of the following: □ A variety of membrane desalination solutions, not only covering the three stage RO process, □ Sulphate precipitation technology, □ Biological treatment technology, not using sewage sludge as a carbon source. It is therefore important to position a number of technologies to be able to benefit from these emerging technologies in the development of a Long Term Solution.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Recommendations** Firm recommendations to pump AMD for 19 hours, install flow equalization tanks and treat AMD for 24 hours must be confirmed by an appropriate techno – economic analysis. The AMD pumping cost contributes less than 5% of the different Operating and Maintenance (O&M) Cost Table 2.4]. Also, Ion Exchange mine water treatment technology has been demonstrated and should be included in the list of treatment processes to reflect at least an innovative technology.	Andre van Niekerk	Addressed	Dale Timm

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Prefeasibility Report, First Draft V1.0	**Initial screening of options** West Basin. The reference Project includes pumping reclaimed AMD to the Rustenburg Platinum Mines. One needs confirmation that the Platinum Mines do require this water. Three emerging treatment technologies are recommended for pilot testing including: □ Biological treatment plus Bio-sulphur plus RO membrane treatment, □ Alternative RO membrane treatment, □ Alternative biological treatment processes. I do not agree with the selection of these technologies for pilot testing. It is essential to conduct a much more comprehensive analysis of the alternative innovative and emerging technologies [including technologies based on precipitation of sulphate, ion exchange technologies] before making these firm recommendations. The Reference Project includes a Sludge Storage Facility. The potential for filling several other open mine pits and the potential for co-disposal with ongoing tailings reclamation projects in the West Rand mining area cannot be ignored.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	Central Basin Co-disposal of a liquid waste [brine] with the HDS sludge is not demonstrated and cannot be assumed to be practical for these projects. To my knowledge it is not the practice on any of the other full-scale AMD treatment plants. This may constitute a fatal flaw to both the Base Case and the Reference Project. The same comments apply with respect to the recommended pilot testing of biological treatment – please refer to the West Basin comments.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	East Basin No additional comments offered.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	General comments. The identification of project options use the configuration reflected in the Inter-Ministerial Committee Report based on: □ Three separate basin dewatering facilities □ Three separate AMD treatment plants The system configurations of linking the three basins and developing one/two centralized AMD treatment facilities are not considered. These configurations formed the basis of the original 2009 proposal developed by the mining industry and cannot be ignored.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Assessment of selected options for the west basin** Limited information is given with respect to the protocols and databases used for the Capex and Opex costing, making the preparation of comments difficult. Option W2 .2 .1 .1 includes biological treatment and the description of the complications related to this treatment technology as described in the report confirm my review comments above.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Assessment of selected options for central basin** No additional comments	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Assessment of selected options for the east basin** No additional comments	Andre van Niekerk	Addressed	Dale Timm

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Prefeasibility Report, First Draft V1.0	**Comparison of options** Western Basin The accuracy or confidence envelope of Capex and Opex cost estimates is not recorded, but at the concept level of engineering is assumed to be -30%, +30%. Given the indicative level of costing, the differences in the calculated URV values would not seem to be a reliable basis for ranking of options. It would seem, given the relatively narrow range of the lower URV values [15 to 20 R/m3], that the decision on the recommended Reference Project should draw on other considerations. For example, the risk profile of each of the selected options may provide a more rational way of selecting a preferred option, based on Option Risk/Opportunity Assessment methodologies.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	Central Basin The recommended Reference Project includes delivery of water to local industries. I'm not sure about the choice of the recommended Reference Project if the existence of such local industrial uses cannot be confirmed at this time and if Rand Water has not agreed to sacrificing their lucrative industrial water consumers for the benefit of this AMD reclamation project.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	Eastern Basin No additional comments	Andre van Niekerk	Noted	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**General Comments** It is clear that no potable or industrial customers for the reclaimed AMD could be confirmed as part of developing the Long Term Strategy. Against this background, I would suggest that the reasonable Reference Project in all cases is simply neutralization/desalination and discharge to local rivers in a manner which supports the Vaal River Water Resources Reconciliation Strategy and the Crocodile West Water Resources Reconciliation Strategy.	Andre van Niekerk	Addressed	Dale Timm
Specific	Prefeasibility Report, First Draft V1.0	**Principles and approach to implementing the long-term solution** No mention is made of the further investigation research and development related to the waste and residues generated by AMD treatment. For example, mention is made earlier in the report on the potential for underground sludge disposal in old mine workings, recovery of by-products from waste etc. These aspects need to be reflected as part of the process of developing the Long Term Solutions. If the Central Basin and East Basin DBOM or PPP contracts are anticipated to be awarded in 2016, acceleration of the opportunity to pilot emerging treatment technologies to be market ready by 2016 should be pursued.	Andre van Niekerk	Addressed	Dale Timm

Report 5.1					
Ekurhuleni					
General or Specific	**Reference**	**Comments**	**Reviewer**	**Response**	**Respondent**
General	Study Report 5.1, Draft V2.0	**Geotechnical Section** On Page 38 – Section 2.2.3.3: Disposal of Neutralised Water-Eastern Basin: Propose 0,7km 900mm diameter concrete treated water pipeline will discharge neutralised water into the Blesbokspruit. This can't be allowed as they are on dolomite and should use HDPE pipes (SANS 1936 regulations); except if they can prove that the pipe alignment (by means of dolomite studies) is an Inherent Hazard Class (IHC) 1. **Further concerns:** • Still the potential of flooding (tables at the back of report) during the summer months of lower lying residential areas adjacent to the Blesbokspruit & Elsburgspruit/Natalspruit; not yet quantified. In the document they estimate a 10mm rise for the Blesbokspruit and no rise for the Elsburgspruit, although the tables at the back specify something else –concern for flooding. • No estimation had been made if the current tailings dams proposed to be used can cater for the additional sludge generated from AMD treatment process-Long Term. • High sulphate loads added to the Vaal River system due to AMD water, sterilising drinkable water. • From what I can understand in the document they did quantify everything related to the pumping facilities at each point where water will be abstracted within the basin; however what happens thereafter is not yet quantified (sludge & treated water).	Ekurhuleni	Concerns should be addressed in EIA for the STI	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Disaster Management** The Disaster Management division is still in support of the current project in relation to the Acid Mine Drainage (AMD). The position of this Division with regards to the project is that the project must continue to alleviate any possible Disaster Risks that may be associated with NOT treating the AMD. This is in line with our previous e-mail on the project. (See the previous e-mail below as copied to this correspondence) "The Disaster Management Centre supports the application as we are of the view that something needs to be done urgently about this challenge. It is our view that leaving it in order to complete the EIA would only create a much larger challenge. Please also consider the comments provided below in any responses regarding this matter. However, the colleagues feel that the AMD Report is silent on the following issues that are likely or not likely to impact on Disaster Management: 1. How will the project impact on the communities around the Central and Eastern Basin, especially areas such as Marathon, Makausi, Jerusalem and others? 2. Will there be a need to relocate the areas mention? If yes, what will be process in this regard and the available land identified? 3. Will the dispersing of waste into the streams have any impact to the water bodies around the informal communities? 4. Were the communities around the Central and Eastern Basin consulted about the pending project? 5. Is there any public awareness and education conducted in the adjacent areas to the Central and Eastern Basin? 6. Has the allocations of site for pumps to extract the underground water considered the proximity or distance to the settled communities? Please note that all the questions raised in relation to the AMD Report will be the burden of the municipality if are not clearly addressed forthright. Moreover, the many have the same consequences with the previous issues of Bapsfontein."	Ekurhuleni	Concerns should be addressed in EIA for the STI	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**The Water Quality Section** On behalf of The Water Quality Section just 2 comments on this report: 1. In the report it is clearly mentioned that in the STI the proposal is to continue with disposal of Waste Sludge to tailings dams, open pits and mine voids, but the report clearly mentions that there exists a number of problematic issues around this disposal and that it should be addressed in the EIA for the STI. Will the fact that the exemption for an EIA on The Short Term Intervention, as applied for, not prevent that these problematic issues be addressed? 2. The report does not include any actions in the STI to prevent the re-ingress of water into the basins.	Ekurhuleni	Concerns should be addressed in EIA for the STI	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
General	Study Report 5.1, Draft V2.0	**City Development:** 1. The Report touches on most of the important issues relevant to the management of AMD. The "desk top" approach should now make way for a "Plan of Action" including a Communication Strategy to inform local authorities and communities on the way forward. 2. A section of the Action Plan should also deal with the responsibility of local authorities to budget for related downstream operational projects. This should be prioritised and linked to the respective IDP's. Government should make a commitment towards financing these projects. 3. The relevant bodies responsible for treatment of AM water should be responsible for the selection and installation of equipment that meets the specifications set by government. Indemnity should not be given to any "treatment" body against releasing water in the drainage systems that does not meet the required standards. 4. Consideration should be given to plan and establish independent water monitoring stations in drainage systems in which the mine water is released. Rand Water should possible play a role together with the relevant councils in this regard. 5. Is there really no commercial value for this water in a country where water is a scarce commodity? Should the private sector not be invited to make proposals?	Ekurhuleni	Recommendations made in relevant reports	Johan van Zyl
WISA					
neral or Spec	**Reference**	**Comments**	**Reviewer**	**Respnse**	**Respondent**
General	Study Report 5.1, Draft V2.0	**Introduction** **The authors of the report list three main risks associated with Acid Mine Drainage (AMD) in the western, central and eastern basins, namely:** Decanting AMD in the Western basin and rising AMD levels in the mine voids of the Central and Eastern basins – Breaching of the Environmental Critical Levels (ECLs) will have serious environmental and social consequences and must be prevented. This is one of the key objectives of the Short-Term Intervention (STI). This means that the STIs has to assess and address the emergency situation, but Department of Water Affairs (DWA) realises that such emergency measures, to protect the ECLs, may not necessarily be sustainable in the long-run, and the FS: LTS (Long-Term Solution) must address this. The risk posed to the security of water supply from the Vaal River System if salts from AMD are discharged into the rivers for an extended period. It is estimated that if releases from Vaal dam, to dilute the saline water pumped from the mine voids by the STI, continues beyond 2015 there is a significant risk to the security of supply. Thus fast-track implementation of the LTS will be required. **The report entitled Current Status of Technical Management of Underground AMD (Study Report No 5.1) has the following aims:** *Describe the current and expected status of the technical management of AMD, primarily within the Study area. In particular the proposed STI and its implications are reviewed.* *Based on literature that is readily available the report provides an overview of the management of AMD nationally and internationally, to put the AMD problem in the Witwatersrand into* perspective.	WISA (Ingrid Dennis)	Noted	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Review of Chapter 1: Introduction** Chapter 1 provides a background to the study and more specifically the STI, emphasising the urgency of taking action. The aims of the project as listed above are discussed. The chapter ends with a summary of nternational experiences related to AMD and relates them back to that currently experienced in South Africa.	WISA (Ingrid Dennis)	No Response Required	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Specific comments:** In Section 1.1 it is stated that The STI will require several of the same implementationactivities (Environmental Impact Assessment (EIA), land negotiations, etc.) than the LTS. It is important that all these activities be listed with a short explanation of what is involved in each of these activities as this provides the scope of the STI. The following paragraph states It was emphasised that this study is in the public eye and that the Feasibility Study should investigate possible solutions and disqualify those found to be not suitable. All related decisions must be defendable. All possible solutions were not discussed in this report – only a few variations of the High Density Sludge (HDS) approach. It is suggested that a literature survey of all available approaches be included together with the pros and cons of every approach. Alternatively if this discussed in another one of the project reports – the authors must reference the corresponding report in this section.	WISA (Ingrid Dennis)	Addressed by STI team or addressed in other reports	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**In Section 1.3 the STIs include:** Firstly, investigate and implement measures to neutralise and remove metals from the AMD; Secondly, investigate and implement measures to pump the underground mine water, in order to prevent the violation of the Environmental Critical Levels (ECLs); and Thirdly, to initiate a Feasibility Study to address the medium- to long-term solution. Why were salts such as sulphates included and monitoring not included? This also applies to the directive given by DWA to the TCTA. One of the Directive's given by the Minister of Water and Environmental Affairs was that the TCTA ensure the water will be treated to drinking water standards. However later in the document, the Directive is changed by the Mr Smit (Regional Head: Gauteng) for the Tweelopies Spruit. No motivation was provided as to why the Directive was changed.	WISA (Ingrid Dennis)	Concerns should be addressed in EIA for the STI	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report 5.1, Draft V2.0	**Section 1.4** discusses the international experience in the management of AMD. This section basically mentions who is responsible for the AMD and how the funds are generated. It is expected that this section would provide a detailed discussion on the various treatments applied and the associated successes, failures, costs and impacts on the receiving environment. The funding mechanisms are also just briefly mentioned – it would add value to the report if for example the working of performance bonds are explained. The same comments as above apply for Section 1.4.5 – this section must be expanded and detail added. Section 4.1 does not fulfil the following objective: Based on literature that is readily available the report provides an overview of the management of AMD nationally and internationally, to put the AMD problem in the Witwatersrand into perspective.	WISA (Ingrid Dennis)	Falls otuside the scope of this study to discuss the STI in such detail. Subsequent reports will elaborate on the LTS financial.	Johan van Zyl
General	Study Report 5.1, Draft V2.0	It is recommended that the project team also highlight the importance of initiating studies in the Far Western Basin and Free State Gold Fields to ensure the current challenges are addressed before they become urgent as in the case of the western, central and eastern basins.	WISA (Ingrid Dennis)	Will be recommended in subsequent reports.	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Review of Chapter 2: Infrastructure** This Chapter provides an overview of a due diligence report for the western, central and eastern basins. The tender design is provided including abstraction works, primary treatment, disposal of neutralised waste and waste management. The Chapter ends off with an assessment of the sustainability of the STI once again taking the abstraction works, primary treatment, disposal of neutralised waste and waste management into account. Conclusions are made concerning stakeholders who can benefit from neutralised AMD water.	WISA (Ingrid Dennis)	No Response Required	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	***In Section 2.1***, the authors refer to a Due Diligence report compiled by the consultants – yet no formal reference is made to the report. The authors then list the components for the STI for each of the basins. However there is no discussion concerning these options. What is the motivation for choosing these options? No suggestions are provided on the impacts of the receiving environment. It is understood that this a short-term intervention, yet one would still expect the receiving environment would play a huge role in the choices made on implementation. It is also requested that the authors list the pros and cons of the various STI components listed in Sections 2.1.1 – 2.1.3 including preventative measures taken to prevent/minimise further pollution of water resources and the rest of the receiving environment. Maps of the area would assist in the understanding of the text. It is also stated that the pumping depth might depend on that of Central Rand Gold (in the Central Basin) and Gold One (in the Eastern Basin), these depths must be quantified as it will definitely affect the STI.	WISA (Ingrid Dennis)	Refer to TCTA Due Diligence report for detail on how options were selected. Concerns to be addressed by STI EIA.	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	***Section 2.2*** provides an overview of the tender design together with maps indicating the STI for all three of the basins. The ingress for each of the basins is document (together with a maximum ingress). However the calculations provided by the authors of this report differ from those calculated by TCTA. It is important the methods used to make these calculations are documented in an Appendix together with an associated confidence level. It would also be beneficial to see how the inflows vary monthly with rainfall. The authors must also just check that everything mentioned in the text is documented on the associated maps. ***In Sections 2.2.3 and 2.2.4*** no mention is made of monitoring quality and quantities of water and waste. In addition no monitoring of the receiving environment is mentioned. No mention is made of preventative measures to minimise/avoid further pollution.	WISA (Ingrid Dennis)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Section 2.3** assesses the sustainability of the STI. Here the authors mention that . . The entire system will be investigated holistically taking into account capital, operational and maintenance costs for both STI and LTS options. Entire can include not only the engineering of the system but also legal, financial, environmental and social considerations. Table 2.1 provides the expected flows due to the discharge of neutralised water. Maps showing the locations of the calculated flows (flood and additional discharge) in relation to the discharge points must be shown. In Section 2.3.4 a meeting with Rand Water is mentioned, who said they would not be interested in including fully treated AMD in their potable system, however they would consider other options. It would be interesting to know what these options can be. In Section 2.3.5 sludge management and disposal are discussed. Once again no mention is made of monitoring quality and quantities of water and waste. In addition no monitoring ofthe receiving environment is mentioned. No mention is made of preventative measures to minimise/avoid further pollution.	WISA (Ingrid Dennis)	Addressed in subsequent reports	Johan van Zyl
General	Study Report 5.1, Draft V2.0	In general it is difficult to review this Chapter as it lacks some detail. There are two potential long term solutions mentioned on numerous occasions namely a greenfields engineered disposal site and disposal in the mine void. It is important that both these solutions be carefully considered and studied in detail. The consequences of polluting more land within the study areas with greenfields engineered disposal sites must be fully understood. The disposal of sludge in shallower mine voids (without plugging) might just lead to the circulation of the problem and not the solution thereof.	WISA (Ingrid Dennis)	Noted, Addressed in subsequent reports	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Review of Chapter 3: Neutralisation of AMD** This Chapter assesses the proposed STI, with the evaluation criteria being water quality. The process followed is then discussed, followed by an overview of the process technology. Sludge quantities and qualities and the suitability of the HDS process as a pre-treatment for reverse osmosis are also mentioned. The Chapter ends with a review of the STI.	WISA (Ingrid Dennis)	No Response Required	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report 5.1, Draft V2.0	***Section 3.1*** states the objectives of the proposed solutions. In Section 3.1.2 it is clearly stated that the evaluation of the STI is based on water quality which is valid. Yet this must be considered together with the financial, social and environmental consequence. What happens if 'clean' water is discharged but in the neutralisation process many of the 'clean' aquifers/ surface bodies are polluted? A question to the authors – in Table 3.2 how did they calculate the TDS/EC ratio to be 10.6? The subscripts a and b are missing in the physical table.	WISA (Ingrid Dennis)	Noted and Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	In Section 3.1.3 the process is described, with the goal being: Precipitation and removal of heavy metals (specifically iron (Fe), Manganese (Mn), Aluminium (Al) and Uranium (U)); Neutralisation of acidity of mine water; and Reduction of the salt load by partial precipitation of high sulphates presents in mine water.	WISA (Ingrid Dennis)	No Response Required	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	There is no problem with the above-mentioned goal – however monitoring must be on going and standard anion – cation analyses must be onducted every six months. It has been seen in the past that the water type changes and then the neutralisation goal will also change. A note to authors – Magnesium is also a metal (page 45) and should be included under the metals bullet on page 46. The supplied process description discussed in Section 3.1.4 is clear. Figure 3.1 is however too small and it is difficult to read the text.	WISA (Ingrid Dennis)	Noted, Addressed in subsequent reports	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Sections 3.1.5 and 3.1.6** provides an overview of process technology and of slug quantities and qualities. One aspect about the neutralising process not mentioned is how effective has the neutralisation process been in the Western Basin. It has been going on for a couple of years and the success/failure of the what has been done so far should surely influence future neutralisation processes. It would also be interesting to see how effective the process was in other countries. It would also assist if some of the calculations (and associated assumptions/limitations) made concerning the expected water quality (Table 3.4) were included as an Appendix. Similarly calculations (and associated assumptions/limitations) for the expected sludge quantities and composition (Table 3.5) should also be included in an Appendix.	WISA (Ingrid Dennis)	Part of STI	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	The Short-Term Intervention (Section 3.2) is briefly evaluated. This Section provides a brief review of alternative AMD desalination technologies – it is important to review the alternatives and therefore the pros and cons of these alternatives should be discussed in detail.	WISA (Ingrid Dennis)	See report 5.4	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	Under **Section 3.2.3** water licences must also be considered and the impacts of these proposed options on agricultural/economic/social activities in the area and also human health. The associated risks must also be determined for the above-mentioned factors and the rest of the receiving environment including ecological risk, air pollution risks etc.	WISA (Ingrid Dennis)	Noted	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Review of Chapter 4: Environmental Aspects** Chapter 4 is a one-pager evaluating the long-tern environmental suitability of the STI Under Section 4.3 the final storage facility also needs to be considered as one of the project components. The requirements of the receiving watercourses must be considered in terms of the Reserve, Resource Water Quality Objectives and the Classification of the water resource. Chapter 4 covers the environmental impacts, which need to be expanded and requires more detail.	WISA (Ingrid Dennis)	Noted	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Review of Chapter 5: Implications for Procurement of the LTS** This Chapter concludes the report with a half-page discussion on the procurement of the solution for the AMD. However this Chapter only mentions a Private Party being involved. It is suggested that this Chapter be expanded and various alternatives/scenarios be discussed.	WISA (Ingrid Dennis)	Addressed in Report 7	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Review of Appendix E: Environmental Comments on the STI** This Appendix is a Table which provides comments on how the Short Term Infrastructure will play a role in long-term sustainability. The western, central and eastern basins are discussed separately.	WISA (Ingrid Dennis)	No Response Required	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Western Basin** A site walk over should be conducted to ensure there are no sensitive environmental features such as wetlands and rivers. The abstraction point in the Western Basin can have impacts on the groundwater system. Bringing the groundwater level down to the ECL, can change groundwater flow directions and associated pollution. The pollution can be drawn to the point of abstraction. The quality of the water abstracted from Shaft No 8 can therefore deteriorate with time. The geology and geological lineaments in the vicinity of the treatment plant must be investigated as groundwater pollution can occur with will in turn lead to surface water pollution at groundwater discharge points. There is no confirmation in this document that the current water quality at the discharge point is of an acceptable quality and meets the standards set out in DWA's directives. The environmental/hydrological/geohydrological impacts of the disposal point must also be considered.	WISA (Ingrid Dennis)	Addressed in subsequent reports, and will be addressed further during implementation	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Central Basin** A site walk over should be conducted to ensure there are no sensitive environmental features such as wetlands and rivers. The discharge point is in the Elsburg Spruit and not the Tweelopies Spruit. The general discussion is identical to that of the Western Basin. The geology and geological lineaments in the vicinity of the treatment plant must beinvestigated as groundwater pollution can occur with will in turn lead to surface water pollution at groundwater discharge points. The environmental/hydrological/geohydrological impacts of the disposal point must also be considered. It is important to extensively investigate the option of underground disposal. If it is considered various scenarios must be considered like as deep as possible and plugging to ensure the water pumped from the SWV Shaft does not move through and leach the sludge.	WISA (Ingrid Dennis)	Addressed in subsequent reports, and will be addressed further during implementation	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
General	Study Report 5.1, Draft V2.0	**Eastern Basin** A site walk over should be conducted to ensure there are no sensitive environmental features such as wetlands and rivers. The discharge point is in the Blesbok Spruit. The general discussion is identical to that of the Western Basin. There is a Ramsar site in the Blesbok Spruit. It is important to extensively investigate the option of underground disposal. If it is considered various scenarios must be considered like as deep as possible and plugging to ensure the water pumped from the Grootvlei no 3 shaft does not move through and leach the sludge. Question to authors – the sludge is going have to be deep – so how is it going to prevent subsidence. How is the mining at Goldone going to affect possible mitigation options?	WISA (Ingrid Dennis)	Addressed in subsequent reports, and will be addressed further during implementation	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**Editing** There are a couple of minor editing issues that need to be addressed There are a few acronyms (e.g. FS) is not included in the list of Acronyms There are a few of the Appendices (e.g. Appendix A) not referred to in the text. There are a few of the Annexures (e.g. Annexure B) not referred to in the text. The report should start on page 1 and not on page 25. One page 26: Two of the main risks associated with the AMD are time-related should be Three of the main risks associated with the AMD are time-related. On page 40: Heading 2.3.5 states Discussions with other stakeholders such as Magalies Water and the Municipalities still need to be initiated. Sludge Management and Disposal There are some grammar and typing errors as well. A list of references is missing.	WISA (Ingrid Dennis)	Addressed	Johan van Zyl
General	Study Report 5.1, Draft V2.0	**General** To conclude, the authors have covered most of the objectives set out in Chapter 1. However in many cases the detail needed to motivate a section or opinion is missing. I do understand the authors had tight deadlines and it is challenging and time consuming to discuss detail in a project as huge as the STI – however for the same reason is important that the detail is included.	WISA (Ingrid Dennis)	Noted and Addressed	Johan van Zyl
TCTA					
neral or Spec	**Reference**	**Comments**	**Reviewer**	**Respnse**	**Respondent**
Specific	Study Report 5.1, Draft V2.0	**Executive Summary** page xi Agreement has already been reached on disposal to Brakpan TSF. This was announced in Dec 2012 The situation has completely changed since the tender was issued due to budgetary constraints. Two pumps have been procured which will act as one duty one stand by	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page xii Put on hold due to budgetary constraints. Now upgrading existing plant but proposals have been received from Mintails that could postpone this expenditure until reworking of the tailings is complete Two pumps donated by CRG each with capacity of 35 ML/day Both duty no standby	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page xiii This is known by DWA as DWA issued the instruction All this has changed with the conditions attached to the granting of the environmental authorisation for the STI which is seen as an integral part of the solution for AMD Only Central has currently proceeded with new infrastructure. The LTFS can still influence Western and Eastern solutions for the STI	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page xiv Incorrect. An economic analysis would need to be undertaken to determine if the solution was cost effective in the long run given the existing infrastructure.	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Introduction** page 25 In the context of this report it should include when the directive was given to TCTA, when the PS was appointed and when the construction tender was issued. This is a report written by consultants on behalf of DWA	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 26 Major issue is who will pay for the O&M in the interim Outdated given the conditions of the environmental authorisation for the STI This is not a greenfields project. It is 2013 already. The LTS is running under the same constraints of time as the STI. If the 2015 deadline is to be met certain decisions need to be made now to ensure implementation in time	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 29 directive not mandate This statement should not be in this report. DWA has made both appointments. Why should the LTS be questioning appointments made by DWA? Not sure this is in the right report as this is more around how to fund the long term liabilities, rather than the current technical status of the STI	TCTA (Richard Holden)	Addressed	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report 5.1, Draft V2.0	**Infrastructure** page 33 Instruction from DWA	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 34 Reading this as an outsider you would not believe that it is the same Department issuing instructions. It does not look good	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 35 Again from an outside perspective this looks bad. It looks like DWA has and Implementing agent and a consultant not talking to each other. Will only be one duty one standby. Due Diligence was written in July 2011 and tender was in December 2011. So much has changed that this is outdated information due to budget constraints using existing infrastructure	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 36 Already found and removed. So what bearing does this have on the LTI? This sentence does not make sense. CRG have donated the two pumps to the project. There is no existing pump in the shaft	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	Page 37 Until the ECL is reached there after it will be turned off. The STI plant can therefore be smaller	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 39 Until the ECL is reached there after it will be turned off. The STI plant can therefore be smaller	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 40 Arrangements have already been concluded for the disposal of sludge until the long term solution can be implemented	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 41 No such thing as Bulk water services authorities, only water service authorities	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	Neutralisation of AMD page 44 It was never intended to be, as per DWA directive, so why the statement?	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 50 can the basis of this statement be explained. Need to check against current results on Western Basin using less than optimum configuration	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 56 There is agreement Need to check the agreements In the Western Basin waste is already being codisposed and heads of agreement have been reached with ERGo. The disposal will be within the existing authorisation Check heads of Agreement Ads of check hAgreement reached page 57 heads of Agreement have been reached to dispose to current TSF's An EiA is not been done for the STI. One EIA is being done for the entire project	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	page 58 Western Basin only. In Central and Eastern 30 years	TCTA (Richard Holden)	Addressed	Johan van Zyl
Specific	Study Report 5.1, Draft V2.0	**Environmental aspects** page 59 Incorrect. a completely different route was followed after discussion with DEA The STI is not sustainable and the environmental authorisation recognises this.	TCTA (Richard Holden)	Addressed	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
General	Study Report 5.1, Draft V2.0	**General** The report as it stands at the moment represents a huge reputational risk for DWA as it is based on old and out dated information and in effect criticises the decisions that DWA has made (the decision to go with proven technology is one). The reader is also left wondering why the consultant could not have asked for certain information (such as on the pumps where statements are made that they could not ascertain how many duty pumps there are and if any standby is provided) Two examples that stand out: 1) The heads of agreement that have been reached, on behalf of DWA, with the mining companies for the co-disposal of sludge in existing tailings facilities (In the Western Basin this has been occurring since the middle of last year). The report still talks of the risks associated with not reaching agreement 2) The Environmental Authorisation granted to DWA, exempting DWA from the requirements of the Environmental Impact Assessment Regulations. The report talks of the use of Section 24G. DWA has made certain decisions regarding the implementation of the STI and they have become the given on which the STI has been implemented and the Long Term Feasibility. These decisions should be reflected as such and not questioned in what is intended to become a publically available report. The situation on the STI has been extremely fluid due to the lack of funding and currently only the Central Basin has the construction of permanent works underway, meaning the choice of technology in both the Western and Eastern Basin can still be influenced. The question needs to be asked can the LTS provide those answers in the time available or not. If it can then it must state by when the information will be available so that technology choice can be influenced. If it cannot then the implication is that infrastructure could become redundant in the future but there is nothing that can be done to mitigate the risk as delaying will result in breach of ECL and an even larger plant to draw down to ECL later.	TCTA (Richard Holden)	Addressed - Disclaimer added to all reports to state that report was correct at the time of first issue.	Johan van Zyl

Report 5.2

Hobbs

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No. 5.2 Third draft	**Executive Summary** page xii/ xiii Not only the shaft but also all of the stopes that link to 5 Level would need to be plugged ! Not previously defined as South West Vertical shaft, so no context for the uninformed reader Inconsistent use of space as thousand's separator for elevation values Perhaps "shallow" ? I know it is a matter of preference, but the Oxford spelling is one word Figure 4.4 only talks to annual precipitation ! No discharge rates associated, so not a load Total dissolved "solids" - it depends how the determination was carried out: if it was done by drying and weighing, then total dissolved "solids" is correct, due to the subtle difference that certain salts decompose during drying. If not, then total dissolved "salts" is correct.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Table B** page xv 5th %iles apply also to "this report" pH data	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**List of Acronyms** page xxiii - xxv *Al/ Ca/ Cl/ Mn/ Na/ SO4/ U* - Already in list of chem. Constituents *Alk/ CaSO 4/ COD/ DO/ TDS/ TH* - Move to list of chem. constituents *Cond* -Same as EC *EC/ SAR* - A physical chemical variable, so not sure of calling it a constituent and moving to list of chem. constituents	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**List of chemical constituents** page xxvi Mℓ - Megalitre is not a chemical constituent. See Comment [PJ16 - Move to list of chem. constituents] Suggest inclusion of a LIST OF UNITS	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Glossary of terms** page xxvi Ramsar Convention - Check on consistency of "ize/iza" versus "ise/isa" throughout text; e.g. see "stabilise" in text below Figure A, p xv	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Hydrogeology** page 20 The term 'primary aquifer' has a specific hydrogeologic meaning that does not describe the 'significance' of a groundwater resource as would seem to be implied here. Water-bearing dolomite is a secondary aquifer, deriving its porosity and permeability only long after formation of the strata by means of karstification (carbonate dissolution). The term 'primary aquifer' has a specific hydrogeologic meaning that does not describe the 'significance' of a groundwater resource as would seem to be implied here. Water-bearing dolomite is a secondary aquifer, deriving its porosity and permeability only long after formation of the strata by means of karstification (carbonate dissolution). Report average as a single value, not a range.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Rainfall** page 24 Not sure how this is evident from the data in Figure 4.1 Values reported in table require clarification, e.g. are decadal values averages or totals.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Climate change** page 25/ 26 *" as well as monthly average rainfall"* - Not evident from Figure 4.4. *"The recommended water level monitoring should be used to determine abstraction rates"* - This observation lacks context.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Existing open pits** page 28/ 29 *"tailings from reprocessing plants"* - It can be argued that such material is unsuitable depending on its source and degree of inertness. *"Mine Tailings tailings and Dumps dumps"* - How is this different from the "Mine residue deposits" subsection?	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Rivers, water bodies and stormwater drainage systems** page 29 *" Appendix A4"* - This appendix is currently the "Review note on AMD qualit	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**AMD** page 31/ 33 *"1981"* - Date is 1996 in "References" *"1996"* - Date is 1971 in "References" *"TDS was seldom directly determined"* - In accordance with Comment [PJ13] then, the correct terminology is "total dissolved salts"	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Water levels** page 44/ 46 *"water levels"* - Presumably the water table in the karst outlier that hosts the locus of decant. *"Central Vent Shaft and CPS borehole"* - What about #8 Shaft? Also cannot find these structures on any map, which would assist in contextualising their potentiometric info. *"1669 m amsl"* - Source of this value? Own information indicates a lower value of ~1662 m amsl, *"Section 4.2.3"* - Cross-reference linkage is missing	Phil Hobbs	Adressed	C Myburgh

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No. 5.2 Third draft	**Proposed Environmental critical level** page 49 / 50 This body of text seems out of place here. Would be more appropriate in an introductory section. Not sure what is meant by "direct AMD". Perhaps more appropriate to use reduction in AMD impact on spring water quality as a metric in this regard.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Meteorology** page 52/53 What criteria inform "most representative" ? Consider defining this in the "Glossary of terms" for the benefit of the uninformed reade	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Sources of ingress and estimated volumes** page 56/59 How does this say anything different from the next bullet ? I would suggest a single paragraph would suffice to convey this outcome.This discrepancy is either insignificant (if the void volumes arrived at are similar) or crucial (if they differ significantly) for the veracity of the 'final' void volume used for further calcs. In the light of Comment [PJ64], it is advisable to resolve the discrepancy with the original source (Krantz) if not already done. A combination of these factors, and not one or the other, resulted in decant I would'nt call a difference of 30% "marginal". To what level? Perhaps above ECL´.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Pumping volumes required** page 63 This text is essentially a repeat of previous material and therefore redundant. Simply refer to the section where this is first presented.This is a potentiometric level and not a water table.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Water chemistry** page 67 Not supported by 18 Winze = 76 mg Mn/L versus 17 Winze 85 mg Mn/L ! **Figure 6.17** "Aviary Spring" station should read "Aviary Dam" station where surface water chemistry is monitored, not to be confused with the Aviary Spring, an actual groundwater source. **Oxidation** This is called hydrolysis, and is amply illustrated on the basis of 100s of pH values at up to 5 stations over a distance of ~6.5 km down the Tweelopie Spruit, so more concrete than the speculative alternate explanation proferred. **Table 6.12** What is the significance of the 60th %ile ? How is the TDS estimated?	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Change of water quality with time** page 69/ 71 To what extent has the sampling protocol (sample collection procedure, locality, etc.) been queried for any change that might provide a logical explanation. Suspect these reference nos. have changed? Refuted by the TDS values presented in earlier part of Figure 6.1	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Hydrogeological Settings** page77 These drainages are already in the Vaal River catchmen	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Proposed Environmental critical level** page 91 This replacement text is less provocative of critical comment.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Meteorology** page 96 This statement contradicts to some extent the 1st bullet in the observations listed in the reviewer revised Section 4.2.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Estimations based on pumping reates and void volume** page 102 Check for possible conflict with <20 m reported in Section 7.4.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Figure 7.16** page 105 What is the equation and CoV that describes the conservative fit '	Phil Hobbs	Adressed	C Myburgh

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No. 5.2 Third draft	page 107/ 108/ 109/ 110 What about February 2011 and December 2011, or else the event referred to is the late-2009 to early-2010 spike peaking at ~250 mm. *"The construction of a canal to the south of Florida Lake is currently underway"* - Re-write to reflect the current situation, i.e. canal commissioned This paragraph is a 100% duplication of that following the bullet list in the subsection titled "Rivers, water bodies and stormwater drainage systems" on p 28 at the end of Section 4.4. Simply refer to this paragraph. The concept of an average pumping capacity is severely flawed. Most pumps have a maximum rated capacity. Any pump can deliver a yield from nil (running 0 hours per day) to its maximum rated capacity (running 24 hours per day). The TCTA approach of coupling a pumping range to a pump (e.g. 24 to 36 ML/d) does not make sense. Any reference to a TCTA pumping capacity must take cognisance of this, and establish emphatically what the TCTA understands this to mean.	Phil Hobbs	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Hydrogeological Settings page 123** Chert layers serve as barriers to trans-formational flow in the dolomite succession. Compartmentalisation is created by internal impermeable boundary conditions (e.g. dykes). Perhaps reference to chert should rather focus on the different water-bearing character of chert-rich versus chert-poor dolomite	Phil Hobbs	Adressed	C Myburgh
Peter Camden Smith					
General or Specific	**Reference**	**Comments**	**Reviewer**	**Response**	**Respondent**
General	Study Report No. 5.2 Third draft	Overview and general comments The report presents a comprehensive background of the geological features of the Western, Central and Eastern Basins of the Witwatersrand Basin. The background describes the geological setting and the establishment of mine voids. Diagrammatic illustrations have been used in certain instances to enhance the descriptions. The information on this has been well researched and seems to be available and congruent amongst the sources. Information and data on water quantity e.g. water ingress into the voids as well as historical and current pumping has been sufficiently provided. However, data on water quality seemingly by virtue of insufficient research/disclosure by the sources, is inadequate. The specifics of this will be explained later. A few typographical errors were identified. A common observation was the loss in the reference links as indicated by the error phrase "Error! Reference source not found" e.g. on pp 50 and 116.	Peter Camden-Smith	Adressed	C Myburgh
General	Study Report No. 5.2 Third draft	Strengths As alluded earlier, the information on the geological aspects and problem setting in this regard has been comprehensively presented. The data on water quantity has also been sufficiently provided as are the descriptions on the distribution of mine voids, their interconnectivity and so on.	Peter Camden-Smith	Adressed	C Myburgh
General	Study Report No. 5.2 Third draft	Weaknesses The water quality data was found to be insufficient to make a conclusive assessment of the pollution situation. There is no description of the instrumental techniques used for analysis of the water. For instance, atomic absorption spectroscopy (AAS) or inductively coupled plasma optical emission/mass spectroscopy (ICP-OES/MS) for metal analysis; ion chromatography (IC) for anions; titrations for alkalinity; etc. Such descriptions would have to be accompanied by uncertainties in the measurements as well as the detection limits of the instruments used. This would help in elucidating whether any variations or similarities in the results is solely to do with sample variability and not erroneous measurements.	Peter Camden-Smith	Adressed	C Myburgh

General or Specific	Reference	Comments	Reviewer	Response	Respondent
		The following aspects are also lacking in terms of water quality data. **a) Physical-chemical parameters**			C Myburgh
Specific	Study Report No. 5.2 Third draft	**Redox potential and oxygen** The data did not provide any measurements of reduction-oxidation (redox) potentials of the water. In certain instances the amount of dissolved oxygen was provided, but this is insufficient to understand the reduction/oxidation reactions occurring. T redox potential would give insight into some of the latent reactions that could occur as a result of redox-active species such as iron and uranium. This is evident from the inference drawn on page 66 “Alternatively, however, the slow oxidation of ferrous iron to insoluble ferric hydroxide may also account for the persistence of low pH’s downstream of the surface decant, as demonstrated in the Natalspruit by Naicker et al.(2003).” Since the redox potentials can be related to the prevailing elemental species in solution, it would have been easier to assess the composition of various water samples in this course along the Tweelopies Spruit with respect to changes in iron speciatio With a known redox potential, the total concentration of iron can be used such that the existence of Fe (II) and Fe (III) is deduced. This requires some modelling as explained later. On page 152, it is cited that “The water described by Holland and Witthueser (2009) are plotted for reference. Of interest is the water cluster that they referred to as influenced by anthropogenic sources (H&W Con in Figure 10.1) which overlap with water from the DRD 6 shaft. The latter also show high alkalinity and nitrate values and some form of human waste interaction is suspected.” Redox potential values would have been important as well to describe such samples. Where were these samples collected according to the source? Were they ground or surface water samples? It should be noted that wetland samples or water impacted by these features may show similar chemistry to this cluster of samples reported here. Elsewhere (in Conclusions on page 150) it was cited that “Progressive oxygen deficiency in the deeper levels should retard t oxidation of acid producing minerals (reduction in new AMD formation).” This may be an oversimplification since the following reaction may be predominant here: $FeS2 + 14Fe3+ + 8H2O \rightarrow 15Fe2+ + 2SO42- + 16H+$ This is a self-sustaining reaction that perpetuates acid mine drainage (AMD) and can persist in the absence of oxygen as long as there is sufficient Fe(III). Thus, ingress of AMD from tailings on the surface can lead to the sustenance of this reaction by contacting pyrite in those deeper levels where oxygen may be deficient.	Peter Camden-Smith	Adressed	C Myburgh

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No. 5.2 Third draft	**Buffering capacity** On page 63, it is cited that “The BRI, and to some extent Winze 18, water is slightly more neutral than the Winze 17 water and is probably partially buffered by dolomite, as suggested by higher Mn contents.” Is it not the Mg (since dolomite is CaMg (CO3)2) instead of Mn that would be a pointer to the buffering effect of the dolomite system? There are no reported values for Mg. These could have been checked against Ca and the alkalinity to confirm the role of dolomite. It is not clear what the contribution of the tailings is in terms of alkalinity. This is especially important for active slimes dams as deposition is done at elevated pH regimes following cyanidation in the gold extraction process. Low pH in these facilities usually takes place on the outer oxidized reaches while the central and other portions have prolonged high pH values. Leaching of alkaline plumes from the facilities will also imply that cyanide complexes are mobilised as well since they are soluble under these conditions. The impact of these plumes in terms of groundwater contamination should be assessed.	Peter Camden-Smith	Adressed	C Myburgh
Specific	Study Report No. 5.2 Third draft	**Presence of organic moieties** Water chemistry and elemental speciation is heavily influenced by the presence of organic ligands which act as complexing agents. On page 133, it is cited that “The Grootvlei No. 3 Shaft is also located on the Blesbokspruit wetland, which is a known ingress source into the mine void. The discharge of the neutralised water into the Blesbokspruit will mean that this water will be recycled and, until desalination commences, some of the salts will be returned to the void.” It is known that this wetland is heavily impacted by sewage discharge as well as natural organic matter in the wetland itself. It would also be expected to be impacted by organic substances of coal origin owing to the Karoo system on which it lies. The reported water quality data lacks in characterising these important substances which exert a notable influence in elemen chemistry. Organics can influence parameters such as oxygen, pH and redox potential. They would also inform ionic balance aspects as explained later.	Peter Camden-Smith	Adressed	C Myburgh
		b) Modelling	Peter Camden-Smith	Adressed	C Myburgh
Specific		**Water classification models** Simple water classification would have helped to shed some light on some of the water chemistry aspects. For instance, the use of Stiff plots would have helped to see the causes, if any, of imbalances in ionic charges. This would be important in instances where the “missing” counter ion may not have been measured, but likely to have an influence on the chemistry of the water. This is a case in point for organic moietites. An overbalance of cations would have pointed to a likely presence of ions such as those of organic origin that were not accounted for. Other classification models such as Piper and Durov models could have shown the predominant water types (sulphate-type or dolomite-type or a mixture of these). These models are important in predicting any mixing processes as explained in the following section.	Peter Camden-Smith	Adressed	C Myburgh

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No. 5.2 Third draft	**Geochemical modelling** Most of the predictions and forecasts could have been improved by use of geochemical modelling. On page 64, it is cited that “It is noticeable that the pH values for the three surface decant sites are on average higher than for the sites lower down the Tweelopies Spruit. This discrepancy may suggest diverse sources and/or channelling pathways for the AMD escaping from the mine void (see Section 0) and could result in variability of the quality of the water, especially during the initial phases of pumping.” A geochemical model based on the composition of the different sites on the Tweelopies Spruit could have been used to simulate mixing processes in order to understand this variability. Typically, Solution 1 + Solution 2→ Solution 3 Having compositions of any two of these per time, the composition of the third can be predicted. Thus, it is possible to predict the resultant solutions for a series of mixing reactions along a flow path. A citation on page 111 reads “The Central Basin data is scattered over a wide field, reflecting the diversity of samples within the database, ranging from extremely contaminated surface samples to water within the potable range. However, the water quality of the Central Basin is generally acidic with high levels of dissolved solids. Prolonged pumping will tend to stabilise the chemistry, depending on the degree of mixing and the extent to which channelling is effected during the pumping exercise.” As stated earlier, it is possible to construct mixing models to simulate such interactions amongst different types of water. On page 131, it is cited that “In some areas in the Eastern Basin the mine void is in contact with a dolomitic aquifer located immediately above the Black Reef workings. At this interface clean dolomitic groundwater has been observed flowing into the mine void. In its passage through the mine void to the pumping station, this water becomes contaminated and acidified. Interception of this water before it becomes polluted via a well field or in-mine infrastructure would make a source of clean water available for use and also reduce the volume of water from the basin that needs to be pumped and treated. This pumping will need to be approached with caution to prevent subsidence effects that could be triggered by dewatering of the dolomite.”	Peter Camden-Smith	Adressed	C Myburgh

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No. 5.2 Third draft	It should be noted here that the transition of AMD through a dolomitic system is nothing more than a natural titration. A forward model for this can be constructed, notably based on: Solution 1 + Dolomite→ Solution 2 The subsequent solution can be mixed with another solution (e.g. clean, acidic or alkaline water) or titrated further with more dolomite depending on the scenario and so on. Any minerals that are likely to precipitate will be predicted as well as their role in changing water chemistry upon dissolution. Also, a reactive transport model showing the evolution and transport phenomena of the water through various compartments could be constructed and would give a better assessment. This could be coupled with speciation modelling to assess the toxicity potential (lability and bioavailability) of constituent elements following contact with the dolomite. Subsequent transformations of the water upon contact with the minerals in the void could possibly be predicted. Aspects such as retardation and partitioning of pollutants between the water column and solid phase would be important to consider as well. However, reactive transport modelling would require extra information such as water flow rates and hydraulic conductivities which may be incongruent amongst the data sources or not available at all. Speciation modelling will be important to understand a situation such as that described on page 65 “Likewise, it has been observed that the uranium content, over the past 9 years of water decanting on surface from the Western Basin, has reduced from over 6000 µg/l U, initially, to 100-200 µg/l U. This decrease is probably due to less U being mobilised from the mine void (Winde, 2011).” This is an interesting observation in that U tends to form very stable complexes with carbonates. The impact of mixing or introduction of other complexing agents to a uranium-carbonate system can be simulated. This could partly explain the decrease in U concentration over time. The effects of dilution could also be simulated in this case since 48% of ingress is said to be from undisturbed geology and shallow aquifer. On page 110, it is cited that “Another factor that needs to be considered here is that before 1930, mine workings were filled to a depth of several hundred metres with sand and rubble, but mainly with ash derived from the many steam engines used in stamp mills, hoists and locomotives (Scott, 1995). This practice physically reduced the mine void but can also be expected to have an influence on the water chemistry. The alkaline nature of coal ash that can lead to pH values of between 10 and 12 would tend to neutralise the early-formed AMD. However, the degree of interaction of the ash with void water over time is unknown.” The interaction of ash and void water can be simulated over a projected time scale. A 1-dimensional adsorption model can be	Peter Camden-Smith	Adressed	C Myburgh
General	Study Report No. 5.2 Third draft	**Conclusion** The report’s strong points on water quantity assessment can be enhanced by a complementary adequate water quality assessment. There is a lot of information that can be extracted from this latter assessment, particularly from the computer modelling perspective. A range of important aspects such as elemental speciation, mixing and dilution processes, neutralisation and acidification among others can be predicted. Such predictions can be of significance as inputs for remediation strategies.	Peter Camden-Smith	Adressed	C Myburgh

Report 5.3					
World bank					
General or Specific	**Reference**	**Comments**	**Reviewer**	**Response**	**Respondent**
Specific	Report 5.3 Draft V1.1	***List of Acronyms*** page x - See my comments in Study report 5.4	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Glossary of terms*** page xiv - No, both operating & abundance. Definitions should always be the same and operating	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Background*** page 1 - ***Mine Drainage*** Not necessary it depends on the ratio of acid forming and buffering minerals ***Salt-loading*** The international word is "mineralisation"	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Introduction to this report*** page 4 ***Waste products*** "Residues" would be a better term	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Water supply to the Witwatersrand region***- page 5 ***Approximately*** Do you mean "approximately" or "nearby" ***Salt*** As explained earlier: the expression "salt" should be exchanged against "mineralisation", because we are not only dealing with "salts" as a problem	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Vaal River System Reconciliation Strateg***! - page 8 ***(Coleman, 2007)*** Missing in reference **(3 767 Mℓ/day)** Wrong SI unit, unit for day is d ***4.1 million*** This number differs from those given in table A.1. ***3%*** This is very low. Usually it is about 10-20%	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Industrial Re-use*** page 13 , 14 ,18 ***m3/day or Mℓ/d*** You are inconsistent with units. ***Significantly*** You should restrict the use of this word to cases where you statistically proved a "significance". Use "substantially" in all other cases. Search your documents and replace in all cases where you did not conduct a statistical investigation which proved the significance. ***variable*** Not too sure about that term in ZA use, but normally it is called "parameter". You also write "constituents" - you should be consistent with your terminology. In table A.8 you call the "variable" a "problem" ***Acidity/Alkalinity*** There are other tables with Acidity/Alkalinity it is not known what you want to say. Either Acidity or Alkalinity. ***Iron – Fe*** Why Iron - Fe? You didn't write that for the other component	World Bank - Christiaan Wolkersdorfer	Noted and addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Agricultural Re-use - Irrigation***page 23 ***Systems or streams*** You should already here refer to Annadale and other authors who investigated those issues. ***Table A.10*** This table can't be read or is hard to read because of the not matching fonts or the graphic resolution. Optimize.	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Neutralised water*** page 25 - ***OPEX*** Missing from abbreviations ***Saline water*** Define what you mean with "salt water"	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 5.3 Draft V1.1	***Potential for the use of neutralised AMD in Agriculture***page 27 ***Gypsum*** There is no "gypsum"rich ground water! There is simply no gypsum in water! There is Ca2+ and SO42- - that's it ***Presence of clay layers*** You can simply look into Ca-SO4-CO2-H2O-stability diagrammes and then you know what is going on. The subsoil is in reducing conditions and part of the water evaporates and consequently the water becomes over-saturated in regards to Ca2+ and SO42- or the gypsum saturation and based on the k = [A2+] × [B2-] = [AB] Therefore it is obvious, what will happen	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Rand Water -*** page 38 ***Emalahleni*** Either write eMalahleni OR Emalahleni	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Volume Required*** - page 41 ***AM*** - Not in list of abbreviations ***Ml/d*** The unit symbol for litre is a capital L	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Environmental use -*** page 42 ***Department of Water Affairs and Forestry, 2009*** Not in reference list. In the references you have "DWAF". but you have 5 times DWAF 2009 - you need to identify each single reference by letters a-e, e.g. DWAF 2009b	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Blesbokspruit as a Tributary of the Suikerbosrand River***page 44 ***E.coli*** At least at first appearance: Escherichia coli ***Table C.1*** pH can't be < 6.5 AND > 8.5 at the same time. Write < 6.5 or > 8.5 coli must be written in small letters	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Tweelopiespruit*** page 47 ***Table D.4*** Values differ from Table C.1	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Principles for Discharge of Water to a Water Resource*** - page 48 ***Environment*** We now need to clarify: what is "environment"? it includes your residues storage facility!! You need to write "surrounding environment" or "receiving environment" or "natural" or "aquatic" or "coastal" environment. Verify all appearances in all your reports.	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Introduction*** page 63 ***NP*** Not in the list of Acronyms	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Potential waste disposal sites*** - page 73 ***Table D.6*** Your report highly confuses me. Where are those numbers from. Why are they different from tables D.5, D.7, or D.3? There is so much inconsistency in your reports - possibly not for you because you are familiar with the subject - but for me, the novice in regards to the reports' contents. I sometimes have the feeling your intention is to cause confusion. I mean: inconsistent use of terminology, capital letters, numbers in tables don't match; units are different in tables and so on.	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Design Criteria*** page 77 ***Table D.8*** Why are you writing sometimes 35% moisture (table D.21), sometimes not (table D.8) Why do you call it slurry one time and sludge the other time. Be consistent.	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Western Basins*** page 79 ***Geology*** "geology" is a science. You should write "geological situation" or "geological structure" or something similar.	World Bank - Christiaan Wolkersdorfer	Addressed	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Central Basin Tunnel: Option 2 -***page 91 I don't understand the difference between option 1 and 2. Why do you need two options here (it is not obvious form THIS report alone - which it should).	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 5.3 Draft V1.1	***Western Bain Sites -*** page 105 On page 105 you write that lining (page 125) will protect from potential sinkholes. I question this works with the lining you are proposing. There is no bridging in the lining composition which might protect from sinkholes. You would need to include that. There are geotextiles that can bridge smaller sinkholes but not the really large ones. Good experiences have been achieved in the motorway construction from Ljubljana (Slovenia) to Triest (Italy) and Piran (Slovenia) - this motorway passes directly through the classical karst area of the Slovenian Dinarides.	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Closure Requirements*** page 127 Vegetation? Did I read that correctly? How can you ensure the roots don't damage the lining. A substantial work about potential plants has been conducted by Wismut in Germany and the colleagues in Canada.	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Discussions*** page 141, 142 ***Iron*** The iron has nothing to do in regards to the gelatinous structure. It is the water content in the sludge that causes this (on page 74 you also write that the gypsum might have gelatinous structure - and the gypsum should not have considerable amounts of iron any more - therefore it is not the iron). ***Sinkhole*** They can't because sinkhole prediction is still impossible up to a certain degree. In addition: the proposed liner will not protect from sinkholes as explained in remark 118.	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Specific	Report 5.3 Draft V1.1	***Conclusions and recommendations on sludge disposal*** page 143 ***Water Balance*** Not part of hydrogeology	World Bank - Christiaan Wolkersdorfer	Noted	Johan van Zyl
Meiring du Plessis					
General or Specific	**Reference**	**Comments**	**Reviewer**	**Response**	**Respondent**
Specific	Report No. 5.3, Second Draft	**1.5.1 Water Balance and Reconciliation** - The impression I received (which was confirmed by the answer to my question at one of the public meetings) is that the volume of AMD is so small that desalinating it is not of real importance to the future Vaal water supply (quantity). Howerer, its salt load is such that it will necessitate a large quantity of dilution water to retain releases from the Barrage suitable for downstream users. It is the need for this quantity of dilution water that will create a water supply deficit in the Vaal system. This study is thus focussed on alternatives to eliminate or reduce the salt load associated with the AMD. In my opinion this understanding should be highlighted prominently as it provides clear focus to the study and help to provide perspective to the reader.	Meiring du Plessis	Incorporated this into report: "It must be emphasised while the quantity of AMD from all three basins is not very significant as a resource in the Vaal River System, it is still important and should be used. However, the volume of the dilution releases required to curb the effect of the AMD related salt loading is very significant and will threaten the supply security."	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**1.6.1 Treated AMD Reused Domestically** - In the context of this paper re-use should be evaluated as an option that will solve the problem of getting rid of the salinity associated with AMD. Not as reuse for the sake of reuse, Domestic re-use will return to waste water treatment works and the Vaal system without any salts being removed. Will thus not solve the problem of increased salinity and the need for dilution water. It does not appear as if this was the approach you took in this paragraph.	Meiring du Plessis	Noted, see response above	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**1.6.2 Industrial Re-use** - An acceptable water quality for the applicable industry is not the only consideration when determining the re-use of AMD (treated or otherwise). The main concern of DWA is the removal of salts from the system so that they would not need to use dilution water. Unless industrial re-use end in a salt sink and substitute the use of good quality water, it would not contribute to solving the main problem (salt load) of the AMD. It appears as if you only considered the quality aspects (fitness for use) of AMD in this paragraph on industrial re-use.	Meiring du Plessis	Noted, see response above	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**1.6.3 Reuse for WateringParks, Gardens and Sports Facilities** - The considerations for this re-use would conceptually be very similar to re-use by irrigation. Throughout this paragraph neutralised AMD is equated with reclaimed sewage. They are distinctly different kettles of fish.	Meiring du Plessis	Unfortunately, the water demands for parks, gardens and sportsfields are significantly less than the demands for industrial use	Andrew Wood

