

**Dr DG PATERSON**  
*Soil Survey & Mapping, Land Evaluation*  
PhD Soil Science (UP)  
SACNASP Reg. No. 400463/04

12A Wallace St, Kilner Park 0186  
Tel: 083 556 2458

E-mail: [dgarrypateron59@gmail.com](mailto:dgarrypateron59@gmail.com)

21<sup>st</sup> June 2026

## **COMPLIANCE STATEMENT REDSTONE PV SOLAR PROJECT, NORTHERN CAPE**

To whom it may concern:

Under my authorship, the Agricultural Research Council-Soil, Climate and Water previously compiled a specialist report (Paterson, 2011) concerning soils and associated agricultural potential for an area east of Postmasburg in the Northern Cape.

This report was part of the Environmental Impact Assessment process for the development of a solar power plant and associated infrastructure. The area covered (shown in white) and general locality is shown in Figure 1 below.



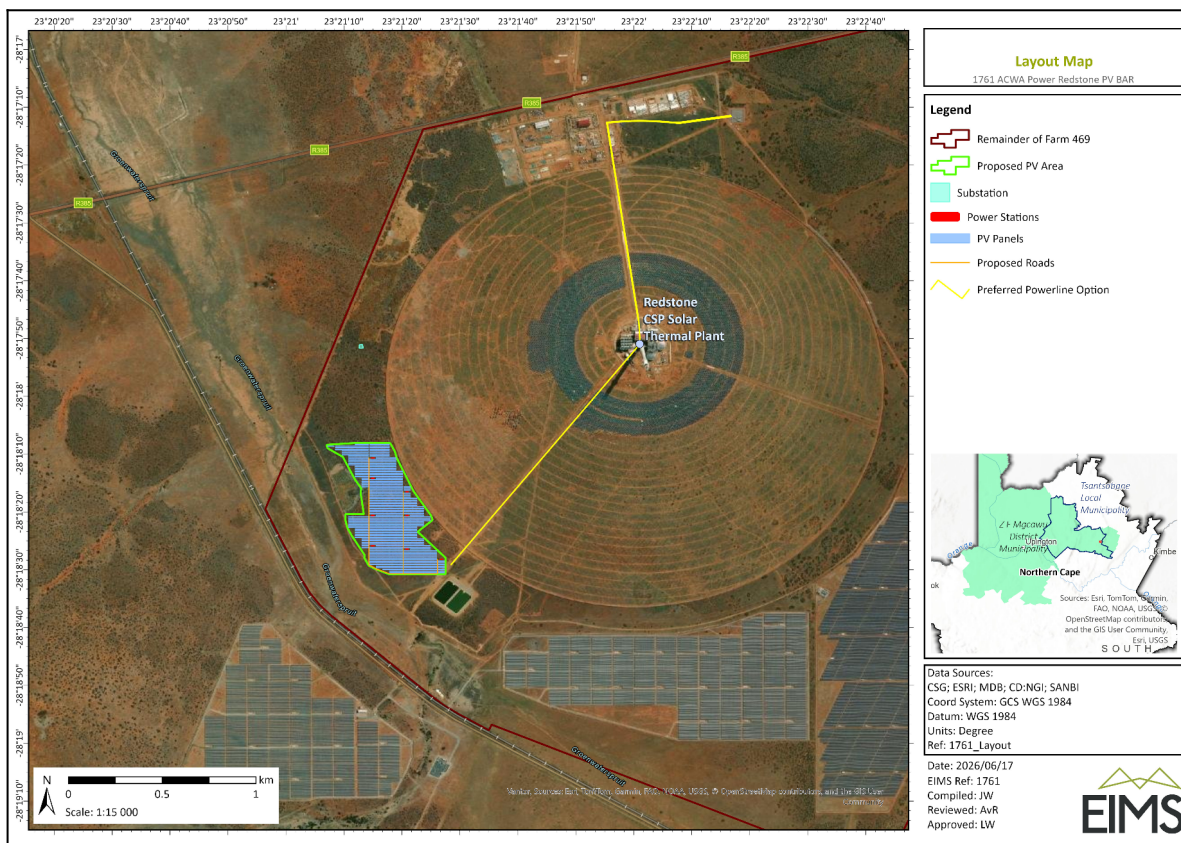
**Figure 1.** Locality of project area

The study used available soil and climate information, and the conclusion was that the soils were mostly reddish, structureless, sandy to loamy with variable depth to bedrock (between 300 and 1200 mm).

The main limiting factor, however, is the climate, with hot, dry conditions for most of the year. Temperatures over 40°C are regularly experienced in summer, with a long term average rainfall of just over 400 mm. This leads to consequent high evaporation rates and a very low suitability for any sort of agriculture except for extensive livestock grazing.

This is backed up by the Google Earth image which shows little or no indication of agricultural infrastructure across the broad area.

This current statement applies to a smaller area (shown in blue in Figure 2 below) within the original project site.



**Figure 2.** Current Redstone PV Solar project (shown in blue)

As a soils specialist, I can confirm that the originally stated soil conditions and their impact on any form of agriculture, will not have altered in the intervening period (2011 to 2026). The conclusions, significance and mitigation from that original report will all still be valid.

