THE QUALITY OF ENVIRONMENTAL IMPACT REPORTS FOR EXPLOSIVE INDUSTRY PROJECTS IN SOUTH AFRICA

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ABSTRACT

Environmental Impact Assessment (EIA) is a process that seeks to reduce the negative environmental consequences of listed development activities, which could have a detrimental effect on the environment, in the advance of their implementation, and a requirement of legislation in South Africa. An important element of the systematic EIA process is the submission of an environmental impact or scoping report or an environmental impact report (EIR) to the relevant governmental department, interested and affected parties and/or specialist for review to determine the report's adequacy before a project can be authorised or if further information is required. The information made available in reports to decision-makers with regard to developments with the potential of affecting explosive projects, plays a significant role in the authorisation of the project after the authority review process, which is dependent on the quality of the report. In order to contribute more effectively to sustainable development, more attention must be placed on assessing the quality of EIA's as part of determining how effectively EIA has been functioning in South Africa; hence this study is aimed at assessing the quality of EIA assessment reports of four projects with the potential of impacting on explosive industry projects. The objectives of the study included the review by independent reviewers of the quality of four-selected impact reports using a checklist, analysis of the review process results and provision of recommendations to improve the quality of environmental impact reports for explosive projects.

Based on the review results it is concluded that the quality of the four reports were of an acceptable standard, although certain areas were found poorly performed i.e. improvement with regard to identification of key impacts and considerations of alternatives and mitigation as well as the control and treatment of waste. Otherwise the review method is fairly robust and consistent and therefore can be seen as a reliable indication of EIR quality.

The following was recommended to improve the quality of the reports for explosive projects:

- The use of a quality review checklist for explosive projects by EIA practitioners and authorities to be used as an additional tool to the EIA regulations (DEAT 2002) and the Integrated Environmental Management series (DEAT 2002) can further improve the quality of the EI reports for explosive projects.
- The use by EIA practitioners of an explosive review checklist will assist in ensuring that all key aspects are addressed before submission to relevant authorities, i.e. the report contains all pertinent information and is technically sound, the report is set-up clearly and coherently organized and presented so that it can be understood and that it has addressed all the key issues to make a decision about the proposed development. This will further assist in fast-tracking the approval process often delayed by the request of additional information from the applicant as a result of inadequate reports.
- Regular use of the review checklist by EIA practitioners and authorities for ascertaining the quality of the environmental impact reports will contribute to a baseline of EIR quality for evaluating EIA practice for explosive projects under the new regulations promulgated in June 2006.

Keywords: Environmental Impact Assessment, Environmental Impact Report, Quality Review Explosives

OPSOMMING

Omgewingsinvloedbepaling (OIB) word vereis vir gelyste ontwikkelingsaktiwiteite wat 'n nadelige invloed op die omgewing mag hê. Een van die belangrikse elemente van die OIB-proses is die indien van 'n Omvangbepalings- of Omgewingsinvloedverslag aan die betrokke owerheid en ook aan spesialiste en belanghebbende en geïnteresseerde partye vir evaluering, om vas te stel of die verslag voldoende is en of meer inligting benodig word voordat 'n beslissing vir projekgoedkeuring gemaak kan word. Die inligting wat in die verslag aan besluitnemers beskikbaar is ten opsigte van ontwikkelings met die potensiaal om plofstofprojekte te beinvloed, kan 'n noemenswaardige rol speel in die van die projek na afloop van die owerheid se evaluering van die kwaliteit van die verslag. Om volhoubare ontwikkeling te verseker, moet meer aandag geplaas word op die evaluering van die kwaliteit van OIB-verslae as deel van die effektiewiteit van OIB in Suid Afrika. Gevolglik het hierdie studied it ten doel gestel om die kwaliteit van vier OIV-verslae van plofstofprojekte te evalueer. Die doelwitte van die studie sluit in: 'n evaluering van die verslagkwaliteit deur onafhanklike evalueerders m.b.v 'n stiplys, 'n analise van die evalueringsresultate en aanbevelings ter verbetering van verslagkwaliteit vir plofstofprojekte.

Op grond van die evaluering is die slotsom bereik dat die vier verslae bevredigend is, ten spyte van enkele weglatings of tekortkominge, bv. Die identifikasie en evaluasie van sleutelimpakte en die oorweging van alternatiewe en matiging sowel as die beheer en behandeling van afval. Die evalueringsmetode is relatief robuust en betroubaar.

Die volgende aanbevelings word gemaak:

- Die gebruik van 'n kwaliteitsevalueringstiplys deur OIB-praktisyns en owerhede as 'n addisionele hulpmiddel tot die OIB regulasies (DEAT, 2002) en die Geintegreerde Omgewingsbestuurreeks (DEAT, 2002) kan die kwaliteit van OIB-verslae vir plofstofprojekte verder verbeter.
- Die gebruik van 'n kwaliteitsevalueringstiplys deur OIB-praktisyns kan bydra om te verseker dat alle sleutelaspekte aangespreek is voordag die verslag aan die bevoegde owerhede voorgelê word, nl. dat die verslag wetenskaplik en tegnies aanvaarbaar is, dat die verslag duidelik en samehangend georganiseer en aangebied is sodat dit verstaanbaar is en al die belangrike

sake aangespreek is, ten einde 'n ingeligte beslissing te maak ten opsigte van die beoogde ontwikkeling. Dit sal verder help om die goedkeuringsproses te bespoedig, welke proses dikwels vertraag word deur die aanvra van addisionele inligting a.g.v. 'n tekort in die aanvanklike verslag.

- Gereelde gebruik van die evalueringsstiplys deur OIB-praktisyns en owerhede om die kwaliteit van die verslae te bepaal sal bydra tot 'n basislyn van OIB-kwaliteit vir evaluasie van plofstofprojekte kragtens die nuwe OIB-regulasies wat in Junie 2006 geproklameer is.

LIST OF ACRONYMS AND ABBREVIATIONS

AEL	African Explosives Limited
CAIA	Chemical Allied Industries Association
CEC	Commission of European Communities
CIE	Chief Inspector Explosives
DEAT	Department of Environmental Affairs and Tourism
EA	Environmental Assessment
ECA	Environment Conservation Act 73 of 1999
EIA	Environmental Impact Assessment
EIM	Integrated Environmental Management
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
GDP	Gross Domestic Products
GG	Government Gazette
GN	Government Notice
I&AP	Interested and Affected Parties
MPRDA	Minerals and petroleum Resources Development Act
NEMA	National Environmental Management Act 107 of 1998
NGO	Non Government Organisation
NW-CEE	North West Cartridge Emulsion Explosives
NW-MPF	North West Munitions Press Facility
NW-PWD	North West Product Waste Disposal
NWU	North West University
RoD	Record of Decision
SA	South Africa
SEA	Strategic Environmental Assessment
UN	UNITED NATIONS
WC-PWD	Western Cape Product Waste Disposal

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PREFACE

For this dissertation, the article format was used. The dissertation contains the following:

Chapter 1 – Introduction and Problem Statement

The chapter is an introduction to the study as conducted in Chapters 2 and 3. An introduction to the legal position of Environmental Impact Assessment (EIA) in South Africa and a brief exploration of the relevant legislation is included in the chapter as well as some problems that have been pointed out regarding the South African EIA system. This chapter also introduces the Explosives Industry.

The aim of the study is establishing a baseline of environmental impact report (EIR) quality for explosive projects in the first era of EIA practice in South Africa, against which EIR quality under the new (2006) regulations can be compared for future explosive projects. To this end some specific objectives have been set, including.

a) The reviewing of selected EIR reports by independent reviewers using a checklist;
b) Analysing the results of the review process and
c) Providing recommendations for improving the quality of environmental impact reports for future explosive projects.

Chapter 2 – Literature review

The literature review explores the history and process of EIA, why it is such an important tool in the context of sustainable development as well as some of the research conducted both within South Africa and abroad. This will serve as background and context for the adaptation and implementation of an EIR quality review package for specific use in Explosive projects. The methodology explores the materials and methods utilised in the development of the EIR quality review package and its application.

Chapter 3 – The Quality of environmental impact reports for explosive industry projects in the format of an article manuscript.

This chapter contains the results generated from the use of a newly developed EIR review package. These indicate that while the EIRs generated by the South

African EIR system are of a generally acceptable standard, there is still room for improvement especially with regard to the evaluation and identification of key impacts and the consideration of alternatives and mitigation. These results are in line with international findings.

The article manuscript is aimed at publication in the South African Geographical Journal, and will be submitted after examination of the dissertation is complete. The supervisor and student will be cited as co-authors. For the improved reader friendliness, tables and figures have been placed in the text at appropriate locations rather than in the appendices as required for manuscript submission and the pages will be numbered from 1 onwards.

References are cited at the end of Chapters 1, 2 and 3, in accordance with the requirements of the North West University (NWU).

Chapter 4 - Conclusion

CHAPTER 1 – INTRODUCTION AND PROBLEM STATEMENT

Mining is the search for extraction and beneficiation and processing of solid minerals from the earth. The kinds of minerals extracted from the earth vary widely. For thousands of years these and other minerals have provided the raw materials with which human civilisation have been built. (Anon, 2007)

1.1 EXPLOSIVES INDUSTRIES IN SOUTH AFRICA

According to a communication by Mr. M. Conradie (1980), currently with many new mines opening, the demand for explosive products is greater than the actual supply of product. Local demand for explosives outstrips the local supply of raw materials (i.e. urea and ammonium nitrate), and has therefore to be imported, which impacts further on the environment with the road transportation thereof. The growth in the South African mining industry increases the problem of increased explosive product shortages. Although the mining of these minerals adds to the bottom line of South Africa's GDP, it poses a greater threat to the biodiversity decline function including pollution, waste disposal, agriculture, wetland loss and urbanisation.

With the explosives challenges to the environment, the development of the chemical industry has been dominated by three factors: the demand for explosives by the mining industry, the abundance of relatively cheap coal, and the political and regulatory environment in which it operated between 1948 and 1994. Today, the greatest challenges of these huge explosive industrial complexes are problems posed by operating with the natural

environment surrounded by densely populated residential areas. Since the start of producing dynamite, explosive producers are now making more modern, technologically safer and more effective explosive products in a far more competitive environment. (Chemical and Allied Industries' Association, (CAIA) 2003)

1.2 ENVIRONMENTAL IMPACT ASSESSMENT

Environmental Impact Assessment (EIA) is a legal requirement for a specified list of activities which could have a detrimental effect on the environment. (South Africa, 1997). These regulations established EIA practices in South Africa and were replaced in July 2006 by new regulations promulgated in terms of Section 25(5) of the National Environmental Management Act (NEMA), No 107 of 1998 (South Africa, 1998, 2006).

Voluntary EIAs have been conducted in South Africa since the early 1970's (Sowman et al, 1995), but only became mandatory in September 1997 when regulations were promulgated in terms of the Environment Conservation Act, No 73 of 1989 (South Africa, 1989). Explosive manufacturing is an activity listed under Section 21 of the Environment Conservation Act, Act 73 of 1989. (South Africa, 1989). Because of ongoing evaluation of the EIA process by the relevant national and provincial government departments, the Government initiated a programme to review and modify the EIA regulations in terms of the

National Environmental Management Act (NEMA): Second Amendment Act of August 2003. In the amendment of Section 24, the Act makes particular reference to a number of issues (including provision for independent review of EIRs), and these changes have been incorporated into the new regulations implemented in July 2006 (South Africa, 2006).

Although the 2006 regulations were introduced in order to improve EIA practice, there is limited knowledge of the quality of EIA reports for EIA practice in general under the 1997 Regulations (See Sandham & Pretorius, 2008, Sandham et al., 2008a, b; Kruger and Chapman, 2000), and no knowledge at all regarding EIR quality in the explosives industry projects. Therefore this article focuses on EIA practice in the first era of mandatory EIA (September 1997 – June 2006), in order to investigate the quality of EIRs, and to provide a base line of EIR quality to evaluate future trends in performance under the 2006 regulations.

1.3 AIMS AND OBJECTIVES

Aim

This study is aimed at establishing a baseline of Environmental Impact Report (EIR) quality for the first era of EIA practice in South Africa, against which EIR quality under the new regulations can be compared for future Explosive projects.

