

# APPENDIX F

## SPECIALIST DECLARATION

- **Ecology:** Iggdrasil Scientific Services (Pty) Ltd. Lorain den Boogert
- **Heritage:** Archaetnos CC. Prof A.C. van Vollenhoven
- **Geohydrology:** Geo-logic Hydrogeological Consultants CC. JHB Kruidenier



# read

Department:  
**Rural, Environment and Agricultural  
Development**  
North West Provincial Government  
**REPUBLIC OF SOUTH AFRICA**



AgriCentre Building  
Cnr. Dr. James Moroka  
and Stadium Rd  
Private Bag X2039,  
Mmabatho 2735

**CHIEF DIRECTORATE: ENVIRONMENTAL SERVICES**  
**DIRECTORATE: ENVIRONMENTAL QUALITY**

Tel: +27 (18) 389 5156  
Fax: +27(18) 389 5006  
E-mail: [oskosana@nwpg.gov.za](mailto:oskosana@nwpg.gov.za)  
Enq: EIA Admin Officer

### DETAILS AND EXPERTISE OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014

#### PROJECT TITLE

Proposed expansion of a feedlot for cattle on Portion 4 of the farm Vlaknek 472JP, Ditsobotla Local Municipality, North West Province.

#### 1. Details of Specialist

Specialist:	Iggdrasil Scientific Services (Pty) Ltd.		
Contact person:	Lorainmari den Boogert		
Postal address:	Postnet Suite nr 409, Private Bag X37, Lynnwood Ridge		
Postal code:	0040	Cell:	0722006244
Telephone:		Fax:	
E-mail:	<a href="mailto:lorain@iggdrasilscientific.com">lorain@iggdrasilscientific.com</a>		
Professional affiliation(s) (if any)	SACNASP Reg. No. 400003/13 (Professional), Member of South African Association of Botanists, Board member of the Botanical Society Pretoria Branch, SASS5 Accredited through DWS (2011, 2014, 2017), Member of South African Association of Aquatic Scientists (SASAqS)		

Project Consultant:	HydroScience		
Contact person:	Paulette Jacobs		
Postal address:	P.O. Box 1322, Ruimsig		
Postal code:	1732	Cell:	082 850 5482
Telephone:	082 667 5056	Fax:	086 692 8820
E-mail:	<a href="mailto:paulette@hydroscience.co.za">paulette@hydroscience.co.za</a>		

## 2. Expertise of the Specialist including Curriculum vitae (Appendix 6 (1)(a)(ii) of EIA Regulations, 2014)

### Lorainmari den Boogert

#### Resume Summary

Contact: +27 722 006244  
Email: lorain@iggdrasilscientific.com  
Languages: English, Afrikaans, Dutch

#### Career Highlights

##### DIRECTOR, ECOLOGIST

Iggdrasil Scientific Services

Jan 2012 – Present

A medium sized enterprise specialising in ecological assessments, covering fauna, flora, wetland and aquatic ecosystems.

##### PLANT ECOLOGIST

GEM – Science, South Africa

Oct 2010 – Jan 2012

A medium sized enterprise providing comprehensive geological and environmental consulting service for the mining industry.

##### JUNIOR ENVIRONMENTAL CONSULTANT

Bokamoso Environmental Consultants, SA

Jan 2010 – Oct 2010

##### PROJECT RESEARCH ASSISTANT

Abiotic Research Group, Alterra, Wageningen, The Netherlands

Jan 2009 – Jun 2009

##### BOTANY DEMONSTRATOR

University of Pretoria, Plant Sciences, SA

Jul 2008 – Nov 2008

##### FIELD ASSISTANT

University of Pretoria, Zoology, SA

Nov 2007 – Feb 2007

##### PROJECT RESEARCH ASSISTANT

University of Pretoria, Zoology, SA

Jan 2006 – Aug 2006

#### Education and Training

##### Degrees

- Master of Science in Geohydrology, in progress: expected completion December 2018  
University of the Free State, Bloemfontein, SA
- Master of Science Plant Science 2010  
Wageningen University, The Netherlands and University of Pretoria, SA
- Bachelor of Science (Honours) Plant Science (Cum Laude) 2008  
University of Pretoria, SA
- Bachelor of Science Ecology 2007  
University of Pretoria, SA