### **Sensitivity**

In the Screening Report, the agricultural sensitivity is shown as mostly “medium”, with patches of “low”. However, this map is generated at a very small (non-detailed) scale, using pixels generated by GIS processes. The fieldwork on which the soil survey is based confirms that the agricultural sensitivity should rather be classed as “low” throughout the area and vicinity, mainly due to the climatic restrictions.

### **Mitigation**

As referenced in the original report (Paterson, 2011), the main soils-related mitigation would be to ensure that as little pollution or physical disturbance occurs. This would include removing as little surface vegetation as possible, and ensuring that water runoff (despite the low rainfall) would not lead to soil erosion.

### **Conclusion**

Regarding the soils occurring, along with their associated agricultural potential, my specialist opinion is that there are no fatal flaws or other impediments to the proposed development.

Yours sincerely,

A handwritten signature in black ink, appearing to be 'D.G. Paterson', with a stylized flourish extending to the right.

### **Reference:**

**Paterson, D.G.**, 2011. Soil information for the proposed Humansrus solar thermal energy power plant, near Postmasburg, Northern Cape. Report No. GW/A/2011/42, Agricultural Research Council-Soil, Climate and Water, Pretoria.

## **CURRICULUM VITAE: D G Paterson**

**SURNAME:** PATERSON  
**FIRST NAME(S):** David Garry  
**KNOWN AS:** Garry  
**DATE OF BIRTH:** 25-08-1959 in Bellshill, Scotland  
**NATIONALITY:** South African  
**I.D. No.:** 5908255258088  
**LANGUAGE PROFICIENCY:** English, Afrikaans (both fluent), French (poor)

**ADDRESS:** 12A Wallace Street  
Kilner Park  
Pretoria 0186  
Republic of South Africa  
**TEL.:** 083 556 2458 (cell)

**E-MAIL ADDRESS:** [dgarrypaterson59@gmail.com](mailto:dgarrypaterson59@gmail.com)

### **ACADEMIC QUALIFICATIONS:**

- Matriculated: 1976, Dalziel High School, Motherwell, Scotland
- BSc (Hons) Geography, 1980, University of Strathclyde, Glasgow, Scotland
- MSc (Soil Science) *cum laude*, 1998, University of Pretoria (*Title of thesis: "The use of Ground Penetrating Radar to investigate subsurface features in selected South African soils"*)
- PhD (Soil Science), 2014, University of Pretoria (*Title of thesis: "The use of palm leaf mats in soil erosion control"*)

### **PROFESSIONAL CAREER:**

- 1981-1987: Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1987-1992: Senior Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1992-2017: Senior Soil Scientist: ARC-Soil, Climate & Water, Pretoria
- 2017-2024: Research Team Manager (Soil Science): ARC-Soil, Climate & Water
- 2024-present: retired

### **FIELDS OF SPECIALITY AND COMPETENCE:**

- Soil classification and mapping
- Soil interpretations
- Soil conservation, including biotextiles
- Soil rehabilitation (especially coal mine soils)
- Soil survey project management
- Environmental assessment and land evaluation
- Soil survey and land capability course presentation
- Ground penetrating radar

### **PUBLICATIONS (see attached list):**

- Twenty refereed articles
- Nine Congress papers/posters
- Two book chapter contributions
- S.A. Soil Classification (1991 and 2018 editions) (*Member of working group*)

- Five 1:250 000 Land Type Maps
- Three Land Type Memoirs
- More than 250 soil survey reports and/or maps

#### **COURSES COMPLETED:**

- Course in Project Management (University of Stellenbosch)
- Course in Junior Personnel Management (Dept of Agriculture)
- Course in Handling of Grievances and Complaints (Dept of Agriculture)
- Course in Marketing (ARC-ISCW)
- Course in National Qualifications Framework Assessment, ARC-CO
- Training Course in Ground Penetrating Radar (GSSI, USA)
- Introduction to ArcGIS 8, GIMS, 2004

#### **PROFESSIONAL STATUS:**

- Registered Natural Scientist: Soil Science (SA National Council for Natural Scientific Professions) – **registration number 400463/04**
- Member of South African Soil Classification Working Group, 1990-present
- Convenor of South African Soil Classification Working Group, 2013-2015
- Member of Soil Science Society of South Africa (1982-present)
- President of Soil Science Society of South Africa (2005-2007)
- Member of South African Soil Survey Organisation (2000-present)
- Council Member of South African Soil Survey Organisation (2002-2003)
- Member of International Erosion Control Association
- Scientific Referee, S.A. Journal for Plant and Soil
- External Examiner, Universities of: Pretoria, Witwatersrand, Venda, Free State, North West, Fort Hare, Stellenbosch.

#### **AWARDS:**

Best Article on Soil Science, South African Journal for Plant and Soil, 2011

#### **ACADEMIC SUPERVISION:**

##### SUPERVISION:

**Dr Obert Nethononda** (University of Venda, 2012) – PhD - "Spatial variability of soil and land evaluation for specific crop ranges for Rambuda Irrigation Scheme in Vhembe District".

