

ALIGNING ENVIRONMENTAL AND REGULATORY PROCEDURES WITH A HOLISTIC PROJECT MANAGEMENT APPROACH FOR RESIDUE DEPOSITS

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ABSTRACT

To avoid the manifestation of undue risks and ensure the optimization of resource exploitation, owners of mines and practitioners of mine residue disposal must conduct disposal practices in accordance with fundamental safety and environmental objectives and principles as a set of performance criteria. Codes of practice recognise a number of minimum requirements, one of which is management practices within the constraints of the law. However, it has been noted that the current project management models for the development of a new residue deposit do not provide a holistic approach to integrate the requirements of the EIA legislation, mining regulations and others during the various project life cycle phases. The research subsequently set out to establish a project management protocol that addresses the short comings between the regulatory requirements and the project management models employed when developing a new residue deposit taking cognisance of client requirements and expectations during the various project life cycle phases. A theoretical model was developed and then verified through a case study approach. Project stakeholders of two separate cases in the South African mining sector were engaged to determine the practicality of the model. Modifications to the model are proposed and further recommendations are made to improve the model for the mining sector.

1 INTRODUCTION

Safe and environmentally responsible deposition of mining waste is a major concern in the mining industry worldwide. Mining operations that use flotation as the concentration method are especially important as the total mining residue corresponds to the total tonnage of treated mineral. In general, the recovered product represents a very small percentage of the total tonnage. For example, in the copper industry, 98% of the treated mineral will be disposed as waste together with a significant amount of water. Today, there are several such metal projects under study that consider production of more than 200 000 tonnes of minerals per day (Jewell & Barrera, 2005).

Conventional techniques for the transport, deposition and storage of mine residue are based on moving large volumes of very wet, low-density slurries. This approach uses large volumes of water and can have negative consequences in that much of the water is often lost during the operation. Another important issue associated with the storage of fluid residue are the environmental impacts associated with acid drainage and land sterilization. Therefore, the planning, design, implementation, operation and closure of mine residue deposits should be conducted in such a manner to minimise the potential environmental impacts associated with

this mining activity. Failure to accept the responsibility can lead to risks and costs to society that diminish or even exceed the benefits of the original exploitation of the resource (SABS, 1998).

1.1 Legislative responses in South Africa

The advent of a democratic South Africa has brought about the promulgation of new environmental legislation. This was necessary to give legal effect to the principles of sustainability as laid down in the new Constitution of South Africa (Act No 108 of 1996). As a result the National Environmental Management Act, No 107 of 1998 (NEMA) and the National Water Act, No 36 of 1998 (NWA) were promulgated in 1998, and the Mineral and Petroleum Resources Development Act, No 28 of 2002 (MPRDA), dealing with mining activities, was promulgated in 2004. Mining activities is one of the listed activities that should be regulated to give effect to the environmental rights provided in the South African Constitution. Often project delays can be ascribed to non-conformance to the legal and regulatory processes, because:

- The South African EIA legislative process that is applicable to mine residue deposition does not focus on project management procedures, project implementation practices, and associated timeframes;
- There is a lack of understanding the interrelationships between the different regulations and inter alia the involvement of the different governmental departments; and
- The timeframe required to obtain a positive Record of Decision are not considered.

As a result of the new legislation and applicable regulations, a range of applications have to be prepared and submitted to different governmental organisations prior to implementing a new residue deposit. The planning and implementation strategy for a new mine residue deposit has to take cognisance of the time constraints placed on the implementation timeframe as a result of the new permitting procedures. The applications that have to be submitted to the different government departments to implement a new residue deposit include, amongst others:

- An Environmental Management Programme (EMP), submitted to the Department of Mineral and Energy Affairs (DME);
- Environmental Impact Assessments (EIA), through formal application processes of the Department of Environmental Affairs and Tourism (DEAT);
- Water use licence applications (WULA) through the Department of Water Affairs and Forestry (DWAF); and
- A dam safety licence application with the Department of Water Affairs and Forestry (DWAF) that is dependant on the specific employed construction method.

One of the challenges for the project manager responsible for implementing a new mine residue deposit today, is to align the various application processes with the various project lifecycle phases for mine residue deposits, and the requirements of the SABS Code of Practice (1998), to optimise the overall implementation process.

1.2 Objectives of the research

This study was subsequently conducted to:

- Develop a proper understanding of the environmental and mining legislation and regulations applicable to the development of mine residue deposits; and
- Establish an integrated project management model or protocol to integrate the technical, legal and regulatory, environmental and mining company requirements for the various project lifecycles into one model, taking cognisance of the interdependencies between the applicable legislation and the technical process and the boundary conditions that can be applicable.

2 MODEL DEVELOPMENT

2.1 Defining lifecycle phases

The lifecycle phases for a mine residue deposit as defined by the SABS Code of Practice (1998), the key phases of the various application processes as specified by the applicable regulations, and the requirements of mining companies are illustrated in Figure 1.