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report No. 5.3, Second Draft	**1.6.3 Reuse for WateringParks, Gardens and Sports Facilities** - Use of treated sewage was probably found to be not viable as the cost benefit calculation probably required that the cost of a separate pipeline to be paid for by the saving in treated sewage vs potable water cost. In the case of treated AMD the cost of a separate pipeline need to be compared with the cost of eg a desalination plant. (in addition to the saving in water cost).	Meiring du Plessis	Deleted section of paragraph	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**1.6.3 Reuse for WateringParks, Gardens and Sports Facilities -** "irrigational control would be required to prevent run-off of treated AMD returning a substantial portion of the salt load to the river systems" - This is definitely not a problem but part of proper irrigation management.	Meiring du Plessis	Noted	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**1.6.3 Reuse for WateringParks, Gardens and Sports Facilities** - "thus resulting in a potential public health risk" - Drinking neutralised AMD is not a health hazard as for treated sewage.	Meiring du Plessis	Rephrased to "potential health hazard"	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**1.6.5 Agricultural Re-use - Irrigation -** Livestock watering will not remove salt from the water environment	Meiring du Plessis	Noted	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**3.1 Use or discharge of neutralised AMD, Introduction** - "If salts are removed from the water, what then happens to the salts?" - To me this sentence sounds as if the author either does not understand the concepts supporting the irrigation option or is sceptic or has a bias against it. The irrigation option is conceptually different from use by mines or industry where no mechanism for salt retention (removal from the system) has been put forward.	Meiring du Plessis	Deleted sentence	Andrew Wood
Specific	Report No. 5.3, Second Draft	**3.1 Use or discharge of neutralised AMD, Introduction -** My reading of this paragraph is that the authors takes an "all or nothing" approach to finding a long term solution. (They also do not accept that some salt can be permanently removed from the water environment through gypsum precipitation) . Surely there must be intermediate options that should be considered? Suppose 70% of the salts can be removed at 25% of the cost of removing all the salts. Is it not possible that the cost to society of coping with the remaining salt load would be less than removing all the salts? I was under the impression that the study goal was to identify viable potential alternatives for dealing with salt removal from the system, the costs and benefits of which would have to compared with each other for each specific application, before the most appropriate is selected for a specific application. It should not be a case of one size fits all. In my opinion the study should identify the pros and cons of potential alternatives, ballpark costs and the procedures to firm up on these.	Meiring du Plessis	Clearly Meiring has some points, but clearly the intent was not to have a single solution across the Witwatersrand and site specific opportunities are to be considered. However, there still remains the material issue as to where such significant volumes of AMD could be re-used, how would users pay for such AMD delivery to them, how would they control application indefinitely into the future….how would they be held liable for salt load discharged into water systems (surface and groundwater) arising from the use of such water who pays if there are claims that the AMD has damaged the soil productivity or crop productivity etc. n principle, whilst it may appear a cheap solution for some of the AMD in the short-term who retains the long-term liability for such an outlet to be maintained taxpayer or farmer	Andrew Wood
Specific	Report No. 5.3, Second Draft	**3.3 Potential for the use of neutralised AMD in agriculture** The way this paragraph is phrased convey the impression that the factors influencing the success of irrigation with neutralised AMD is so rigid and restrictive with no flexibility for trade offs, that it is doomed to failure except under very unique conditions.	Meiring du Plessis	Accpeted MdP's inputs into paragraph	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**3.3 Potential for the use of neutralised AMD in agriculture** - I do not follow which point you try to make except to discredit irrigation as an option. The literature appears to be quoted out of context.	Meiring du Plessis	Sentence is deleted. It was not meant to discredit irrigation, but was intended to illustrate some of the factors to be considered when extrapolating the literature findings unilaterally	Andrew Wood
Specific	Report No. 5.3, Second Draft	**3.3 Potential for the use of neutralised AMD in agriculture** - This paragraph seems to be quoted out of context as the sodium hazards of irrigation water has little to do with the four quoted guidelines. The guidelines appear to me to be general preconditions for successful irrigation with neutralised AMD (and actually all irrigation ventures)	Meiring du Plessis	The paragraph was extracted from Annandales article	Andrew Wood
Specific	Report No. 5.3, Second Draft	**3.3.1 Limitations of neutralised amd for Agricultural use** The team of experts who will be tasked to investigate the feasibility of the irrigation option should be able to optimise between potentially conflicting objectives.	Meiring du Plessis	Accepted	Andrew Wood

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report No. 5.3, Second Draft	**3.3.1 Limitations of neutralised amd for Agricultural use**- Sounds worse than actual requirements. Proper irrigation management practices aimed at achieving the set goals are required	Meiring du Plessis	Deleted sentence	Andrew Wood
Specific	Report No. 5.3, Second Draft	**3.3.1 Limitations of neutralised amd for Agricultural use -**These are normal prerequisites for proper well managed irrigation and well understood as such by practitioners	Meiring du Plessis	Rephrased sentence	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**3.3.1 Limitations of neutralised amd for Agricultural use**- This is unsubstantiated. Parks, golf courses , vegetable gardens? May not be available or suitable but need investigation.	Meiring du Plessis	Rephrased sentence	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**3.3.1 Limitations of neutralised amd for Agricultural use**- A normal occurrence under irrigation. The publications described what was observed and pointed out the implications thereof.	Meiring du Plessis	Noted	Andrew Wood
Specific	Report No. 5.3, Second Draft	I may be over sensitive and must admit I did not check the equivalent paragraph for other options that are being considered, but it seems to me that too much is made of the challenges and uncertainties facing the irrigation option. They are presented as overly problematic and difficult to overcome. I suspect that every option that is considered will have its own set of challenges and uncertainties. These should be sorted out as part of a feasibility investigation.	Meiring du Plessis	Noted. It is not the intention to be overly critical, but just to list some aspects that should be considered if agriculture is included in the proposals during implementation.	Johan van Zyl
Specific	Report No. 5.3, Second Draft	**Agriculture** page 33 I concur that the agricultural use option on its own is not the ultimate long term solution, but I would also argue that it may form part of the optimum viable long term solution. To determine whether this potential is realisable, will require further feasibility studies.	Meiring du Plessis	Noted. Proposals involving agricultural will most likely be accepted during implementation and evaluated according to the same principles as other proposals.	Johan van Zyl
John Annandale					
General or Specific	**Reference**	**Comments**	**Reviewer**	**Response**	**Respondent**
General response by Andrew Wood to email from John Annandale - With due respect to Meiring and John.....it had not been meant to discredit the option of use of AMD for irrigational purposes....we had hoped that we had indicated that there were					
General	Report No. 5.3, Second Draft	I am not at all comfortable with the way this has been written - it comes across as a very superficial and biased account of this technology, and seems to attempt to discredit this option in any way possible.	John Annandale	Apologies...this was not the intention.....various examples of the research work that had been undertaken were presented, attempting to illustrate that there is an opportunity for the technology, and citing the considerations to be made in assessing site specific opportunities ...unfortunately, the research does not appear to have produced a defined guideline that the team were made aware of, and the specific project is to consider long-term options on the basis of proven, accepted technology. We were not able to identify where the technology has been applied at a level that corresponds to the brief for the identification of a proven long-term solution to the AMD problem of the Witwatersrand.	Andrew Wood

General or Specific	Reference	Comments	Reviewer	Response	Respondent
General	Report No. 5.3, Second Draft	A lot of the "facts" presented are just plain wrong, and the papers cited have clearly not been carefully read or understood. There are also absolutely no advantages of this option listed - like the expected cost effectiveness of utilising water that perhaps does not need to be treated to the same degree as is currently proposed	John Annandale	perhaps it is in the wording.....the logistics team were providing the cost-benefit evaluations.....it is expected that the AMD will arise at three locations, for which short-term HDS technology is proposed. It is therefore necessary to consider the re-use of the neutralised AMD from those three locations.....at a high-level assessment, which was all that was available at the time....there was not an identified ready demand for the significant volumes of neutralised AMD (>120 Ml/day) for use for irrigation water that is not currently being met by surface water resources...at low cost to the users....the provision of the neutralised AMD by pipeline to end-users was considered a material logistical and operational cost, as well as legislative limitations and long-term liabilities. It was assessed that the bulk of the AMD would need to be treated to a superior degree to obviate legislative limitations and long-term liabilities.....discharge to river requires a SO4 of <200 mg/l etc, being more restrictive than SANS 241 as drinking water.	Andrew Wood
General	Report No. 5.3, Second Draft	a drastic reduction in salts in solution	John Annandale	it is accepted that there would be a reduction in salts in solution.....but in the context of the >120 Ml/d AMD being generated, and the assessed lack of irrigation demand for AMD in the vicinity of the discharge points to accommodate the full load, day-in, day-out, irrespective of seasonal irrigational demand.....the bulk of the salts would still need to be removed at source....in respect of legislative and long-term liabilities...the discharge quality has been set at 200 mg/l SO4 (amongst other criteria).....the irrigational disposal would need to demonstrate that no surface run-off, or seepage, or groundwater recharge, would exceed 200 mg/l SO4...a legislative challenge for the long-term liabilities of assured irrigational disposal...etc	Andrew Wood
General	Report No. 5.3, Second Draft	the issue of job creation	John Annandale	we are missing where AMD irrigation creates additional jobs that are not available from the irrigation with surface water resources or reclaimed sewage, in the specific context of the 3 AMD discharge points ....or the treatment of the AMD at source.	Andrew Wood
General	Report No. 5.3, Second Draft	value addition to the water through agricultural production	John Annandale	we are missing where AMD irrigation creates value addition that is not available from the irrigation with surface water resources or reclaimed sewage in the specific context of the irrigational water demand in the vicinity of the 3 AMD discharge points....the users would have to pay for the neutralised AMD supplied to them ?	Andrew Wood
General	Report No. 5.3, Second Draft	the reduction in the amount of brine to manage etc.	John Annandale	the base case technology option generates no, or very little brine.....given the difficulties of brine disposal, technologies have been developed to minimise brine and incorporate mono-valents and mixed-valent salts within the sludge, for disposal/re-use as solid waste.....The Witbank area AMD treatment plants are generating gypsum as a commercial by-product, further minimising sludge disposal liabilities	Andrew Wood

General or Specific	Reference	Comments	Reviewer	Response	Respondent
General	Report No. 5.3, Second Draft	There is confusion about Na somehow limiting the precipitation of gypsum	John Annandale	please correct the confusion....it was understood that Na could limit gypsum precipitation under certain circumstances ?	Andrew Wood
General	Report No. 5.3, Second Draft	There is a misleading discussion about possible pore clogging with gypsum that includes a presumption that pores will clog at depth in the profile	John Annandale	please correct the confusion.....is it to be understood that precipitation of gypsum within the soil profile will never cause clogging or pores ?...it does readily precipitate in pipelines and cause clogging of pipelines and had been assumed to have a propensity to result in some clogging of soil pores. It was not stated that the whole soil profile would clog, just identified it as a point for consideration.	Andrew Wood
General	Report No. 5.3, Second Draft	The limitations to choice of crop using saline water is overstated for gypsiferous waters	John Annandale	accepted and amended...it was not the intent...we understand various crops can be grown on gypsiferous minewater, but crop selection still presumably plays a role, as with soil type etc, in the amount of irrigation water	Andrew Wood
General	Report No. 5.3, Second Draft	There is an unsubstantiated statement about land availability	John Annandale	there were figures illustrating the land-uses 5 and 10 km radius from the 3 AMD discharge locations which area available for widespread irrigation with AMD where surface water resources are not available.....limited area is available to receive the > 120 Ml/d AMD....though we accept there is some land that could receive some AMD.....with associated logistical, legislative and long-term liability challenges to be addressed	Andrew Wood
General	Report No. 5.3, Second Draft	The issue of balancing water supply to crop demand is also presumed to be a show stopper without any thought of how to attempt to overcome this real concern	John Annandale	Perhaps the wording...it was not seen to be a show-stopper...it was also in consideration of the specific context of the >120 Ml/d AMD being generated by the 3 specific discharge locations.....we accept there is some land that could receive some AMD.....with associated logistical, legislative and long-term liability challenges to be addressed	Andrew Wood
General	Report No. 5.3, Second Draft	An underlying assumption also seems to be that a huge mass of salts will eventually migrate to the Vaal River system - no consideration of the treatment of a far smaller volume of intercepted water is even mooted?	John Annandale	Unfortunately this needs to be considered in the context of the brief to identify a long-term solution for the >120 Ml/d AMD to be generated by the specific 3 AMD discharge locations.....that is the volume that is projected to be generated and require management, in terms of the brief.	Andrew Wood
General	Report No. 5.3, Second Draft	I would have been much more comfortable if a more balanced account had been given, that honestly attempts to highlight possible strengths and weaknesses of this option. Sure there will be challenges to overcome, but let's list them up front and say what will be necessary to attempt to address these - I believe the potential benefits to the country are too great to just assume this is a no flyer. Should this chapter not plead for more detailed site specific studies to highlight the strengths and weaknesses of this approach, and to attempt to quantify costs and benefits that can then be fairly weighed up against other options? We owe it to our fellow tax paying citizens to objectively assess all the opportunities that exist to manage this liability and to make sure that well informed decisions are made on the best way forward.	John Annandale	We had hoped to illustrate that we accept that irrigational re-use of AMD is a viable option for some of the AMD, but in the context of the brief to identify a long-term solution for the Witwatersrand basins specific problem.....a specific criteria for which was taken to be 'proven technology'.....that could be implemented imminently (Minister expected implementation within next year !).....at a scale that materially reduces the salt load to the Vaal system before 2019....	Andrew Wood
General	Report No. 5.3, Second Draft	Fortunately the WRC (Research Manager Dr Jo Burgess and project leader Dr Michael van der Laan) have launched a research project on opportunities and costs of irrigating with mine water in the gold fields. It would surely be prudent to closely follow this to ascertain if any opportunities exist to include irrigation as part of a long term strategy to solving a pressing and expensive problem facing our country.	John Annandale	accepted	Andrew Wood

General or Specific	Reference	Comments	Reviewer	Response	Respondent
General	Report No. 5.3, Second Draft	I would be more comfortable with a section in the report that highlights both potential benefits and real concerns, and is open minded towards more carefully considering this option, with a genuine desire to attempt to overcome any problems associated with irrigation should this appear to be a feasible option.	John Annandale	noted	Andrew Wood
WISA					
General or Specific	Reference	**Comments**	**Reviewer**	**Response**	**Respondent**
General	Report No. 5.3 Final First Draft V1.1	Introduction The authors state that this report describes the possible options for the use, discharge or disposal of the treated water and of the waste products resulting from the treatment process. All possible options which have been identified are described. Preferred options for disposal of waste are identified for each basin and cost estimates for those options are presented. The report is divided into five sub-sections including: 1. A general background 2. Options for the use, discharge or treatment of the neutralised water 3. Options for the use, discharge of treatment of the desalinated water 4. Options for the use, discharge or disposal of waste from the treatment processes, and 5. Conclusions and way forward.	Professor Ingrid Dennis	No response required	Johan van Zyl
General	Report No. 5.3 Final First Draft V1.1	Review of Part A: General This sub-section provides a short description concerning the history of mines and associated decanting in the Witwatersrand Basin and the associated role the Department of Water Affairs has played in this matter since 2008. The authors then go on to discuss the short-term intervention. Thereafter the water supply to the Witwatersrand region, including the history of Rand Water and their challenges is discussed. The sub-section is concluded with a summary of general re-use options.	Professor Ingrid Dennis	No response required	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section A.1.1, it is stated that 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 (RQO) in the Vaal Barrage and downstream river. It is suggested that the authors include a sentence to say they will be discussed in more detail later in the report.	Professor Ingrid Dennis	Not included	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Figure A.1 – are these the new WMAs? Have DWA not changed the delineation of the WMAs. It would be recommended that the latest ones be included.	Professor Ingrid Dennis	Figure taken out	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Sections A.3.2, A.3.3 and A.3.4 – the references used for water use are a couple of years old. Are there no new references?	Professor Ingrid Dennis	This was the only references available to the study team	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section A.4.2, Table A.7 – are these the only quality problems with waste disposal? It is expected that there would be more.	Professor Ingrid Dennis	Reference by reviewer confusing. Not sure where this table is.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section A.4.3, the authors state The level of treatment also need to be considered as high salinity water could contribute to the detriment of the soils that may lead to leakage of saltsto groundwater and causing damage to the flora of the parks. It is recommended that they include groundwater contamination and indirect surface water contamination if there is groundwater – surface water interaction.	Professor Ingrid Dennis	Groundwater is mentioned. The Vaal river resmebles surface water and this is discussed in numerous other places.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	It is a concern that in Section B.3 the authors mainly refer to work conducted by Annandale. It would be good to include some international studies/findings.	Professor Ingrid Dennis	At a local level Annandale has conducted the most work on this, not deemed necessary to include more detail at this study level.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section B.3.1, the authors state The duration over which irrigation is intended to be practiced must be considered. Annandale et al. (2009) predict that in the short- to mediumterm (8 years), the impact to groundwater would be negligible – I disagree with this statement and have seen studies that have indicated the opposite.	Professor Ingrid Dennis	Acknowledged, but Annandale's studies were very site specific. This paragraph was also substantially amended in the final report	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report No. 5.3 Final First Draft V1.1	In Section B.3.2, it is recommended that a soils map for the study areas be included.	Professor Ingrid Dennis	Section taken out	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Sections B.3.2 to B.3.5, are very academic. Even though the information is interesting, it is suggested that they be shortened and the detail included as an appendix.	Professor Ingrid Dennis	Section taken out	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	There are conclusions made about the impacts on the environment (Section B.4.3), however the environment is not discussed in the body of this sub-section.	Professor Ingrid Dennis	Addressed	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section C.1.1, the authors state they will also consider the idea of supplying/supplementing industrial grade water to the mines from treated AMD water, especially in the Western Basin where the mines in the Rustenburg area could benefit. It is suggested that the authors clarify this – i.e. the discharge which goes into the Tweelopies and finally Hartebeesport Dam, which supplies many of the Rustenburg mines – most of which are platinum.	Professor Ingrid Dennis	It hasn't been determined how the water will be conveyed to the mines (through a direct pipeline or via the Hartbeespoort Dam)	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section C.1.2, why can't Magalies Water supply the platinum (Rustenburg) and coal mines (Mpumalanga) as well?	Professor Ingrid Dennis	The recommendation (Reference Project) of the Feasibility Study is industrial supply via Rand Water. If better alternatives are put forward this will be considered.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section C2.2.1, is Secunda not part of the Evander goldfields?	Professor Ingrid Dennis	Will check	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section C.4.1, the authors state The RWQO for the major tributaries of the Vaal River (Level 2 points, the Vaal River main stem, being Level 1), were available for the sub catchments of the Upper Vaal WMA. To my knowledge PSPs have been contracted by DWA and are currently busy with it.	Professor Ingrid Dennis	Noted, but it was not yet available to this study.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Sections C.4.1.1 to C.4.1.3, include maps of what is being discussed in the text.	Professor Ingrid Dennis	No figures provided by author	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Table C.5, the proposed RWQOs do not include sulphates and, metals such as iron and uranium.	Professor Ingrid Dennis	Noted, suphates now included	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section C.4.3.1, the principles for discharge of water to a water resource are discussed. Will temperature play a role?	Professor Ingrid Dennis	Yes most probably, but this will have to be addressed during the EIA	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Figure D1 must be explained in the text.	Professor Ingrid Dennis	Figure taken out	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D1, the authors state It is important to note that the monovalent species (Na and Cl) are within specification for the Western and Central Basins whereas the sodium (Na) levels are slightly above specification (325 mg/ ℓ vs. 200 mg/ℓ) for the Eastern Basin. It is important that the authors explain why the Na is higher in the Eastern Basin.	Professor Ingrid Dennis	Refer to Report 5.4 for detail on Treatment Technologies evaluation.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Provide a short overview of Figure D.2.	Professor Ingrid Dennis	Figure taken out, refer to Report 5.4 for detail on treatment technologies.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Sections D.2.1.1 – D2.1.3, provide maps to assist in the understanding of the text.	Professor Ingrid Dennis	Refer to Report 5.1	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.2.1.2, the authors must please place emphasis on the importance of conducting scientific studies to make sure the waste disposal underground is done correctly.	Professor Ingrid Dennis	Noted	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.2.2, the Eastern Basin is not included.	Professor Ingrid Dennis	Addressed in final report	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.2.2, it would be good to include some of the results from the Western Basin.	Professor Ingrid Dennis	Not available to us.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.2.4, the short comings of the STI are a concern – even though they fall outside the scope of this study.	Professor Ingrid Dennis	Noted	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.2.4, the last sentence the authors state: The LTS considers the long-term sustainability of the neutralisation approach chosen for the short-term in relation to subsequent waste handling, re-use and disposal options, yet to be defined. This sentence must be re-written.	Professor Ingrid Dennis	Addressed in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.2, the handling and disposal of sludge must take indirect issues (e.g. social and environmental) into account as well.	Professor Ingrid Dennis	To be addressed in EIA	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.3 on page 68, the authors state Research and development work in this area are on-going. The incentives driving the recovery of by-products include the following: o Reduction of waste sludge and brine products, which require perpetual handling and disposal with associated long-term environmental liabilities; o Generation of a revenue stream to partly or fully offset the on-going treatment cost; and o Contribution to the long-term sustainability of mine water treatment projects. The indirect impacts (environmental, perceptions of society etc.) must also be considered. The authors must also consider what has been successful internationally.	Professor Ingrid Dennis	Done, included some of the GARD guidelines	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.4, are the authors sure there are only 3 main technologies available for final brine treatment? More technologies would be expected. If there are more technologies, it would be recommended that the authors include them in a table and state why they are not being considered.	Professor Ingrid Dennis	Final report lists more and proposals on more are welcome during implementation	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.6, the authors discuss the base case scenario but they don't define/described the scenario.	Professor Ingrid Dennis	Section re-written in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.7.1, the sludge composition of the central basin does not add up to 100% in Table D.5. A question to the authors – what are the estimates concerning the flushing time of the voids for the three basins?	Professor Ingrid Dennis	Corrected in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.8, the authors must include dust monitoring and surface water monitoring (if necessary) in their list of aspects relating to the operation and management of a class H:H site.	Professor Ingrid Dennis	Since it will be gelatinous sludge, dust will be minimal.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.9, it would be suggested that the authors provide a list of the minimum requirements for waste disposal by landfill (even if in an appendix).	Professor Ingrid Dennis	Noted	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.11, Table D.8 it would be recommended that the authors include the location of surface water bodies and the underlying geology. The majority of Site 1 is on dolomites and has a number of surface water bodies close by. Site 2 is also partially on dolomites and has a number of surface water bodies close by.	Professor Ingrid Dennis	Done in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.15, all tunnel sites are on dolomites.	Professor Ingrid Dennis	Tunnel sites not part of reference projects, thus not a concern.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.16 (Table D.11), the surface water locations (streams and wetlands) must also be considered.	Professor Ingrid Dennis	Done	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.17 (Table D.12), Sites 1 & 2 are on dolomites and there is a chance of potential sinkhole formation.	Professor Ingrid Dennis	Tunnel sites not part of reference projects, thus not a concern.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.18 (Table D.13), it looks as though Sites 2 & 3 are on dolomites.	Professor Ingrid Dennis	Tunnel sites not part of reference projects, thus not a concern.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.3.19 (Table D.14), are Sites 1 & 2 not next to a Ramsar Site? Site 1 is underlain by dolomites.	Professor Ingrid Dennis	New site identified in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Sections D.5.1 to D.5.6 (Tables D.15 – D.20), unstable areas in dolomites are usually the high groundwater recharge areas. Dolomites are also normally important aquifers. Soil thickness/shallow bedrock has not been addressed to this point.	Professor Ingrid Dennis	Noted, this study didn't include assessing the soil thickness.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	In Section D.6.1, it is unlikely that lining is going to be sufficient to stop doline and sinkhole formation. However according to the geology map, only a small section of the site would be underlain by dolomites. Maybe the disposal site's footprint can be slightly altered to avoid the dolomites.	Professor Ingrid Dennis	Site 1 recommended in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section D.6.2, Site 1 is totally underlain by dolomites.	Professor Ingrid Dennis	Tunnel sites not part of reference projects, thus not a concern.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section D.6.4, Site 2 is on dolomites.	Professor Ingrid Dennis	Tunnel sites not part of reference projects, thus not a concern.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section D.6.5, Site 3 is on dolomites.	Professor Ingrid Dennis	Tunnel sites not part of reference projects, thus not a concern.	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section D.9.1, check that Figures D.32 and D.33, correspond with the text in Sections D.9.2 and D.9.3.	Professor Ingrid Dennis	Done in final report	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section D.11, why did the authors not take aerial photographs and detailed topography data into account?	Professor Ingrid Dennis	This is a feasibility level investigation. More detail will follow during implementation	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	Section D.12, other studies should include biodiversity, soils, hydrological, wind dispersion, radioactivity etc.	Professor Ingrid Dennis	Noted	Johan van Zyl
Specific	Report No. 5.3 Final First Draft V1.1	To conclude, the authors have covered the objectives as set out in the Introduction. In most cases the authors included the detail necessary and additional motivations. It is understood that the authors had tight deadlines and numerous challenges. However it is recommended that they re-visit the site selection process to ensure that even if it is at a high level, it will not be criticized for lack of detail/motivations.	Professor Ingrid Dennis	Addressed in final report	Johan van Zyl

Report 5.4

World Bank

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Third Draft v3.0	***Executive Summary*** page vi This "exception" should be at the end of the summary. ***Abbreviation*** Why "waste products", I would write "residuals". There is more mine water in Lusatia - write "one of the largest"	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Table 1*** page vii ***MI*** not in list of abbreviations ***Water Quality*** Inflow/ Outflow ***Products*** +Semimetals/ co-precipitates	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***List of Acronym*** page xvi ***CaSO4.2H2O*** Gypsum ***HFO*** Hydro Ferrous Oxide	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Glossary of Terms*** page xxi ***Groundwater*** very simplistic explanation. I am not too sure if this is correct from a legal point of vie In some countries groundwater is the underground water that is completely filling the space. Other than water in the unsaturated zone which – in some countries – belongs to the groundwater. ***Surface Decant*** You defined "decant" earlier as a surface discharge. Here you define "surface decant" - this is a contradiction.	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Background*** page 2/3 ***Salt loading*** What is meant by "salt" loadings? Not defined ***Neutralised*** Metals can't be neutralised	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Expected AMD Quality of AMD per Basin*** page 8 ***Table 3.3*** ***Conductivity*** conductivity or electrical conductivity? ***Derived*** *Problematic! In higher concentrations as can clearly be seen in Hedlin et al. 1994. Wolkersdorfer 2008 gave a better equation (p. 185) taking into consideration the activity as well*	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Third Draft v3.0	***Expected AMD Qualities as estimated in this study*** page 9,10 This approach is very problematic. Which statistical method has been used? ***Table 3.4*** Several numbers are not consistent with the long tables These pH-values are 5th percentile Why do you use decimal dot or comma? Be consistent. In table 3.7 this value is 166 mg/L In tab. 3.7 it is 2289 Table 3.6 shows total alkalinity, but why do you have a "-" here? ***Brine*** I am not too sure if the authors understood the principles of RO - It will produce a "brine" in any case. Brine has nothing to do with Na or Cl - it just means high mineralization above 1000 mg/L ***Heavy metals*** this term should not be used anymoe as examplified by Duffus 2002 ***Na and Cl*** I am not too sure if the authors understood the principles of RO - It will produce a "brine" in any case. Brine has nothing to do with Na or Cl - it just means high mineralization above 1000 mg/l	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Design Feed and Product Water Quality*** page 14,15 I don't understand why you are writing "limestone not needed" but "lime" - Why do you use both? For me, the sentence as it is written here does not make sense. ***Filtration*** Those filters only work when Fe <≈ 1 mg/L and Fe ox works only when the water is not alkaline. the date gives no indication if the water is not alkaline or not acidic ***Table 3.9*** There is no "Note 4" in this table The correct technical term is "circumneutral" I think the process is not understood by the authors. redundant: alkalinity always is also buffer capacity ***Gypsum*** strictly taken this expression is chemically wrong. You do not remove gypsum. You increase the pH to a level where the saturation of CaSoO4 is "oversaturated" and the Ca2+-ionen and the SO -molecules in the mine water precipitate as gypsum ***typical High Density*** This is not a "typical" HDS plant. Thee are about half a dozen of HDS processes - I don't know what the authors are referring to here. ***LTS*** what does that mean? You want to treat the mine water with the STI process and thereafter with a treatment plant for the LTS	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Principles of the LTS*** page 17,18 ***Desalinated*** Why are you distinguishing between "waste products" and "desalinated waste products"? You should just deal with MW treatment residuals ***Salts*** "salts" there are no "salts" in the mine water: just ions or molecules - if and when they form "salts" depends on pH and concentrations - mineralization or constituents would be a much better term) can not be "leached" from the mine water - they are transported; in addition "salts" can not be leached by "run-of". This sentence from a hydrological/hydrogeological/chemical point of view is completely wrong. ***Tupical End-Users*** animals are not "watered"	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Third Draft v3.0	***Requirements of the Treatment Process*** page 18 ***Process*** You are combining two facts that are not connected with each other. It is simple: you add an alkaline material to increase the pH and the (semi-)metal usually starts to precipitate ***Waste*** No! They are "centered" around the treatment, but need to "consider" the other effects	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Specific	Third Draft v3.0	***Classification of AMD treatment Technologies*** page 21 ***Considered (bullets)*** contradiction to page 27, where you use another "grouping". ***Demonstration-size*** This is usually called "pilot plant"	World Bank - Christian Wolkersdorfer	Noted / Addressed	Walter Johannes
Achim Wurster					
General or Specific	**Reference**	**Comments**	**Reviewer**	**Response**	**Respondent**
Specific	Fourth Draft V4.0	**Preface** page 2,3 Abbreviation not yet defined, assume it refers to the Short Term Interventions?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Phase 2: Prefeasibility** page vii, viii Should this be “rising AMD levels in the mining basins” or similar? Either use full wording throughout or use abbreviation throughout (once defined). Sentence structure does not flow easily – rephrase. Possibly: ”…abstraction, treatment, use or discharge of water and disposal of waste, as well as the configuration of the infrastructure required, including pipelines and pump stations, into a range of options.” ?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Phase 3: Feasibility Study** page viii, ix Keep tense same as preceding and following paragraphs. “Solution to AMD” sounds too generic, keep specific to the required project outcome. Spaces when defining abbreviation but no spaces when abbreviation is used again? Be consistent.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Acknowledgements** Confirm that this is not the same Yacob Beletse as for the SMC committee or that Yacob moved position during study period.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Executive Summary** page xvi, xvii Update after addressing comments in report’s final discussion and recommendations. Minor inconsistencies are already present between exec summary and main body discussion and conclusions For info: a 2 Ml/d demonstration scale Paques plant has been running at Anglo Coal’s Navigation Colliery for well over 5 years already. Options to replace conventional organic energy source materials include methanol, ethanol or hydrogen gas sourced from the petrochemical industry. These are usually linked to fuel price and can be expensive	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**List of chemical constituents** page xxi, xxii Ca2+ Calcium ion - Inconsistent use of ion vs. ionic solution in this table, I suggest sticking to “xxx ion”. NH4+ Ammonium ion - Either “NH3 Ammonia” or “NH4+ Ammonium ion”. In water chemistry the NH4+ is usually applicable at near neutral pH while the NH3 represents the dissolved gas phase that can be present at high pH.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Glossary of Terms** page xxiv, xxv AMD - Many active mines have AMD, rather remove section in brackets or replace with: "(active or abandoned)". Discharge - Just ground water? Also mine water? What about clean treated water being "discharged" to a river. Not sure if "discharge" definition should be restricted this way Ettringite - Rather "hydrated"? "Hydrous" sounds like the American version of "hydrated", while we are sticking to the British version for spelling aluminium and sulphate. Reef - Differentiate from other conglomerate in which there is no interest.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Principles of the LTS** page 3, 4 The first sub-bullet is applicable to the AMD standard of treatment, make part of first bullet. Also rath refer to "a water quality standard" than just "standard". The next two sub-bullets do not apply directly to the AMD standard of treatment – move these to a separate main bullet that covers waste generation, beneficiation and disposal. Treated AMD will not reduce demand but it can add to the supply side. Not sure what is referred to by "these", is it just the augmentation of the water supply or does this also refer to the bullets in the preceding paragraph? Please specify more clearly, if only for the preceding sentence in the same paragraph then use "this" rather than "these" and drop the s from requirements. If it refers to the preceding paragraphs bullets as well then it is a duplicate statement. This sentence does not add any value over and above what the last bullet gives and becomes a duplicate statement: Either remove last bullet from bullet list or remove this sentence, I suggest keeping this sentence as this summarises the net effect of the other individual requirements and removing the last bullet.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Possible end users of neutralised water** page 4 Was acidic mine water used for irrigation or neutral saline mine water? If neutral saline mine water then do not refer to AMD as it gives the impression that the pretreatment will not be required.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Typical end users of desalinated AMD** page 4 Sentence structure and meaning ambiguous. Not sure if the second half refers to the treatment and disposal that the industries would need to implement or that would be required from the LTS.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Requirements of the Treatment Process** page 6 The "Note:…" is seen as part of the figure caption and repeated wherever the caption is referred to. Remove note from figure caption.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Thermal desalination can be added next to RO under Physical Desalination.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	Levels vs. concentrations. Although the word “level” is in widespread use when referring to concentrations of dissolved ions I prefer the use of the word “concentration” as it cannot be confused with “level of treatment” or “water level”, as used in the ECL for instance. Also when using level to refer to concentration, reference to e.g. a “high level” can be misleading as it can be either a “high concentration” or a “low concentration” depending on the context and misinterpretation of the context can lead to misunderstanding of what the author meant. Review rest of document for level vs. concentration if changing.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Study Process** page 15 This paragraph makes it appear that the previous list of companies that registered their interest (Table 4.1) was not used in coming up with the list of stakeholders invited at the beginning of the study. This may lead to problems (accusations of unfair treatment) once the report becomes public. I suggest adding a section on, or clarifying how, the list of companies that had registered their interest was reduced to the list that was invited at the beginning of the study.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Quantity and quality of AMD** page 17 Existing full-scale AMD to potable projects used the 95 percentile as the basis of design for the treatment plant to ensure that the product quality will be within specification 95% of the time, as this was the service agreement with the downstream water users. However, the chemical consumption, electricity usage and waste disposal storage facility capacity were always based on a 50 percentile feed water quality for costing purposes. If a technology provider designs on a 50 percentile then 45% of the time the product quality could be out of specification, surely this is not acceptable? Exception is where multiple abstraction points feed a single plant, then it is unlikely that the 95% quality of each stream will report simultaneously to the plant and a lower percentile is appropriate for the basis of design.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Surely “around the 50th percentile”?? Not “between 50 and 60”.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	If evaluating the 60 and 75th, then I would also look at the 40 and 25th to cover the corresponding pH. Remember that for example the 5 percentile pH value corresponds with the 95 percentile value for most other constituents.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Very important point! Good to see it included	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Expected AMD quantities as estimated in the LTS** page 17,18 Very large peak factor of 1.74, compared to 1.3 and 1.25 for the others. This large a peak factor will make the plant much bigger if it has to handle peak flows. Any flow balancing options using the mine voids and possibly drawing down lower than the ECL to create balancing capacity?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	I am more worried about the impact on capital cost as a lot of capacity will be required that will not be used full-time. See previous comment regarding balancing capacity.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Are there really gaps in the data for Mg, Cl, Acidity and Al? Surely for such an important project we would have some data for these?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Central Basin** page 20 Cell alignment for 75th% column - align same as other columns. Li at 60th ?.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Eastern Basin** page 21 Parameter “Salinity” with mg/l units is new to me, is this correct?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Design Feed and Product Water Quality** page 23,24,25 These are under the SANS 241 column and the SANS standard does not vary per basin, therefore only the SANS standard should be reported here. Discharge standards for catchments should be reported under their own column if required.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Acidity, even if not measured, can be calculated from the metals concentration. Assuming the metals precipitate as hydroxides the corresponding acidity is quickly calculated.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	A value of 227 is reported in Table 5.5.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Why modified? The normal HDS process uses only lime and the limestone/lime combination is the modified version.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Why modified? The normal HDS process uses only lime and the limestone/lime combination is the modified version.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Calculate, note that even a near neutral water with alkalinity present can also have acidity due to dissolved metals.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Typical / original HDS process does not use any limestone. Limestone is a relatively recent pretreatment optional addition that can precede the conventional / typical lime-only HDS process.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Should this not be “an optional source” depending on the LTS selected?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Pre-Treatment Processes** page 28 The preceding description is for a normal lime neutralisation step, the HDS component requires sludge recirculation and combining the sludge with the lime to condition the sludge before contacting the sludge and the AMD. The sludge conditioning significantly reduces the volume of sludge produced hence the “high density” name.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Title should be “Simplified process diagram of the limestone pre-neutralisation and HDS process”. Figure error: flow from sludge conditioning should not go to the neutralisation reactor but only to the metal oxidation reactor otherwise the limestone neutralisation component will not work due to too hig pH. “Neutralisation” reactor should be labelled “pre-neutralisation” and “metal oxidation” should be “neutralisation”. Metal oxidation will occur in both, Fe predominantly in the pre-neutralisation and Mn in the neutralisation.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Description of the Process p**age 29 1. Dissolved Fe can be present as the 2+ or the 3+ form. Usually when withdrawn from mine workings where oxygen interaction was limited a large fraction is in the 2+ form, however it could also be largely 3+ if oxygen interaction occurred. Stating that it is present as 2+ implies all of it is 2+. 2. Term “wastewater” used, rather stick with AMD or mine drainage as wastewater is preferentially used for domestic sewage or industrial effluents.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	Much longer required if gypsum removal is also targeted, in the order of 2 hrs. Since Figure 6.1 shows gypsum removal either specify that 10 min refers to metal oxidation section only and/or add gypsum removal retention time as well.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Specify as Mn is not oxidised at the lower pH.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Neutralisation** page 30,31 The sentence implies that lime is slaked in the neutralisation reactor. I hope the intention is to slake before dosing into the reactor – rephrase sentence to indicate separate slaking before dosing into the neutralisation reactor. Please note: do not slake calcium oxide in the presence of high concentrations of sulphate – it will not work as the unslaked lime is armoured by a layer of gypsum. Unslaked lime must be slaked and diluted with low sulphate water to form the 10% slurry before it is dosed into the neutralisation reactor.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Any CO2 still present will immediately follow reaction 3 in this high pH environment and will not be driven off, this belongs under pre-neutralisation.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Correct but move to pre-neutralisation section	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	It is not clear to me what this sentence is trying to say: what is meant by “interactive screening” and how does it negatively affect the process? Elaborate or remove.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Check: this is under the neutralisation section. The preneutralisation in section (a) talks about 30 minutes. Remove “pre” from pre-neutralisation?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Clarifier** page 31 Clarifier design criteria is a rise rate (m/h) not a volumetric rate (m3/h). Also stick to SI units where I think “h” is preferred over “hr” for hour.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	I assume m/m not m/v. Best to specify if known in order to avoid confusion.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	True but misleading under the context. The most scaling environment is where lime or limestone and AMD contact i.e. in the pre-neutralisation and neutralisation reactors. If the reaction times are selected appropriately the sludge streams should not be a significantly scaling environment. After lime addition in the sludge conditioning tank the conditioned sludge can be somewhat scaling, where possible I suggest surface overflows between reactors instead of pipes. Blockages are often due to accumulation of heavy sludge solids or settling in the pipes. Redundant piping is therefore a good idea. Alternatively piping must allow for easy access and quick cleaning.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Sludge Recycling** page 32,33 See earlier comments for Figure 6.1 as well. Sending sludge with lime in it to the pre-neutralisation reactor will make the limestone addition very ineffective as the lime reaction with low pH AMD is quicker than the reaction of limestone with AMD. This will also increase the lime consumption. The pre-neutralisation reactor does not need a seed sludge recycle as it targets primarily pH adjustment and some iron precipitation. The conditioned sludge should go to the neutralisation reactor as here the gypsum seed is required and the required retention time for gypsum precipitation is provided.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.2** "…product water qualities from the HDS process…"? See previous table.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Estimated Quality and Quantities of Waste Products**page 33, 34, 35 See previous comments. If the recycled sludge is conditioned then this is the HDS process. The process using limestone is not the HDS process but an expanded process using HDS as part of the process. Rephrase e.g. "Given the feed water quality in the Eastern Basin, the limestone pre-neutralisation component may not be required and the HDS lime dosing process may be sufficient. If the sulphate concentrations are low and Gypsum precipitation is not required then the reaction retention time can be reduced to 30 minutes. This would result in reduced capital …"	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.3** Unreacted lime and inert components in the lime can be around10% of the lime dosed (depending on lime quality and slaking efficiency) and should be taken into account in the sludge solids prediction.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	See earlier comments: "HDS" or "limestone plus HDS"? Also applies to Table 6.4.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Why are we not oxidising completely to Fe3+? See additional bullet under section 6.2.1.1.(b)? Also applies for Table 6.4	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	This CaCO3 percentage seems high considering that Limestone dosing is not being used due to the already higher pH. For Western and Central it makes sense as limestone utilisation is never 100%. F east where no limestone use is proposed any CaCO3 would have to come from carbonate alkalinity in the water and at pH 5.9 with significant Fe present the alkalinity should not be high enough for that? Please check. Also applies for Table 6.4.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.4** Why is this higher for the 50% than for the 75% and even the 95%? Would expect lower. Please check and if correct discuss in text.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	First mention of a second clarifier. Process described thus far is for a single clarifier. Remove "second"? If only one clarifier then sludge will be a mixture of all precipitates and unreacted limestone/lime. If separation of gypsum for use as product is desired then additional separation method (separate reactor and clarifier or hydrocyclones) is required.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	If offering this as alternative then first mention / describe alternative before mentioning second clarifier sludge composition. The first sentence after Table 6.4 gives impression that topic is about the sludge produced and listed in the table.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Description of the Process** page 37 Does this refer to the source of high pH gold processing wastewater being available for 30 years? If yes th we also need to know if it will be able to treat all of the AMD or only a fraction and if so approximately what fraction.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	We would want to avoid pumping this waste stream and would therefore need to pump the AMD to wherever the cyanide waste is. Have the relative locations and pumping feasibility been investigated?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Physical Processes** page 39 This paragraph does not make sense as the start of the "Physical processes" section. It rather seems to belong under the previous Fe-CN Mintails process description. Move to preceding section or delet	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Desalination Conventional Reverse Osmosis** This should rather be "Conventional Multistage RO" or just "Multi-stage RO" as conventional RO is a once-off RO with about 60 to 80% water recovery max.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Description of the process** Is only the Aveng multi stage RO process being considered as an option? Note that many other RO based configurations exist and these should at least be considered.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	A competitor to Aveng has a technique where the first RO stage is done at a low pH where metals remain soluble, metals removal before RO is then not required.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Any method of metal removal will do for neutral pH RO, it need not be an HDS process although the HDS process is often chosen.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Ro Concentration and Gypsum Precipitation** page 40,41,42 "the required" implies to potable standards which is not the case.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.5** page 41 Please check: contradicts previous statements. Eastern with high Na to be less than 100%, western and central can be 100% although western Na is also high at 95 percentile feed water quality and may not be 100%. Also take water loss to sludge disposal stream into account which will result in all being less than 100%. Alternatively qualify that this applies to RO step recovery only.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Qualify why. The RO system must definitely be designed for the 95 percentile to ensure that the product quality is within specification 95% of the time. However, the reactors could be designed for the 75 percentile with the plant volumetric capacity down-rated during periods when the quality exceeds the 75 percentile. However, I agree that it is preferred to have the reactors also designed for the 95 percentile to simplify plant operation and maintain production capacity at the required volumetric rate.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	When suggesting a relaxed standard both the positives (no brine treatment and disposal costs and no long term environmental liability) need to be weighed against the negative impacts (sodium intake can exacerbate certain disease conditions: persons suffering from hypertension, cardiovascular or renal diseases should restrict their sodium intake, bottle fed infants should also restrict sodium intake). Sodium also has negative impacts on agriculture. Controlled blending with other lower sodium water sources may be a better alternative than just relaxing the standard although this will probably require significant additional piping and pumping costs.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Final brine treatment: Eastern Basin** page 43 The preceding points are technology descriptions, now we are discussing a specific basin. I suggest that a different heading style be used to start this section in order to distinguish it from the technology descriptions.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Repeat of statements in section (i) above. Only repeated for evap pond not for mechanical evaporati Either remove repeat or make it specific to discussion/comparison between the two options in the preceding bullets.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.6** page 44 Although within the SANS 241 limit these are much higher than the Gauteng users are currently used to.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	These high Ca concentrations add significantly to the water hardness and will increase soap consumption for end users	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	See section 6.3.1.1. where western and central are to bleed monovalents back into product and not produce brine, but eastern is to retain monovalents and produce brine. I would therefore expect that the western and central sodium is near feed water concentration while the eastern is lower than feed. This table has western lower but central and eastern at feed concentration. Please check. Eastern Na is out of spec?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Exceeds SANS limit. Out of spec?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Alkalinity, pH and Ca to be taken into account to determine stability / scaling potential of water. Would be nice to list the Calcium carbonate precipitation potential as well for these predicted product water qualities. May need to add stabilisation treatment.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.7** page 45 Compare to Ca for 95 percentile where Central is highest and others are low while here the western is highest and central is low. Please check.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Higher than feed Na?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Out of spec for 50 and 75 percentile.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Preceding tables seem to indicate no brine production when looking at the product Na concentrations. No brine production figures shown in this section. Either state that SANS 241 will not be met and no final brine produced (as product quality tables indicate) or state SANS 241 will be met and provide brine production rates.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	Pretreatment is mandatory for this RO process, although HDS is not mandatory and any other form of pretreatment could be used. Rather state that for this case the pretreatment was assumed to be limestone followed by HDS process and rephrase next sentence / rest of section as well.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.8** page 46 What feed water Mg was assumed – no Mg indicated in feed water quality in Table 5.2.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	At the low western feed water pH I do not expect significant alkalinity and therefore CaCO3 should not form, however at the eastern feed water quality I do expect some CaCO3. Are the two not possibly swopped around in the table? Please check.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.9** page 47 What feed water Mg was assumed – no Mg indicated in feed water quality in Table 5.3. Also applies 75th percentile.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Chemical Consumption** page 48 Note that an allowance for speciality chemicals for membrane cleaning should be made. It is however difficult to predict the exact type and usage as this varies and can only be established once a plant is operational. Sum should however be less than 10% of cost of all other predicted chemicals.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.12** page 49 Why about double the usage rate compared to the other basins? Check and add a brief explanation / discussion in the text after the table if correct.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.13** page 49 Clearly indicate whether capex for waste disposal has been included or excluded. Also clarify whether this is the total treatment train including the upfront limestone & HDS process or just the multistage RO section.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Seems low compared to number of stages listed in table 6.5. I would expect more instrumentation if more stages.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.14** page 50 Again clarify whether just multistage RO section or whether pretreatment and waste disposal is included.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 6.15** page 50 Report same no of significant digits as rest of table.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Advantages** page 51 Water qualities presented in tables exceed specifications. Either state that SANS 241 will not be met and no final brine produced (as product quality tables indicate) or state SANS 241 will be met and provide brine production rates. Saying that it can meet SANS 241 but then presenting qualities and costs for an option that doesn't is misleading.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Description of the Process** page 50 General note: Veolia Water Services (VWS) has in the past proposed a very similar process based on the first RO stage being a low pH stage that doesn't require the upfront neutralisation and metals removal pretreatment but neutralises the brine from the first RO stage.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Current existing multistage RO plants are successfully supplying gypsum to the market. The capacity of the market to absorb the quantities to be produced by the additional AMD treatment plants is the real question.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Advantages** page 54 I would imagine that this more complex system requires more operator input/presence and therefore a large number of decentralised units is not ideal from an operating point of view. It would be just as or less suitable for decentralised installations as the previous RO system in section 6.3.1.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Disadvantages** page 54 Correct: the membranes can scale instantly if the pH is not low enough to keep metals in solution. A life of membranes constantly operating at low pH may need to be confirmed.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Figure 6.5** page 59 Figure is not clearly legible. Insert higher quality version please.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**AMD neutralisation** page 59 See previous comments re limestone pre-neutralisation being a pre-treatment step to the HDS proce and not part of the original HDS process.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Sulphate Precipitation on Gypsum (CaSO4)** page 60 Use either "gypsum" or "calcium sulphate" throughout the section, don't alternate, this makes it easier for readers not familiar with the terminology.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	This statement should be expanded on, on its own it doesn't add value. I would imagine that it should read: "The residual sulphate requirement for the STI is 2500 mg/l, at the higher pH of 11.5 proposed for this step the sulphate concentration will be reduced to xxx mg/l." Fill in the xxx.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Combined three paragraphs into one paragraph and re-arranged to improve logic flow.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Post-treatment of the treated AMD** page 61 Or use description other than just AMD as it no longer is an acidic metal rich saline stream at this point.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Figure 6.6** page 61 Use hard-spaces (control-shift-space) to ensure that "Figure" and its number remain next to each other.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Outgoing streams have a very small font describing destination – use larger font or remove.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Recovery of BaCO3 and Ca (OH)2 from the sludge** page 61,62 Two paragraphs earlier BaS and CaO are mentioned but no CaS. Next sentence again talks about CaO. Confirm all species present and use consistently. Also see figure 6.6 for "CaS" filter cake which should probably be "Ca(OH)2" filter cake? I think that it would be predominantly BaS and CaO, with very little CaS if any? The BaS dissolves while the CaO is slaked to Ca(OH)2, the bulk of which stays in solid form due to the high concentration.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Mention that it is related to the cost of the make-up barium.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Elemental Sulphur Production** page 62 Avoid use of comma before "and".	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Provide reaction numbers as for earlier part of report. Applies to rest of document as well – see SAVMIN process description.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Target Quality of treated water** page 63 This same comment also applies to the RO options considered under section 6.3. See tables 6.6 and 6.7. Mention comment there as well if commenting on it here.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Estimated Quality and Quantities of Waste Products**page 63,64 Again any metals removal and neutralisation technique would do, HDS per se is not mandatory. We can assume for this case study that it would be the HDS process as this is a proven technology	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Agreed. A high lime treatment step is required to remove Mg. However, beware that aluminium re-dissolves at higher pH and a two-stage high lime treatment process may be required. First stage to around pH 8 and then clarify to remove Fe and Al sludge solids, followed by second stage to pH 11.5 and then clarify again to remove Mn and Mg. This would apply to especially the central basin with its high Al content. Eastern Al may be low enough and Western no Al given therefore uncertain.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	There is such an oversupply of ash that I would rather see this as a waste than a by-product even if ash can be used beneficially.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	This statement on its own is useless as context is missing. Either make it applicable for one of the basins or also give the flow and sulphate concentration on which it was based.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Estimated costa** page 64 Give context: is this for the 3 basins combined or for another case study? Give flows, sulphate loads, etc.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Advantage** page 64 Add that it's unit treatment cost decreases significantly as the treatment capacity increases. It becomes more economically attractive as the capacity of the facility increases due to economies of scale. In comparison: for RO the membrane related costs increase proportionally as the capacity increases	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**HDS for neutralisation and Oxidation** page 66 Reaction numbers as for start of document.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Estimated Quality and Quantities of waste products produced through the process** page 68 I assume these values will vary significantly based on the feed water quality. Give the flow and quality (or the loads) that these numbers are based on to show relevance to this project.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Advantage** page 68 Again see similar earlier comments: This implies that SANS 241 can be complied with when it cannot comply at all times. Statement needs to be qualified or reference to additional "special processes" (probably RO) as mentioned under 6.4.2.2. needs to be made otherwise it is misleading.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Biological Processes** page 69 Not sure if "high-technology" applies to Claus process only or to metals recovery as well. Check phrasing: ", which is a high technology…" if only referring to Claus or ", these are high technology…" if referring to the metals recovery as well. Adjust rest of sentence as well.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	The paques process seems very well established and proven. I am just not sure of the largest scale. I know a 2 Ml/d plant has been in continuous operation at Anglo's Navigation colliery near eMalahleni for probably more than 5 years already, successfully treating water for use at the coal plant.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Description of the process** page 70,71,72 "+" missing between compounds?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Metal sulphides can be difficult to settle in a clarifier as they often form very small precipitate crystals that can remain in suspension. Please enquire about and comment on the efficiency of the metal sulphide clarification step of the biosure process.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Nitrate content of the final treated water?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	This statement should be before the mention of the HDS sludge stream from Grootvlei being sent to the biosure process. Check section for logic flow.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Follow up, either report for this project case or for the pilot plant case (list feed water quality and flow if for the pilot plant case).	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Disadvantages** page 73 Separate bullet unless referring to being proven at large scale with alternative energy sources? 10 Ml/d not considerd large enough scale if separate bullet?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Figure 6.9** page 74 Assuming the treated water recycle is to provide alkalinity to neutralise AMD and precipitate metals: Label first reactor "Neutralisation and metals removal reactor" and show metals sludge removal. Met sludge going directly to the anaerobic section can possibly "poison" sulphate reducing bacteria -check with supplier. Label second reactor "Anaerobic sulphate reducing reactor". Looks like two configuration options are shown on the same diagram making it confusing – consider showing separate configurations: first MeS sludge, second MeCO3 sludge and bio S.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Disadvantages** page 75 The configuration used at Anglo's Landau Colliery (Navigation Colliery?) does not produce metal sulphides but only metal carbonates & hydroxides as well as bio-sulphur. This is the configuration that I would propose be used.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	I see this as an advantage as the large AMD stream is then not contaminated with pathogens and other contaminants present in the primary sewage sludge.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Evaluation Criteria** page 76 Does this cover control requirements, operator expertise levels required and operator availability as well? The ability to actually effectively operate the plant after its construction is critical and is often overlooked.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.3** page 78 Fill in where known – i.e. for HDS (can be calculated from feed quality).	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.4** page 78 A course relatively pure gypsum fraction can often be isolated relatively cheaply using hydrocyclones and then used beneficially.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.8** page 80 It's unlikely to balance both therefore one will always be out and require additional chemical dosage.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Treatment Technologies for neutralised AMD** page 81 Should this not rather be "desalination of" than neutralised as some do not require pre-neutralisation and their main aim is desalination?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.9** page 81 This should rather be "Conventional multi-stage RO" or just "Multistage RO" as conventional RO can only give about 80% water recovery max.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Also Veolia? Also low pH 1st RO stage but then different approach for brine from 1st stage RO.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.10** page 82 Is uranium not precipitated at the higher pH in the pre-treatment step?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Is uranium not precipitated at the higher pH in the stage 1 RO brine treatment step?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Is uranium not removed in the upfront HDS process?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Is uranium not removed by the high pH environment in the first reactor?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.11** page 83 Some of the quantities listed unknown can be estimated by the study team using simple calculations and the equations provided.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.12** page 85 Where no data available from supplier the quantities can be estimated from the feed and anticipated product water quality.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Brine can be estimated for the 50, 75 and 95 percentile cases based on the feed water quality and the product water quality.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	**Table 7.13** page 86 Also for conventional RO: selective crystallisation using eutectic freeze crystallisation or ion exchange can be used to selectively recover salts. Costs may not be excessive since it will be for a small stream only.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	This was true a few years ago and I think this is still true but check and change if needed.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.14** page 87 Currently only one (Aveng) has implemented the multistage process at full scale. Others have implemented conventional RO at full scale using other configurations (e.g. mechanical or thermal evaporators) for brine treatment/reduction.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	I would rate the paques technology similar to or higher than the Biosure process in terms of TRL. Reasons: 1. Complete process train is proven and long term operational data is available from various operating installations, even if the flow rates are smaller than for the single biosure application. 2. Configuration to produce stable sludge streams is proven making the overall package more applicable than the current biosure package. I would rate biosure 7 and paques 8.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Table 7.16** page 89 Not really as upfront high-lime process will then only remove more of the sulphate, leaving same concentration for the Barium step. The same applies to the other technologies using HDS as pretreatment.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Aluminium content may have an impact on the make-up aluminium required.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	True since assuming HDS process precedes in all cases.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Not true if HDS process not preceding. Excessive metals concentration may require HDS pretreatment.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Summary of Processes** page 90,91 The reduction is not significant in all the options listed.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	No values given by technology provider but I do not agree that volumes will be less as it is only a pre-treatment step. Note that only Fe will be present as Fe-CN, other metals will probably still form as hydroxides during the neutralisation process. If counter ion to alkalinity is calcium or magnesium we will still produce sludge somewhere in the overall treatment process while if it is sodium or potassium we will produce extra brine.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Do we have the time to do this? If no then do not recommend this, rather state that it would be ideal if we could.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Do not think we can mandate it here in this report, we should probably only recommend.	Achim Wurster	Noted / Addressed	Walter Johannes

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Fourth Draft V4.0	I see the body of this report focuses purely on the minimum water quality requirements according to SANS 241. Other acceptability issues, such as comparison to current potable water quality, negative impacts of reduced quality on water users, acceptability for industrial use or receiving water quality objectives for end discharge catchments should also play a role. It may therefore be required to trea a standard higher than the minimum specified by SANS 241. Ideally a cost benefit analysis, taking the overall cost impact on society and industry into account, should be carried out when selecting the target treated water quality. This may influence the selection of the final treatment technology.	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	**Recommendations** page 94 "… that" does not sound right. Rather "…we recommend that"	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	Difficult to test a pretreatment only at this scale if no desalination treatment is added. Where will pretreated water go? For others / in general: where will off-spec water from any trial plant go while the technology is being tested / refined?	Achim Wurster	Noted / Addressed	Walter Johannes
Specific	Fourth Draft V4.0	I would call these demonstration plants rather than pilot plants at 10 Ml/d. Together = full western basin flow! The cost for this will be significant, who will carry it? I don't see the technology providers being able to and for the tax payer / government it will also be difficult to spend this sort of money on trial plants (loss of economies of scale, etc.). A more appropriate option may be long term operation of the technologies at a much smaller pilot scale, say 1 Ml/d, with a large proven limestone, HDS and multistage RO plant carrying the bulk of the treatment load on the western basin and thereby assuring effective treatment for the bulk of the flow. I would also include the ABC process in the list of plants to trial.	Achim Wurster	Noted / Addressed	Walter Johannes

