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GENERAL NOTICE

NOTICE 546 OF 1994

SAFETY IN MINES RESEARCH ADVISORY COMMITTEE

CALL FOR RESEARCH PROJECT PROPOSALS

SUBMISSION FOR PROPOSALS FOR RESEARCH PROJECTS IN MINE SAFETY ARE INVITED
IN THE FIELDS AS STIPULATED BELOW OR IN ANY ADDITIONAL FIELDS

(The committee is not obliged to accept any of the proposals and each proposal will be considered on its merits.)

GOLD AND PLATINUM MINES

1. SAFETY/HEALTH RISK

Description: Injury or fatality caused by the instability of an excavation during a seismic event/rockburst.

SUGGESTED RESEARCH TOPIC

Title: Improvement of worker safety through the investigation of site responses to rockburst event mechanisms.

Primary output: Recommendations for stable excavation and support design adjusted according to type and cause of seismic activity in a certain geotechnical area.

Envisaged scope of possible research project:

- Compare damaged and undamaged areas after seismic events and try to determine the difference; e.g. haulages suffer damage over short distances, why not for larger areas? (Some data will become available from other investigations conducted after major rockburst involving multiple fatalities.)
- Similarly, stopes collapse while the adjacent ones remain undamaged—determine the difference in order to improve design/support criteria for seismically active areas.
- Stand-alone seismic wave recorders (black boxes) to be installed at selected sites to study site responses.

2. SAFETY/HEALTH RISK

Description: Rockfall accidents in gold and platinum mines, resulting from failure to detect dangerous hanging wall conditions because of inadequate examination techniques and inadequate or unsuitable illumination.

SUGGESTED RESEARCH TOPIC

Title: Investigate improved techniques to detect unsafe hanging wall conditions in gold and platinum mines, to reduce rockfall injuries and fatalities.

Primary output: Report on possible, more reliable techniques, equipment, systems (including illumination) for identifying unstable hanging wall conditions in gold and platinum mines.

Envisaged scope of possible research project:

- One year project.
- Investigate practices and procedures of examination (including current, illumination standards), look for ways of improving these by providing criteria which can be used by the persons responsible for making safe and recommended additional practical techniques and/or equipment which could be used or developed to assist in the reliable detection of unsafe hanging wall conditions in gold and platinum mines.

3. SAFETY/HEALTH RISK

Description: Injuries and accidents in gold and platinum mines, to which environmental factors could have contributed.

SUGGESTED RESEARCH TOPIC

Title: Investigate the role of environmental factors in causing or contributing to underground accidents in gold and platinum mines.

Primary output: A report identifying the role of environmental factors causing or contributing to underground accidents in gold and platinum mines and recommending changes to accident reporting systems to include such contributory factors.

Envisaged scope of possible research project:

- One year project.
- Identify which environmental factors cause or contribute to accidents and to what degree. (Noise, illumination, heat, etc.)
- Should include examinations of recent accidents. (Interviews with accident victims, supervisors etc.—do not depend on accident records.)
- Must include surface (e.g. open cast) and underground operations. (Same reporting system used.)
- Examine present accident/safety reporting system and make recommendations on how best to change this so that reports properly reflect the contributions of environmental factors to unsafe conditions and accidents.
- Recommend further work to improve safety, where appropriate.

4. SAFETY/HEALTH RISK

Description: Falls of ground leading to injury or death—Inadequate techniques of testing quality of rockbolt installation in gold and platinum mines.

SUGGESTED RESEARCH TOPIC

Title: Critically evaluate techniques for the *in situ* testing of steel tendon grouting effectiveness, as a basis for reducing falls of ground injuries and fatalities.

Primary output: Recommendations on the most promising technique to be developed for testing the efficiency of grouted steel in rockbolts *in situ*, to minimize the likelihood of falls of ground.

Envisaged scope of possible research project:

- One year project.
- Critical review of past work.
- Examine existing rockbolt installation techniques.
- Establish deficiencies with present rockbolt installation.
- Recommend further work to develop testing technique for quality grouted rockbolt installation.

