

**PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE
PROPOSED TSIANDA ELECTRIFICATION PROJECT,
MAKHADO LOCAL MUNICIPALITY, LIMPOPO
PROVINCE**

DESKTOP STUDY (PHASE 1)

By

Prof. Marion Bamford



(AHSA) Archaeological and Heritage Services Africa (Pty) Ltd
Reg. No. 2016/281687/07

48 Jacqueline Street, The Reeds, 0157, Centurion, Pretoria

Email: e.matenga598@gmail.com.

Cell: +27 73 981 0637 / +2784 073 7774

Website: www.archaeologicalheritage.co.za

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Prof Marion Bamford

Palaeobotanist

P Bag 652, WITS 2050

Johannesburg, South Africa

Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford

Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf

Experience: 31 years research; 23 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Archaeological and Heritage Services (Pty) Ltd, Pretoria, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford



Signature:

EXECUTIVE SUMMARY

The Makhado Local Municipality proposes to undertake an electrification project from the Muledane-Tshakuma 22kV feeder to Reubander 21 LT and Tsianda, Makhado Local Municipality, Limpopo Province.

To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed project.

The route for the proposed power line lies entirely on the basalts of the Sibasa Formation, Soutpansberg Group. Basalts are of volcanic origin, and these ones are older than the origin of any body fossils, so there is NO CHANCE of fossils being preserved in the vicinity. It is recommended that the SAHRIS paleosensitivity map be amended to reflect the lack of fossils. It incorrectly shows the area as moderately sensitive (green). Based on this information it is recommended that no palaeontological assessment is required and the project may proceed.

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1. Background

The Makhado Local Municipality proposes to undertake an electrification project from the Muledane-Tshakuma 22kV feeder to Reubander 21 LT and Tsianda, Makhado Local Municipality, Limpopo Province (Figures 1 and 2).

The whole area is indicated as moderately sensitive (green) on the SAHRIS Palaeosensitivity map so a desktop study is required.

To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed project and is reported herein.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (amended 2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant section in report
ai	Details of the specialist who prepared the report	Appendix B
a ii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 2
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5

j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	N/A
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies if any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A



Figure 1: Locality map of the Tsianda line from the Muledane-Tshakuma 22kV feeder to Reubander 21 LT and Tsianda shown by the blue line. Map supplied by EM.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

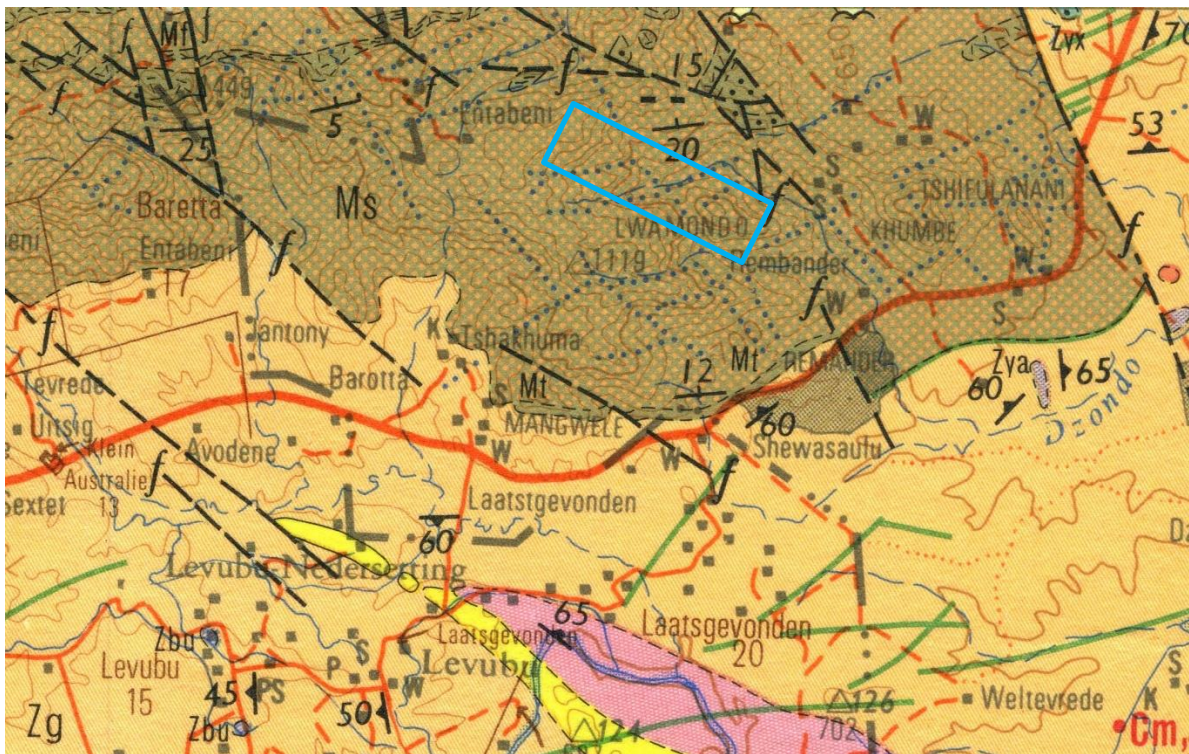


Figure 2: Geological map of the area around Reubander and Tsianda, Machado (Louis Trichardt) Local Municipality, Limpopo Province. The location of the proposed project is indicated within the

blue rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2330 Tzaneen.