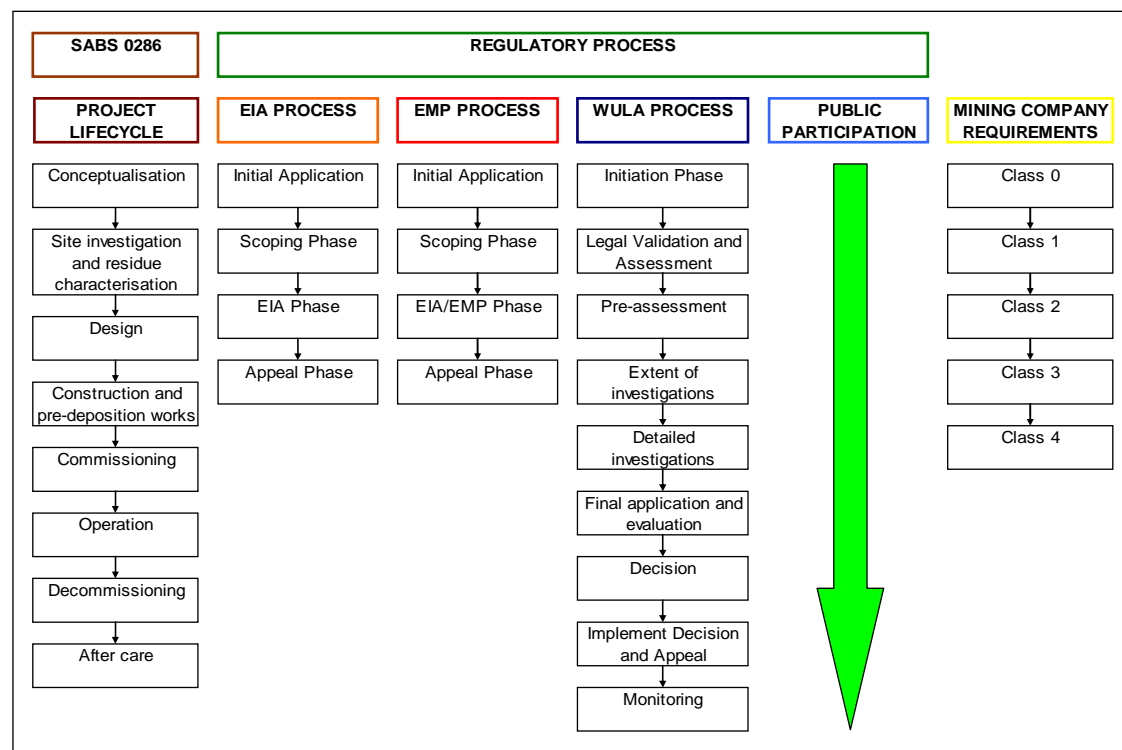


Figure 1. Project lifecycle phases of various processes applicable to residue deposits

During each of the project lifecycle phases of a residue deposit as well as the various phases of the regulatory processes shown in Figure 1 there are key milestones that have to be met before the next phase can be executed. The study aimed to determine the interdependencies between the various phases of a mine residue deposit and that of the various permitting application processes presented in Figure 1.