5. SAFETY/HEALTH RISK

Description: Injuries or fatalities arising from rockbursts and rockfalls caused by seismic events in gold and platinum mines.

SUGGESTED RESEARCH TOPIC

Title: Reduce injuries and fatalities in gold and platinum mines through a better understanding of the mechanisms of seismicity.

Primary output: A quantitative description of seismic sources recorded at intermediate and near field to improve the use of quantitative seismology on mines and thus enhance the safety of workers.

Envisaged scope of possible research project:

Phased approach (3 years):

- In 1995, study sources recorded at intermediate field.
- In 1996, study sources recorded at near field.
- Develop description of seismic sources from work done in 1995 and 1996.
- Formulate and evaluate proposals on how monitored seismic data can be used to reduce risks and enhance safety.

6. SAFETY/HEALTH RISK

Description: Fall of ground injuries and fatalities.

SUGGESTED RESEARCH TOPIC

Title: Develop a reliable cost effective technique for *in situ* ground stress measurements in deep gold mines.

Primary output: Literature survey and feasibility study.

Envisaged scope of possible research project:

- 6-month project.
- Literature survey of existing stress measurement techniques.
- Feasibility study for a reliable, cost effective stress measurement technique.

COAL MINES

1. SAFETY/HEALTH RISK

Description: Injury or fatality caused by underground machinery or transport in coal mines.

SUGGESTED RESEARCH TOPIC

Title: Quantify the nature and magnitude of the contribution of engineering factors to the risk of injury or fatality caused by underground machinery or transport and delineate the essential causes.

Primary output: *Phase 1:* A risk assessment quantifying the magnitude and nature of the risk to workers caused by the engineering and physical factors associated with underground machinery and transport and providing a focus for further work to alleviate such risks.

Phase 2: Recommendations on improved reporting and investigating procedures for underground machinery or transport related accidents.

Envisaged scope of possible research project:

Phase 1:

- Interview accident victims and witnesses.
- Analyse and evaluate accidents leading to injury or fatality.
- Identify the engineering, physical and environmental factors contributing to such accidents.
- Quantify the magnitude and nature of the risk to workers caused by the various factors, in such a way as to provide a focus for further work to alleviate such risks.
- Recommend further work aimed at alleviating such risks.

Phase 2:

- Examine and analyse existing reporting procedures and investigating techniques for accidents caused by underground transport and machinery.
- Recommend improved reporting procedures and investigating techniques that properly highlight the causes and contributing factors.

2. SAFETY/HEALTH RISK

Description: Injury or fatality caused by underground machinery or transport in coal mines.

SUGGESTED RESEARCH TOPIC

Title: Quantify the nature and magnitude of the contribution of human factors to the risk of injury or fatality caused by underground machinery and transport and delineate the essential causes.

Primary output: Report quantifying the nature and magnitude of the contribution to underground machinery and transport accidents made by human factors.

Envisaged scope of possible research project:

- First phase of a possible longer project, depending on recommendations.
- 6 months to 1 year duration initially.
- Interview accident victims, witnesses, supervisors and management.
- Analyse and evaluate accidents leading to injury or fatality.
- Identify the human factors contributing to such accidents, distinguishing between those attributable to—
 - > workers' approaches;
 - > supervisors' approaches;
 - > management approaches;
 - > training techniques.
- Recommend further work or changes in attitudes, approaches, training etc., needed to alleviate such accidents.

3. SAFETY/HEALTH RISK

Description: Explosions and fires.

SUGGESTED RESEARCH TOPIC

Title: Evaluate methods for dynamic goaf ventilation and methane drainage to reduce the explosion and fire risks of methane layering.

Primary output: Recommendations on ventilation methods to render methane layering harmless.

Envisaged scope of possible research project:

- Phased long term project.
- Investigate methane layering, how it arises, where it occurs.
- How can methane layering be rendered harmless?
- Recommend effective ventilation methods.

4. SAFETY/HEALTH RISK

Description: Explosions and fires.