##### EXTERNAL EXAMINATION:

**Dr Astrid Hattingh** (University of the Free State, 2018) – PhD – "Spatial variability of soil properties in two maize producing areas surveyed for precision farming in Northwest Province, South Africa"

**Dr Cosmos Parwada** (University of Fort Hare, 2017) – PhD - "Litter quality effects on soil stability and erodibility in Ntabelanga area, Eastern Cape, South Africa"

**Mr Caspar du Plessis** (University of Fort Hare, 2019) – MSc - "Studies on large-scale mapping of soil factors influencing erosion in the T35D-E catchments in the Eastern Cape Province using digital soil mapping and machine learning"

**Mr Gerhard van Rooyen** (University of Pretoria, 2021) – MSc – “Carbon dioxide release from disturbed wetland soils of the Mpumalanga Highveld”

**Dr Carel Wessels** (University of the Free State, 2024) – PhD – “Exploring the poor uptake of new agricultural-based technologies in rural communities in South Africa”

**Mr Paul Rheeder** (University of Stellenbosch, 2024) – MSc - “Optimizing soil organic carbon stock assessments for spekboom afforestation of degraded lands in the Eastern Cape, South Africa”

#### **MISCELLANEOUS:**

- Editor, Soil Science Society newsletter, 1993-present
- Member, Clapham High School (Pretoria) Governing Body, 1998-2002
- Member, Northern Gauteng Football Referee’s Association, 2000-2002
- Member, Pretoria Golf Club
- Chairman, Rosslyn Golf Club (Club Champion 2002, 2007 & 2018)

#### **INTERESTS:**

Sport, especially golf and soccer; wildlife; reading; music; craft beer.

#### **PUBLICATIONS LIST:**

##### ***Refereed Articles:***

**BÜHMANN, C., KIRSTEN, W.F.A., PATERSON, D.G. & SOBCZYK, M.E.**, 1993. Pedogenic differences between two adjacent basalt-derived profiles. 1. Textural and chemical characteristics. *S. Afr. J. Plant & Soil*, 10: 155-161

**BÜHMANN, C., KIRSTEN, W.F.A., PATERSON, D.G. & SOBCZYK, M.E.**, 1994. Pedogenic differences between two adjacent basalt-derived profiles. 2. Mineralogical characteristics. *S. Afr. J. Plant & Soil*, 11: 5-11

**PATERSON, D.G. & LAKER, M.C.**, 1999. Using ground penetrating radar to investigate spoil layers in rehabilitated mine soils. *S. Afr. J. Plant & Soil*, 16:131-134.

**BÜHMANN, C., PATERSON, D.G., PIENAAR, G.M.E., NELL, J.P., MULIBANA, N.E., VAN DEVENTER, P.W., FULLEN, M.A., SUBEDI, M. AND SARSBY, R.W.** (2010). Rainfall simulator study of the erosion control potential of palm geotextiles for mine dam slope stabilization, p. 443-451 In: R.W. Sarsby and T. Meggyes (Eds) Construction for a Sustainable Environment. CRC Press, Balkema, The Netherlands. (ISBN: 13: 978-0-415-566179).

**\*PATERSON, D.G., BÜHMANN, C., PIENAAR, G.M.E. & BARNARD, R.O.**, 2011. Beneficial effects of palm geotextiles on inter-rill erosion in South African soils and mine dam tailings: a rainfall simulator study. *S. Afr. J. Plant & Soil*, 28: 181-189.

*\*This paper was awarded the prize by the Soil Science Society of South Africa for the best soil science article published in the Journal in 2011.*

**PATERSON, D.G. & BARNARD, R.O.**, 2011. Beneficial effect of palm geotextiles on inter-rill erosion in South African soils. *S. Afr. J. Plant & Soil*, 28: 190-197.

**BHATTACHARYA, R., FULLEN, M.A., BOOTH, C.A., KERTESZ, A., TOTH, A., SZALAI, Z., JAKAB, G., KOZMA, K., JANKAUSKAS, B., JANKAUSKIENE, G., BÜHMANN, C., PATERSON, D.G., MULIBANA, N.E., NELL, J.P., VAN DER MERWE, G.M.E., GUERRA, A.J.T., MENDONCA, J.K.S., GUERRA, T.T., SATHLER, R., BEZERRA, J.F.R., PERES, S.M., ZHENG YI, LI YONGMEI, TANG LI, PANOMTARANICHAGUL, M., PEUKRAI, S., THU, D.C., CUONG, T.H., TOAN, T.T.**, 2011. Effectiveness of biological geotextiles for soil and water conservation in different agro-environments. *Land Degradation and Development*, 22: 495-504.

**FULLEN, M.A., SUBEDI, M., BOOTH, C.A., SARSBY, R.W., DAVIES, K., BHATTACHARYA, R., KUGAN, R., LUCKHURST, D.A., CHAN, K., BLACK, A.W., TOWNROW, D., JAMES, T., POESEN, J., SMETS, T., KERTESZ, A., TOTH, A., SZALAI, Z., JAKAB, G., JANKAUSKAS, B., JANKAUSKIENE, G., BÜHMANN, C., PATERSON, D.G., MULIBANA, N.E., NELL, J.P., VAN DER MERWE, G.M.E., GUERRA, A.J.T., MENDONCA, J.K.S., GUERRA, T.T., SATHLER, R., BEZERRA, J.F.R., PERES, S.M., ZHENG YI, LI YONGMEI, TANG LI, PANOMTARANICHAGUL, M., PEUKRAI, S., THU, D.C., CUONG, T.H., TOAN, T.T., JONSYN-ELLIS, F., SYLVA, J.T., COLE, A., MULHOLLAND, B., DERALOVE, M., CORKILL, C. & TOMLINSON, P.**, 2011. Utilising biological geotextiles: introduction to the Borassus Project and global perspectives. *Land Degradation and Development*, 22: 453-462.