Objectives

The objective of the study are:

a) To review the quality of four selected environmental impact reports by independent reviewers, using a quality review checklist;

b) To analyse the results of the review process and

c) To provide recommendations for improving the quality of environmental impact reports for future explosive projects.

1.4 STRUCTURE OF DISSERTATION

This dissertation is in an article manuscript format. This article is aimed at a *journal publication, and will be submitted after the dissertation has been* submitted for examination. For ease of reading, tables and figures have been placed in the text at appropriate locations, rather than in appendices as required for manuscript submissions.

References are cited at the end of Chapters 1, 2, and 3, in accordance with the requirements of the North West University (NWU). Following the abstract the structure of the dissertation is a follows:

- Chapter 1

  Provides the aim, objective and structure of the study.

- Chapter 2

  Provides background information and a literature review of the EIA process in general, the South Africa EIA process and quality review, and the context of the explosives industry in South Africa.

- Chapter 3 is the article manuscript and consists of the following:

  Article abstract: Provides brief information about the aim of the study, results and conclusions of the study.

  - The Introduction: Discusses the EIA process in South Africa, an overview of explosives, the problem statement leading to the study and the aim of the study.
  - Materials and Methods: Provides information on the case studies used, the concept of the Lee and Colley review model, the development of a review checklist, the review methodology applied and the re view process.
  - Results and Discussion: Provides the results of the quality review of the EIRs, interpretation thereof and the discussion of the results.
  - Conclusions and Recommendations: Provides conclusions and recommendations derived from the results of the quality review.
  - References: Provided according to the style stipulated by the South African Geographical Journal.
  - Appendices: Quality review checklist and Review results.
- Chapter 4 Conclusion

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CHAPTER 2 – LITERATURE REVIEW

This chapter will provide a literature review of EIA quality review and the explosives industry in South Africa, EIA in general and EIA in South Africa,

2.1 THE EXPLOSIVES INDUSTRY IN SOUTH AFRICA

Gold mining was the catalyst that fuelled the industrial awakening of South Africa. The discovery of the Witwatersrand Reef in 1886 resulted in Johannesburg becoming the largest market in the world for dynamite. (African Explosives Limited, 2006).

The word 'Explosives' immediately raises the thought of defensive weaponry. However, there are major differences between military munitions, explosives and commercial explosives used for blasting in South Africa and African mines and quarries. The energetic materials (high explosives, gun propellants and rocket propellants found in military munitions of all types) are more sensitive to thermal stimuli than commercial explosives, which are used mechanically to break rock enabling the extraction of relevant minerals.

2.1.1 Explosives History

The *'Zuid Afrikaansche Fabrieken voor Ontplofbare Stoffen Beperk'*, a company formed specifically to supply dynamite to the mines, was the brainchild of Paul Kruger, President of the South African Republic. Four explosive factories were built with infrastructure and housing, producing an estimated output of 240,000 x 50 lb cases of explosives per year, and the first cartridge explosives were produced in June 1896. Munitions were

also produced for the Anglo Boer War in 1899. An era of fierce competition existed when Cecil John Rhodes' Cape Explosive Works started in 1903 and South Africa's Kynoch's factory at Umbogintwini manufactured explosives between 1908 - 1919. In 1919 Kynoch and Nobel and the principal explosives manufacturers in Britian amalgamated, and by 1924 the competition ended at Umbogintwini with the ultimate amalgamation of the Cape Explosive Works. (African Explosives Limited, 2006).

In 1924, an industrial plant was established using coke as a feedstock and iron as a catalyst, and in 1932 a synthetic ammonia plant was erected, which was one of the greatest industrial developments of the 20th century. The ready availability of ammonia and nitric acid precipitated extensive research and development into a wide range of chemicals and explosives resulting in the partial substitute for nitroglycerine. This saw the introduction of ammonium gelignite, thus paving the way for a new generation of ammonium nitrate-base explosives. The war years led to diversification into the manufacture of a range of chemicals many of which were an aid to improving the general standard of life in South Africa (i.e. aluminium sulphate, zinc chloride, zinc ammonium chloride, and special curing saltpeter).

After the Second World War (1941) pioneering work was carried out on explosives and explosives accessories tailored to local conditions

encountered across the wide spectrum of mining activities in South Africa (i.e. gold, diamonds, platinum, iron ore, coal, copper, asbestos and quarrying. In 1959 a water-resistant explosive was introduced. (African Explosives Limited, 2006).

Legislation was enforced on all explosive manufacturing sites in 1956 when the Explosive Act was promulgated resulting in all explosive industry was required to apply and obtain the required permit/license from the Chief Inspector Explosives (CIE) before any development/construction could commence.

Although not a legal requirement, voluntary EIAs were conducted for new/upgraded explosive production sites, and followed the Integrated Environmental Management Guidelines as published by the then Department of Environmental Affairs in 1992, (Peckham, 1997), but the information with regard to the quality of the EIRs was not measured.

2.1.2 Explosives Issues and Environmental management

The issue to be addressed here is how environmental damage can be avoided or reduced so as to ensure that development initiatives and their benefits are sustainable. The directive of environmental management should be to achieve the greatest benefit presently possible for the use of natural resources without reducing their potential to meet future needs and the carrying capacity of the environment. Taking environmental considerations into account in development planning does not imply that

the pace of socio-economic progress will be slowed-down; the various phases of the project cycle must not be seen as placing undue constraints on a country's development options. If a project is to be suspended on environmental grounds, alternative opinions that are environmentally sound must be provided to meet the country's developmental needs. (Sadler, 1996; Baker, 2003).

As governed by the Explosive Act and Regulations, all new upgrade/developments/product projects first have to be applied for and approved by the Chief Inspector, Explosives (CIE) i.e. license, permit or authorisation. This process must determine/ensure that the development is suitable from a security point of view and/or the explosives are manufactured for the purposes of research or development in such quantities and under such conditions as the Chief Inspector permits in writing. Only after approval by the CIE, can EIA applications be initiated. (Explosives Act, Act 15 of 2003 – s.43B, 2003).

Since the EIA report (EIR) is a major component of the EIA process, and the quality of the report can contribute towards better decision-making regarding environmental issues, the review of EIR quality is an important aspect of measuring the effectiveness of the EIA process (South Africa, 2004, Fuller, 1999; Leu et al., 1996; Sadler, 1996). As there are no guidelines to assist the EIA practitioners on what information is required specifically for explosives projects, and the EIA practitioners'

understanding of the activities and interpretations differs per province, leads to inconsistencies in the review process of EIRs for projects affecting explosive industry. The dependence of the EIA practitioners on inputs from reviewers to determine if the quality of EIRs is adequate or not is a gap still to be addressed in the new EIA regulations, (Sandham et al, 2008). Monitoring and auditing play a vital role in making EIA an effective environmental management tool. According to Bird and Therivel 1996; Sadler and Verheem, 1996), environmental impact monitoring and impact auditing are two vital activities, which must be performed in order to assess the effectiveness of EIA in achieving environmental protection. To be truly effective the quality of EIAs has to achieve goals for better environmental management of any particular project, be it explosives or wetlands, and has the chance to be effective on a nation-wide level by contributing information to future projects (Sadler, 1996).

2.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) IN GENERAL

Environmental Impact Assessment (EIA) is a management tool used globally to identify and evaluate the potential environmental consequences of a proposed project and helps to ensure that the project, over its life cycle, will be environmentally acceptable and sustainable. (Glasson et al, 1995a; Sadler, 1996; Wood 1999; Wood 2003). EIA was first formally established when the United States enacted the first national EIA law - the National Environmental Policy Act of 1969. Following on this act, provisions related to EIA started appearing in developed countries' legislation from the 1970s.

The role and scope of EIA are expanding continuously, although its application, practice and procedures vary from country to country. (Glasson et al., 1995a; Wood, 2003). There are still some uncertainties and issues in EIA that are being discussed in a wide range of literature. In recent years there has been an increasing trend in examining the effectiveness and quality of EIA (Sadler, 1996). Reference to EIA was made in the environmental legislation of Malaysia, Ecuador and the Philippines, which required the State to conduct EIAs in respect of activities that are likely to significantly affect the environment. (Paoletto, 2006; Sadler, 1996). In 1987 the Goals and Principle of Environmental Impact Assessment developed under the auspices of UNEP by the Working Group of Experts on Environmental Law was adopted by the UNEP Governing Council at its 14th session, and commended to the States to be considered for use as a basis for preparing appropriate national measures including legislation. (Morgan, 1993; Paoletto, 2006). Another requirement in the context of transboundary impacts was incorporated in several regional agreements, e.g. UN/CEC Convention on Environmental Impact Assessment in a transboundary context and several Regional Agreements concluded under UNEP's Regional Seas Programmes and resolutions of international bodies, e.g. 1984 ECA Council Resolution on Environmental and Development in Africa, 1984 EEC Council Directive on Assessment of the Effects of Major Public and Private Projects on the Environment. This requirement was also reflected in Principle 17 of the Rio Declaration on Environment and

Development, Article 5 of the Legal Principle for Environmental Protection and Sustainable Development, and adopted by the Experts Group on Environmental Law of the World Commission on Environment and Development. (Sadler, 1996; Paoletto, 2006).

2.3 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) IN SOUTH AFRICA

Voluntary EIAs were conducted in South Africa from the early 1970s (Snowman et al, 1995) and became mandatory in 1997 when the regulations were promulgated in terms Sections 21, 22 and 26 of the Environment Conservation Act, No 73 of 1989. (South Africa, 1989). These regulations enforced EIA practice in South Africa, for a number of activities listed in the published regulations which include projects in the explosive industry and in mining. Although mining was one of the activities identified as requiring and EIA (South Africa, 1997a; South Africa, 1997b) the mining industry was separated from all other activities that required an EIA under a separate set of legislation, the Minerals Act, Act 50 of 1991 (South Africa, 1991) and supervised by the Department of Minerals and Energy (DME). (Sandham et al., 2008b). Like the ECA, the Minerals Act has since been repealed and replaced with a new set of legislation, the Minerals and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA), the environmental sections of which came into force in 2004 with the introduction of a set of regulations (R527) (South Africa, 2004).

EIA provisions are contained in the Environment Conservation Act 73 of 1989 (South Africa, 1989). The environmental impact assessment

regulations were implemented in April 1998 (NEMA, 1997), namely R.1182, (first set of regulations), listing nine activities which could have a substantial detrimental effect on the environment and therefore required an EIA. Regulations R1183, (the second set) prescribed the actual conduct and contents of environmental assessments, and the third set of regulations (R1184), allowed the Minister of Environmental Affairs and Tourism to designate competent provincial authorities to issue written authorisation to undertake listed activities as provided in regulation R1183. (South Africa, 1997a, b.; 1998a).