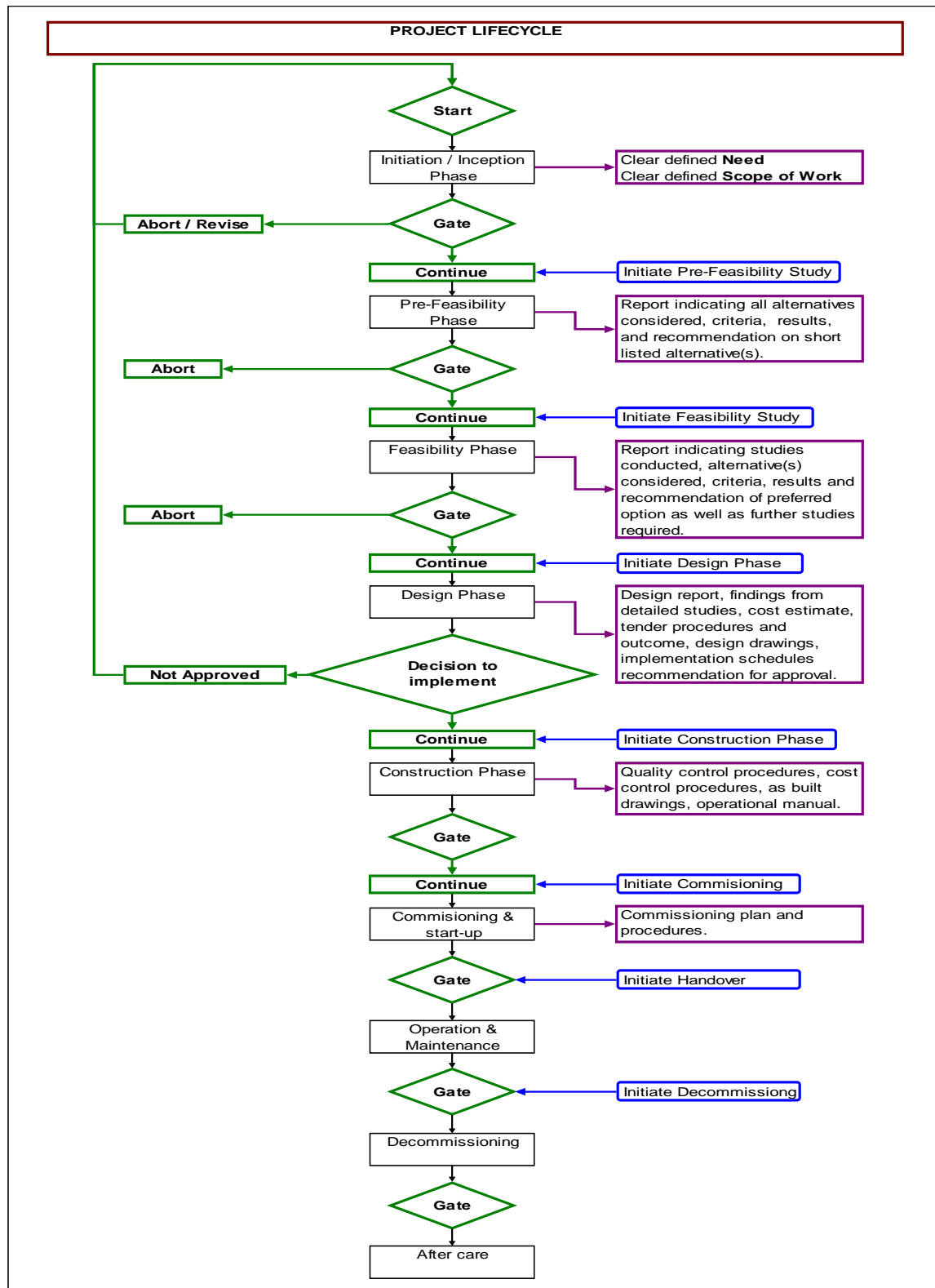


Figure 2. Proposed project lifecycle for a mine residue deposit with gates

To achieve this, the concept of gates was applied to the lifecycle phases of a mine residue deposit and the various phases of the permitting application processes. The gates represent key milestone points that have to be achieved before the next phase can commence (Petrick & Brent, 2005).

A flow sheet was prepared for the lifecycle of a residue deposit as well as each of the permitting processes, distinguishing between the various phases, highlighting key milestones and showing key deliverables of each phase. The flow sheet developed for the lifecycle phases of a mine residue deposit is shown in Figure 2. The figure shows that up until the point that the decision is made to implement the project, the option exists to abort the project. During each of the initial phases the risks associated with the project is better defined, quantified and the feasibility confirmed. The key factors that influence the feasibility of a project can be categorised in the following categories:

- Technical aspects;
- Financial considerations; and
- Social or environmental factors.

The aim of the initial phases is to ensure that the best balance is reached between the technical, financial and social or environmental aspects before the decision is made to implement the mine residue deposit. To achieve this, it is necessary to consider the legislation and regulations applicable to mine residue deposits.

2.2 Applicable legislation

Table 1 provides a summary of the legal and regulatory documents considered during the study. It must be noted that it is not a comprehensive list and other legislation, which apply either directly or indirectly to mine residue deposits, are listed in section 2.2.4.

The following sections provide an overview of the key legal and regulatory aspects applicable to mine residue deposits. These aspects include:

- A narrative of the most applicable sections in the legislation applicable to the study;
- Applicable timeframes within which the applicant and regulator have to respond;
- Requirements of each of the application processes; and
- Connections between the various legislation and regulations as regulated by the various Governmental departments.

2.2.1 Department of Environmental Affairs and Tourism (DEAT)

2.2.1.1 National Environmental Management Act (NEMA)

NEMA was promulgated in 1998 came into operation at the beginning of 1999. It applies throughout the country, and must be complied with in all actions of all organs of state. The aim of the NEMA is “*to provide for co-operative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; and to provide for matters connected therewith*”. It can be

described as South Africa’s “primary” or “parent” environmental statute and guides decision-making in all South African legislation concerned with the environment (DWAF, 2000).

Table 1. Applicable legal and regulating documents considered

Acts	Regulations / Guideline Documents
National	
Constitution of South Africa (Act No 108 of 1996)	
Department of Environmental Affairs and Tourism (DEAT)	
Environmental Conservation Act, No 73 of 1989 (ECA)	Government Notice No. 1986 of 24 August 1990
National Environmental Management Act, No 107 of 1998 (NEMA)	<ul style="list-style-type: none"> • Government Notice No. R385 of 21 April 2006 • Government Notice No. R386 of 21 April 2006 • Government Notice No. R387 of 21 April 2006 EIA Regulations, 2005, Integrated Environmental Management Guideline Series <ul style="list-style-type: none"> • Guideline 3 – General Guide to the EIA Regulations • Guideline 4 – Public Participation • Guideline 5 – Assessment of alternatives and impacts • Guideline 6 – Environmental management frameworks
Department of Mineral and Energy Affairs (DME)	
Minerals Act (Act 50 of 1991) (MA)	<ul style="list-style-type: none"> • Aide-Memoire for the preparation of Environmental Management Programme Reports (EMPRs) for Prospecting and Mining
Mineral and Petroleum Resources Development Act, No 28 of 2002 (MPRDA)	<ul style="list-style-type: none"> • Government Notice No. R527 of 23 April 2004 • Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine
Department of Water Affairs and Forestry (DWAF)	
Water Act, No 54 of 1956	<ul style="list-style-type: none"> • Government Notice No. R287 of 20 February 1976
National Water Act, No 36 of 1998 (NWA)	<ul style="list-style-type: none"> • Government Notice No. 704 of 4 June 1999 • Government Notice No R1560 of 25 July 1986 • Water use authorisation process for individual applications – Edition 1, Revision 3 (December 2000) • M Series Guideline Documents

2.2.1.2 Environmental management regulations

Prior to the promulgation of NEMA in 1998, Environmental Impact Assessment (EIA) regulations were promulgated in 1997 in terms of the Environmental Conservation Act, 1989 (Act No. 73 of 1989). Before the EIA legislation became law in 1997, application of the EIA principles in terms of ECA were voluntary.