##### Certificates and Accreditations

- SASS5 Accreditation (freshwater Aquatic Zoology) 2017, 2014, 2011  
Department of Water Affairs, SA
- Dutch as a professional language 2011  
CNaTV, Belgium



## Additional Courses

- Asteraceae ID course, by Paul Herman from SANBI's National Herbarium at the University of Pretoria, Department of Plant and Soil Sciences. 2018
- MIRAI (Macro invertebrate Response Assessment Index), Department of Water and Sanitation 2016
- Invasive Species and Herbicide Training, South African Green Industries Council (SAGIC) 2016
- A rapid method for water quality assessment, Nepid Consultants, Sabie 2011
- EIA water use authorisation and waste management activity licences, CBSS, Pretoria 2011
- Tools for wetland assessment, Rhodes University, Grahamstown 2011
- Inventory and survey methods for invasive plants, Online Course, Department of land resource of environmental Sciences, Montana State University, Bozeman, Montana. 2009

## Conference Presentations

- **Course Presenter: Riparian Vegetation Assessment Methods for DWS** 2017  
Department of Water and Sanitation, DWS, Roodeplaar
- **Conservation Planning in Urban Open Spaces** 2016  
Botanical Society, Pretoria
- **The Vegetation ecology of Seringveld Conservancy, Cullinan South Africa** 2010  
South African Association of Botanist's Annual Conference, Potchefstroom
- **A comparison between Ellenberg and Wamelink Biological indicator values** 2009  
Wageninen Abiotic Research Group, Alterra Annual Conference, Wageningen, The Netherlands
- **The effect of the higher energy flow in the Ash River System, Bethlehem, SA** 2003  
Stockholm International Youth Science Seminar, Sweden
- **The youth of South Africa would like to see underground water pollution addresses in light of the international summit for sustainable development** 2003  
Water institute of South Africa, Annual Conference, Durban

## Achievements

- Board member of the South African Botanical Society Pretoria Branch
- Selected for an exchange program to the University of Wageningen as part of my MSc studies.
- Overall Winner and gold medalist of the Eskom Expo for Young Scientist, representing south Africa in the Stockholm Sweden at the Stockholm international youth seminar
- Winner of the South Africa youth water prize of the department of water affairs and represented South Africa at the international youth water prize during world water week in Stockholm Sweden.

## Membership & Associations

- South African Council of Natural Scientific Professions - Registered Professional Scientist (Pr.Sci.Nat: 400003/13),
- South African Association for Botanists,
- South African Botanical Society,
- South African Society for Aquatic Scientist,
- Department of Water and Sanitation SASS5 practitioners,

\*Full project list and references available on request



**3. Declaration by Specialist**

I, Lorainmari den Boogert (Name of Specialist) of Iggdrasil Scientific Services (name of company) declare that;

- I act as an independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant/ Environmental Assessment Practitioner appointed by applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- **all the particulars furnished by me in this form are true and correct; and**
- **I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 49B(2) of the Act.**

*Boogert*

Signature of the specialist

**Iggdrasil Scientific Services**

Name of company (if applicable)

*2018/10/29* 30

Date

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*Sgt. M.J. Safoor*

Signature of the Commissioner of Oaths

*2018-10-30*

Date

*Sergeant*

Designation

Official stamp:





**read**

Department:  
**Rural, Environment and Agricultural  
Development**  
North West Provincial Government  
REPUBLIC OF SOUTH AFRICA



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Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014

**PROJECT TITLE**

Proposed expansion of a feedlot for cattle on Portion 4 of the farm Vlaknek 472JP, Ditsobotla Local Municipality, North West Province.