SUGGESTED RESEARCH TOPIC

Title: Reduce explosion and fire risks by improving the ventilation of Continuous Miner Headings.

Primary output: More effective and safer systems of ventilation for Continuous Miner Sections and Headings.

Envisaged scope of possible research project:

- Medium-term, phase project.
- Basic studies of novel ideas such as air and water curtains for ventilation control, making the atmosphere at the drum inert and chemical removal of methane, either at the face or by seam infusion.
- Approach to be in the context of the general ventilation of Continuous Miner Sections and not limited only to the heading.

5. SAFETY/HEALTH RISK

Description: Explosions and fires.

SUGGESTED RESEARCH TOPIC

Title: Identify methods to reduce the risks of explosions and fires caused by frictional ignition hazards.

Primary output: A summary of the causes of frictional ignitions with recommendations for prevention.

Envisaged scope of possible research project:

- Short term project (6 months).
- Technology search and analysis (local and overseas).
- Applicability of overseas technology to local conditions.
- Recommendations on equipment, techniques, control methods to prevent frictional ignitions.
- Emphasis to be on prevention aspects-identify techniques and determine applicability.

6. SAFETY/HEALTH RISK

Description: Explosions and fires.

SUGGESTED RESEARCH TOPIC

Title: Improve worker safety by development warning systems for potentially explosive gas/dust mixtures.

Primary output: Recommendations for the use or development of appropriate warning systems.

Envisaged scope of possible research project:

Medium term, phased project:

Phase 1:

- Review available literature to establish the composition of potentially explosive gas/dust mixtures in South African collieries. (Note: In this context, "gas" is not necessarily restricted to methane.)
- Then investigate the availability and applicability of detection and warning systems for potentially explosive gas/dust mixtures and recommend suitable systems for use in SA coal mines.
- Recommend further work to be undertaken in subsequent phases, if appropriate.

(Note: The work of the first phase should indicate how the "explosivity" of gas/dust mixtures can be measured *in situ*, and how workers can be warned rapidly and effectively of a detected hazard as a result.)

7. SAFETY/HEALTH RISK

Description: Fall of ground injuries or fatalities.

SUGGESTED RESEARCH TOPIC

Title: Investigate what causes South African miners to go inappropriately under unsupported roof so that measures can be formulated to ensure or promote safer practices.

Primary output: A report providing an analysis of why South African miners go under unsupported roof, together with practical recommendations on how to address (rectify) the underlying causes and formulate measures to ensure or promote safer practices.

Envisaged scope of possible research project:

- One year project.
- It should establish a psychological profile of South African miners and supervisors and compare this with the equivalent (existing) American and Australian profiles. The research should among other things include the following socio political and environmental factors, together with any other relevant factors:
 - > Levels of suspicion and distrust;
 - > the effect of management example;
 - > the effect of religion/superstition;
 - > ability to grasp and retain information and the ability to relate this to the practical environment.

- Incidences of accidents resulting from the described hazard should be compared with National/Cultural/Environmental characteristics and factors identified that pre-dispose South African coal mine workers to disregard this hazard.
- Practical recommendations should be made on how to address the causes for disregarding this hazard, together with recommendations for further work, if appropriate.
- Related work has previously been conducted by the United States Bureau of Mines and may serve as a grounding.

(Note: A high proportion of fall of ground accidents are due to either a failure to recognise hazards or a failure to adhere to safety standards and procedures.)

8. SAFETY/HEALTH RISK

Description: Fall of ground injuries and fatalities.

SUGGESTED RESEARCH TOPIC

Title: Develop a seismic early warning device for the early detection of goafing so as to reduce injuries and fatalities from falls of ground and associated air blasts.

Primary output: Develop an early warning device for the detection of imminent goafing. It may also be feasible to develop other geophysical techniques to achieve the same goal.