A review of the EIA legislation in terms of ECA commenced in 2000 because inadequacies were identified. These inadequacies included:

- A wide interpretation of listed activities resulted in an inconsistent application by the authorities;
- To many small scale or insignificant activities were made subject to an EIA;
- The EIA process were lengthy and inflexible, with too many “authority stops” or “decision points”;
- Inadequate provisions were made for public consultation;
- The EIA process was not supported by strategic planning tools; and
- Enforcement measures were generally weak.

After the review process, the Minister of Environmental Affairs and Tourism passed new environmental management regulations (R385) in terms of Chapter 5 of the NEMA on 21 April 2006. These new regulations replaced the EIA regulations promulgated in 1997.

The NEMA EIA regulations came into effect on 1 July 2006 for all listed activities (in terms of R386 and R387) except for those related to mining permits, which will come into effect on 1 April 2007. The NEMA EIA regulations distinguish between a basic assessment and a thorough (both scoping and environmental impact assessment phases required) EIA process. A thorough EIA process is required for the implementation of a mine residue deposit in terms of the new regulations because of the potential impact on the environment.

Figure 3 illustrates the flow sheet developed for the EIA process applicable to mine residue deposits with gates between the various phases of the process. The key milestones or deliverable is also shown in the flow sheet.

The NEMA EIA regulations prescribe timeframes within which the EIA process should be completed. Table 2 below summarise the steps for a thorough EIA process as prescribed by the NEMA EIA regulations and shows the timeframes applicable to each step. The timeframes described in Table 2 were used during the study to determine the timeframe requirements to implement a mine residue deposit. It should be noted that these timeframes represent the maximum duration applicable to each of the activities listed. The extend to which these timeframes can be reduced can not be evaluated; there are no case studies to assess the effectiveness of the new regulations.

2.2.2 Department of Minerals and Energy (DME)

2.2.2.1 Mineral and Petroleum Resources Development Act (MPRDA)

Section 5(4) of the MPRDA stipulates that no person may prospect for or remove, mine, conduct technical or reconnaissance operations, explore for and produce any mineral or petroleum or commence with work incidental thereto (including the construction of any residue deposits) on any area without inter alia an approved environmental management programme or approved environmental management plan, as the case may be.

Table 3 indicate the requirements (environmental management programme or plan) for the different mining applications.

