NOTICE 118 OF 2009

NOTICE OF INTENTION TO MAKE REGULATIONS REGARDING THE KAROO RADIO ASTRONOMY ADVANTAGE AREA FOR SQUARE KILOMETRE ARRAY RADIO TELESCOPE

The Minister of Science and Technology hereby gives notice of intention to make regulations in the schedule in terms of section 50 read with sections 7,9 and 11 of the Astronomy Geographic Advantage Act, 2007 (Act No.21 of 2007), which are hereby published for public comment under section 42 of the said Act.
Interested persons are hereby invited to submit written comments or written representations with regard to the proposed regulations not later than 16h30 on the 6th of March 2009. For the attention of:

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M MANGENA

MINISTER OF SCIENCE AND TECHNOLOGY

SCHEDULE

ARRANGEMENT OF REGULATIONS

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Definitions

In these regulations any word or expression to which a meaning has been assigned in the Act shall have the meaning so assigned and, unless the context otherwise indicates

"Act" means the Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007).

"Detrimental radio interference" means a radio frequency interference which endangers or obstructs the functioning of the radio astronomy devices and impacts negatively on the related scientific endeavours.

"Saturation" means a phenomenon that occurs in radio receivers by which they cease operation when a high level electromagnetic energy reaches the receiver, independent of the frequency.

Purpose of regulations

1.

(1) To provide for the protection of the Karoo radio astronomy advantage areas in the context of their use for the Square Kilometre Array (SKA) radio telescope.

(2) For effective protection purpose these regulations must be read together with other regulations of astronomy advantage areas.

Scope of regulation

2.

These regulations apply to the Karoo radio astronomy advantage areas which will be used for the Square Kilometre Array radio telescope.

Commencement of regulations

3.

(1) These regulations will commence and become effective on the date the Square Kilometre Array radio telescope becomes operational.

(2) The commencement date will be published by a notice in the Gazette

(3) On commencement date these regulations shall become effective.

Specific protection requirements

4.

(1) Protection for the Karoo radio astronomy advantage areas in the Northern Cape against detrimental radio frequency interference is based on specified protection levels at the reference point, within the Karoo core radio astronomy advantage area located at geographical coordinates 21.388000 degrees East and 30,71480 degrees South.

(2) The designated frequency spectrum within which radio astronomy observations will be carried out and which needs protection is the continuous spectrum from 100 MHz to 25.5 GHz.

(3) Observations will also be carried out in the spectrum from 70 to 100 MHz.

(4) Existing transmitters operating in the frequency band between 87.5 and 100 MHz will not be subject to the protection requirement needed for radio astronomy observations in this band.

(5) In the event of saturation in the radio astronomy receiving equipment causing malfunctioning of the equipment due to the received signals within 87.5 and 100 MHz band exceeding -120 dBm/Hz, the transmitting installation involved will have to be relocated or its transmission characteristics changed to reduce the signals causing the saturation to below -120 dBm/Hz.

(6) The requirement referred to in subsection (5) will take precedence over any other requirement with respect to protection which may imply a concession on the need to avoid saturation.

(7) The protection levels to be applied in connection with all the Karoo radio astronomy advantage areas, to which these regulations are applicable, are as follows:

(a) The protection levels are derived using the methodology described in ITU Recommendation ITU-R RA.769-2.

(b) The technical assumptions made in the derivation are that receiver and sky temperatures are linearly interpolated from those values found in ITU-R RA.769-2, and that receiver bandwidth is assumed to be 10% of the observing frequency.

(c) Derived protection levels, which are equivalent to threshold levels of interference for new generation radio astronomy observatories and based on the methodology outlined in ITU-R RA.769-2, are specified in Figure 1.

(d) A linearly piecewise function is defined as the South African Radio Astronomy Services (SARAS) protection level. This function is described by the following equations, which are to be used to calculate the required protection level at any frequency in the spectrum from 70 MHz to 25,500 MHz.

$$SARAS\ [dBm\ /\ Hz] = -17.2708\ \log_{10}(f) - 197.0714, \quad f < 2\,GHz$$

$$SARAS\ [dBm\ /\ Hz] = -0.065676\ \log_{10}(f) - 253.8661, \quad f \geq 2\,GHz$$

The values of (f) are to be in MHz

(e) The South African protection levels are reflected in Figure 1 below together with the ITU interpolated continuum threshold levels of interference.