Envisaged scope of possible research project:

- Noting that seismic early warning device has reached an advanced stage of development (CSIR - Miningtek), the primary concern is to pre-set the trigger levels in order to ensure that Continuous Miners and normal mining operations do not trigger the system.
- The project would therefore involve the monitoring of goafing on an ongoing basis to establish the frequency range of the goafing process, and the background noise associated with mining. The trigger levels can then be pre-set to detect goafing associated activity.
- If early warning by seismic techniques proves not to be feasible, other geophysical techniques should be evaluated by means of a technology survey and appropriate recommendations made for alternative approaches.

(Note: Many fall of ground fatalities involve high extraction mining operations. In many cases the fall was triggered by a sudden "unexpected" goaf overrun, or a fall triggered by goafing. Both the sidewalls and roof were responsible for the fatalities.)

9. SAFETY/HEALTH RISK

Description: Fall of ground injuries and fatalities.

SUGGESTED RESEARCH TOPIC

Title: Reduce fall of ground injuries and fatalities by developing a remote sensing sounding device for the detection of unstable roof conditions.

Primary output: A prototype sounding device which will aid mining personnel in the early detection of poor roof conditions. The equipment should be easy to use and should provide an on-line alarm system.

Envisaged scope of possible research project:

- Phase 1:* Evaluate geophysical techniques such as ground penetrating radar (GPR) for the detection of poor roof conditions, determine the likelihood of success, and identify the best two systems or techniques. (Estimated duration 3 months.)
- Phase 2:* Purchase or sub-contract to existing user, geophysical equipment identified during Phase 1 and evaluate underground under varying roof conditions. Produce a report on the technology available and provide design specifications for the most appropriate equipment/technology. (Estimated duration 9 months.)

(Note: Fall of ground fatalities contribute to 44% of the total number of fatalities on C O M collieries. 55% of the fatal falls of ground involve the collapse of an "Apparently" competent sandstone roof. The underlying cause was attributed to inadequate examination in 49% of the cases.)

10. SAFETY/HEALTH RISK

Description: Fall of ground injuries and fatalities.

SUGGESTED RESEARCH TOPIC

Title: Develop effective temporary supports to reduce fall of ground injuries and fatalities at the coal face.

Primary output: Novel temporary support systems to provide the necessary aerial cover for the installation of roofbolts.

Envisaged scope of possible research project:

Phase 1: Technology survey.

Phase 2: Identify alternative supports with potential for application.

Phase 3: Evaluate alternatives and/or modify designs.

This system will reduce the practice of production personnel operating under unsupported roof between the face and the first line of permanent support.

(Note: 77% of all FOG incidents occur at the coal face, in 74% of the cases no discontinuity was detected and in 57% of the cases no support had been installed.)

OTHER MINES**1. SAFETY/HEALTH RISK**

Description: Injuries caused by transport and tramming accidents on mines other than coal, gold and platinum.

SUGGESTED RESEARCH TOPIC

Title: Investigate the causes of transport and tramming accidents on mines other than coal, gold and platinum.

Primary output: A report providing a detailed analysis of the causes of transport and tramming accidents on other mines, with recommendations on suitable approaches (including further research work) for reducing the incidence and severity of such accidents.

Envisaged scope of possible research project:

- A one year project;
- All possible root causes should be examined;
 - e.g. — Environmental (illumination, noise, effect of heat, dust etc.).
 - Ergonomic (Man/machine Interface).
 - Engineering.
 - Communications.
 - Layouts.
 - Organizational procedures.
 - Management attitudes and approaches.
 - Training.
 - Education.
- Recommend practical approaches that can be adopted by mine managements to reduce transport and tramming accident injuries, and recommend any further work needed to improve the safety of workers in this area.

GENERIC**1. SAFETY/HEALTH RISK**

Description: Injury or fatality caused by underground machinery or transport.

SUGGESTED RESEARCH TOPIC

Title: Reduce injuries and fatalities by restriction of access to high risk areas.

Primary output: Recommendations on methods to be adopted to warn workers of proximity to high risk areas and where appropriate to restrict their access.