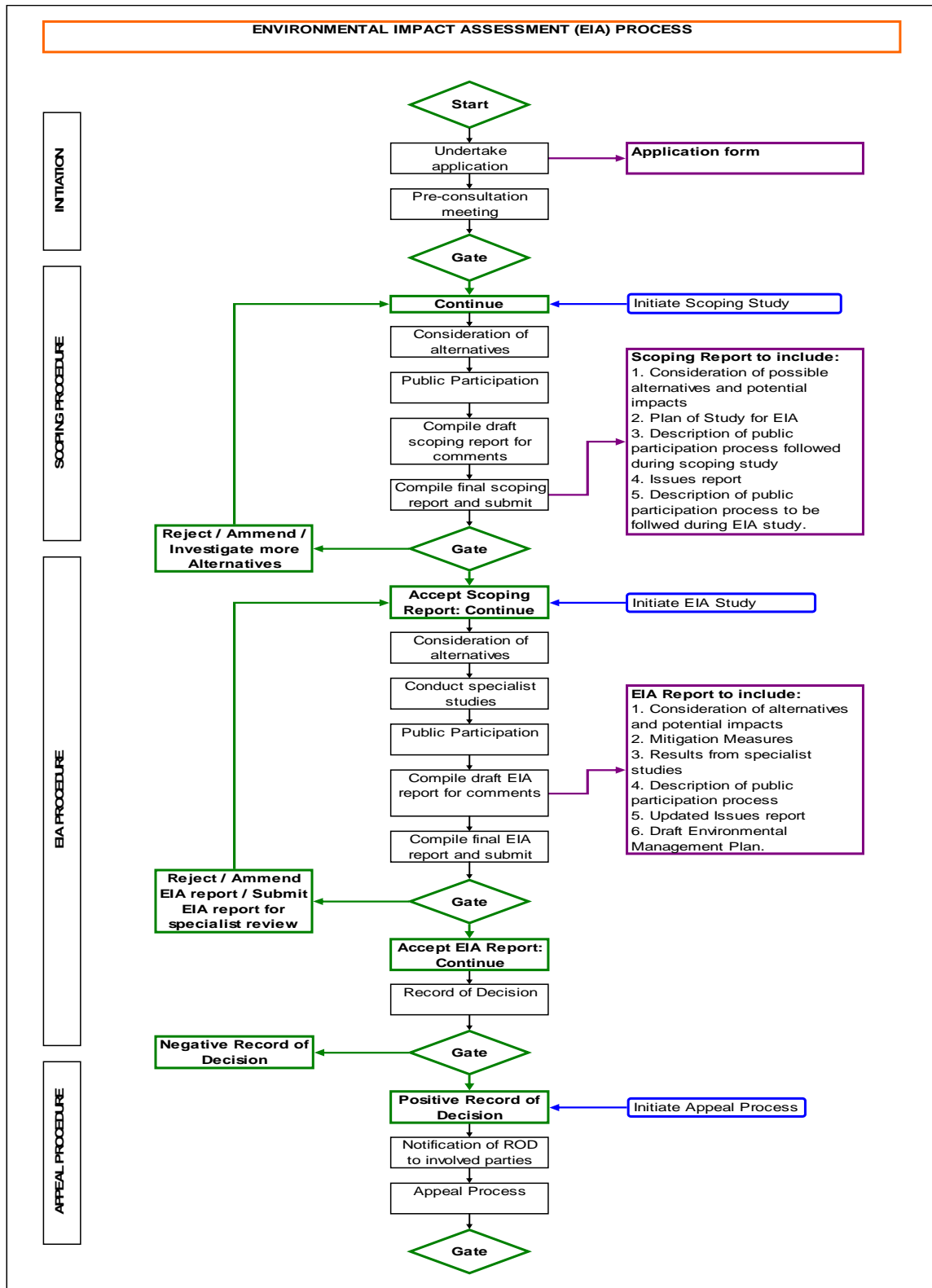


Figure 3. Flow sheet for a thorough EIA process with gates

Table 2. Timeframes for EIA process as prescribes by NEMA EIA legislation

Step	Action	Who	Timeframe
1	Submit application form and relevant prescribed documents to the authority	Applicant / Consultant	Not prescribed
2	After submission of Application form, conduct basic public participation and compile Scoping Report & Plan of study for EIA	Consultant	Not prescribed
3	Submit Scoping Report and plan of study for EIA to relevant authority	Consultant	Not prescribed
4(a)	Consider Scoping Report and notify applicant of required amendments (or 4(b))	Authority	30 days from receipt
4(b)	Consider and accept Scoping Report and POS for EIA (or revised scoping report/ POS if 4(a) is relevant)	Authority	30 days from receipt of accepted reports
5	Conduct EIA in line with approved POS and compile EIA Report and draft EMP. Submit reports to authority for consideration	Applicant / Consultant	Not prescribed
6	Consideration of reports followed and either accept it (see 7(a)) or refer parts of it for specialist review (see 7(b) and (c)) – notify applicant of outcome	Authority	60 days from receipt
7(a)	Issue decision with conditions and notification of appeal provisions or 7(b)	Authority	45 days from acceptance notice
7(b)	Specialists conduct reviews of reports and submit review reports to authority	Specialist	Not specified
7(c)	If 7(b) applies, issue decision with conditions and notification of appeal provisions	Authority	Within 45 days of receipt of specialist reviews
8	Notify interested and affected parties of decision and appeal provisions	Applicant / Consultant	Within 5 days of decision
9	If applicable, consider and respond to appeals received	Minister / MEC	Up to 90 days

Table 3. Environmental management requirements applicable to the different mining applications

Type of application	Requirements with regards to environmental management programme or environmental management plan
Prospecting rights	Environmental management plan
Mining rights	Conduct an environmental impact assessment and submit an environmental management programme
Mining Permits	Environmental management plan

Section 37 requires that the principles set out in section 2 of NEMA must apply to the prospecting and mining operations, and that the generally accepted principles of sustainable development must be applied by integrating social, economic and environmental factors during the planning and implementation phases of mining projects.

2.2.2.2 Mineral and Petroleum Resources Development regulations

Government Notice No. R527 (R527), dealing with the mineral and petroleum resources development regulations, was published in the Government Gazette of 23 April 2004.

In terms of regulation 48, an environmental impact assessment contemplated in section 39(1) of the MPRDA is a process which results in the compilation of a:

- Scoping report, the contents of which is described in regulation 49; and
- Environmental impact assessment report, the contents of which are described in regulation 50.

The contents of an environmental management programme or report, whichever is applicable (see Table 3), is described in regulations 51 and 52 respectively, while the requirements for monitoring performance assessments of these programmes/plans are described in detail in regulation 55.

The methods and quantum of financial provision for the rehabilitation, management and remediation of negative environmental impacts (including those associated with mine residue deposits) are given in regulations 53 and 54.

It is important to note although the same phases, i.e. scoping and environmental impact assessment, are required in terms of regulations R385 (NEMA EIA) and R527 (MPRDA), two separate submissions are required. An environmental practitioner can request the two regulators concerned to submit the same reports (scoping and EIA / EMP) for both applications.