**1. Details of Specialist**

Specialist:	Archaetnos cc		
Contact person:	Prof AC van Vollenhoven		
Postal address:	Po Box 55, Groenkloof		
Postal code:	0033	Cell:	0832916104
Telephone:	0123430509	Fax:	0865204173
E-mail:	antonv@archetnos.co.za		
Professional affiliation(s) (if any)	ASAPA – 166 SASCH – CH001		

Project Consultant:	HydroScience		
Contact person:	Paulette Jacobs		
Postal address:	P.O. Box 1322, Ruimsig		
Postal code:	1732	Cell:	082 850 5482
Telephone:	082 667 5056	Fax:	086 692 8820
E-mail:	paulette@hydroscience.co.za		

2. Expertise of the Specialist including Curriculum vitae (Appendix 6 (1)(a)(ii) of EIA Regulations, 2014)

<p style="text-align: center;"><b>CURRICULUM VITAE</b> <b>Prof Anton Carl van Vollenhoven</b></p> <p><b>PERSONAL INFORMATION</b></p> <ul style="list-style-type: none"><li>• Born: 20 January 1966, Pretoria, RSA</li><li>• Address: Archaetnos, PO Box 55, Groenkloof, 0027</li><li>• Cell phone: 083 291 6104</li><li>• Nationality: RSA</li><li>• E-mail: antonv@archaetnos.co.za</li></ul> <p><b>TERTIARY EDUCATION</b></p> <ul style="list-style-type: none"><li>• BA 1986, University of Pretoria</li><li>• BA (HONS) Archaeology 1988 (cum laude), University of Pretoria</li><li>• MA Archaeology 1992, University of Pretoria</li><li>• Post-Graduate Diploma in Museology 1993 (cum laude), University of Pretoria</li><li>• Diploma Tertiary Education 1993, University of Pretoria</li><li>• DPhil Archaeology 2001, University of Pretoria.</li><li>• MA Cultural History 1998 (cum laude), University of Stellenbosch</li><li>• Management Diploma 2007 (cum laude), Tshwane University of Technology</li><li>• DPhil History 2010, University of Stellenbosch</li></ul> <p><b>EMPLOYMENT HISTORY</b></p> <ul style="list-style-type: none"><li>• 1988-1991: Fort Klapperkop Military Museum - Researcher</li><li>• 1991-1999: National Cultural History Museum. Work as Archaeologist, as well as Curator/Manager of Pioneer Museum (1994-1997)</li><li>• 1999-2002: City Council of Pretoria. Work as Curator: Fort Klapperkop Heritage Site and Acting Deputy Manager Museums and Heritage.</li><li>• 2002-2007: City of Tshwane Metropolitan Municipality. Work as Deputy Manager Museums and Heritage.</li><li>• August 2007 – present – Managing Director for Archaetnos Archaeologists.</li><li>• 1988-2003: Part-time lecturer in Archaeology at the University of Pretoria and a part-time lecturer on Cultural Resources Management in the Department of History at the University of Pretoria.</li><li>• 2014-2015: Part-time lecturer for the Honours degree in Museum Sciences in the Department of History and Heritage Studies at the University of Pretoria</li><li>• Since 2015: Extraordinary Professor of History at the Mahikeng campus of the Northwest University</li></ul> <p><b>OTHER</b></p> <ul style="list-style-type: none"><li>• Has published 79 articles in scientific and popular journals on archaeology and history.</li><li>• Has been the author and co-author of over 845 unpublished reports on cultural resources surveys and archaeological work.</li><li>• Has published books on the Military Fortifications of Pretoria and Heritage Guidelines.</li></ul>
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- Contributed to a book on Mapungubwe.
- Has delivered more than 66 papers and lectures at national and international conferences.
- Member of SAHRA Council for 2003 – 2006.
- Member of the South African Academy for Science and Art.
- Member of Association for South African Professional Archaeologists.
- Member of the South African Society for Cultural History (Chairperson 2006-2008; 2012-2014).
- Has been editor for the SA Journal of Cultural History 2002-2004.
- Member of the Provincial Heritage Resources Agency, Gauteng's Council.
- Member of Provincial Heritage Resources Agency, Gauteng's HIA adjudication committee (Chairperson 2012-2015).