**SMETS, T., POESEN, J., BHATTACHARYA, R., FULLEN, M.A., SUBEDI, M., BOOTH, C.A., KERTESZ, A., SZALAI, Z., TOTH, A., JANKAUSKAS, B., JANKAUSKIENE, G., GUERRA, A.J.T., BEZERRA, J.F.R., ZHENG YI, PANOMTARANICHAGUL, M., BÜHMANN, C. & PATERSON, D.G.**, 2011. Evaluation of biological geotextiles for reducing runoff and soil loss under various environmental conditions using laboratory and field data. *Land Degradation and Development*, 22: 480-494.

**NETHONONDA, L.O., ODHIAMBO, J.J.O. & PATERSON, D.G.**, 2012. Indigenous knowledge of climatic conditions for sustainable crop production under resource-poor farming conditions using participatory techniques. *Sustainable Agriculture Research*, 2 (1), 26-31.

**NETHONONDA, L.O., ODHIAMBO, J.J.O. & PATERSON, D.G.**, 2012. Assessment of spatial variability of selected soil chemical properties in a communal irrigation scheme under resource-poor farming conditions in Vhembe District of Limpopo Province, South Africa. *African J. Agric. Res.* 7 (39), 5445-5492.

**NETHONONDA, L.O., ODHIAMBO, J.J.O. & PATERSON, D.G.**, 2013. Spatial variability of soil penetrability and distribution of compacted layer as affected by long-term ploughing at shallow depth in Rambuda irrigation scheme in Vhembe district, South Africa. *Bulgarian Journal of Agricultural Science*, 19 (2): 248-254.

**SUBEDI, M., FULLEN, M.A., BOOTH, C.A., THU, D.C., CUONG, T.H., TOAN, T.T., JONSYN-ELLIS, F., COLE, A., GUERRA, A.J.T., BEZERRA, J.F.R., YI, Z., LI, T., BÜHMANN, C. & PATERSON, D.G.**, 2012. Contribution of biogeotextiles to soil conservation and socio-economic development. *Outlook on Agriculture*, 41(3).

**PATERSON, D.G., SMITH, H.J. & VAN GREUNEN, A.**, 2013. Evaluation of soil

conservation measures on a highly erodible soil in the Free State province, South Africa. *S. Afr. J. Plant & Soil*, 30: 213-217.

**PATERSON, D.G., TURNER, D.P., WIESE, L.D., VAN ZIJL, G.M., CLARKE, C.E. & VAN TOL, J.**, 2015. Spatial soil information in South Africa – situational analysis, limitations and challenges. *S. Afr. J. Science* 111 (5/6). Art. #2014-0178, 7 pages. <http://dx.doi.org/10.17159/sajs.2015/20140178>.

**PATERSON, D.G., MUSHIA, N.M. & MKULA, S.D.**, 2018. Effects of stockpiling on selected properties of opencast coalmine soils. *S. Afr. J. Plant & Soil*, 36:2, 101-106. DOI: 10.1080/02571862.2018.1493161

**EZEOKOLI, O.T., NWANGBURUKA, C.C., ADELEKE, R.A., ROOPNARAIN, A., PATERSON, D.G., MABOETA, M.S. & BEZUIDENHOUT, C.C.**, 2018. Assessment of arbuscular mycorrhizal fungal spore density and viability in soil stockpiles of South African opencast coal mines. *S. Afr. J. Plant & Soil*, 36:2, 91-99. DOI: 10.1080/02571862.2018.1537011

**VAN ZIJL, G.M., TURNER, D.P., PATERSON, D.G., KOCH, J., VAN TOL, J.J., BARICHIEVY, K.R., CLARKE, C.E., DU PLESSIS, M.J. & VAN DEVENTER, P.W.**, 2020. The new soil classification system in South Africa, its history, important changes made and implications for users. *S. Afr. J. Plant & Soil*, DOI: 10.1080/02571862.2020.1815244

**MYENI, L., MDLAMBUZI, T., PATERSON, D.G., DE NYSSCHEN, G. & MOELETSI, M.E.**, 2021. Development and evaluation of Pedotransfer functions to estimate soil moisture content at field capacity and permanent wilting point for South African soils. *Water* **2021**, 13, 2639. <https://doi.org/10.3390/w13192639>.

**NHAMO, L., PATERSON, D.G., VAN DER WALT, M., MODI, A., KUNZ, R., CHIMONYO, V., MASUPHA, T., MPANDELI, S., LIPHADZI, S., MOLWANTWA, J. & MABHAUDI, T.**, 2022. Optimal production areas of underutilized indigenous crops and their role under climate change: focus on Bambara groundnut. *Frontiers in Sustainable Food Systems*, 6:990213. Doi:10.3389/fsufs.2022.990213.

**VAN DER WAALS, J.H., PATERSON, D.G., GRUNDLING, A.T., TURNER, D.P., VAN HUYSSTEEN, C.W. & ROSSOUW, P.S.**, 2024. Review of soil form and wetness indicators for wetland delineation in South Africa. *Water SA*, 50(2), 211-230.