Report 5.5

Achim Wurster

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Preface** page ii Either only the comma "," or only the "and". The "and" fulfils the same 'pause' role as a comma in most instances. Check rest of document as well.	Achim Wurster	Changed	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Phase 3 Feasibility** page viii Keep tense same as preceding and following paragraphs. Not project specific – sounds like solution to all AMD problems world-wide.	Achim Wurster	Resolved	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Executive Summary** page xviii Metals containing sludge disposal is not normally classified as general waste. Brine would also not normally be classified as general waste. Both of these are expected from a multistage RO plant given the design feed water qualities listed in report 5.4.	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	Agreed, should we not therefore use the precautionary principle until the classifications have been confirmed?	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	This contradicts the report 5.4 recommendation of implementing the treatment technology for a planned 15 year horizon. See report 5.4 recommendations section 8.	Achim Wurster	Retained 50 years as this is the project horizon	Ian Hammond
Specific	Study Report No 5.5 Second draft	**List of Chemical Constituents** page xxvi NH4 vs NH3 - NH4+ is the ammonium ion.	Achim Wurster	Noted	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Units of Measurement** page xxvii hr - "h" is preferred to "hr", e.g. as used in kWh for power use or m/h for clarifier rise rate. kl - Recommend we use only m3 and not both m3 and kℓ in same report, m3 is the preferred unit.	Achim Wurster	Noted and addressed	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Glossary of terms** page xxviii/ xxix Discharge - Decant and discharge definitions swopped? Reef - Gold containing conglomerate vs. just conglomerate? SAMIN - Veolia proposes it only as the brine treatment step after conventional RO if I am not mistaken. If correct then "proposed as a brine treatment step by Veolia Water" is more appropriate.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Structure of report** page 1 "Reclassified" sounds as if it is an arbitrary decision that a person can make based on preference. The decision will be determined by the outcome of a classification process relative to existing guidelines. Consider using a synonym more familiar to the general public for ease of reading.	Achim Wurster	Noted	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Evaluation Criteria** page 3 Agreed, it is imperative that the overall project lifecycle cost including all project costs be used to compare alternatives.	Achim Wurster	Thank you	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Evaluation of technlogies** page 3 Update with comments in relevant section from report 5.4.	Achim Wurster	Done	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 2.2** page 4 This is direct copy/paste from report 5.4 – adapt comments to this report. Check and add if this is a possibility. Also add to report 5.4 if true.	Achim Wurster	Done	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Table 2.8** page 8 What do we do during gold plant maintenance shuts or if there is a large variation in gold price and the economics necessitate gold plant shuts? There would typically be an oversupply of one stream and a undersupply of another – this means that either there will not be sufficient gold plant flow or there won't be sufficient AMD, requiring that capacity to treat whatever stream is in excess will still be required.	Achim Wurster	Noted	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 2.9** page 9 See relevant comments in report 5.4 and update this table. Lower feed SO4 will only mean less gypsum in HDS step, it will not impact the ABC part of the process unless the SO4 is less than output of the HDS step after gypsum precipitation. This statement is therefore not entirely correct, check with supplier. Also update in report 5.4 if needed. As mentioned previously differentiate between Mintek and Veolia versions of this technology: Mintek: full stream through SAVMIN process. Veolia: 1 conventional RO stage first then brine goes through SAVMIN process. Update report 5.4 as well where appropriate. Not always, depends on configuration and Mg removal required.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Table 2.10** page 10 Not removed in upfront HDS step?	Achim Wurster	Noted	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Table 2.11** page 11/12 If the chemicals used are known and the process equations are known then estimates are possible for most of the processes. I would suggest we do the calculations and include the estimates with a disclaimer that it is an estimate based on the study teams calculations and not confirmed by the supplier. If this is known then the approximate quantities for the various basins can be estimated and included in the table.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Table 2.12** page 12 Again, if the process equations are known we should be able to estimate waste quantities for most of the technologies even if the technology supplier has not provided these.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Table 2.14** page 15 These are all from the same technology supplier, comment that “numerous suppliers available” may be slightly misleading, even if they can supply it they do not all have the proven track record. See report 5.4 comments: TRL should be 8 or 9 in my opinion.	Achim Wurster	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Table 2.15** page 17 Check what was meant: this process uses a carbon source, why is "production of carbon source" then seen as a complex process? Should this be "production of bio-sulphur is a complex process not yet fully understood/developed"? I do not see too many issues in up-scaling this process from the currently well understood and proven smaller operations to the scale required. Probably only a 10x scale increase which for a well proven process with a long operating history is not too much of an issue. I see the downside more on the cost and final treated water quality side rather than a technology risk or complexity issue.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Table 2.16** page 19 Release of Hydrogen Sulphide from process can be dangerous and should be noted as possible health and environmental issues. Quantities released at a time will probably not be enough to cause catastrophic failure as for ABC process. Release of Hydrogen Sulphide from process can be dangerous and should be noted as possible health and environmental issues. Quantities released at a time will probably not be enough to cause catastrophic failure as for ABC process.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Summary of processes** page 20 Statement is made but there is no data in Table 2.12 to back this up. I would therefore re-state to say "A reduction in the production of waste products, relative to the conventional RO process, is anticipated for the following processes:" See comments report 5.4 on this recommendation as well as the others below.	Achim Wurster	Addressed and noted in the report	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Reference technology residue characteristic** page 23 See report 5.4 for comments re limestone lime process vs. HDS process: the simple lime dosing and clarification process (with sludge recycle to a sludge conditioning tank) is the HDS process – the limestone part is a later addition/modification to the HDS process.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Table 3.1** page 24 Check if correct? For similar feed TDS I would expect the higher flow central basin to produce more sludge? Could be wrong as metals do significantly influence sludge quantities.	Achim Wurster	Noted	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 3.2** page 24 See comments report 5.4	Achim Wurster	OK	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Estimated Quality and Quantities of Waste Products** page 27 This section cover the RO stages sludge only, not the HDS sludge. Assume HDS can be deleted.	Achim Wurster	Noted and Addressed	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Potential for reclassification** page 29 Provide reference to guidelines/procedure used to derive general waste classification. Provide reference. State which relevant department is being referred to. Any indication on what would be the parameters that would exceed the general limits and warrant the hazardous classification? I think this section requires an bit more depth to give the reader a better understanding of the parameters of concern and the associated risks involved.	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Commentary on other aspects if the residue is reclassified** page 29 Why a separate section 4.2 and 4.3, can all these aspects not be covered under a single section?	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Sosial issues** page 30 What about the scenario where the waste is classified as general but the public thinks it should rather be classified as hazardous so that the engineering measures used are more stringent and impact on the environment is minimised?	Achim Wurster	Commented on. The bottom line is that waste is classified according to regulation, not individual or group emotion	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Potential to recover useful products** page 33 Consider sub-sections for 6.2 to help organise logic flow.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	page 35 These trials were completed successfully. The Earth technology is sound and based on proven ion exchange processes that have been around for longer than RO. The risk comes in on the commercial side where the cost difference between the relatively expensive ion exchange regenerating chemicals and the products produced cannot be guaranteed to provide sufficient cost recovery over the long term. If not for this commercial risk then ion exchange could be technically more appropriate than RO for the treatment of AMD	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Disposal options** page 37/ 38 N and P not normally an issue with AMD treatment residues unless as residue from explosives (N). State how, e.g. as interstitial water between sludge particles.	Achim Wurster	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Co-disposal of sludge and brine with tailings** page 38 Why does this one option as listed under 6.3 get its own subheading and the others don't? Consider re-naming this heading to something more appropriate – see comments in rest of section. Review what the intention of this section was and either delete this section or ensure that content speaks to the heading and follows logical reasoning flow. Check against table 3.1 – statement contradicts table 3.1. Why is this detail required, it is not referred to in the rest of this section. These streams are already discussed in the preceding sections 6.2 and 6.3, why mention again here? Rather add detail to earlier mentions or re-phrase if more detail is required. Relevance to co-disposal option under this section heading? Sludge storage will (not might) be required. Question is whether on existing tailings facilities or whether on new facilities. Second sentence does not fit in: why will brine be co-disposed with the sludge in this scenario? Rephrase sentence and clarify logic as well as what it is trying to convey. True but relevance to section heading? This has been stated before in earlier sections of the report. Relevance to this co-disposal section? Also reported in tables in this report (copies from report 5.4) rather refer to the relevant tables in this report than to report 5.4.	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Sludge storage facilities** page 39 I would use the 95 percentile for sizing of the sludge handling facilities (e.g. dewatering and transport) and the 50 percentile for the sizing of the sludge disposal facilities (e.g. lined ponds). Clarify how brine would be disposed of. (Was this the intention of section 6.4?) Brine should always be in a lined facility due to its mobility. If co-disposed with sludge the sludge will have to be in a facility designed for brine which is usually a much more expensive liner system than for dewatered sludge. If together with a liquid sludge then the decant water will be contaminated by brine and separate decant water treatment will again be required. Reconsider the validity of this statement. No indication of separate brine sites/areas allowed for or required. I would suggest listing the brine storage volumes and evaporation areas required. Note that reduced evaporation rate of brine relative to fresh water and net evaporation rate after rainfall must all be taken into account when sizing brine areas and storage volumes required.	Achim Wurster	75 percentile used	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.1** page 39 Rephrase heading to indicate “design” or “sizing” of waste sludge management sites. Why is west less than central and central less than east on 50 years when daily amounts are other way around? Check quantities.	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Management of sludge disposal facilities** page 40 Appropriate for brine co-disposal? Is wall raising an acceptable method to increase storage capacity for lined facilities? I am concerned about liner joints and wall stability at the raise "joints". Has building a disposal facility at full depth but adding cells later on been considered? This has advantage of phased implementation of the large area of the bottom liner as well as risk reduction as failure of any one cell will have a reduced impact relative to one large cell failing. Not possible if brine co-disposed. Not if using wall raising to increase capacity, full drainage system will then need to be in place from start. See above wall raising vs additional cells comment. Again depends on whether sludge is dewatered or liquid. Possible if dewatered but then lose brine co-disposal evaporation area. Not possible if liquid sludge is disposed. Also if sludge is dewatered how will it be placed – gelatinous sludge does not support heavy equipment for placing or closure	Achim Wurster	Brine disposal addressed in report 6	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Site selection and cost estimates** page 41 This implies disposal of a liquid sludge with return of the decant. This would not allow for the co-disposal of brine with the sludge as the brine would simply return to the water treatment plant with the return decant.	Achim Wurster	Brine disposal is recommended to be done in evaporation ponds. Addressed in section 6	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Central Basin** page 41 Rephrase: possible tunnel or Crown Mines tunnel? Delete second tunnel or change to shaft"…possible tunnel from the Crown Mines (shaft) in the Central Basin…"?	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Central basin disposal sites** page 50 Figure 6.9 - Not a linked reference – won't update automatically if numbering changed. Link reference.	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Site ranking** page 63 The disposal of dewatered sludge would pose no bird attraction. The disposal of liquid sludge will produce a water pond area that may attract some birdlife although significantly less than a landfill disposing municipal waste would as the water will not support any significant biological activity. Birds are therefore not seen as a major issue around this type of sludge disposal site. Rather a construction issue as construction material will have to be imported, why is this seen as a fatal flaw? Check placement of "chapter 4" in the reference sentence - Refers to chapter 4 in the minimum requirements or is the referenced document "chapter 4"?	Achim Wurster	These are the regulaitons, and may need to be designed out or motivated during the design stage	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.8** page 65 3 according to table content?	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Western basin sites** page 71 True that lining will reduce formation of new or growth of existing underground voids but it won't prevent existing underground voids from causing sinkholes. This will be costly – guatrain work through dolomite areas around Pretoria can be consulted as an example of the costs involved.	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Capacity assessments** page 73 I do not agree with this statement - see earlier comments re separate brine disposal area requirements for storage and evaporation.	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Table 6.14** page 73 Check against table section 3 of this report and design percentile values used (I recall 75 percentile being mentioned). Values do not match. List details e.g. solids percentage, percentile feed water quality used as basis, solids SG assumed for various types of solids (Fe sludge, gypsum sludge, etc.), etc. used to get to the solids t/d. Do this as a separate paragraph under 6.7.10 before starting subsection a) so that it applies to all. This high a in-situ solids content may not be achievable without mechanical dewatering of metal hydroxide rich sludge, the earlier info implied that pumping a wet sludge with decant return would be used. These assumptions are not compatible and could result in being too optimistic in either costing or design sizing.	Achim Wurster	Values now match	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.15** page 73 10m crest - Seems wide for a crest width.	Achim Wurster	Not when you add safety berms - net width is then 7m or less	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.16** page 74 If no different from Western Basin option then just refer to the previous identical table (6.14).	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.17** page 76 If no different from Western Basin option then just refer to the previous identical table (6.15) (or figure). Same applies to the stage curves fig 6.18 and 6.19. Also applies to all other tunnel options listed.	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.20** page 82 Why is sludge production for tunnel option 1 higher than for central basin table 6.18?	Achim Wurster	Corrected	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Table 6.23** page 85 Why is this suddenly higher than in tables 6.19 and 6.21? Should be same since sludge volume stays same. Unless wall lengths and heights are custom adjusted relative to the site location but that does not seem to be the case for this study.	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 6.24** page 88 I see the in-situ density was assumed the same for all sludge streams. Note that there will be variation depending on the sludge consistency (metal hydroxide sludge dewaters less than gypsum sludge, also SG of sludge solids particles differs between various precipitates). If same is used as this is a pre-feasibility study then it is ok but the assumption should be listed at the start of this section.	Achim Wurster	The density needed to be assumed for the report. This will be checked during the design stage	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Management of sludge disposal facilities** page 91 See earlier comment regarding wall raising for lined facilities. This is appropriate for unlined self-supporting tailings but may not be suitable for lined facilities with leachate detection and collection systems. It is a trade-off between storage and evaporation until sufficient area is available so that the evaporation rate matches the brine flow rate. Since co-disposal is unlikely to be allowed the area required can be substantial and should be considered now as part of this study. I don't think that this will be considered acceptable as the wall area will then be a "dirty" area resulting in groundwater pollution, exactly what we want to prevent by lining the sludge storage facility. Lining the area under the wall to collect the AMD and prevent groundwater pollution will probably not be technically feasible?	Achim Wurster	It is approporiate	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Evaporation ponds** page 93 Have we checked the net evaporation rates for the study areas? See WRC report on Field testing to determine the evaporation rate of brine solutions formed during the membrane treatment of mine-water Report No. 1895/1/12. For further info on evaporation rate reduction estimates.	Achim Wurster	Yes	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Mechanical or thermal evaporation and crystallisation** page 93 Can be "mechanical vapour recompression" (MVR) or steam/waste heat based process. Both result in evaporation and ultimately crystallisation of salts It is normally a wet salt, a separate dryer to dry the salt is not often added.	Achim Wurster	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Freeze desalination and crystallisation** page 93 See earlier comments regarding selective salt recovery using eutectic freeze crystallisation. This can significantly reduce salt disposal costs and long term liability associated with salt disposal.	Achim Wurster	Noted	Johan van Zyl
Specific	Study Report No 5.5 Second draft	**Co-disposal with sludge residues** page 94 How is the brine going to get onto/in the sludge without just running off? Elaborate or otherwise remove this part of sentence and just leave brine wash option in sentence. The moisture content may be a critical factor determining the ability to effectively handle and place a dewatered sludge. Any slight increase in moisture content may make it impossible for heavy machinery to move around on the dewatered sludge. See section 6.7.11 Check and if agreed with this statement adjust rest of report where required.	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Co-disposal with mine residues** page 94 The load may be small but after 50 years the accumulate load of highly mobile monovalent salts will have an impact if not contained. The conditions under which any co-disposal can occur therefore need to be clearly stipulated including proper containment which usually involves some form of positive liner system be it to keep salty water in or rainfall off the top of a co-disposal site (to prevent leaching).	Achim Wurster	Addressed and noted in the report	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Cost analysis** page 96 Specify liner system used for costing. Different liner systems can have very different unit area costs. Earlier section mentioned a ringed pipe penstock system. Use same design or assumptions in the various sections of the report.	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Basis of cost analysis: capital, operating and closure costs** page 98 This supports my earlier comments re sludge placing methods (pumped sludge vs. placing a dewatered sludge) and in-situ dewatering achievable.	Achim Wurster	Pumping and de-watering is achievable. Dewatering sludge is most likely not acheivable.	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Table 8.2** page 98 I understood that there will be either the “Western Basin” or the “Western Basin Tunnel” implemented, not both. Remove this row from table?	Achim Wurster	Done	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Discussion** page 102/ 103 The Optimum Water Reclamation Plant? If yes then refer to this as this has been mentioned before whereas “Middleburg” is difficult for the reader to place in context if they are not aware of the optimum water reclamation plant near Middelburg. Important point following on from previous important point. This is why further research and testing of options that recover useable resources from the waste streams is so important to give us alternatives!	Achim Wurster	Addressed and noted in the report	Ian Hammond

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Study Report No 5.5 Second draft	**Brine disposal** page 103 Misleading if reference project is based on disposal of liquid sludge and decant return. Dilution capacity? Not technically feasible if disposing a pumped sludge and returning a decant to the water treatment plant as has been assumed for the sludge disposal facility design – see below: Monovalent salts will not be retained significantly and will be recycled straight back to the treatment plant until after a few weeks the treatment plant will be overloaded salinity wise and will fail. The area required to evaporate the brine and the sludge water component will be huge if no decant is returned. There will be no separation of monovalent salts from the liquid phase in the sludge storage facility even if the flow seeps through the sludge. The monovalent salts will simply recycle back to the treatment plant, no matter the route, as long as flow is taken back to the treatment plant.	Achim Wurster	See report 6 and recommendation in section 7.	Ian Hammond
Specific	Study Report No 5.5 Second draft	**Conclusions and recommendations on sludge disposal** page 104 This will be the only way to prove what the impact of brine and sludge co-disposal will be on the return water going from the sludge disposal back to the treatment plant in order to determine the monovalent salt recycling impact on the treatment plant. Agreed. This also lends motivation to implementing smaller waste disposal sites initially in the hope that resource recovery from the wastes or alternative disposal systems will make planned future waste disposal site expansions redundant.	Achim Wurster	Thank you	Ian Hammond

Report 8

Mariette Liefferink (FSE)

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Acknowledgements** Thirty three (33) Study Management Committee members, forty one (41) members with an additional thirty eight (38) "alternative" members of the Study Stakeholder Committee are acknowledged for their contributions in the foreword of the above-mentioned Report. It is impressive. It may, however, misrepresent to the public the factual status of affairs. In order to ripen the public's judgment regarding the number of the above- mentioned Study Management Committee- and Study Stakeholder Committee members who actively and meaningfully participated in the study, and attended the three study stakeholder committee meetings and offered relevant and meaningful comments, we hereby request an attendance register of the Study Management Committee meetings and of the three study stakeholder committee meetings and the Minutes of the said meetings. The attendance register and the Minutes of the meetings will adduce evidence whether the participation was broad based and whether all members actively, intelligently and meaningfully contributed to the process.	FSE (Koos Pretorius & Mariette Liefferink)	Noted.	Johan van Zyl
Specific	Report 8, First Draft	**Section 1.1** Will the DWA and NT be the only organs of state in the position to scrutinise the Implementation Plan and approve the Plan or will the public, be involved in the process?	FSE (Koos Pretorius & Mariette Liefferink)	Implementation Plan was sent to SSC for comment. Public participation to take place through the EIA.	Johan van Zyl
Specific	Report 8, First Draft	**Section 1.1** page 1 The salt load of the neutralised water is still high. (Page 4. Section 2. Subsection 2.1.) Since the Report advocates that, pending the results of the current study (Resource Water Quality) standards, that, with reference to the long term solution, it will be acceptable to release neutralised AMD into the system without compromising the fitness for use of water resources of Hartebeespoort Dam and downstream on the environment and acceptability, it begs the question: how will the near surface aquifers and the environment within the Zwartkrans compartment be protected from the high sulphate contribution? In terms of Section 15.4.1, it is acknowledged that this aquifer is an important supply of water for agriculture and local abstraction of more than 10 Million m3/a is used in commercial farming.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. Discharge of neutralised AMD into the streams in the Western Basin is not recommended as a Long-Term Solution.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 5.1** page 22 The Environmental Impact document DWAF 16/2/7/C221/C/24, titled "Impact of the discharge of Treated Mine water, via the Tweelopies Spruit, on the receiving water body Crocodile River System, Mogale City, Gauteng Province", dated 3 December 2006 found that within the Zwartkrans Compartment 2654 Ha are under irrigation using borehole water; 458 Ha are under irrigation using river water and 11 491 persons live on dolomite using 250 l/person/day groundwater. The Report furthermore found that high concentrations of sulphate exert predominantly acute health effects (diarrhoea) and that sulphate concentration of 600 mg/l and more cause diarrhoea in most individuals and adaptation may not occur. (The Report stated that "the tendency of sulphate to induce diarrhoea in people depends to some extent on the associated cation. Magnesium will induce diarrhoea, whereas sodium will not. Unfortunately magnesium occurs in near-saturated quantities in dolomite, as it forms part of the dolomite mineral, CaMg(CO3)2. In concentrations over 200 mg/l, it will produce a brackish taste to water".)	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 5.5** page 28 The cost to the environment, the costs attributed to the loss of ecological services, the cost downstream water users in comparison to the financial benefit if the AMD is neutralised and not desalinated must be determined.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. This was in principle considered (i.e. at feasibility level) and the recommendation is to desalinate in the long-term.	Johan van Zyl
Specific	Report 8, First Draft	**Section 5.1** There appears to be no reference in the Report to the CPS Pit, which is currently acting as a clarifier. For which period of time will the CPS Pit be used as a clarifier? There is shallow surface seeping from the CPS Pit into the Mill Site Pit area, which is of concern.	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope.	Johan van Zyl
Specific	Report 8, First Draft	**Section 5.4.3** It is necessary to assess the impacts of "treated water" which will not meet the specifications on downstream water users and the environment and to mitigate the impacts. Interested and affected parties must be involved in the decision-making process pertaining to proposals for implementation.	FSE (Koos Pretorius & Mariette Liefferink)	Relevant to EIA process.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 5.5 (a)** The compatibility of this proposal with the (NWA, 1998), which provides for the protection of water resources by apportioning an agreed amount of the water available in a system to maintain the natural environment in some pre-agreed condition, is problematic. To fulfill the above-mentioned purpose, this water needs to be of an appropriate volume and quality, and be available at the appropriate time of the year, and is known as the ecological reserve.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft, Section 1.1	**Section 1.1** page 1 Is the proposed engagement with the public information dissemination or public participation? Will the public be involved and in the position to influence the decisions? In order to capacitate the public to participate effectively and meaningfully in the decisi making process, the FSE requests access to the following information: A copy of the original document on which the 2003 Directive apportionment was based and any subsequent documents. • All the water monitoring data – both continuous and grab sampling from within the area that will be affected from 2005 to current. • All documents dealing with the impact of the AMD on the Tweelopiespruit from 2002. • All documents dealing with the impact of the AMD on the Wonderfonteinspruit (WFS) since 2002, including the impact of seepage from the Western Basin (2002 – 2012) on the Wonderfonteinspruit Catchment during heavy rainfall. In addition to the decant to the Tweelopie Spruit to the north, the seepage of water to the Wonderfonteinspruit to the south has been observed during periods of heavy rainfall. (Reference: DMR – Regional Mine Closure Strategy for the West Rand goldfields. 2008). • The action plans, strategies, time frames and financial provisions for the remediation mining-affected surfaces areas within the West Rand, Central Rand and East Rand Basins.	FSE (Koos Pretorius & Mariette Liefferink)	Public engagement will take place as part of the EIA. The purpose of the FS was to engage with key stakeholders and inform the public. Private parties are requested to obtain documents, not drafted by the AMD LTS study, directly from the relevant authors or project managers.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft, Section 1.1	Section 1.1: Risk assessment of the impact of the erosion of iron hydroxide crust (yellow boy) within the Hippo Dam, the Tweelopiespruit and the Aviary Dam since the discharge of neutralised AMD into the Tweelopiespruit from August, 2012 upon the downstream water users, the water quality of the Crocodile West and the ecology. The Scoping Report states that in order to investigate and assess the impacts of the proposed AMD project the following specialist studies have been proposed for the EIA phase. Section 9.1.1 (page 85) of the Report states that the Final scoping report was completed but was not submitted to the DEA and the specialist studies were in process, but were since stopped. In view of the aforesaid, we request all the documents dealing with the impact assessment and possible mitigation of the Tweelopiespruit, Blesbokspruit and Klipriver since 2002, including all documentation done in the pre – and scoping phases of the process, namely: □ Surface water assessment, □ Surface water quality; and □ Surface water quantity	FSE (Koos Pretorius & Mariette Liefferink)	EIA related reports for the STI can be obtained from the TCTA.	Johan van Zyl
Specific	Report 8, First Draft, Section 1.1	Section 1.1: Characterisation of the social environment; Radiation study (including radon exposure where the rising mine water will come into contact with the near surface aquifer and radon exposure via the open shafts); • Community Health Impact Assessment (CHIA); • Ecological assessment, including: □ Wetland investigation; □ Fauna & flora assessment; and □ Aquatic assessment. □ Geohydrological assessment; □ Archaeology and heritage assessment; □ Economic analysis; □ Agricultural assessment; □ Technology assessment; □ Air quality assessment	FSE (Koos Pretorius & Mariette Liefferink)	Private parties are requested to obtain documents, not drafted by the AMD LTS study, directly from the relevant authors or project managers.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft, Section 1.1	Section 1.1: Risk assessments and documentation dealing with the ingress of pollutants and water from the West Wits Pit and the CPS Pit into the Western Basin Void. Risk assessments and documentation dealing with the ingress of pollutants and water from the West Wits Pit and the CPS Pit into the Western Basin Void. • Assessments of desalination in the current phase of operations. • Full operational and capital cost assessments of the current process. • All documents relating to the seismic activity in the area. • All agreements between DWA/TCTA and mining companies for the use of facilities, issuing of licenses, and costs. • The action plans, strategies, time frames and financial provision to address the diffuse sources of ingress such as sinkholes, open shafts, rock dumps, sand dams and tailings storage facilities. • Assessment of the contribution to AMD from the current hydraulic mining of old slimes dams and sand dumps, using high pressure water cannons, within the West Rand and Central Rand. The associated contribution to ingress is likely to be considerable since it introduces large volumes of additional water into a highly disturbed area where surfa mining and subsequent filling resulted in exceptionally high infiltration rates.	FSE (Koos Pretorius & Mariette Liefferink)	Ingress is discussed in Report 5.2 which is available on the DWA AMD Webpage. Private parties are requested to obtain documents, not drafted by the AMD LTS study, directly from the relevant authors or project managers.	Johan van Zyl
Specific	Report 8, First Draft, Section 1.1	Section 1.1: Assessment report of the accumulative impact of the Brakpan TSF operated by ERGO (DRD Gold) and the additional deposit of metal sludge on th Blesbokspruit River System since it is proposed that the sludge will be pumped to th existing ERGO regional TSF for co-disposal with their tailings. In terms of the DMR's Regional Mine Closure Strategy for the East Rand goldfields (2008) the two mega dumps (Daggafontein and Withok) are currently impacting on the Blesbokspruit river system. Since, in terms of section 6.6.1 (page 38) of the Report "based on the volume of sludge expected to be produced over 50 years, the predicted final size of the sludge storage facility is....high" it can logically be inferred that the contribution of sludge to the existing ERGO regional TSF for co-disposal with their tailings will be a significant contribution to the impact on the Blesbokspruit river system.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 2.1 and 2.2.1** How and when will it be addressed and which mitigation measures are proposed?	FSE (Koos Pretorius & Mariette Liefferink)	To be addressed in the EIA.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 2.1** If most and not all of the metals are precipitated, which metals and which percentage of metals remain? Furthermore it should be noted that the metals have not simply disappeared but that th have merely changed to a different oxidation state, which changed them from a soluble form to a solid form. They are still there, in the area where the precipitation had occurred in the first place. The process could be reversed and the contaminants mobilised, should the water become acidic. In terms of section 2.2.1 (c) the treated AMD that is discharged during the immediate and STI must not exceed 2 500 mg/l sulphate. The impact of the high salt load on the environment, animals, eco-health and downstream users must be assessed and mitigated. We refer to subjoined graph of the increase in sulphate levels in a borehole within the Zwartkrans compartment since the implementation of the immediate and STI.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 2.2.1** page 4 Please clarify	FSE (Koos Pretorius & Mariette Liefferink)	Further clarification necessary.	Johan van Zyl
Specific	Report 8, First Draft	**Section 2.2.2** page 6 It is alleged by affected communities within the Central Rand that the donation of the pumps by CRG is used by CRG as an offset against its commitments to communities in terms of its Social and Labour Plan. It is necessary to address or refute this allegation.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. This should be clarified with the TCTA as it is part of the STI.	Johan van Zyl
Specific	Report 8, First Draft	**Section 2.2.3** page 7 The ECL within the Eastern Basin, we were informed, will be reached in 2014. The short term action plan to solicit sufficient funds to purchase the pumps and to cover the operational costs for the short- and medium term treatment of AMD within the Central Basin and Eastern Basin are not addressed in the Report.	FSE (Koos Pretorius & Mariette Liefferink)	Noted, relevant to the STI.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft, Section 2.4	**Section 2.4** page 10 The justification of the rational that the polluters will not have to pay is not addressed in the Report. We argue that in terms of section 24(a) of Act 108 of 1998 of the Constitution of the Republic of South Africa the right of every person to an environment that is not harmful to their health or wellbeing is guaranteed. Effect is given to this right in the National Environmental Management Act (107 of 1998) (NEMA) through the imposition of a duty that requires that: *Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot be reasonably avoided or stopped, to minimise and rectify such pollution or degradation of the environment." (Section 28(1))*	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft, Section 2.4	Although this duty is imposed on *"every person"*, the NEMA specifically refers to the owner of, or person who has the right to use the land or premises. The scope of what constitutes *"reasonable measures"* is not defined but Section 28(3) of the Act indicates that they may include, but are not limited to, assessing the impacts of activities, eliminating the source of pollution; containing pollution; or remedying the effects of pollution.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft, Section 2.4	A very similar duty of care, but specific to water resources, is set out in section 19 of the National Water Act (36 of 1998) (NWA) where once again *"reasonable measures"* must be taken to prevent or rehabilitate pollution. However, the NWA is slightly narrower than NEMA in that the obligation is imposed on owners, persons in control of or persons who occupy land only	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft, Section 2.4	What is clear is that our law imposes obligations to remove pollution from the environment and to rehabilitate affected areas. Section 28 of NEMA clearly uses retrospective-type language.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft, Section 2.4	While conceding that it is somewhat difficult to compel a mining company to incur substantial costs today for activities that were not considered particularly irregular 50 to a 100 years ago, foreign jurisdictions appear to view the alternative solution as far more unpalatable – namely that ordinary taxpayers, who have no connection whatsoever to the harm and derived no benefit from it, will through the clean-up activities of their governments, be compelled to pay for the remediation of the affected environment. As a result many foreign jurisdictions have had no difficulty in holding parties (who generally derived some direct or indirect financial benefit from the harmful activities) liable for harm caused retrospectively, even where such harm occurred substantially prior to the enabling legislation. (Reference: Environmental Liability. Ian Sampson, Shepstone & Wylie Attorneys.)	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft, Section 2.4	If, Government is going to fund the solution, we request information regarding how Government will recover all the costs incurred, jointly and severally, from the responsible persons. We think it relevant to here refer to section 19(5) of the National water Act (36 of 1998): "Subject to subsection (6) a catchment management agency may recover all costs incurred as a result of it acting under subsection (4) jointly and severally from the following persons: *(a) Any person who is or was responsible for, or who directly or indirectly contributed to the pollution or the potential pollution;* *(b) The owner of the land at the time when the pollution or potential pollution occurred, or that owner's successor-in-title.* *(c) The person in control of the land or any person who has a right to use the land at the time when-* *(i) The activity or the process is or was performed or undertaken, or* *(ii) The situation came about, or* *(d) Any person who negligently failed to prevent-* *(i) The activity or the process being performed or undertaken, or* *(ii) The situation from coming about."*	FSE (Koos Pretorius & Mariette Liefferink)	These reports cannot be disclosed at this time, as it may jeopordize future legal processes.	Johan van Zyl
Specific	Report 8, First Draft, Section 2.4	Since Government, that is the taxpayer, will fund the solution in this scenario, it is imperative that the public be involved in the decision – making process.	FSE (Koos Pretorius & Mariette Liefferink)	Will need to be taken into the EIA process and the recommended public participation processes that may follow.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 2.4** page 9 What is the time frame within which the salts will be removed or suitably reduced (or the time when the Long Term Solution for AMD will be implemented)? In view of the findings (subjoined) of the DWA's Reconciliation Strategy for the Vaal River System the salts must be removed or suitably reduced from the system in 2014/2015, howev Table 5:1 (Page 23) of the Report indicates that this phase will only be implemented by 2017. Please elucidate the anomaly. **Figure 1: Vaal River System Reconciliation** In the case of the Vaal River System only the Polihali Dam has advanced sufficiently far in planning to enable construction to commence and with first transfers expected by 2020. The pre-feasibility for Orange-Vaal Transfer and Thukela Vaal Transfer has not yet commenced, therefore, the ability to obtain water from these systems is even further in the future. The conclusion by the Department of Water Affairs is that use of Acid Mine Drainage remains the only option available to augment the Vaal River System within the required timeframe. Although the use of AMD only produces 58 million m3/annum due to the fa that dilution release will not be required it will release a further 220 million m3/annum, in the Vaal Dam, for consumptive use. The effect of implementing this option is shown below.	FSE (Koos Pretorius & Mariette Liefferink)	The implementation of the LTS should be in time not to compromise the assurance of supply of water from the Vaal River system.	Johan van Zyl
Specific	Report 8, First Draft	**Figure 4: Vaal River System Reconciliation** If AMD is not treated to a level where the salt load is removed, the Upper Vaal will go in deficit in 2014/2015 and if there is a drought, long overdue, either: 1) Restrictions will be placed on consumers in the Upper Vaal; or 2) The dilution standard at Vaal Barrage will be relaxed resulting in very poor quality water reaching the consumers in the Middle and Lower Vaal (KOSH area, Free State Goldmines and all the mining activity in the Northern Cape on the Vaal Gamagara Scheme).	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 6.7** page 39 The costs of the RO package plants ought to be compared to the costs to the environment and downstream water users if the sulphates cannot be reduced significantly or taken out of the system by 2014/2015. High salinity will furthermore have an impact on Eskom's energy generation. Water restrictions may result in job stagnation, economic stagnation and possible social decay.	FSE (Koos Pretorius & Mariette Liefferink)	The aim of the LTS is to avoid and prevent unacceptable impacts on the water resource and downstream users. Package Plants were considered and initial indications are that they will not be feasible as a Long-Term Solution.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 4.2** page 19/20 There can be no uncertainty that AMD contains uranium. Please see subjoined graphs, which are grounded upon the DWA's Western Basin Decant Technical Working Committee presentations by DDScience. (Source: Western Basin Decant Technical Working Group Committee - Surface Water Quality and Sample Locations. 11 November 2010) Furthermore, in section 6.4.2 (page 37) of the Report it is stated that "if Ion Exchange is used to treat the full flow of raw AMD, it will have a high cost, b all the Uranium will be removed and could have a commercial value." It follows hence that raw AMD contains uranium. Uranium and its progeny are radioactive. In addition, Coetzee et al., 2003 report a uranium concentration in a surface-water body next to the northern watershed of the headwater region of the Wonderfonteinspruit (Robinson Lake) of 16 mg/l after underground mine water decanting into the Tweelopiespruit was pumped into the lake. The combination of pH- and redox-driven reactions resulted in a measured uranium concentration of 16 mg/l, and resulted in the NNR declaring the lake a radiation area. (Reference: Coetzee, H. (compiler) 2004: An assessment of sources, pathways, mechanisms and risks of current and potential future pollution of water and sediments in gold-mining areas of the Wonderfonteinspruit catchment. WRC Report No 1214/1/06, Pretoria.)	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	The Task Team's Report (December 2010) to the Inter-ministerial Committee on AMD stated: *"Acid mine drainage in the Witwatersrand typically has a pH value around 3 ... and is enriched in a number of toxic metals, often including uranium."The Task Team's Report (December 2010) to the Inter-ministerial Committee on AMD stated: "Acid mine drainage in the Witwatersrand typically has a pH value around 3 ... and is enriched in a number of toxic metals, often including uranium."* *It follows hence that the sludge, after neutralisation or the brine, after desalination, will contain uranium and its progeny. The National Nuclear Regulator Act (No 47 of 1999) (NNRA) is therefore applicable to the implementation of the short-, medium and long term treatment of AMD. Research findings into the health effects of uranium add to a body of knowledge which now suggest that uranium displays a much wider spectrum of chemo- and radiotoxic properties than was previously thought to be the case. There is a duty of care on DWA to assess the impacts of uranium on the environment and humans and to comply with the NNRA.* *Please also see the paper titled "Desktop assessment of the risk for basement structures of buildings of Standard Bank and ABSA in Central Johannesburg to be affected by rising mine water levels in the Central Basin" (May 2011) (Prof. Dr. Frank Winde) appended hereto. (APPENDIX "C") I quote verbatim from pages 8 and 9:*	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	"***Groundwater pollution and associated radon exposure***: *Where the rising mine water will come into contact with the near-surface aquifer, U contamination is, at least initially to be expected. The associated radon risk needs to be assessed especially for informal settlements where the radioactive gas (formed ongoingly through the radioactive decay of uranium contained in the mine water) can easily accumulate in low-lying, poorly ventilated shacks which often lack concrete floors that could limit a radon influx. As a leading cause of lung cancer in uranium miners, radon exposure constitutes a severe health risk.*	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	***Radon (Rn) exposure via shafts***: *Since shafts are directly connected to the mine water and act as preferred conduits for equalizing barometric pressure differences between the void and the surface, it is likely that radon can reach the surface relatively quickly and well before it decays (the half life of Rn is 3.8 days) even in areas where the water table will remain deep below the surface. Thus, radon is likely to already escape from shafts well before the flooding of the mine void is complete. This renders shafts potential hot spots for radon exposure of surrounding areas. With over 100 shafts distributed across the mining belt the potential for radon exposure is considerable. The identification of affected areas may be difficult especially where old shafts have been covered with soil, or other material. As radon is odourless and the covered shafts invisible such spots are particularly dangerous for nearby residents."*	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	Furthermore, in terms of a court document which was submitted by the Chief Director: Compliance of the Department of Environmental Affairs in its responding Affidavit to the FSE's application pertaining to the unlawful removal of radioactive tailings from the Tudor Shaft Informal Settlement, it was stated by the DEA that "because the radioactive nature of the material ...means that the National Nuclear Regulator Act, 1999 (Act No 47 of 1999) is applicable. This means that the National Nuclear Regulator (NNR) has jurisdiction and therefore the obligation to consider whether or not to authorize the removal of the tailings dam." By analogous reasoning since AMD and the sludge contains radionuclides, the NNR ought to be involved and the NNRA is applicable.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	It is our firm opinion that the sludge disposal facilities fall squarely within the NNRA's definition of a "*nuclear installation*" in that it is "*a facility specifically designed to temporarily store any radioactive material which is intended to be disposed of as waste material.*" (Section 2 of the NNRA.) (The exemption is: If the level of radioactivity is lower than 0.5Bq/g, the NNR would not apply and the DEA would have jurisdiction over the sludge disposal facilities.)	FSE (Koos Pretorius & Mariette Liefferink)	The costed Concept Design allows for Ion Exchange which will remove the uranium prior to the HDS Step, thus producing sludge and brine that does not contain Uranium.	Johan van Zyl
Specific	Report 8, First Draft	There can be no doubt those receptor dams of AMD, such as the Robinson Lake falls within the jurisdiction of the NNR. For example: Coetzee et al., 2003 reported a uranium concentration in a surface-water body next to the northern watershed of the headwater region of the Wonderfonteinspruit (Robinson Lake) of 16 mg/l after underground mine water decanting into the Tweelopiespruit was pumped into the lake. This extreme concentration is believed to be the result of remobilisation of uranium from contaminated sediment by acidic water. The Robinson Lake was declared a radioactive area by the NNR. (Reference: WRC Report 1214/1/06.)	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 16 & 16.2.2** page 174-179 The contribution to AMD of tailings reclamation activities on surface has not been addressed. Tailings reclamation is particularly pronounced in the West and Central Rand. The associated contribution to ingress is likely to be considerable as old tailings are hydraulically mined using high-pressure water cannons (Mintails uses acid mine water in its reclamation process). This introduces large volumes of additional water into a highly disturbed area were surface mining and subsequent filling resulted in exceptionally high infiltration rates. It furthermore introduces air and water into anaerobic tailings, which will exacerbate water pollution in the short and medium term.	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope. This study only deals with AMD generated in the underground mine workings.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	The following findings from The Council of Geoscience and the Department of Mineral Resources are highly relevant with reference to the reclamation of mine tailings dams (reference: Mine Closure 2008 – A.B. Fourie, M. Tibbett, I.M. Weiersbye, P.J. Dye (eds); ISBN 978-0-9804185-6-9; "South Africa's Challenges Pertaining to Mine Closure – the Concept of Regional Mining and Closure Strategies"):	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	• In past dump reclamation activities, a number of cases have been indentified where the re-mining of dumps was not completed, either due to a lack of funding on the part of the miner or due to heterogeneity in the dumps which were mined. Any new application to exploit mining residues should only be approved if it involves the removal of an entire residue deposit and the rehabilitation of the remaining footprint. If this is not the case, rather than consolidating contaminated sites, the reprocessing activities result in the creation of two contaminated sites, where one previously existed.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	The past practice of granting rights and authorization for the reprocessing of individual residue deposits may need to be reviewed insofar as it allows the selective extraction of value from portions of a site without ploughing some of that value back into the rehabilitation of the entire mining area. It must be accepted that the reprocessing of some mining residues will never be economically viable and that these will need to be transported to superdumps, if this is not too costly or rehabilitated in situ. • Radiometric surveys over previously reprocessed mine residue deposit footprints have, in some cases, shown elevated levels of residual radioactivity in the soils. In these cases, it must be accepted that some areas will never be suitable for unrestricted developments and these areas will need to be demarcated as such, and appropriate la uses proposed and implemented. reprocessing of individual residue deposits may need to be reviewed insofar as it allows the selective extraction of value from portions of a site without ploughing some of that value back into the rehabilitation of the entire mining area. It must be accepted that the reprocessing of some mining residues will never be economically viable and that these will need to be transported to superdumps, if this is not too costly or rehabilitated in situ.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	The from source pollution from current operations has not been adequately addressed. In many areas water contaminated on mine sites enters the local surface water system with little or no attempt to mitigate its impacts and there is little or no enforcement of environmental infractions. To exemplify:	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope. This study only deals with AMD generated in the underground mine workings.	Johan van Zyl
Specific	Report 8, First Draft	1. The separation of clean and dirty water (in terms of GN 704) within the Lancaster Dam area, which is within the source of the Wonderfonteinspruit, is grossly inefficient – rainwater is diverted into an unlined trench where it interacts with the highly contaminated soil and flows directly into the Upper Wonderfonteinspruit.	FSE (Koos Pretorius & Mariette Liefferink)	Agree, but outside of this Study's scope.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	2. There are regular unmitigated spillages of slurry and acid mine water from Mintails operations within the Upper Wonderfonteinspruit.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. Outside of this Study's scope.	Johan van Zyl
Specific	Report 8, First Draft	3. The footprint of the reclaimed CAMS Dump is unremediated and plumes of highly contaminated water flowing into the Upper Wonderfonteinspruit are visible within the area.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. Outside of this Study's scope.	Johan van Zyl
Specific	Report 8, First Draft	4. Mintails is currently conducting open cast operations within the source of the Wonderfonteinspruit and is of the intention to reclaim the Tudor Dam. The Tudor Dam is located in the south eastern portion of the headwaters of the WCA. During rainy periods water would flow into and out of the dam. The activity concentration of uranium 238 in the soils and sediments behind the dam are high, 8000 – 10000 Bq/kg with radium 226 at 1700-2800 Bq/kg. The dry wetland below Tudor Dam contains uranium activity concentrations at 2000 Bq/kg and 1200 Bq/kg for radium. (Reference: Wonderfonteinspruit Catchment Area: Remediation Action Plan. April 2009. DWA. NNR.) (WCA: RAP). Unless the reclamation activities are conducted responsibly and environmental infractions are enforced with commitment and diligence, the reclamation activities will exacerbate the water pollution. The WCA: RAP found that “any erosion of material from this area will wash down into the Lancaster dam area and will have to be dealt with the mine at this location.”	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	5. It is believed that there is a fault underneath the highly toxic Lancaster Dam, which allows for the ingress into the groundwater. Although the WCA: RAP identified the Lancaster Dam (MP46) as “the most urgent” for “immediate action.””The main pollutants are suspected of being acidic water and associated toxic metals arising from oxidation sulphides such as iron sulphide, also known as pyrite.” It was recommended that the following actions should be taken “as a matter of priority”: “That a mining and rehabilitation plan for the Lancaster dam site be prepared and submitted to the licensing authority for approval within a year.”	FSE (Koos Pretorius & Mariette Liefferink)	Noted. Outside of this Study's scope.	Johan van Zyl
Specific	Report 8, First Draft	After the effluxion of more than 4 (four) years since the publication of the WCA: RAP and more than 6 (six) years since the publication of the Brenk Report, the Lancaster Dam, the Tudor Dam and identified radioactive hotspots within the Wonderonfeintspruit remains unremediated. Ingress control will be superfluous unless environmental infractions are enforced and the recommendations of Reports, such as the above-mentioned, diligently implemented.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 16** There is no reference made to the remediation of receptor dams, river and wetlands which have been contaminated by AMD and mining activities. The Task Team's Report to the Inter-Ministerial Committee on AMD found that: "Unfortunately this water is of po quality. Some is already contaminated owing to interaction with mining residues and other materials on the surface before it enter the mine void." Remediation of mining-affected surface areas may result in the improvement of the decant water quality. This would simultaneously improve living conditions in many of the densely populated settlements which encroach onto the mining belt across the Central and West Rand. It appears that the remediation of contaminated areas falls outside the scope of the immediate, short-, medium and long term solution for AMD. This is a serious flaw and gap. Please see subjoined photographs of some of the contaminated areas.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. Outside of this Study's scope.	Johan van Zyl
Specific	Report 8, First Draft	**Section 5.1** page 22 The concern was raised during the information dissemination meetings that the FSE foresees that the short term solution will translate into the long term solution. This proposal substantiates the FSE's fears and concerns. We request that an assessment of the impact of the discharge of neutralised AMD, containing 2 500 mg/l sulphate, via the Tweelopie Spruit, on the receiving water body of the Crocodile River System, the ecology, the downstream water users and agricultural activities particularly within the Zwartkrans Compartment be conducted in order to determine the costs to the ecology and downstream water users as a resu of the high salinity.	FSE (Koos Pretorius & Mariette Liefferink)	Noted, such water quality modelling are being done by WRP. Results thereof were not available when drafting Report 8. The report will however be updated once the results are available. In principle it is not advisable to discharge highly saline water into the crocodile river system in the long-term as this may affect its fitness-for-use.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	In terms of the Environmental Impact Document (DWAF In terms of the Environmental Impact Document (DWAF 16/2/7/C221/C/24) titled "Impact of the discharge of Treated Mine Water, via the Tweelopies Spruit, on the receiving water body Crocodile River system, Mogale City, Gauteng Province" 2 654 Ha are under irrigation using borehole water, 458 Ha are under irrigation using river water and 11,491 people live on dolomite using 250l/person/day groundwater for domestic use within the Zwartkrans Compartment. Sulphate concentrations of 600mg/l or more cause diarrhoea in most individuals and adaption may not occur. The tendency of sulphate to induce diarrhoea in people depends to some extent on the associated cation. Magnesium will induce diarrhoea, whereas sodium will not. Unfortunately magnesium occurs in near-saturated quantities in dolomite, as it forms part of the dolomite mineral, $CaMg(CO3)2$. We refer to the increase in sulphate concentrations in the groundwater within the Zwartkrans Compartment since the neutralisation process within the Western Basin commenced in August, 2012. Please see subjoined graph	FSE (Koos Pretorius & Mariette Liefferink)	Noted.	Johan van Zyl
Specific	Report 8, First Draft	**Table 5.1** page 23 In terms of the Task Team's Report to the Inter-Ministerial Committee on AMD it was stated that "the open pit operations are directly connected to the mine void." And in terms of section 7.6.1 (page 46) of the said Report, with reference to the nature of the HDS sludge it is stated "it is assumed that the sludge will be classified as hazardous." We raise serious concern regarding the discharge of the sludge and other residues, assumed to be hazardous, into an open pit, directly connected to the mine void, in the absence of a high confidence, independent assessment. Continuous monitoring of the shallow surface aquifer as well as the deeper aquifer and the disclosure of the monitoring data to interested and affected parties are essential. There is intense interest in recent years by the public in water resource quality.	FSE (Koos Pretorius & Mariette Liefferink)	LTS Reference Project allows for Ion Exchange to remove uranium.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	Monitoring of radioactivity and the disclosure of the radioactivity concentrations to the public are furthermore called for. We raise serious concerns regarding the history of extreme secrecy and confidentiality on all nuclear issues and the failure by the National Nuclear Regulator to engage, in transparency, honesty and openness, with the public on issues of radioactivity. By and large, radioactive materials, primarily from the uranium series, form part of the same package as other contaminants, including a range of metals, some of which are potentially toxic. Furthermore, it has been shown that the risk posed by uranium, an important by-product of gold mining in the Witwatersrand and an identified hazardous component of the wastes and effluents from Witwatersrand mining activities, occurs due to both radiotoxicity and chemical toxicity with, in some cases, the chemical toxicity dominating over the radiotoxicity. It is therefore logical that an integrated approach be adopted for the monitoring and management of radioactive and chemical contamination and this ought to be facilitated by the different government agencies and regulators involved. (Reference: South Africa's Challenges Pertaining to Mine Closure – The Concept of Regional Mining and Closure Strategies. D.M. van Tonder et al. ISBN 978-0-9804185-6-9)	FSE (Koos Pretorius & Mariette Liefferink)	Noted, outside of this Study's scope, although uranium removal has been allowed for.	Johan van Zyl
Specific	Report 8, First Draft	**Section 5.4.4** page 28 While it is heartening that neutralised AMD for the use of irrigation is currently researched, it is disheartening that the proposals for saline agriculture on the tops of tailings dams (brown fields) to produce bio- fuel and to ameliorate the dust fallout are not considered as relevant for research.	FSE (Koos Pretorius & Mariette Liefferink)	Noted. As with all other possible solutions, service providers proposing this will be considered and evaluated against the Reference Project. The aim is to reduce salt loading of the major river systems and proposed solutions would be evaluated in the context of this aim. An email was sent to Prof Robin Barnard to review the Options for Use Report, but no feedback was received.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 16.2.1** page 176 The backfilling of the Pits is recommended as ingress control. It is imperative that a high confidence independent geochemical assessment be conducted in order to determine the geochemical characterisation of the tailings and the impact of the tailings and sludge on the groundwater. It is furthermore imperative to continuously monitor the shallow aquifer and deeper aquifer surrounding the Pits and to make the water quality data available to affected and potentially affected water and land users, to mitigate the impacts and to compensate affected parties if there are damages.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 2.3** page 9 We refer to the preliminary comments from Prof. Dr. Frank Winde pertaining to the Mintail's Tailings Water Treatment Technology for AMD. (APPENDIX "B") The preliminary report by Prof. Winde concluded: ***(5) Summary and conclusion*** Since the proposal presented to us for review lacks important data we are not able to fully assess the feasibility and viability of the proposal. This lack of crucial technical information and detail combined with an unjustifiable abundance of largely irrelevant information (e.g. on the – faulty - history of AMD) and an over-complicated (partly erroneous) chemistry section creates the impression that the document was designed to impress uninformed parties rather than to inform decision makers. Based on additional information supplied to us via e-mail correspondence a first opinion on the general merits of the proposal was formed. Generally, we believe the proposal is not a sustainable or in any form desirable as a long-term solution to the AMD problem. The proposed method should only be considered as a treatment option after having be subjected to rigorous scientific review by an independent party to which all required data have to be supplied by the applicant (i.e. Mintails) and if the review confirms the proposed method to be technically sound and economically viable. The main concern is that the proposal does not, in any way, offer a long-term solution to the AMD problem and would, at best, only allow postponing the need for finding a sustainable long-term solution provided the method is as successful as claimed.	FSE (Koos Pretorius & Mariette Liefferink)	Noted, due to confidentiality and non-disclosure agreements we could not reveal any more detail on the Mintails process. Additionally, if implemented, the Mintails process will only be for the medium-term (due to the number of mine-dumps that are available for processing).	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	a Whether the suggested mixing of AMD and alkaline tailings will have the claimed effects of neutralising discharged surplus water is by no means proven. The supplied data are sketchy and insufficient to support this claim especially with respect to reactions in water discharged into nearby streams as well as long-term consequences. Errors and omissions regarding pertinent chemical reactions governing the process cast further doubt on the viability of the proposed method. Furthermore, the impression is gained that the proposal is an attempt to recover normal operational (and even capital) costs incurred by treating tailings and ore from government through offering the 'service' of neutralising acid mine water even though the latter is part of the normal operation. If costs to Government for treating pumped AMD at the existing (recently expensively revamped) water plant of Rand Uranium can be lessened in the short-term by Mintails through using AMD in its internal processes this should however be considered as a means to lower the burden on society. This should preferably be done with the understanding that saved funds are used to address the root cause of AMD and to implement sustainable solutions. However, before the method can be considered for short-term implementation it first needs to be established by rigorous laboratory and field trials that the claimed effects of the mixing method are indeed present and that they are not outweighed by possible other costs such as increased pumping depth or environmental deterioration."	FSE (Koos Pretorius & Mariette Liefferink)	Noted, see comment above	Johan van Zyl
Specific	Report 8, First Draft	implementation it first needs to be established by rigorous laboratory and field trials that the claimed effects of the mixing method are indeed present and that they are not outweighed by possible other costs such as increased pumping depth or environmental deterioration." Prof. Dr. Christian Wolkersdorfer, the general secretary of the International Mine Wate Association, in personal communication with the CEO of the FSE, dated the 5th of July, 2013 wrote "In addition, I think that the Mintails technique needs a sound scientific investigation. Based on current information I can't say if it is a good or a bad technique."	FSE (Koos Pretorius & Mariette Liefferink)	Noted, see comment above	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 4.1** page 19 The reference is undoubtedly to the engagement of the DWA with the mining companies, however, by analogous reasoning, the FSE's endeavours to solicit a response regarding the invitation by Messrs Keet, van Wyk and Claassens, extended during the third and last Feasibility Study SSC on the 18th of May, 2013, to meet in order to obviate legal interventions, including an appeal process (see page 87, section 9.1.3(b)) by the FSE have been fruitless and abortive. The FSE is now compelled to escalate its concerns. It may have legal implications for the DWA, the TCTA and Aurecon. While the DWA is reticent in utilising tax payer and Government funds, it perplexes that the highest cost burden of combating salinity is still being carried by the agricultural and domestic sectors and the environment and not by the industry as might be expected.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	The Water Research Commission's Report WRC Report No 800/1/00 titled "An Economic and Technical Evaluation of Regional Treatment Options for Point Source Gold Mine Effluents Entering the Vaal Barrage Catchment" (2000) concluded in 2000 that the highest cost burden of combating salinity is currently being carried by the household sector and not by industry as might be expected and recommended that the most feasible economic strategy to encourage the internalisation of externalities should be investigated and implemented. It furthermore found that the "user savings" are economic costs: they take into account the costs borne by those other than the polluter. As such, they can be used to form a basis for internalising the externalities. Some economic instruments that could be use in this regard were proposed in the said Report. It also found that the "polluter pays principle" is based on the internalisation of externalities and therefore is central to the equitable resolution of pollution costs currently being borne by the end user.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	It perplexes that after effluxion of more than 12 (twelve) years since the above-mention WRC Report, the DWA has not implemented the strategies proposed by the Water Research Commission. Furthermore, the taxpayer is currently funding the infrastructure and treatment of the short term treatment of AMD. If additional pumping is required in order to protect the commercial interests of Gold Reef City and Central Rand Gold, it will be unfair and inequitable if the additional costs are carried by the taxpayer who will derive no commercial benefit from Gold Reef City and Central Rand Gold's commercial activities.	FSE (Koos Pretorius & Mariette Liefferink)	Noted, ECL of LTS Reference Project for Central Basin is above Gold Reef City museum and well above the level that CRG wants to mine.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 9.6** page 101 **and Chapter 15** It raises concern whether there are sufficient funds available for ongoing and long term monitoring. We were credibly informed by the DWA that there are insufficient funds available e.g. to do continuous monitoring and to monitor for certain metals, such as cobalt, copper, uranium, etc. With water samples displaying pollution levels only for the exact moment they were taken, a sufficiently small sampling interval is needed for reliably characterising such dynamic systems such as streams. This, however, is a major shortcoming in the current monitoring and data used. The report which the DWA supplied the FSE with only analysed grab samples. In view of frequently drastic short-term fluctuations of pollution levels caused by day-night rhythms of discharging mine effluents, natural diurnal fluctuations of water chemistry as well as events such as rainstorms and spillages weekly sampling intervals are inadequate. This is illustrated by the fact that U- levels in samples used in IWQS (1999) from identical sites (normally sampled at the same day of the week and the more or less the same time of the day) at some locations fluctuate by up to an factor of 1000 (i.e. 100000%).	FSE (Koos Pretorius & Mariette Liefferink)	Noted, therefore it is stated in the report: "Intensive monitoring is critical for the on-going effective management of AMD".	Johan van Zyl
Specific	Report 8, First Draft	**Section 6.8** page 40 The Private Sector will not invest in the treatment of AMD if it is not economically viable and there are no clients to purchase the treated water. Since Rand Water has not identified the current and potential industrial consumers and has not specified the locations or quality requirements for the users, this may result in a disincentive for the private sector to invest. While there is no doubt that a public private partnership is required however the details of such arrangements are far from being resolved. It will have serious implications for the implementation of the long term treatment of AMD. We foresee that DRD Gold will consider such an arrangement as unfair, onerous and one-sided. On the other hand, the DWA/TCTA may offer benefits to DRD Gold or offsets which may be prejudicial to the environment or the public.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	The concern was raised during the information dissemination meetings for the immediate-, short and medium term treatment of AMD, namely that the long term treatment ought to advise the immediate-, short and medium term treatment of AMD and that failure in this regard, may result in the HDS infrastructure redundancy with resultant wasted costs for the taxpayer and Government. It raises concern that wasted costs will be incurred if infrastructure is erected at significant cost to the taxpayer, and after 10 – 15 years abandoned as redundant.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 7.3.1** page 4.3 This deplorable situation has resulted from the failure of the DWA to enforce existing environmental legislation. The Aurora Grootvlei Mine scandal has been widely reported upon. Aurora Empowerment System brought the Grootvlei Mine to its knees: it stripped the Mine; it neglected to pump acid mine water from its shafts; it allowed for th flooding of the remaining pumps in the Grootvlei Mine and prior to the flooding of the Grootvlei Mine, it discharged approximately 108 Ml/d untreated mine water into the Blesbokspruit. Grounded upon the above-mentioned case, the construction of expensive water treatment works and erection of expensive pumps in the absence of the enforcement of environmental contraventions and infractions nullify the positive benefits which may flow from the treatment of AMD.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 9.1.3 (a)** page 86 On the 20 November 2012, the DWA/TCTA advised the FSE: AMD SHORT TERM INTERVENTION: EXEMPTION APPLICATION The Department of Water Affairs recently received a communiqué from the Department of Environment Affairs directing that the Exemption Application for the Short Term Interventions for the AMD Problem in the Witwatersrand Goldfields must be made in terms of the following: • Section 24M of NEMA provides for the circumstances for under which an exemption application can be made; • Section 50 through 54 of the EIA Regulations provides the conditions for the consideration of the application for exemption; and • Section 31 through 34of the EIA Regulations provides for the parts of the EIA Regulations that are to be exempted.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	The Exemption Application has been prepared and submitted to DEA in terms of Section 24M, and the communication with stakeholders through Section 54.However, the components of the EIA regulations that are to be exempted were not previously defined and it is therefore necessary to detail these requirements. The exemption application therefore, now includes Regulations 31 through 34, viz: 31. Environmental impact assessment reports; 32. Specialist reports and reports on specialised processes 33. Content of draft environmental management programme (operations, rehabilitation and closure). 34. Consideration of environmental impact assessment reports. The DWA reaffirms its commitment to conduct an EIA that includes the short and long term interventions and their implications for the environment, together with the development of an EMP for operations, rehabilitation and closure. There is therefore an anomaly between the statement in the Report which states "The LTS in the Central and Eastern basins (and by logical inference – the Western Basin) will comprise existing activities (STI) which are already authorised and new activities which are unique to the LTS" and the above highlighted section in the letter from the DWA/TCTA to the FSE. Please elucidate.	FSE (Koos Pretorius & Mariette Liefferink)	EIA for the long-term should include STI activities as well. As far as it is understood, this was one of the conditions for the exemption.	Johan van Zyl
Specific	Report 8, First Draft	New activities will augment or add on to the activities which are already authorised. It will be necessary to investigate and assess the accumulative impacts and propose mitigation and management measures. To exemplify: While the disposal of toxic and radioactive sludge in the West Wits Pit or on ERGO's facilities for the short term treatment of AMD has already been authorised, the LTS may introduce additional risks, which ought to be investigated and assessed. Furthermore, the release of highly mineralised water (sulphate levels of 2 500mg/l) into the Tweelopiespruit has already been authorised for the short term treatment of AMD, however, the long term discharge of high sulphate loads during the LTS may create additional risks to the environment, the ecology and downstream water users. This must be investigated and assessed.	FSE (Koos Pretorius & Mariette Liefferink)	Noted, although discharge of high sulphate load water is not recommended for the long-term.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	It should be noted that any environmental contraventions by Mintails (Mogale Gold) during the 10 -15 years of co-disposal and agreement with DWA and future adverse environmental impacts, will also reflect negatively on the DWA and may trigger criminal and civil charges against the DWA. (To exemplify: Mintails is currently operating without a Water Use Licence. A pre-directive or an application for a Water Use Licence is not a basis to commence operations.) The responsibilities and liabilities and duty of care in the long term will furthermore rest, not only on Mintails, but also on the DWA. Insolvency or liquidation of the Mine, possible cessation of operations, abandonment of the Mine, and the sale of the Mine or other factors must be taken into consideration. Furthermore since environmental impacts of mining are cumulative and typically require several decades to take effect, by the tir environmental consequences become noticeable, Mintails may have closed or become insolvent and thus cannot be compelled anymore to contribute to remediation, either financially or through other actions.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	The risk to the DWA may be in terms of: Statute • Direct statutory liability – e.g. exposure to the "duty of care" requirement in terms of section 38 of the MPRDA or section 28 of the NEMA. • Administrative liability – pollution directive and cost recovery exposure. • Criminal liability – fines and criminal damages claims. Delict Potential strict / absolute liability exposure Reputational harm The legal precedent which was established in the Harmony Gold Mining Co Ltd v Regional Director: Free State, Department of Water Affairs and Forestry (2006) SCA 65 (RSA) case has relevance. In the context of section 19 of the NWA steps required may extend beyond a mine's land. The learned judge found that: "I find nothing in the wording of section 1991) and (2) which warrants the conclusion that the measures required are intended to be confined to the land of the person obliged to take such measures. The wording is wide enough to include measures on another's land."	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	Where does the risk to the DWA come from? • National Environmental Management Act 107 of 1998 (NEMA): Section 28(1) "Every person who causes, has caused or may cause significant* pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring..." *(In terms of legal precedent, the threshold for "significant" is not high.) "...an owner of land or premises, a person in control of land or premises or a person who has the right to use the land or premises on which or in which...any activity or process is or was performed or undertaken...or any other situation exists which causes, has caused or is likely to cause significant pollution or degradation of the environment."	FSE (Koos Pretorius & Mariette Liefferink)	DWA bears the overall responsibility.	Johan van Zyl
Specific	Report 8, First Draft	National Water Act 36 of 1998 (NWA): Section 19 "An owner of land, a person in control of land or a person who occupies or uses the land on which...any activity is or was performed or undertaken; or...any other situation exists, which causes, has caused or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring." NEMA section 34(7): Any person who is or was a director of a firm at the time of the commission by that firm of an offence under a provision listed in Schedule 3 (this includes the NWA) will be guilty in their personal capacities of the offence and liable on conviction to the penalties imposed if the offence in question resulted from the failure of the director to take all reasonable steps that were necessary under the circumstances to prevent the commission of the offence by the company. Proof of the said offence by the firm under the Schedule 3 provision shall constitute prima facie evidence that the director is guilty under this subsection of NEMA.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	Under these provisions, which includes the NWA, it is only necessary to show that the responsible person* at the time failed to take reasonable measures, which implies a strict (almost absolute liability) since such failure to take reasonable measures, or ever pollution impacts were caused inadvertently, automatically invokes the liability. *(Responsible person: Section 19 of the NWA deals with the prevention and remedying effects of pollution and states in subsection 19(1) that "an owner of land, a person in control of land or a person who occupies or uses the land on which- (a) any activity or process is or was performed or undertaken; or (b) any other situation exists, which causes has caused or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring." Section 28 of the NEMA, deals with the duty of care towards pollution prevention and remediation, and provides for a very broad duty to take reasonable measures to rectify pollution or degradation in section 28(1). It includes persons who, inter alia, causes and has caused pollution or degradation.)	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**section 9.2.1** page 9 (b) The land which could be offered by the mines will be degraded or contaminated land. The current and future liabilities of the management and remediation of contaminated land will be transferred to DWA. The mines will furthermore not be held accountable for the costs pertaining to the short-, medium and long term address of AMD since the donation of contaminated land would be considered as an offset. This is a gross violation of the "polluter pays principle."	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 9.3.1** page 94 The concern was raised during the information dissemination meetings for the immediate-, short and medium term treatment of AMD, namely that the long term treatment ought to advise the immediate-, short and medium term treatment of AMD and that failure in this regard, may result in the HDS infrastructure redundancy with resultant wasted costs for the taxpayer and Government. We again raise concern that wasted costs will be incurred if infrastructure is erected at significant cost to the taxpayer, and thereafter mothballed.	FSE (Koos Pretorius & Mariette Liefferink)	Noted, but other innovative technologies are not yet proven and may lead to an environmental catastrophe should they fail. Approach for LTS was to follow low risk option, albeit it is at a high cost. Innovative technologies that have in the mean time been proven to work would be considered during the tender process for a LTS and would be measured against the reference project.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 9.3.3** page 97 Concern is raised regarding the current human- and technical resources constraints within the DWA to implement the evaluation process. The FSE further points out that governmental response for AMD would involve collaboration between five departments. Interdepartmental collaboration may prove to be problematic. If the DWA appoints an Implementing Agent will it be a consultancy firm such as Aurecon or the TCTA?	FSE (Koos Pretorius & Mariette Liefferink)	This has not yet been determined, although Aurecon is not an implementing agent, but a Professional Service Provider.	Johan van Zyl
Specific	Report 8, First Draft	**Section 9.1.3 (d)** In addition to the EIA for the long term treatment of AMD, Digby Wells Environmental will be in the position to complete its EIA Report and specialists' studies for the immediate and short term treatment for AMD at little additional cost since it has already embarked and advanced on the EIA Report and specialists' studies for the short term treatment of AMD when the process was stopped by the DWA/TCTA . The information must be made available to the public for scrutiny. The EIA for the long term treatment of AMD must include a public participation process that is genuine and not merely a tokenism	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 9.5** page 101 We raise concern that communication with affected communities, particularly the disadvantaged and disempowered, in culturally appropriate ways, was not conducted. In terms of section (4)(f), (g) and (q) of the NEMA: "The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured. "Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge. The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted	FSE (Koos Pretorius & Mariette Liefferink)	A feasibility study does not include public consultation. This is part of the EIA process that follows the feasibility study.	Johan van Zyl
Specific	Report 8, First Draft	**Section 15.4.1** page 160 The impacts upon the environment and downstream water users of the drying up of the springs must be assessed and the impacts must be mitigated.	FSE (Koos Pretorius & Mariette Liefferink)	To be addressed in EIA.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Section 15.4.1** page 170 Since the dewatering has commenced since August 2012 and exemption from the EIA has been requested and authorised, if dolines, subsidences or sinkholes, human fatalities or damage to property occur, by logical inference, the DWA/TCTA will be responsible and liable since DWA/TCTA failed to exercise a duty of care*. *The duty to take care is the duty to avoid doing or omitting to do anything the doing or omitting to do which may have as its reasonable and probable consequence injury to others, and the duty is owed to those to whom injury may reasonably and probably be anticipated if the duty is not observed. In terms of the law of delict, DWA/TCTA there can be in addition to criminal liability, grounds of civil liability for negligence or culpa*. *Culpa is not to foresee what a reasonable man would have foreseen. Negligence may be defined as conduct which involves an unreasonable risk of harm to others. It is the failure in given circumstances to exercise that degree of care which the circumstances demand.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	**Section 16.1 & 16.2** Windblown dust from tailings dams as a significant source of potential water pollution has not been addressed. In substantiation: In terms of the West Rand District Municipality's Environmental Management Framework 43 tons per day of windblown dust from tailings dams disperse into the receiving environment. Stormwater drainage systems, into which windblown dust from adjacent slimes dams is flushed by run-off from sealed surfaces, are likely to constitute a major source of potential water pollution. Based on (conservative) assumptions regarding the affected surface area and average deposition rates of dust from adjacent slimes dams, it was estimated that approximately 10 tons of (particle-bound) uranium per year are flushed by stormwater into receiving watercourses. Dust concentrations of up to 3 700 mg per m³ of air were reported from areas adjacent to slimes dams of the East Rand during a windy day. (Reference: "An Assessment of Sources, Pathways, Mechanisms and Risks of Current and Potential Future Pollution of Water and Sediments in Gold-Mining Areas of the Wonderfonteinspruit Catchment." Report, WRC, H Coetzee et al, Council for Geoscience. 2004. Report No 1214/1/06. 2006	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	It is necessary to establish the impacts upon the groundwater during the disposal of tailings into the pits and whether or not there exists the potential for the remobilisation and solubilisation of metals under redox conditions. The monitoring of the groundwater should be continuous and interested and affected parties should be supplied with the data. In terms of MRD Regulation 62 interested and affected parties must be involved in the agreements regarding future land use of affected areas and the decisions regarding the establishment of objectives for such future land use, as well as in discussing the alternatives for engineering interventions, where decisions regarding such options will affect the future land use.	FSE (Koos Pretorius & Mariette Liefferink)	To be addressed in EIA.	Johan van Zyl
Specific	Report 8, First Draft	**Section 16.3** page 186 Notwithstanding this noble imitative, the FSE is unaware of any remediation or effective rehabilitation* of mine residue areas. *(Rehabilitation, form the mining industry perspective, means putting the land impacted by the mining activity back to a sustainable usable condition. It recognises that the restoration of what was previously there is simply impossible with current best practice. The definition and implied intention includes the concepts of minimisation of loss of land use capability and of net benefit to society. Section 38(1) of the MPRDA refers to having the mine area restored to its natural or predetermined state but this is tempered by the qualification that rehabilitation must be practicable and also provides for a Public Participation Process to define "end use.") The Guidelines for the Rehabilitation of Mined Land by the Chamber of Mines of South Africa/Coaltech (November 2007), which apply to all minerals10 and metals, and not merely to coal, have significant relevance. It involves inter alia soil replacement, soil amelioration, minimisation of compaction, soil fertilisation (immobile fertilisers should be incorporated into the plant rooting zone e.g.), dealing with soil acidity (e.g. prevention of capillary action by i.e. encapsulating the acid-generation material or introducing a gravel or coarse sand layer; while acidified soils can be treated with limestone, for this limestone to be effective, it has to be incorporated throughout the acid soil horizon: there is no leaching of lime downwards – this should be done by deep ploughing) and metal toxicity and radiation (e.g. simple chemical amelioration cannot correct the situation), revegetation and biodiversity re-establishment.	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope. Study by GDARD addresses this.	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	Experts consider residential townships, edible crop production and livestock grazing to be high risk land-uses for tailings storage facilities' footprints. (Reference: Mine Closure 2007. A. Fourie, M. Tibbett and J. Wiertz. ISBN 978-0-9804185-0-7. South African Legislation Pertinent to Gold Mine Closure and Residual Risk. M.W. Sutton et al.) Reclamation of historical or existing tailings dams and sand dumps are currently undertaken by the mining companies, Mintails, Gold One and DRD Gold. The reclamation activities exacerbate the dust and water pollution and introduce a new set of environmental impacts in the short and medium term and unless these impacts are managed responsibly and environmental infractions are enforced, the reclamation of tailings dams has little socio-economic and environmental benefits. Furthermore, the unremediated footprints have become secondary sources of pollution	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope. Study by GDARD addresses this.	Johan van Zyl
Specific	Report 8, First Draft	Proposals by Government for the reclamation and remediation of mine residue areas have been made for many years with feeble or no implementation. To exemplify: In 1999 the Report, titled "Radioactivity Monitoring Programme in the Mooi River (Wonderfonteinspruit) Catchment" (Institute for Water Quality Studies. DWAF, April 1999) found that mining activities are a major contributor to uranium and uranium series radionuclides within the catchment. Concentrations decrease downstream of the sources, indicating removal from the dissolved fraction by interaction with sediments.	FSE (Koos Pretorius & Mariette Liefferink)	Outside of this Study's scope. Study by GDARD addresses this.	Johan van Zyl
Specific	Report 8, First Draft	In 2002 the Report, titled "Radioactivity study on sediments in a dam on the Wonderfonteinspruit Catchment" (Conducted by the Council for Geoscience and commissioned by the DWAF. Wade et al. (2002) (WRC).) was published. In 2002 the Report, titled "Tier 1 Risk Assessment of Selected Radionuclides in Sediments of the Mooi River Catchment" (WRC Report 1095/1/02 by P. Wade) was published. It was found that radionuclides are concentrate in sediments downstream of their sources. Sequential extractions showed that these radionuclides are distributed in multiple phases within the sediments and that they may be remobilized by environmentally plausible chemical processes such as AMD. In 2002 the Report titled "Uranium and heavy metals in sediments in a dam on the farm Blaauwbank" was published. This study confirmed the findings of Wade et al and used further sequential extractions to characterize the sediments in a dam downstream of mining activities in the Carletonville area.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	In 2005 the Report, titled “Contamination of wetlands by Witwatersrand gold mines – processes and the economic potential of gold in wetlands” by H Coetzee et al, Report No. 2005-0106 found that for more than a century, the mines of the Witwatersrand have discharged contaminated water into the streams and rivers of the area, which led to the formation of a system of large wetlands. Concerns have been raised about their ability to cope with the pollutant loads flowing into wetlands.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	The Report recommended the remediation of the Wetlands. In 2005 the Report, titled “Impacts of gold-mining activities on water availability and quality in the Wonderfonteinspruit Catchment” was published. Mining-related impacts such as large-scale land degradation associated with dewatering of karstic aquifers and widespread pollution of surface water and groundwater systems are discussed. In 2004 the Report titled “An Assessment of Sources, Pathways, Mechanisms and Risks of Current and Potential Future Pollution of Water and Sediments in Gold-Mining Areas of the Wonderfonteinspruit Catchment” (Report, WRC, H Coetzee et al, Council for Geoscience. 2004. Report No 1214/1/06) was published and found that the measured uranium content of many of the fluvial sediments in the Wonderfonteinspruit, including those off mine properties and therefore outside the boundaries of licensed sites, exceeds the exclusion limit for regulation by the National Nuclear Regulator. A decision is therefore necessary by the NNR, regarding a regulatory response to this problem.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	In 2007 a Report by JS du Toit, (Acting Manager: Environmental Manager, Mogale City Municipality) titled “Background Report on Communities at Risk Within Mogale City Local Municipality Affected by Mining Related Activities, with Special Reference to Radiation & Toxicity” was published. On the 12th of July, 2007 the NNR Report – TR-RRD-07-0006 titled “Radiological Impacts of the Mining Activities to the Public in the Wonderfonteinspruit Catchment Area” was published. It found inter alia: • The measured uranium content of many of the fluvial sediments in the Wonderfonteinspruit, including those off mine properties and therefore outside the boundaries of licensed sites, exceeds the exclusion limit for regulation by the National Nuclear Regulator. • For approximately 50% of the 47 sampling sites, the calculated incremental doses of the respective critical group are above 1 mSv per annum up to 100 mSv pa. • The radioactive contamination of surface water bodies in the Wonderfonteinspruit catchment area caused by the long-lasting mine water discharges and diffuse emission of seepage and runoff from slimes dams poses radiological risks to the public resulting from the usage of polluted environmental media. • The pathway sediment→SPM →cattle→milk/meat→person (“SeCa”) can cause radioactive contamination of livestock products (milk, meat) resulting in effective doses of the public in some orders of magnitude above those resulting via the pathway “WaCa.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	In November, 2008 in terms of the Remediation Action Plan, the DWA and the NNR embarked on a co-operative venture to evaluate the extent of impairment in the Wonderfonteinspruit Catchment and to determine what remediation is to be implemented. A Specialists Task Team went through a process of identifying 36 Areas of Intervention focusing on sites that could be impacted on by water-borne radioactive material within the Wonderfonteinspruit catchment and could potentially be a public health risk and recommended the remediation of e.g. the Tudor Dam, the Lancaster Dam, wetlands downstream of the Tudor Dam. Notwithstanding the above-mentioned Reports, their findings and recommendations, the Wonderfonteinspruit remains unremediated. We therefore are unconvinced that the noble initiatives of the GDARD will be implemented. We request access to a copy of the funding structure of GDARD for the implementation of the initiative to enable the reclamation of mine residue areas for beneficial use. With reference to the “consultation process” by the GDARD: We request the Minutes o the consultation which was conducted by GDARD with the communities and the Mines and the comments and response report. The FSE, although a principal stakeholder, was not invited to the meeting. We furthermore request information on how communities will be assisted in finding productive solutions and how communities will b capacitated to implement site specific solutions and the funding available for these initiatives.	FSE (Koos Pretorius & Mariette Liefferink)	Private parties are kindly requested to obtain documents outside of this study from the relevant authors or project managers (GDARD in this case).	Johan van Zyl