The flow sheet for the EMP process discussed above is not included due to the similarities between the EMP and EIA process flow sheets (see Figure 3). The only difference between the two flow sheets is a slight difference in scoping and EIA / EMP report contents and the fact that the DME has to consult with other state departments that administers any law relating to matters affecting the environment.

2.2.3 Department of Water Affairs and Forestry (DWAF)

2.2.4 National Water Act (NWA)

In terms of section 4 of the NWA, water may only be used if it is a Schedule 1 use, a continuance of an existing lawful use (ELU), or authorised in terms of a general authorisation (GA) or licence. A water use may therefore not be implemented unless it is properly authorised under one of these types of authorisations.

The NWA provides for tiered regulatory control over 11 water uses as identified in Section 21 of the NWA. The disposing of waste in a manner which may detrimentally impact on a water resource is defined as a water use in section 21 (g) of the NWA. Waste includes any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted.

Any mine, who wishes to implement a new residue deposit, has to apply for a water use licence authorisation (WULA). It is important to note that a specific use of water could be regarded as being governed by more than one of the water uses listed.

A mine residue deposit is a typical example of such a water use. In this case either section 21 (b) (storing of water) and section 21 (g) (disposing of waste or water containing waste in a manner which may detrimentally impact on a water resource) could be applicable. When considering applying for a water use licence, the most appropriate applicable water use should be applied for.

2.2.4.1 Dam safety requirements

Chapter 12 of the NWA contains measures aimed at improving the safety of new and existing dams with a safety risk so as to reduce the potential for harm to the public, damage to property or to resource quality. A dam with a safety risk means any dam which contain more than 50 000 m³ of water (irrespective whether such water contains substances or not) and which has a wall of a vertical height of more than 5 meters.

Dam Safety Regulations published in Government Notice R1560 of 25 July 1986, which are still in force under the NWA, require that dams with a safety risk must be classified into categories, and that licences must be issued before any task relating to a specific category of dam may commence.

It is important to note that a dam safety licence is entirely different from a water use licence discussed above. A dam safety licence may under no circumstances be issued unless the associated water use licence had been issued.

The implementation of a new mine residue deposit (more often then not) include a return water dam for the storage of water harvested from the surface of the residue deposit for re-use in the process plant. The same licence (water use licence and dam safety licence) application procedures will apply to the return water dam.

It is clear that a number of applications have to be lodged at the DWAF before implementation of the residue and related structures can commence.

2.2.4.2 Water Use Regulations

The first regulations aimed at prevention of water pollution resulting from mining and related activities were published in Government Notice No. R287 of 20 February 1976 (R287) in terms of section 26 of the Water Act, 1956 (Act 54 of 1956).

A review of R287 was initiated in May 1995 through a press release following the Merriespruit slimes dam disaster in February 1994. In this press release, which concerned the improvement of tailings dam safety, the Minister suggested that the DWAF review R287 in co-operation with all interested and affected parties. The Merriespruit disaster caused both loss of life and water pollution. However, DWAF decided to only address water pollution

aspects as the DME undertook to develop regulations addressing safety aspects at residue deposits.

Government Notice No. 704 (GN704), regulations on use of water for the mining and related activities aimed at the protection of water resources, was promulgated in terms of section 26 of the NWA on 4 June 1999.

Regulation GN704 deals inter alia with the following:

- Information and notification to the DWAF before the commencement of a new mine or activity (including mine residue deposits);
- Restrictions on mine residue deposit locality;
- Restrictions on the use of residue, which may cause pollution of a water resource, for the construction of any dam, roads, railways or other purpose;
- Protection of water resources;
- Security and fencing off of impoundment; and
- Temporary or permanent cessation of a mine or activity, etc.

The requirements of Regulation GN704 are important when considering alternative sites for the positioning and designing of the residue deposit.

The flow sheet developed for the WULA process as explained by DWAF (2000) is described in detail elsewhere (Snyman, 2006) (see the Appendix). The DWAF document also provides estimated timeframe requirements for the WULA process, which were used to develop the timeframe requirements to implement a mine residue deposit. It should be noted that the timeframes listed for the various activities are estimates only and are not prescribed in the legislation.

2.2.5 Other applicable legislation

Other legislation which might be applicable to one or more of the lifecycle phases of a mine residue deposit are the:

- Mine Health and Safety Act, 1996 (Act 29 of 1996);
- Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965); and
- National Heritage Resources Act, 1999 (Act 25 of 1999).

2.3 Boundary conditions

According to Nicholas (2001) one of the characteristics of a project is that it is a temporary activity and is undertaken to accomplish a goal within a given period of time. As a first step in developing the integrated project management model the boundary conditions has to be defined. The boundary conditions include:

- The existence of a need; and
- The “decision making milestone” or funding approved gate highlighting the requirements that have to be met before the decision to implement can be made.

These two conditions were included as gates in the lifecycle flow sheet for a mine residue deposit (see Figure 2).

The definition of the need and decision making milestone is shown as the initiation phase of the project. The need should define the requirements of the client and consist of a well defined scope of work including the requirements pertaining to implementation timeframes. The decision making milestone is the point where funding approval will be requested. Mining companies normally require a certain level of accuracy at this point and the design should have progressed to an advanced phase. Within these two boundaries the pre-implementation phases should be defined. An important aspect to be included as part of the decision making milestone (and to be addressed during the initiation phase) is the progress of the permitting processes. In other words can funding be requested before a positive record of decision has been obtained from the regulators? The answer to this question will inter alia be determined by the timeframe constraints applicable to the project.