### ***Books & Reports:***

**PATERSON, D.G. & MUSHIA, N.M.**, 2012. Chapter 32. Soil databases in Africa. *In: Handbook of Soil Science: Resource Management and Environmental Impacts (2<sup>nd</sup> Edn)*. Eds. P.M. Huang, Y Li & M.E. Sumner. CRC Press, Boca Raton FL.

**ZGŁOBICKI, W., POESEN, J., DANIELS, M., DEL MONTE, M. GUERRA, A.J.T., JOSHI, V., PATERSON, D.G., SHELLBERG, J., SOLÉ-BENET, A. & ZHENG'AN SU**, 2018. Chapter 9. Geotouristic value of Badlands. *In: Badland dynamics in the context of global change*. Eds. E. Nadal-Romero, J.F. Martinez-Murillo, N.J. Kuhn. Elsevier, Amsterdam.

**SOIL CLASSIFICATION WORKING GROUP\***, 1991. Soil classification. A taxonomic system for South Africa. ARC-Institute for Soil, Climate & Water, Pretoria.

**SOIL CLASSIFICATION WORKING GROUP\***, 2018. Soil classification. A natural and anthropogenic system for South Africa. ARC-Institute for Soil, Climate & Water, Pretoria.

\* Co-author as member of Working Group

**JOB, N.M., LE ROUX, P.A.L., TURNER, D.P., VAN DER WAALS, J.H., GRUNDLING, A.T., VAN DER WALT, M., DE NYSSCHEN, G.P.M. & PATERSON, D.G.**, 2018. Developing wetland distribution and transfer functions from land type data as a basis for the critical evaluation of wetland delineation guidelines by inclusion of soil water flow dynamics in catchment areas. *Volume 1: Improving the management of wetlands by including hydrology and land type data at catchment level*. Report No. 2461/1/18, Water Research Commission, Pretoria.

**KIDSON, M.V., ROOPNARAIN, A, ADELEKE, R.A. & PATERSON, D.G.**, 2024. Conservation and regenerative agriculture: sustainable solutions to agricultural production under uncertain climate change conditions. In: Handbook of nature-based solutions to mitigation and adaptation to climate change (W. Leal Filho et al. Eds.) Springer Nature Switzerland.

[https://doi.org/10.1007/978-3-030-98067-2\\_24-1](https://doi.org/10.1007/978-3-030-98067-2_24-1)

#### ***Theses:***

**PATERSON, D.G.**, 1998. The use of ground penetrating radar to investigate subsurface features in selected South African soils. Unpublished MSc Thesis, University of Pretoria.

**PATERSON, D.G.**, 2014. The use of palm leaf mats in soil erosion control. Unpublished PhD Thesis, University of Pretoria.

#### ***Congress Papers:***

**PATERSON, D.G.**, 1987. The relationship between geology and soil type in the northern Kruger National Park. 14<sup>th</sup> Congress of the Soil Science Society of S.A. Nelspruit, 14-17 July 1987.

**PATERSON, D.G.**, 1990. A study of black and red clay soils on basalt in the northern Kruger National Park. 16<sup>th</sup> Congress of the Soil Science Society of S.A. Pretoria, 9-12 July 1990.

**PATERSON, D.G.**, 1992. The potential of ground penetrating radar as an aid to soil investigation. 17<sup>th</sup> Congress of the Soil Science Society of S.A. Stellenbosch, 28-30 January 1992.

**PATERSON, D.G.**, 1995. The complex soil mantle of South Africa. ARC Wise Land Use Symposium, Pretoria, 26-27 October 1995

**PATERSON, D.G. & LAKER, M.C.**, 1998. Locating subsoil features with ground penetrating radar. 21<sup>st</sup> Congress of the Soil Science Society of S.A. Alpine Heath, 20-22 January 1998.

**PATERSON, D.G.**, 2000. Mapping rehabilitated coal mine soils in South Africa using ground penetrating radar. Eighth International Conference on Ground Penetrating Radar, Gold Coast, Australia, 23-26 May 2000.

**PATERSON, D.G. & VAN DER WALT, M.,** 2003. The soils of South Africa from the Land Type Survey. 24<sup>th</sup> Congress of the Soil Science Society of S.A., Stellenbosch, 20-24 January 2003.

**PATERSON, D.G.,** 2015. Geotextiles – applications for soil conservation. Congress of the Soil Science Society of S.A., George, 19-22 January 2015.

#### ***Land Type Maps:***

**PATERSON, D.G.,** 1990. 1:250 000 scale land type map 2230 Messina. Dept. Agriculture, Pretoria.

**PATERSON, D.G. & HAARHOFF, D.,** 1989. 1:250 000 scale land type map 2326 Ellisras. Dept. Agriculture, Pretoria.

**PATERSON, D.G., PLATH, B.L. & SMITH, H.W.,** 1987. 1:250 000 scale land type map 2428 Nylstroom. Dept. Agriculture, Pretoria.