Envisaged scope of possible research project:

- Medium term, phased project.
- Investigate, delineate and highlight the high risk areas on the various mines.
- Recommend methods for use to warn workers of approach to high risk areas where dangerous machinery or other conditions exist.
- Methods (automatic?) to physically bar unauthorised workers from entering such areas.
- First phase—investigate methods and techniques, report on possibilities and recommend further work if appropriate.

2. SAFETY/HEALTH RISK

Description: Injuries caused by non-compliance with accepted safety and work standards in mines.

SUGGESTED RESEARCH TOPIC

Title: Improve the safety of workers by investigating the reasons why accepted safety and work standards are not complied with in mines.

Primary output: A report providing an analysis of the causes of non-compliance with accepted safety and work standards in mines, together with recommendations to enable mine managers to identify and address the causes of non-compliance by employees.

Envisaged scope of possible research project:

- A one year project
- Should involve Chamber MSD and NOSA
- Should investigate the influence of—
 - > physical working environment;
 - > ergonomics;
 - > management attitudes and practices;
 - > difficulty or inconvenience of compliance;
 - > suitability of training measures;
 - > individual responsibility for own safety.
 - > worker perceptions of reasons for existence of safety standards
- Should provide practical recommendations to enable mine managers to identify and address the causes of non-compliance by employees.

3. SAFETY/HEALTH RISK

Description: Injuries caused by non-compliance with accepted safety and work standards in mines.

SUGGESTED RESEARCH TOPIC

Title: Human—computer interaction in rock engineering.

Primary output: *Phase 1:* Feasibility study providing recommendations on the application of artificial intelligence and virtual reality (VR) in rock engineering for the training of mining personnel in hazard identification in stopes and tunnels

Phase 2: Develop computer systems (including, for example, expert systems and neural networks) to assist mine managers and rock engineering practitioners in making decisions regarding the selection of rock engineering and support strategies for various mining conditions

Envisaged scope of possible research project:

Phase 1: ➤ Feasibility study and recommendations.

- Phase 2:* ➤ must provide production personnel and inexperienced rock engineers with practical training measures enabling them to identify dangerous ground conditions;
- must assist mine personnel in the knowledge of support installations and layout using computer simulated environments (virtual reality);
 - must assist mine managers and rock engineers with decision making regarding the selection of rock engineering and support strategies for various mining conditions.

Closing date for proposals: **31 July 1994.**

Application forms are obtainable from:

Mr L. Naude
DEPARTMENT OF MINERAL AND ENERGY AFFAIRS
Private Bag X59
PRETORIA
0001.

Tel: (012) 317-9000 X 021.

Fax: (012) 322-0810.

BELANGRIK!!

Plasing van tale:

Staatskoerante

1. Hiermee word bekendgemaak dat die omruil van tale in die *Staatskoerant* jaarliks geskied met die eerste uitgawe in Oktober.
2. Vir die tydperk 1 Oktober 1993 tot 30 September 1994 word Afrikaans EERSTE geplaas.
3. Hierdie reëling is in ooreenstemming met dié van die Parlement waarby koerante met Wette ens. die taalvolgorde deurgaans behou vir die duur van die sitting.
4. *Dit word dus van u, as adverteerder, verwag om u kopie met bogenoemde reëling te laat strook om onnodige omskakeling en stylredigering in ooreenstemming te bring.*

—oOo—

IMPORTANT!!

Placing of languages:

Government Gazettes

1. Notice is hereby given that the interchange of languages in the *Government Gazette* will be effected annually from the first issue in October.
2. For the period 1 October 1993 to 30 September 1994, Afrikaans is to be placed FIRST.
3. This arrangement is in conformity with Gazettes containing Act of Parliament etc. where the language sequence remains constant throughout the sitting of Parliament.
4. *It is therefore expected of you, the advertiser, to see that your copy is in accordance with the above-mentioned arrangement in order to avoid unnecessary style changes and editing to correspond with the correct style.*