A list of reports can be viewed on [www.archaetnos.co.za](http://www.archaetnos.co.za).

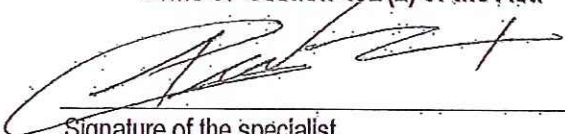




**3. Declaration by Specialist**

I, AC Van Vollenhoven (Name of Specialist) of Archætnos (name of company) declare that;

- I act as an independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- there are no circumstances that may compromise my objectivity in performing such work;
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- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant/ Environmental Assessment Practitioner appointed by applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 49B(2) of the Act.



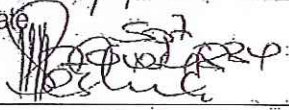
Signature of the specialist

Archætnos

Name of company (if applicable)

24/10/2018

Date



Signature of the Commissioner of Oaths

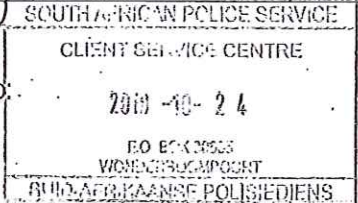
2018/10/24

Date

Sergeant

Designation SOUTH AFRICAN POLICE SERVICE

Official stamp:





**read**

Department:  
**Rural, Environment and Agricultural  
Development**  
North West Provincial Government  
**REPUBLIC OF SOUTH AFRICA**



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**CHIEF DIRECTORATE: ENVIRONMENTAL SERVICES**  
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Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014

**PROJECT TITLE**

Proposed expansion of a feedlot for cattle on Portion 4 of the farm Vlaknek 472JP, Ditsobotla Local Municipality, North West Province.

**1. Details of Specialist**

Specialist:	HK Geohydrological Services		
Contact person:	JHB Hruidenier (Henk)		
Postal address:	25 <sup>th</sup> Avenue 327, Villieria Pretoria		
Postal code:	0186	Cell:	082 872 5705
Telephone:		Fax:	
E-mail:	henk@geo-logic.co.za		
Professional affiliation(s) (if any)	SACNASP 400106/15		

Project Consultant:	HydroScience		
Contact person:	Paulette Jacobs		
Postal address:	P.O. Box 1322, Ruimsig		
Postal code:	1732	Cell:	082 850 5482
Telephone:	082 667 5056	Fax:	086 692 8820
E-mail:	paulette@hydroscience.co.za		

2. Expertise of the Specialist including Curriculum vitae (Appendix 6 (1)(a)(ii) of EIA Regulations, 2014)



**3. Declaration by Specialist**

I, JHB Kruidenier\_(Name of Specialist) of HK Geohydrological Services Pty Ltd (name of company) declare that;

- I act as an independent specialist in this application.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- there are no circumstances that may compromise my objectivity in performing such work;
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- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant/ Environmental Assessment Practitioner appointed by applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- **all the particulars furnished by me in this form are true and correct; and**
- **I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of Section 49B(2) of the Act.**

*JHB Kruidenier*

Signature of the specialist

**HK Geohydrological Services**

Name of company (if applicable)

**5 November 2018**

Date

*Sebetso 7182960-1*

Signature of the Commissioner of Oaths

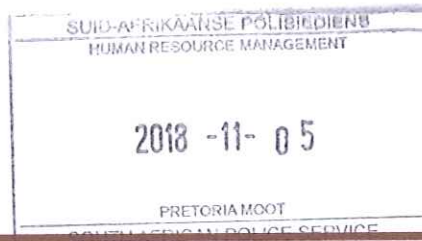
*2018/11/05*

Date

*Police constable*

Designation

Official stamp:



## CURRICULUM VITAE – Henk Kruidenier

### PERSONAL DETAILS

SURNAME	Kruidenier
NAME	Jan Hendrik Basson
ADDRESS	327 25th Avenue Villieria Pretoria 0186 South Africa
HOME NUMBER	+ 27 12 329 1352
CELLULAR NUMBER	+27 82 872 5705
HOME LANGUAGE	Afrikaans
OTHER LANGUAGE	English
MARITAL STATUS	Married, 3 Children
NATIONALITY	SA Citizen
BIRTH PLACE AND DATE	Brakpan, South Africa, 30 March 1962

### EDUCATIONAL DETAILS

TERTIARY INSTITUTION	Technicon Pretoria
DATE	01/1997 to 12/1998
QUALIFICATIONS	B Tech Degree Geology: Geohydrology as main subject: Thesis (Feasibility study, Establishment and evaluation of Transactie well field – A water source for nine villages in the ODI 1 District)
TERTIARY INSTITUTION	Technicon Pretoria
DATE	01/1980 to 06/1983
QUALIFICATIONS	National Diploma of Geotechnology

### LANGUAGE SKILLS (mark 1 to 5 for competence)

LANGUAGE	READING	SPEAKING	WRITING
English	5	5	5
Afrikaans	5	5	5
Dutch	5	2	1

## **ACHIEVEMENTS/OTHER SKILLS**

1. Various word processing program, database and data manipulation packages, presentation and spread sheet packages.
2. Present position: Director.
3. Years of professional experience: Thirty four years' experience in geohydrological and geophysical ground water exploration and project management of water supply programs for private developers, mining industry and government institutions.
4. Years with present firm: 17 Years
5. Key qualifications:

**Project Management:** Environmental related groundwater studies, integrated water use license application reports. Ground and surface water management, especially in the development of water management plans and protocols.

**Geophysical Exploration:** Application of different geophysical techniques in ground water exploration, mining industry and environmental projects.

**Technical report writing:** All related groundwater study reports.

**Contamination Risk Assessments:** Onsite sanitation systems, landfill sites, filling stations and mining industry.

**Groundwater quality assessment and evaluation:** Contamination related projects, bulk water supply systems, rural water supply.

**Groundwater Management:** All related aspects of water quality and quantity management.

### **PREVIOUS COMPANIES:**

<b>Country</b>	<b>Employee</b>	<b>Date From/to</b>	<b>Position</b>	<b>Job Description</b>
RSA	Geo-Logic Hydro Geological Consultants CC	2013 to Present	Director	Director Responsible for technical and financial proposals, Project management and groundwater related reports.
RSA	AGES	2010 to 2013	Geohydrologist	Responsible for technical and financial proposals, Project management and groundwater related reports.
RSA	Geo-Logic Hydro Geological Consultants CC	2009 to 2010	Director	Director Responsible for technical and financial proposals, Project management and groundwater related reports.
RSA	Geo-Logic Trading Trust	2002 to 2009	Director and Trustee	Responsible for all aspects such as technical and financial proposals and financial management of the company.
RSA	VSA Geoconsultants	1992 to 2002	Snr Geohydrologist	Programme manager for all projects to be executed since 1996.
RSA	CSIR (NFNL)	1982 to 1992	Snr Geotechnician	Research related studies such as the regional Bushveld complex study, mining industry, regional groundwater studies.
RSA	Geological Survey	1980 to 1982	Geo technician	Training as geotechnician.