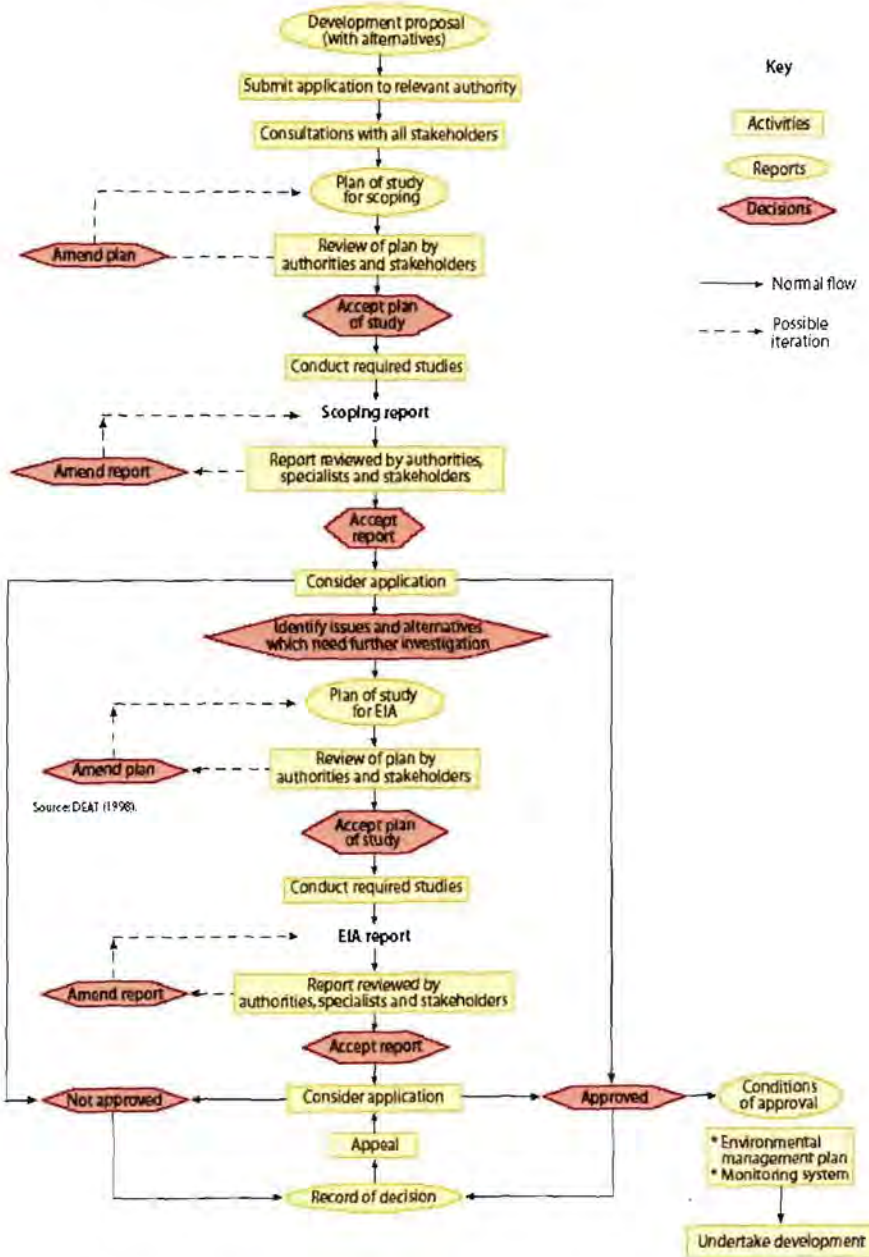
Figure 1 shows the procedure to be followed for obtaining authorisation to commence with a listed activity. A requirement of the South African EIA process is the submission of a scoping report and/or an environmental impact report to the relevant department authority for review, before the project can be approved for implementation (Sadler, 1996, Lee and George, 2000). The environmental impact report was intended to assist (South Africa, 1998a), and consisted of the following:

i. The proponent to plan, design and implement the proposal in a way that eliminates or mimises negative effects on the biophysical and socio-economic environments;

ii. The competent authority responsible for deciding whether a proposal should be approved and the terms and conditions that should be applied; and

iii. The public to understand the proposal and its impacts on the community and environment and to provide opportunity for comments on the proposed action for consideration by decision makers.

Figure 1: Application and EIA Process (South Africa, 1998a)



As indicated in Figure 1, some development projects can be approved at the scoping phase after the review of the scoping report. A full EIA, which requires development of an environmental impact report, is conducted

where issues identified during the scoping phase require further investigation as for explosive industry projects. The guideline document on the first era EIA regulations, (South Africa, 1997 & 1998a; Sandham et al., 2008), focussed mainly on the EIA process in general and had the following objectives:

- Providing the applicant, business and industry, Non Government Organisation (NGOs), the public, labour organisations and national authorities on national and provincial or local government level with a uniform basis for implementing sections 21, 22 and 26 of ECA and read with GN R1182-R1184 in GG 18261 of 5 September 1997;
- Providing background information regarding the legislation controlling environmentally harmful activities;
- Assisting applicants with the preparation, completion and submission of applications and required environmental report(s); and
- Assisting authorities in determining their roles and responsibilities as decision makers.

The 1997 EIA regulations are an amendment process (South Africa 2004 and 2005). The regulations were amended under section 24(5) of the National Environmental Management Act. Act No. 108 of 1998 (NEMA, 1998b). The above sections of the ECA and its regulations were repealed once the new EIA regulations were promulgated. The new EIA regulations were to be read with the National Environmental Management Amendment Act 8 of 2004. As mentioned above, draft EIA regulations

were published for comment under section 24(5) of the National Environmental Management Act 108 (NEMA) of 1998 (GN 12 in GG 27163, of 14 January 2005). Quality review of EIR was valid and a necessary requirement under the old regulations and the intention of the new EIA regulations is to specify the report contents in order to facilitate improved quality of the reports.

The activities in the new 2006 EIA regulations are divided into two categories.

- Category I - activities are required to undergo a basic assessment process in order to determine whether there are potential significant impacts that would require further investigation or whether a decision can be made based on the information provided.
- Category II -activities are subject to a full environmental impact assessment process.

Both sets of the regulation impact on explosives, which are a listed activity requiring an EIA for projects likely to affect the environment.

2.4 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) EFFECTIVENESS

Whether environmental assessment has achieved its goal of reaching better decisions has continually engaged the attention of academics, EIA practitioners and policy makers. An approach as to whether environmental assessment has achieved its goal is by examining the effectiveness of EIA. Here effectiveness refers to whether something works as intended and meets the purpose for which

it is designed (Cashmore et al., 2004; Fuller, 1999; Retief, 2005; Sadler, 1996, Wood, 2003).

In Brazil and UK EIA systems have been compared using a development of a model proposed by Leu et al. (1996), which includes the seven key criteria, or Wood's (1999) set of fourteen key criteria to analyse the various stages in the EIA (EIR). (Wood, 1999; 2003) evaluated the South African EIA system as set out in ECA, and NEMA, and made various recommendations, shown in Table 1. Roux, (2003) extended these evaluations and recommendations to include the National Environmental Management Second Amendment of 2004, (this Bill was enacted on 7 January 2005). Following her assessment, various critical amendments were made to NEMA with the National Environmental Management Amendment Act 8 of 2004 and draft amendments of the EIA regulations published January 2005. These draft regulations and NEMA amendment Act are assessed together with Wood and Roux's negative findings and comments in Table 2 and 3 respectively where all Wood's and Roux's criteria is shown. The assessments are represented in two separate tables as Roux's evaluation includes the Draft National Environmental Second Amendment Bill of 2004.

Table 1: An assessment of Wood's (1999) findings on ECA and NEMA against the amendments made in the National Environmental Management Amendment Act, Act No 8 of 2004 and the January 2005 draft regulations (Wood, 1999 and 2003).

Wood's (1999) findings on ECA and NEMA Regulations of 1999 and 2003	Amendment made in the National Environmental Management Amendment Act, Act 8 of 2004 and the Draft regulations January 2005
Criterion 2: Coverage of EIA systems The principal omissions for EIA coverage are mining-related activities, developments within rivers and intensification of various land uses	Chap. 4 of the January 2005 draft regulations provides for the identification of activities and geographical areas requiring either screening or EIA. Mining – related activities are covered in Section 23 and require an EIA. In addition, the applicant has to comply with the requirements of the Mineral and Petroleum Resources Development Act 28 of 2002. Developments within the one to hundred year flood line of a river or stream require screening. Thresholds are given for a variety of activities, including intensification of land-uses such as the concentration of animals and storage of water.
Criterion 6: EIA report preparation The acceptance of plan of study ensure that content requirements are met, but no formal checks on adequacy exist, despite informal use of draft environmental impact report (EIR's)	In January 2005 draft Regulations sections 10(1)(b) & (2), 12(1)(b) & (c) & (2) and 17(1)(c) & (d) & (2) allow for the competent authority to request that the applicant amends inter alia the plan of study, screening, scoping, or EIA reports, due to inadequacy based on the regulation, requirements or requested information by the authority. These reports may also be rejected, and after amendments have been made, the application may re-submit them. NEMA Amendment Act 8 of 2004 Section 24(5 (h) provides for the prescription of minimum criteria for report content to ensure consistent quality and ease of evaluation. In addition, the Act allows for the registration of environmental assessment practitioners thus enabling their accreditation and ensuring competent report preparation.

Criterion 7: EIA Report review No requirement for scoping report, or EIR review, but guidance on review exists and previous good practice suggests adequate review should often occur.	NEMA Amendment Act 8 of 2004 section 5(c) and 241, and the January 2005 draft regulations 17(3) and (4) make provision for specialist reviewers. These reviewers are to assist where specialist knowledge is required and where high a level of objectivity is required.
Criterion 8: Decision-making Environmental authorisation must be based on scoping report, or EIR (and any review), but decisions are sometimes narrowly based on nature conservation matters, not on full range of EIR issues, Refusals are very rare.	Section 18 of the January 2005 draft regulations stipulates the requirements for issuing environmental authorisations. These requirements include inter alia environmental, economic and social considerations.
Criterion 9: Monitoring and auditing of actions. No formal requirements for monitoring exist, but uses of monitoring (not auditing) conditions are common.	The NEMA Amendment Act 8 of 2004 – section 24(4)(f) makes provision for audits, the management of impacts and the assessment of their effectiveness after their implementation. No regulations have been compiled to describe how the audits are to occur, but 24(5)(a) make provision for these regulations to be written.
Criterion 11: Consultation and participation. Extensive provisions are made for public involvement during scoping and in EIR preparation, but this is not matched by formal rights of Interested and Affected Parties (I&AP) to comment on completed scoping and environmental impact reports.	The January 2005 draft regulations, makes no formal provision for comments by the public on completed reports. However, section 4(1)(f) provides for the distribution of public information to I&AP and stipulates that they are given a reasonable opportunity to participate within the process.
Criterion 12: Monitoring of EIA systems No formal EIA system monitoring or review requirements. Few records are kept, therefore proposed EIA system changes unlikely to be based on experience to date.	There are to date no requirements for system monitoring, however the NEMS Amendment Act, Act 8 of 2004 Section 24(5)(5) recommends that authorities have a registry of applications and the ensuing environmental authorisations.
Criterion 14: Strategic environmental assessment. Assessments are conducted on project proposals to extend environmental assessment to land use plans and possibly to policies and programmes. There is some limited informal strategic environmental assessment (SEA) practice.	The January 2005 draft regulations require that cumulative impacts of an activity be assessed. The NEMA Amendment Act 8 of 2004 section 24(5)(b)(iii) provides for the Minister to make regulations regarding the preparation and evaluation of strategic environmental assessments.

Table 1 indicates that eight of Wood's findings have been incorporated within the NEMA Amendment Act and the draft January 2005 EIA regulations. The only purpose of discussing the NEMA system is to show that EIR quality will be even more relevant, and that this research will be a base-line for comparison of future practice for explosives. Criterion 6, 7, 8 definitely has an impact on EIA quality review, especially where the Act allows for the registration of environmental assessment practitioners thus enabling their accreditation and ensuring competent report preparation

Roux's, (2003) findings and recommendations from her evaluation of ECA, NEMA and the National Environmental Management Second Amendment Bill of 2004 are presented in Table 2. Roux, (2003) used Wood's evaluation criteria in her evaluation and therefore there is some repetition in this assessment. Roux's recommendation following her evaluation of South African EIA legislation indicate that nine of her findings were incorporated within the NEMA Amendment Act and the draft January 2005 EIA Regulations. Seven findings have been only partially incorporated.