General or Specific	Reference	Comments	Reviewer	Response	Respondent
Specific	Report 8, First Draft	**Chapter 19, titled** The FSE is grateful for the opportunities DWA/AURECON afforded its directors to participate in the Study Stakeholder Committee meetings. Significant costs (in both time and money) were incurred. There was also opportunity costs incurred. These costs refer to losses involved in giving up other activities such as income lost. It also required seeking expert interpretation by experts, at cost. For the FSE to furthermore disseminate the information to its constituencies, which amount to a significant number of persons, NGOs, communities, organisations, etc., incurred significant time and money. There is no provision for such costs to be reimbursed. It is furthermore disheartening that little of the information which the FSE supplied to the DWA and Aurecon has been used. Technical information was withheld by the DWA, and still is, until late in the process. The result is self education and independent data collection by the public, who have no access to the corresponding information from the DWA. Eventually, each side trusts only its version of the facts. It is essential to engage in full interaction with both affected and interested parties. In order to manage and correct undue fears and expectations, it is necessary not to lean too heavily on the facts. It is incorrect to assume that objective scientific analysis and facts will resolve controversial issues, This assumption ignores the frequent disagreements among scientists and the research indicating that, once people make up their minds, information simply confirms rather than shapes their attitudes.	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl
Specific	Report 8, First Draft	Successful stakeholder engagement and communication is most achievable on the small scale, localised level where community interest is high. We recommend the following key points in the proposed Stakeholder Engagement process: **Objectives:** Clear and specific. The call for participation must be genuine – it is not satisfactory to set a plan of action and implementation and attempt to force it on the communities. **Process:** Incremental and sustained – not ad hoc, ritualistic or tokenistic. **Method:** The diversity of consultation techniques should reflect the diversity of communities (cultural, economic status, level of education, etc.) **Resources:** Provide direct support in terms of funding, professional skills and time. **Timing:** As early as possible and before any major decisions	FSE (Koos Pretorius & Mariette Liefferink)	Noted	Johan van Zyl

Appendix G
Written Comments and Responses

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

Written Comments Received from Stakeholders

May 2012 - July 2013

Record of written comments received from stakeholders via the dedicated AMD mailbox (amdsainfo@srk.co.za) and responses (where provided) from the Feasibility Study Team.

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1. Comments related to Request for Information (RfI)

1.1 Comments received:

Comments, Issues and Suggestions Raised	Commentator and/ or Organisation	Date
Subsequent to the televised Carte Blanche programme on Acid Mine Drainage, Sunday 15th instant, I contacted Steve Horak of Digby Wells, who in turn advised me to contact Elna de Beer at SRK Consulting. She, Elna, in turn advised that I should contact you, as I am positive that my Company has a long-term solution to the AMD problem in South Africa. I have been trying to contact various people at DWA, to no avail; therefore the contact company's and names which were mentioned on the Carte Blanche programme was so welcome. I enclose herewith a PowerPoint presentation, copies of laboratory analysis of results obtained from testing at WWTW, AMD Media Briefing and an explanation of Electromagnetic Deionization, which is similar to desalinisation. As will be noted from the laboratory analysis, we have managed to clean sewerage water to potable water standards (drinking water standards). Our patented process is capable of removing all impurities, minerals, salts and heavy metals with our process; with a greatly reduced settling time of between 10 and 15 minutes (instead of the usual 8 to 10 days). We feel we can make a positive contribution towards cleaning not only the wastewater, but also the acid mine drainage. It would be appreciated if you could advise whether we may be of assistance with the cleaning-up of the water (be it waste water or acid mine drainage) in our country.	Mr Phil Van Der Merwe, Watsol	19 July 2012
Vaalchem act on behalf one of our clients – Lengana Health SA (Pty) Ltd who own resources on alternative treatment of AMD with Calcium Bentonite Lengana Health SA (Pty) Ltd own various new order Calcium Bentonite prospecting rights and Mining Rights on Calcium Bentonite and as such is a strong position on supply of Calcium Bentonite for AMD treatment. Vaalchem does have the technical ability and resources to demonstrate the use of Calcium Bentonite in AMD treatment. With above in record it is respectfully requested that a opportunity is availed to demonstrate the advantages (Both in cost and Performance) of Calcium Bentonite is AMD treatment.	Mr Johan Human, Vaalchem	14 August 2012
I was offered new patented technology from the USA. I would like to talk to someone to present this and see how we can move this forward.	Mr Bertus Swanepoel	7 May 2013
I wrote last week to Dr Beason Mwaka introducing my company Minus and NeutraSeal a low energy mine water treatment process we have developed. However I've just tried calling the Pretoria reception no and the call is not going through. Could you indicate another number so that I might speak to someone about the potential for our process in South Africa.	Mr Justin Daglish, Minus Engineering	1 July 2013

1.2 Responses Sent:

Response	Respondent and/ or Organisation	Commentator and/ or Organisation Addressed	Date
I have consulted with the responsible person and they have requested that I refer you to the DWA AMD Website (see the link below): http://www.dwa.gov.za/Projects/AMDFSLTS/ When the webpage opens, you will see a column for announcements on the right hand side, with the heading: Request for Information - Please click on the link directly below (**Long-Term Solutions for the management of**	SRK Consulting	Mr Bertus Swanepoel	7 May 2013

AMD), and familiarise yourself with the **Process for the Provision of Information**. Deadlines for submission of information are not applicable in this instance. Please do not be discouraged by the fact that you have to submit the information electronically, all information submitted is taken into consideration by The Feasibility Study Team. I am registering you as an I & AP on the project database, in order for you to receive information as it becomes available to stakeholders. We appreciate your participation.			
Please refer to the DWA Website for submission of the information of treatment options (see the link below): http://www.dwa.gov.za/Projects/AMDFSLTS/ When the webpage opens, a column for announcements on the right hand side appears, with the heading: Request for Information. Please click on the link directly below (**Long-Term Solutions for the management of AMD**), and familiarise yourself with the **Process for the Provision of Information**. Please do not be discouraged by the fact that you have to submit the information electronically and that the deadline for submission has already been reached. The Feasibility Study for a Long-Term Solution to address AMD in the Gauteng Province is concluding at the end of July 2013, but all information submitted is taken into consideration by The Feasibility Study Team. Irrespective of the conclusions of the study and the recommendations made for immediate implementation, the DWA will still continually be looking at future cost-effective technologies. I am registering you as an I & AP on the project database, in order for you to receive newsletters and information as it becomes available to stakeholders. We appreciate your participation.	SRK Consulting	Mr Justin Daglish, Minus Engineering	2 July 2013

2. Comments related to stakeholder engagement

2.1 Comments Received

Comments, Issues and Suggestions Raised	Commentator and/ or Organisation	Date
Thanks for the invitation, which I will accept and have booked out in my diary. You mention specific groups of people in this focus group, which excludes the various government departments and mining houses that is responsible for this AMD problem. How can most likely all of the questions that may well be asked to these sectors, be answered if they are not in attendance? You may answer that your team will answer as best as possible or else questions will be noted and answered at a later date. This will not be acceptable as questions tend to go unanswered, or not answered in full, based upon my experience of focus meetings. By having focus meetings, you exclude certain parties from other meetings and vice a versa and therefore prevent the exchange of good dialogue and the proper dissection of problems and the proper answering thereof. More so, in a real sensitive case such as this long-lasting AMD problem and the utter deviousness of all applicable government departments and mining houses in side-stepping the real issues and concerns of local communities, human health and especially environmental / ecological health, do you really think that those attending this focus meeting will go home being happy and satisfied that their concerns have been addressed and are being looked after? I will think not. So please reconsider having separate focus meetings and rather one large meeting with all, and I mean all, the departments represented that must be there.	Pieter van Eeden, Eco Monitor	17 August 2012

3. Comments related to saline agriculture

3.1 Comments received:

Comments, Issues and Suggestions Raised	Commentator and/ or Organisation	Date
What I do think should have happened was, more than 10 years ago, when Ewald Erasmus and I recommended the application of saline agriculture as one of the possible solutions for the Western Basin, the potential should at least have been investigated. DWAF dismissed it out of hand.	Prof Les Stoch, North West University	29 May 2012
There are a host of remediation measures that can be implemented to lessen the environmental and human health burden regarding both mining and re-mining, that are indeed part of the acidic mine water solution. Among others, these include all aspects of saline agriculture and the vegetation and re-vegetation of tailings and mine dumps.	Shan Holmes, REALSEARCH, Environmental Management and Development	23 May 2012

3.2 Response:

Response	Respondent and/ or Organisation	Commentator and/ or Organisation Addressed	Date
Saline Agriculture as a possible solution will be taken into account during the study and a meeting will be held with Prof Les Stoch to obtain all the relevant information.	Department of Water Affairs (DWA)	Prof Les Stoch, North West University	June 2012

4. EIA related comments

4.1 Comments received:

Comments, Issues and Suggestions Raised	Commentator and/ or Organisation	Date
We hope that you can assist us in the following matter; if you are not the ideal person to contact, please refer us to whoever may be a more/the most appropriate contact person. Also note that similar questions may have been asked of other stakeholders in the process, as we are not always entirely sure who the correct person/organisation is to ask specific details. As part of the Gauteng City-Region Observatory's project entitled '*The Intersection between Disaster Vulnerability and Sustainability*', an academic research report on acid mine drainage in the Gauteng City-Region will be compiled, drawing together facts and observations made on the current state of acid mine drainage and the process of engagement and decision making. The aim of this academic output is to provide an overview of sequential events that have developed since the completion of the GCRO's first Provocation which was launched in 2010 (http://www.gcro.ac.za/report/provocation-series-decanting-acid-mine-water-gauteng-city-region). Our investigation further seeks to identify and describe the relationships that exist between various role players in the decision making and implementation process, and position AMD within the contexts of the broader water quality and quantity debate in South Africa. The GCRO was established in 2008 as a partnership between the University of Johannesburg, the University of the Witwatersrand (Wits) and the Gauteng Provincial Government (GPG), with local government in Gauteng also represented on the GCRO board. The GCRO is charged with helping to build the knowledge base that government, business, labour, civil society and citizens need to make the vision of a well-functioning City-Region a reality. The GCRO provides policy analysis and support, undertakes applied research and publishes reflective academic work.	Ms Kerry Bobbins, Gauteng-City Region Observatory (GCRO)	15 October 2012

It would be appreciated if you could assist the GCRO with clarifying the following facts/questions to be used in the report: 1. What is the current status of the long term EIA and stakeholder participation, and what are the estimated time frames of this process? 2. Do you foresee the incorporation of any specialist studies in the long term intervention EIA? If so, do you have any idea of what such specialist studies may entail or is it too early to tell? 3. Has SRK engaged with BKS/Digby Wells Environmental about potential environmental impacts that cut across the short and long term AMD interventions? 4. In your view, what issues cause the most delay in the implementation of the short and long term AMD interventions? Your response is extremely valuable to us and it is part of our validation process to ensure that the information contained in our report is correct. If you are able to assist us by email, then please do so before **19th October 2012** so that it may be incorporated into the report. If you need more time to respond, please let us know. Alternatively, if you would prefer to meet in person to discuss the above questions, we are available to meet you at any suitable date and time.		

4.2 Response sent:

Response	Respondent and/ or Organisation	Commentator and/ or Organisation Addressed	Date
Thank you for your interest in the feasibility study for the long term solution to AMD. I have forwarded your request to the study managers.	SRK Consulting	Ms Kerry Bobbins, Gauteng-City Region Observatory (GCRO)	16 October 2012

5. Comments related to Polluter Pays Principle

5.1 Comments received:

Comments, Issues and Suggestions Raised	Commentator and/ or Organisation	Date
I brought this issue up re polluter pays in my presentation to the Portfolio Committee on the NWRS 2, amongst other concerns. I am of the strongest opinion that the members of the Chamber of Mines must provide the maximum funding for a comprehensive solution to the AMD problem. The water must be non-toxic and desalinated. If this issue is fudged, we take the whole matter to court as the saline water is unusable and threatens the viability of communities throughout Gauteng, North West, Free State, Mpumalanga and the Northern Cape.	Ms Judith Taylor, EarthLife Africa	14 December 2012

5.2 Response sent:

Response	Respondent and/ or Organisation	Commentator and/ or Organisation Addressed	Date
The polluter pays principle is considered in the Feasibility Study.	SRK Consulting	Ms Judith Taylor, EarthLife Africa	December 2012

6. General comments

6.1 Comments received:

Comments, Issues and Suggestions Raised	Commentator and/ or Organisation	Date
Poor communities know that Consultants do not have the best interest in mind, SKR consultants already tried to fool me that they only need specialist from communities therefore my input of companies from the Johannesburg and South African community. Letter below states that by the end of day on 16th April 2012 my issues will be finalized and sent to me, ha, ha, ha. For this reason I'm again bringing attention to issues from poor community members at SAHRC workshop as I do not believe our voice will be represented and we have powerful organizations that has the majority support of poor communities, this organization is the ANC and I'm blank copying the ANC & COSATU. Workshop Issues: Before the first presentation, Lebogang Mangaliso (LM) made a comment around the fact that issues which have been raised at other meetings have, as yet not been addressed. He queried why answers to questions were not forthcoming, and said that it would be useless to hold meetings on a foundation that is not solid. Some Questions after presentation: Koos Pretorius (FSE) (KP) asked what the cost of the water that is delivered as potable water through the proposed process is. LM made the comment that the 'public' is something that belongs to anyone and everyone. Participation is only relevant where someone has a real share in a process or outcome. Public participation has not been done well up until this point. The way the issue is currently put to the public decreases its value as a problem. May Hermanus (Wits University) (MH) What is the most sustainable and optimum solution? LM: Before looking at the gap, we first need to understand what is guiding the funding requirements. Why are they making us so scared? There is ZAR 7 million allocated for administration only at the TCTA – what is that all for? Is there no other way to address the issue more cost-effectively- simple and easy, and without such high cost. What about the options that can be cheaper, and create jobs at the same time, e.g. farming? TCTA increases the costs as time goes by; there is a new report every time with a new budget reflecting significant increases in costs. Why is this? Pieter van Eeden (EcoMonitor) (PvE) explained that he is part of the Klipriver and Blesbokspruit catchment forum. These stakeholders want to know where the funding is coming from. If the money is there in the fiscus, why should the onus always be on the taxpayer to fork out? If the Government spends their money wisely, the taxpayer need not be burdened. LM: Assessment of the AMD Report – is the IMC report correct or not? That is the foundation that brings us here today. Is there misleading information being fed by the IMC, and are communities across South Africa being misled? Leslie Stoch (LS) presented his thoughts and experiences and research dealing with AMD issues. LS also explained that he is consulting with Professor Frank Winde and EE and advised for non-panic. He explained that the water on the surface is not clean, thus stopping the ingress of rainwater will not stop the AMD or related pollution. The Gold Reef City tunnel can be sealed and protected, alleviating the immediate need for pump installations there. LS is concerned that pumping from shafts will draw clean water down, further polluting it, and unnecessarily drawing out clean water. The water can be intercepted at any point if one can get into the mine. The Western Basin AMD decants out of the side of the aquifer: it can interfere with the length of flow which is already somewhat cleaning the water. Some plants are growing lush on the worst quality AMD water. The two nuisances can be married: tailings dams causing dust: plant on it, and then generate biofuel from the plants. Calculations in a worst case scenario, 45 megalitres of AMD will result in the process to be run at a loss of 1.5 million per annum. In the best case scenario, the process can make a profit. It may thus not burden the fiscus at all. However, encouraging irrigation in a water -stressed area is not a DWA policy. To treat the	Mr Mark Biggars	7 May 2012

water of the HDS process, you need significant clean water. The saline agriculture solution will save 3.8 megalitres of clean water used to dilute the HDS process. The saline agriculture will get rid of the dust problems, and there are potentially carbon credits involved. The solution is community-friendly and sustainable. Compared to what has been decided, it is a cheap solution (practically-free), pumps can be moved at any time, not a huge legacy – even if it does work it will not cause money loss etc. Some of Discussion session: ML – Have the alternative options been considered by DWA, or have the decisions already been taken? No toxicological risk assessments have been done to date to determine the human health risks. If the EIA is taking place concurrently: we ask the TCTA and DWA if the current neutralisation option shows fatal flaws/unacceptable risk, what then? When environmental legislation is deliberately contravened, would application for e.g. water use licences be allowed? LM: What is DWA going to do following the information that there is an agricultural solution that can create jobs, farming etc. – it is a much needed solution and more productive that the TCTA's spending solution. Judith Taylor (Earthlife Africa) (JT): Would the agricultural process not recharge the system thus adding to the water deficit? LS: No, because there is less water required to dilute the pollution – the savings will assist to alleviate the problem. Direct AMD can be used on the tailings – no neutralisation is required. The problem with isolation of elements is a question of balance e.g. seaweed growing in saline water. Is the problem water shortage or a water management issue? He referred to grass that grows in the Western Basin spontaneously in highly polluted AMD. The trick is not to let the agricultural process dry out: it is essentially a hydroponic solution. The plants that are not in the food chain – the solution gets rid of the AMD nuisance on top of another nuisance, while creating work and something that can be sold. The water table can be moved 6 metres up and down without disturbing the groundwater table. Sludge from water care works could be used to mix with AMD as is for the proposed agricultural solution. Even if this is a 4-year solution, the savings on the agricultural solution versus the short-term HDS solution is significant. Mark Biggars (MB): Who ordered what and when? How many pumps were ordered? LM: Is it necessary to go to Germany to source the pumps? Why not use local or more affordable, more accessible technology? LM: Pleased with the direction of Day 2's discussions and it appeared that there were solutions on thehorizon. Why did DWA not consider human rights in the beginning? They started with step 20 and now we are back at step 1. If they'd considered human rights at the beginning, then the solution might have been much easier. There may be loopholes where TCTA and DWA will still run with the matter in the way that they want to -who is going to allow the short term to proceed while it is still not related to the long term? MB: Some mines for reclaiming are not economically viable. LS' proposal for saline agriculture can create green jobs. GADRD, TCTA & DWA have to create jobs do not throw away LS idea. The ANC Manifesto clearly states - 'To develop and invest in a programme to develop a large number of green jobs'. This is a 5 year contract between the people and Government; if you do not listen to us then we will go to the ANC. Why don't we plant bamboo on these mines? Tracy-Lynn Humby (TH): Changing the EIA to a section 24G process has been set in the KZN High Court. Nigel Rossouw (NR): Aurecon and BKS are the design engineers, and are not part of the EIA process at all. The long-term ToR doesn't include EIA process, only feasibility process. Digby Wells was appointed by TCTA; If long and short are linked, this will not be a problem. They are responsible for all the EIA work, not just for the PPP. Environmental Crime: Chamber of Mines did not care of impacts of apartheid on the majority of people; they are a signatory of international sustainable development in the mining industry; what was their role in preventing or assisting <due to lack of lobbying government> that AMD is a danger to the developmental state? When we come to EIP - PPP we will again be raising these issues, having a feasibility study to bypass public participation process does not mean you get rid of public questions on why their tax money is not used in the most sustainable manner.		

I am impressed with the progress being made in the Feasibility Study.	Dr Anthony Turton, Centre for Environmental Management	12 Sept 2012
Please accept the FSE's and my cordial thanks for your valuable participation in the meeting with Prof. Dr. Christian Wolkersdorfer yesterday afternoon and evening. I, on behalf of myself and the FSE, furthermore express my unfeigned gratitude to Prof. Wolkersdorfer for his willingness to present the excellencies of his research to key stakeholders yesterday. It is sincerely hoped that esteemed academics and scientists involved in addressing the AMD "emergency" will co-operate and supply the public and civil society, not with contradictory findings, definitions and recommendations, which impedes accurate judgement, but with analogous and unambiguous findings, definitions and recommendations. As you may reflect great debates, solicitous consultations and cabals are held by academics in order to dispute or defend the AMD Reports and these transactions have not only created factions and divisions betwixt persons of equal worth in points of parts and of balancing merit but these diverse and contrary opinions **have been highly confusing to the public.** We no longer know what to doubt nor what to believe. I furthermore, respectfully, appeal to scientists and academics to spare invective when ordinary persons like myself, in diffidence and deference, quote – with hyper-scrupulous attention to content and context - from esteemed scientists' reports and the terminology employed in these reports is deemed to be inappropriate. And finally, in a participatory democracy the reticence of scientists and organs of state to release important data and information to the public perpetuates the legacy of our apartheid past and its instinctive resistance to disclose information. *"Clearness of judgment makes men liberal, for it teacheth men to esteem of the goods of fortune not for themselves, for so they are but jailors to them, bur for their use, for so they are lords over them; and it makes us to know that it is beatius dare quam accipere, the one being a badge of sovereignty, the other of subjection."* (Francis Bacon.)	Ms Mariette Liefferink, Federation for Sustainable Environment (FSE)	27 June 2013

6.2 Response sent:

Response	Respondent and/ or Organisation	Commentator and/ or Organisation Addressed	Date
SRK Consulting is part of the team of consultants led by Aurecon in association with Turner and Townsend, and supported by specialists from different institutions, appointed by the Department of Water Affairs to conduct a feasibility study of the long-term solution for the treatment of the acid mine drainage in the Witwatersrand Goldfields. A response to all your initial comments and questions is being finalised and will be sent to you during the course of today. Thank you for your interest in the AMD project indicated through the mails that were sent. In this reply to your mail we deleted your contact details as per your original request. This response includes inputs from Aurecon and the Department of Water Affairs. It seems that most of your comments relate more to the work done by TCTA, we thus copy this response to TCTA. Regarding your comments: • The procurement of the pumps is part of the process for the immediate solution managed by TCTA, where an EIA process is currently running, in which you seem to be involved already and that provides you with the forum to air your specific concerns. • For the long-term solution, a feasibility study is being conducted. A team of consultants, led by Aurecon in association with SRK Consulting and Turner and Townsend, and supported by specialists from different institutions, was appointed on 30 January 2012 by the	SRK Consulting	Mr Mark Biggars	

Department of Water Affairs to conduct the feasibility study of the long-term solution for the treatment of the acid mine drainage in three basins of the Witwatersrand Goldfields. The team is responsible for conducting this study over a period of 13 months (ending in February 2013). • The feasibility study will include a groundwater component, treatment process and infrastructure options, and will enable the consideration of a possible public private partnership solution. The study will be conducted over a very short period and will therefore to a large extent be based on existing information and monitoring initiatives. It will be informed by technical input and expertise from key role-players in various relevant fields, who will be engaged at certain milestones throughout the study. The study has therefore made provision for focussed engagement with key stakeholders and stakeholder sectors/ groups to assist in identifying sustainable solutions, technical options, management scenarios, etc. to inform the study for the most workable long term solution. • Thank you for the information that was sent regarding the consideration of agriculture as a possible solution. The team is in contact with persons that you mentioned as well as other experts from Universities etc. The use of agriculture as a possible solution is under consideration as an option. • Since the feasibility study is a planning study to investigate different options and recommend a feasible long-term solution for the AMD challenges in the east, central and western basins, it will not be involved in the procurement of any equipment such as pumps etc., and is not in control of the TCTA's EIA process. • The feasibility study will be followed by a legislated EIA and full public participation process during which all stakeholders including the general public will have an opportunity to participate and comment. The practitioner appointed for the EIA will provide you with the opportunity to register as an I&AP. • It is not clear if you are a potential service provider of equipment that can be utilised in the treatment of AMD. The experts of the project team are aware of the pumping equipment supplied by local manufacturers. It seems though that you have information of alternate locally manufactured submersible pumps and related equipment of the size, standard and technology that can be utilised in the AMD process. The team will be delighted to receive more information of such equipment, in order to inform the feasibility study. It is assumed that you will continue to participate in the EIA process of TCTA.			

Appendix H
Study Management Committee Terms of Reference

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 MANAGEMENT COMMITTEE (SMC)

TERMS OF REFERENCE

1. INTRODUCTION

Acid Mine Drainage (AMD) on the Rand Mining Areas has been a severe environmental challenge for many years. The Inter Ministerial Committee in respect of AMD, provided some direction as toward the way forward. In this regard the implementation of short-term solutions is underway on authority of a directive issued by the Minister of Water Affairs to the Trans Caledon Tunnel Authority (TCTA). Apart from the short-term solutions, long-term solutions need to be investigated and the objective of this study is to determine the most feasible long-term solution to the AMD situation in the West, Central and East Rand underground mining Basins. A feasible solution will be one that is sustainable technically sound, economically viable, institutionally feasible and legally acceptable. As such, this study's focus is not only on the technical aspects of a long term solution (in terms of treatment options), but also on legal, economic, financial and institutional aspects. In addition, it needs to be understood that the Study is one component of the larger picture and that other parallel actions are in process.

The study goal is to investigate and recommend a feasible long-term solution to the AMD problems emerging in the study area, in order to ensure long-term water supply security and continuous fitness for use of Vaal River water. The study area is restricted to the Eastern, Central and West Rand Mining Basins, to be considered at in the context of the Vaal River water supply area.

2. STUDY GOVERNANCE STRUCTURE

Various stakeholders need to be consulted during study execution, while study progress and outcomes also need to be communicated appropriately. As such, the study requires appropriate governance structures.

The Minister and the Department of Water Affairs are the organs of state that take responsibility for the Study.

The Minister and Department is supported in this process by other stakeholders such as other Government, Semi-Government and private institutions. The Inter-Ministerial Committee (IMC), the Intra-Government Task Team (IGTT) and the Project Executive Committee (PEC) all have specific coordination and control roles in this process. The PEC, IGTT and the IMC need to receive reports from DWA regarding the progress, issues, outcomes and recommendations of the Study.

The Chief Directorate: Integrated Water Resources Planning is supported by the members represented on the SSC. In this regard, the representatives from different spheres of Government, parastatals and institutions, together with private sector, representatives from industries and non-governmental organisations represent key stakeholders. They need to assist the DWA by providing broad level inputs on principles, guidance, direction and impacts, etc.

The SMC comprise of Governmental representatives that need to support DWA in the management of the Study ond coordination with other parallel actions. Other significant and current parallel actions identified by the IMC that are relevant are for e.g.:

- The STS actions managed by TCTA;
- The ingress study by CGS;
- Environmental key study by DEA;
- Groundwater monitoring lead by DWA.

There are also other initiatives that are important such as:

- The GDARD study on rehabilitation of mine dumps;
- CSIR studies;
- Study regarding the Cradle of Human Kind, etc.

3. OBJECTIVE OF THE STUDY MANAGEMENT COMMITTEE (SMC)

The main objective of the SMC is to provide support to the Directorate Water Resource Planning Systems with regard to the direction and outcomes of the Feasibility Study. The official accountability of the Study lies with the DWA Manager who will need the support and advice of the SMC in decision-making.

4. FUNCTIONS And RESPONSIBILITIES

Noting that the Study is part of a planning process where different options, perspectives, issues and implications are debated and considered, it will be required that the SMC contribute inputs representing the strategic perspective, in accordance with the Study Terms of Reference (ToR) and the Study Inception Report.

The SMC will:

- Provide strategic guidance and direction to the Study.
- Coordinate the actions from this Study with other parallel actions, activities and studies that may have a bearing on the Study or the overall process.
- Confirm achievement of the deliverables of the Study.
- Make decisions at the appropriate level on the basis of recommendations from the Study Administration Committee (SAC).

In this regard, the SMC will:

- Discuss the technical aspects, including the legal, institutional and financial aspects relating to the Feasibility Study.
- Provide technical advice.
- Prepare technical support information for the Study Stakeholder Committee (SSC).
- Serve as a contact point and coordination mechanism with other related actions that may impact on the Study and vice versa.

5. COMPOSITION

- The SMC consist of representatives from different sections in DWA, as well as key representatives from other Government Departments and parastatals. SMC members are to attend on invitation. The Study Administration Committee (SAC) recommends the composition of the SMC.

6. CHAIR PERSON AND DEPUTY CHAIR PERSON

- Chair Person: DWA Director: Water Resource Planning Systems (WRPS) (Beason Mwaka)
- Deputy Chair Person: DWA Scientific Manager: Directorate WRPS: Water Quality Planning (Pieter Viljoen)

7. REPRESENTATION

The institutions that should be represented on the SMC are:

- **DWA Chief Directorate: Integrated Water Resources Planning**
- **Other relevant DWA Chief Directorates, Directorates, Sub-Directorates and Regional Offices,** as required
- **National Government Departments:**
  - National Treasury;
  - Department of Mineral Resources
- **Parastatals and Utilities:**
  - Council for Geo Science;
  - Trans Caledon Tunnel Authority (TCTA)
  - Rand Water

8. MEETINGS

The SMC will meet as required by the programme of the Study and is expected to be not more frequent than once a month.

Appendix I
List of Study Management Committee (SMC) Members

First Name	Last Name	Company	City
Jurgo	van Wyk	Department of Water Affairs (DWA): Water Resource Planning Systems (WRPS)	Pretoria
Jacqueline	Jay	DWA: WRPS	Pretoria
Peter	Pyke	DWA: Options Analysis	Pretoria
Seef	Rademeyer	DWA: National Water Resource Planning	Pretoria
Rod	Schwab	DWA: WRPS	Pretoria
Pieter	Viljoen	DWA: WRPS	Pretoria
Fanie	Vogel	Aurecon SA (Pty) Ltd	Pretoria
Andrew	Tanner	Aurecon SA (Pty) Ltd	Pretoria
Joanne	Henrico	Aurecon SA (Pty) Ltd	Pretoria
André	Hindley	SRK Consulting SA (Pty) Ltd	Pretoria
John	Samuel	Turner & Townsend (Pty) Ltd	Johannesburg
Beason	Mwaka	DWA: WRPS	Pretoria
Yacob	Beletse	DWA: WRPS	Pretoria
Henk	Coetzee	Council for Geoscience (CGS)	Pretoria
Fortress	Netili	Council for Geoscience	Pretoria
Humberto	Saeze	Council for Geoscience	Pretoria
Peter	Kelly	Department of Mineral Resources (DMR)	Johannesburg
Mahlori	Mashimbye	Department of Science and Technology (DST)	Pretoria
Umeesha	Naidoo	Department of Science and Technology	Pretoria
Shanna	Nienaber	Department of Science and Technology	Pretoria
Henry J.	Roman	Department of Science and Technology	Pretoria
Candice	Willard	Department of Science and Technology	Pretoria
Nigel	Adams	DWA: Compliance Monitoring and Enforcement	Pretoria
Kurt	Fortuin	DWA: Capital Projects	Pretoria
Ernst	Bertram	DWA: Hydrological Services	Pretoria
Nico	de Meillon	DWA: Hydrological Services	Pretoria
Fanus	Fourie	DWA: Water Resource Planning Systems	Pretoria
Bashan	Govender	DWA: Gauteng Regional Office	Pretoria
Marius	Keet	DWA: Gauteng Regional Office	Pretoria
Alice	Mabasa	DWA: Hydrological Services	Pretoria

First Name	Last Name	Company	City
Dumisani	Maluleke	DWA: Resource Protection and Waste	Pretoria
Zacharia	Maswuma	DWA: Hydrological Services	Pretoria
Paul	Meulenbeld	DWA: Water Abstraction and Instream Use	Pretoria
Nancy	Motebe	DWA: Reserve Requirements	Pretoria
Thivhafuni	Nemataheni	DWA: Resource Protection and Waste	Pretoria
Linda Page	Page	DWA: Communication Services	Pretoria
Sputnik	Ratau	DWA: Communication Services	Pretoria
Anil	Singh	DWA: Legal Services	Pretoria
Eddie	van Wyk	DWA: Hydrological Services	Pretoria
Strover	Maganedisa	National Treasury	Pretoria
Tawanda	Nyandoro	Rand Water	Johannesburg
Johann	Claassens	Trans-Caledon Tunnel Authority (TCTA)	Pretoria
Craig	Hasenjager	Trans-Caledon Tunnel Authority	Pretoria

Appendix J

Focus Group Meetings: Invitation Letter, Reminder Letter and other information documents

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Mr Stephan du Toit
Mogale City Local Municipality
stephant@mogalecity.gov.za

Dear Mr du Toit,

Invitation to a focus group meeting - Feasibility Study for a long-term solution to address the acid mine drainage associated with the East, Central and West Rand underground mining basins in the Gauteng Province

As you may already be aware, the Department of Water Affairs has commissioned a feasibility study for a long-term solution to address the acid mine drainage (AMD) associated with the three Witwatersrand underground mining basins in the Gauteng Province. We trust that you have received our newsletter – if not, please let us know on the contact details below.

Note that since the feasibility study is a planning study to investigate different options and recommend a feasible long-term solution for the AMD challenges, it does not include a public participation process in terms of the National Environment Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA). It is foreseen that the EIA process will commence in due course once the feasibility study has progressed to a certain point. It is during this EIA process that all interested and affected parties will have an opportunity to register as stakeholders, participate and comment.

For this feasibility study, focused engagement with identified key stakeholders and stakeholder sectors/ groups in various relevant fields is being undertaken at certain milestones throughout the study. This engagement has the primary function to afford such key stakeholders the opportunity to provide inputs and views on AMD related issues, and to obtain their input and comments on concepts, principles and assessment of alternatives, etc.

You have been identified as a key stakeholder in this feasibility study, and we cordially invite you to participate in a focus group meeting with *affected Local and District Government*. The purpose of the meeting is firstly to provide you with an opportunity to raise issues, concerns, comments and suggestions to inform the study, and to update you on progress with the feasibility study.

The details of the focus group meeting are as follows:

Date: *Friday, 31 August 2012*

Time: *9:00 – 12:00*

Venue: *City of Johannesburg, Infrastructure and Services Department (5th floor Boardroom), 125 Simmonds Street,*

Braamfontein

Your participation will be truly appreciated. Kindly inform Leoni Lubbe on tel: 012 361 9821 or email: projectadmin@srk.co.za by **Friday 24 August 2012** to confirm your attendance. An agenda and map/directions to the venue will then be emailed to you.

We look forward to hearing from you.

Yours sincerely,

Mr M Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 16 August 2012

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir/Madam,

Feasibility Study for a long-term solution to address the acid mine drainage associated with the East, Central and West Rand underground mining basins in the Gauteng Province

- Postponement of focus group meeting from 31 August 2012 to Friday, 7 September 2012

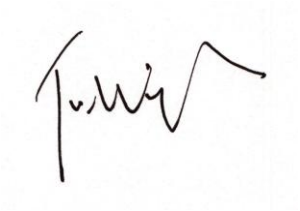
We sincerely apologise for having to inform you that due to unforeseen circumstances we have to postpone the focus group meeting from 31 August 2012 to Friday 7 September 2012. Our apologies for any inconvenience this may have caused.