**PATERSON, D.G. & ROSS, P.G.,** 1989. 1:250 000 scale land type map 2330 Tzaneen. Dept. Agriculture, Pretoria.

**PLATH, B.L. & PATERSON, D.G.,** 1987. 1:250 000 scale land type map 2426 Thabazimbi. Dept. Agriculture, Pretoria.

#### ***Land Type Memoirs:***

**PATERSON, D.G., PLATH, B.L. & SMITH, H.W.,** 1988. Field Investigation. In: *Land types of the maps 2426 Thabazimbi & 2428 Nylstroom. Mem. Agric. Nat. Res. S. Afr.* No. 10. Dept. Agriculture, Pretoria.

**PATERSON, D.G., SCHOEMAN, J.L., TURNER, D.P., GEERS, B.C. & ROSS, P.G.,** 1989. Field Investigation. In: *Land types of the maps 2330 Tzaneen & 2430 Pilgrim's Rest. Mem. Agric. Nat. Res. S. Afr.* No. 12. Dept. Agriculture, Pretoria.

**PATERSON, D.G.,** 1999. 1:250 000 land type survey of the former Ciskei (Unpublished). ISCW Report GW/A/99/24.

#### ***Also:***

**PATERSON, D.G.,** 1992. Ground penetrating radar applications in USA and South Africa. Report on an official study tour to USA, 13-29 July, 1991. ISCW Report GW/A/92/8.

**PATERSON, D.G.,** 2000. Report on official overseas visit to GPR2000 Conference, Broadbeach, Australia, 23-26 May, 2000. ISCW Report GW/A/2000/40.

***Plus:*** numerous ARC-ISCW Reports on soil surveys, soil interpretations, environmental impact assessments, soil suitability studies, popular publications.

## **DR GARRY PATERSON, Research Team Manager (Agricultural Research Council)**

Dr Garry Paterson commenced a career in agricultural research at the previous Department of Agriculture in 1981, which became ARC in 1994. Postgraduate studies were carried out in Soil Science at University of Pretoria in 1998 (MSc *cum laude*) and culminated in a PhD (Soil Science in 2014).

Until his retirement in 2024, Dr Paterson was the Research Team Manager of the Soil Science Division at ARC-NRE, which deals with all aspects of research into the soils of South Africa, including their properties, distribution, limitations and potential. Specific research areas include conservation agriculture (CA), land capability, soil conservation (especially on soils affected by mining), irrigation suitability and a range of important soil properties, including those most important for soil fertility. The Division has recently moved into the field of soil spectroscopy research.

Dr Paterson is the past president of the Soil Science Society of South Africa, as well as author or co-author of 19 peer-reviewed scientific papers, two books, over 100 technical reports, and two book chapters. He has made 20 presentations at local and international scientific conferences. Previous student supervision includes two PhD students, while two MSc and one PhD students have graduated under his supervision.

Dr Paterson was also previously involved as either project leader or national co-ordinator for:

- the EU-funded Borassus project (2008-2011), studying soil conservation using biotextiles,
- a Coaltech-funded project looking at soil stockpiling and rehabilitation in coal mine soils (2012-15) and
- a DALRRD project studying sweet sorghum trials under different conditions (2019-date).

He was also work package leader for a multi-national project “Soils4Africa”, which has analyzed 30 000 soil samples from across the continent.

# REPORT

On contract research for

*SSI ENVIRONMENTAL / WORLEYPARSONS RSA*

and SolarReserve SA (Pty) Ltd



## SOIL INFORMATION FOR THE PROPOSED HUMANSRUS SOLAR THERMAL ENERGY POWER PLANT, NEAR POSTMASBURG, NORTHERN CAPE

By

D.G. Paterson (Pr. Sci. Nat. 400463/04)

May 2011

Report No. GW/A/2011/42

ARC-Institute for Soil, Climate and Water,  
Private Bag X79, Pretoria 0001, South Africa

Tel (012) 310 2500

Fax (012) 323 1157

## DECLARATION

I hereby declare that I am qualified to compile this report as a registered Natural Scientist and that I am independent of any of the parties involved and that I have compiled an impartial report, based solely on all the information available.

A handwritten signature in black ink, appearing to read 'D G Paterson', is shown within a light gray rectangular box.

*D G Paterson*  
May 2011

| CONTENTS                    | Page |
|-----------------------------|------|
| 1. TERMS OF REFERENCE       | 4    |
| 2. SITE CHARACTERISTICS     | 4    |
| 3. METHODOLOGY              | 6    |
| 4. SOILS                    | 7    |
| 5. AGRICULTURAL POTENTIAL   | 9    |
| 6. IMPACTS                  | 10   |
| REFERENCES                  | 11   |
| APPENDIX: MAP OF LAND TYPES |      |

## 1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by SSI Environmental / WorleyParsons RSA to undertake a soil investigation on a site near Postmasburg, in the Northern Cape Province. The purpose of the investigation is to contribute to the Environmental Impact Assessment (EIA) process for a proposed concentrated solar power (CSP) facility on behalf of SolarReserve SA (Pty) Ltd.

The objectives of this study, which is a desk-top investigation that forms part of the scoping phase assessment, are:

- To obtain all existing soil information and to produce a soil map of the specified area as well as
- To assess broad agricultural potential.

## 2. SITE CHARACTERISTICS

### 2.1 Location

An area was investigated lying approximately 25 km to the east of the town of Postmasburg between 28° 17' and 28° 20' S and between 23° 20' and 23° 24' E.

The area lies immediately to the south of the R385 Posmasburg-Danielskuil tar road. The position of the site is shown on the map in Figure 1.