Table 2: An Assessment of Roux's (2003) recommendations on ECA, NEMA and the National Environmental Management Second Amendment Bill of 2004 against amendments made in the National Environmental Management Amendment Act 8 of 2004 and the January 2005 draft regulations

Roux's (2003) recommendations on ECA, NEMA and National Environmental Management Second Amendment Bill of 2004:	Amendments made in the National Environmental Management Act 8 of 2004 and the January 2005 draft regulations
Key definitions as 'environment', 'EIA', 'significant impact' and 'SEA' should be defined and explained.	The January 2005 draft regulations defined • 'EIA' as 'the process of collecting, organising, analysing, interpreting and communicating information that is relevant to a decision contemplated in regulation 17 in respect of the potential impact of a proposed activity; • 'significant Impacts' as 'an impact that by its magnitude, duration, intensity or probability of occurring may have an effect on an important aspect of the environment' NEMA's definition of 'environment' has been retained and 'SEA' has not been defined.
Provision must be made for one set of framework legislation, which sufficiently prescribes the minimum national standard with which all EIA procedure must comply.	The January 2005 draft regulations provide minimum national standards for EIA.
NEMA must make provision for uniform departmental policy regarding the administration of the regulations. A mechanism must be created to facilitate and ensure integration and co-operation between the respective environmental authorities. They must attempt to consolidate the previous fragmented legislation and promote a standardised environmental approach toward development planning.	The *NEMA Amendment Act 8* of 2004 in section 24(4)(g) make provision for co-ordination and co-operation between state departments where a project falls under the jurisdiction of more than one body.
The regulations must include one complete list of all possible activities which may have a detrimental effect on the environment (including mining-related activities among others) and a list of geographical areas based on environmental attributes in which	The January 2005 draft regulations have two lists of activities, namely those that require screening and those that require EIA. Mining-related activities are covered in regulation 23 and require an EIA. In addition, geographical areas have been identified in which specified activities require environmental

activities may not commence without prior environmental authorisation from the competent authorities. In this respect, provinces should be given the ability to identify sensitive areas in which additional criteria should apply. Attention should be given to aspects of desirability or need of the activity.	authorisation. The need or desirability of the activity is to be included in the scoping document.
Although section 24(3) of the *NEMA Amendment Bill* provides for the investigation of cumulative effects of the activity this aspect needs more consideration. Because cumulative effects may be local, regional or global in scale, co-ordinated institutional arrangements are required in dealing with them. In most case, cumulative effects must be addressed before the project level, because cumulative impacts may result broader biophysical, social and economic considerations.	The January 2005 draft regulations require that the cumulative impact of the activity need to be assessed. The assessment is to be based on the 'nature of the impact, the extent and duration of the impact in terms of the spatial size or area of influence'. Thus, the scale of the assessment would need to be determined by the competent authority and the environmental assessment practitioner.
Screening process must make provision for thresholds to eliminate minor activities. The proponent should submit clear and detailed information for the discretionary determination of which action should be assessed. Public participation should play an important part during this stage, as this might be the final stage before the proponent will be given authorisation to proceed with the project.	Activities as listed in Category I in regulation 22 of the January 2005 draft regulations require screening. In addition, thresholds are given for these activities. Public participation is stipulated as part of the screening process and the minimum requirements is that I&AP are notified of the application and how they may participate in the process.
The current comprehensive scoping procedure must be streamline. Authorities with the necessary expertise, accredited consultants and interested groups could assist in the identification of potential significant impacts.	It is intended that with the two lists of activities (Chapter 4 of the January 2005 draft regulations) identifying those that need screening. EIA or authorisation, a more streamlined process will have been created
Public participation must be part of the decision-making process. The regulations must include factors which ought to be considered in reaching the final decision,	The January 2005 draft regulations provide factors, which are to be taken into account for consideration of an applicant in regulation 18. However, no eight is given to any of the factors. Provision is made to

and they must describe the weight that must be given to the different factors in order to establish a fair decision-making process.	include I&AP comments as part of the decision-making process.
The regulations must pay special attention to mitigation measures and must make provision for the option of not implementing the activity. A separate document specifically concerned with mitigation measures, which includes implementation of mitigation measures as well as reporting procedures, similar to the Comprehensive Mitigation Plan of Swaziland could be helpful to address this issue.	The January 2005 draft regulations require mitigation measures for both screening and scoping applications. The no-go option is also to be considered in both applications.
Public participation must take place prior and following the EIA report preparation. Copies of the EIA documents must be available to the public at designated places and the results should be published. The roles, responsibilities and duties of I&AP must be defined.	Regulation 5 of the January 2005 draft regulations stipulates the responsibilities of I&AP. No provision is made for public participation to occur after report preparation, other than the leave to appeal the authority's decision. I&AP are to be notified of the record of decision.
The EIA system must be monitored in order to get feedback from experience and to remedy any weaknesses. An accurate record of the time required to complete all facets of the EIA report must be maintained. The regulations should set out effective feed back procedures and must establish a system for the keeping of records relating to the EIA procedures. These records must be available for the public, at a stipulated place, and on an internet website.	The January 2005 draft regulations have time frames in which the applicant and competent authority have to conduct the screening or EIA process. There are no requirements for monitoring of the system, nor record keeping other than a register of applicant received and authorisations granted. Records are available in terms of the *Promotion to Access to Information Act 2* of 2000 that sets out the rights of information requesters and the obligations of the entities who must make records of information available. However, records are not available on a website.
The *NEMA Amendment Bill* does not stipulate the process for appeal that must be followed when the minister is the responsible decision-making authority. It is important to address this issue, as an appeal cannot be heard by the same official or department, who originally made the decision which is subject to appeal.	The *NEMA Amendment Act 8* of 2004 and the January 2005 draft regulations stipulate the process to appeal, but do not have a specific process if the Minister of Environmental Affairs is the responsible decision-making authority.

Of all Roux's comments dealing with the 2005 draft regulations, no significant changes regarding those issues were evident when the final version of the regulations were promulgated in 2006.

As the EIA report (EIR) is a major component of the EIA process, the quality of the report can contribute towards better decision-making regarding environmental issues, and a review of EIR quality is therefore an important aspect of measuring the effectiveness of the EIA process (South Africa, 2004; Fuller, 1999; Leu et al., 1996; Sadler 1996; Wood, 2003; Boclin et al., 2005). All over the world many different methods of determining the quality of EIR has been designed and used. Another method which is more commonly used is the checklist (review package), designed as a method for reviewing the adequacy of the EIR for adequacy, suitability and completeness of information towards better decision making with regards to environmental issues. One such example is the Guidance document on EIA (EIR) Review (European Commission, 2001), used in projects in Portugal (Canelas, 1996); The packages typically consist of a series of questions grouped hierarchically into two or more tiers. By allocating grades to the questions at each level, an overall grader for the quality of the EIR is determined. In 1992 Lee and Colley developed a four tier package for the review of Environmental Impact Statements (EIS) in the UK (Lee and Colley, 1992), which has been widely used in the UK and in a number of other countries, including Belgium,

Denmark, Germany, Greece, Ireland, Portugal and Spain, (Glasson et al., 2005; Ibrahim, 1992; Lee et al., 1999; Mwalyosi and Hughes, 1998; Rout, 1994; Rzeszot, 1999). Findings from these studies indicated that the description of the project and the environment, and communication of results tend to be the better performed areas, whereas impact identification, assessment of significance, alternatives and mitigation tend to be less well performed. It was also shown that EIR quality improved over time (European Commission, 1996; Lee, 2000).

Given the limited amount of research carried out in this area in South Africa (Du Pisani, 2005, Kruger and Chapman, 2005, it is clear that a gap exists for an appropriate EIA review package to assist in the assessment of the quality of environmental reports in South Africa is a requirement to be addressed. (Sandham et al., 2007, 2008a & 2008b). In view of the widespread use and utility of the Lee and Colley review package, it was regarded as an appropriate starting point for the development of a South Africa review package to assess the quality of the EIRs. (Sandham and Pretorius, 2007). The review package was adapted to the regulation in force from 1997 to 2006, but nothing has been done on explosives hence the need for this research.

It is the intent of the revised Environmental Impact Assessment (EIA) regulations promulgated in June 2006 to ensure that environmental concerns are fully addressed. The NEMA Amendment Act 8 of 2004 –

section 24(4)(f) makes provision for audits, the management of impacts and the assessment of their effectiveness after their implementation (Roux, 2003).

This study' aims to assess the quality of the environmental impact reports for explosive projects and expound the results in terms of EIA effectiveness for future explosive projects or developments. The research methodology, findings, conclusions and recommendation will be discussed in Chapter 3.

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CHAPTER 3

The Quality of Environmental Impact Reports for Explosive Industry Projects in South Africa

Article Manuscript

The Quality of Environmental Impact Reports for Explosive Industry Projects in South Africa

Abstract

The South African revised Environmental Impact Assessment (EIA) regulations came into effect July 2006, which focused attention on the question of EIA effectiveness. The information made available to decision-makers in the Environmental Impact Report (EIR) is a major determinant in the outcome of explosive industry projects; therefore the review of the quality of the EIR is one of the important quality control functions contributing to the EIA effectiveness within the EIA system.

The quality of the four environmental impact projects reports with the potential of impacting on explosive was assessed using an EIA report quality review checklist.

It is concluded that the quality of the four reports were of an acceptable standard, although certain areas were found poorly performed i.e. identification of key impacts and considerations of alternatives and mitigation as well as the control and treatment of waste. The review method is fairly robust and consistent and therefore can be seen as a reliable indication of EIR quality. The results are in line with international findings.

To improve the quality of the reports for explosive projects it is recommended that a quality review checklist for explosive projects be used by EIA practitioners and authorities as an additional tool to the EIA regulations and the Integrated Environmental Management series. This should assist in improving the quality of the environmental impact reports, and also will contribute to a baseline of EIR quality for explosive projects under the new regulations promulgated July 2006.

Keywords: Environmental Impact Assessment, Environmental Impact Report, Quality Review, Explosives.

3.1 INTRODUCTION

The discovery of the Witwatersrand Reef in 1886 resulted in Johannesburg becoming the largest market in the world for dynamite. Gold mining was the catalyst that fuelled the industrial awakening of South Africa. Today, the greatest problems of these huge explosive industrial complexes are the challenges posed by operating within the natural environment surrounded by densely populated residential areas. Since the start of producing dynamite in 1886, explosive producers have continually improved the quality of commercial explosives and are today making more modern, technologically safer and more effective products in a far more competitive environment. (AEL, 2006).

In spite of the economic downturn of 2008, the *demand* for explosives is likely to remain greater than the *supply.* Local demand of explosives outstrips the local supply of nitrogen (i.e. urea and ammonium nitrate), and has therefore to be imported. The growth in the South African industry exacerbates the problem of the increased shortages. Although the mining of these minerals adds to the bottom line of South Africa's GDP, it poses a greater threat to the biodiversity decline function including pollution, waste disposal, agriculture, and urbanization. There is, therefore, an urgent need for environmental management in order to promote sustainable development on the road to achieving sustainability.

Environmental impact assessment (EIA) is being used globally, either as a planning or management tool, in order to minimise the harmful consequences of development. Its emphasis is on prevention and it is hence an example of the precautionary principle (Glasson, 1995a). Ensuring environmental protection and management is the primary goal of EIA (Bailey, 1997; Morrison-Saunders and Bailey, 1999). Since its introduction in the early 1970s, the role and scope of EIA has been expanding continuously, although its application, practice and procedures vary from country to country (Glasson et al., 2005).

EIA in South Africa.

In South Africa environmental impact assessment (EIA) became a legal requirement for specified listed development activities, which could have a substantial detrimental effect on the environment (South Africa, 1997; Wood, 1999; 2003), of which certain explosive projects fall under the listed activities category. A key element of the EIA process is the submission of an environmental impact report (EIR) for review in order to determine the adequacy, and/or whether further information is required before the project can be submitted for authorisation. The information available to decision-makers in the EIR is a major determinant in the outcome result for explosive projects, even though the overall performance of the EIA process is dependent on other factors and from these the quality statements are of particular importance, and studies have shown that the quality of EIRs, Sadler (1996), especially during the earlier years of use to be unsatisfactory.

Internationally a number of studies have been published relating to the review of EIR quality) (Lee and Colley, 1991; Lee 1995; Hickie, 1998; Lee, 2000; Weston et al, 2000; Leu et al, 1996; Wood 2003), emphasising again that the quality of statements are of importance as studies have shown that the quality of EIRs during the earlier years to be unsatisfactory, Sadler (1996).

According to Canelas, (2004), the quality of EIRs is of great importance to properly inform the public and decision makers about the significant effects of the project as well as to enable better decision making regarding environmental issues, the review of EIR quality is therefore an important aspect of measurement with regard to the effectiveness of the EIA process.

Various methods of determining the quality of EIR have been used and developed world wide. In some countries a matrix system is used, i.e. Taiwan (Leu et al., 1996), and the fuzzy logic approach (Boclin et al., 2005). The method which seems most commonly used is a review package e.g. the European Commission checklist. (European Commission, 1996). These packages have largely the same methodologies, consisting of hierarchically grouped sets of criteria

focusing on aspects of the generic EIA process. Lee and Colley developed a four tier package in 1992for the review of Environmental Impact Statements (EIS), in the United Kingdom (UK) (Lee and Colley, 1992). This package has been widely used in the UK as well as a number of other countries, including Belgium, Denmark, Germany, Greece, Ireland, Portugal and Span, (Glasson et al., 2005); Ibrahim, 1992; Lee et al., 1999; Mwalyosie and Hughes, 1998; Rout, 1994; Rzeszot, 1999). These studies found that certain aspects such as description of the project and the environment and the communication of results tended to be better performed areas whereas impact identification, assessment of significance, alternatives and mitigation tended to be less well performed. EIR quality improvement was shown over time (European Commission, 1996; Lee, 2000).