2.4 Pre-implementation phases

Once the boundary conditions have been established, the scope of work finalised, and the timeframes considered, the number of pre-implementation phases can be determined. Factors that should be considered to determine the number of phases are:

- The complexity of the project and site conditions;
- The requirements pertaining to the decision making milestone, especially the status of the permitting processes;
- The number of alternatives that will be considered;
- Extension of an existing or new mine; and
- Timeframe constraints.

Figure 2 shows three pre-implementation phases; namely the:

- Pre-feasibility phase;
- Feasibility phase; and
- Design phase.

These phases can be aligned with the conceptualisation, site investigation and residue characterisation and design phases of the SABS Code of Practice (1998) (see Figure 1). The simplified alignment shown in Table 4 below was considered as point of departure to align the technical and regulatory processes.

Table 4. Alignment of processes

Technical	EIA Process	EMP Process	WULA Process
Pre-feasibility phase	Initial application	Initial application	Initiation / Legal validation and pre-assessment
	Scoping phase	Scoping phase	Extend of investigations
Feasibility phase	EIA phase	EIA phase	Detailed investigations:
Design phase	Final submission	Final submission	Final application and evaluation
Construction	Decision	Decision	Decision

2.4.1 Pre-feasibility phase

The purpose of the pre-feasibility phase is to develop and consider alternative concepts. Factors that should be considered to determine the alternatives are:

- Residue preparation technologies;
- Deposition strategies and construction methods; and
- Alternative sites.

The SABS Code of Practice (1998) highlights the importance of this initial phase by indicating that frank consideration of alternatives is central to an optimisation process. Conceptualisation and planning of residue disposal facilities provide an opportunity to consider a wide range of options before a commitment is made to follow a particular option.

The pre-feasibility phase can be conducted in one or subdivided into more phases. The purpose of subdividing the pre-feasibility phase is to conduct a first order analysis to eliminate fatally flawed alternatives. This is especially useful if a large number of alternatives are considered. The outcome of the pre-feasibility phase should be a report highlighting the following:

- Alternatives considered;
- Selection criteria used to eliminate alternatives based on technical, financial, and social or environmental factors;
- Preferred feasible concepts that will be considered during the feasibility phase; and
- Specialist studies that should be conducted as part of the feasibility phase.

It was indicated in Table 4, the scoping phases (EIA and EMP) and extend of investigations phase (WULA) should be aligned with the pre-feasibility phase. It would be ideal to use the output from the pre-feasibility study as input to initiate the regulatory processes. However, the regulatory processes are on the critical path of the project and should be initiated once sufficient information is available during the pre-feasibility phase. This is typically the point where all the alternatives have been defined and the results from a first order fatal flaw analysis are available.

2.4.2 Feasibility phase

Once the preferred feasible concepts have been selected, site investigations and residue characterisation should be conducted to narrow down the feasible concepts to one optimised alternative. The SABS Code of Practice (1998) indicates that the investigations should include:

- Geotechnical investigations;
- Ground water and surface water studies; and
- Environmental baseline.

The planning of the site investigations should be aligned in such a way that it compliments both the technical and regulatory processes. For example the ground water and surface water studies should be expanded if necessary to cover the requirements of the WULA process. The SABS Code of Practice (1998) indicates that all investigations should be integrated and take cognisance of the scope and results of all other investigations. The planning of the

investigation should be based on well-developed design concepts, to ensure cost and technical efficiency. The minimum requirements applicable to the ground water investigations and residue characterisation phase are summarised in Table 5.

Table 5. Investigations and minimum requirements

Investigation	Minimum Requirements
Ground Water Investigation	<ul style="list-style-type: none"> • Potential rate of seepage; • Quality of such seepage; • Geohydrological properties of the strata within the zone that could be affected by the quality of the seepage; and • Vulnerability of existing and potential use of the groundwater resource within the zone that could potentially be affected by the residue facility
Residue characterisation	<ul style="list-style-type: none"> • Engineering properties • Geochemical properties – This needs to be established for all classes of deposits to assess: <ul style="list-style-type: none"> • The probable quality of leachate and return water in the case of hydraulically placed disposal facilities; • The potential for scaling, sedimentation or clogging of components within the disposal facility; and • Combustibility, including the potential for spontaneous combustion.

The minimum requirements listed in Table 5 are important aspects that will be required as part of the WULA process.

The outcome of the feasibility phase should be a report highlighting the following:

- The nature, character, total volume and mass, rate of production and source of the residue;
- The production process;
- The product life and assumptions regarding residue production over the full lifecycle;
- Closure provisions and intended final land use aims; and
- Alternatives considered in terms of:
 - Waste minimisation;
 - Amelioration and modification;
 - Disposal techniques;
 - Alternative disposal sites;
 - Risk; and
 - Economics.

The quantum provisions required for closure is an important aspect that should be considered during the feasibility phase as this is one of the aspects that should be addressed as part of the final EIA / EMP submission.