Please note that the details of the meeting are now as follows:

Date: ***Friday 7 September 2012***
Time: *13:30 – 17:00*
Venue: *Kruger Kloof Lodge, Krugersdorp Game Reserve,*
R24 Rustenburg Road,
Krugersdorp

Kindly confirm your attendance by Friday 31 August 2012 with Leoni Lubbe on telephone number 012 361 9821 or email address projectadmin@srk.co.za.

Yours sincerely,



Mr M Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 27 August 2012

DIRECTIONS:

CITY OF JOHANNESBURG, 125 SIMMONDS STREET, BRAAMFONTEIN
(Infrastructure and Service Department)

From Pretoria:

- Take the **N1 South**
- Drive straight to **Johannesburg M1**
- Take the **Jan Smuts offramp**
- Go over **Empire Road**, drive up the hill and go straight at first set of robots.
- Drive pass **Wits University** on the left ,
- Before the second set of robots, turn left into **Jorissen Street**.
- Drive straight up **Jorissen** and turn left at **Cnr Simmonds and Jorissen street** (Cosatu House on the left)
- Continue straight until **traffic circle**
- Turn left into **Stiemens Street** immediately turn right to the underground **parking entrance** (marked **Infrastructure and Service Department** – first parking on right hand side)

From Krugersdorp:

- Join Onderkaas Street and go straight to join Smith Street.

Should you have difficulties with the directions please call:
Khetsiwe on 083 772 1914

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Ms Carolyn Ah Shene Verdoorn
BirdLife South Africa
advocacy@birdlife.org.za

Dear Ms Ah Shene Verdoorn,

Invitation to a focus group meeting - Feasibility Study for a long-term solution to address the acid mine drainage associated with the East, Central and West Rand underground mining basins in the Gauteng Province

As you may already be aware, the Department of Water Affairs has commissioned a feasibility study for a long-term solution to address the acid mine drainage (AMD) associated with the three Witwatersrand underground mining basins in the Gauteng Province. We trust that you have received our newsletter – if not, please let us know on the contact details below.

Note that since the feasibility study is a planning study to investigate different options and recommend a feasible long-term solution for the AMD challenges, it does not include a public participation process in terms of the National Environment Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA). It is foreseen that the EIA process will commence in due course once the feasibility study has progressed to a certain point. It is during this EIA process that all interested and affected parties will have an opportunity to register as stakeholders, participate and comment.

For this feasibility study, focused engagement with identified key stakeholders and stakeholder sectors/ groups in various relevant fields is being undertaken at certain milestones throughout the study. This engagement has the primary function to afford such key stakeholders the opportunity to provide inputs and views on AMD related issues, and to obtain their input and comments on concepts, principles and assessment of alternatives, etc.

You have been identified as a key stakeholder in this feasibility study, and we cordially invite you to participate in a focus group meeting with *Environmental NGOs/ conservation groups/ interest groups/ tourism/ recreation*. The purpose of the meeting is firstly to provide you with an opportunity to raise issues, concerns, comments and suggestions to inform the study, and to update you on progress with the feasibility study.

The details of the focus group meeting are as follows:

Date: *Friday, 31 August 2012*

Time: *13:30 – 17:00*

***Venue**:* *Kruger Kloof Lodge, Krugersdorp Game Reserve,*
R24 Rustenburg Road
Krugersdorp

Your participation will be truly appreciated. Kindly inform Leoni Lubbe on telephone: 012 361 9821 or email: projectadmin@srk.co.za by **Friday 24 August 2012** to confirm your attendance. An agenda and map/directions to the venue will then be emailed to you.

We look forward to hearing from you.

Yours sincerely,

Mr M Sirenya
DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 16 August 2012

Dear Sir/ Madam,

Confirmation of focus group meeting - Feasibility Study for a long-term solution to address acid mine drainage, Gauteng Province

Thank you for confirming your attendance of the focus group meeting.

We hereby confirm the meeting details as follows:

Date: Friday 7 September 2012

Time: 13:30 – 17:00

Venue: Kruger Kloof Lodge, Krugersdorp Game Reserve,

R24 Rustenburg Road, Krugersdorp

We attach a map to the venue for your convenience.

If you have not already received the Newsletter via email, please click on the following link to obtain it from the Department of Water Affairs website: http://www.dwa.gov.za/Projects/AMDFSLTS

We look forward to your participation.

Sincerely,

Feasibility Study Team
Long-term solution to address AMD in Gauteng Province

Krugersdorp
Game Reserve
brought to you by:
Protea Eco Adventures
Conservation through Utilization
www.passport2adventure.co.za
S 26° 05.305
E 27° 43.010
14th Avenue
Christiaan de Wet Drive
Westgate Shopping Mall
Wilgerood
C.R. Swart Drive
Krugersdorp
Robert Broom Drive
Rustenburg/Magaliesburg
Ventersdorp
Kok Street
M47
Hendrik Potgieter Road
N1
Soweto
Peter Road
Doreen Road
N14 Pretoria
R28
Petrol Station
Mogale/Hekpoort
Magaliesburg/Ventersdorp
R24
CLEARWATER
makro
SILVERSTAR

Appendix K
Focus Group Meeting: Affected Municipalities - Proceedings

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam

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

Draft Proceedings of Focus Group Meeting held on 7 September 2012 with Affected Municipalities

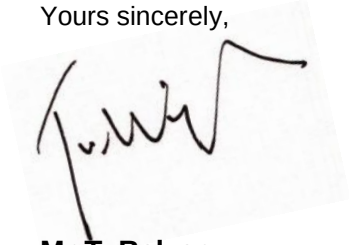
Your participation during the Focus Group Meeting in September 2012 is much appreciated. At the meeting, attendees were introduced to the Feasibility Study for a Long-term Solution, and comments and inputs were invited to inform the study. Many valuable inputs and sources of information were received at this meeting and thereafter. Please find enclosed the draft proceedings of the meeting for your information. The meeting presentation is available on the Department of Water Affairs (DWA) website (see below).

In terms of progress with the study: Phase 1 (study initiation phase) is completed, while Phase 2 (pre-feasibility phase) is in the process of being concluded. Phase 3 (feasibility phase) is the final phase of this study and has commenced. Note that the complexity of the study necessitated an extension of the study contract. The Feasibility Study is due for completion on **31 July 2013** and will, thus, be conducted over an 18 month period.

The updated versions of the AMD Voids Report (Draft 3) have been made available on the website (http://www.dwa.gov.za/Projects/AMDFSLTS). The draft reports of Phase 2 are expected to be made available to the public in due course, while the Phase 3 reports are expected to be made available towards the end of the study.

We thank you for your participation.

Yours sincerely,



Mr T. Balzer
Acting DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 9 April 2013

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

FINAL PROCEEDINGS OF A FOCUS GROUP MEETING WITH AFFECTED MUNICIPALITIES

Held on 7 September 2012

At City of Johannesburg Offices, Infrastructure and Services Department, Braamfontein

Distribution: Focus Group Meeting Invitees, Acceptances and Attendees

Table of Contents

List of Appendices

A. Introduction

This document records the proceedings in comment and response report format, of a focus group meeting with representatives of affected Local and District Municipalities, for the AMD long-term solution Feasibility Study.

The Focus Group meeting was held on 7 September 2012 at the City of Johannesburg Offices, Infrastructure and Services Department, 125 Simmonds Street, Braamfontein, and attended by 20 people (see **Appendix A** for a list of the attendees). The list also includes apologies, those who declined the invitation, those who did not respond and those absent.

The meeting was facilitated by Mr Jurgo van Wyk (DWA) with presentations, as listed in Part D below.

B. Welcome and Introductions

The facilitator, Mr Jurgo van Wyk (DWA Study Manager) welcomed attendees, expressed his appreciation for their attendance, and pointed out that the focus of the meeting is on the AMD Long-Term Solution (LTS) Feasibility Study.

He outlined the meeting procedure and process, and encouraged attendees to participate freely, pointing out that they are welcome to raise comments in their language of choice. He requested attendees to introduce themselves.

C. Meeting Objectives

Mr Van Wyk outlined the objectives of the meeting as follows:

- To provide key stakeholders with an opportunity to raise issues, concerns, comments and suggestions to inform the study; and
- To update key stakeholders on progress with the Feasibility Study for the LTS.

D. Workshop Presentations and Presenters

Information at the meeting was presented as follows:

- Mr Van Wyk presented an overview of the Feasibility Study; and
- Mr Andrew Tanner (Aurecon) presented an update on study progress to date.
- Note that the presentations are not appended to these proceedings but are available to focus group meeting attendees on the following website: http://www.dwa.gov.za/Projects/AMDFSLTS/documents.aspx.

E. Proceedings

The table below lists the comments, questions, recommendations and suggestions raised by meeting participants, as well as the responses from the Feasibility Study Team.

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
Please explain unlawful uses of water, and how this is possible.	Ms Maureen Dosoudil, Sedibeng United Business Forum	Unlawful use means that people are using water without the necessary authorisation to do so. The large quantities of water that comes through the Lesotho Highlands Water Scheme to the Vaal River passes by many farms, where some farmers unlawfully abstract water for irrigation. The Department of Water Affairs is in the process of addressing the problem and has made good progress.	Mr Jurgo van Wyk, DWA.
In addition to the Vaal Dam catchment forums, other forums such as those for the Hartebeespoort Dam area, e.g. the Crocodile Marico Catchment forum must also be engaged in this process.	Mr Stephan du Toit, Mogale City Local Municipality	Thank you for this information	Mr Jurgo van Wyk, DWA.
How will the costs of desalinating water for discharge into the Vaal River ultimately impact on the cost of water for the agricultural sector?	Ms Maureen Dosoudil, Sedibeng United Business Forum	The cost of the necessary infrastructure for desalination and the cost to operate such infrastructure can be very high. How the cost will be recovered and from whom has not yet been decided.	Mr Jurgo van Wyk, DWA
A media article indicated that the AMD short-term intervention (STI) will cost R2.2 Billion. Is this figure correct?		Yes, the figure is relatively accurate, but constantly changes due to the fact that there are a few options available on how to implement the STI for e.g. how to refurbish the existing treatment plant in the western basin.	
Concerns were raised regarding the total cost of the implementation of the long-term solution (LTS). It was assumed that it will cost much more than expected.		Appropriate treatment is likely to have a high capital cost, which is still being determined. The early estimates for the operational expenditure indicate that the operating cost for 4-6 years will equal the capital cost.	
Will there be a period during the Feasibility Study when it will be decided that the STI should be halted, so that the LTS can be immediately implemented, or must the STI be completed first? There is concern regarding the excessive cost implications of implementing the STI.		It will not be possible to halt the STI because the STI is addressing an emergency situation that needs to be resolved in the best manner possible to protect the Environmental Critical Level (ECL). Noted.	
Is the business sector represented on the Study Stakeholder	Ms Maureen	Yes, NEDLAC which represents organised business is part of	Mr Fanie Vogel,

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
Committee (SCC)? Note that there are many other types of businesses like tourism and agriculture that should be represented on the SSC.	Dosoudil, Sedibeng United Business Forum	the SSC and it is their responsibility to communicate the information from the SCC meetings to the relevant stakeholders. Information on the study is also available on the DWA website: http://www.dwa.gov.za/Projects/AMDFSLTS/documents.aspx	Aurecon
What are the preferred options for the long-term solution?	Ms Rosemary Anderson, Stonehaven on Vaal, Emfuleni Tourism Association & Sedibeng Interim Regional Tourism Association	The preferred long-term solution is still being investigated.	Mr Jurgo van Wyk, DWA
What is the life-of-mine for Central Rand Gold (CRG)?		It has been estimated at 10 years, but will depend on the gold price.	Mr Jurgo van Wyk, DWA
How much will it cost to save the Cradle of Humankind?		The objective is to prevent water from reaching the Cradle of Humankind and preventing the impacts on it.	Mr Andrew Tanner, Aurecon
Where will the water in the western basin be treated and where will the neutralised water be discharged to?		The neutralised water will flow into the Tweelopies Spruit. Two treatment "trains" are being upgraded at the existing Rand Uranium treatment plant to treat the water.	
It was mentioned that the water quality from Rand Uranium did not meet the promised standard. Has this been rectified? Who is responsible to ensure that the water that is running into the Tweelopies Spruit is neutralised?		The Rand Uranium treatment process is still in the process of being rectified to meet the standard.	Mr Jurgo van Wyk, DWA
		The Department of Water Affairs and Rand Uranium are responsible for neutralising the water. Rand Uranium is responsible for 10 Mℓ per day and the Department of Water Affairs is responsible for neutralising the rest of the water.	Mr Richard Holden, TCTA
It was said that the water is polluting itself over and over and ends up back into the void. Is this problem being addressed?		Ingress control was identified as an important aspect of managing AMD generation in the mine voids. The matter is being addressed by the Department of Mineral Resources in collaboration with the Council for Geoscience.	Mr Jurgo van Wyk, DWA
Is there a difference in the Central Basin between the environmental critical level and the social economic critical level?	Ms Rosemary Anderson, Stonehaven on Vaal, Emfuleni Tourism Association &	Yes, the ECL is the level to below which the water should be kept to protect the environment, including shallow aquifers. One of the SECLs is the level to protect Gold Reef City and a lower SECL is required to allow mining to resume.	Mr Andrew Tanner, Aurecon
A recent media article indicated that there is surface water pollution		The pollution is from the Tweelopies Spruit, and not directly	Mr Andrew

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
in the Cradle of Humankind in one of the water courses. Where is it from and is it also from underground?	Sedibeng Interim Regional Tourism Association	from the underground mine water.	Tanner, Aurecon
Is Gold Reef City Mine more important than the Cradle of Humankind? Is the surface water pollution in the Cradle of Humankind?		The Study Team provide the information and outcomes of the studies, but cannot speculate on which features are more important than the others.	Mr Andrew Tanner, Aurecon
		Yes, AMD also called “yellow boy” deposits were discovered in the Tweelopies Spruit running through the Krugersdorp Game Reserve, but the deposits stop short of the Cradle of Humankind. However the water with high sulphate goes down to the Tweelopies Spruit and further into the Crocodile River. The latest water results received from DWA indicate that the groundwater aquifers towards the Cradle have not yet been affected by AMD. Some of the sub-compartments upstream and closer to the Krugersdorp Game Reserve have shown some signs of contamination but not within the Cradle itself.	Mr Stefan du Toit Mogale City
How would a flood season affect the water quality of the mine voids in the western basin?	Ms Rosemary Anderson, Stonehaven on Vaal, Emfuleni Tourism Association & Sedibeng Interim Regional Tourism Association	In the flood seasons there is more ingress and slightly higher volumes of water may have to be pumped. The effect on water quality is not known, but the water quality should not be any worse in flood seasons.	Mr Andrew Tanner, Aurecon
What is the planned life of operation of sludge disposal dams?		The sludge disposal sites being used for the STI have relatively short lives, e.g. 3-5 years in the west. However, new sludge storage facilities with an initial life of 50 years are being planned for the LTS.	Mr Andrew Tanner, Aurecon
What are the volumes of water that need to be treated in the desalination process?	Dr Ziboneni Godongwana, East Rand Water Care Company (ERWAT)	The treatment of AMD by the High Density Sludge (HDS) process results in neutralised water. Approximately 80% of the neutralised water would need to be desalinated.	Mr Andrew Tanner, Aurecon
Where will the treated water be pumped to and will it be desalinated?	Ms Rosemary Anderson, Stonehaven on Vaal, Emfuleni Tourism Association &	The water from the underground mine voids will be pumped to the surface for neutralising at HDS plants. For the LTS, it will then be treated, and desalinated at that point and distributed. It is important to neutralise the water when it comes out of the ground because it contains acidic	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
	Sedibeng Interim Regional Tourism Association	components and will be dangerous to transport at that stage. Alternative points for discharge or use of the desalinated water are still being considered.	
The agricultural sector is not receiving enough attention. Salt tolerant crops can handle neutralised water, specifically in the Steenkoppies area where it can be gravity feed into that area for irrigation. The water that will be removed from the western basin into the Tweelopies Spruit to the Crocodile River catchment can be used for irrigation since there is a huge demand for water in that area. The over abstraction of water from the Steenkoppies compartment has affected the flow of the Maloney's Eye and the Mogalies River is drying-up as a result. One centre irrigation pivot uses the equivalent of more than 1Mℓ per day of water and there are currently approximately 96 pivots in that area. Therefore, consideration must be given to the use of neutralised AMD water for irrigation.	Mr Stefan du Toit, Mogale City Local Municipality	Attention is being given to irrigation areas in the WB, which have been identified as a possible user. There is still the concern that the salts will still end up in the river system. There are options to increase the allocation of water for irrigation in the Crocodile West Catchment. The Vaal River System is expected to have shortfalls for some periods in the future and it is preferred to use the water in that system. We have considered linking the WB and Central Basin (CB), but the distance is too long. There are also the reconciliation strategies for the Vaal River and the Crocodile West that guide water use. We would first need to see how it all fits in together.	Mr Andrew Tanner, Aurecon
Rand Water currently supplies 4000 Mℓ of water per day. About 200Mℓ will emanate from the different basins. The Rand Water solution would be ideal because, the desalination cost of the 200Mℓ can be absorbed in the overall treatment costs and passed onto the consumer.	Ms Rosemary Anderson, Stonehaven on Vaal, Emfuleni Tourism Association & Sedibeng Interim Regional Tourism Association	The Study Team is considering all options, including supply to Rand Water. Other options beyond Rand Water absorbing all the cost were also considered for e.g. passing some or all treatment costs to the users of the Vaal River because there is a benefit to their whole system.	Mr Andrew Tanner, Aurecon
Is there an option for Rand Water to treat the water in the STI? There is concern that DWA is currently failing in its obligation on the STI and in terms of sewerage treatment plants. DWA's credibility is questionable and there is no trust that promises made will be honoured.		DWA has trust in Rand Water and that would be a good option to pursue The Feasibility Study is to recommend an institutional solution towards the end of the study. The identification of a suitable implementing and/ or operating agent(s) is important to the implementation of the LTS. DWA is doing everything possible to meet its obligations.	Mr Jurgo van Wyk, DWA
Implementing the STI will do irreparable damage to the Vaal River System. There is grave concern regarding the discharge of saline neutralised water into the Vaal River, because there is no trust that the water is currently being properly neutralised. Decisions on the STI process did not include public involvement.		STI is necessary for the LTS. LTS comprises of desalination and treating for use of the water. Implementing the STI with discharge of neutralised water will be similar to the situation when the mines were pumping, but there should be better control of the neutralisation process. There is no reason to expect irreparable damage to the	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
Please involve the public in the long-term solution.		system. No AMD water is currently being discharged into the Vaal River System. This workshop is one of the activities to involve the stakeholders in the LTS.	
The City of Johannesburg is concerned about the sludge disposal issue, which does not seem to be addressed in the STI or LTS.	Mr Daniel Masemola, City of Johannesburg	Sludge disposal from the AMD treatment processes is part of both the STI and the LTS. Sludge management will be monitored by the DWA Regional Office. The LTS seeks to find the best possible solution, also as far as waste disposal and management is concerned.	Mr Jurgo van Wyk, DWA
Have all the options been considered, when will the options be decided on and when will it be implemented?	Ms Rosemary Anderson, Stonehaven on Vaal, Emfuleni Tourism Association & Sedibeng Interim Regional Tourism Association	A wide range of options are considered in the Feasibility Study. At the end of the Study, the Department will need to take decisions and implement an agreed solution.	Mr Andrew Tanner, Aurecon
Is it correct to summarise, that DWA is going out to tender, enter a bid process to desalinate the water, and then the operator will sell the water back to the Government?		That is a possible scenario. However, the desirable model still needs to be determined.	Mr Jurgo van Wyk, DWA
It is very positive to hear that government will base decisions on the outcomes of this study. Stakeholders are very encouraged and have a better understanding about the process, from the information presented at this meeting. The initial negative perceptions have now been turned into positive ones.		Noted. Thank you.	Mr Jurgo van Wyk, DWA

F. Closure

In closing the meeting, Mr van Wyk thanked participants for their time and valuable comments and inputs to this study, and added that he looks forward to their continued participation throughout the study.

The meeting closed at 12:30.

Appendix A:

Present, Apologies, Declined Invitation and Absent/No Response

Present:

City of Johannesburg	Mr	Freddie	Letsoko
City of Johannesburg	Mr	Daniel	Masemola
City of Johannesburg	Ms	Nomvula	Mofokeng
City of Johannesburg	Mr	Chris	Rabaji
ERWAT	Dr	Ziboneni	Godongwana
Johannesburg Water	Mr	Ntshavheni	Mukwevho
Mogale City Local Municipality	Mr	Stephan	du Toit
Mogale City Local Municipality	Ms	Angie	Mpshe
Randfontein Local Municipality	Mr	Richard	Magwanya
Randfontein Local Municipality	Mr	Diagiso	Matlanado
Sedibeng United Business Forum	Ms	Maureen	Dosoudil
Stonehaven on Vaal, Emfuleni Tourism Association & Sedibeng Interim RTO	Ms	Rosemary	Anderson
West Rand District Municipality	Ms	Estelle	du Toit
West Rand District Municipality	Ms	Susan	Stoffberg

Present (Project Team/Consultants):

Aurecon	Mr	Andrew	Tanner
Aurecon	Mr	Fanie	Vogel
Department of Water Affairs (DWA)	Ms	Jackie	Jay
Department of Water Affairs (DWA)	Mr	Jurgo	van Wyk
SRK Consulting	Ms	Donne	du Toit Chetty
SRK Consulting	Ms	Vassie	Maharaj
TCTA	Mr	Richard	Holden

Apologies:

Mogale City Local Municipality	Cllr	Andy	Mathibe

Declined Invitation:

City of Johannesburg	Ms	Antonino	Manus
Ekurhuleni Metropolitan Municipality	Ms	Elsabeth	van der Merwe
Johannesburg Water	Mr	Mthokozisi	Ncube
Rand Water	Mr	Solomon	Mathebula
Rand Water	Mr	Tawanda	Nyandoro
Randfontein Local Municipality	Ms	Maliba	Ramatlhape
Vaal University of Technology - Iscor Innovation Centre	Mr	Jan	Jooste
West Rand District Municipality	Ms	Herina	Hamer

Absent/No Response:

Ekurhuleni Metropolitan Municipality	Ms	Cecilia	Rakgoale
Emfuleni Local Municipality	Mr	Sibusiso	Biyela
ERWAT	Mr	Koos	Wilken
Gauteng Department of Agriculture and Rural Development (GDARD)	Ms	Rina	Taviv
Johannesburg Water	Mr	Ariel	Mafejane
Mogale City Local Municipality	Cllr	Emily	Mathe
Randfontein Local Municipality	Mr	Dira	Modimogale
Randfontein Local Municipality	Cllr	Arthur	Sampson
Sedibeng District Municipality	Mr	Mbuyiselo	Kantso
South African Local Government Association (SALGA)	Mr	William	Moraka

Appendix L

Focus Group Meeting: Environmental and conservation NGOs, Recreation, Tourism and other interest groups - Proceedings

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Schoeman Street, Pretoria
Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam

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

Draft Proceedings of Focus Group Meeting held on 7 September 2012 with Representatives of Environmental NGOs, Interest Groups, and Tourism and Recreation

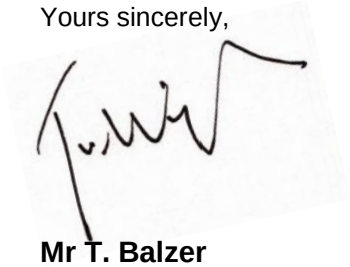
Your participation during the Focus Group Meeting in September 2012 is much appreciated. At the meeting, attendees were introduced to the Feasibility Study for a Long-term Solution, and comments and inputs were invited to inform the study. Many valuable inputs and sources of information were received at this meeting and thereafter. Please find enclosed the draft proceedings of the meeting for your information. The meeting presentation is available on the Department of Water Affairs (DWA) website (see below).

In terms of progress with the study: Phase 1 (study initiation phase) is completed, while Phase 2 (pre-feasibility phase) is in the process of being concluded. Phase 3 (feasibility phase) is the final phase of this study and has commenced. Note that the complexity of the study necessitated an extension of the study contract. The Feasibility Study is due for completion on **31 July 2013** and will, thus, be conducted over an 18 month period.

The updated versions of the AMD Voids Report (Draft 3) have been made available on the website (http://www.dwa.gov.za/Projects/AMDFSLTS). The draft reports of Phase 2 are expected to be made available to the public in due course, while the Phase 3 reports are expected to be made available towards the end of the study.

We thank you for your participation.

Yours sincerely,



Mr T. Balzer
Acting DIRECTOR-GENERAL
Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 9 April 2013

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

FINAL PROCEEDINGS OF A FOCUS GROUP MEETING WITH REPRESENTATIVES OF ENVIRONMENTAL NGOs, INTEREST GROUPS, TOURISM AND RECREATION

Held on 7 September 2012

At Kruger Kloof Lodge, Krugersdorp

Distribution: Focus Group Meeting Invitees, Acceptances and Attendees

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A. Introduction

This document records the proceedings in comment and response report format, of a focus group meeting with representatives of environmental non-governmental organisations (NGOs), interest groups, and tourism and recreation representatives for the AMD long-term solution Feasibility Study.

The Focus Group meeting was held on 7 September 2012 at Kruger Kloof Lodge, in the Krugersdorp Nature Reserve, and attended by 40 people (see **Appendix A** for a list of the attendees). The list also includes apologies, those who declined the invitation, those who did not respond and those absent.

B. Welcome and Introductions

Mr Jurgo van Wyk (DWA Study Manager) welcomed attendees, expressed his appreciation for their attendance, and pointed out that the focus of the meeting is on the AMD Long-Term Solution (LTS) Feasibility Study. He introduced Mr Solly Manyaka (Kaleo Consulting) as facilitator of the meeting.

Mr Manyaka briefly outlined the meeting procedure and process, and encouraged attendees to participate freely, pointing out that they are welcome to raise comments in their language of choice. He requested attendees to introduce themselves.

C. Meeting Objectives

Mr Van Wyk outlined the objectives of the meeting as follows:

- To provide key stakeholders with an opportunity to raise issues, concerns, comments and suggestions to inform the study; and
- To update key stakeholders on progress with the Feasibility Study for the LTS.

D. Meeting Presentations and Presenters

Information at the meeting was presented as follows:

- Mr van Wyk presented an overview of the Feasibility Study; and
- Mr Andrew Tanner (Aurecon) presented an update on study progress to date.

Note that the presentations are not appended to these proceedings, but are available to focus group meeting attendees on the following website: http://www.dwa.gov.za/Projects/AMDFSLTS/documents.aspx.

E. Proceedings

The table below lists the comments, questions, recommendations and suggestions raised by meeting participants, as well as the responses from the Feasibility Study Team.

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
There is concern about Government's commitment to resolving the AMD crisis, given that mining is allowed to continue and about DWA's credibility in terms of honouring promises to affected landowners.	Ms Elize Strydom, Landowner	Comment noted.	Mr Jurgo van Wyk, DWA
It is believed that there will be a re-prioritisation of the short-term treatment of AMD within the Western Basin and that the construction of a water treatment plant will be deferred because of a lack of funding. The installation of a submersible pump and infrastructure and the treatment of AMD within the Central Basin will be prioritised.	Ms Mariette Liefferink, Federation for Sustainable Environment (FSE) & Public Environmental Arbiters (PEA)	Confirmed.	Mr Sean O'Beirne, TCTA
Please confirm whether or not Digby Wells Environmental, who has been appointed by TCTA to conduct the scoping and environmental impact assessment, will still be conducting an EIA for the short-term treatment of AMD, or whether this EIA will be collapsed and consolidated with the long term treatment of AMD.	Ms Mariette Liefferink, FSE & PEA	The EIA for the short-term treatment of AMD will not be continued in its current form and a Section 24M exemption will be applied for from the Department of Environmental Affairs (DEA).What is also being considered is the possibility of combining the short-term and long-term environmental assessment requirements into a single process. ***Post meeting note:*** *The outcome of the above still needs the approval of the authorities.*	Mr Sean O'Beirne, TCTA
Why is this study 10 years late? The public has a problem with the sincerity of the process to find the long-term solution.	Mr Paul Fairall, Jukskei River Catchment Area Management Forum, Wetlands in Crisis-Gauteng & Wetland Society of South Africa.	It must be pointed out that although this study is only taking place now, the Department is committed to finding a long-term solution to the AMD problem, and there are several parallel studies and initiatives by the DWA and other government institutions, all working towards a sustainable solution.	Mr Jurgo van Wyk, DWA
Will the "polluter pays" principle apply?	Mr Israel Mosala, Earthlife Africa	DWA does support the polluter pays principle. It is difficult to commit to a time line at this stage, but it can be	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		assured that, where appropriate, the Polluter Pays Principle will be applied. In addition, Government may engage with the mining industry soon about various aspects, including access to land and infrastructure, partnering, etc.	
The discrepancies in water quality data are of concern. How is it possible to work towards a solution if the water quality and volume in the Eastern Basin is unknown or uncertain?	Prof Les Stoch, Private Capacity	The Mine Voids report will be issued shortly and will provide clarity on the discrepancies in data.	Mr Jurgo van Wyk, DWA
There is concern about the lack of public participation in the process for the long-term solution. For example, there are experts that need to participate; where do the mines fit into this process? The public needs answers?	Prof Les Stoch, Private Capacity	The relevant key stakeholders are involved and key role players are being consulted as part of this Feasibility Study. A wider public participation process will be conducted during the forthcoming environmental assessment process.	Mr Jurgo van Wyk, DWA
Given the potential scale and implications of this process, it is suggested that an independent auditor should be appointed to monitor progress, and provide credible information to stakeholders.	Mr Len Jansen, Stop Mining in Magaliesburg Action Group (SMMAG)	Independent peer reviewers will be identified at a later stage. In addition, the World Bank has also expressed their willingness to avail independent international experts in a peer review capacity.	Mr Jurgo van Wyk, DWA
With reference to the Status Quo Report and other draft reports which have been made available this far. When the first water came into the Western Basin (WB) the JCI Environmental Engineering Division calculated an inflow of 42 ML/day, which was the average at that stage. None of the reports show that amount of inflow to the basin. The prediction model which was designed by Risen Consulting at that stage made use of this inflow figure to the basin and the model was calibrated to predict surface decant. One of the objectives in the WB is to protect the dolomite aquifers in the basin towards the Cradle of Humankind. There is over emphasis on surface water quality monitoring. The information presented on the timings of the Environmental Critical Levels (ECLs) for various basins shows that the ECL has been breached in the WB and that water has surfaced. There is need to emphasize that, originally a certain percentage of dolomite water was seeping into the basin, and because the ECL is breached there is a sub-surface reverse flow back into the dolomite. History shows that as soon as the water table is lowered, more	Mr Stephan du Toit, Mogale City Local Municipality & Krugersdorp Game Reserve	The Feasibility Study team has studied the Risen Report, but will look at it again. The Short-Term Intervention (STI) current average long-term pumping prediction is around 30 ML/day. For the long-term, pumps will be able to pump up to 40 ML/day. There will be a capacity to pump 70 ML/day while the water level is being lowered. This will cope adequately with the incoming flow. The reduction of ingress and stabilization of the situation is being considered carefully. The protection of the dolomite aquifers in the Cradle of Humankind is an objective. Considering all the studies, there is no reason to believe that these dolomite aquifers have been or will be polluted by underground seepage of AMD, but pollution from the Tweelopies Spruit is a risk.	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
water will come into the basin. This is not adequately assessed at this point. It is critical to have a good understanding of what the ECL will be. With reference to the Socio-Economic Critical Level (SECL) being lower than the ECL; based on historic rates, pumping needs to take into consideration that there is additional inflow over and above what is anticipated.			
The ECL of the Central Basin has been determined at 1520 metres above mean sea level (m amsl) and the SECL for Gold Reef City has been determined at 1480 m amsl. It appears that the DWA will be pumping water from 1480 m amsl in order to protect the commercial interests of Gold Reef City. Who will pay for the additional pumping and treatment costs to protect the commercial interests of Gold Reef City – the tax payer?	Ms Mariette Liefferink, FSE & PEA	It should not be passed over that during a previous meeting with key stakeholders in the Sunnyside Hotel (Parktown), on 11 July, 2012, representatives of the TCTA responded to the same question; indicating that the ECL of the Central Basin corresponds with the socio-economic critical level (SECL) for Gold Reef City. This now appears to have been an erroneous statement. The Feasibility Study is looking at the costs of pumping to keep the water level below the ECL versus the SECL. Discussions will be held with Gold Reef City on the merits, costs and benefits of the alternatives, which will be reported. Recommendations would then be provided. Obviously one of the options for funding the solution is from the fiscus. The Feasibility Study will however also consider various other options and will evaluate their risks and benefits. TCTA has a different ECL level to the long-term solution. As stated before, TCTA use the ECL of the IMC in this basin to project the weathered and fractured aquifers that exist within the basin, specifically close to the potential decant point. These aquifers generally only extend 80-100 m below the surface. The ECL was therefore taken as 150 m below the lowest lying shaft, from which decant is likely to occur, providing a 50 m buffer to ensure the protection of these groundwater resources.	Mr Sean O'Beirne, TCTA
It is well established that Mintails, by its deposition of gold tailings in the unlined West Wits Pit (southern section), causes the displacement of water, which contributes significantly to the ingress and to the decant volumes within the Western Basin. The public is currently paying for the pumping and treatment of AMD within the Western Basin. Since Mintails contributes significantly to the ingress source of AMD, does the polluter pays principle not dictate that Mintails should carry the costs for the additional	Ms Mariette Liefferink, FSE & PEA	DWA does support the polluter pays principle. Apportioning of the liabilities is however a challenging process and it is not yet clear how it will be implemented. The case being referred to is overseen by the Gauteng Regional Office of DWA through the implementation of the Short-Term Interventions. The LTS aims to establish a fair and sustainable outcome,	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
volumes of AMD which have to be pumped and treated?		converting a water environmental threat into a water resource solution.	
In terms of the apportionment of liabilities, has consideration been given to the provision in Section 38 of the Mineral and Petroleum Resources Development Act (MPRDA) namely that the Directors of a company or members of a CC are jointly liable for any unacceptable negative impact on the environment, including damage, degradation or pollution advertently or inadvertently caused by the company or CC, which they represent or represented?	Ms Mariette Liefferink, FSE & PEA	Yes, consideration was given to the mentioned provision of the MPRDA. However, only the mines and not the individual responsible persons, that may be held liable in terms of the MPRDA, are being identified through the Feasibility Study. This matter may however be considered as part of a strategy for DWA to implement the recommendations from this study.	Mr Jurgo van Wyk, DWA
Will the Minister of Mineral Resources be considering the liquidation of the trust funds held by the Department of Mineral Resources (DMR)? The law makes provision for that. Stakeholder would like to know the value of those trust funds.	Ms Mariette Liefferink, FSE & PEA	DWA has started investigating the issue of the trust funds, and will enter into discussion with DMR in due course.	Mr Jurgo van Wyk, DWA
Water quality data from the permanent monitoring station have been repeatedly requested in order to assess the success of the immediate treatment of AMD within the Western Basin. These requests have been unsuccessful..	Ms Mariette Liefferink, FSE & PEA	***Post meeting note:*** *This monitoring station no longer exists. Data is obtained on a weekly and sometimes daily basis from Gold One.*	Mr Craig Hasenjager, TCTA
How will it be possible to continue with procurement and to award tenders if there are insufficient funds? The Treasury has pledged R433 million for the STI and the required funds are R2.2 billion.	Ms Mariette Liefferink, FSE & PEA	Tenders will only be awarded for contracts to the value of the funds that are available. In the long run there are funding options that may be pursued such as public private partnerships, loans, funding through the Vaal River tariff structure (user-pays principle), application of the Waste Discharge Charge System (polluter-pays principle), etc. The Feasibility Study is investigating suitable funding models.	Mr Sean O'Beirne, TCTA
The Terms of Reference for the Feasibility Study team is set up to minimise salt loads in the Vaal River System. Ingress is a very important issue. Ingress of AMD generated from surface is much more than AMD generated from underground. There are more chlorides in the Eastern Basin than in the Western Basin, because of the Sappi dam on the surface on top of the dyke. The sulphates and chlorides go directly underground. Is ingress management part of the LTS? Possible strategy for apportionment might be to remove residue and fill open cast voids as a means of stopping the ingress.	Mr Anthony Turton, Touchstone Resources	Studying or planning control of Ingress from surface is not part of the Feasibility Study. It is an on-going separate project by DMR through CGS. The LTS Feasibility Study is looking at how much the volumes could be reduced if ingress is managed and the potential benefit for the water quality.	Mr Andrew Tanner, Aurecon
		Addressing ingress is not part of the mandate of the Feasibility Study. It is being addressed by DMR and the Council for Geoscience. This study looks at the effect of ingress prevention	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		and makes predictions of prevention percentages and the effect on the LTS and design sizes. The Mine Voids report, which will be available on the DWA website, will provide information on that and ingress prevention.	
Will the pumps be underground multi-stage dry pumps or submersible multi-stage pumps?	Mr Anthony Turton, Touchstone Resources	They will be submersible multi-stage pumps.	Mr Andrew Tanner, Aurecon
Will some of the reports always remain confidential? Tax payers are paying for the treatment of AMD, and have a right to information.	Ms Melita Steele, Greenpeace Africa	There are three confidential reports. One, the Apportionment of Liabilities Report with two parts, being Legal and Technical, which will remain confidential until the objectives of the strategy to engage with the mines have been achieved, which is part of upcoming negotiations with DMR. The other two confidential reports are linked to the procurement process, which will be kept confidential until the procurement and tender process is concluded. The ultimate intention is not to keep reports confidential.	Mr Jurgo van Wyk, DWA
It is estimated that there are over 5 000 abandoned mines in SA, however not all in these three basins. How do these other mines fit into the Feasibility Study for the long-term solution, and the liability issue?	Ms Melita Steele, Greenpeace Africa	The Feasibility Study is only looking at the three basins. Similar projects are planned as part of the Mine Water Management National Strategy for AMD on the Highveld coalfields, and AMD generated from the coal mines. The eMalahleni and Optimum plants are already desalinating water from those mines. There are plans to potentially augment the Olifants River System, which is a stressed catchment, and the water from the coal mines in Upper Vaal River and Upper Komati River Catchments are also being considered as part of the strategy. Parallel to that study, DWA is also looking at the defunct coal mines, and will continue using existing legislation (NWA) to regulate operating mines, so that current operating mines should not be future defunct mines, and perpetuate the AMD problem.	Mr Pieter Viljoen, DWA
		The study team are trying to determine who took over the liability or are the legal successors of the abandoned mines.	Mr Andrew Tanner, Aurecon
It was mentioned that the ECL has been set to a conservative value higher than necessary, and that with monitoring, will be decided if it should be lowered. There is concern about the ability	Ms Melita Steele, Greenpeace Africa	In the WB the water is at the surface, and investigations are being done on lowering the ECL to 1 600 metres, and monitoring to see if pollution stops. If not, it will be lowered further. The	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
to monitor and reduce, given the costs around implementing.		team is aware of existing monitoring. In the other two basins the ECL is already low. Investigations are to stop the water level conservatively at lower ECL and monitor when the situation is stable, it is proposed to let the water rise comfortably and slowly whilst monitoring. The saving in pumping costs would pay for the monitoring.	
It may not be possible to make a distinction between the SECL and the ECL considerations in the Magaliesburg region.	Mr Len Jansen, SMMAG	Noted.	Mr Andrew Tanner, Aurecon
The Feasibility Study cannot be completed without an EIA. In terms of timelines it is already a procedural flaw because tax payers' money is involved.	Mr Len Jansen, SMMAG	Noted.	Mr Andrew Tanner, Aurecon
No information should be confidential in this process. All information should be in the public domain. A complete list of monitoring systems, streams, data and plans for expanding the model must be available to the public.	Mr Len Jansen, SMMAG	Noted.	Mr Andrew Tanner, Aurecon
Two Ritz pumps cost R16 million each. Switch gear is R6 million without specialist assistance. Operating, managing, acts of nature and unreliable electricity supply are critical aspects to be considered. It appears that the mining company supplying the pumps has got a trade off with government for a benefit. Those pumps are unnecessary. Pumps from surface can be used. It is wrong to pump from mine shafts which are normally sealed, taking water down and bringing it up the shaft as dirty water in a 44 km long single basin, which can be intercepted anywhere.	Prof Les Stoch, Private Capacity	Noted.	Mr Andrew Tanner, Aurecon
How thick is the dolomite in the WB? Presentation shows ECL is 70 metres below the dolomite, 300 metres in some parts. In WB up to about 150 metres, the porosity of dolomite is approximately 87%. Going 70 metres below the dolomite and pumping at a great expense can let the water come up much higher.	Prof Les Stoch, Private Capacity	Thank you. The slide is incorrect. The proposed ECL is 70 metres below the surface, not below the dolomite. The draft report on which this information is based has been approved and will be available on the DWA website.	Mr Andrew Tanner, Aurecon
Information must be provided to stakeholders in advance for them to contribute to technical discussions such as this. Will information, paid for by public money, be made available to people who have an interest in this issue, or is the information	Prof Les Stoch, Private Capacity	This study is in the Pre-Feasibility stage and not at a stage where alternatives with recommendations can be defined. It is, however, nearing the stage where it can be registered as a project for an EIA.	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
confidential?		It is suggested that the EIA process should start parallel with Feasibility phase with other options subject to the EIA process. As a result of the tight timeline, this study is attempting to involve people as soon as possible while the reports are still being prepared, and some information cannot be disclosed at this stage as it may potentially compromise future procurement and legal processes.	
The STI pump and treat process might be totally incorrect. It is illogical to do an EIA when the decision has already been taken, without the public being involved? Now an application is going to be made for the Minister to bend legislation to allow a process to happen. The process is flawed. The Constitution allows for the public to receive information, to be consulted, and to participate in decisions that affect them.	Prof Les Stoch, Private Capacity	The Feasibility Study must not be confused with an EIA or with implementation of a desired solution. Although there is a degree of environmental screening that is already being done within the Feasibility Study, the formal EIA can only follow once the Feasibility Study has appropriately defined the possible and most desirable options. The EIA, thus, normally follows after the most feasible options had been described, and aims to address all environmental concerns at an appropriate resolution that is not typically done at the feasibility level of assessment. The Feasibility Study is only now getting to a stage where the next level of detail can be investigated and where the environmental issues can be engaged.	Mr Jurgo van Wyk, DWA
The High Density Sludge (HDS) process with associated infrastructure has been decided upon for the short-term treatment of AMD and in the Western Basin the immediate treatment of AMD by means of the HDS process has already been commissioned. The HDS process is usually the first stage of a process, followed by reverse osmosis. It would therefore appear that the long-term treatment technology of AMD has already been decided upon in order to link with the HDS process even though the Feasibility Study for the long-term treatment will only be completed by February 2013?	Ms Mariette Liefferink, FSE & PEA	The technologies for the treatment of AMD have been categorised into three categories – embryonic, innovative (e.g. the ABC process) and proven. Currently, the only proven technology with acceptable risks that we have been able to identify is the HDS process followed by conventional reverse osmosis. If some of the embryonic or innovative technologies can be proven, then they can be considered at that time. Most of the technologies which have been reviewed require neutralisation before they can be used and for those technologies the proposed HDS installations are acceptable, sometimes with some modifications to suit the alternative desalination processes. However, for a low risk solution to be implemented as soon as possible, there do not yet appear to be any proven alternatives to HDS followed by conventional reverse osmosis. The solution will probably be procured through a competitive process allowing alternatives.	Mr Andrew Tanner, Aurecon

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
		While the HDS followed by reverse osmosis is the leading contender for low risk implementation as soon as possible, it is not the only technology that is being considered by the LTS Feasibility Study. An option is that a proven solution be put in place for a limited period; say 10 years, to allow time for innovative technologies to be pilot tested and proven and a new procurement process to be concluded. If the testing shows that worthwhile savings in lifecycle costs can be achieved, with new investment but reduced costs of treatment and waste disposal, a new procurement process can be started to allow them to compete, given that operating costs are very high, this is a realistic approach.	
It appears that the pump and treat option by means of reverse osmosis, has already been decided upon since alternatives such as saline agriculture, the use of sewage water, wetlands, etc. will not require the HDS infrastructure. What will happen to the HDS infrastructure if an alternative option is decided upon? Will this not constitute wastage of taxpayers' money?	Ms Mariette Liefferink, FSE & PEA	All the options mentioned require the water to be neutralised. If a technology for desalination that does not require any neutralisation can be proven, the HDS infrastructure may then become redundant. The operational costs for the treatment of AMD by means of the HDS process and reverse osmosis will be high in comparison to the capital expenditure (indications are that the operational costs may in every 4-7 years, be equivalent to the capital cost). The LTS has to look at the solution for the next 100 years or more and it would thus be in society's interest to come up with cheaper technologies. Hence the cost spent now on some infrastructure that may become redundant in future, can be justified.	Mr Pieter Viljoen, DWA
No acknowledgement or recognition was given by the DWA to AMD activists for making documents available, at no cost, and supplying Aurecon with the contact details of stakeholders.	Ms Mariette Liefferink, FSE & PEA	The DWA and LTS study team acknowledge and thank the FSE and others for keeping DWA/Government alert to environmental issues, and encourage them to continue to keep a watchful eye. In particular, the FSE assistance in providing information and documents is acknowledged and duly appreciated, Ms Liefferink has been instrumental in creating awareness in government about this problem and that is recognised and appreciated. The NGO support in identifying stakeholders, who were invited to the focus group meeting and other meetings, is also appreciated.	Mr Pieter Viljoen, DWA
Since Interested and Affected Parties can no longer interact with Digby Wells Environmental as the EIA practitioner in view of the fact that the EIA process for the short-term treatment of AMD will	Ms Mariette Liefferink, FSE &	It was noted that for the LTS, there will be a broader public participation process during the EIA where concerns could be	Mr Sean O'Beirne, TCTA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
not proceed, stakeholders are compelled to use the opportunities provided by the LTS to raise concerns regarding all AMD related issues.	PEA	raised. Until TCTA has received exemption from the Department of Environmental Affairs the STI EIA avenue is still available.	
FSE's numerous requests for a copy of the service agreement between TCTA and Central Rand Gold (CRG) have been unsuccessful to date.	Ms Mariette Liefferink, FSE & PEA	TCTA cannot give a copy of this agreement until it has been approved by DWA and signed by both parties.	Mr Sean O'Beirne, TCTA
The draft agreement, which was unwittingly supplied to FSE, states: "TCTA shall use its reasonable commercial endeavours in ensuring the grant of such IWULA to Mogale Gold." Mintails (Mogale Gold) is currently depositing hazardous tailings material into the unlined West Wits Pit without a water use license. The short-term treatment of AMD requires the use of the West Wits Pit for the disposal of the radioactive and toxic heavy metal residue after neutralisation. Mintails has to agree that the TCTA may co-deposit the sludge in the West Wits Pit. From the above clause in the Draft Agreement, it is inferred, that the TCTA shall use its commercial endeavours in ensuring the granting of a water use license for Mintails' operations. This is alleged unethical behaviour?	Ms Mariette Liefferink, FSE & PEA	TCTA is not sure which draft has been provided to FSE. It could be a marked up version received from Mintails, which is not the final version.	Mr Sean O'Beirne, TCTA
New mining applications (e.g. the open cast mining operations by Mintails SA adjacent to the West Wits Pit) are approved and environmental compliance is not enforced, which exacerbates the AMD situation. How will the DWA and Aurecon address these issues in this study?	Ms Mariette Liefferink, FSE & PEA	This does not fall within the mandate of the current LTS Feasibility Study. Any new application will, however, have to follow due process, including DWA approvals.	Mr Andrew Tanner, Aurecon
What provision will be made for the remediation of the receptor dams (e.g. Robinson Lake, Hippo Dam, and Aviary Dam), Tweelopies Spruit East and eco-systems, as well as compensation for affected parties?	Ms Mariette Liefferink, FSE & PEA	Diffuse sources, remediation of affected dams, river systems, soil, etc. and compensation for affected parties, fall outside the mandate of the current LTS Feasibility Study. Government (including Departments other than Water Affairs will have to look at this in future). A recommendation for remediation can be included in the Implementation Plan for the LTS	Mr Andrew Tanner, Aurecon
Has consideration been given that the Minister of Mineral Resources, has, in terms of Section 45 of the MPRDA, the power to recover costs in the event of urgent remedial measures? Section 45. (1) states that if any prospecting, mining, reconnaissance or production operations cause or results in	Ms Mariette Liefferink, FSE & PEA	Yes. However, the apportionment of liability issue is sensitive. The study report on the apportionment of liability will inform DWA's legal strategy and will be a confidential document until such time that the necessary negotiations/actions have taken place. The Department is to engage with the Department of	Mr Jurgo van Wyk, DWA

QUESTIONS/ COMMENTS/ SUGGESTIONS	COMMENTATOR	RESPONSE/ DISCUSSION	RESPONDENT
ecological degradation, pollution or environmental damage which may be harmful to the health or well-being of anyone and requires urgent remedial measures, the Minister may direct the holder of the relevant right, permit or permission to— (2)(c) In order to implement the measures in paragraph (a), which states that the Minister may apply to a High Court for an order to seize and sell such property of the holder as may be necessary to cover the expenses of implementing such measures.		Mineral Resources on the subject in due course.	
As a representative of potential investors in the UK, and being involved in direct foreign investment and Pubic Private Partnerships, it must be pointed out that the wrong language is being used in terms of funding. Accountability, transparency, responsibility and an EIA are key words and issues in funding language, and it seems that DWA is embarking on a project where that process is flawed. The Freedom of Information Act was passed by government, so it is not acceptable that reports are confidential and being hidden to protect the mines. Given this situation, how can international funders be expected to assist the project? Even if Treasury gives guarantees, who is going to repay the costs? This is a practical problem that requires serious consideration.	Mr Abrie Lottering, Structured Credit & Finance Solutions Ltd (UK) & Strategic International Resources (RSA)	Fully agree. The concerns are noted. The reports are not confidential to protect the mines but rather to strengthen Government's position and ensure that the procurement process is not flawed.	Mr Pieter Viljoen, DWA
		It is understandable that there is a lot of anger towards the AMD situation. DWA, however, does not believe that the process is flawed. The public are being involved, and the process is being opened up for input and ideas from key stakeholder groups. Wider public participation, as explained earlier, will follow in due course as part of the LTS EIA. The Feasibility Study executes a defined scope and will not address every aspect pertaining to AMD. Issues, such as the rehabilitation of affected streams, can be mentioned as part of the Implementation Plan being produced as part of the Feasibility Study.	Mr Jurgo van Wyk, DWA
Note that HDS facilities need massive engineering work. I am comforted with what was presented on the LTS. Note that it is a transition from a dilemma to a problem. DWA and these respected water resource engineers are commended for their efforts and contributions. However, there is concern that because of the pressure, a long term solution may be decided upon, too soon. The matter is about what the business case is. At the moment there is none. SA is down to 64 from number 3 on the list of attractive foreign investment countries – declared non investor friendly. The national economy has been built on a fundamentally flawed model by externalising costs, and the issue is how to re-internalise and re-invent 120 years of internalities, and of flawed macro-economic planning?	Mr Anthony Turton, Touchstone Resources	Fully agree. Thank you. Mr Turton is also acknowledged for being instrumental in creating awareness in government about the AMD problem.	Mr Pieter Viljoen, DWA

F. Closure

The facilitator requested all participants to contribute their closing views and comments. These are included in the table below.

Closing remarks by meeting participants	
Looking at finances and financial models associated with treating AMD, the decision to allow mining to continue, was wrong. Economic benefits of continued mining are outweighed by remedial costs for AMD management. The key questions are then, who should be prosecuted, who should be held liable – the mine or the authority who authorised mining to start or continue? There are five applications for mining authorisations in the Magaliesberg, Decision makers are not aware of the problem and do not attend meetings. DMR should attend meetings so that they are aware of the magnitude of the AMD problem, and will reconsider authorising new and continued mining. It is unfair on DWA as a regulator to try and rescue the crisis without support from other government departments.	Mr Stephan du Toit, Mogale City Local Municipality & Krugersdorp Game Reserve
There is concern from Local Government and the Krugersdorp Game Reserve that the immediate and STI processes exclude certain issues and processes, like remediation and rehabilitation. This was raised previously and there was commitment from the regulator at that point that these two matters would receive attention. To date there has been no feedback on any aspect such as budgets for remediation or rehabilitation. It was hoped that this would be taken up in the LTS, but it is not.	Mr Stephan du Toit, Mogale City Local Municipality & Krugersdorp Game Reserve
A major concern is that compensation for losses incurred by affected parties is not being addressed. Mogale City, as Local Government and as an affected party would like this issue to form part of either the STI, intermediate or LTS process.	Mr Stephan du Toit, Mogale City Local Municipality & Krugersdorp Game Reserve
There are 103 specialists working on the LTS, with a big budget and an impossible job compressed into 13 months. At this stage in the process the public, who have not been provided with information, time or resources are expected to participate and make a useful contribution. The process is not transparent and is therefore flawed. How can this study team propose a sensible solution if they do not have correct data?	Prof Les Stoch, Private Capacity
As a directly affected party, there is concern that over the years and throughout the various AMD studies, questions from affected parties have been ignored and unanswered. The process is not transparent, and there is an urgent need for a forum where affected parties can raise their concerns and receive answers.	Ms Elize Strydom, Land Owner
The team is commended for considering options of irrigation and passive treatment systems, and it is recommended that the team liaise with John Annandale and Jan Jansen who are involved in soil science and passive treatment systems. There is, however, concern that the volumes of AMD cannot be treated with passive treatment systems. Will it be possible to have an integrated system dealing with engineering and biological approaches? *Post meeting note: Meetings have been held with these practitioners.*	Mr P S Rossouw, Jukskei River Catchment Area Management Forum, Wetlands in Crisis-Gauteng & Wetland Society of South Africa/Rossouw and Association
Rowing South Africa has been working with various water sports organisations for some years trying to build a new water sports facility. Since there is no clean water anywhere near Johannesburg, there is a need for an adequate supply of clean water close to Johannesburg for a rowing and swimming training facility. Treated AMD could be considered for that water supply, and would demonstrate a great success story to the world.	Mr Selwyn Jackson, Rowing South Africa
Concerned about the rising water in the shaft at Gold Reef City – the rise is approximately 2m per week. Gold Reef City should be informed about when the pumping will start and whether the water will be contained at 5 level.	Mr Jimmy Swan, Gold Reef City

Stakeholders are well represented, and the team is commended for the progress with the study. There is a positive feeling that the issues are being resolved, and for involving stakeholders in the process.	Mr Anthony Duigan, Rhenosterspruit Nature Conservacy
The Feasibility Study team, especially government are thanked for the commitment and progress on the study.	Mr Abrie Lottering, Structured Credit & Finance Solutions Ltd (UK) & Strategic International Resources (RSA)
There is disappointment with DWA as an organisation (but not with individual officials), for the manner in which the department is handling the AMD issue. I will be further involved in engagement with DWA via a consortium of scientists.	Mr Paul Fairall, Jukskei River Catchment Area Management Forum, Wetlands in Crisis-Gauteng & Wetland Society of South Africa.
There is disappointment in the alternatives presented by the study team. I am willing to make data freely available, to inform the study.	Prof Les Stoch, Private Capacity
The Agreement between TCTA and CRG must be made publicly available.	Mr Godfrey Makomene, Affected Community Elected Representatives (Acer) & Johannesburg Mining Forum (JMEEF)
Recent research done by Phil Hobbs demonstrates clearly a 10 year time lag between when the decant started and when the pollution was first discovered. It is crucial that the correct systems and options be evaluated for informed decision making. It should not be a quick-fix situation.	Mr Stephan du Toit, Mogale City Local Municipality & Krugersdorp Game Reserve
The country is in crisis because of AMD and the situation must be resolved as soon as possible.	Mr Eugene Viljoen, FSE
Other government departments must be involved.	Ms Simone Liefferink, FSE
More corporates should be involved in finding a solution to the AMD challenge.	Ms Isa Swart, Sun International
There needs to be unity between scientists and decision makers in order to find the best solution to the AMD crisis.	Ms Deborah Lottering, Structured Credit & Finance Solutions Ltd (UK) & Strategic International Resources (RSA)
A suitable solution to the AMD crisis must be found as soon as possible.	Mr Danie Boshoff, Sun City
TCTA is committed to the STI and LTS and assisting DWA to resolve the AMD situation.	Mr Craig Hasenjager, TCTA

In closing the meeting, Mr Pieter Viljoen stated that he in his individual capacity as a DWA official and his team are committed to ensuring that a thorough Feasibility Study is done, even though people perceive the study to be starting from a flawed foundation. He pointed out that the aim of the study is to recommend a sustainable long-term solution, which is acceptable to everybody.