No local or international published studies could be found with regards to the quality review of environmental impact reports specifically for the manufacturing of explosives and their impact on the environment, and a limited amount of research conducted in South Africa was found (Du Pisani, 2005; Kruger and Chapman, 2005; Moloto, 2005; Sandham and Pretorius, 2007; Sandham et al, 2008a; Sandham and Hoffmann, 2007).

To address this gap, the aim of this study is to assess the quality of environmental impact reports of explosive projects using the methodology of the Lee and Colley quality review model (Lee et al, 1999; 2000).

The objectives of the study entail a) review by independent reviewers the quality of four selected environmental impact reports using a checklist adapted for use in South Africa; b) to analyse the results of the review process; and c) to provide recommendations for improving the quality of environmental impact reports for explosive projects

3.2 METHODOLOGY

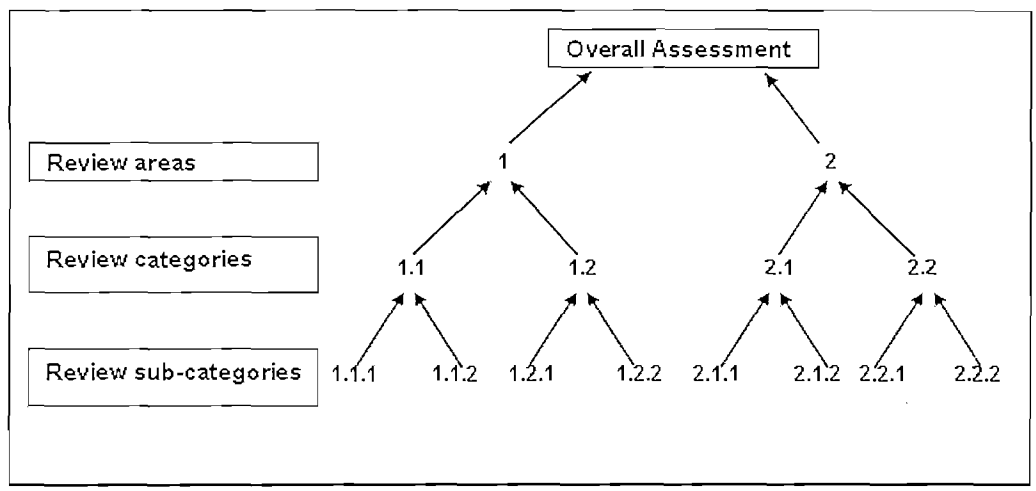
3.2.1 Development and Concept of the Review Checklist

In 1989, Lee and Colley developed a review package (checklist), for the review of environmental impact statements (EIS) reports in the UK for the newly mandated planning regulations of environmental assessments. This package was first published in 1990 and, republished in 1992 after

minor changes, (Lee and Colley, 1990; 1992) with the use of a hierarchy of detailed review criteria, which was tested in different Member States (i.e. Lee and Brown, 1992; Lee and Dancey, 1993; Barker and Wood, 1998; Lee and Colley, 1991), and found to be robust and reliable.

The Lee and Colley (1992) review package has been widely used to carry out reviews of project level environmental impact statements (EIS) as well as being applied successfully elsewhere (Barker and Wood, 1999; Lee, 2000; Lee and Brown, 1992). The review package consists of multiple criteria arranged in a 4-level hierarchical structure consisting of an overall report grade, review areas, categories and sub-categories, which are used to assess (using assessment symbols) the quality of environmental impact reports. (Figure1)

Figure 1: Hierarchical structure of the Lee and Colley (1992) EIR review package - Level 4 – overall assessment EIR; Level 3 – assessment of review areas; Level 2 – assessment of review categories; Level 1 – assessment of review sub categories



The list of assessment symbols can be seen in Table 1.

The quality review evaluates how well a number of assessment tasks (sub-categories, categories and areas) have been performed. The review is commenced on the lowest level (sub-categories) (Table 2), which contain simple criteria relating to the specific tasks and procedures. Using these assessments the reviewer then moves progressively from one level to another, applying more complex criteria to broader tasks and procedures in the process until the overall assessment of the EIR has been completed. The assessment from applying each criterion is recorded on a Collation Sheet (See Figure 2). Letters are used as

symbols rather than numbers as symbols have the advantage that they cannot easily be added or subtracted, which can distort results (Simpson, 2001).

Figure 2: Example of the collation sheet (Source: Lee and Colley 1992)

COLLATION SHEET
Overall assessment ... ..

1	... .	2	... .	3	... ...	4	... .
1.1	... .	2.1	... .	3.1	... ...	4.1	... .
1.1.1	... .	2.1.1	... .	3.1.1	... ...	4.1.1	... .
1.1.2	... ...	2.1.2	... .	3.1.2	... ...	4.1.2	... .
1.1.3	... .	2.1.3	... .	3.1.3	... ...	4.1.3	... .
1.1.4	... ...	2.1.4				4.1.4	... .
1.1.5	... ...						
1.1.6	... .						
1.1.7	... .						
1.1.8	... .						
1.1.9	... ...						
1.2	... .	2.2	... .	3.2	... .	4.2	... .
1.2.1	... .	2.2.1	... .	3.2.1	... .	4.2.1	... .
1.2.2	... .	2.2.2	... .	3.2.2	... ...	4.2.2.	... .
1.2.3	... .			3.2.3	... ...	4.2.3	... .
1.2.4	... .						
1.2.5	... .						
1.2.6	... .						
1.3	... .	2.3	... ...	3.3	... ...	4.3	... ...
1.3.1	... .	2.3.1	... ...	3.3.1	... .	4.3.1	... ...
1.3.2	... .	2.3.2	... ...	3.3.2	... .	4.3.2	... ...
1.4	... .	2.4	... ...			4.4	... ...
1.4.1	... .	2.4.1	... ...			4.4.1	... ...
1.4.2	... ...	2.4.2	... ...			4.4.2	... ...
1.4.3	... .	2.4.3	... ...				
1.4.4	... .						
1.4.5	... .						
1.5	... ...	2.5	... ...				
1.5.1	... ...	2.5.1	... ...				
1.5.2	... ...	2.5.2	... ...				
1.5.3	... ...	2.5.3	... ...				

The symbols represent the following:

- A to C represents generally satisfactory performance (A = very satisfactory, B = satisfactory and C = just satisfactory)
- D to F represents generally unsatisfactory performance at each of the levels in the review hierarchy.
- N/A represents a review topic irrelevant in the context of the EIR.

Table 1: List of assessment symbols (from Lee and Colley, 1999)

Symbol	Explanation
A	Generally **well performed**, no important tasks left incomplete
B	**Generally satisfactory** and complete, only minor omissions and inadequacies
C	Can be considered **just satisfactory** despite omissions and/or inadequacies
D	Parts are well attempted, but must, as a whole, be considered just **unsatisfactory** because of omissions or inadequacies
E	Not satisfactory, significant omissions or inadequacies, **poor attempt**
F	Very satisfactory, important task(s) poorly done or **did not attempt**
N/A	Not applicable. The review topic is not applicable or irrelevant in the context of this EA report

The review checklist used in this study has been developed from an environmental impact report quality review checklist adapted for South Africa based on the Lee and Colley, (1999) quality review model (Moloto, 2005; Pretorius, 2007). The checklist was adapted to accommodate the scoping reports in accordance with the regulatory requirements in South Africa and a lesser focus on best practice, in contrast to the Lee and Colley package with a primarily best practice focus. Although, the EIA system as a whole does capture much of what is regarded as best practice as follows:

- The upper tiers of the quality review checklist (i.e. overall score and review areas) were applicable to the South African EIA system without any changes. At the lower tiers of the quality review checklist (categories and sub-categories), a number of differences were found and amended to the South African EIA system requirements). (Table 2).

  These changes were also incorporated into the collation sheet. In summarising, the resultant change from the Lee and Colley package is that the review areas remained the same, review categories reduced from 17 to 15, and sub-categories increased from 52 to 61 and 4 review areas to a single overall score/Grade. (Sandham and Pretorius, 2007). The checklist will be referred to as the (South African) NWU review checklist. One adaptation was made to the South African review package to include review topic

4.4 - Executive summary: there should be a clearly written executive summary of the main findings of the study and how they were reached for the explosives industry.

Table 2: Abbreviated EIR Review Criteria – Review area; 1.1 Review Category; 1.1.1 Review sub-category

1. Description of the development	*2.3 Scoping*
1.1 Description of the Development	2.3.1 Example of notice published in media
1.1.1 Identification of Applicant	2.3.2 On-site notice
1.1.2 Purpose and objectives of Development	2.3.3 Identify affected people
1.1.3 Description and nature of activity/development	2.3.4 Identify interested people
1.1.4 Description of the site	2.3.5 Procedure whereby I&AP can participate
1.1.5 Proposed location	2.3.6 Provision for I&AP to express their views
1.1.6 Description of processes & technology employed	2.3.7 List of issues identified
1.1.7 Expected rate of production	2.3.8 Notification criteria
1.1.8 Raw materials used during different phases	2.3.9 Record of all views as an addendum
1.1.9 Source and availability of water and materials	2.3.10 Evidence that I&A parties were approached
1.2 Site Description	2.3.11 Key impacts identified for further investigation
1.2.1 Site plan	*2.4 Prediction of Impact Magnitude*
1.2.2 Description and demarcation of land use areas	2.4.1 Prediction of impact magnitude
1.2.3 Estimated duration of different phases	2.4.2 Quantification of impact magnitude prediction
1.2.4 Expected number of workers and visitors	*2.5 Assessment of Impact Significance*
1.2.5 Access to site and likely means of transport	2.5.1 Significance of impact on affected community
1.2.6 Infrastructure required	2.5.2 Significance of impact (nature, intensity, duration, probability, extent)
1.3 Wastes and residuals	2.5.3 Method of assessing significance and ranking
1.4 Types & quantities of waste & disposal routes	
1.4.1 Proposed handling & disposal of waste	**3 Alternatives and Mitigation**
1.5 Environmental Description	*3.1 Alternatives*
1.5.1 Indication of likely area to be affected	3.1.1 Description of methods used to identify alternatives
1.5.2 Physical description of site	3.1.2 Description of analysis of range of alternatives
1.5.3 Biological description	3.1.3 Investigation of at least two (2) alternatives
1.5.4 Social characteristics	3.1.4 Discussion and reasons for final choice
1.5.5 Cumulative impacts	*3.2 Mitigation*
1.6 Baseline Conditions	3.2.1 Description of mitigation methods
1.6.1 Important components of the affected environment	3.2.2 Mitigation measures considered
1.6.2 Interaction and effect of project on the environment	3.2.3 Mitigation measures clearly defined
	3.2.4 Indication of effectiveness of mitigation measures
2 Identification and Evaluation of key Impacts	**4 Communication of Results**
2.1 Definition of Impacts	*4.1 Layout*
2.1.1 Description of interaction of project on environment	4.1.1 Introduction briefly describing the project
2.1.2 Description of interaction of effects on environment	4.1.2 Logical arrangement of information
2.1.3 Impacts from non-standard operating procedure	4.1.3 External sources acknowledged
2.1.4 Impacts from deviation from Base Line conditions	*4.2 Presentation*
2.2 Identification of Impacts	4.2.1 Comprehensible to non-specialist
2.2.1 Project divided into distinct phases	4.2.2 Presented as an integrated whole
2.2.2 All possible impacts from each phase identified	*4.3 Emphasis*
	4.3.1 Emphasis given to potentially severe impacts
	4.3.2 EIR is unbiased
	4.4 Executive summary
	4.4.1 Executive summary of main findings & conclusions
	4.4.2 EIR summary of main issues

3.2.2 Case Studies

Due to the confidentiality and nature of the explosives industry, four case studies, of which two at a National level and two at a Provincial level, were the only available explosive assessment reports with a potential of impacting on the environment at the time the research was conducted. The reports of the following explosive projects were approved for implementation by the National Department of Environmental Affairs and Tourism and the North-West Provincial Department of Agriculture, Conservation and Environment. The selected case studies are described

briefly below. Due to the sensitivity/confidentiality of the cases, the exact location of the projects may not be given. Therefore only abbreviations based on descriptions of the project will be used to refer to the case studies hereafter, and only the province where it is located will be given.