### **ABBREVIATED CLIENT LIST**

#### **Government Organizations:**

- Department of Water Affairs & Forestry
- Department of Agriculture
- Greater Sekhukhune District Municipality
- Tshwane Metropolitan Municipality
- ESCOM

#### **Consulting Engineers:**

- African EPA

- Africon
- AGES Group
- BVI Raadgewende Ing
- Conic Mokete Consulting Engineers
- Cubic Civils cc
- D&G Consulting Engineers
- Engineering Design Services (Pty) Ltd
- EPS Consulting Engineers(Pty) Ltd
- Exigent Engineering Consultants
- LJR Civil Consultants cc
- Masakhe Isizwe Engineers
- Mokete Civil and Electrical Consultants
- Mpatho Project Solutions CC
- NPM Projects (Pty) Ltd
- Nyeleti Consulting (Pty) Ltd
- PDS Civil Engineers
- PVA Consulting Engineers
- Schoemann & Partners
- SRK Consulting
- Van Rensen and Fortuin
- VIKNA
- VNJ Consulting Engineers (Pty) Lt



**Other:**

- AJ Kruger & Partners
- Aqua 24
- Batlhako Mining
- Blokskor Eiendomme
- City Scope Town Planners
- Concor
- Conradie Land Surveyors
- Croc River Farm Development
- Ditholo Lodge
- Djawena CC
- Eagle Granite
- Eco Consult Inc
- Extrata Mining
- Hanlu Ontwikkelings
- Hlabi Morudi
- Index
- Interdesign Landscape Architects
- Johan vd Merwe (Pty) Ltd
- Landscape Dynamics
- Mabalingwe Game Reserve
- Maxim Planning Solutions
- Naluwan Accociation

- J Paul van Wyk Urban Economists & Planners
- PPC Lime Acres
- Projectlaw
- Propforum 25 (Pty) Ltd
- Rock Environmental
- Roundabout Outdoor (Pty) Ltd
- Rustenburg Rotary Club
- Seaton Thompson & Associates
- Sisters of Mercy
- SJ Diederics T/A North West Water Services
- Smith & Associates Town Planners
- Strategic Environmental Focus (Pty) Ltd
- Tatz Property Brokers
- The Mvula Trust
- VSA Earth Resource Consultants
- Westgate Motors

### **WORK EXPERIENCE**

Experienced gained during the years since 1980, when I was appointed as learner geotechnician at the former Geological Survey, are all relevant and groundwater related. A National Diploma in Geology was obtained in 1983 from the Technicon Pretoria. A BTech Degree in Geology, with Geohydrology as main subject was obtained in 1998.

### **Aquifer Characteristics:**

From 1992 until 2002 work experience were gained at VSA Geoconsultants in borehole yield testing for Groundwater Source Development studies such as the RDP 1 to RDP6 projects, Crisis and Drought relieve projects done in the former Bophuthatswana for DWAF.

During these years more than 600 existing and at least 400 new boreholes were submitted to borehole yield testing procedures. Boreholes yield testing supervision was done and aquifer yield tests were interpreted. In the latter years 1998 to 2002 a position of project manager was held for more than 70 small to large groundwater related projects. Aquifer recharge calculations were done on a routine basis. Large well fields of boreholes were created for rural villages and towns such as Delareyville, Zeerust, Schweizer – Reneke, Transactie and Atamalang, to only mention a few of which the sustainability had to be calculated.

During the period from **2002 to present at Geo-Logic Hydrogeological Consultants**, projects include source development projects such as Eco Estates to more environmentally related projects such as landfill sites, filling stations and contamination risk assessments for sewerage treatment facilities. The aquifer tests conducted for these projects included sustainable groundwater abstraction calculations and contamination risk assessment calculations.

#### **Hydrogeochemistry:**

From **1992 until 2002 at VSA Geoconsultants** groundwater monitoring programmes were mainly designed to ensure sustainable groundwater abstraction. The groundwater quality evaluation of a few hundred boreholes established for rural water supply was done during this period. A number of rural and urban filling station monitoring facilities were designed to ensure sustainable groundwater abstraction and to ensure that hydro carbon pollution will be traced immediately after occurring. A large number of landfill site monitoring facilities were also planned and established during this period.

During the period from **2002 to present at Geo-Logic Hydrogeological Consultants**, projects include Eco Estates, landfill sites, filling station sites, sewerage treatment plants and the mining sector. Groundwater management programmes or protocol documents had to be established for a large number of these projects which all included detail groundwater abstraction impact and water quality monitoring plans.