He thanked participants for their time and valuable comments and inputs. He stated that in addition, appropriate tools must be used to manage appropriate activities by other departments. For example, mining is managed by the Mineral and Petroleum Resources Development Act (MPRDA) and the National Water Act (NWA) is used to focus on water use authorisations. Mines have been mining long before they receive water use authorisations. The NWA was not designed to manage mining; it was designed to manage water use. It is important to look at appropriate legislation to manage mining, and whether authorisations given under mining legislation are done appropriately.

He also gave assurance that DWA will follow up on the concerns raised by Mogale City Local Municipality.

Mr Jurgo van Wyk thanked participants for their time and inputs to this planning process.

The meeting closed at 18:00.

Appendix A:

Present, Apologies, Declined Invitation and Absent/No Response

Present:

Affected Community Elected Representatives (Acer) & Johannesburg Mining Forum (JMEEF)	Mr	Godfrey	Makomene
BirdLife South Africa	Ms	Carolyn	Ah Shene Verdoorn
Earthlife Africa	Mr	Israel	Mosala
Earthlife Africa (Greenhouse Project)	Ms	Rachel	Adatia
Endangered Wildlife Trust	Ms	Bridget	Corrigan
Energy Caucus	Dr	Elke	Bey
Federation for Sustainable Environment (FSE) & Public Environmental Arbiters (PEA)	Ms	Mariette	Liefferink
Federation for Sustainable Environment (FSE) & Public Environmental Arbiters (PEA)	Ms	Simone	Liefferink
Federation for Sustainable Environment (FSE)	Mr	Eugene	Viljoen
Gold Reef City	Mr	Jimmy	Swan
Greenpeace	Ms	Melita	Steele
Highveld Biological Association & Energy Caucus	Dr	Mike	Whitcutt
Jukskei River Catchment Area Management Forum, Wetlands in Crisis-Gauteng & Wetland Society of South Africa.	Mr	Paul	Fairall
Jukskei River Catchment Area Management Forum, Wetlands in Crisis-Gauteng & Wetland Society of South Africa/Rossouw and Ass	Mr	P S	Rossouw
Lawyers for Human Rights	Ms	Emma	Algotssom
Legal Resources Centre	Ms	Naseema	Fakir
Mintails	Ms	Vicky	Henrico
Miracles/Land Owner	Ms	Elize	Strydom
Mogale City Local Municipality	Mr	Stephan	du Toit
National Assoc of Conservancies (NACSA) & Gauteng Conservancy Assoc (GCA)	Mr	Bob	Dehning
Private Capacity	Prof	Leslie	Stoch
Rhenosterspruit Nature Conservacy	Mr	Anthony	Duigan
Rowing South Africa	Mr	Selwyn	Jackson
South African Human Rights Commission (SAHRC)	Ms	Angela	Kariuki
Stone Haven	Ms	Rosemary	Anderson
Stop Mining in Magaliesburg Action Group (SMMAG)	Mr	Len	Jansen

Structured Credit & Finance Solutions Ltd (UK) Strategic International Resources (RSA)	Mr	Abrie	Lottering
Structured Credit & Finance Solutions Ltd (UK) Strategic International Resources (RSA)	Ms	Deborah	Lottering
Sun City	Mr	Danie	Boshoff
Sun International	Ms	Isa	Swart
Touchstone Resources	Dr	Anthony	Turton
Wildlife & Environment Society of SA (WESSA) - Northern Areas	Mr	John	Wesson
Yellow Fish Working Group (FOSAF)	Mr	Peter	Arderne

Present (Project Team/Consultants):

Aurecon	Mr	Andrew	Tanner
Aurecon	Mr	Johan	van Zyl
Aurecon	Mr	Fanie	Vogel
Department of Water Affairs (DWA)	Ms	Jackie	Jay
Department of Water Affairs (DWA)	Mr	Jurgo	van Wyk
Department of Water Affairs (DWA)	Mr	Pieter	Viljoen
Kaleo Consulting	Mr	Solly	Manyaka
SRK Consulting	Ms	Donne	du Toit Chetty
SRK Consulting	Ms	Vassie	Maharaj
TCTA	Mr	Craig	Hasenjager
TCTA	Mr	Sean	O'Beirne

Apologies:

Beeld	Mrs	Elise	Tempelhoff
North West University	Prof	Johann	Tempelhoff

Declined Invitation:

Benchmarks	Mr	Brown	Motsau
Centre for Environmental Rights	Ms	Mellissa	Fourie
Clean Water Foundation and Ekurhuleni Ratepayers Association	Ms	Nicole	Barlow
Earthlife Africa	Ms	Judith	Taylor
Earthlife Africa (Greenhouse Project)	Mr	Mabule	Mokhine
Endangered Wildlife Trust (EWT)	Ms	Yolan	Friedmann
Gold Reef City	Ms	Joan	Goosen
Gold Reef City	Mr	Darrel	Phillips
Greenpeace	Ms	Ferrial	Adam

International Alliance on National Resources in Africa	Ms	Anne	Mayher
Krugersdorp Game Reserve	Mr	Jannie	Rykaart
MLDPG and Federation for Sustainable Environment	Dr	Koos	Pretorius
Pelindaba Working Group	Mr	Dominique	Gilbert
Save the Vaal	Mr	Coenie	Nel
Socio-Economic Rights Institute of South Africa (SERI)	Ms	Jackie	Dugard
South Durban Community Environmental Alliance (SDCEA)	Mr	Desmond	D'Sa
Vaal University of Technology - Iscor Innovation Centre	Mr	Jan	Jooste
Wildlife and Environment Society of South Africa (WESSA)	Mr	Garth	Barnes

Absent/No Response:

Action Aid	Mr	Bulelwa	Mshumpela
Benchmarks	Mr	David	van Wyk
Coalition Against Nuclear Energy (and various others)	Mr and Mrs	Robert & Christene	Garbertt
Cradle of Humankind	Ms	Lindsey	Smith
Custodian Project & Chronicle Environmental News Website	Ms	Mercia	Komen
Earthlife Africa	Ms	Fatima	Goondie
Earthlife Africa	Ms	Ruweida	Mills
Earthlife Africa	Ms	Rookaya	Ngwenya
Eco Monitor	Dr	Pieter	van Eeden
Groundwork	Mr	Bobby	Peek
Jubilee SA	Mr	Brand	Nthako
Kromdraai, Marievale Wetland - Ramsar Site	Mr	Mashau	Mpfareleni
Land Owners Association of Magaliesburg (LOAM)	Mr	Mitchell	Krog
Legal Resources Centre	Mr	Michael	Power
Mvula Trust	Mr	Victor	Munnik
National Council of the Society for Prevention of Cruelty to Animals (NSPCA)	Ms	Jane	Marston
National Water Forum (NWDF) and Transvaal Labour Union (TLU)	Mr	Louis	Meintjies
Potch Petitioners and Clay Disposal	Ms	Rene	Potgieter
Real Search	Ms	Shan	Holmes
Save the Vaal	Mr	Trevor	Stubbs
Sedibeng United Business Forum	Ms	Maureen	Dosoudil
Vaal Environmental Justice Forum	Mr	Phineas	Malapela

Appendix M
List of Engagement Meetings with Individuals and Key Stakeholder Groups

Date	Type of Engagement	Institution/ Stakeholder Group	Locality
9 February 2012	Consultation Meeting	Rand Water	Rand Water
10 February 2012	Information gathering meeting	Trans Caledon Tunnel Authority (TCTA)	Aurecon
13 February 2012	Information gathering meeting	Trans Caledon Tunnel Authority (TCTA)	TCTA
21 February 2012	Consultation Meeting	North West University (NWU)	Aurecon
12 March 2012	Consultation Meeting	World Bank	World Bank
14 March 2012	Discussion on LTS & STI	National Treasury	Aurecon
29 March 2012	Technical Workshop	Geohydrology Specialists	Aurecon
3 April 2012	Information sharing meeting: Project Introduction to the Gauteng Regional Manager	DMR – Legal Division	DMR
4 April 2012	Consultation Meeting	Rand Water	Aurecon
11 April 2012	Consultation Meeting	Federation for a Sustainable Environment (FSE)	Private Residence of Ms Mariette Liefferink
11 April 2012	Discussion on LTS	National Treasury	
Mid April 2012	Information gathering meeting: Ascertaining whether regional archives contain useful information	DMR – Legal Division	Aurecon
Mid April 2012	Information gathering meeting: Obtaining information on historic/current mines operating in the Witwatersrand	DMR – Legal Division	DMR
20 April 2012	Consultation Meeting	Council for Scientific and industrial Research (CSIR)	DMR
20 April 2012	Technology Providers Discussion	Aveng Water	CSIR
20 April 2012	Technology Providers Discussion	ERWAT/ VitaOne8	Aurecon

Date	Type of Engagement	Institution/ Stakeholder Group	Locality
20 April 2012	Technology Providers Discussion	WUC	Aurecon
20 April 2012	Technology Providers Discussion	Eclipse	Aurecon
24 April 2012	Technology Providers Discussion	New World Sanitation and Solar Solutions (Pty) Ltd (NWSS)	Aurecon
24 April 2012	Technology Providers Discussion	TUT	Aurecon
25 April 2012	Technical group meeting: Salination of the Vaal River System	WRP, Golder, DWA	Aurecon
Late April 2012	Information gathering meeting: Requesting information on holders of mining titles	DMR - Legal	Aurecon
4 May 2012	Site Visit: Central & Western Basin	World Bank	Western Basin (Krugersdorp), Central Basin (Germiston)
10 May 2012	Information gathering meeting: Sourcing of report on “apportionment of liability” and relevant info	DMR - Legal	DMR – Mine Environment
14 May 2012	International Gathering	Rand Water	Rand water
18 May 2012	Telephonic consultation	TCTA (Richard Holden)	SRK
28 May 2012	Information gathering meeting: Sourcing of report on “apportionment of liability” and relevant info	Council for Geoscience (CGS) - Legal	Council for Geoscience (CGS)
5 June 2012	Agriculture Water Options	Agriculture Sector: North West University (NWU)	Welverdiend
6 June 2012	Consultation Meeting	North West University	

Date	Type of Engagement	Institution/ Stakeholder Group	Locality
11 June 2012	Focus Group Meeting	Agricultural Sector: Tshwane University of Technology (TUT), University of Pretoria (UP), SASRI, Institute for Soil/Climate/Water, Agricultural Research Council (ARC Roodeplaat)	Aurecon
11 June 2012	Treatment Technology Information gathering meeting	University of Pretoria	
11 June 2012	Technology Providers Discussion	MiWaTek	Aurecon
18 June 2012	Key Stakeholder Meeting	Gold Reef City: Management	Gold Reef City
19 June 2012	Information Showing	City of Johannesburg Metropolitan Municipality	Johannesburg
19 June 2012	Consultation Meeting	Johannesburg Water	
25 June 2012	Discussion on options	Rand Water	DWA Offices
13 July 2012	Technology Providers	New World Sanitation and Solar Solutions (Pty) Ltd (NWSS) – Canada Team	Aurecon
19 July 2012	Discussion on Options	Rand Water	Aurecon
16 August 2012	Discussion on Technical Option	Rand Water	Aurecon
16 August 2012	Discussion on possible institutional arrangements	Rand Water	Aurecon
3 September 2012	Discussion on options	Rand Water	Rand Water

Appendix N
Request for Information and Related Documents

Feasibility Study for a long-term solution to address the Acid Mine Drainage associated with the East, Central and West Rand Underground Mining Basins in Gauteng Province

Registration of Interest for Providing Services for the Long Term Solution for Management of Acid Mine Drainage

Dear Stakeholder

Aurecon, in association with SRK and Turner and Townsend have been appointed by the Department of Water Affairs for the Feasibility Study of the Long-Term Solution for the treatment of the Acid Mine Drainage in the Witwatersrand Goldfields.

This request for registration of interest is to inform the study and is not part of any procurement process or Environmental Impact Assessment. Any response or non-response to this enquiry will have no bearing on any future procurement process. Issuing this call for registration of interest is not and should not be construed as a commitment by the DWA to issue any procurement documentation.

Background Information

Acid Mine Drainage (AMD) on the Rand Mining Areas has been a severe environmental challenge for many years. The Inter Ministerial Committee in respect of AMD, provided some direction as toward the way forward. In this regard the implementation of short term solutions is underway on authority of a directive by the Minister of Water Affairs to TCTA. Apart from the short term solutions, long term solutions need to be investigated and the objective of this study is to determine the most feasible long term solution to the AMD situation in the West, Central and East Rand underground mining Basins. A feasible solution will be one that is technically sound, economically viable, institutionally feasible and legally acceptable. As such, this study's focus is not only on the technical aspects of a long term solution (in terms of treatment options), but also on legal, economic, financial and institutional aspects. The Study is one component of the larger picture and other parallel actions are in process.

The study goal is to investigate and recommend a feasible long term solution to the AMD problems in the study area, in order to ensure long term water supply security and continuous fitness for use of Vaal River water. The study area is restricted to the Eastern, Central and West Rand Mining Basins, which will be considered in the context of the Vaal River water supply area.

Registration of Interest

If you wish to register interest as a potential Service Provider for:

- Providing information about a treatment technology for AMD, which you own or for which you are the licensed provider in South Africa; or
- Providing funding for implementation of solution; or
- Providing AMD treatment process and plants for delivery of treated water and management of waste; or
- Providing and/or operating the infrastructure for managing AMD.

Please provide the following information to amdrsainfo@aurecongroup.com as soon as possible:
Company Name:

Area of Interest:

Contact Person:

Email Address:

Telephone Number:

Mobile Number:

Fax Number:

Physical Address:

Postal Address:

I have read the "Guidelines for provision of Information technologies" which follows and

I am interested in providing information on appropriate Treatment Technologies and would like to be contacted.

Please indicate with a tick: ☐ Yes

☐ No

Guidelines for Provision of Information on Technologies

The study team is currently collecting information on available technologies which have the potential to treat the Acid Mine Drainage. The information collected will inform our Feasibility Study into the Long Term Solution. It should be noted that the purpose of this study is the collection of technical information only, and does not form part of any procurement process.

The typical quality of the AMD as it comes out of the mining void is reported to be as follows:

Water Quality Parameter	Units	Western Basin	Central Basin	Eastern Basin	Eastern Basin (Expected future)
Flow	Mℓ/d	27	56	82	82
Total Dissolved Solids	mg/ℓ	6700	5950	2880	5500
Conductivity	mS/m	506	560	295	450
Calcium (Ca)	mg/ℓ	400	500	395	550
Magnesium (Mg)	mg/ℓ	218	330	160	230
Sodium (Na)	mg/ℓ	103	105	220	325
Sulphate (SO_4)	mg/ℓ	4100	4000	2400	3275
Chloride (Cl)	mg/ℓ	46	180	250	260
pH		3.6	2.6	5.9	5.0
Acidity ($CaCO_3$)	mg/ℓ	1740	1690	230	750
Iron (Fe)	mg/ℓ	725	750	120	370
Aluminum (Al)	mg/ℓ	29	30	0.1	1
Manganese (Mn)	mg/ℓ	148	30	3.5	10
Uranium (U)	mg/ℓ	0,1	NT*	NT*	NT*

*NT = no tests

The quality of the Treated Effluent, after first stage neutralization in the Short Term treatment process which is currently being implemented by the Trans-Caledon Tunnel Authority (TCTA), and which it is expected that the Long Term (second stage) treatment works will receive, is as follows:

Water Quality Parameter	Units	Quality
pH		6 – 9
Iron (Fe)	mg/ℓ	<1
Manganese (Mn)	mg/ℓ	<3
Aluminum (Al)	mg/ℓ	<1
Uranium	µg/ℓ	<50
Sulphate	mg/ℓ	<2400

The Quality of the water, after second stage Treatment in the works envisaged in the Long Term Solution, should meet either or both of the following specifications:

Water Quality Parameter	Units	Potable SANS 241-1:2011	Environmental release
Flow	Mℓ/d	25	25
Total Dissolved solids	mg/ℓ	<1 200	<650
Conductivity	mS/m	<170	<100
Calcium (Ca) (SANS 241:2006)	mg/ℓ	(<150)	
Magnesium (Mg) (SANS 241:2006)	mg/ℓ	(<70)	
Sodium (Na)	mg/ℓ	<200	<80
Sulphate (SO_4)	mg/ℓ	<250	<350
Chloride (Cl)	mg/ℓ	<300	<75
pH		>5 to 9,7	6,4 – 8,5
Iron (Fe)	mg/ℓ	0,3	<1,0
Aluminum (Al)	mg/ℓ	<0,3	
Manganese (Mn)	mg/ℓ	<0,1	<2,0
Uranium (U)	mg/ℓ	<0,015	

You are invited to present to the study team the technology that you own, or to which you have the rights for in South Africa. We would appreciate it if the following aspects can be addressed:

- Description of the process in adequate detail to enable the study team to understand the principles involved in the technology;
- Capital Expenditure (CAPEX) projected for a 25 Mℓ/d facility – order of magnitude, for the IBL portion of the work;
- Annual Operational Expenditure of the process (OPEX) projected for a 25 Mℓ/d facility – order of magnitude;
- Chemical, Energy and Labour requirements of the process;
- Waste products produced (Quality and Quantity), disposal required or re-use potential;
- Quality of the treated water produced by the process. Options under consideration include to produce potable water, to produce secondary quality water for industrial and agricultural use or to produce water of a quality fit for environmental discharge.

This information gathering, while informing the Feasibility Study, is not a part of any procurement or prequalification process and no comments as to the suitability or otherwise of the processes presented will be communicated to any outside party by the Study Team. The information will be used solely for the purpose of informing the Feasibility Study. All information presented to the Study Team will be treated confidentially.

Kindly indicate your interest to present your technologies to the Study Team, by completing the appropriate box on page one. We will register your interest and contact you in due course.

Should you have any queries about the process please send your query to:
Email: amdrsainfo@aurecongroup.com.
Tel: (012) 427-3121

Kind regards

SC Vogel
Study Team leader
Aurecon

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

REQUEST FOR INFORMATION

Invitation to those interested in proposing long-term solutions for the management of Acid Mine Drainage in the Witwatersrand

Purpose of this Request

Considering the complexity of managing Acid Mine Drainage (AMD) in the East, Central and West Rand underground mining basins in the Gauteng province, the Department of Water Affairs (DWA) wishes to seek from the open market innovative solutions for the long-term management of AMD originating from the Witwatersrand underground mine voids. Information received with regard to the solutions will be captured for consideration in the on-going Feasibility Study.

Parties interested in providing information could be any individual or service provider or group of service providers that can offer any of the services required for the management of AMD. This would include institutional matters, financial matters, technology as well as the operation and maintenance of the pump stations, treatment plants and waste management.

Background

In January 2012, The Department of Water Affairs initiated a **"Feasibility Study for a long-term solution to address the AMD associated with the East, Central and West Rand underground mining basins"**. This study is currently in the process of concluding its pre-feasibility (options screening) phase. More information on this study can be found on the DWA AMD Website at: http://www.dwa.gov.za/Projects/AMDFSLTS/

A feasible long-term solution for the management of AMD will not only involve the sustainable protection of water resources and the environment from pollution, but the salts that are contributed by AMD to the river systems must also be removed in order to meet downstream user requirements and ensure security of supply. The management and safe disposal of by-products from the treatment of AMD will be as important as the quality of water being discharged to the environment or supplied to users.

Type of Information Requested

Interested parties and service providers are invited to provide concise information on their proposed solutions, or services for the following, for which we will undertake to enter into a commitment in terms of a Declaration on Protection of Information:

- A complete long-term solution for managing AMD, including use or disposal of waste;
- Details of treatment options or technologies which can form part of a solution;
- Design, construction, operation and maintenance of infrastructure for treatment and distribution of water and/or management of waste;
- Use of waste products; and
- Financing.

Guidelines for Provision of Information

Interested parties and service providers are invited to provide concise information on their proposed solutions, or services. Proposed solutions should be able to manage or treat the full flow of AMD expected from a basin, although proposals that can work in modules of 10 Mega litres per day will also be considered.

Currently it is expected that the following approximate volumes of AMD will be extracted from the underground mine workings:

Western Basin between 20 – 27 Mℓ/day, Average 23 Mℓ/day

Central Basin between 30 – 90 Mℓ/day, Average 46 Mℓ/day

Eastern Basin between 70 – 100 Mℓ/day, Average 80 Mℓ/day

AMD would normally be subjected to the following processes before it is fit for release to the environment or is utilised in potable or industrial systems:

- Neutralisation of the acids;
- Removal of metals and Nucleoids;
- Removal / reduction of sulphates and other salts; and/ or
- Removal of specific chemicals.

Water quality characteristics of AMD, before first stage neutralisation and the characteristics after first stage neutralisation are given in the Guideline for the Provision of Information (see link below).

Those parties offering technological and treatment solutions should either own or be the license holder for the technology in South Africa. Suggestions for innovative and sustainable solutions that can be considered in the long-term solution are welcome, including solutions involving passive treatment of AMD.

Further details on the information to be provided are also given in the Guideline for the Provision of Information, which must be consulted before the submission of information.

Process for the Provision of Information

Parties that are interested in providing information are requested to:

1. Download and read the Guideline for the Provision of Information
2. Complete the online Registration Form
3. Email a copy of the saved Registration form and the information on your solution (the type of information the DWA would require and the email address is provided in the guideline).

The completed registration form together with the information you wish to provide should be submitted before **31 January 2013**.

Terms and Conditions

This RfI will inform the Feasibility Study and the anticipated procurement of a long-term solution for managing AMD associated with the mine voids in the Witwatersrand and is thus an important first step in the process.

Interested parties who submit proposed solutions will be captured on a RfI database that will be used to inform those on the database if and when procurement documents are issued to procure the provision of a suitable long-term solution to address AMD.

Parties interested in submitting information must note that although the outcome of the RfI may inform future procurement processes, the submission of information or registration of your interest does not constitute a commitment, implied or otherwise, that DWA will take procurement action in this matter or be responsible for any cost incurred in furnishing this information, nor does it place anybody as a potential vendor on the DWA vendor list or Environmental Impact Assessment (EIA) Interested and Affected Parties (I&AP) list.

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

REQUEST FOR INFORMATION

Invitation to those interested in proposing solutions for the long term management of Acid Mine Drainage in the Witwatersrand

Company Name:*
Contact Person:*
E-mail Address:*
Telephone Number: +
Mobile Number:* +
Fax Number: +
Physical Address:*
Postal Address:

I would like to register interest in providing the following services for the long-term management of AMD in the Witwatersrand:*

- ☐ Funding
- ☐ Treatment Technology(ies)
- ☐ Waste Management
- ☐ Designing and Constructing Infrastructure
- ☐ Operating and Maintaining Infrastructure
- ☐ Other

If you have selected "Other" Please stipulate the type of service you would be able to provide:*

If you have selected the provision of a treatment technology, please stipulate if it is a technology for treating:*

- ☐ Acid Mine Drainage (Water)
- ☐ Acid Mine Drainage (Sludge)

I have read the guidelines for the provision of information and I am interested in providing further information on the items selected above.

Please indicate:* ☐ Yes ☐ No

If you have selected yes, please send a copy of this form, together with the relevant information (as per the guidelines for the provision of Information) to AMDRFI@dwa.gov.za

Submit and Save

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

GUIDELINES

Guidelines, Background and Data for those Interested in Providing Services or Proposing Long-term Solutions for the Management of Acid Mine Drainage associated with the East, Central and West Rand underground mining basins

Purpose of the Guideline.

This document serves as a guideline for the submission of information regarding innovative long-term solutions for the sustainable management of AMD associated with the East, Central and West Rand underground mining basins. It contains both technical information enabling those interested to submit their ideas and it provides the details on how to submit the information.

Background.

The Department of Water Affairs is currently undertaking a ***"Feasibility Study for a long-term solution to address the AMD associated with the East, Central and West Rand underground mining basins"*.**

The main goal of the AMD Long-Term Solution Feasibility Study is to-

Investigate and recommend a feasible long-term solution to the AMD problems emerging in the Central, East and West Rand underground mining basins.

A feasible solution will be one that is technically sound, environmentally sustainable, economically viable, institutionally feasible & legally acceptable.

This study will be used to inform the criteria to be used for the evaluation of possible service provider(s) for the long-term solution to AMD for which interested parties may register their interest. Parties who register their interest will be advised if and when procurement documents are issued to procure a suitable long-term solution to address AMD.

As part of the feasibility study the Department needs to obtain information on the different types of treatment technologies that are available and the associated costs. It also needs to obtain information on the possible institutional and financial solutions.

This information gathering is to inform the Feasibility Study, and is thus not a part of any procurement or pre-qualification process and no comments as to the suitability or otherwise of the processes presented will be communicated to any outside party by the Study Team. The information will be used solely for the purpose of testing the market and informing the feasibility study.

Guidelines for the Provision of Information on Treatment Technologies.

AMD treatment will be required to:

- Neutralize acids
- Remove metals
- Remove sulphates and other salts
- Remove specific chemicals (such as cyanide)

The sustainable management of the treatment by-products is also an important component of the long term solution and is seen as an integral part of any proposed solution.

The quantities to be treated by the process are:

Western Basin between 20 – 27 Mℓ/day,	Average 23 Mℓ/day
Central Basin between 30 – 90 Mℓ/day,	Average 46 Mℓ/day
Eastern Basin between 70 – 100 Mℓ/day,	Average 80 Mℓ/day

It is expected that proposed technologies should either be able to treat the raw water, with the qualities reflected in the tables below, or the water coming from the first stage treatment (Neutralisation), also described below. The treatment technology proposed should be able to treat the wide range of water quality values as reflected in the statistical water quality data sets. The process design should be able to treat the 90th percentile values as the worst case. The operational impacts of treatment and volumes of waste should however rather be representative of the 50th to the 75th percentile of the data set. It is expected that the quality of the water will vary with time, once pumping commences.

The information that is currently available on the quality of the AMD as it comes out of the mining void is as follows:

Western Basin								
Parameter	**Unit**	**Percentile**						
		5th	10th	50th	60th	75th	90th	95th
pH	@ 25°C	3.5	3.9	5.4	5.5	5.6	5.9	6.0
Conductivity	mS/m @ 25°C	320	334	385	392	415	434	442
TDS^	mg/ℓ	3 549	4 031	4 628	4 743	4 890	5 208	5 434
Iron	mg/ℓ	358	439	662	703	772	890	954
Sulphate	mg/ℓ	2 366	2 687	3 085	3 162	3 260	3 472	3 623
Sodium	mg/ℓ	65	86	110	118	132	175	227
Calcium	mg/ℓ	424	470	549	558	584	633	703
Manganese	mg/ℓ	31	38	56	63	70	81	89
Acidity	mg/ℓ	794	864	1 039	1 062	1 174	1 406	1 520
^Estimated	n = 148 for all parameters			Data accumulated between January 2011 and March 2012				

Central Basin								
Parameter	Unit	Percentile						
		5th	10th	50th	60th	75th	90th	95th
T	°C	21.7	22.0	22.9	23.2	25.3	26.3	26.8
pH		2.4	2.5	3.0	3.7	4.2	4.3	4.4
EC	mS/m	371	371	397	405	412	450	465
TDS^	mg/ℓ	3 644	3 896	4 247	4 319	4 429	4 561	4 592
Tot Alk	mg/ℓ CaCO3	2.5	2.5	2.5	2.5	8.9	28.9	34.0
Na	mg/ℓ	108	110	122	134	169	170	171
Mg	mg/ℓ	118	159	172	177	201	249	258
Al	mg/ℓ	10	21	122	129	133	184	193
K	mg/ℓ	3	3	5	5	7	12	13
Ca	mg/ℓ	241	243	279	351	403	459	563
Fe	mg/ℓ	1	2	40	41	48	94	108
Mn	mg/ℓ	13	24	47	47	49	50	50
F	mg/ℓ	0	0	1	2	2	4	4
Cl	mg/ℓ	84	87	137	138	141	144	146
NO3	mg/ℓ	10	12	23	26	29	33	34
PO4	mg/ℓ	0	0	0	0	0	11	15
SO4	mg/ℓ	2 429	2 597	2 831	2 879	2 953	3 041	3 062
Li	µg/ℓ	274	290	372	-	428	450	495
Be	µg/ℓ	2	4	20	21	23	24	25
B	µg/ℓ	214	245	280	300	318	361	712
V	µg/ℓ	1	1	1	1	4	9	12
Cr	µg/ℓ	5	5	87	100	129	130	148
Co	µg/ℓ	601	1 200	4 684	4 923	5 205	5 637	5 760
Ni	µg/ℓ	1 268	2 600	10 589	11 122	11 669	12 633	12 850
Cu	µg/ℓ	28	40	328	332	371	375	376
Zn	µg/ℓ	1 046	1 991	9 122	9 195	9 625	11 174	11 736
Ga	µg/ℓ	3	3	3	3	19	79	88
As	µg/ℓ	1	1	31	33	39	55	115
Se	µg/ℓ	6	10	40	42	45	46	47
Rb	µg/ℓ	15	15	19	19	25	38	42
Sr	µg/ℓ	443	493	634	638	661	693	697
Mo	µg/ℓ	3	3	3	3	3	3	3
Ag	µg/ℓ	1	1	1	1	15	15	15
Cd	µg/ℓ	1	1	11	11	12	12	15
Te	µg/ℓ	1	1	1	1	1	1	1
Ba	µg/ℓ	5	5	11	18	442	2 053	2 213
Tl	µg/ℓ	1	1	1	1	1	1	1
Pb	µg/ℓ	5	7	28	35	80	132	276
Bi	µg/ℓ	1	1	1	1	1	1	2
U	µg/ℓ	56	123	606	645	657	682	695
Number of samples = 12		^ Estimated			Numbers rounded			

Eastern Basin									
Parameter	Unit	n	Percentile						
			5th	10th	50th	60th	75th	90th	95th
T	°C	138	18.9	20.0	26.5	27.0	28.0	28.0	29.0
pH		101	5.9	6.1	6.5	6.5	6.6	6.9	7.1
EC	mS/m	144	98	161	280	292	312	349	360
TDS^	mg/ℓ	138	484	781	2 292	2 468	2 840	3 196	3 358
Alkalinity	mg/ℓ CaCO3	61	12	32	168	187	232	327	560
Total Hardness	mg/ℓ	23	1 481	1 500	1 655	1 692	1 700	1 749	1 759
Salinity	mg/ℓ	38	0	0	1	1	1	2	2
Na	mg/ℓ	139	58	70	208	223	238	252	264
Mg	mg/ℓ	51	0	0	54	62	119	163	166
Al	mg/ℓ	79	0	0	0	0	0	1	2
K	mg/ℓ	38	3	3	4	5	5	6	6
Ca	mg/ℓ	61	0	0	77	129	379	407	421
Fe	mg/ℓ	139	0	0	74	88	126	209	227
Mn	mg/ℓ	139	0	0	3	3	4	5	6
Cl	mg/ℓ	139	66	75	157	170	184	205	254
NO2	mg/ℓ	38	0	0	0	0	0	0	0
Br	mg/ℓ	38	0	0	0	0	0	0	0
NO3	mg/ℓ	38	0	0	8	11	15	20	31
PO4	mg/ℓ	38	0	0	7	8	10	13	19
SO4	mg/ℓ	139	240	364	1 148	1 273	1 610	1 917	2 289
Li	µg/ℓ	38	4	6	17	23	39	95	147
B	µg/ℓ	38	64	71	98	106	125	523	1 170
Ni	µg/ℓ	61	0	0	302	350	515	1 318	2 553
Co	µg/ℓ	38	0	0	45	61	96	446	748
Cu	µg/ℓ	38	0	0	0	0	9	73	499
Zn	µg/ℓ	38	520	525	586	647	1 021	3 131	4 416
Ga	µg/ℓ	38	0	0	0	0	0	23	43
As	µg/ℓ	38	0	0	0	0	10	46	112
Se	µg/ℓ	38	0	0	8	14	29	56	94
Rb	µg/ℓ	38	5	7	11	14	20	29	33
Sr	µg/ℓ	38	126	179	336	461	616	1 100	1 433
Ag	µg/ℓ	38	0	0	0	0	0	0	1
Cd	µg/ℓ	38	0	2	3	3	3	9	18
Ba	µg/ℓ	38	93	95	104	106	108	320	1 146
Pb	µg/ℓ	38	14	15	16	17	18	41	83
U	µg/ℓ	38	1	2	10	21	92	357	470
COD	mg/ℓ	67	11	12	32	38	53	166	180
DO	mg/ℓ	100	1.3	1.8	2.4	2.5	2.6	3.1	3.4
Data rounded									

The quality of the treated underground mine water, after first stage neutralization in the short-term treatment process (currently being implemented by the TCTA), which can be used as the feed water for the long-term (second stage) treatment works is expected to be as follows:

Water Quality Parameter	Units	Quality
pH		6 – 9
Iron (Fe)	mg/ℓ	<1
Manganese (Mn)	mg/ℓ	<3
Aluminium (Al)	mg/ℓ	<1
Uranium	µg/ℓ	<50
Sulphate	mg/ℓ	<2500

The quality of the water, after second stage treatment in the works envisaged in the Long-Term Solution, should meet either or both of the following specifications:

Water Quality Parameter	Units	Potable SANS 241-1:2011	Environmental release
Flow	Mℓ/d	25	25
Total Dissolved solids	mg/ℓ	<1 200	<650
Conductivity	mS/m	<170	<100
Calcium (Ca) (SANS 241:2006)	mg/ℓ	(<150)	
Magnesium (Mg) (SANS 241:2006)	mg/ℓ	(<70)	
Sodium (Na)	mg/ℓ	<200	<80
Sulphate (SO_4)	mg/ℓ	<250	<350
Chloride (Cl)	mg/ℓ	<300	<75
pH		>5 to 9,7	6,4 – 8,5
Iron (Fe)	mg/ℓ	0,3	<1,0
Aluminium (Al)	mg/ℓ	<0,3	
Manganese (Mn)	mg/ℓ	<0,1	<2,0
Uranium (U)	mg/ℓ	<0,015	

How to submit information on Treatment Technologies

If you wish to provide information on a treatment technology , please complete the technology data sheet at the end of this document and submit supplementary information which provides:

- A description of the process in adequate detail to enable the study team to understand the principals involved in the technology. Provide a description of maximum 3 pages plus 3 pages of diagrams and drawings;
- Projected Capital Expenditure (CAPEX) for a 30 Mℓ/d facility;
- Annual Operational Expenditure of the process (OPEX) for a 30 Mℓ/d facility –(indicate order of magnitude if actual figures are not available);
- Chemical, energy and labour requirements of the process;
- Waste products produced (quality and quantity), disposal required or re-use potential; and
- Quality of the treated water produced by the process. Options under consideration include:
    - to produce potable water,
    - to produce secondary quality water for industrial and agricultural use,
    - to produce water of a quality fit for environmental discharge.

Options involving the passive treatment of AMD are also welcome.

Guidelines for the Provision of Information for the Construction, Operation, Maintenance and/or funding of AMD Treatment Facilities

If you are interested in providing information on the operation and maintenance services of a treatment facility and/or in funding the AMD solution:

- Register such interest in the registration form and describe how your organisation would be involved/why your organisation would be suitable for the construction, operation, maintenance and/or funding of such facilities.

Process for the Provision of Information.

The information requested above, which should ideally not be in excess of 3MB, should be emailed, together with a copy of the completed registration form to AMDRFI@dwa.gov.za before **31 January 2013.**

This will enable the information to be considered in the Feasibility Study for a long-term solution to address the AMD associated with the East, Central and West Rand underground mining basins**.** Any information submitted after the 31st January 2013 will be still be captured on the Rfl database but may not be considered in the Feasibility Study,

**Submission of information or registration of your interest does not form part of any procurement or Environmental Impact Assessment (EIA) processes, nor does it place anybody as a potential Vendor on the DWA Vendor List. Any response or non-response to this invitation will have no bearing on any future procurement process. The issuing of this invitation is not and should not be construed as a commitment by DWA to issue any procurement documentation.*

TECHNOLOGY DATA SHEET

Company name: _____

Contact person: _____

It will be useful if you provide the following additional information on your technology either in the form below or in your suplementary information.

Classification of Main Process *(tick the appropriate box for man process)*

Reverse Osmosis: ☐

Ion Exchange: ☐

Chemical Precipitation: ☐

Biological Process: ☐

Passive Treatment: ☐

Other:
- Describe _____

Status of Development *(tick appropriate box and provide information)*

Laboratory Scale: ☐

Small Scale Pilot Plants: Capacity ☐
Location (Town + Country) _____
[Description + indication if site can be visited]: _____
Client Reference: _____
In operation since: _____

Large Scale Pilot Plant 1: Capacity ☐
Location (Town + Country) _____
[Description + indication if site can be visited]: _____
Client Reference: _____
In operation since: _____

Large Scale Pilot Plant 2: Capacity ☐
Location (Town + Country) _____
[Description + indication if site can be visited]: _____
Client Reference: _____
In operation since: _____

In use for Production: Capacity ☐
Location (Town + Country) _____
[Description + indication if site can be visited]: _____
Client Reference: _____
In operation since: _____

Short Description of Process - *to enable understanding of the chemistry, viability and sustainability to be added as separate document*

current works.
Quality of Water (treated)

	Raw		Treated	
pH	_____	mg/ℓ	_____	mg/ℓ
SO_4	_____	mg/ℓ	_____	mg/ℓ
Ca	_____	mg/ℓ	_____	mg/ℓ
Mg	_____	mg/ℓ	_____	mg/ℓ
Fe	_____	mg/ℓ	_____	mg/ℓ
Mn	_____	mg/ℓ	_____	mg/ℓ
U	_____	mg/ℓ	_____	mg/ℓ
Alkalinity	_____	mg/ℓ	_____	mg/ℓ
TDS	_____	mg/ℓ	_____	mg/ℓ
EC	_____	mS/m	_____	mS/m
Na	_____	mg/ℓ	_____	mg/ℓ
Cl	_____	mg/ℓ	_____	mg/ℓ
F	_____	mg/ℓ	_____	mg/ℓ

Type of Waste (by products) Produced *(list of main waste products + possible re-use)*

Indicate special requirements (for e.g. extensive land, hazardous waste dumps, irrigable soil, wetland, etc.

Description	Volume	Mass	Dry	Wet	Re-usable
_____	_____ m^3/d	_____ kg/d	☐	☐	☐
_____	_____ m^3/d	_____ kg/d	☐	☐	☐
_____	_____ m^3/d	_____ kg/d	☐	☐	☐
_____	_____ m^3/d	_____ kg/d	☐	☐	☐
_____	_____ m^3/d	_____ kg/d	☐	☐	☐

Main Chemical Usage

List of hazardous or main Chemicals required:

Energy Consumption

Energy: _____ kWh/kℓ treated

_____ kJ/kℓ treated

Operation cost

Staff/Labour required for operation *[Indication of staff cost and short description of special staff + qualifications required]*:

Passive Treatment

Indicate special requirements such as land, irrigation systems, wetland area, etc.:

Indicate quality of effluent:

Indicate possible environmental impacts (ground water sources, soils, etc.):

Indicate where such pilot / operational systems can be visited:

REQUEST FOR INFORMATION: INVITATION TO THOSE INTERESTED IN PROPOSING A LONG-TERM SOLUTION FOR THE MANAGEMENTOF ACID MINE DRAINAGE (AMD) IN THE WITWATERSRAND

Managing AMD from the deep gold mines in the Witwatersrand has been a major environmental challenge for many years.

In January 2012, the Department of Water Affairs (DWA) initiated a “Feasibility Study for a long-term solution to address the AMD associated with the East, Central and West Rand underground mining basins”. The objective of the Feasibility Study is to investigate and recommend the most feasible long-term solution to the AMD situation in the study area, in order to ensure long-term water supply security and continuous fitness for use of Vaal River water and of water in associated catchments.

A feasible long-term solution for the management of AMD will not only involve sustainable protection of water resources and the environment from pollution, but salts that are contributed by AMD to the river systems must also be removed in order to meet downstream user requirements and ensure security of supply.The management and safe disposal of by-products from the treatment of AMD will be as important as the quality of water being discharged to the environment or supplied to users.

Further information on this study can be found on the DWA AMD Website: http://www.dwa.gov.za/Projects/AMDFSLTS

Considering the complexity of managing AMD in the East, Central and West Rand underground mining basins in the Gauteng province, the DWA wishes to seek, from the open market, innovative long-term solutions for the management of AMD originating from the Witwatersrand underground mine voids. Information received with regard to the solutions will be captured for consideration in the on-going Feasibility Study.

Interested parties and service providers are invited to provide concise information on their proposed solutions, or services for the following, for which we will undertake to enter into a commitment in terms of a Declaration on Protection of Information:

- A complete long-term solution for managing AMD, including use or disposal of waste;
- Details of treatment options or technologies which can form part of a solution;
- Design, construction, operation and maintenance of infrastructure for treatment and distribution of water and/or management of waste;
- Use of waste products; and
- Financing;

Parties interested in providing information could be any individual or service provider or group of service providers that can offer any of the services required for the management of AMD. The proposed solution should be able to manage or treat the full flow of AMD expected from the basins, although proposals that can work in modules of 10 Mega litres per day will also be of interest.

More details on the information to be provided are given in a Guideline for the Provision of Information, which is available on the DWA website (www.dwa.gov.za) and which must be consulted before submission of any information. An online registration form is also available which must be completed prior to submitting information. Interested parties are requested to submit the completed registration form together with the information before 31 January 2013.

Interested parties who submit proposed solutions will be captured on an RfI database that will be used to inform those on the database if and when procurement documents are issued to procure the provision of a suitable long-term solution to address AMD.

This RfI will inform the Feasibility Study and the anticipated procurement of a long Term Solution for managing Acid Mine Drainage and is thus an important first step in the process.

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Although the outcome of the RfI may inform future procurement processes, the submission of information or registration of your interest does not constitute a commitment, implied or otherwise, that DWA will take procurement action in this matter or be responsible for any cost incurred in furnishing this information, nor does it place anybody as a potential vendor on the DWA vendor list or EIA I&AP list. To register interest or submit documents, please visit: www.dwa.gov.za

Appendix O
Newsletter 1

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

AMD FS LTS

newsletter

Edition 1 • July 2012

This newsletter provides information to stakeholders on the progress of the feasibility study for a long-term solution to address the acid mine drainage associated with the Witwatersrand underground mining basins.
In January 2012, the Department of Water Affairs (DWA) initiated a feasibility study for the long-term solution. A multi-disciplinary team of consultants led by Aurecon SA in association with SRK Consulting and Turner and Townsend, and supported by specialists from different institutions was appointed to conduct the feasibility study.
The study is a planning study and forms a component of the bigger picture to address the AMD challenge. It is therefore one of several parallel initiatives such as the short-term interventions, monitoring of the underground mining basins, ingress studies and others.

This is the first newsletter on the feasibility study, and stakeholders will receive further newsletters at key milestones in the study.

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IN THIS ISSUE...

- Background on the environmental management challenges associated with mining and mine water management
- The actions taken by government to date
- Focus on the feasibility study for a long-term solution and its progress

For more information on the feasibility study, please visit the AMD webpage on the Department of Water Affairs website:

http://www.dwa.gov.za/Projects/AMDFSLTS

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Background and overview of the AMD challenge

Gold Mining on the Witwatersrand has taken place since 1886 (more than 120 years). Water in the underground mine workings was pumped to surface to enable mining to take place.

Positive consequences:

- Economic growth in Witwatersrand area and South Africa (taxes to State, jobs, wealth creation, etc.);
- Social growth, infrastructure development, urban development, industrial development; and
- Other

Negative consequences:

- When mining stopped, so did the pumping of underground mine water and mine voids started filling up with water;
- On contact with oxygen and water; the sulphide minerals such as Pyrite in the underground rock formed acid mine drainage (AMD);
- AMD then eventually decanted from the underground workings since 2002 from the Western Basin, and may decant in the Eastern and Central Basins in the absence of appropriate intervention; and
- Contribution to salinisation of major river systems threatens continued water supply security.

The challenge:

- Increasing water demand due to urbanisation trends and economic development;
- Threat to surface water and/or groundwater quality:
- Increasing salt loading on the Vaal River System; and
- Increased water demand from the Vaal Dam to dilute high salt concentrations in the Vaal River System.
- Etc.

Potential consequences:

- Deteriorated aquatic ecosystem health;
- Possible water shortages, which may lead to water restrictions that can have significant social, environmental and economic implications;
- Externalised cost to downstream users; and
- Commissioning of the next Vaal augmentation scheme to be brought forward.
- Etc.

Government initiatives to address AMD and water management challenges

DWA Planning Studies:

- Large Bulk Water Supply Reconciliation Strategies; and
- Integrated Water Quality Management Strategy.

Vaal River Strategy:

- Eradicate unlawful water use;
- Reduce water use by 15% through Water Conservation/Water Demand Management;
- Augment water supply through a further phase of Lesotho Highlands Water Project
- Establish a Strategy Steering Committee to facilitate co-ordination of the Strategy implementation;
- Re-use treated effluent (underground mine water return-flows by 2014/15)
- Plan yield replacement scheme in the Orange River by 2035;
- Manage uncertainties in the Crocodile (West) and Olifants Systems.

Cabinet appointed an Inter Ministerial Committee (IMC) to address the AMD challenges in the Witwatersrand Goldfields area.

IMC appointed a Team of Experts to investigate AMD issues. The team identified a number of interventions.

Recommendations to manage salinity in the Vaal River System and ensure water supply to downstream users, requires:

- An increase in dilution releases, until long-term solution is in place;
- Direct re-use of treated AMD; and
- Undertake pre-feasibility and/ or feasibility studies to investigate and recommend a feasible solution to address the AMD challenge in the long-term.

Team of Experts report recommended:

- **Short-Term Intervention -** pump water from the Western, Central and Eastern Basins to prevent surface decant. AMD will then be treated to correct the pH (neutralised) and to remove heavy metals before being discharged to surface water resources/river systems; and
- **Long-Term Intervention -** treatment as described above plus removal of salts, and consideration of alternative discharge/use options.
- Determine feasibility of an environmental levy
- Undertake further research to optimise sustainable solutions in the long term
- Implementation of ingress control measures
- Update monitoring infrastructure and programmes

Pre-feasibility and feasibility study for the long-term solution (this study)
A planning study commenced in January 2012 and is expected to be completed over a 13-month period, in February 2013.

Implementation of short-term interventions
Currently underway on authority of a directive issued by the Minister of Water and Environmental Affairs to the Trans-Caledon Tunnel Authority (TCTA).

Monitoring committee established

Implementation of ingress control measures underway

Research projects: other studies e.g. by CSIR and CGS underway

Terminology, facts and concepts explained

What is AMD?

AMD is produced when sulphate bearing minerals, found in all reefs mined for gold, are exposed to oxygen. The process, termed pyrite oxidation, is enhanced when water moves through and over the surfaces of acid bearing rock, which have been exposed due to mining activities having disturbed the underlying geology.

AMD is generally characterised by one or more of the following: low pH, high Total Dissolved Solids (TDS), high Sulphates (SO_4), and/ or high levels of heavy metals - particularly Iron (Fe) giving it the orange red colour, Manganese (Mn), Nickel (Ni) and/ or Cobalt (Co).

Typical colour of river polluted with AMD

What are salts?

In chemistry, salts are ionic compounds that result from the neutralization reaction of an acid and a base. They are composed of cations (positively charged ions) and anions (negative ions) so that the product is electrically neutral (without a net charge). These component ions can be inorganic such as chloride (Cl^-), as well as organic such as acetate ($CH3COO^-$) and monatomic ions such as fluoride (F^-), as well as polyatomic ions such as sulfate (SO_4^{2-}). There are several varieties of salts. Salts that hydrolyze to produce hydroxide ions when dissolved in water are basic salts and salts that hydrolyze to produce hydronium ions in water are acidic salts. Neutral salts are those that are neither acid nor basic salts. The main component of salinity in water associated with mining activities is usually Sulphate (SO_4). Salt concentrations in water can be measured as electrical conductivity (EC) in millisiemens per meter (mslm) or as Total Dissolved Solids (TDS) in milligrams per litre (mg/ℓ).

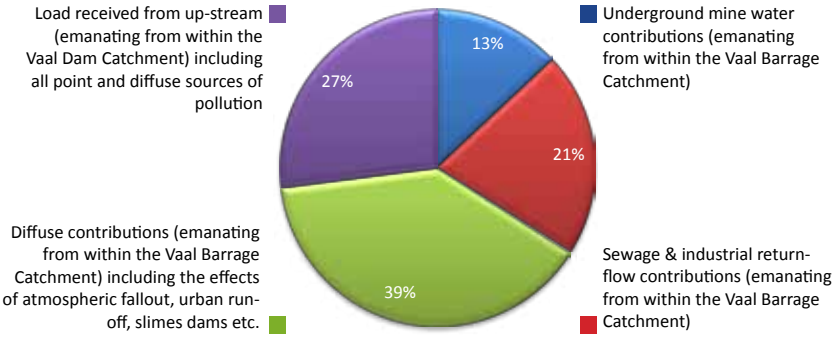
High salt loads have an effect on the fitness for the use of water for the irrigation of sensitive crops and can also affect the aquatic ecosystem and the suitability of water for drinking purposes.

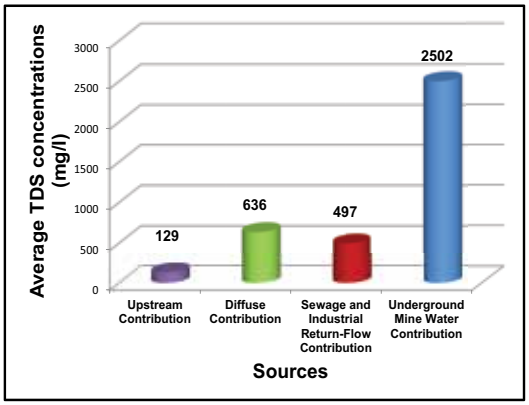
Vaal River Strategy

The Vaal River System supplies water to approximately 60% of the national economy and 45% of South Africa's population. The Vaal River Strategy was developed to ensure that sufficient water of good quality is available to supply the future requirements of this important area.

Where do the high salt loads in the Vaal River System come from?

The approximated load contributions in TDS received in the Vaal Barrage reservoir under a "Short-Term Intervention" scenario, i.e. pumping and semi-treatment without salts removal (based on historic data: October 1995 to September 2004) is as follows:





Note that although the percentage contribution of salts from mining is the lowest, the actual contribution in terms of salt concentration, is the highest.

Apart from applying source controls and addressing diffuse sources of salts through the applications of best practice and other measures, return flows will have to be re-used in future. The re-use of underground mine water has been prioritised since it contains the largest concentration of salts and since the removal of salts from this source would yield the biggest and quickest gains.

It is important to remove the salts from the Vaal System to ensure fitness of use of the Vaal River water further downstream, where the Resource Water Quality Objective has been set at 600 mg/ℓ TDS.

Terminology, facts and concepts explained

Integrated Water Quality Management Strategy for the Vaal River System

In the short-term the Integrated Water Quality Management Strategy allows for the following:

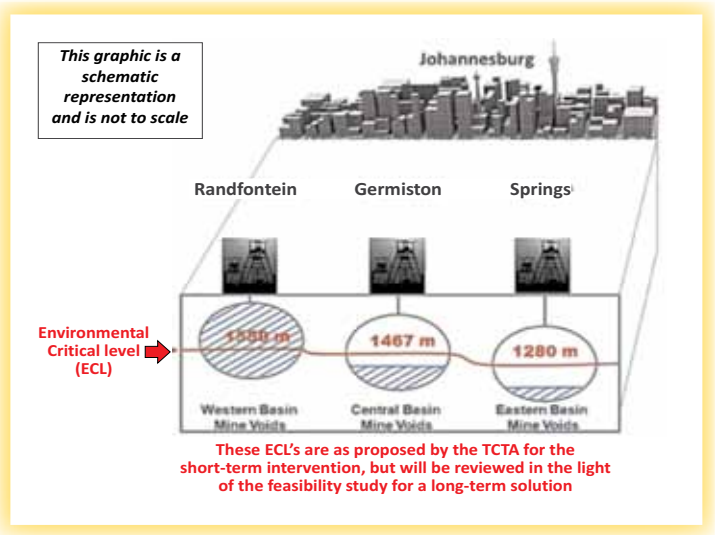
- Release of semi-treated AMD to the Vaal River system after neutralisation and metals removal;
- Dilution releases required from Vaal Dam to comply with the 600 mg/ℓ TDS operating rule set for the Vaal Barrage; and
- "Dilution water" used downstream of the Vaal Barrage.

This short-term scenario will however not be sustainable in the long run. In the long-term population growth and the expected associated increase in salt-loading, inter-alia, due to the return flows from the wastewater treatment works that are steadily increasing over time, will require more and more dam water to be released. Excess "dilution" releases will build up in the lower Vaal in Bloemhof Dam, potentially externalising the elevated salinity levels to the lower Orange River, when Bloemhof Dam starts to spill.

The removal of the salts from the AMD will prevent the use of water for dilution purposes and thus "save" a substantial amount of good quality water in the Vaal System. This will in turn contribute to ensuring water security in the Vaal water supply area.

What is an Environmental Critical Level (ECL)?

The ECL is defined as the shallowest level to which water can be allowed to rise in a flooded mine void before damage may occur to specific environmental features, including groundwater resources such as dolomitic aquifers in the study area.
The ECLs in the different basins have been set at levels which will ensure protection of both ground and surface water resources, including buffer zones. The levels currently being used to guide DWA management can be regarded as conservative estimates of the ECLs for each basin and can possibly in future be adjusted when more information becomes available.



What is a Socio-economic Critical Level (SECL)?

The SECL is the water level in the mine void above which the water in the 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.

Feedback on short-term AMD interventions

Aims of the Immediate and Short-Term Interventions

The immediate and short-term interventions are designed to:

- Stop the uncontrolled decant that is occurring in the Western Basin and draw the water level down to the Environmental Critical Level (ECL); and
- in the Eastern and Central Basins prevent the ECLs from being breached.

A consequence of the ECLs being breached is the need to install larger pumping capacity and treatment works to be able to draw the water levels down again.

Progress on the Immediate and Short-Term Interventions

In the Western Basin the immediate intervention that was made to prevent untreated AMD decanting into the environment was to re-commission 2 of the treatment trains in the existing Rand Uranium water treatment plant. These would operate alongside the existing operating treatment train.
The Trans-Caledon Tunnel Authority (TCTA) is in the final stages of commissioning the recently completed upgrade and is very satisfied with the functioning and the related water quality. The two newly upgraded treatment trains are treating around 14 megalitres per day (Ml/d) and TCTA is in the process to increase treatment capacity to 25Ml/d.
The combined capacity of all three treatment trains is between 30Ml/d and 34 Ml/d, depending on the incoming water quality. Once this is achieved, the combined capacity of the plant will exceed the current decant by between zero and 8 Ml/d, which if the dry season continues will allow some drawdown in the mine void, and allow DWA to create a buffer against future high rainfall events.
On the short-term intervention the tender evaluation is complete and it is expected that the tender will be awarded in due course. The contract is structured in such a manner that award can be made in part or in full depending on the amount of funding available.

The TCTA is implementing "Emergency Water Works Management", as part of immediate and short-term interventions, on authority of a directive issued on 6 April 2011 by the Minister of Water and Environmental Affairs.

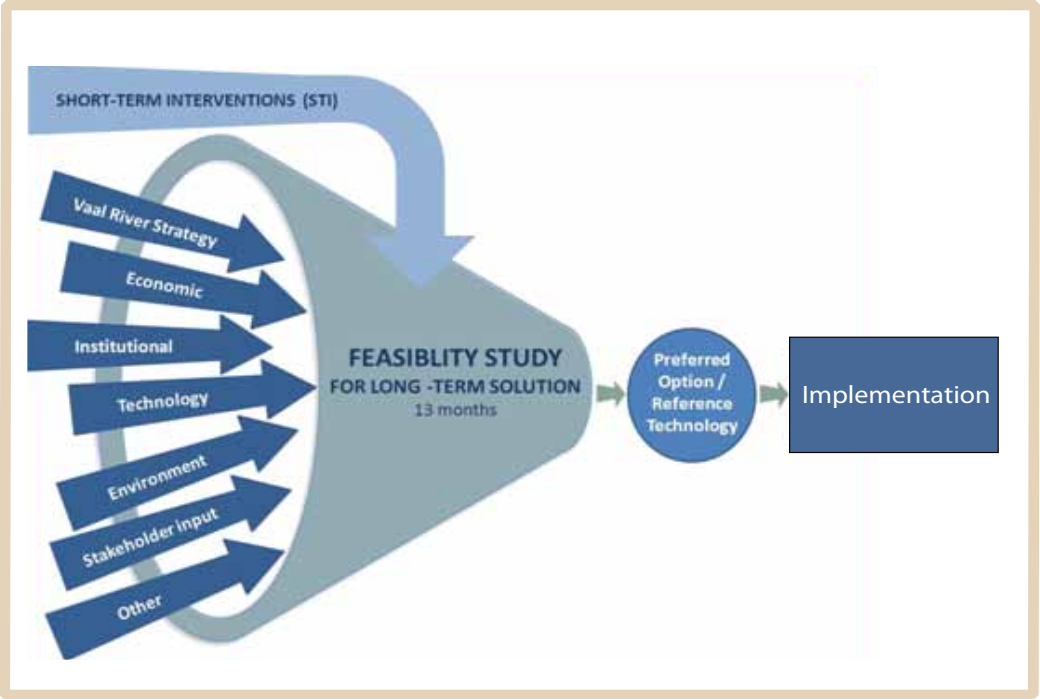
Feasibility study for the long-term solution

Why is it necessary to do a feasibility study?