1. Insensitive Munitions Press Filling Facility (NW-MPF), (North West Province). (This is a listed activity in terms of Section 1 (c) of regulation 1182, Environment Conservation Act, Act 73 of 1989, Section 20, 21 & 22). Due to increased demand, it became necessary that an extension to an existing munition press filling facility be built on its existing site. A low vulnerable explosive is to be used, whereby the process used will be press-filling instead of the melt and pour method. The explosive safety circles (Explosives Act 1956 and draft Explosive regulations, 2007) were the main problem, as the new circles around the facility meant that no other workshop, office or public building could be situated in the safety circles. Before an application for EIA can be registered a plan of the proposed development is to be approved via a permit through the Chief Inspector Explosives (CIE) as per the Explosive Act 26 of 1956 Regulations, which list the safety distances between buildings/operations dependant on type/class of explosive/munitions to be manufactured. This is then allocated on a site plan via safety circles and authorised by the CIE.

2. Construction of Existing Product Waste Disposal System (WC-PWD), (Western Cape), on an existing site. (Schedule 1, Item 8 of regulation 1182) Disposal system and the treatment of hazardous waste site. The area was all within the explosive safety circles. (See explanation above with regard to explosive safety circles). This project also included the construction or upgrading of *'transportation routes and structures, and manufacturing storage, handling or processing facilities for any substance which is dangerous or hazardous and is controlled by national legislation* (Schedule 1, Item 1(c) GG No 18261, R1182, (1997); Environment Conservation Act, Act 73 of 1989, Section 20, 21 & 22). The area proposed was on the existing site, a gun club, area for

sand mining, magazines for storage of components and materials used in the manufacturing of munition products and a test range.

3. New development of Cartridge Emulsion Explosives. (North West Province), (NW-CEE) (This is a listed activity in terms of Schedule 1, Item 1(c) GG No R.1182, (1997); Environment Conservation Act, Act 73 of 1989, Section 22). Used in accordance with the formulations specified by the process Licensor. Plastic strip and clips will be used to cartridge the explosive as sausages. No nitro-glycerine will be used, which means the emulsion sausages will be very much safer and healthier to produce, store and load than the nitro-glycerine containing explosive cartridges originally used on gold mines. The production, storage, testing and despatch will be all in accordance with the requirements of the Explosive Act 26 of 1956 Section 22. The existing company owned farm was granted rights to the rezoning of 5.5 Ha of farm land from agricultural to industrial as well as permission to proceed with the development, by the Explosives Inspectorate of the Department of Labour, Chief Directorate: Occupational Health and Safety in Pretoria, 1995.

4. Upgrade of existing Explosives Product Waste Disposal facility (NW-PWD), (North West Province). Upgrade of an already registered facility's existing explosive open burning facility to a dedicated waste burning area on a wire mesh sheet within a concrete bunded area. (This is a listed activity in terms of Environment Impact Assessment Regulations, Sections 21, 22 & 26 of the Environment Conservation Act, Act 73 of 1989; Atmospheric Pollution Prevention Act No 45 of 1965; Schedule 1 Listed activity 9 of GN. R.1182, 1997). The facility is to be equipped with an extraction hood, fan and a 6m high stack to ensure the adequate dispersion of emissions into the atmosphere. The upgrade will allow for burning of wastes under controlled permit conditions, with monitoring of emissions associated with burning of explosive wastes within the approved explosive safety circles (Refer safety circles explanation under Item 1 above).

The four case studies listed above are all major projects with potentially significant adverse impacts requiring full EIAs. The EIRs of these projects were reviewed using the NWU review checklist

3.2.3 Quality Review Process

The review methodology for the four case study reports NW-MPF, WC-PWD, NW-CEE and NW-PWD followed that of Lee and Colley, commencing at the lowest level (Figure 1) and conducted by two independent reviewers who are familiar with the requirements of the EIAS. Working independently, the findings of the review are recorded on a collation sheet using the assessment symbols shown in Table 5. These symbols do not allow for a 'neutral' assessment, i.e. at any level of review the performance is either satisfactory (C) or not satisfactory (D). Grades for higher levels of the hierarchy are not determined by numerical averages, but by an overall performance grade per category, and again for the review area.

The reviewers met after their independent reviews to compare and discuss the differences identified in the assessment, re-examined some areas and reached consensus. (Lee, 2000). (Sandham and Pretorius, 2007). However, the investigation of the difference in the assessment scores made by the different reviewers of the same EIR and the source of the differences does not form part of this study, therefore only the consensus scores are presented. (Tables 3 and 4).

3.3 RESULTS

While the assessment symbols A – well performed, B – satisfactory and complete, and C – just satisfactory, all reflect differing degrees of 'satisfactoriness', only A and B scores can be regarded as well done, and similarly, E and F scores can be regarded as poorly done. Therefore in order to determine strengths and weaknesses, the best (A to B) and worst (E to F) grades are discussed.

The review results presented include the sub-category level, the category level, the review area level and the overall report. The detailed sub-category review results appear in Table 3.

3.3.1 Review Results at the Sub-category Level

The following were well performed areas at the sub-category levels (4As) – the environment, expected to be affected, by the development (1.4.1); and with (4Bs) - Information presented so as to be comprehensible to the non-specialist (4.2.1); Summaries of data presented in separately bound appendices and presented as an integrated whole (4.2.2). Areas with (3As and 1B) – Name and address of the applicant (1.1.1); description of land use area and different land use areas demarcated (1.2.2); Biophysical description of the site including the relevant physical features and characteristics as landscape features, dynamics and patterns (1.4.2); notice published to the media (2.3.1); and onsite notices placed on proposed development site (2.3.2), was achieved in all four case studies.

Areas achieving (2As and 2Bs) – Description and nature of activity/development (1.1.3); the estimated duration (start/completion date) of the construction phase, operational phase (1.2.3); the number of workers/visitors entering the development site during both construction and operations phases (1.2.4); and their access to site and likely means of transport (1.2.5). Infrastructure servicing the project and means of transporting (i.e. road, rail etc.) raw materials and products to and from the site and approximate quantities involved (1.2.6); cumulative impacts not included in the report (1.4.5); a description of the direct effects and any indirect secondary, cumulative, short, medium and long-term, permanent/temporary, positive/negative effects of the project (2.1.1); description of the effects on the environment and the interactions between these (2.1.2) project divided into phases from which impact activities can be identified (2.2.1);

Other tasks at the sub-category level that were poorly performed are:

- The nature and quantities of raw materials needed during both the construction and operations phases (1.1.8)
- The types and quantities of wastes which might be produced (1.3.1)

- Impacts which might arise from non-standard operating conditions (2.1.3)
- Nature of impacts (i.e. extent, duration, intensity and probability (2.4.1 and predictions of impacts expressed in measurable quantities (2.4.2)
- Methods used to identify alternatives not clearly described (3.1.1)
- Mitigation methods (3.2.2) and how mitigating methods should be done (3.2.3) as well the effectiveness of these measures not included (3.2.4)
- Executive summary of main findings and conclusions (4.4.1) and EIR executive summary of main issued (4.4.2).

The sub-category tasks assessed as not applicable (N/A) during the review period included the emphasis given to severe impacts.

Table 3
Sub-category quality review scores (shading to separate sub-categories per category)
* The criteria listed in the table were summarised for brevity.

Review Topic	Criteria Description	NW-MPF	WC-PWD	NW-CEE	NW-PWD
1.1.1	Identification of Applicant	A	A	B	A
1.1.2	Purpose and objectives of Development	C	B	A	A
1.1.3	Description and nature of activity/development	B	B	A	A
1.1.4	Description of the site	C	B	B	A
1.1.5	Proposed location	B	B	C	C
1.1.6	Description of Processes and Technology employed	D	A	B	B
1.1.7	Expected rate of production	D	A	A	F
1.1.8	Raw materials used during different phases	D	F	C	F
1.1.9	Source and availability of water and materials	C	A	C	C
1.2.1	Site Plan	B	C	A	B
1.2.2	Description and demarcation of Land use areas	A	A	B	A
1.2.3	Estimated duration of different phases	D	A	C	A
1.2.4	Expected number of workers and Visitors	D	D	C	D
1.2.5	Access to site and likely means of transport	F	D	C	D
1.2.6	Infrastructure required servicing	C	D	B	D
1.3.1	Types and quantities of waste and disposal routes	F	A	B	B
1.3.2	Proposed handling and disposal of wastes	C	C	B	B
1.4.1	Indication of likely area to be affected	A	A	A	A
1.4.2	Physical description of the site :	A	A	B	A
1.4.3	Biological Description	C	A	B	B
1.4.4	Social characteristics	C	A	C	C
1.4.5	Cumulative impacts should be included.	D	A	C	C
1.5.1	Important components of the affected environment	C	A	C	A
1.5.2	Interaction and effect of project on existing environment	F	A	C	B
2.1.1	Description of effects of project on environment	D	C	C	D
2.1.2	Description of effects on environment	C	C	C	D
2.1.3	Impacts from non-standard operating procedure	C	A	F	A
2.1.4	*Impacts from deviation from Base Line conditions*	B	A	C	A
2.2.1	Project divided into distinct phases	D	A	C	B
2.2.2	All the possible impacts from each phase identified	D	A	C	B

Review Topic	Criteria Description	NW-MPF	WC-PWD	NW-CEE	NW-PWD
2.3.1	Example of notice in published in media	A	A	B	A
2.3.2	On-site Notice	A	A	B	A
2.3.3	Identify affected people	A	B	C	C
2.3.4	Identitfy Interested people	B	C	B	B
2.3.5	Procedure whereby I&A parties can participate	C	F	B	C
2.3.6	Provision for I&A parties to express their views	C	C	C	B
2.3.7	List of issues identified	A	C	A	F
2.3.8	Notification criteria	A	A	C	D
2.3.9	A record of all the views as an addendum	A	D	B	D
2.3.10	Evidence that I&A parties were approached	A	B	A	F
2.3.11	Key impacts identified for further investigation	D	A	C	B
2.4.1	Prediction of impact magnitude	F	B	C	B
2.4.2	Quantification of impact magnitude prediction	F	A	C	A
2.5.1	Significance of impact to affected community	C	A	B	B
2.5.2	Significance of impact (Nature, intensity, duration, probability, extent)	D	A	C	B
2.5.3	Method of assessing significance & rating	D	D	C	B
3.1.1	Description of methods used to identify alternatives	E	D	C	F
3.1.2	Description of analysis of range of alternatives	D	B	C	C
3.1.3	Investigation of at least 2 alternatives	B	A	C	B
3.1.4	Discussion and reason for final choice	B	A	C	B
3.2.1	Description of mitigation measures	C	A	C	A
3.2.2	Mitigation measures considered	F	C	C	C
3.2.3	Mitigation measures clearly defined	F	B	C	C
3.2.4	Indication of effectiveness of mitigation measures	F	B	C	C
4.1.1	Introduction briefly describing the project	C	A	C	A
4.1.2	Logical arrangement of information	C	A	B	A
4.1.3	External Sources acknowledge	D	C	C	D
4.2.1	*Comprehensible to non-specialist*	B	B	B	B
4.2.2	Presented as an integrated whole	B	B	B	B
4.3.1	Emphasis given to severe impacts	C	B	N/A	B
4.3.2	EIR should be unbiased	C	B	C	B
4.4.1	Executive summary of main findings and conclusions	F	F	F	F
4.4.2	EIR executive summary of main issues	F	F	F	F

Overall EIR Score, Review Areas and Review Categories		NW-MPF	WC-PWD	NW-CEE	NW-PWD
Review Area 1. Description of the development, local environment and baseline studies		C	B	B	B
1.1	Description of the development	C	B	B	B
1.2	Site description	C	C	C	B
1.3	Wastes	C	B	B	B
1.4	Environment description	B	A	B	B
1.5	Baseline conditions	C	A	C	B
Review Area 2. Identification and evaluation of key Impacts		C	B	C	B
2.1	Definition of potential impacts	C	C	C	B
2.2	Identification of impacts	D	A	C	B
2.3	Scoping	A	B	B	C
2.4	Prediction of impact magnitude	C	B	C	B
2.5	Assessment of impact significance	C	B	C	B
Review Area 3. Alternatives and Mitigation Impacts		C	C	B	B
3.1	Alternatives	C	C	C	B
3.2	Scope and effectiveness of mitigation measures	C	C	C	C
Review Area 4. Communication of results		B	A	B	B
4.1	Layout (Information)	B	A	B	B
4.2	Presentation (information)	C	B	B	B
4.3	Emphasis (Impacts)	C	B	N/A	B
4.4	Executive Summary	F	F	F	F
Overall EIR scores		C	B	B	B

3.3.2 Review results at Category Level

The 4 case studies were rated satisfactory despite omissions and/ or inadequacies. A 91% satisfactory performance was found at the category area level and 8% well performed (Table 4). These findings are very similar to those reported by Lee, (2000) for EIRs in general in both high-income and low-income countries where 70% or more EIRs were graded at C or above.