#### **Geohydrological Mapping:**

Each individual project since 1992 was accompanied by a hydro-census study. This information is used together with desk study information to verify groundwater sources, abstraction figures, water level depth, sources of possible contamination, aquifer boundaries. This information is normally integrated with the geological and geohydrological information that is available to be able to assess the aquifer in terms of exploitability and vulnerability. Groundwater recharge can normally be calculated and verified once enough groundwater regime information is available.

Geohydrological Mapping is updated once the fieldwork such as monitor – or production borehole drilling and yield testing is completed. In the order of 700 completed geohydrological mapping projects was done since 1992 to present.

#### **Development of Water Supply Schemes from Groundwater Sources:**

During the years form **1980 to 1982 at the Geological Survey** a large array of geophysical methods was studied and used. All these geophysical methods studied could be used fruitfully in the latter years for groundwater exploration methods. Methods such as Wenner and Slumberger profiling methods, Gravity, Magnetics, Frequency - and time domain Electromagnetic methods and Surveying were studied. Geological interpretation of the geophysical data was combined to do interpretations of groundwater occurrence. A responsibility level of learner technician was held during the years from 1980 to 1982.

At the **CSIR from 1982 to 1992** the position of Geotecnician and later Senior Geotechnician was held. Large groundwater exploration projects were done during which the Slumberger DC sounding method and Time Domain Electromagnetic methods were used on a regional scale. These soundings were interpreted and regional groundwater maps produced for the Kalahari from Askham to Van Zylsrust. For the mining sector Geophysical Exploration Methods were used to establish borehole well fields and to facilitate the structural and geology mapping of coal fields. The same methods were used to establish large borehole well fields.

During the years from **1992 to 2002 at VSA Geoconsultants**, the position of Senior Geotechnologist was held. Three to four people were part of the team under my supervision during the latter years at VSA. The development of a large number of water supply schemes from ground water sources was done during this time. The assessment of water supply needs, conducting of hydro-census and the use of specific geophysical methods to select drilling targets were done. Geological knowledge together with air photo interpretation was used prior to field surveys been conducted. Well fields were established for a large number of villages such as Delareyville, Zeerust, Schweizer – Reneke, Transactie, Bapong, and Atamalang to name a few. The reports on the projects included the finer detail of a water supply scheme project such as borehole logs, yield test information, borehole construction design, borehole yield recommendations, duty cycles, pump selection, aquifer sustainability, groundwater recharge calculations and water quality analyses. The project management, financial management, project execution and final report writing was all part of my duties during the latter years at VSA Geoconsultants.

From 2002 to present at Geo-Logic, water supply scheme planning and implementation is an integral part of the projects handled. The planning, designing and establishing of large abstraction boreholes and well points with the capacity of in excess of 45l/s was done during the latter years to present. The designing of well points include the use of well screens, sieve analyses of alluvial material and the planning and mixing of gravel packs and the installation of final screens. In the order of 350 projects were done for the period 2002 to present. In the order of 50% of these projects included a water supply development part in the project.

#### **Development of Production and Monitoring Boreholes:**

Drilling supervision and development of boreholes were done over an extended period of 30 years. In the order of 600 boreholes were constructed in hard rock formations with a normal solid and slotted casing in the uppermost weathered strata of the borehole. In the order of 150 boreholes were constructed in difficult drilling conditions such as dolomite aquifers or alluvial aquifers. The Odex method was normally used in dolomite and or difficult drilling conditions. The drilling supervision was done on a number of boreholes drilled with a tricone bit by using the normal circulation mud rotary method with Johnsons Screens or PVC Free Flow casing installed. Sieve analyses were used to develop and mix site specific gravel packs for the high yielding boreholes situated in thick alluvial deposits. Screen openings were decided on during the planning phase of these wells.