Nothing beats good planning - if you fail to plan, you plan to fail. There are several potential solutions that must be considered to address the AMD issue in the long-term. The aim of the feasibility study is to find the most cost effective solution/combination of solutions that are environmentally sustainable, technically sound, economically viable and institutionally feasible, in the best interest of the public. This is a very complex process and requires careful analysis of each option for all the different criteria.

What is most important is that Government takes action, and does so fast – hence the proposed fast track process (see page 5). But, whatever solution is implemented, it must be defendable. The study aims to provide a sound basis for why certain decisions will be made and why some options will be discarded.

The figure shows that in addition to the short-term intervention that feeds into the long-term solution, there are several other aspects that must also be considered when conducting the feasibility study. The study will take all of these aspects into account when evaluating alternative options and "filter" the options using certain criteria. From the evaluation process a preferred option / reference technology may be formulated which will be used to compile the Request for Proposals.



One of the unfortunate by-products of AMD treatment is the considerable amount of waste that may be generated. Within the above filtering process the study will therefore not only look at technological options for treating AMD but will also look at options for minimising and managing the waste. The study will also look at options for funding the treatment of AMD and for managing the treatment plants.

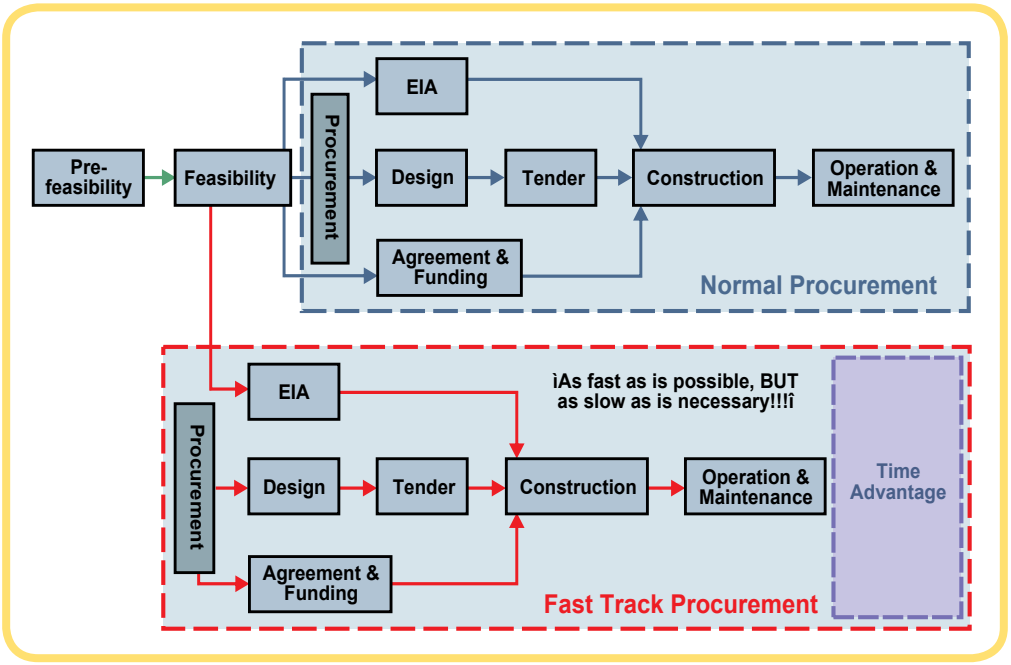
Although the preferred solution may be expensive it should consider the interest of the tax payer and also protect the interest of the water users in the Vaal River water supply area. Initial indications are that the Operating Expenditure (OPEX) associated for treating the AMD may be substantial, especially since such treatment will most likely be required for an indefinite period of time. Spending money and time now on a feasibility study can reduce the OPEX significantly and it is worthwhile to first consider all possible options for the long-term before making a final decision.

Feasibility study for the long-term solution – fast tracked

Fast tracking the process

Normally feasibility studies for most projects take 2-3 years to complete. Given the urgency to find a long-term solution to the AMD challenge this feasibility study is being fast tracked, both in terms of the study, which will be completed in 13 months and in terms of the implementation of the long-term solution.

Early information of the study indicates that commencement of implementation processes can be expedited if certain implementation related activities are initiated whilst the feasibility study is still in process. This will require a special effort from DWA to manage and coordinate the complex implementation actions in parallel to the study and to coordinate closely with other Government Departments and stakeholders.



In order for this to happen, exemption is required from National Treasury for issuance of the so called Treasury Approval 1 (TA 1), which is normally required before procurement can start. The exemption will save significant time as it will allow actions such as commencement of the Environmental Impact Assessment for the long-term solution, appointment of a Project Manager, and other actions to run in parallel with each other, and start before completion of the feasibility study.

The diagram shows only the main components of the project under a "traditional" implementation scenario. Note that there are many other actions that also need to take place, but that cannot be shown on this scale. In the top half of the diagram, the typical process that is expected to be followed for this project (from conception through to construction and operation and maintenance) is shown, if procurement with a normal programme is followed.

After the feasibility phase is completed and DWA has approved all the deliverables, the procurement of a Professional Service Provider (PSP) designer, and an EIA consultant can follow. While the EIA, design and tender is taking place, necessary or desirable agreements (access to land, water off-take agreements, etc.) and funding should be obtained. Once all of these are completed, construction can follow.

The lower half of the diagram illustrates the procurement processes commencing before the completion of the Feasibility Study, which can have a considerable time advantage, and that will benefit the assurance of supply situation associated with the Vaal System.

Risks of Fast Tracked Procurement

Any procurement process will have inherent risks, whether it be fast tracked procurement or according to a normal programme. However, some risks are likely to be higher for fast tracked procurement.

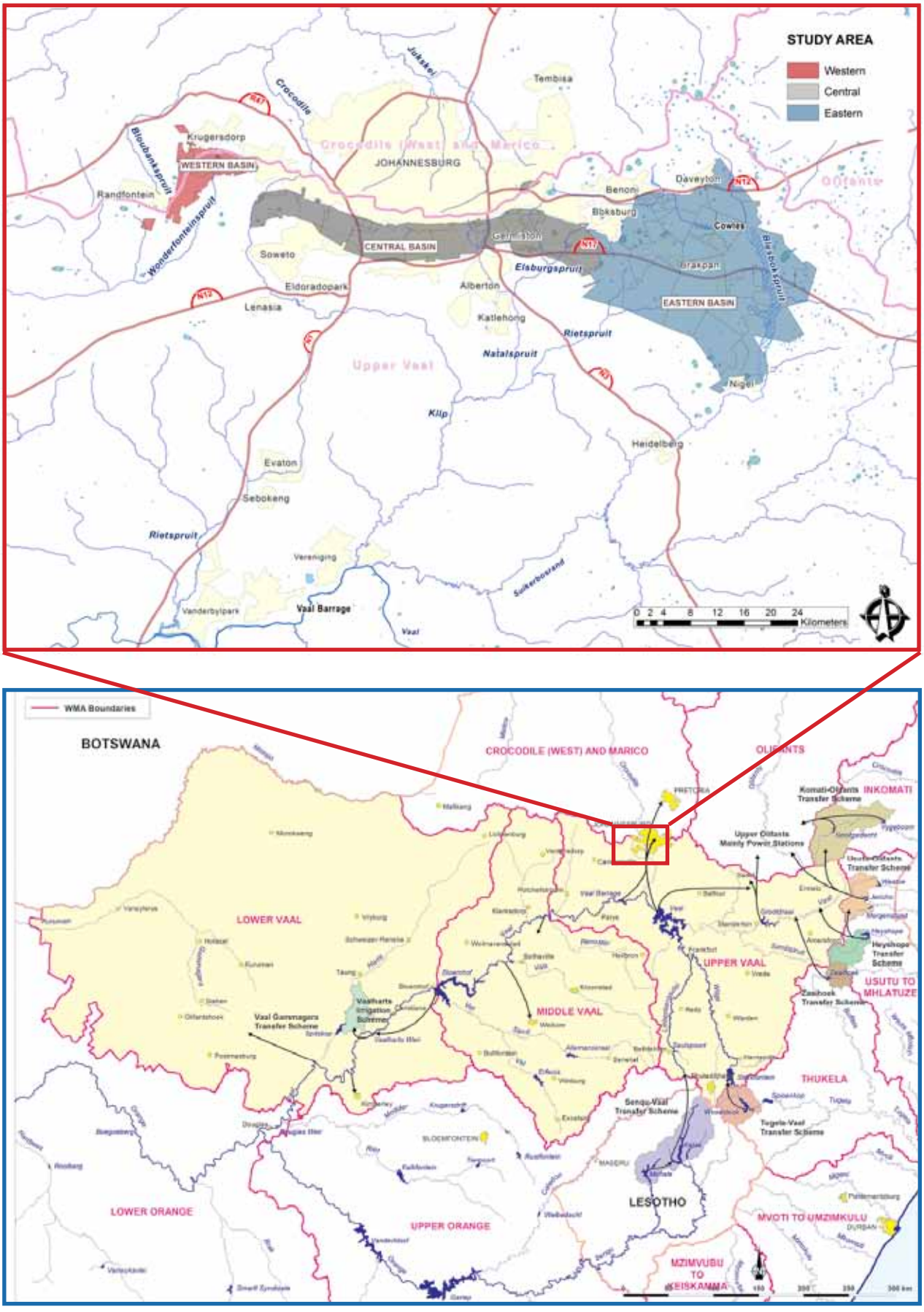
Fast track procurement places a time constraint on various implementation actions such as the statutory approvals and licensing, negotiations with landowners, stakeholder engagement (manage concerns and perceptions) and securing funding. The limited time might result in these actions not being finalised before the Request for Proposals need to be issued. Some key agreements, e.g., water use off-take agreements and waste purchase agreements might also not be finalised in time.

The Environmental Impact Assessment (EIA) and procurement documents will be based on preliminary information and may need adjustment as more information becomes available. Duplicate work might also be required in the EIA to cover alternative solutions.

Feasibility study for the long-term solution – study boundaries

The focus of the feasibility study is on the East, Central and West Rand underground mining basins, and will be considered in the context of the Vaal River water supply area and all associated affected catchments from an integrated water resource management perspective, as shown in the figure below.

The Western Basin covers the Krugersdorp, Witpoortjie and Randfontein areas. The Central Basin extends from Durban Roodepoort Deep (DRD) in the west to the East Rand Proprietary Mines (ERPM) in the east. The Eastern Basin covers the East Rand area, including the towns of Boksburg, Brakpan, Springs and Nigel.



Feasibility study for the long-term solution – scope

Study objectives

The objective of the study is to investigate and recommend a technically sound, economically viable and institutionally feasible long-term solution to the AMD situation in the study area.
This is to:

- Ensure long-term water supply security and continuous fitness for use of Vaal River water; and
- Endeavour to meet the requirement to remove mine water induced salt-loading by 2015 or soonest thereafter.

Study focus

Developing a long-term solution to address AMD requires the careful assessment and integration of the following focus areas:

- A sound understanding of the geohydrology, the underground water resource, 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;
- Identifying suitable technology options for potentially treating the AMD to standards that can be accepted by the environment or will be accepted by other users;
- Assessment of the options for the location, configuration and type of infrastructure required to potentially treat the AMD return-flows;
- Consideration of alternative options for a long-term solution that will prevent the salts from underground mine water from entering major river systems;
- Definition of the most desirable management scenario, technical option and end user(s), followed by an analysis of the infrastructure configuration and detailed value assessment of the selected option;
- The assessment of alternative institutional models for implementation, ranging from “traditional” government funded implementation to full private sector implementation, through Private Sector ownership or a Public Private Partnership (PPP), and any combinations thereof.

Recommending the most appropriate model for implementation, and in particular assessing the options for a PPP is not a common component of DWA studies and is probably the most challenging and certainly as important for a suitable solution, as the technical components. The most appropriate and sustainable model will be recommended.

Feasibility study for the long-term solution – Current Status

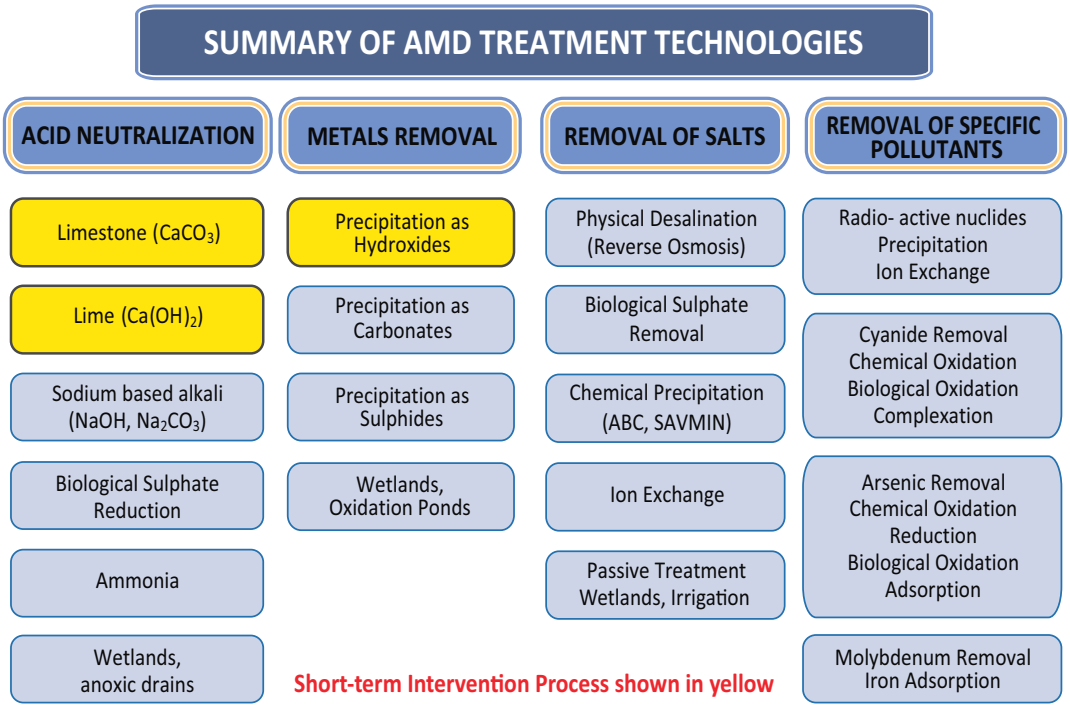
The project is currently well advanced with the pre-feasibility phase. Technical Options under consideration include:

- Potential raising of the ECLs (with monitoring) to levels that are still deemed “safe”;
- Potential abstraction options (from old mine shafts, through multiple boreholes or through tunnels in the Western and Central Basins);
- Applications of passive treatment such as saline agriculture, considering the potential associated social benefit;
- Waste discharge options - (this is a very important challenge);
- Management and use of treated water; and
- Alternative treatment technologies.

The diagram below indicates the different categories of technology that are under consideration. Some technologies are already proven while others are still considered as innovative where it is still in pilot plant stage. There are also other technologies that are considered as embryonic and are not proven yet.

The Ideal Solution

The Institutional and Financial models that are to be considered should enable the effective management of the AMD challenge in a cost effective manner. The obligations of the state, civil society and business as well as the interests of the tax payer, and water user need to be considered. The optimum institutional and financial solution will need to be well balanced considering all the above factors. In the technical sphere, the optimal solution should not only be environmentally and financially sustainable but should also contribute to improving the water supply situation in the Vaal System. In this regard the solution to the AMD issue is a crucial element of the Vaal River Water Resource Management Strategies. The challenge of the study is to seek innovative solutions to convert an environmental threat into a water resource solution.



Feasibility study for the long-term solution- communication and way forward

Stakeholder Engagement and Communication

Since the feasibility study is a planning study to investigate different planning options and recommend a feasible long-term solution for the AMD challenges, it does not include a public participation process in terms of the National Environment Management Act (NEMA, Act 107 of 1998) (NEMA: 107:1998). However, once the feasibility study has progressed to the point where feasible options can be recommended and an institutional model has been agreed upon, an EIA practitioner can be procured and the EIA process may commence.

It is during this EIA process that all interested and affected parties will have an opportunity to register as stakeholders, participate and comment.

Who are key stakeholders?

Key stakeholders are defined as directly affected parties, those who have a high level of negative or positive influence (in government and civil society domains, and on the direction and success of AMD long-term initiatives) and those whose input is critical to the study (for e.g. representatives of various National, Provincial, and Local and District Government, NGOs, organised business, mining, industry, labour, agriculture, affected mines, affected water utilities, community leaders, academics etc

Objectives of key stakeholder engagement

The objectives of the engagement and communication component of the feasibility study are to:

- Undertake focussed engagement with identified key stakeholders and stakeholder sectors/ groups in various relevant fields at certain milestones throughout the study, to obtain their input and comments on concepts, principles and assessment of alternatives, etc.; and
- Communicate information on study progress and outcomes at certain milestones to the wider key stakeholder group, and provide opportunities for constructive input to inform the study.

	Information gathering to inform the study (existing information, monitoring data, technical input and expertise).	**Communication with wider stakeholder group**
PURPOSE	Information gathering to inform the study (existing information, monitoring data, technical input and expertise).	Communicate progress and key outcomes at certain milestones in the study.
METHOD OF ENGAGEMENT	• Individual consultation meetings; • Focus group meetings; • Technical workshops; • Study Stakeholder Committee (SSC) Meetings; and • Presentations by DWA to Catchment Forums and existing forums	• Newsletters at certain milestones in the study; • Press releases; • AMD webpage on the DWA website;

Study Stakeholder Committee (SSC)

The DWA has established a SSC comprising key representatives from both Government and the private sector to contribute inputs representing the broader stakeholder perspective. The SSC will be involved in the planning process where different options, perspectives, issues and implications are debated and considered.

Next Steps

The next steps in the feasibility study are now foreseen to be as follows:

- August 2012: Finalisation of pre-feasibility study recommendations.
- August 2012: Focus group meetings with key stakeholder sectors/ groups for their inputs to inform the study;
- August – mid October 2012: All technologies presented to the feasibility study team will be screened and considered.A Reference Process will be selected and priced;
- October 2012: Next SSC meeting to receive and provide information, and to discuss progress and draft outcomes of study components;
- November 2012: Newsletter and/or press release to update stakeholders on study progress, procurement options and recommendation;
- January/February 2013: Final SSC meeting to provide information and procurement options to discuss progress and draft outcomes of study components; and
- 28 February 2013: Study closure.

Appendix P
Newsletter 2

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

AMD FS LTS

newsletter

Edition 2 • 2013

This newsletter provides stakeholders with an update on the progress of the Feasibility Study for a long-term solution (LTS) to address the Acid Mine Drainage (AMD) associated with the Witwatersrand underground mining basins. The goal of the Feasibility Study is to investigate and recommend a feasible LTS to the AMD problems emerging in the study area (shown in Edition 1), in order to ensure long-term water supply security and continuous fitness for use of water in affected major river systems.

The study consists of three phases, of which the first two, the Initiation and Prefeasibility Phases have now been completed. The completion of the Feasibility Phase will be the focus for the upcoming months. The focus of this newsletter is to present the results of the Prefeasibility Phase. For more background on the Initiation Phase, Edition 1, which was issued in 2012, can be consulted. It is available on the DWA website as indicated below.

More newsletters will follow.

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IN THIS ISSUE...

Comments can be sent to the above AMD email addresses and to DWA Communication Services
For more information on the feasibility study, please visit the AMD webpage on the Department of Water Affairs website:

http://www.dwa.gov.za/Projects/AMDFSLTS

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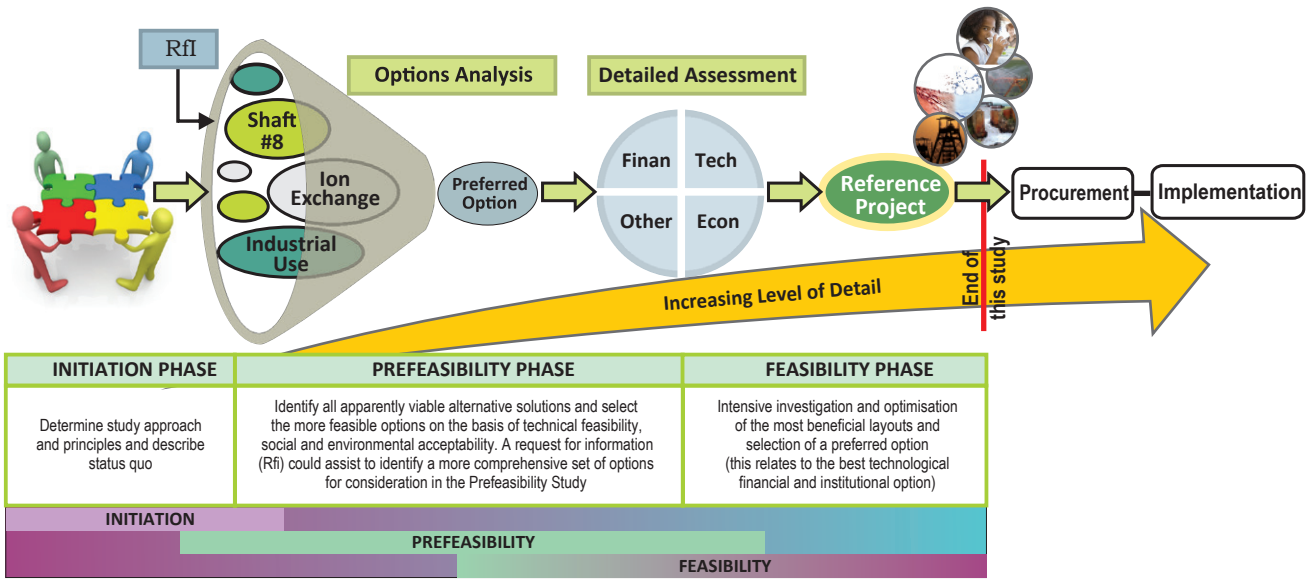
REPUBLIC OF SOUTH AFRICA

The Study Approach

In order to explain the study approach, a short summary of the problem is provided here (refer to Edition 1 for more detail). In the Witwatersrand region, mining has taken place in the three underground mining basins of the East, Central and West Rand since the discovery of gold in 1886. As the mines were worked out and abandoned, dewatering of the mine voids became the responsibility of fewer and fewer mines, until underground mining essentially ceased in 2010. The voids (tunnels, drives, stopes and shafts) are currently filling with water that ingress into the mined out workings. Acid Mine Drainage (AMD) is formed due to exposure of sulphide bearing minerals to oxygen and water. AMD is typically characterised by elevated sulphates, low pH, dissolved metals and sometimes when uranium is present, radiological properties. Once pumping from the Central and Eastern Basins commences again, large quantities of water will have to be released from the Vaal Dam to dilute the salinity, resulting from AMD, in the Vaal River System. The continuation of these dilution releases will reduce the system yield, potentially affecting the assurance of supply and increasing the risk of introducing water restrictions, and ultimately adversely affecting economic growth. It is therefore necessary to undertake a Feasibility Study for a Long-term Solution to address the salinity of AMD in the most cost effective way, in order to avoid negative impacts to the environment and humans, as well as to conserve water. The Feasibility Study is a planning study, comprising three phases: Initiation, Prefeasibility and Feasibility Phases, as shown in the figure below. Note that there is some overlapping between the phases.



Study Progress

"Where are we now?"
The Prefeasibility Phase of the Study has been completed, with the findings contained in a group of reports culminating in the Technical Prefeasibility Report (which is in the process of being reviewed). The preferred option that was identified in this phase is analysed in more detail in the Feasibility Phase and Concept Design. The first drafts of these reports are now in the process of being completed.

Results from the Prefeasibility Phase allowed the financial team to start compiling the economic models and conduct the necessary analyses for the financial and institutional arrangements. The results of these analyses will be contained in a report encompassing the institutional procurement and financial assessment. A subsequent report on the Implementation Strategy and Action Plan will describe several of the recommended actions that will be required for implementation for e.g. monitoring and communication.

Study Deliverables

The aim is to finalise all the deliverables by July 2013. All study reports (except the confidential ones) will be available on the DWA website as soon as they have been approved.

Why are some reports confidential?

The Feasibility Study, being a planning study, does not allow for extensive public participation. Instead, key stakeholders are consulted as the Feasibility Study progresses, while information is made available to the public through newsletters and the AMD website. Wider public participation is foreseen during the implementation stages, including the EIA. With this being said, it must be stressed that there are certain reports that cannot be made public until the appropriate implementation process stages have been reached, as such reports may potentially compromise future procurement and legal processes. Of the 18 reports to be produced, six are considered confidential.

Management of AMD in the Witwatersrand

Multiple initiatives are needed to manage AMD in Gauteng. While the Feasibility Study is focussed on underground AMD, there are other initiatives which complement the Feasibility Study, such as the studies and programs run by the DMR, CGS, CSIR and the monitoring programme by the Hydrological Monitoring Committee chaired by DWA.

Vaal River Strategy

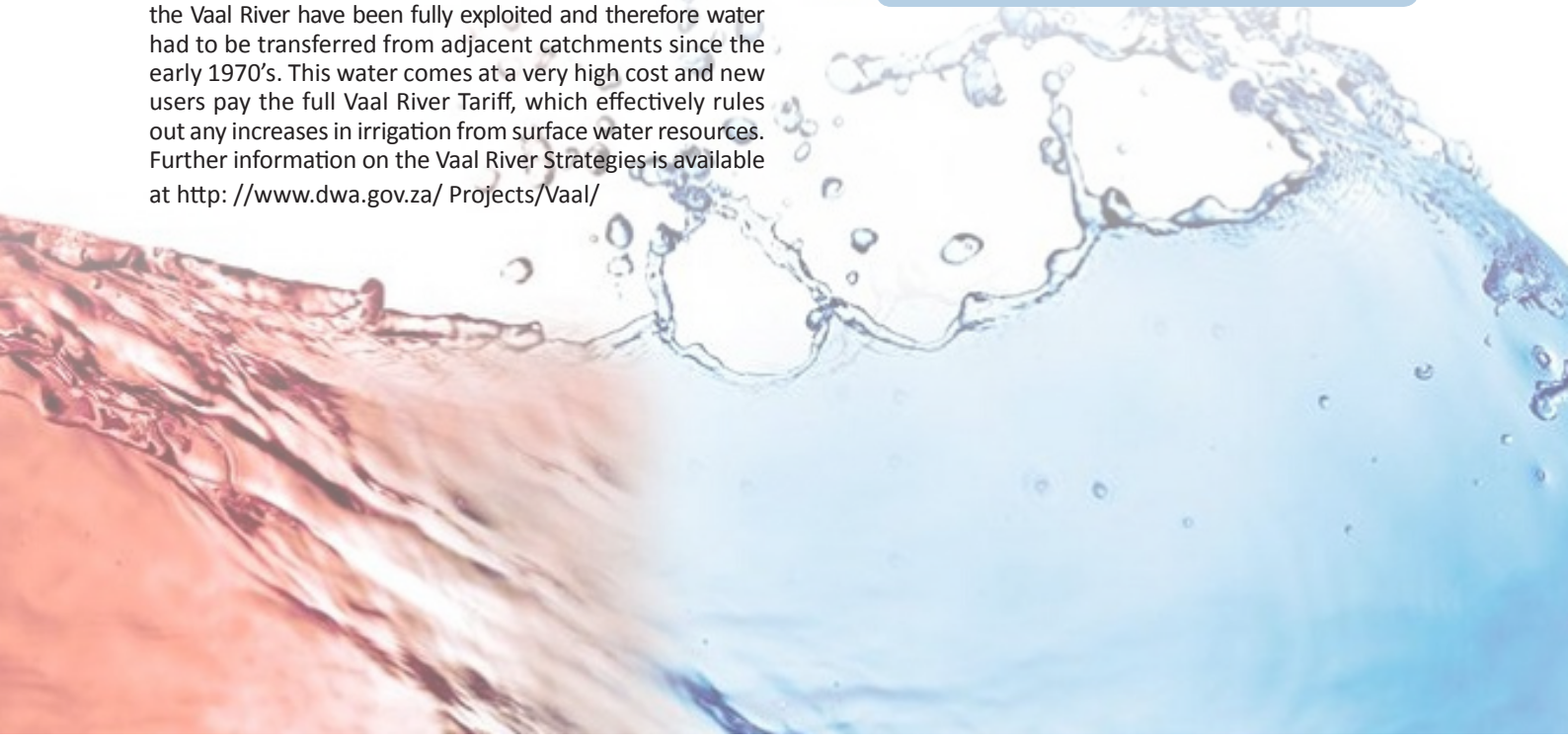
The AMD challenge needs to be managed within the context of the Vaal River strategies. These strategies deal with a dynamic area, with huge growth in water requirements, and needs to sustain water supply for social and economic activities. Efficient use of this scarce resource is therefore important, and special efforts must be taken to ensure that there will be enough water that is fit for use in this important area. The strategies to be implemented to achieve this amongst others include:

- The eradication of unlawful water use, which will increase the available water supply;
- The implementation of Water Conservation and Water Demand Management to reduce water use of relevant Water Services Authorities by 15%; and
- Addressing the AMD related salinity to sustain the current system yield into the future.

Successful implementation of all these strategies will mean that the second phase of the Lesotho Highlands Water Project (LHWP), which is the construction of Polihali Dam, can be expected to supply the water demands from 2020 onwards. Should these strategies fail to be implemented, the risk of water restrictions occurring can be expected to be higher in future. The local surface water resources of the Vaal River have been fully exploited and therefore water had to be transferred from adjacent catchments since the early 1970's. This water comes at a very high cost and new users pay the full Vaal River Tariff, which effectively rules out any increases in irrigation from surface water resources. Further information on the Vaal River Strategies is available at http: //www.dwa.gov.za/ Projects/Vaal/

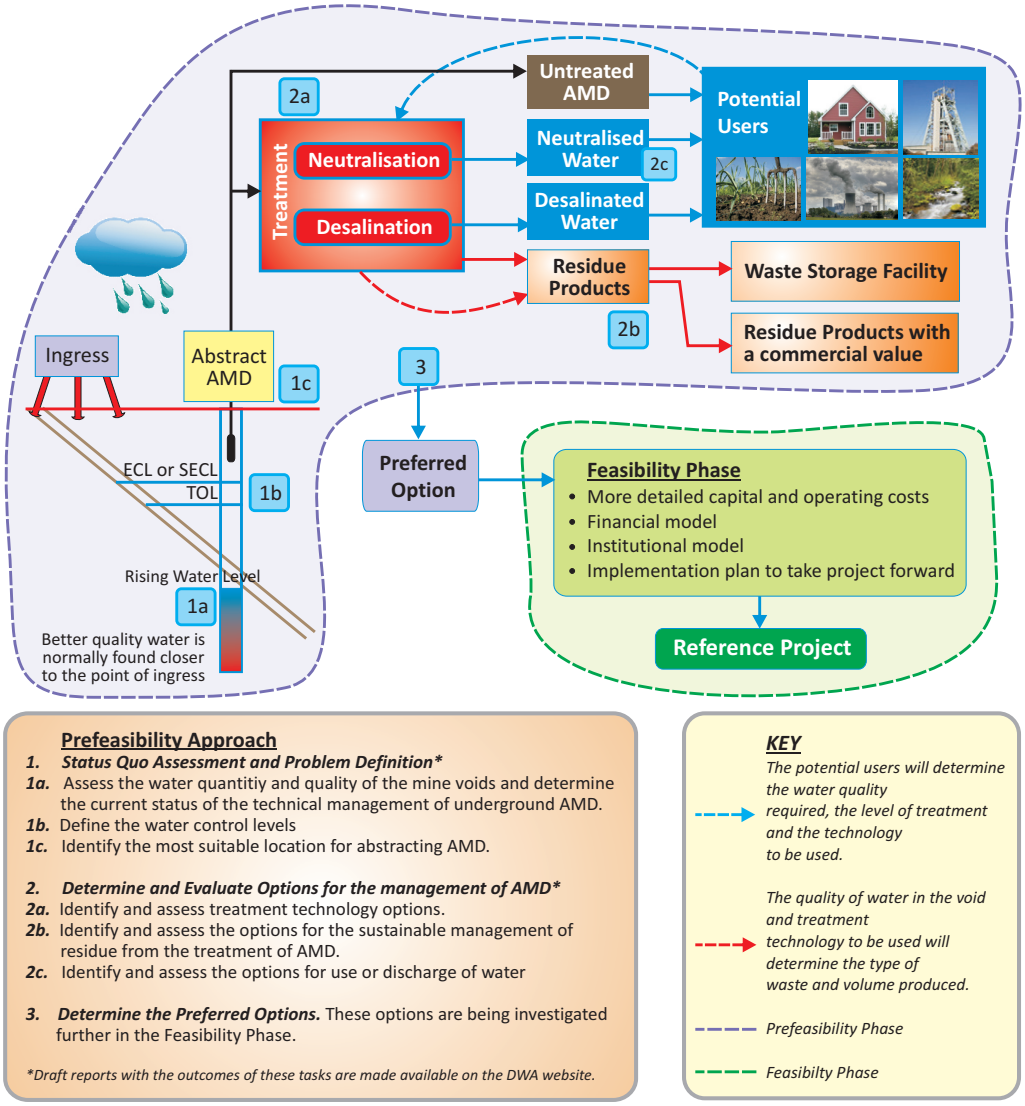
Long-term monitoring, at an adequate number of locations in the three basins are essential for:

- Establishing the Target Operating Level (TOL) – This is the level in the mine voids at which the water should be maintained in order to protect the ECL or SECL. (explained on page 5). The recommended TOL may be adjusted based on monitoring after pumping commences;
- Determining the volume of AMD to be pumped and treated, and obtain a better understanding of seasonal fluctuations, will be more certain with continuous monitoring being implemented;
- Obtaining more data on the water quality of AMD and how it may vary; and
- Obtaining a better understanding of the connectivity of the mine voids.



Prefeasibility Phase

The AMD challenge in this study deals with the largest potential quantities of AMD in the world. The figure below shows the "AMD life-cycle" and the key aspects of the complex and multiple interdependent activities forming part of the study, for underground AMD.



It can be seen how the information (e.g. ECLs, raw water quality, ingress, etc.) and the decisions to be made, or the options to be investigated (e.g. abstraction points, qualities and quantities required by potential users, locations of users, treatment technologies), feed into the options assessment and identification of the Reference Project.

What is meant by the Reference Project?

This is the option that uses proven technologies, has the least associated risk, and is used for financial modelling and budgeting purposes. It will probably not be exactly the same as the option that is implemented, but constitutes the benchmark against which implementation proposals will be judged.

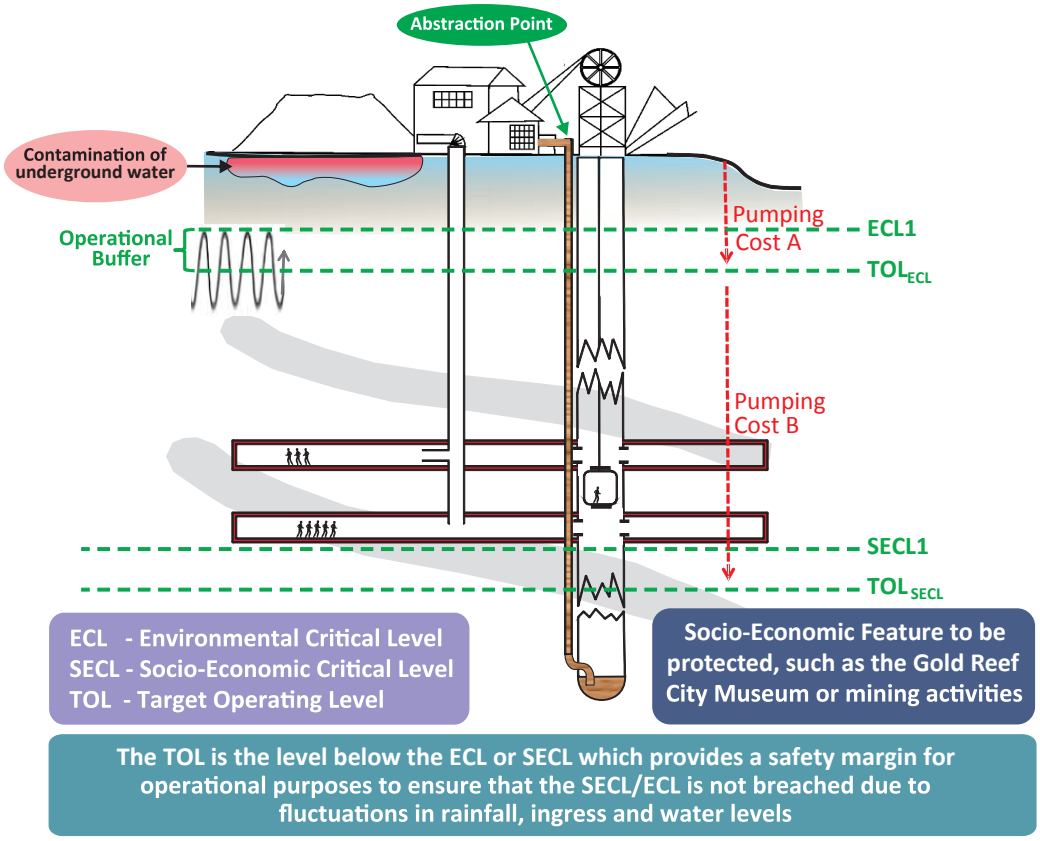
The Concept Design, which forms part of the Feasibility Phase, is based on the Reference Project and includes the costing and land requirements. This in turn provides input for the evaluation of the institutional framework, procurement and financing options and the implementation strategy and action plan. The figure below is a generic illustration of the Reference Projects that are recommended for each of the underground mining basins. All the main aspects of the Reference Projects are shown here, e.g. abstraction, neutralisation, desalination, brine and sludge disposal and supply to an end user.

The details of each basin's specific Reference Project will obviously differ. The following aspects are results from the prefeasibility phase and are dealt with under the appropriate headings.

Key findings of the assessment of quantity and quality of water in mine voids

The current body of knowledge relating to the quality and quantity of water in the mine voids and the connectivity between the shafts and different sub-components in the mine void will be strengthened through proper monitoring once the pumping of AMD has commenced and has continued for a number of years.

What are the ECL, SECL and TOL?



The ECL, SECL and TOL proposed for the three basins are:

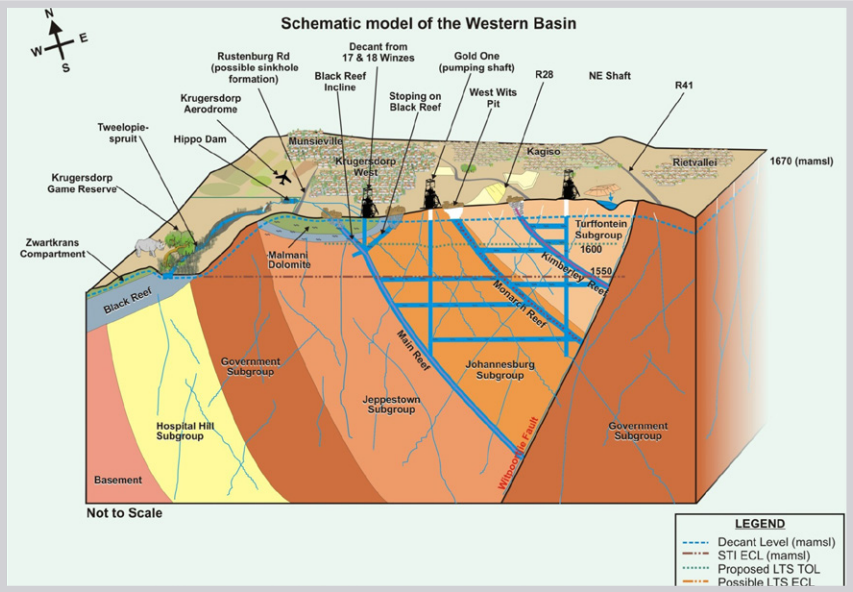
Proposed Water Control Levels				
Basin	***ECL or SECL (mamsl*)***	***TOL (m)***	***Depth to TOL at abstraction point (m)***	***Rationale***
Western Basin				Water surface be held at initial level for an extended period. If monitoring shows on-going polution, it should be lowered to the conservative level.
Initial Level	*1 600*	*1 585*	*141*	
Conservative Level	*1 565*	*1 550*	*176*	
Central Basin				Protection of the Gold Reef City Museum Protection of the groundwater sources
SECL	*1 474*	*1 454*	*192*	
ECL	*1 520*	*1 500*	*146*	
Eastern Basin				Protection of dolomites Protection of groundwater sources
Conservative Level	*1 280***	*1 280*	*290*	
Higher Level	*1 470*	*1 450*	*120*	

** metres above mean sea level*

*** This level is considered to be conservative and the TOL is also set at 1 280 mamsl*

The recommendations made regarding control levels are based on the existing information that was available. The recommendations will be refined once more comprehensive monitoring data becomes available, but for now a conservative approach has been used. It is essential that in the future the TOL be adjusted to the highest possible elevation, due to the high cost of pumping. Significant cost savings can be made if pumping from shallower levels can be done while still protecting the environment and users.

Western Basin



It is recommended that the water table is lowered to, and maintained at 1 600 m amsl by pumping void water from Gold One Shaft (previously called Rand Uranium #8) and monitored to verify that the groundwater flow is reversed towards the void, with no further decant to the shallow aquifer and the Tweelopies Spruit. In addition, by effectively minimising infiltration through removal of old tailings dams, dumps, and covering old surface excavations, the surface water ingress into the void can be reduced. It is estimated that there can be a reduction of at least 5-6 Mℓ/day.

Central Basin

If the Central Basin void is allowed to fill completely, decant is likely to occur at a level of approximately 1620 m amsl in the vicinity of the Cinderella Shaft, in the east, into the Elsburgspruit. It is possible that decant can also take place through several other points across the basin in low lying areas. Shallow surface workings were widespread in the Central Basin and several rivers cross these, resulting in ingress into the void.

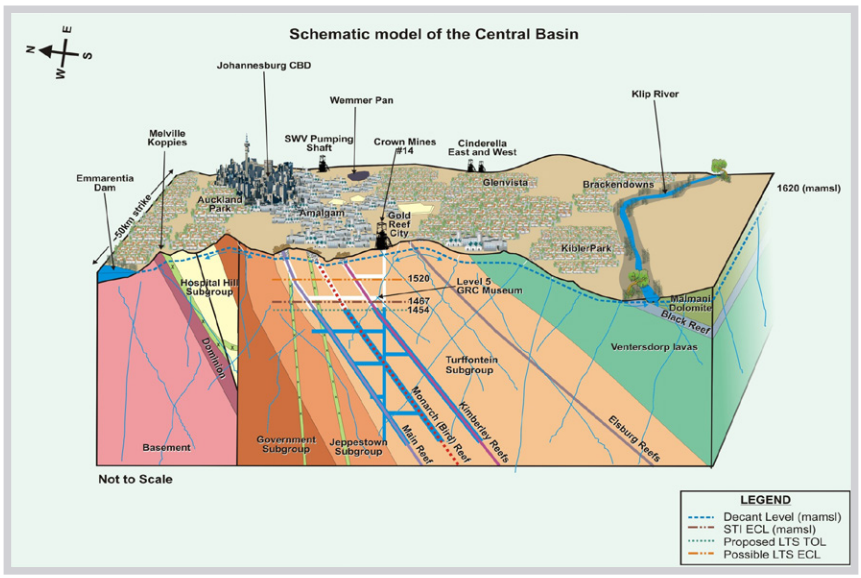
Ingress can be reduced by an estimated 10 Mℓ/day by implementing proposed plans to canalise rivers and surface water bodies overlying or near mine workings, and upgrading leaking municipal infrastructure in this highly urbanised area.

The proposed abstraction point for the Short-term intervention (STI) is South West Vertical shaft located in the eastern corner of the basin. There is a slight risk that in future connectivity to the western side of the basin could be restricted through rock falls. Then additional pumping will be needed at either a sustainable shaft or through deep boreholes.

"Why do we need to pump? Why not leave the untreated AMD to decant naturally?"

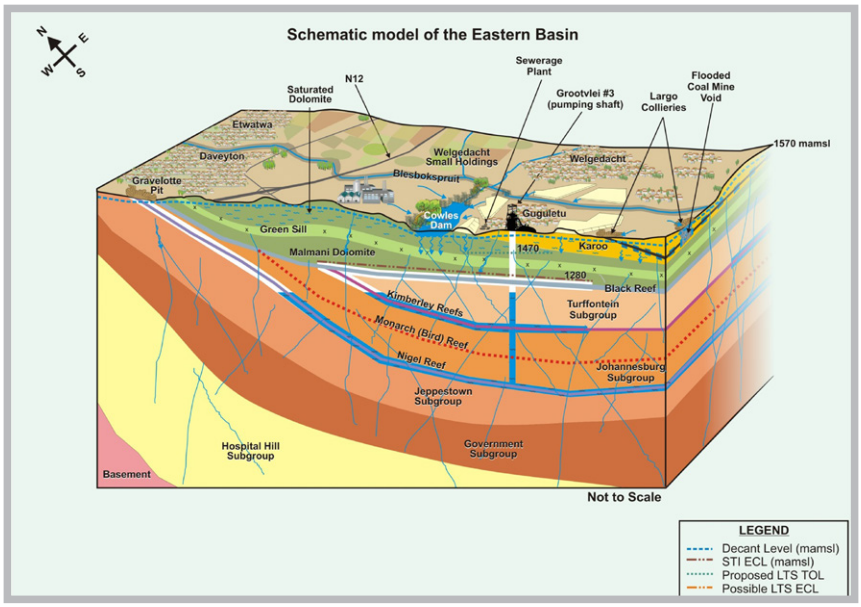
If the mine voids are allowed to fill completely and decant into the streams and springs, it will affect the fitness-for-use of water in the receiving water resources. The water quality in the tributaries to the Vaal and Crocodile Rivers will deteriorate, adding to the salt load, resulting in severe localised environmental impacts, as well as affecting major river systems. In addition, if the void water mixes with overlying shallow aquifers occurring in the weathered and fractured rocks, the deterioration in water quality will compromise groundwater use from shallow boreholes and result in further deterioration in surface water quality as such aquifers provide baseflow to the rivers.

Another big drawback of the Do-Nothing Option (i.e. no pumping, thus allowing decant) is that what is essentially a point source of pollution may become a non-point (diffuse) source of pollution, thereby making it extremely difficult, if not impossible to manage.



Eastern Basin

In the Eastern Basin there is a horizontal layer of dolerite occurring within the dolomites ("Green Sill" on diagram), which effectively acts as an aquaclude preventing complete dewatering of the saturated dolomite aquifer whilst mining was occurring. The water quality in this void has a higher pH of around 7 and lower TDS of 3 300 mg/ℓ indicating the effectiveness of the buffering capacity of water from the dolomite compartments.



It is recommended that pumping should commence to initially maintain the water at 1 280 m amsl and then gradually increase the level in steps to a maximum of 1 450 m amsl while it is adequately monitored to see that no pollution of the aquifer occurs. The groundwater from the saturated dolomites would still flow towards the mine void, leaving the water quality in the dolomites uncompromised.

The abstraction point proposed for the STI is Shaft #3 at Grootvlei, which was used to maintain the water level whilst mining took place. This shaft is also recommended for the LTS. Ingress volumes from surface water bodies through fractures in the dolomites into the mine void could be reduced by an estimated 21 Mℓ/d.

The anticipated average volume that will have to be abstracted from each underground mining basin to maintain the water levels was estimated and is given in the table below. These estimates are shown against the volumes to be abstracted if measures to reduce ingress are implemented.

Basin	Average Abstraction Rates (Mℓd)		Reduction from ingress control (Mℓd)	Predicted Abstraction with improved ingress control (Mℓd)	
	Average	Range		Average	Range
Western	23	19-27	5	18	14-22
Central	46	30-90	10	36	24-74
Eastern	80	70-100	21	59	49-79

Treatment Technology/ Processes Options Investigated

A Request for Information (RfI) on different treatment technologies that could be used to treat AMD was issued in December 2012 and about 50 technology providers responded through registering and providing information. This information was assessed and assembled to evaluate the various options. In order to evaluate the various treatment technologies, it was necessary to classify the technologies according to the state of development, which impacts directly on the risks associated with the implementation of the technology. The following categories were used:

- Laboratory-scale Technologies - Includes all technologies that have only been tested at a theoretical laboratory scale. (High risk)
- Pilot-scale Technologies - Technologies that have been simulated in pilot plants to prove the chemical, physical or biological principles on a larger scale. (Medium risk)
- Proven Technologies - Technologies that have been in operation at a scale comparable with the scale required for the application under consideration. (Low risk)

Options for **passive, biological, chemical** and **physical** treatment were assessed. The low risk technologies that are proven and that can currently be recommended if government provides funding are:

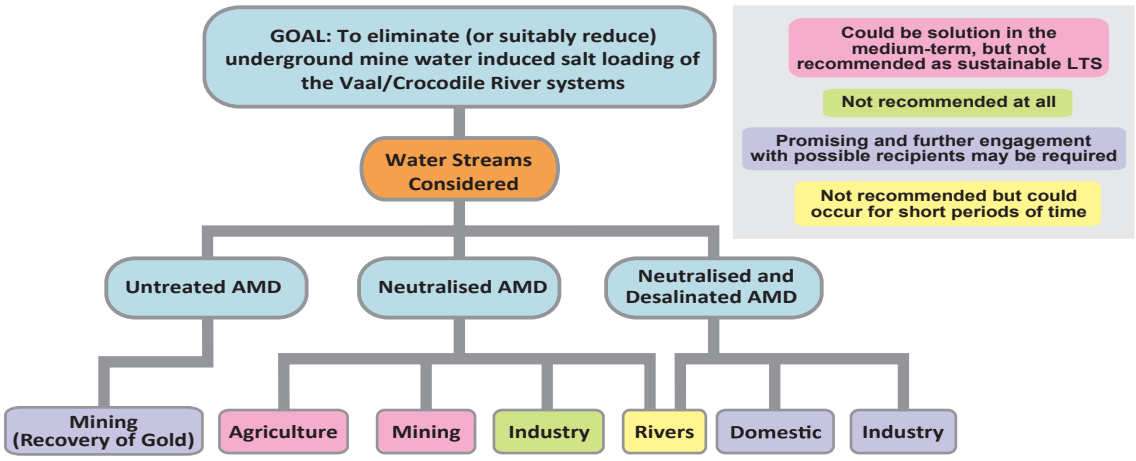
- **High density sludge** (HDS) for neutralisation and removal of most metals;
- **Reverse Osmosis** (RO) for desalination (physical process); and
- **Ion exchange** for the removal of uranium (physicochemical process)

A possible alternative is that **Government partners** with the mining companies for a period, for a **combined gold extraction and neutralisation process (in the Western Basin) and the disposal of waste, and thus shares risks and costs.**

The private sector may be prepared to fund a project with a technology other than those proposed above and carry the risk for the success of it. A Design Build Operate Maintain (DBOM) or Design Build Operate Maintain and Fund (DBOMF) (PPP) contract could allow alternative processes to be offered.

Potential application of raw and treated AMD

The various water uses that were considered are summarised in the figure below



Using neutralised water for agriculture or mines (pink boxes in figure) poses too great a risk since there is no assurance that the salts in the system will be reduced to acceptable levels. In the long-term it might end up back in the river, which will mean that the objective of the strategy has not been achieved. These usage options have been considered for the medium-term, while alternative solutions for the long-term are further investigated. An option that was also proposed is to implement agriculture in conjunction with a desalination plant treating the return flow from the agriculture, with the intention that the agriculture would remove a great deal of the salts at low costs. The problem posed by this approach is that the salts that will still remain in the system will no longer be a point source of pollution, but a diffuse source which is much harder, if not impossible, to manage.

Supplying neutralised water to industry (green boxes) is not recommended. For industries, the salts will not be consumed in the industrial processes and will most likely end up back in the river system.

The discharge of any water to rivers is not recommended, because discharging neutralised water to the river will defy the objective of the Study and doing this with fully treated water will not be financially sustainable.

The one option that has been identified for the reference project is the supply of fully treated water to industries or domestic users. During implementation further engagement with Rand Water and other possible recipients is necessary to optimally utilise this option.

Alternative Residue Management Options Considered

The proven technology for neutralisation is the HDS process that produces gelatinous sludge, requiring special facilities for disposal. Co-disposal of the sludge from the HDS and the RO plant with the processed tailings provides an attractive option currently being considered. In the long-term, provision needs to be made for the safe disposal of all non-commercial residue products to ensure that the salts and other pollutants do not find their way back into the river systems.

The resultant brine from the RO process will also need to be disposed of in specifically designed facilities i.e. evaporation ponds. The sizing and location of land required for such facilities are identified for the three mining basins.

In the Reference Project, allowance is made for Ion Exchange to remove uranium. The uranium must be disposed of in a sustainable and safe manner (i.e. as hazardous waste) or it can be sold as a product to offset the cost of treatment.

The viability of the safe disposal of the residue underground into the mine voids can currently not be proven and further research will be required before such methods can be considered.

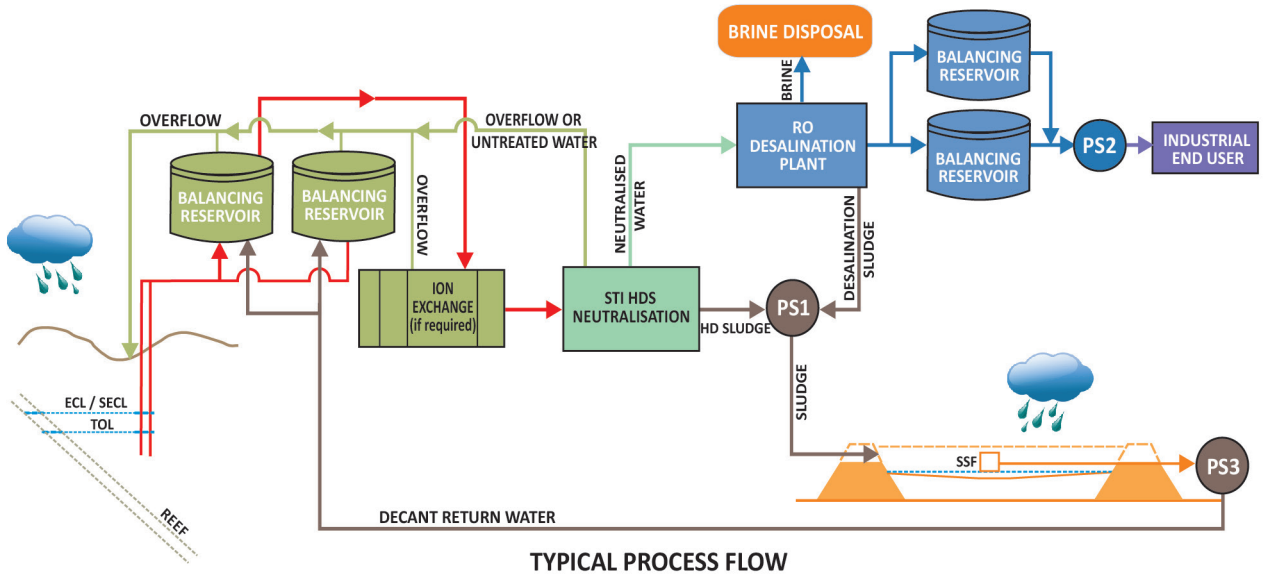
Alternative Technical Options Considered

The process of analysis of technical options involved evaluating the information on options for alternative use, discharge or disposal, and developing alternative treatment and infrastructure layout options to supply the treated AMD to the potential recipients. The options were analysed and considered on the basis of:

- Technical and practical viability;
- Recipient water quality requirements;
- Land development constraints;
- Geological constraints;
- Legal and institutional considerations / constraints;
- Environmental constraints;
- Socio-economic considerations; and
- Meeting the objectives of the applicable water resource strategies (e.g. Vaal and Crocodile Reconciliation Strategies).