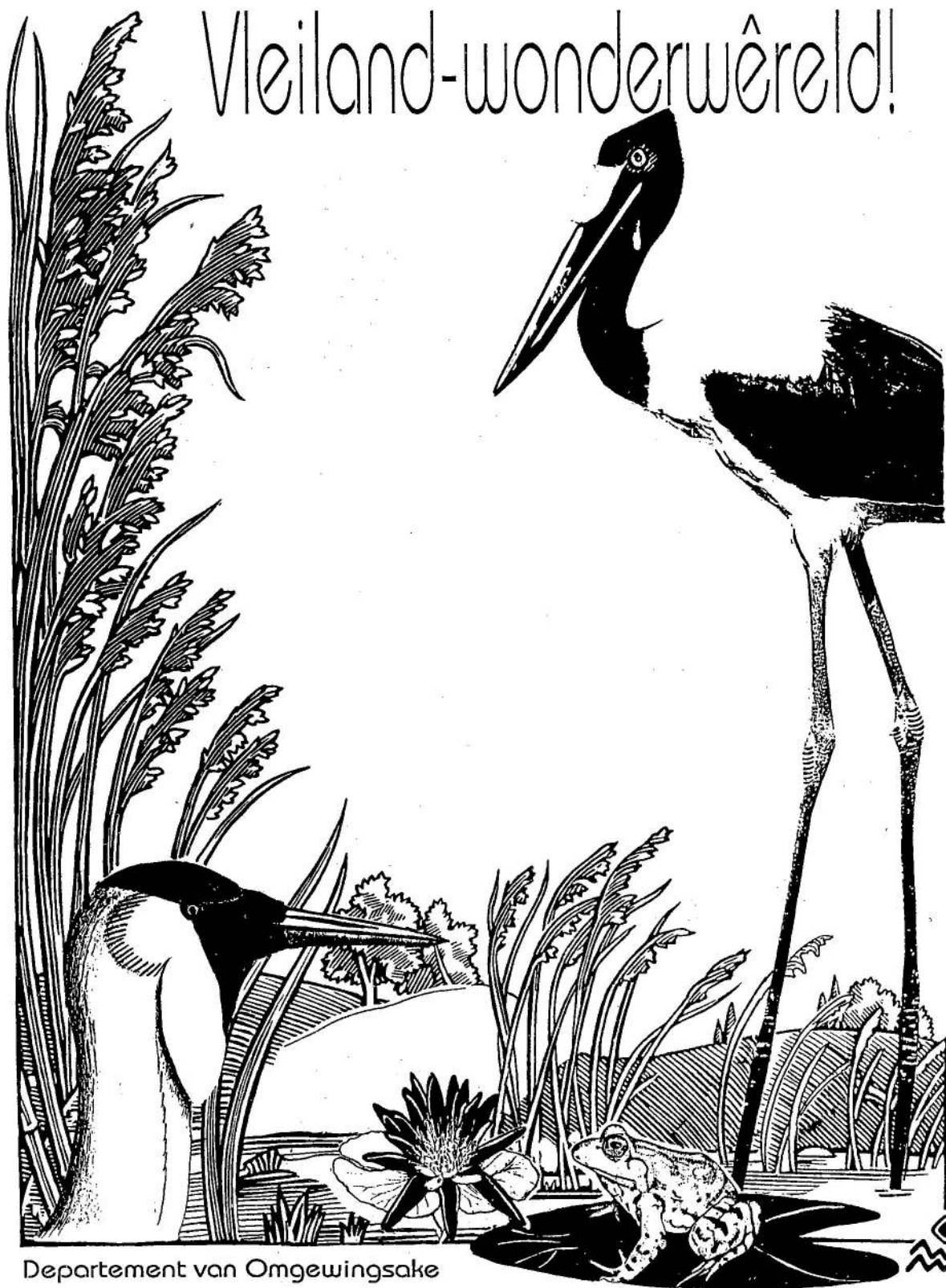
IS JOU TERREIN GEREGISTREER?
IS YOUR SITE REGISTERED?