### 2.2 Terrain

The site is generally flat to gently sloping and lies at a height of approximately 1500 metres above sea level (although small areas of slightly steeper topography occur close to the north-eastern boundary). No permanent drainage ways occur in the study area, with only one small seasonal stream running through the south-western portion.

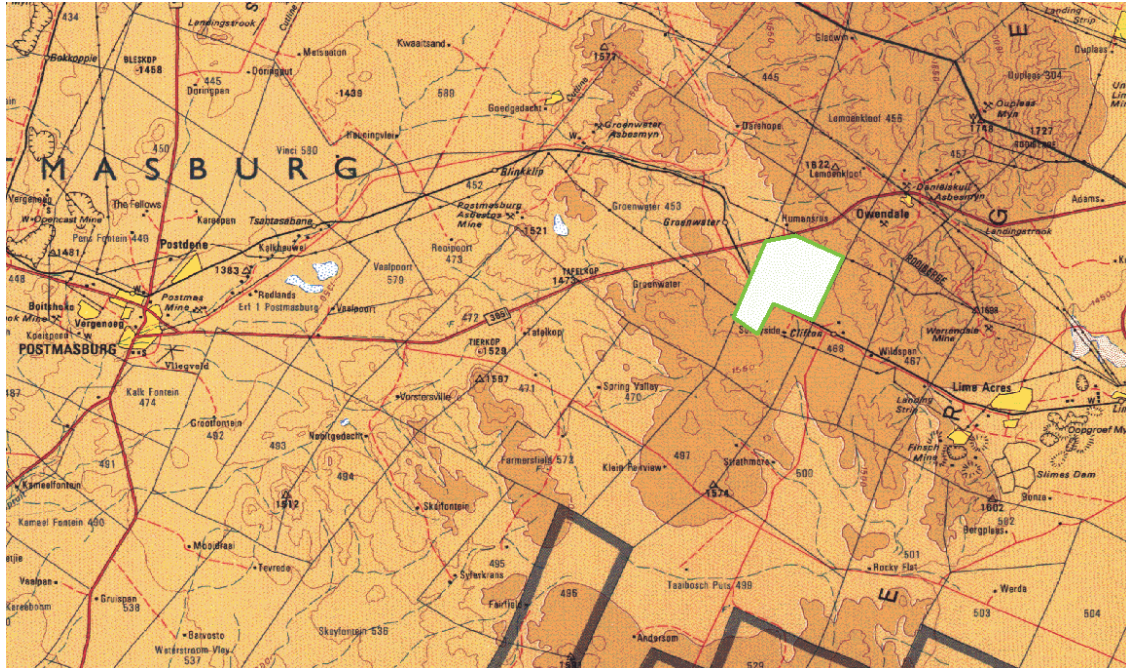


Figure 1 Locality map

### 2.3 Climate

The climate of the area can be regarded as typical of the northern Karoo interior, with a low, generally summer rainfall distribution, warm to hot summers and cold to very cold winters (Koch & Kotze, 1986). The main climatic indicators are given in Table 1 below.

Table 1 Climate Data

| Month | Rainfall<br>(mm) | Min. Temp<br>(°C) | Max. Temp<br>(°C) |
|-------|------------------|-------------------|-------------------|
| Jan   | 62.6             | 17.1              | 33.2              |
| Feb   | 71.9             | 16.5              | 31.5              |
| Mar   | 84.3             | 14.5              | 29.0              |
| Apr   | 45.3             | 9.3               | 26.0              |
| May   | 19.1             | 4.7               | 22.8              |
| Jun   | 7.8              | 1.0               | 19.3              |
| Jul   | 3.1              | 0.6               | 19.8              |
| Aug   | 7.2              | 3.0               | 22.4              |
| Sep   | 7.5              | 7.1               | 26.3              |
| Oct   | 20.0             | 11.2              | 28.9              |
| Nov   | 29.1             | 13.7              | 30.7              |
| Dec   | 50.1             | 15.6              | 32.0              |
| Year  | 407.9 mm         | 18.2°C (Average)  |                   |

Very warm temperatures (>42°C) may be experienced in summer, while frost in winter (end of March to early September) is not uncommon, and may be severe on occasion.

#### 2.4 Parent Material

The geology of the area comprises rocks of the Griqualand west Sequence (Geological Survey, 1977). In the west, lava of the Ongeluk formation occurs, while in the east, jaspelite, crocodilite and shale of the Danielskuil Formation is present. Much of the central area is covered by wind-blown Quaternary sand deposits.

### 3. METHODOLOGY

Existing information was obtained from the map sheet 2822 Postmasburg (Eloff *et al.*, 1986) from the national Land Type Survey, published at a 1:250 000 scale. A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar *et al* (1977).

The area under investigation is covered by a total of three land types, as shown on the map in the Appendix, namely:

- Ae214, Ae215 (Red structureless soils, high base status)
- Ib237 (Rocky areas with shallow soil)

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may also occur. The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.

A summary of the dominant soil characteristics of each land type is given in Table 2 below (the colours correspond to those used in the map in the Appendix).

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in bold type.

#### 4. SOILS

A summary of the dominant soil characteristics is given in Table 2 below.

It should be noted that the Agricultural Potential referred to in column 6 is *soil potential only* and does not take prevailing climatic conditions into account.