3 RESEARCH METHODOLOGY

An integrated project management protocol was developed to integrate the technical requirements and regulatory application process requirements into one consolidated model. This was done by considering the requirements of the SABS Code of Practice (1998) as well as the various environmental application processes applicable to mine residue deposits.

Flow sheets of the various processes were developed and consolidated into one to identify interdependencies between the various processes. The timeframe requirements prescribed by the new NEMA EIA regulations and the Mineral and Petroleum Resources Development Regulations were considered to compile an integrated project schedule to compliment the model containing the integrated flow sheets.

The model was tested against a case study to determine the following:

- Validity of the model and confirm the logic of process;
- Confirm and expand the interdependencies identified during the literature study as used in the model;
- Compare the timeframes of actual projects with that prescribed by the applicable regulatory processes; and
- Determine the need for an integrated model.

The focus group technique (Greenbaum, 1998) was used for the model evaluation. This was done by presenting the objectives of the study to project team members, explaining the concept model and comparing it with the case study.

4 RESULTS

The results of the focus group technique are summarised in Table 6. The following main observations were made:

- In terms of the new NEMA EIA regulations a thorough EIA process is required for the implementation of a new residue deposit and the timeframes listed in Table 2 apply.
- Various permit application processes are on the critical path of the project.
- The initiation of the various application processes should be such that the specialist studies required during the various phases comply with all the applicable regulatory processes simultaneously.
- The number of lifecycle phases during the pre-implementation phase should be determined based on the complexity of the project and site conditions.
- Various documents applicable to the implementation process of mine residue deposits have not kept up with the change in legal and regulatory requirements and reference defunct legislation. An example is Clause 5 of the SABS Code of Practice (1998), which describes the legal framework applicable to residue deposits.
- Mining companies should take cognisance of the time constraints as a result of the regulatory processes.
- A co-operative management style should be adopted with buy-in from all the authorities, the client, and the technical project executioners.

Table 1: Results of Focus Group Techniques Session

1	<p>Question: What criteria should be used to define the number of pre-implementation phases?</p> <p>Answer: The complexity of the project would determine to a large extent the number of phases.</p> <p>The timeframe available in which to conduct the study is important. A tight timeframe may necessitate eliminating one of the technical phases by combining it into one.</p> <p>The client’s risk profile should be considered to determine the number of phases.</p>
2	<p>Comment: Give an estimate of the duration of each of the phases provided on the flow sheets.</p>
3	<p>Question: What is your overall impression of the flow sheets? How can it be improved?</p> <p>Answers: A lot of information is shown and it takes a while to understand the flow sheet.</p> <p>Try to summarise the process flow sheets showing less information, i.e. role out the activities or provide a function to show more detail pertaining to the applicable phase.</p>
4	<p>Comment Ground water study durations can be significantly influenced by factors such as availability of drilling rigs, remoteness of the site, weather conditions, etc. Ample time should be allowed to conduct the study.</p> <p>Action: Adjust project schedule to reflect a realistic timeframe.</p>
5	<p>Question: Do you think this model would add value to a project? Motivate.</p> <p>Answer: Yes.</p> <p>The model assists project team members to understand the interdependencies between the various disciplines.</p> <p>It is proposed that the model be introduced at the early stages of the project to focus all the team members.</p> <p>The model can be used to track progress and provide a quick overall summary of the process.</p>
6	<p>Comment: The model should be used as a guideline and should not become a regulatory tool.</p>

5 CONCLUSIONS AND RECOMMENDATIONS

Due to uniqueness of projects of this nature, it is difficult, if not impossible, to develop a generic model applicable to all projects. However, with the necessary adjustments to address project specific requirements, the proposed model provides a starting point to develop a project management strategy that integrates technical, environmental regulations and client requirements. The limitations of the proposed model are:

- The model does not address the requirements of the new NEMA EIA regulations applicable to mining permits, as this will only come into effect on 1 April 2007. Adjustments to the model will be necessary to accommodate the requirements of the new regulations once promulgated.
- The case study used to evaluate the proposed model was conducted according to the requirements of the old EIA regulations, which did not prescribe maximum timeframes.
- The timeframes specified in the new NEMA EIA regulations were used to develop the project schedule. These timeframes constitutes the maximum period within which the process should be finalised, provided the application submission complies with the regulatory requirements.

It can be concluded that the project schedule is not an optimised timeframe with regards to the environmental regulatory process, but gives an indication of the maximum expected duration. Therefore, the study has shown that the various permit application processes are on the critical path of the project. Also, it should be noted that various documents applicable to the implementation process of mine residue deposits have not kept up with the change in legal and regulatory requirements and reference defunct legislation.

Mining companies should subsequently take cognisance of the time constrains associated with the regulatory authorisation processes and consider adjusting their class estimate documents to reflect the updated regulatory requirements. Effective planning is necessary to ensure a positive record of decision within a given period of time. To this end the proposed model provides a clear guidance to all parties (public and client) involved on the progress and the process, as well as clarity on the decision making sequence.

It is recommended that the model be evaluated in more detail once case studies are available that have been conducted based on the requirements of the new EIA regulations. Also, the integrated model may be overwhelming for all stakeholders and a simplified model should be introduced for information purposes.

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APPENDIX