From 2002 to present at Geo-Logic, in the order of 350 projects were done for this period. Groundwater monitoring facility establishment was done for all the projects to date. Only very small projects such as borehole drill site establishment projects did not include groundwater monitoring facility establishment. These small projects did not form part of the 350 projects done to date. This included the monitoring facility establishment for filling stations, landfill sites, grave yards and sewerage treatment plants.

#### **Environmental Geohydrology**

From 2002 to present at Geo-Logic the investigation of contaminated landfill sites for the purpose of landfill closure was done. Nigel Landfill in particular is a site which was constructed near an open water pan with a constant water level rise. Special mitigation measures had to be put in place on a number of occasions. On a number of occasions new monitoring facilities had to be established due to vandalism and water levels rising to un-expected levels. The landfill site was flooded by water later creating very challenging situations to mitigate the groundwater quality below the landfill site.

A number of studies were conducted over an extended period during which the impact of ground water abstraction had to be calculated on the neighboring farm portions. The chemical water quality impact on the groundwater regime of landfill sites, graveyards, surface water features and feedlots had to be calculated during a large number of studies. Mitigation measures had to be put in place on a large number of these projects.

### **Aquifer Modeling**

During a dewatering scenario of a channel through a wetland a groundwater model was used to calculate the dewatering over a period. For Category C studies numerical models are normally used to calculate the abstraction impact on boreholes located in a 1km radius from the abstraction borehole. These calculations are used to predict future groundwater levels in an impacted area. At contamination sources these calculations are used to calculate the spreading of contaminants towards a specific direction.

### **Groundwater Management**

From 2002 to present at Geo-Logic at a number of farming developments, residential and farming developments, landfill sites and abattoirs groundwater quality and abstraction volumes are managed on an annual and bi-annual basis. Water sampling and water level depth measurements together with abstraction volumes are measured on a monthly basis. Rainfall is measured on a daily basis. These data is evaluated on an annual and or bi-annual basis. Groundwater contours is updated and contamination spreading is evaluated. Groundwater abstraction volumes are then adjusted where needed and mitigation measures are put in place to eradicate the source of contamination spreading.

A groundwater monitoring report explains the changes in the geohydrological regime, gives recommendations on abstraction volume changes and gives new abstraction volumes and duty cycles for each individual borehole. For landfill sites no groundwater abstraction is allowed near the site. This will aggravate groundwater flow and may expedite groundwater contamination rates. The biological and chemical water quality changes is explained in detail, mitigation measures is recommended and follow up measures and changes in the monitor programme is explained.

### **Communication**

Communication normally starts during the first field visit. It is important to establish the need of the client to be able to do a project – and financial proposal that will suite the client. The project and financial proposals must preferably be verbally presented if possible. With smaller projects

this is most often not a possibility. I normally contact the client after the proposal was delivered to find out if the proposal addressed all the client's needs. The financial proposal is also finalized during this phase.

During the life of a project, communication is a crucial factor to ensure that a fruit full relationship with your client will endure long after a project is completed. This is normally done by email or can be achieved by a short progress report as and when a client needs to be updated on information. Your final geohydrological report must reflect your field work information, findings, conclusions, recommendations and mitigation measures in such a manner that it can function as a multipurpose document for EIA purposes and can be used to serve as backbone for a WULA or IWWMP. Your geohydrological report is your final opportunity to convince your client of superior service deliverance.

For the tendering of large projects it is necessary to give a verbal presentation of the project proposal and financial proposal. During this opportunity to have direct access to the client we normally ensure that we understand the needs and the expectations of the client. This was successfully done on a number of occasions. For large projects it is required by the client to verbally do a presentation of the final outcome of a project. This is normally done by a formal presentation on power point to a number of the client representatives. It is most often necessary to clarify technical detail not understood by the client.

For larger mining projects confidentiality clauses need to be signed as a rule. On the closure of a project it is normally expected from each specialist to send back all data to the client via DVD or CD and wipe all files from your mainframe and personal computes. This confidentiality relationship between the client and consultant is always respected.