Table 2 Land types occurring (with soils in order of dominance)

| Land Type | Dominant soils | Depth (mm) | Percent of land type | Characteristics                                       | Agric. Potential (%)               |
|-----------|----------------|------------|----------------------|-------------------------------------------------------|------------------------------------|
| Ae214     | Hutton 36      | 300-1200   | 31%                  | Red, sandy loam to sandy clay loam soils on hard rock | High:7.0<br>Mod: 41.3<br>Low: 51.7 |
|           | Hutton 33/36   | 100-300    | 30%                  | Red, loamy sand to sandy clay loam soils on hard rock |                                    |
| Ae215     | Hutton 33      | 450-1200   | 81%                  | Red, sandy soils on hard rock and calcrete            | High:0.0<br>Mod: 92.5<br>Low: 7.5  |
|           | Hutton 30      | 450-1200   | 8%                   | Red, very sandy soils on hard rock and calcrete       |                                    |
| Ib237     | Rock           | -          | 61%                  |                                                       | High:0.0<br>Mod: 14.0<br>Low: 86.0 |
|           | Hutton 30/33   | 50-300     | 25%                  | Red, sandy topsoils on rock                           |                                    |

## 5. AGRICULTURAL POTENTIAL

Much of the central part of the area (land type Ae215) comprises moderately deep to deep soils (300-1200+ mm deep) onto rock, while the remainder has more shallow soils (land type Ae214) or rock (land type Ib237). However, the low rainfall in the area (Table 1) means that the only means of cultivation would be by irrigation and the Google Earth image (Figure 2) of the area shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation.



Figure 2 Google Earth image of study area

The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is very low, around 15-20 ha/large stock unit (ARC-ISCW, 2004).

## 6. IMPACTS

The project as envisaged will comprise infrastructure as follows:

1. Solar Field – the solar field consists out of all services and infrastructure related to the management and operation of the heliostats.
2. Molten Salt Circuit which includes the thermal storage tanks for storing the hot and cold liquid salt, a concentration tower, pipelines and heat exchangers);
3. The Power Block; and
4. Auxiliary facilities and infrastructure which includes the steam turbine, condenser-cooling system, electricity transmission lines, a grid connection, access routes, water supplies and facility start-up energy plant (gas or diesel generators).

The major impact on the natural resources of the study area would be the loss of arable land due to the construction of the various types of infrastructure. However, this impact would in all probability be of limited significance (due to the low potential soils and the fact that construction of the infrastructure will not involve deep excavations or large-scale topsoil removal) and would be local in extent. At the end of the project life, it is anticipated that removal of the structures would enable the land to be returned to more or less a natural state, with little impact, especially given the low prevailing agricultural potential.

The impact can be summarized as follows:

Table 3      Impact significance

|                         |                                                                                                           |                                                                                  |
|-------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Nature of impact        | Loss of agricultural land                                                                                 | Land that is no longer able to be utilized due to construction of infrastructure |
| Status of impact        | Neutral (N)                                                                                               | No cost or benefit to receiving environment                                      |
| Spatial Scale of impact | Low (1)                                                                                                   | Confined to site boundary                                                        |
| Time Scale of impact    | High (3)                                                                                                  | Lifespan of project                                                              |
| Probability of impact   | Probable (2)                                                                                              | Likely to materialise                                                            |
| Severity of impact      | Average (2)                                                                                               | Mitigation & rehabilitation will be possible                                     |
| Significance of impact  | Medium (8)                                                                                                |                                                                                  |
| Mitigation factors      | The main mitigation would be to ensure that as little pollution or other non-physical disturbance occurs. |                                                                                  |

It does not appear, from a soils aspect, that there are any especially sensitive areas ("fatal flaws") within the site that should be avoided.

In conclusion, due mainly to the low potential soils and prevailing climatic limitations for agriculture, it is extremely unlikely that any sort of detailed soil investigation will be necessary.

#### REFERENCES

ARC-ISCW, 2004. Overview of the status of the agricultural natural resources of South Africa (First Edition). ARC-Institute for Soil, Climate and Water, Pretoria

Koch, F.G.L. & Kotze, A.V., 1986 Climate data. In: Land types of the maps SE27/20 Witdraai, 2720 Noenieput, 2722 Kuruman, 2724 Christiana, 2820 Upington & 2822 Postmasburg. *Mem. Nat. Agric. Res. S. Afr.* No. 3. ARC-Institute for Soil, Climate and Water, Pretoria.

Eloff, J.F, Idema, S.W.J. & Bennie, A.T.P., 1986. 1:250 000 land type map 2822 Postmasburg. ARC-Institute for Soil, Climate and Water, Pretoria.

Geological Survey, 1977. 1:250 000 Geological Map 2822 Postmasburg. Department of Mineral and Energy Affairs, Pretoria.

MacVicar, C.N., de Villiers, J.M., Loxton, R.F, Verster, E., Lambrechts, J.J.N., Merryweather, F.R., le Roux, J., van Rooyen, T.H. & Harmse, H.J. von M., 1977. Soil classification. A binomial system for South Africa. ARC-Institute for Soil, Climate & Water, Pretoria.

## APPENDIX

### MAP OF LAND TYPES

# HUMANSRUS CSP PROJECT: Land Types