Table 2: Explanation of symbols for the geological map and approximate ages (Barker et al., 2006; Robb et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Kalahari Group	Soil, sand, alluvium	Quaternary ca 2.5 Ma to present
Mw	Wyllies Poort Fm, Soutspansberg Group	Pink quartzite, minor conglomerate, shale and sandy shale	2000 – 1700 Ma
Ms	Sibasa Fm, Soutspansberg Group	Basalt, metamorphosed at the base	2000 – 1700 Ma
Zg	Goudplaats Gneiss, Basement complex / Archaean granitoid intrusions	Gneiss	Ca 3333 - 3274 Ma

Makhado lies in the southwestern part of the Soutspansberg Basin that is an intracratonic to mobile belt or near cratonic environment (Barker et al., 2006). The sediments that filled the basin are about 1700 to 2000 million year old are what are known as red beds. These Palaeoproterozoic red beds formed when there was sufficient free atmospheric oxygen to produce oxides of the ferruginous materials, i.e. red beds (ibid). Just northeast of Makhado are exposures of the Sibasa Formation and the Wyllies Poort Formation basalts.

To the south of the Sibasa Formation is the extensive Goudplaats-Hout River Gneiss Suite that is Archaean in age. It is composed of a wide spectrum of granitoid gneisses of various types and compositions (Robb et al., 2006). Exposures are poor and it tends to form flat ground.

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 3. The route for the power line is indicated as moderately sensitive (green), however the geological map shows that it is all on the basalts of the Sibasa Formation (brown in Fig 2). The Palaeotechnical report for Limpopo (Groenevald et al., 2014) also shows this formation as having insignificant to zero palaeosensitivity (blue). It is likely, therefore, that the SAHRIS map needs to be corrected.

Since there is no chance of fossils occurring along the proposed route for the power line, there is no need for a Fossil Chance Find Protocol.

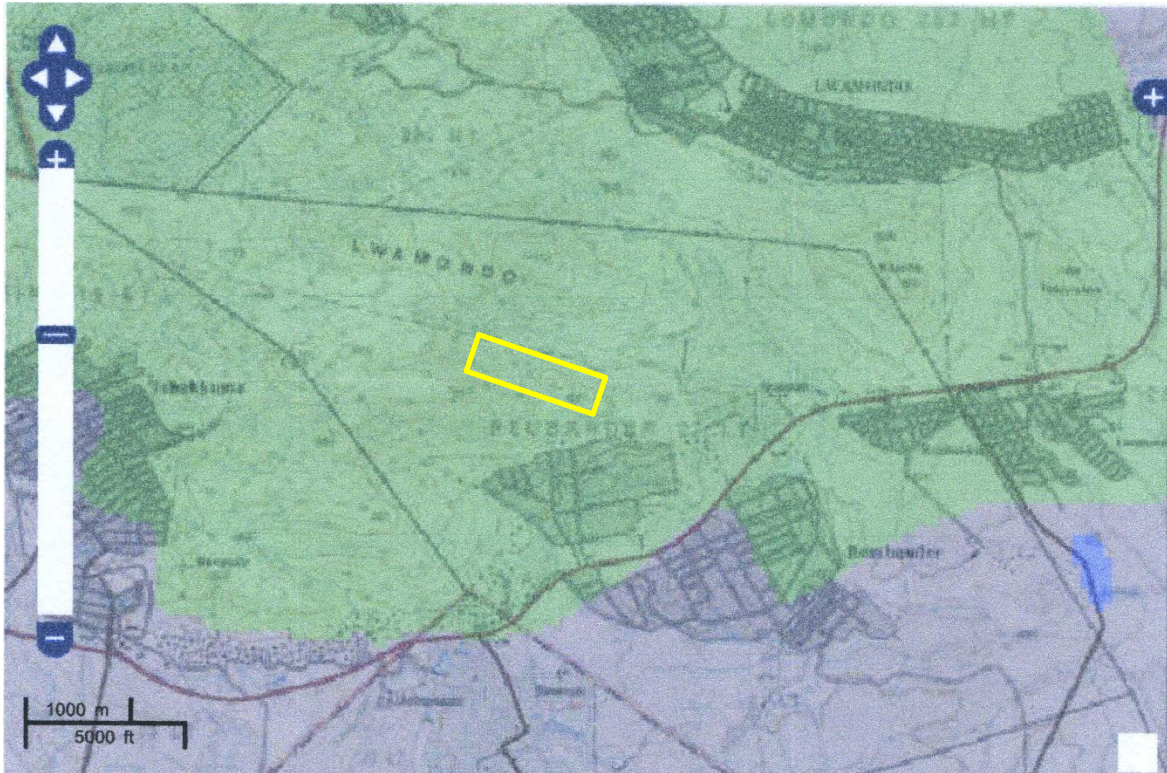


Figure 4: SAHRIS palaeosensitivity map for the site for the Tsianda Electrification project shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