Table 4: Total Performance in Percentages of the Review Categories of the 4 case studies

Symbol	Explanation	Number Symbols
A	Generally **well performed**, no important tasks left incomplete	5 (8%)
B	**Generally satisfactory** and complete, only minor omissions and inadequacies	28 (44%)
C	Can be considered **just satisfactory** despite omissions and/or inadequacies	25 (39%)
D	Parts are well attempted, but must, as a whole, be considered just **unsatisfactory** because of omissions or inadequacies	1(2%)
E	Not satisfactory, significant omissions or inadequacies, **poor attempt**	0 (0%)
F	Very satisfactory, important task(s) poorly done or **did not attempt**	4 (6%)
N	Not applicable. The review topic is not applicable or irrelevant in the context of this EA report	1 (2%)
Total		64 (100%)

It was found in the assessment that all 4 review areas were performed satisfactorily (Table 5). Only Review Area 4 (Communication of results) *can be regarded as well done with* (1A & 3Bs). However, Review Area 1 (Description of the development and the environment), Review Area 2 (Identification and evaluation of key impacts) and Review Area 3 (Alternatives and mitigation of impacts) were weaker with 3Bs & 1C, 2Bs & 2Cs and 2Bs & 2Cs respectively.

That al four reports were considered satisfactory (3Bs) and 1 just satisfactory (1C) in terms of the review results, suggests that the decision

making by the relevant environmental authorities was based on overall satisfactory quality information.

Table 5: Review results at the review category area and report levels

Review Category	Review Results			
	NW-MPF	WC-PWD	NW-CEE	NW-PWD
Review Area 1 Description of the Development	**C**	**B**	**B**	**B**
1.1. Description of the development	C	B	B	B
1.2. Site description	C	C	C	B
1.3. Wastes	C	B	B	B
1.4. Environment description	B	A	B	B
1.5. Baseline conditions	C	A	C	B
Review Area 2 – Identification and evaluation of key Impacts	**C**	**B**	**C**	**B**
2.1. Definition of Potential Impacts	C	C	C	B
2.2. Identification of impacts	D	A	C	B
2.3. Scoping	A	B	B	C
2.4. Prediction of impact magnitude	C	B	C	B
2.5. Assessment of impact significance	C	B	C	B
Review Area 3 – Alternatives and mitigation	**C**	**C**	**B**	**B**
3.1. Alternatives	C	C	C	B
3.2. Scope and effectiveness of mitigation measures	C	C	C	C
Review Area 4 – Communication of results	**B**	**A**	**B**	**B**
4.1. Layout (information)	B	A	B	B
4.2. Presentation (information)	C	B	B	B
4.3. Emphasis (impacts)	C	B	N/A	B
Overall EIR scores	**C**	**B**	**B**	**B**

3.3.3 Quality of the Review Areas

The results obtained from the use of the (South African) NWU review checklist are similar to other South African studies concerning EIA (Moloto, 2005; Pretorius, 2006) which show similar patterns of distribution as well as results from outside South Africa. However, there are some differences – some weakness in RA1, 2 & 3, but relative strength in RA4, which differs somewhat. The more common pattern is best performance in RA1 and 4, and weakest in RA 2 and 3.

Review Area 1 – Description of the development and the environment

The aim of this Review Area is to describe the site, the environment in which it is situated and the baseline conditions that prevail. The EIRs contained satisfactory descriptions of the environment (1A and 3Bs), generally satisfactory for the base line conditions (1A, 1B and 2Cs),

description of the development (3Bs and 1C), for the site description (3Cs and 1B); estimated quantities of wastes scored (3Bs and 1C); Site description scored (1B and 3Cs). Problem areas related to the estimated duration of the different phases, number of workers entering the site and their access to the site, means of transport, and infrastructure required, which in most of the EIRs were either unsatisfactory or poorly attempted. Information on the means of transporting and use of raw materials and products to and from the site and the approximate quantities involved, were generally less than satisfactory.

Review Area 2 – Identification and evaluation of key impacts

In this review area two reports received a satisfactory grading and two reports were found to be just satisfactory. Scoping was satisfactory with (1A, 2Bs & 1C), while prediction of impact magnitude (2Bs & 2Cs) and assessment of impact significance 2B & 2Cs) also just satisfactory.

Although the cases showed evidence of impacts identified for the projects as a whole, even though the regulations required that the impact of each phase of the development (planning, construction, operation and decommissioning be identified separately, two cases gained (1A & 1B), while the other two gained (1C & 1D) respectively. Omission and deficiencies observed in this area included: coverage is mainly confined to direct impacts with poor treatment of cumulative and secondary impacts in all phases and identification of all possible impacts was only just satisfactory. (Table 5).

Review Area 3 – Alternatives and mitigation of impacts

As shown in Table 4 all 4 reports were just satisfactory. For Alternatives one project scored (1B), while the other scores were (3Cs). No categories in this review area received an unsatisfactory grade, except one E and one F score recorded for the Sub-Category 3.1.1 (Table 3) are the only unsatisfactory scores for this area.

Both the categories 3.1 Consideration of alternatives and 3.2 Scope and effectiveness of mitigation measures were both rated with just satisfactory in all the reports. (Table 5).

Review Area 4 – Communication of results

This was the best performed review area with 1A, 3Bs at category level with regard to Layout of information (1A & 3Bs), whereas the presentation of the information resulted in (3Bs & 1C). A single N (not applicable) at sub-category level and category level, (4.3.1 - Emphasis given to severe impacts). The layout of the report (Review Area 4) scored 1A, 3Bs.
A poorly performed area scoring 4Fs was added on the review topic Executive summary whereby there should be a clearly written executive summary of the main findings of the study and how they were reached for the explosives industry. Although all the case studies had reasonable adequate data, there was not evidence of an executive summary. Although this is poor practice, but since it was not a regulatory requirements, it is understandable. Although the area could still be scored at A and B level, which links to the argument that they should/could have been scored as N. (Table 5).

3.3.4 Review Results of the Overall Report

Three of the four case studies were rated satisfactory overall despite omissions and/or inadequacies with a B ratings (satisfactory) for WC-PWD, NW-CEE and NW-PWD and a C rating (just satisfactory) for NW-MPF, (Table 6). These results suggest that the environmental authority's decision was based on the overall satisfactory quality of information.

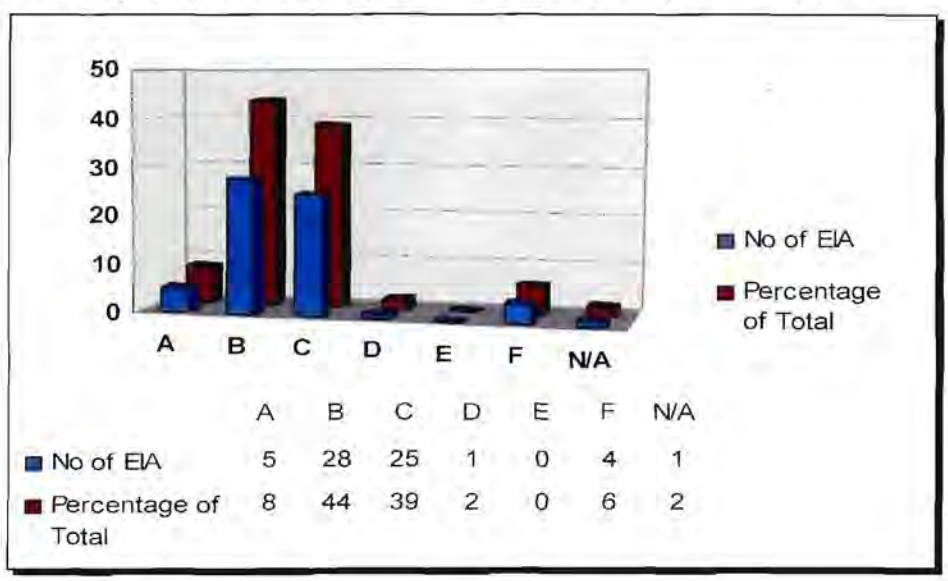
Table 6: Review Results of the Review Areas

REVIEW AREA	Review Results			
	NW-MPF	WC-PWD	NW-CEE	NW-PWD
1. Description of the development, local environment and baseline studies	C	B	B	B
2. Identification and evaluation of impacts	C	B	C	B
3. Alternatives and mitigation of impacts	C	C	B	B
4. Communication of results	B	A	B	B
OVERALL REPORT SCORE	C	B	B	B

As with the overall reports these are in agreement with international findings (Lee, 2000) and elsewhere in South Africa (Sandham et al., 2007. 2008a) where a better performance is observed in the more descriptive areas (Review Area 1 and 4) and poorer performance in the technically more demanding areas (Review Areas 2 and 3). (Table 6)

The analysis of the overall quality of the EIRs in the sample (Fig. 2) indicates that 94% of the reports were graded satisfactory (A-C). 8% of the reports were graded as well performed, while 44% of the reports were graded as generally satisfactory (B) and 39% were graded just satisfactory (C). Of the remaining reports, 2% were unsatisfactory (D) and 6% (F) did not attempt and 2% was marked N/A.

Figure 3: Review category grades for the EIRs. A – well performed, B – generally satisfactory, C – just satisfactory, D – unsatisfactory, E – poor attempt, F – did not attempt



	A	B	C	D	E	F	N/A
No of EIA	5	28	25	1	0	4	1
Percentage of Total	8	44	39	2	0	6	2

3.4 CONCLUSIONS AND RECOMMENDATIONS

3.4.1 Conclusions:

The review categories in each review area allowed for strengths and weaknesses to be determined regarding categories and sub-categories containing only A and B grades as strengths and those with only E and F grades as weaknesses.

Two categories obtained only A and B grades and can be regarded as well performed, these being Description of the proposed development environment development (Category 1.4 – 1A and 3Bs), Layout of information (Category 4.1 – 1A and 3Bs). There was one category with F grades (Category 4.4 – 4Fs), which were the poorest performed.

The distribution of A and B scores shows some evidence that there are areas of strength, mainly in Review Areas 1 and 4. The weaker scores of F reveal no significant weakness at category level, although at sub-category level a few areas of weaker performances are evident. The areas of Wastes and Predictions of impact magnitude which were poorly performed in these studies where they tend to be better performed with the rest of the categories in Review Area 1 and review Area 2. A significant amount of variation in scores was observed amongst different reports, where overall scores are the same, but with variation at lower tiers, e.g. the communication of results EIR executive summary for all four case studies had the most F category scores, but also most A and B scores apart from 2Cs score, but this communication of results received 1A and 3Bs for overall report quality. The scores in the sub-category level indicate that several areas did not receive the attention with regard to the consideration of alternatives, definition of impacts and prediction of impact magnitude. Weaknesses regarding alternatives are exacerbated by the fact that EIA is seldom part of the life cycle of the project (Wood, 2003). These areas are of critical importance if EIA is to achieve sustainability. Alarming still is the indication that a large percentage of EIRs are barely of an acceptable standard. Alarming still is the indication that a large percentage of EIRs are barely of an acceptable standard. Only 44% of all the EIRs reviewed scored B and 8% scored a well performed A, indicating although there appears to be sufficient skill in environmental description and communication of findings, assessment of impact significance needs to be improved and the absence of detail review guidance is a constraint, since environmental assessment practitioners have little idea of what is required for best practice EIRs.