Fourteen options were identified in the Western Basin, of which 4 options were selected for costing. Nineteen options were identified in the Central Basin, with 5 being selected for costing, while 14 options were identified in the Eastern Basin and 3 were selected for costing. Altogether, a total of 47 options were identified of which a total of 12 were selected for costing. From the options that were costed, one Reference Project per basin was recommended for more detailed assessment during the Feasibility Phase of the Study.

A schematic diagram illustrating the generic Reference Project is included below. Note that the specifics for each basin may differ from what is shown in the diagram.



TYPICAL PROCESS FLOW

Note: Ion exchange may not be required in all the basins.

It must be emphasised that what is shown here is not necessarily what will be implemented, but it will be used to compare proposals submitted in response to the Request for Proposals during the project procurement that will follow the Feasibility Study.

Estimated high cost of operation - Preliminary cost estimations have shown that for the planning horizon under consideration (50 years), the schemes will have substantial operational costs. There is thus a need to explore alternative technologies through the implementation of pilot plants with the objective to achieve lower operating cost.

Pilot Plants – An alternative to the Reference Project in the Western Basin would be to invite tenders to design, build, own and operate pilot plants (capacity 8 to 10 Mℓ/day) that utilise alternative treatment technologies which generate less waste and have lower operating costs. The objective is to provide an opportunity for such technologies to be proven suitable for the long-term, with acceptable risks. Such proven technologies can be considered to replace HDS and RO after 10 to 15 years.

Conclusions and Recommendations

HDS and Conventional RO are technologies that are "Proven and Ready for Implementation", but these are also some of the most expensive technologies. Other AMD treatment technologies have distinct advantages, but also disadvantages and risks that need to be resolved. Further research and pilot plant operations are required to improve the promising innovative technologies, such as Alternative RO, Biological treatment and Electro-coagulation.

In the medium-term (10 - 15 year horizon) HDS and conventional RO are proposed as reference processes. The objective of research on pilot-scale technologies during this medium-term period would be to give such technologies the chance to prove themselves and thereby reduce the associated risks. If the associated risks can be reduced, then some of these technologies may be considered for the next phase of the Long-Term Solution if they offer significantly lower operating costs.

The above aspects will need to be considered by Government in the decision making process on the implementation of the works.

Feedback/Progress on the Short-Term Intervention

On the installation of pumps to keep AMD below the ECL and the construction of HDS treatment plants to neutralise AMD before discharge to the environment, a number of agreements have been concluded and decisions made on how to proceed given the extremely limited funds available. In the Central Basin the construction contract has been awarded to Group Five for the installation of pumps, treatment plant and monitoring shafts to the value of R319 million. Construction commenced in January 2013, after Environmental Authorisation was given by the Department of Environmental Affairs. The works are considered of a temporary nature and after 5 years from the date of completion, must be either demolished or incorporated into the final solution. In this regard, the EIA process for the Short-Term Intervention was halted and a new process will commence which looks at the total solution for AMD, rather than the partial intervention, which the Short-Term Intervention represents.

The pumps and plant will be situated at the South West Vertical Shaft in Germiston and an agreement has been reached with ERPM which allows access to land, use of their infrastructure and co-disposal on their tailings facility. They will also use up to 30 mega litres per day of untreated or partially treated AMD.

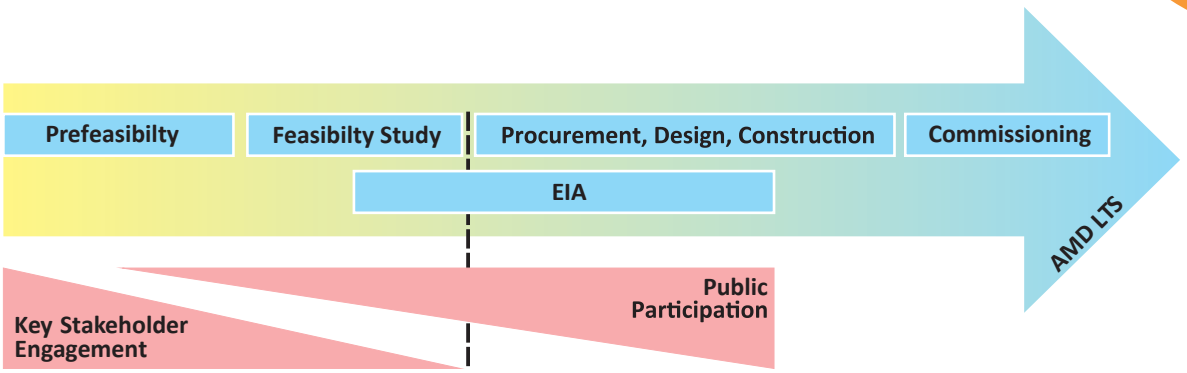
Another agreement has been signed with Central Rand Gold for the donation of the submersible pumps required to keep the water below the ECL. This arrangement is mutually beneficial whereby the project does not have to purchase the pumps required and CRG's underground mining operations, above the ECL, will not be flooded. Any costs associated with drawing down the water level below ECL will be for CRG's account. Both these arrangements have helped significantly to reduce the cost of the project.

In the Western Basin further upgrades will be undertaken to the existing Rand Uranium/Gold One Plant to further improve the quality of the effluent and to draw the water in the mining void down to create a buffer against high rainfall events. This will contain the situation until the "Long-Term Solution" is implemented.

In the Eastern Basin there is currently insufficient funding to commence with construction and no agreement has been reached with the liquidators of Pamodzi (and the associated mines) on access to land and infrastructure.

No more uncontrolled decant in Western Basin!

Key stakeholder engagement and communication



Given that the prefeasibility and feasibility phases of the Study are planning phases, and not a regulatory environmental authorisation process, a regulatory public participation process with the general public is not required. The planning process includes activities such as information collection and verification, the pooling of collective knowledge and wisdom, deliberating the details and complexities around potential solutions and considering alternatives towards the recommended LTS for AMD. This requires high level input from a technical planning perspective, rather than wide public participation, which will be undertaken as part of a separate EIA process.

The tight timeframe and technical complexity of the Study does not permit efficient consultation with the general public. Hence the approach to stakeholder involvement for this Study, as summarised in the table below is directed at focussed engagement and collaboration with identified key stakeholders representing various sectors of society, to inform the Study at a technical level. In addition, the approach provides for communication information, study progress and key outcomes of the Study to the wider stakeholder group, not directly engaged in the technical components of the Study.

	KEY STAKEHOLDER ENGAGEMENT	COMMUNICATION
PURPOSE	Information gathering to inform the study (existing information, monitoring data, technical input and expertise)	Communicate progress and key outcomes at certain milestones in the study
TARGET AUDIENCE	**Key Stakeholder Sectors and Groups** *(Directly affected parties, who have a high level of influence on the direction and success of AMD long-term initiatives, and whose input is critical to the study)*	**Wider Stakeholder Group** *(More than 900 interested and affected parties representing a wide range of sectors of society)*
METHOD OF ENGAGEMENT	Individual consultation meetings; Focus group meetings; Technical workshops; Study Stakeholder Committee (SSC) Meetings; as well as DWA presentations to Catchment Forums	Newsletters at certain milestones in the study; Press releases; and the AMD webpage on the DWA website

Several engagement meetings were held with key stakeholders to date. The various types of meetings and stakeholder groups engaged are summarised below. The study team acknowledges the many valuable contributions and information sources received from stakeholders (see acknowledgements on the DWA AMD website).

TYPES OF MEETINGS	STAKEHOLDER GROUPS ENGAGED
Study Stakeholder Committee meeting: May and October 2012 and May 2013	National Government; Provincial Government; Local Government; Mining Sector; Organised Business; Industry and Labour; Organised Agriculture; Utilities (Water and Electricity); Environmetal NGOs and conservation groups; Catchment Forums or other existing structures; as well as Parastatals
Individual and small group consultation meetings	Independent specialists; Technical commentators; NGO representatives (FSE); National Treasury; World Bank; Gold Reef City; Joburg Water; City of Joburg; and GDARD
Technical workshops / specialist meetings	Geohydrology specialists; Agricultural sector; Rand Water; WRC and DST
Focus Group Meetings (September 2012)	Environmental NGOs; Conservation Groups; Tourism/Recreation and Interest Groups; as well as Local Government
Information gathering meetings	DMR; Council for Geosciences; North West University; University of Pretoria; Various Technology Providers; and TCTA

The key questions, concerns and suggestions, raised by stakeholders during the key stakeholder and communication activities, and responses from the Study Team are available as Frequently Asked Questions and Answers on the AMD webpage on the Department of Water Affairs website:

http://www.dwa.gov.za/Projects/AMDFSLTS

Way forward and Next Newsletter

The way forward in addressing this immense AMD challenge is becoming clearer. The deliverables from the Feasibility Phase of the study, which are due in July 2013, (to be published on the DWA AMD webpage later in the year) will provide definitive recommendations on the implementation actions to be taken by DWA. These deliverables will not only address the technical side of the recommended solution, but also report on the institutional and procurement model, and funding mechanisms.

Focus of next Newsletter:

- Feasibility Phase
- Concept Design for each basin
- Institutional & Financial Arrangements
- Procurement
- Implementation Plan

THE HOPE FOR THIS STUDY, ALL THE PARALLEL INITIATIVES AND THE ACTIONS TO FOLLOW ARE THAT AN ENVIRONMENTAL CHALLENGE WILL BECOME A WATER RESOURCE OPPORTUNITY.

Appendix Q
Newsletter 3

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

newsletter

AMD FS LTS

Edition 3 • 2013

This newsletter provides stakeholders with an update on the progress of the Feasibility Study for a Long-Term Solution (LTS) to address the Acid Mine Drainage (AMD) associated with the Witwatersrand underground mining basins. The goal of the Feasibility Study was to investigate options and recommend a feasible LTS to the AMD problems in the study area, in order to ensure long-term water supply security and continuous fitness for use of water in affected river systems.

The study consisted of three phases, namely the Initiation Phase (covered in Edition 1 of this newsletter), the Prefeasibility Phase (discussed in Edition 2) and the Feasibility Phase, which have all been completed. The focus of this edition of the newsletter is to present the results of the Feasibility Phase. All newsletters are available on the Department of Water Affairs (DWA) website, as indicated below.

STUDY TEAM

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IN THIS ISSUE...

Comments and enquiries can be sent to Mr Marius Keet at the Department of Water Affairs: keetm@dwa.gov.za
For more information on the feasibility study, please visit the AMD webpage on the Department of Water Affairs website:
http://www.dwa.gov.za/Projects/AMDFSLTS

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

The Feasibility Study Approach

A short summary of the AMD challenges and Prefeasibility Phase was given in the first two editions of the Newsletter. The Feasibility Study was a planning study that aimed to recommend a feasible LTS to the AMD situation, also contributing to the long-term water supply security and continuous fitness for use of water in the affected river systems.

A feasible solution will strive to be one that is technically sound, economically viable, environmentally sustainable, institutionally feasible and legally achievable. As such, the study's focus was not only on the technical aspects (in terms of treatment options) of a LTS, but also on legal, social, economic, ecological, financial and institutional aspects (refer to Edition 2 for the feasibility criteria).

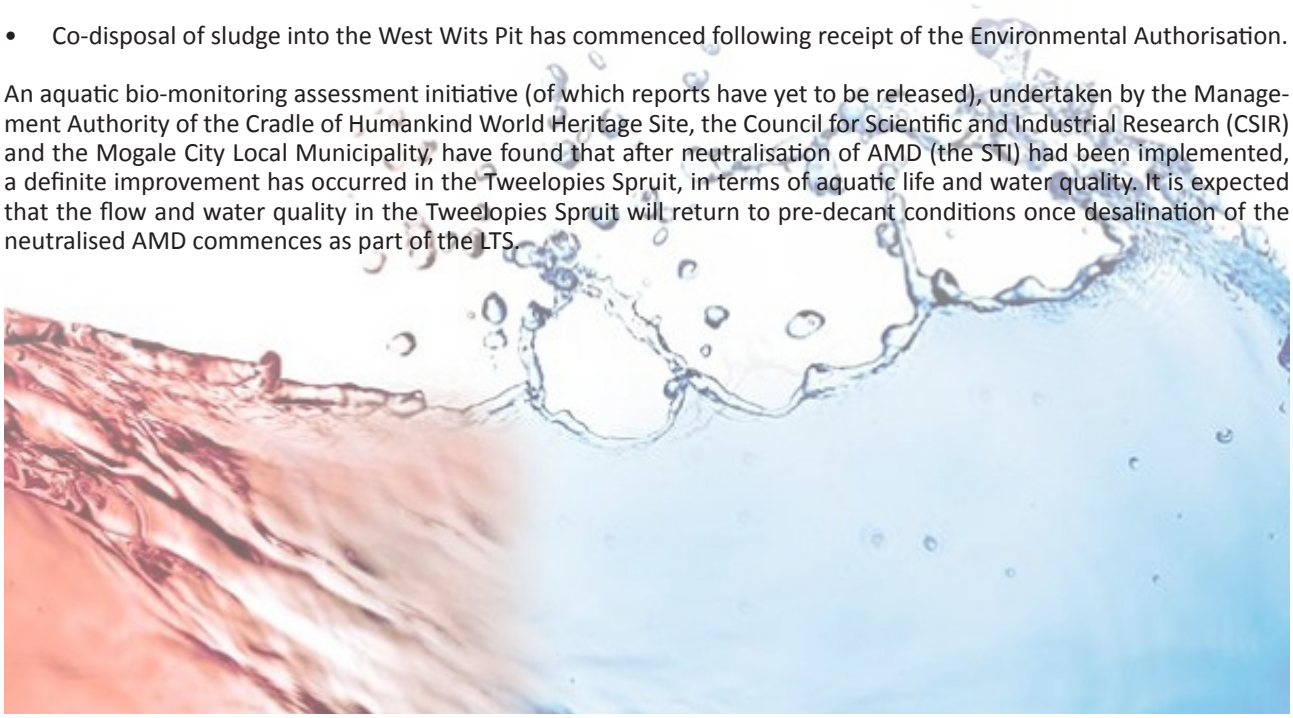
Progress on the Short-Term Intervention

Western Basin

The Short-Term Intervention (STI) to address AMD in the Western Basin has progressed substantially and feedback received from the Trans-Caledon Tunnel Authority (TCTA) on the STI includes the following:

- All three trains for AMD neutralisation purposes were successfully upgraded and are operational;
- Uncontrolled decant in the Western Basin has stopped since commencement of the STI, except for a few isolated instances where power failures occurred. In these cases decant has been minimal and lasted only for a day. Reports indicate a major improvement in the water quality in the Tweelopies Spruit, as well as an improvement in groundwater quality;
- Options for the further upgrade of the Rand Uranium plant are under investigation. A design report has been discussed with the DWA and it has been agreed to upgrade the first train to the same standard as the trains built by the TCTA. Further upgrades of the plant have been put on hold until the DWA/ TCTA has evaluated the Mogale Gold proposal recently received. Significant cost savings could be achieved should the alternative be found technically viable;
- The TCTA installed a new temporary pump in Rand Uranium No. 8 Shaft to increase the volume to be pumped from the shaft to 24 Mℓ/day, instead of the previous 8 Mℓ/day;
- DEA issued the Environmental Authorisation on 7 January 2013, which allowed for the handover of the site to the contractor in January 2013 for commencement of construction of the STI infrastructure; and
- Co-disposal of sludge into the West Wits Pit has commenced following receipt of the Environmental Authorisation.

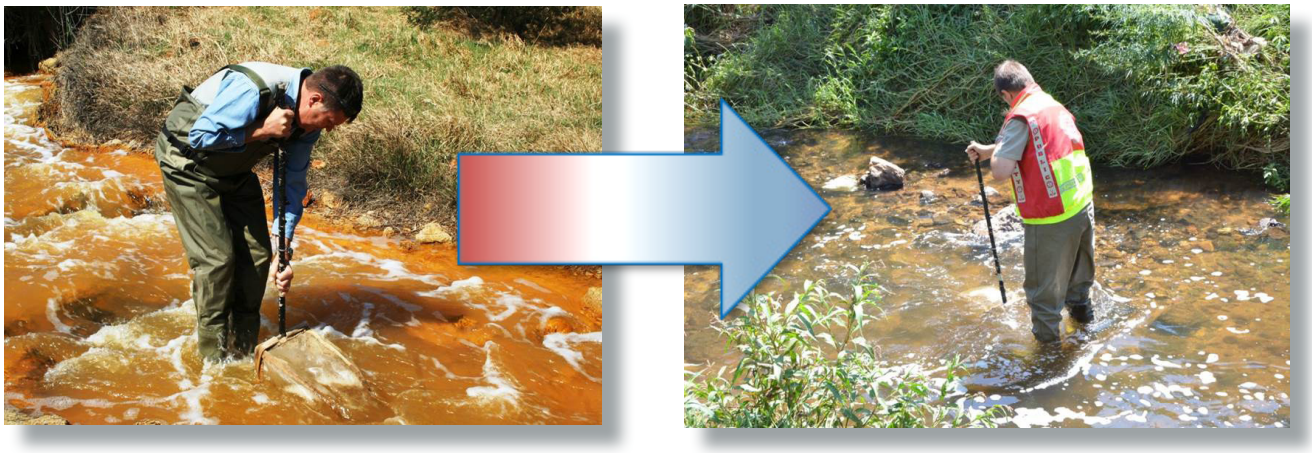
An aquatic bio-monitoring assessment initiative (of which reports have yet to be released), undertaken by the Management Authority of the Cradle of Humankind World Heritage Site, the Council for Scientific and Industrial Research (CSIR) and the Mogale City Local Municipality, have found that after neutralisation of AMD (the STI) had been implemented, a definite improvement has occurred in the Tweelopies Spruit, in terms of aquatic life and water quality. It is expected that the flow and water quality in the Tweelopies Spruit will return to pre-decant conditions once desalination of the neutralised AMD commences as part of the LTS.



The photographs below illustrate the improvement of water quality in the Tweelopies Spruit, which led to the return of aquatic life, since the implementation of the STI:

October 2011

February 2013



Central Basin

Construction of the STI infrastructure is progressing steadily. Test commissioning will commence in December 2013 / January 2014 and full operation by February 2014. This will ensure protection of the Environmental Critical Level (ECL) that has been determined for the LTS.

Construction of a reactor plant for pre-neutralisation and sludge-conditioning chambers

Construction of a sludge recycling pump station

Eastern Basin

Mine water (AMD) pumping, neutralisation and discharge infrastructure, similar to that of the Central Basin, is projected for development at the former Pamodzi/ Aurora Gold Mine (Grootvlei No. 3 Shaft). Through the TCTA, a bid for this project was recently advertised and mandatory site briefing meetings with potential service providers already convened. A construction contract is planned for award by end-2013 and the project is anticipated for commissioning in December 2014.

Summary of Recommendations of the Feasibility Study

Recommended Reference Projects

The conservative benchmarks recommended as Reference Projects for the three basins comprise the following:

Western Basin

- Abstract AMD at Rand Uranium No. 8 Shaft or at a suitable alternative shaft;
- Neutralise and desalinate AMD, using High Density Sludge (HDS) and Reverse Osmosis (RO) processes respectively, at a treatment location situated near the abstraction point;
- The Ion Exchange process for uranium removal is included, but could be reconsidered in the final design;
- Supply to industrial users, with possible use of a pipeline running to the basin boundary (end user/s are to be confirmed in due course);
- A sludge disposal site close to the proposed treatment works was identified;
- A site for brine evaporation ponds was identified adjacent to the treatment works; and
- Options for the re-use of residue products can be accommodated during the detail design process.

What is meant by "Reference Project"?

The term "Reference Project" refers to the option which uses proven technologies, has minimum risk and which is used for financial modelling and budgeting. It is not necessarily the option which will be implemented, but is the conservative benchmark against which implementation proposals will be judged and as such, the Reference Projects for each basin might differ from what is described in the Implementation Phases on Page 5.

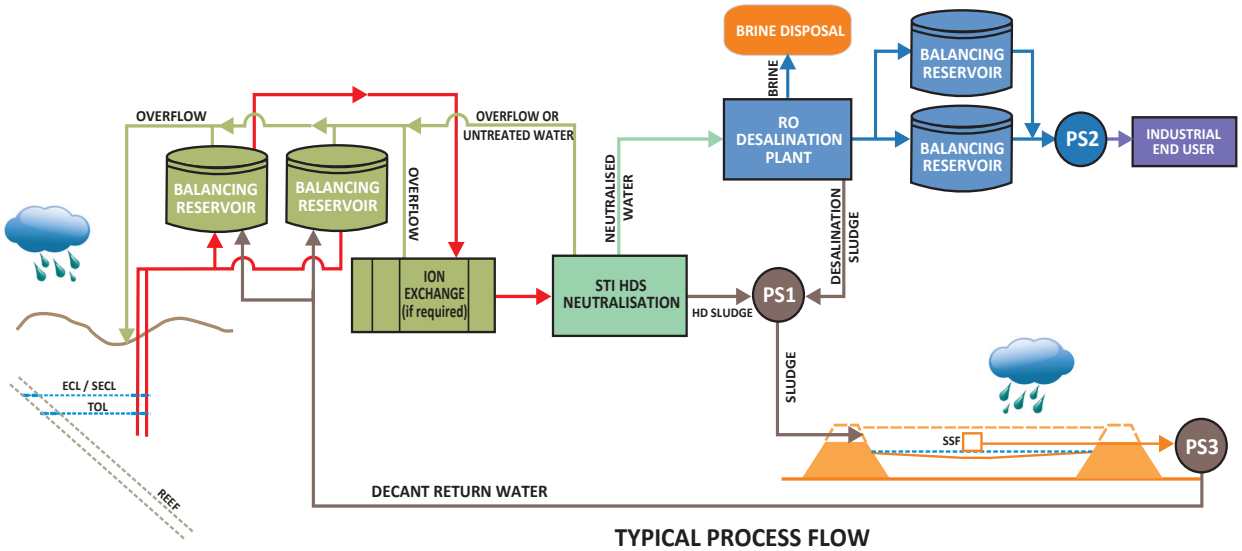
Central Basin

- Abstract AMD at South West Vertical Shaft. Multiple abstraction points/ boreholes throughout the basin should be considered, pending connectivity between sub-basins within the mine void. The protection of the ventilation shaft associated with the South West Vertical Shaft has been identified and may become necessary for possible future use;
- Neutralise and desalinate AMD, using HDS and conventional RO processes respectively, at the treatment location adjacent to the abstraction point;
- The Ion Exchange process for uranium removal is included, but could be reconsidered in the final design;
- Supply to end user/s from the neutralisation and desalination treatment site, with possible use of a pipeline running to the Eastern Basin's treatment site (end user/s are to be confirmed in due course);
- A sludge disposal site and a site for brine evaporation ponds were identified; and
- Options for the re-use of residue are to be considered during the detail design process.

Eastern Basin

- Abstract AMD at Grootvlei No. 3 Shaft. Marievale No. 5 Shaft is considered as a good alternative abstraction point and can be used in future should the need arise;
- Neutralise and desalinate AMD, using HDS and conventional RO processes respectively, at the treatment location adjacent to the abstraction point;
- The Ion Exchange process for uranium removal is included, but could be reconsidered in the final design;
- Supply to industrial users, with possible use of a pipeline running to the basin boundary (end user/s are to be confirmed in due course);
- A residue disposal site was identified close to the proposed treatment works. The identified site for the sludge disposal facilities will also serve as a site for the brine evaporation ponds; and
- Options for the re-use of residue are to be considered during the detail design process.

A schematic diagram illustrating the generic Reference Project is included below; however, the specifics for each basin may differ from what is shown in the diagram:



TYPICAL PROCESS FLOW

ECL – Environmental Critical Level
SECL – Socio-Economic Critical Level
TOL – Target Operating Level

PS1 – Pump Station 1
PS2 – Pump Station 2
PS3 – Pump Station 3

Procurement of LTS and Implementation Phases

The objective of the procurement process will be to initiate implementation of the LTS, most likely under a Design, Build, Operate and Maintain (DBOM) contract to procure a fully integrated treatment facility and service for AMD. Below follows a description of the implementation phases that are likely to be followed for each of the basins as envisaged by the Feasibility Study recommendations.

Western Basin:

- *Phase 1A (STI):* From 2012 - Upgrade Neutralisation Plant to 32 Mℓ/d capacity.
- *Phase 1B (STI):* 2013 – Upgrade neutralisation capacity to ±40 Mℓ/d and install permanent clarifier and permanent pumps. Alternatively implement joint neutralisation process with mining sector, such as Mintails process.
- *Phase 2:* For 5 to 7 years – Construct ancillary works and commission Pilot Treatment Plants (each 5 to 10 Mℓ/d) to develop Innovative Technologies (see heading below – "Pilot Treatment Plants").
- *Phase 3:* 25 years - Procure new operating contract and process with lowest lifetime costs.
- *Phase 4:* 25 years - Procure new operating contract and process with lowest lifetime costs.

Central Basin:

- *Phase 1A (STI):* From 2013 - HDS for ±46 Mℓ/d.
- *Phase 2:* 2016 - Operating contract for 10 to 15 years with a solution that is likely to include Conventional RO.
- *Phase 3:* 25 years - Procure new operating contract and process with lowest lifetime costs.
- *Phase 4:* 25 years - Procure new operating contract and process with lowest lifetime costs.

Eastern Basin:

- *Phase 1A (STI):* From 2014 - HDS for ±80 Mℓ/d.
- *Phase 2:* 2016 – Operating contract for 10-15 years with a solution that is likely to include Conventional RO.
- *Phase 3:* 25 years - Procure new operating contract and process with lowest lifetime costs.
- *Phase 4:* 25 years - Procure new operating contract and process with lowest lifetime costs.

Pilot Treatment Plants

It is recommended that the Western Basin be used to evaluate a number of Service Providers in possession of emerging and innovative technologies that has been shown to work, but not at the scale required to treat AMD in the Witwatersrand Gold Mining Basins.

It is expected that enough AMD for between four and eight Pilot Treatment Plants will be available. Pilot Treatment Plants should be selected in consultation with the Water Research Commission (WRC) and the Department of Science and Technology (DST).

It is recommended that the Pilot Treatment Plants be tested over a 5 to 7 year period, where after proven technologies will be encouraged to bid for the re-issuing of the contracts for the Witwatersrand Basins.

It is recommended that the WRC play a central role during the testing of the Pilot Treatment Plants, supported by the DWA and the DST, and perhaps the Technology Innovation Agency (TIA).

Cost

The grand total of the estimated Capital Cost (CAPEX), of the LTS Reference Projects suggested for the three basins, amounts to approximately R6.66 billion at March 2012 prices, while the maintenance and Operating Cost (OPEX) of the STI together with the LTS Reference Projects amounts to approximately R990 million per annum.

How will the Capital Works be funded?

The Government will take responsibility to ensure that funds are available for the establishment of the works and construction contracts. Some of the mines have contributed land, infrastructure (such as pumps), mine shafts for pumping purposes, etc., while funds will be sourced from the normal Government sources such as the budget, loans etc. for the LTS. The funding of the works should not be misconstrued with cost recovery.

How will the cost of the AMD works be recovered?

The Department supports the polluter pays principle, i.e. the polluter contributes to the costs for the remedial action taken. Apart from the contributions by the polluter, there are other revenue streams that can also be considered, such as that the water users pay. Water users in the Vaal River System will benefit in two ways, i.e. the treated AMD can be supplied for use and it will also limit the need for dilution releases from the Vaal Dam, which will defer the need to implement other water augmentation schemes. In addition, there may be other beneficiaries (e.g. existing and/ or future underground mining) who may require a static water level in the mine void that is kept below the Environmental Critical Level who will need to contribute. The sources for cost recovery must still be confirmed by the DWA.

Institutional and Financial Arrangements

A number of institutions will have to be involved in implementing the LTS for the management of AMD. It is expected that the DWA will have the overall responsibility for the implementation and must be supported by the following role-players:

- Department of Mineral Resources (DMR);
- Department of Environmental Affairs (DEA);
- Trans-Caledon Tunnel Authority (TCTA);
- Water Boards (e.g. Rand Water and Magalies Water); and
- Local Authorities / Water Service Authorities.

The institutional options further evaluated in the Feasibility Study were to:

- Manage the project directly, using:
  - Resources from within the Department;
  - Delegating responsibility, through a suitable contract to a managing agent sourced either from a Public Entity or from the Private Sector; or

- Appoint a Public Entity as the Implementing Agent (IA) which would contract with the Service Provider directly on behalf of the Department.

The financial arrangements have by no means been finalised, but the potential sources of funding identified are:

- Government from the Revenue Fund;
- Private Sector or International Funding Agencies directly to Government;
- Private Sector funding via loans to a Public Entity (State-Owned Entity (SOE) or a Water Board), with an implicit or explicit Government guarantee; or
- Private Sector funding to a Private Sector SPV or Service Provider, established to implement a Design, Build, Operate, Maintain and Finance (DBOMF) Public Private Partnership (PPP) project.

Cost-Benefit Analysis of AMD Management Scenarios

The basic question arose as to why AMD should be treated at a high cost and why its impact cannot be assimilated into the economy instead. An economic cost-benefit analysis was performed to investigate this. The positive and negative effects called benefits and disbenefits to the economy of a few scenarios were quantified at a high level and compared.

The full desalination and treatment of AMD was compared to two "do nothing" options as follows: The first option being the continuation of the release of large quantities of water for the dilution of salinity in the Vaal River, resulting in water shortages that will be experienced in future; The second option being to allow the increase in salinity in the Middle and Lower Vaal, and the impacts of the salinity being "externalised" to downstream users in the Vaal River System.

It was found that the disbenefits of the continued dilution releases are far greater than the disbenefits of the treatment of the AMD. Likewise, the "externalisation" of the disbenefits is more or less similar to the disbenefits of the treatment of the AMD; however, considering the additional negative impacts on the environment and society, it is clear that it is the correct course of action to have the AMD desalinated.

The way forward after the Feasibility Study

The Department will take an appropriate amount of time to thoroughly consider the recommendations made by the Feasibility Study, after which the necessary actions will commence to implement the LTS.

The Environmental Impact Assessment (EIA) for the LTS, which will include the STI, must commence as a matter of urgency along with land acquisitions of sites identified for the LTS. These two activities are on the critical path for implementing the LTS and any delay in these may delay the LTS.

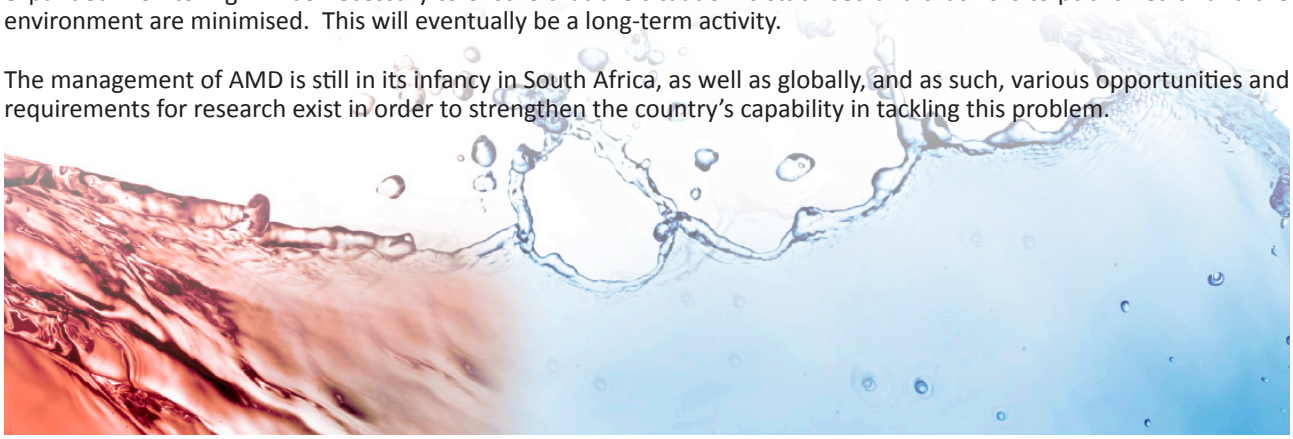
Prior to starting any of the procurement actions, the DWA must confirm the principles (i.e. institutional structure, type of contract and funding arrangements) which will govern the implementation activities and also whether to establish a Special Projects Unit (SPU) and/ or to appoint an Implementing Agent (IA) to manage the LTS for AMD.

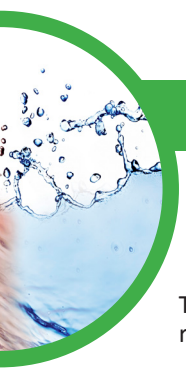
It is also crucial that off-take agreements with the users that have been identified be established as soon as possible. The preparation of procurement documents such as a Request for Qualifications (RfQ) and a Request for Proposals (RfP) for the Central and Eastern Basins will then commence. In the Western Basin, where Pilot Treatment Plants are recommended, the procurement activities will be different, since it is recommended that the Pilot Treatment Plants be implemented as a WRC research project.

Apart from the decisions and actions required by the DWA to implement the LTS, the Feasibility Study identified other requirements for the successful management of AMD. For the three basins within the Witwatersrand, further investigations (e.g. gravity abstraction via tunnel in Western Basin or multiple abstraction locations in the Central Basin) should be undertaken to optimise the projects that are proposed for implementation.

Several activities initiated by the DWA's Hydrological Monitoring Committee (chaired by the DWA) are currently planned and structured. The monitoring program specifically covers the establishment of full-scale mine water monitoring stations. These stations are required to monitor the rise of water in the mine void, as well as the hydro-geochemical characteristics of the water. Following the implementation of the proposed management measures, on-going and expanded monitoring will be necessary to ensure that the situation is stabilised and that risks to public health and the environment are minimised. This will eventually be a long-term activity.

The management of AMD is still in its infancy in South Africa, as well as globally, and as such, various opportunities and requirements for research exist in order to strengthen the country's capability in tackling this problem.





The main area in which research would be focused is treatment technologies, but there is also a need for research in residue management, water use (e.g. saline agriculture), abstraction methods and institutional and financial models.

The DWA may also embark on feasibility studies to address AMD in other mining basins and seek to develop a national strategy for managing AMD. Such a strategy can be improved and updated as new knowledge surfaces and will serve as a benchmark for addressing AMD throughout the country.

In Edition 1 of this Newsletter, it was stated that the aim of the Feasibility Study is to find the most cost effective solution/ combination of solutions that are environmentally sustainable, technically sound, economically viable and institutionally feasible in the best interest of the public.

The DWA firmly believes that the LTS that is recommended for implementation adheres to these criteria, but the successful management of AMD hinges on the stakeholders and public 'buying-in' on the solution that will be implemented. To achieve this, it is recommended that the DWA continues to engage stakeholder groups in line with an overarching communication strategy.

The hope for this study, all the parallel initiatives and the actions to follow are that a water resource challenge will become a water resource opportunity.

Acknowledgements

The DWA thanks all stakeholders who have participated in the Feasibility Study, especially the members of the Study Stakeholder Committee (SSC), the Study Management Committee (SMC) and the Study Administration Committee (SAC), as well as the members of the Study Team and Professional Services Providers (PSPs), for their commitment to the study, attending meetings, and for providing technical expertise that contributed towards arriving at the LTS.

Municipalities, Non-Governmental Organisations (NGOs), Recreational, Tourism, and other institutions are thanked for their participation during focus group meetings and other inputs provided towards informing the study.

Technology providers are thanked for registering their interest and for providing information on AMD treatment processes towards informing the study.

The wider public is thanked for their participation and for giving DWA the opportunity to inform them on AMD and the progress made during the study.

Future Communication

General enquiries on AMD in the Witwatersrand can be addressed to Mr Marius Keet at the DWA (keetm@dwa.gov.za). During the implementation of the LTS, further consultation with stakeholders and interested parties will take place in terms of a comprehensive EIA process. For more information on available reports and Frequently Asked Questions (FAQs), please visit the AMD webpage on the DWA website at: http://www.dwa.gov.za/Projects/AMDFSLTS

Why are some reports confidential?

The Feasibility Study, being a planning study, did not allow for extensive public participation. Instead, key stakeholders were consulted as the Feasibility Study progressed, while information was made available to the public through newsletters and the AMD website. Wider public participation is foreseen during the implementation stages, including the EIA. With this being said, it must be stressed that there are certain reports that cannot be made public until the appropriate implementation process stages have been reached, as such reports may potentially compromise future procurement and legal processes. Of the 18 reports to be produced, six are considered confidential, and will thus be made available at a later stage.

Appendix R
Press Release

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Statement by Minister Edna Molewa at the Acid Mine Drainage media briefing -Rand Fontein West Rand 22 March 2012

Today, the 22nd of March is World Water Day, this is a day dedicated by the United Nations to increasing awareness around the importance of water in our lives, the environment, in health, agriculture and for our economy. We therefore thought it appropriate to come here to the Witwatersrand to show you the effects that decades of reckless and poorly regulated mining activities have had on our precious water resources. This is a problem that is not unique to this area but this is where it requires the most urgent attention.

The issue of Acid Mine Drainage is one that the Government takes very seriously and is committed to resolving. I want to make it clear that the Department of Water Affairs and I speak for all other departments that are in involved in dealing with this challenge. Even though the current government inherited the problem of AMD we are intensifying our efforts and making noteworthy progress.

Our government in particular my Department has been accused of not doing anything to resolve this issue while at other times the charge has been that we are not doing enough. You have seen for yourself the work that is being done, I trust that will give you some indication of our commitment.

In 2010, Cabinet appointed an Inter-Ministerial Committee (IMC) to investigate the challenges posed by AMD in the Witwatersrand Goldfields area, between Randfontein in the West and Nigel in the east. Through a Technical Committee, co-chaired by the Directors General of the Department of Mineral Resources (DMR) and the Department of Water Affairs (DWA), a Team of Experts was appointed and a draft AMD report was presented to Cabinet on the 9th of February 2011.

The Experts Report outlined short, medium and long term interventions and specifically recommended the following short term solutions, which the IMC approved for emergency implementation:

- Installation of pumps to extract AMD from mines to on-site treatment plants.
- Construction of on-site water treatment plants in each basin, with the option of refurbishing and upgrading existing treatment facilities owned by the mines.

- Installation of infrastructure to convey treated water to discharge into nearby water courses.

In April last year, I directed the TCTA to undertake emergency works related to water management of AMD. The work undertaken constitutes the Phase 1 of the Long Term Solution to deal with the problem of Acid Mine Drainage on the Witwatersrand.

The main objectives of this phase are:

- Treating the current uncontrolled AMD decant on the Western Basin (this intervention is known as “the immediate solution”.
- Drawing down the Acid Mine Drainage in the Western Basin by pumping to what it is known as the Environmental Critical Level, (this is the highest water level in the mine void which can be allowed without the mine water negatively impacting on the shallow ground water aquifers and the surface water resources).
- Preventing the rising water levels in the mine voids from exceeding the ECL’s in the Central and Eastern Basins.
- Treating the current uncontrolled AMD decant occurring on the Western Basin involves upgrading the Rand Uranium treatment plant. This plant consists of four parallel treatment process units, of which only one unit is operational and is currently being used to treat mine water at a peak rate of 12 million litres per day.

Work commenced in December 2011 to upgrade the Rand Uranium plant to treat a total capacity of 30 million litres of mine water per day.
The commissioning of the fully upgraded plant is set for April 2012.

I am also pleased to announce that my Department has already commissioned a feasibility study for the long-term solution to address Acid Mine Drainage associated with the East, Central and West Rand Underground Mining Basins. A team of consultants will be responsible for conducting this study over the next 13 months (ending in Feb 2013). The study will focus on investigating possible management scenarios, an analysis of technical options, and optimal infrastructure configuration, as well as recommend suitable institutional and financial models and a suggested implementation plan to provide a sustainable long-term solution.

Ladies and gentlemen, I would now like to talk briefly about the so called short fall in the budget allocated to deal with the AMD challenges. It will cost approximately nine hundred million to a billion Rand to implement the short term solution. The current budget is R433 million. In order to address this funding gap, the smooth integration between the short and the long term solution is essential. I have therefore recently in partnership with the Department of Mineral Resources, instructed my Department to explore the possibility of testing the open market asking for interest to deal with AMD. The responses are expected to deal with all aspects of AMD including institutional matters, financial matters, technology as well as the operation and maintenance of the pump stations and treatment plants. I am awaiting feedback and

once we have more clarity on the way forward and the process that could be followed to speed up the implementation of the long term solutions, my Department will make further announcements in this regard. I will also then report back to the relevant Inter Ministerial Committee.

I thank you

Appendix S
Frequently Asked Questions (FAQ) Document

FREQUENTLY ASKED QUESTIONS

1. Has government allocated adequate resources and funding to address the AMD challenge?

Government is committed to address the matter, but as per the Minister, cooperation between the mining sector and other important role players is critical to finding a long-term solution to deal with the AMD challenge.

2. Why is this study 10 years late? The public has a problem with the sincerity of the process to find a LTS.

It must be pointed out that although this study is only taking place now, the Department of Water Affairs (DWA) is committed to finding a Long-Term Solution (LTS) to the AMD problem, and there are several parallel studies and initiatives by the DWA and other government institutions that have been initiated some time ago, all working towards a sustainable solution.

3. What areas are covered by the long-term solutions study?

The study area lies in the Witwatersrand Goldfields area covering the Eastern, Central and West Rand underground mining basins, between Randfontein in the west and Nigel in the east. The study area is being considered in the context of the water resources of the Vaal River water supply area and associated catchments.

4. What are the effects / consequences of low pH on humans and the environment? – *i.e.* the effect of untreated AMD?

Humans: The water will have a metallic taste due to the metals that may be in solution. Due to the low pH significant quantities of various heavy metals may be dissolved in the water that may render it toxic.

Environment: Aquatic life generally cannot survive in a low pH environment, and hence the receiving rivers may become sterile with little aquatic life (except if such receiving rivers poses sufficient buffer capacity).

A direct relationship between the pH of drinking water and human health effects is difficult, if not impossible to establish since pH is very closely associated with other aspects of water quality.

The taste of water, it's corrosivity and the solubility and speciation of metal ions are all influenced by pH. At low pH water may taste sour.

The potential toxicity of metal ions and chemicals which can be protonated, for example ammonia, is influenced by pH. Changes in pH affect the degree of dissociation of weak acids and bases. This effect is of special importance because the toxicity of many compounds is affected by their degree of dissociation.

Corrosion of the water supply system is a major source of metal contamination in drinking water. Metals that have the potential for causing such contamination are lead, copper and zinc. Lead is subject to corrosion at a pH higher than 12. Corrosion of cadmium is only significant below pH 6. Other metals which are frequently used in household plumbing and that may be affected by pH are copper and zinc.

5. What are the effects/consequences of high sulphates on humans and the environment?

Consumption of excessive amounts of sulphate in drinking water typically results in diarrhoea. Sulphate imparts a bitter or salty taste to water, and is associated with varying degrees of palatability.

SA does not explicitly specify a guideline value for the environment. High values may have an effect on the aquatic environment, although it has been said that aquatic eco-systems are able to adapt reasonably well to gradual and mild changes in salt levels.

6. What dangers will the neutralized and desalinated water hold for humans and the Environment?

There are no dangers in drinking the neutralised and desalinated water from AMD if treated to potable water standards. Though the water could be perfectly safe the public have the perception that it may be unsafe. Society will need to be informed that fully treated water will be safe. All possible toxic constituents can be removed to the levels specified by the South African National Standard (SANS) 241 – 2011 Standard.

7. For what use will the water be treated?

The water can be treated to the quality required by the potential users, these being either potable water users, industrial water users, or eventual release to the rivers.

8. Which towns/industries will use the treated water?

The Feasibility Study recommends that it be mostly utilized in the Vaal River water supply area. It is possible that it can be supplied to either domestic or industrial users or both.

9. Are any high-rise buildings (or buildings with deep basements) in Johannesburg under threat because of AMD?

The Johannesburg Central Business District (CBD) is in the Central Basin and the decant level in the Central Basin is well below the lowest foundations of the buildings that were reportedly considered by the press to be a high risk.

If the water level is maintained at the Environmental Critical Level (ECL), the level will be even lower than the expected decant level.

10. What is the Environmental Critical Level (ECL)?

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.

11. What is the Socio-Economic Critical Level (SECL)?

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.

12. Is there a difference in the Central Basin between the ECL and the SECL?

Yes, the ECL is the level that is required to protect the environment, including shallow aquifers and that is estimated to be safe and should not be breached. The level that is required to protect the Gold Reef City museum (at the current position on level 5) can be considered as the SECL and is lower than the ECL.

13. How will the ECL be implemented in the Western Basin?

In the Western Basin the water is at the surface, and actions are being implemented to lower the water level until it reaches the proposed ECL at 1 600 m amsl. During this process, continued monitoring will be required in order to ensure that the associated dolomitic aquifers are suitably protected. If this is not the case, the water level will be lowered further.

14. How will the ECL be implemented in the Eastern Basin?

In the Eastern Basin, the LTS proposes a higher ECL than the Short-Term Intervention (STI). The way to implement this is to stop the water conservatively at the lower level and monitor to determine if pollution occurs. If it is found that the situation has stabilised without any pollution the underground mine water, the level can be allowed to rise gradually to a next increment whilst monitoring. In this stepwise way the "highest" level where it can be considered as "safe" can be determined and considered as the designated ECL.

15. Is it possible to work towards a solution if the water quality and volume in the basins are unknown or uncertain?

With future pumping and monitoring the understanding of the dynamics of the water flow, quality and quantity in the mine voids, etc. will be enhanced and will it be possible to improve on the management of the system.

16. What are the volumes of AMD that need to be treated?

The treatment of AMD by the High Density Sludge (HDS) process results in neutralised water which would then need to be desalinated. It is expected that the long term average volume of water to be pumped and treated is as follows:

Western Basin – 23 Mℓ/24h

Central Basin – 46 M ℓ/24h

Eastern Basin – 80 M ℓ/24h

17. Will the pumps be underground multi-stage dry pumps or submersible multi-stage pumps?

They will be submersible multi-stage pumps.

18. Is ingress management and control part of the LTS?

Studying or planning control of ingress from surface sources is not part of the Feasibility Study. It is an on-going separate project by the Department of Mineral Resources (DMR), driven by the Council of Geoscience (CGS). The LTS Feasibility Study is looking at how much the volumes could be reduced if ingress is managed and the potential cost benefit. The study looks at the effect of ingress prevention and makes predictions of prevention percentages and the effect on the LTS and design sizes. The Mine Voids Report, which is available on the DWA website, will provide related information.

19. Where will the treated water be pumped to and will it be desalinated?

In the STI the water from the underground mine voids will be pumped to the HDS plants at the surface where it will be neutralised and the metals will be removed before releasing it to streams. For the LTS it will be treated through neutralisation, metal removal and desalination for distribution to users. It is important to neutralise the water where it is pumped as there is a high risk associated with pumping or to transport acidic water over long distances. Alternative points for discharge or use of the desalinated water are possible.

20. Where will the water in the Western Basin be treated and where will the neutralised water be discharged to?

The STI works that are currently implemented and partly operational will neutralise the AMD and remove metals. The partially treated AMD (still containing elevated sulphate levels) will flow into the Tweelopies Spruit until the implementation of the LTS. Two treatment "trains" are being upgraded at the existing Rand Uranium treatment plant to treat the water.

21. When can the long-term solution be expected to be implemented?

Certain implementation actions can already start and from the LTS proposed program it is clear that desalination works can possibly be operational within 4 years. It is slightly different for the different basins.

22. Who will be responsible for implementing the solution?

Government has mandated DWA for implementing the solution as well as for operating and maintaining the works. DWA might contract the implementation of the solution to a third party, but will hold ultimate responsibility.

23. Who will operate and maintain the works?

The DWA takes ultimate responsibility for it and will decide if they need an agent such as the Trans-Caledon Tunnel Authority (TCTA), Rand Water or a private institution to run it.

24. Who will pay for the capital, and operation and maintenance cost of the Long-term Solution?

The Government will take responsibility to ensure that funds are available for the establishment of the works and construction contracts. Some of the mines have contributed land, infrastructure (such a pumps), mine shafts for pumping purposes, etc., while funds will be sourced from the normal Government sources such as the budget, loans etc. for the LTS. The funding of the works should not be misconstrued with cost recovery.

25. How will the cost of the AMD works be recovered

The Department supports the polluter pays principle, i.e. the polluter contributes to the costs for the remedial action taken. Apart from the contributions by the polluter, there are other revenue streams that can also be considered, such as that the water users pay. Water users in the Vaal River System will benefit in two ways, i.e. the treated AMD can be supplied for use and it will also limit the need for dilution releases from the Vaal Dam, which will defer the need to implement other water augmentation schemes. In addition, there may be other beneficiaries (e.g. existing and/ or future underground mining) who may require a static water level in the mine void that is kept below the Environmental Critical Level who will need to contribute. The sources for cost recovery must still be confirmed by the DWA.

26. Will the Polluter Pays Principle apply?

DWA does support the Polluter Pays Principle. It is difficult to commit to a timeline at this stage, but the Polluter Pays Principle will be applied. Government needs to engage with the mining industry soon about various aspects, e.g. access to land and infrastructure and partnering options etc. The apportionment of liability issue is sensitive. The study report on the apportionment of liability will inform DWA's legal strategy and will thus be a confidential document until such time that the necessary negotiations/ actions have taken place. The DWA is to engage with the DMR on the subject in due course.

27. How will the costs of desalinating water for discharge into the Vaal River ultimately impact on the cost of water to the Vaal River users and agricultural sector?

The operational cost of the infrastructure for desalination is very high. How the cost will be recovered and from whom has not yet been decided. The cost of water to the users of raw water is determined in terms of the Departmental pricing strategy. The polluter pays as well as the user pays principles will be guiding principles in this discussion.

28. Were passive treatment technologies considered for the treatment of AMD? What will happen to the STI infrastructure if an alternative option is decided upon? Will this not constitute wastage of taxpayers' money?

All the options mentioned require the water to be neutralised. If a technology for desalination that does not require any neutralisation can be proven, the HDS infrastructure may then become redundant. The operational costs for the treatment of AMD by means of the HDS process and reverse osmosis will be high in comparison to the capital expenditure (indications are that for approximately every 8 years, the operational costs may be equivalent to the capital cost). The LTS looks at the solution for the next 100 years or more and it would thus be in society's interest to come up with cheaper technologies. Hence, the cost spent now on some infrastructure that may become redundant in future can be justified.

29. What is neutralisation?

Neutralisation is a chemical reaction in which an acid and a base interact with the formation of a salt. In this circumstance the acidity of the water is being reduced by dosing with alkaline substances such as lime to increase the pH and precipitate out metals such as Iron to form salts.

30. What is desalination?

Desalination is a process where the salts causing the increase in salinity of water are removed from the water. This can be achieved by chemical, physical or biological processes. Chemical processes entail chemical precipitation of certain elements in the water. Physical processes entail processes such as Reverse Osmosis (RO), where water is pressed through a membrane that retains the salts. Biological processes entail the biological reduction of substances such as sulphates by biological processes. These substances can then be precipitated in a chemical process.

31. What is the recommended treatment process?

The Study recommends a reference solution based on proven Ion Exchange for the removal of Uranium, HDS technology for neutralisation and metal removal and Reverse Osmosis for desalination. During the tender phase the private sector could come with alternate proposals if it can perform the same function and be more cost effective.

32. What waste will be generated and how will it be managed?

The Feasibility Study endeavoured to obtain a holistic solution that will limit the waste products generated by the processes. The reference project will produce sludge from the HDS and RO process that will be disposed of at a Sludge Storage Facility and brine that will be disposed of in an evaporation facility.

Although uncertain at this stage it is envisaged that through subsequent technology development and implementation, the waste products should be in a state where it could be re-used, and if that is not possible, then it needs to be disposed of in a safe manner.

Uranium will either be dealt with as hazardous waste, or it can be sold, if commercially viable.

33. Will hazardous waste be generated from the treatment process?

There are toxic and hazardous substances in the AMD. The treatment processes will concentrate these, and therefore the treatment, possible re-use and disposal of the waste products will take this aspect into account to ensure that the waste handling is conducted in a safe manner.

34. How will the Uranium be managed?

The first step in the handling of the Uranium is to quantify the problem i.e. establish the state and the volumes of the Uranium. All waste products will then be analysed to determine the Uranium content, where after the safe disposal methods and the fate of the Uranium will be established.

35. Will stakeholder inputs be included in the Long-Term Solution Feasibility study?

The Feasibility Study is a planning study to consider all options for the Long-Term Solution, and the communication efforts for this study will be conducted from this perspective.

The inputs from stakeholders will be important in the study. As such, focussed consultation with key stakeholders and stakeholder sectors/ groups will be undertaken to assist in identifying sustainable solutions, technical options, management scenarios, etc. at technical workshops, focus group meetings, one-on-one meetings and presentations to existing forums.

The wider stakeholder group will be kept informed of progress and key outcomes of the study through newsletters and press releases distributed at milestones in the study. Information will be distributed electronically to representatives of sectors of society/ stakeholder groups, through the media and on the DWA website.

Stakeholder issues and comments will be picked up in a Frequently Asked Questions (FAQs) document, which will be updated at intervals during the study when new information becomes available.

Public participation is to commence as part of the anticipated EIA process for the LTS.

36. Who is a key stakeholder?

Key stakeholders are parties whose input is critical to the success of the study and who are able to provide insights that can assist in directing the study and its outcomes (for example: representatives of National, Provincial and Local Government, various Non-Governmental Organisations (NGOs), organised business, mining, industry, labour, agriculture, water utilities, community leaders, academics etc.).

37. Was the business sector represented on the Study Stakeholder Committee (SCC)?

Yes, the National Economic Development and Labour Council (NEDLAC), which represents organised business, and organised agriculture were part of the key stakeholders represented on the SSC. Other sectors of business were also involved in focus group meetings, etc.

38. What provision will be made for the remediation of the receptor dams (e.g. Robinson Lake, Hippo Dam, and Aviary Dam), Tweelopies Spruit east and eco-systems in the Western Basin?

Diffuse pollution sources, remediation of affected dams, river systems, soil, etc. and compensation for affected parties falls outside the mandate of the LTS Feasibility Study. Recommendations for rehabilitation are however provided in the Implementation Strategy and Action Plan (Study Report 9). Government (including Departments other than Water Affairs) will have to consider this in future.

39. Will some of the reports always remain confidential? Tax payers are paying for the treatment of AMD, and have a right to information.

The Feasibility Study, being a planning study, did not allow for extensive public participation. Instead, key stakeholders were consulted as the Feasibility Study progressed, while information was made available to the public through newsletters and the AMD website. Wider public participation is foreseen during the

implementation stages, including the EIA. With this being said, it must be stressed that there are certain reports that cannot be made public until the appropriate implementation process stages have been reached.

The reports dealing with Liability matters will remain confidential until the objectives of the strategy to engage the mines, have been achieved. The other confidential reports are linked to the procurement process, which will be kept confidential until the procurement and tender process is concluded. The intention is not to keep reports confidential indefinitely.

Appendix T
Study Extension Letter

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

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Tel: 012 336 7500 / Fax: 012 323 4470 or 012 326 2715

Enquiries: J.J. van Wyk **Telephone**: 012 366 8407 **Reference**: 14/15/13/2

Dear Sir / Madam

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

Extension of Feasibility Study for completion on 31 July 2013

Please accept our sincere appreciation for your continued interest and participation in the Feasibility Study for a long-term solution to address Acid Mine Drainage (AMD) associated with the East, Central and West Rand underground mining basins in the Gauteng Province. Until now, various meetings have been held with key role-players, and comments and inputs were invited to inform the study. Many valuable inputs and sources of information were received, which will be considered during the continuation of the study.

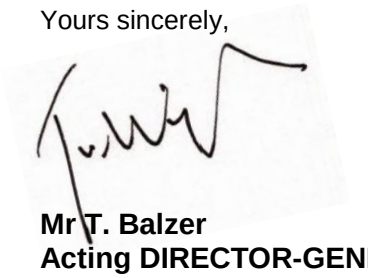
In terms of progress with the study: Phase 1 (study initiation phase) is completed, while Phase 2 (pre-feasibility phase) is in the process of being concluded. Phase 3 (feasibility phase) is the final phase of this study and has commenced.

Given the importance of this study, the Department of Water Affairs (DWA) has recognized the need to allow for some more information to become available, analyses to be completed and further reviews of the reports by the experts to be undertaken. This has necessitated an extension of the study contract. The Feasibility Study is due for completion on **31 July 2013** and will, thus, be conducted over an 18 month period.

For further information on the study deliverables and copies of the reports please access the DWA website at: http://www.dwa.gov.za/Projects/AMDFSLTS. The remaining study reports will be loaded onto the DWA website as they become available towards the end of the study.

We thank you for your participation.

Yours sincerely,



Mr T. Balzer
Acting DIRECTOR-GENERAL

Letter signed by: J.J. van Wyk
Designation: Study Manager
Date: 9 April2013