Departement van Omgewingsake



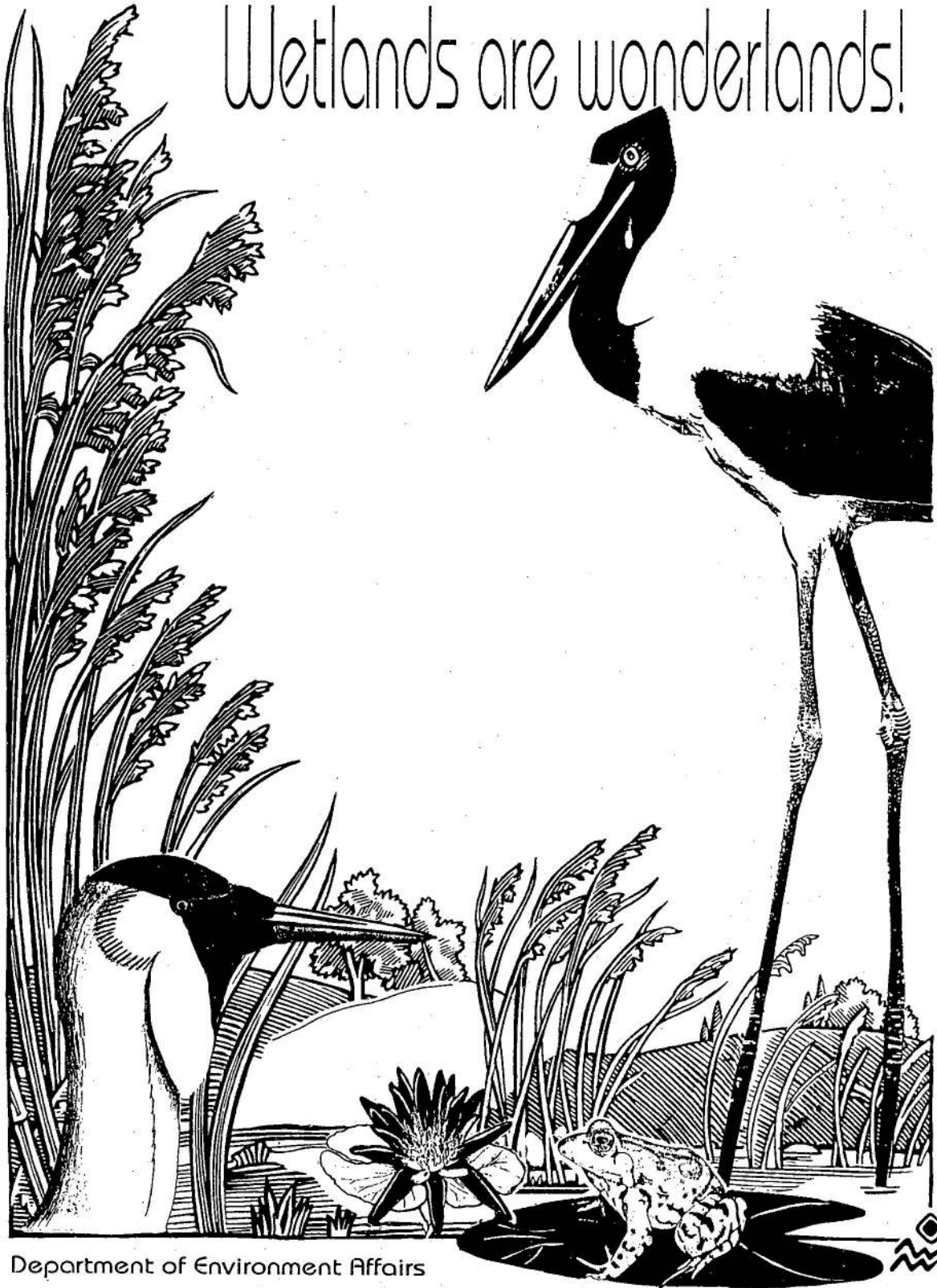
Department of Environment Affairs

Vleiland-wonderwêreld!



Departement van Omgewingsake

Wetlands are wonderlands!



Department of Environment Affairs

WARNING

**Possession of
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