3.4.2 Comparison to other South African Studies

In comparison to other results in South Africa, the results obtained from the use of the NWU review package are very similar to other South African studies concerning EIA, which showed similar patterns of distribution, in the study of (Sandham et al., 2008a), who obtained higher scores in Review Areas 1 and 4 and lower in Review Areas 2 and 3. This is not

dissimilar to the comparative study (Sandham et al 2008b) results of EIRs in the mining industry, which tended to score higher in Review Areas 1 and 4 and lower in Review Areas 2 and 3. Similar results were also the case in a comparative study of (Barker and Wood, 1999). However, the uniquely South African practice of having separate governmental departments administering the practice of EIA complicates direct comparisons with international results due to the separate sets of legislation, which can be perceived to be in conflict.

3.4.3 Recommendations

Environmental impact assessment (EIA) is being used globally, either as a planning or management tool, in order to minimise the harmful consequences of development. Its emphasis is on prevention and it is hence an example of the precautionary principle (Glasson, 1995a).

A successful implementation of the EIA process depends on the production of high quality reports. It is recommended that availability and use of a quality review checklist for explosive projects by EIA practitioners and authorities to be used as an additional tool to the EIA regulations (South Africa 2006). This can further improve the quality of the EI reports for explosive projects. Regular use of a review checklist can ensure that key issues are addressed for the proposed development and could assist in fast-tracking the approval process often delayed by the request of additional information from the applicant, as a result of inadequate reports, while at the same time striving for sustainability of the environment. Regular use of the review checklist by EIA practitioners and authorities for ascertaining the quality of the environmental impact reports will contribute to a baseline of EIR quality for evaluating explosive projects EIA practice under the new 2006 regulations.

Quality review of EIRs is just one method component in evaluating the effectiveness of EIA systems. Results indicate that overall, much more needs to be done within the explosive and other areas in order to ensure effective EIA practice in South Africa.

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Chapter 4 – CONCLUSION

4.1 CONCLUSION

EIA is one of the tools used to achieve sustainable development, a concept that is present throughout South African environmental legislation. The quality review of four EIRs in the explosive industry was carried out with the use of a South African quality review package adapted to accommodate the scoping reports in accordance with the regulatory requirements in South Africa and a lesser focus on best practice, in contrast to the Lee and Colley package with a primarily best practice focus.

Two independent reviewers carried out the review using the assessment symbols A – well performed, B – satisfactory and complete, and C – just satisfactory, all reflect differing degrees of 'satisfactoriness', only A and B scores can be regarded as well done, and similarly, E and F scores can be regarded as poorly done. Therefore in order to determine strengths and weaknesses, the best (A to B) and worst (E to F) grades are discussed and all results recorded on a collation sheet. Although there were differences of scores at the sub-category, these were eliminated as the review moved up the hierarchy and there were no differences at the level of review areas or overall scores. This was deemed sufficient to allow further reviews to be conducted by a single reviewer.

The results show that for the sample of the case studies, in terms of the review package, EIR quality in the explosive industry is of a generally satisfactory standard. Few areas scored significantly below acceptable limits in terms of C or better, but the result indicate that several key areas did not receive the attention they should have, especially the consideration of alternatives and mitigation, where all significant adverse impacts should be considered for mitigation. The distribution of results between scores A to F in some review areas and review categories compared to the clumped distribution of scores in other review areas and categories serves as indication of possible inexperience on the part of the consultant or more compliance with regulations. Although the results reflect the results of

other studies, both nationally and internationally, indicate that although the specific legislation may vary, there is conformity to an overall standard of EIA. The quality of the EIRs in the South Africa explosive industry also reflect this, which is in indication that the EIRs conform to internationally accepted standards and that the EIA system is producing generally similar EIRs to international practice, which does not necessarily mean that EIAs in other countries are well performed. Although the quality review of EIRs is one method used to evaluate the effectiveness of the EIA system, the results indicate that overall perhaps more needs to be done within the explosive industry and other areas to ensure effective EIA practice in South Africa.

APPENDIX A

Environmental Impact Assessment Review

Guide for Authors

The South African Geographical Journal
Information for Contributors

STYLE SHEET FOR CONTRIBUTORS

Authors must adhere to the style as laid out here when preparing manuscripts for submission to the Journal. Failure to do so will delay refereeing and publication. Note: S.I. units must be used throughout; tables should be appended on separate sheets; a separate list of figure captions must precede the figures; and figures should be appended on separate sheets. Figures must be clear and legible for reproduction at single column width; computer graphics of high quality are only acceptable if the line-work and lettering is comparable to conventional productions.

The first page of the typescript should contain the title of the paper and the name(s) and full address(es) of the author(s) in the style shown e.g.:

RAINFALL AND AGRICULTURE IN THE EASTERN CAPE, 1900-1994

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The second page must repeat the title of the paper, followed by an **abstract** of approximately 100-200 words in which the principal findings of the research should appear.

RAINFALL AND AGRICULTURE IN THE EASTERN CAPE, 1900-1994

Abstract

Climatological records show dramatic variability of rainfall in South Africa as a whole during the twentieth century. In theory, agricultural productivity should match these variations, a proposition that is tested with specific reference to crop yields in the eastern Cape. Strong associations do indeed exist between rainfall patterns and agricultural activity. Other changes, such as variations in farm size and farming technologies, appear to exert little effect.

The introduction (and subsequent text) must be typed in double-spacing. The introduction should not contain any subheadings. Leave a space between paragraphs. References to be cited as shown. List citations in ascending date order and alphabetically within the same year. One or more publications by an author in the same year must be distinguished by appending letters a, b, c to the citations. Main headings should be in bold type.

Introduction

Throughout the history, human activity on the land has been governed by the availability of water. In all the available historical research, however, little attention has been given to quantitative estimates of the precise relationship between.... Furthermore, in South Africa, data is now available for the first time, which allows detailed examination of the effect of changes in farming practices on crop yields.

In their discussion the historical geography of agriculture, both Smith (1977) and Andrews (1978) show a keen awareness of the climatological constraints ...

Indent and punctuate particular points as shown, and designate alphabetically. The expression et al. is used when the work of more than two authors of one work is being cited. Use 'n.d.' to show that a work has no publishing date. Foot-noted material to be marked with a superscript.

Rainfall Variability in South Africa

The principal rainfall variations in South Africa have been studied only recently (Reed, 1994). Preliminary screening of climatological data in Southern Africa by Deane (1980, 1983b) shows that numerous sites in the eastern Cape are subject to extreme variations (Fig. 1). Data on precipitation at selected mission stations in the nineteenth century show that:

(a) rainfall was heaviest in summer;
(b) rainfall exhibited great variations within decades1; and
(c) yield varied in concert with rainfall, with a lag of several months (Parker et al., n.d.).

These findings differ markedly from those reported in the study undertaken ten years ago during storm conditions (Brown, 1986), but approximate those made by Gill (1989).

Type sub-headings in italics aligned with the left margin of text. Avoid placing subheadings directly after a main heading. Refer to Figures and Tables as shown. Quantities less than ten should be expressed verbally, otherwise numerically.

Agriculture in the Eastern Cape

Information pertaining to crop yields at 1 117 Cape farms disclose a strong geographical variation which is best understood in terms of two major regions.

The Northern District

The two most distinctive features of yields in this part of the country are ... (Figs 2 and 3). Altogether, ten per cent of the crop yields ... Precipitation at each of the stations shows a very pronounced diurnal variation (Table 1). Early morning and early evening patterns are similar excepting at land lying higher than 1 000 m, but at all other times ...

The Southern District

There are three notable components evident in the eastern zones of the study area (Deane, 1993a). As suggested elsewhere (Francis, 1977, 1978) these accord well with observations that ...

Direct quotations should be cited using double inverted commas and must contain a page(s) reference. Direct quotations which are more than three lines in length should be inset from both margins and typed in single spacing without inverted commas. Avoid ending a paragraph with a long direct quotation.

Rainfall-Agriculture Relationships

In her landmark study, Tessig (1965, p.89) proposed that in dry areas especially, regional studies of arable and pastoral activity which failed to attend to climatic constraints were `a charade'. Others have made the same argument (Yelch, 1962; Bore, 1988), although Tedious (1977, pp. 286-287) has noted that:

> Direct links between climate and agriculture are never proven absolutely until the likely mediating affect of human agency can also be ascertained, and this is the true challenge facing interdisciplinary research science today.

Taking these various opinions into account, and bearing in mind the well known warning given in 1902 by a Government minister, 2 who ...

Equations should be laid out as shown below:

The relationship between rainfall and production of maize may be expressed as follows:

$$P = 1{,}53R + 0{,}86T \qquad (1)$$

where P is production in tonnes ha-1, R is January-March rainfall in mm, and T is a measure of technology levels (Gill, 1989).

Do not introduce new material in the conclusion, and do not use point form in this section. Acknowledgements should follow immediately after the text.

Conclusion

In the eastern Cape during the twentieth century the nature of agricultural activity correlates extremely strongly with patterns of rainfall. On the one hand, ... On the other hand, ...

Taking into account the major differences pinpointed in the Cape region, it is reasonable to suppose that...

Acknowledgements

Grateful thanks are due to M.J. Mouse who drew the maps, and to the Dollar Foundation which provided financial support for the research. The conclusions reached are solely those of the authors.

Footnotes should be kept to a minimum and must be collected numerically at the end of the typescript. Use small superscript digits to number the notes, and indent the text of the notes. Notes should be used for archival references and **not** as a device for elaborating the text or making asides.

Notes

[1] Central Archives Depot, Pretoria

[2](CAD), Department of Agriculture (DA) 468 (12/345): Memoranda concerning production of grain in the colonies, March 1976 - December 1993 2 CAD, DA 469 (47/521): Minister of Lands to Prime Minister, 12 October 1902 3

[3]Ibid., 9 December 1902.

The reference list

The reference list is **not** a bibliography and must contain only material which is cited in the text. **Complete information should be provided for every reference**. Organise the references alphabetically without numbering. The initials of authors and/or editors must appear behind the surname(s). Use the convention 'Anon.' to refer to unknown authors. Do not use 'et al.' in the reference list. Date of publication must appear as in the examples. Punctuate all material exactly as shown. The only words which are capitalised in the titles of journal articles are proper nouns. The titles of journals should **not** be abbreviated. Book and periodical titles should be italicised. Volume numbers must be included for journals, but part numbers should only be used if the pagination in successive issues is not sequential. The names of book publishers and city/town of publication must be included. Monographs and dissertations/theses to be cited in the style shown. Leave a blank line between references.

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Sample figure and table captions

These should be presented on separate sheets immediately preceding the figures.

Figure Captions

Figure 1: The spatial variation of rainfall off the east coast in the summer of 1949 (from Wetty, 1954).
Figure 2: The geography of crop yields.
Figure 3: Rainfall - crop yield relationships, 1944-1954.

Table Captions

Table 1: Farm size classification in the Cape, 1956-1978 (Source: South Africa (Republic), 1976

The South African Geographical Journal
Information for Contributors

The South African Geographical Journal considers publication of original material on all aspects of geography, both physical and human, with particular relevance to southern Africa. Material published includes peer-reviewed research papers, review articles on specific topics of geographical interest and short research notes, and book reviews. The major requirement for publication is the significance and value of the work for the development for geography and geographers. Authors receive a complimentary copy of the Journal and 25 reprints free of charge; additional reprints may be ordered.

1. Full-length articles should not normally exceed 7,500 words in length. Manuscripts should be typed double-spaced with wide margins, and must be submitted in triplicate. The title, the author's name(s) and affiliation(s) should appear on a separate sheet.
2. Original photographic positives of all figures, together with photocopies of figures to accompany the two reviewer copies of the text, must accompany all submissions. All figures should be sized to fit either a double or single column of the Journal when reproduced full-size, or reduced by a factor or two. Computer drawn graphics are acceptable only if they are of comparable quality of those produced conventionally; line-

work must be clear and readily reproducible, and computer characters should be replaced with typeset lettering. Figures will be reviewed by our Cartographic Advisor, and those not meeting our standards will be returned for revision. Figure captions should not accompany the figures, but be typed on a separate sheet.

3. Tables should be included at the appropriate point in the text.
4. Layout and referencing MUST follow the style of the Journal. Incorrectly referenced papers will be returned to the authors for correction.
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