From the SAHRIS map above the area is indicated as moderately sensitive (green) and this incorrectly applies to the Sibasa Formation. The blue colour correctly applies to the Goutplaats-Hout River Gneiss Suite. The whole area should be indicated as blue.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

TABLE 3A: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.

	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	H	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

TABLE 3B: IMPACT ASSESSMENT

PART B: ASSESSMENT		
SEVERITY/NATURE	H	-
	M	-
	L	Basalts of the Sibasa Fm do not preserve any fossils. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	L	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	L	There is no chance of finding fossils in the ancient basalts, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	There is no chance of finding fossils in the basalts of the Sibasa Fm,

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the wrong kind, i.e. basalt which is of volcanic origin. It is older than the origin of any body fossils so would not have trapped fossils when flowing on the land surface. Since there is no chance of finding any fossils along the power line route, or even in the vicinity, no further palaeontological assessment is required.

5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the basalts and gneisses typical for the country and do not contain any fossils of any kind. It is probably a mistake that the area has been mapped as moderately sensitive in the SAHRIS palaeosensitivity map

6. Recommendation

Based on the geology and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the basalts of the Sibasa Formation, Soutpanserg Group. No palaeontological assessment is required and the project can proceed.

It is recommended that the SAHRIS palaeosensitivity be amended to reflect the geology and recommendation given in the Palaeotechnical report for Limpopo.

7. References

Barker, O B., Brandl, G., Callaghan, C.C., Erikssen, P.G., van der Neut, M., 2006. The Soutspanberg and Waterberg Groups and the Blouberg Formation. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 301-318.

Groenewald, G., Groenewald, D., Groenewald, S., 2014. SAHRA Palaeotechnical Report. Palaeontological Heritage of Limpopo. 22 pages.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Robb, L.J., Brandl, G., Anhaeusser, C.R., Poujol, M., 2006. Archaean Granitoid Intrusions. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 57-94.

Appendix A – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD July 2020

I) Personal details

Surname : **Bamford**
First names : **Marion Kathleen**
Present employment : Professor; Director of the Evolutionary Studies Institute.
Member Management Committee of the NRF/DST Centre of

Excellence Palaeosciences, University of the Witwatersrand,
Johannesburg, South Africa-

Telephone : +27 11 717 6690
 Fax : +27 11 717 6694
 Cell : 082 555 6937
 E-mail : marion.bamford@wits.ac.za ; marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:
 1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
 1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
 1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
 1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):
 1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium,
 by Roger Dechamps
 1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
 1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros,
 and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
 Royal Society of Southern Africa - Fellow: 2006 onwards
 Academy of Sciences of South Africa - Member: Oct 2014 onwards
 International Association of Wood Anatomists - First enrolled: January 1991
 International Organization of Palaeobotany – 1993+
 Botanical Society of South Africa
 South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
 SASQUA (South African Society for Quaternary Research) – 1997+
 PAGES - 2008 –onwards: South African representative
 ROCEEH / WAVE – 2008+
 INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/completed	Current
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Honours	7	0
Masters	10	4
PhD	12	5
Postdoctoral fellows	10	3

viii) Undergraduate teaching

Geology II – Palaeobotany GEOL2008 – average 65 students per year

Biology III – Palaeobotany APES3029 – average 25 students per year

Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology;

Micropalaeontology – average 2-8 students per year.

ix) Editing and reviewing

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 – Assistant editor

Guest Editor: *Quaternary International*: 2005 volume

Member of Board of Review: *Review of Palaeobotany and Palynology*: 2010 –

Cretaceous Research: 2014 – 2019; Associate Editor: 2020 -

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics
- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood

- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lieliefontein N&D 2019 for Enviropro
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells

xi) Research Output

Publications by M K Bamford up to December 2019 peer-reviewed journals or scholarly books: over 150 articles published; 5 submitted/in press; 8 book chapters.

Scopus h-index = 29; Google scholar h-index = 36; -i10-index = 80

Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)

NRF Rating: B-3 (2010-2015)

NRF Rating: B-3 (2005-2009)

NRF Rating: C-2 (1999-2004)