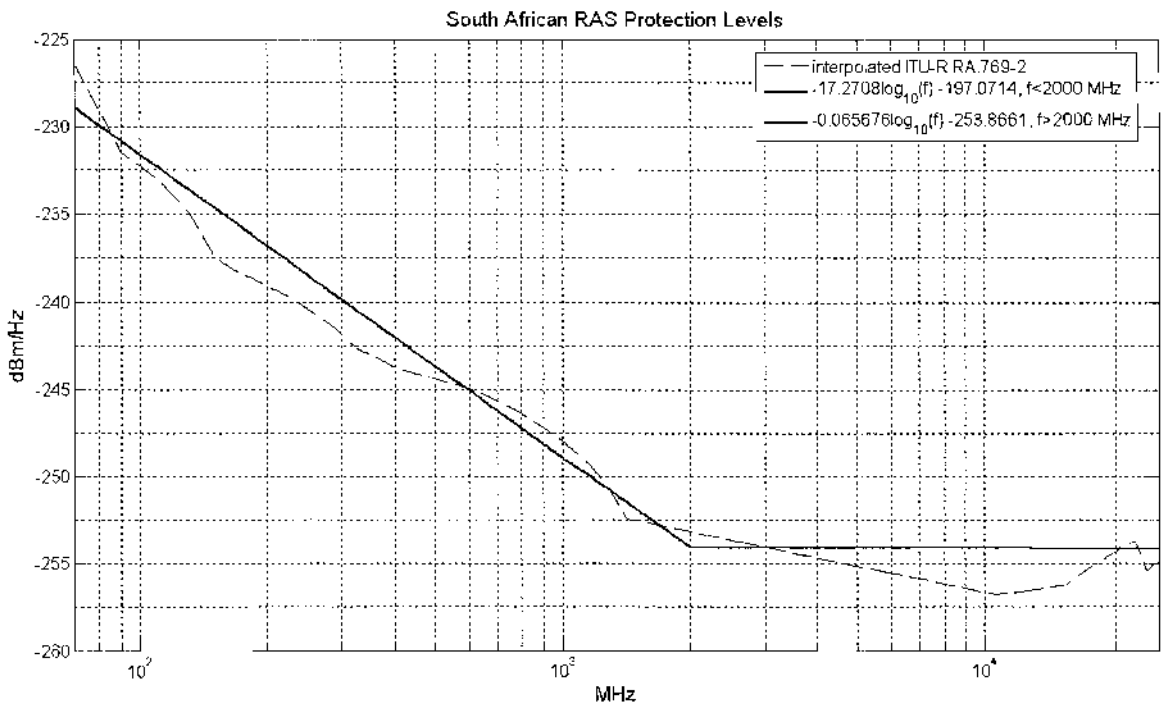


Figure 1: South African Radio Astronomy Service Protection Levels

(f) Due to the variety of units used within the electronic communications sector, the following list of unit conversions is provided (assuming an isotropic radiator).

$$dB(W/m^2/Hz) \rightarrow dBm \quad : \quad SPFD - 20\log_{10}(f) + 10\log_{10}(\Delta f) + 188.5$$

$$dBm \rightarrow dBm/Hz \quad : \quad dBm - 10\log_{10}(\Delta f)$$

$$dBW \rightarrow dBm \quad : \quad dBW + 30$$

$$dBW \rightarrow dB(W/m^2) \quad : \quad dBW + 20\log_{10}(f) - 158.5$$

The values of "f" and "Δf" are to be in MHz.

(8) The radio frequency interference impact assessment will be carried out on the signal level received or predicted at the common reference point within the Karoo core astronomy advantage area at the height of 10 metres.

Karoo core radio astronomy advantage area

5.

(1) The Karoo core radio astronomy advantage area to which these regulations are applicable has been declared in the Gazette number xxxx and in accordance with section 7(1)(a) of the Act.

(2) Radio communications with transmitters located within the Karoo core radio astronomy advantage area which operate within the frequency band from 70 MHz to 25.5 GHz are declared activities that may only be undertaken as prescribed in these regulations.

(3) No fixed transmitting stations operating within the frequency spectrum from 70 MHz to 25.5 GHz maybe located in the Karoo core radio astronomy advantage area.

(4) Any existing transmitter stations operating within the frequency spectrum from 70 MHz to 25.5 GHz within the Karoo core radio

astronomy advantage area will have to be relocated to a location outside the Karoo core radio astronomy advantage area.

Karoo central radio astronomy advantage areas

6.

(1) The Karoo central radio astronomy advantage areas to which these regulations are applicable have been declared in the Gazette number xxxx in accordance with section 9(1)(a) of the Act.

(2) Radio communications with transmitters located within the Karoo central radio astronomy advantage areas which operate within the frequency band from 70 MHz to 25.5 GHz are declared activities that may only be undertaken as prescribed in these regulations.

(3) The geographical extent of the Karoo central radio astronomy areas are defined in the declaration are the areas beyond the declared Karoo core radio astronomy advantage area and within the outer boundaries of the areas referred to as Karoo central radio astronomy areas 1, 2 and 3, herein referred to as annexure A.

(4) Karoo central radio astronomy area 1shall apply to the frequency band 70 to 1710 MHz.

(5) Karoo central radio astronomy area 2 shall apply to the frequency band 1710 to 6000 MHz.

(6) Karoo central radio astronomy area 3 shall apply to the frequency band 6000 MHz to 25.5 GHz.

(7) Frequency bands within the radio astronomy band from 70 MHz to 25.5 GHz to be authorised for radio communication within the Karoo central radio astronomy advantage areas will be determined by the management authority in consultation with the entities involved according to prescribed procedures.

(8) The radio frequency interference impact at the Karoo core radio astronomy advantage area reference point specified in section 4(1) from any transmission within the specified frequency band must not exceed the threshold level prescribed in section 4(7) unless exemption has been granted, in which case a concessionary level will be determined.

Karoo coordinated radio astronomy advantage areas

7.

(1) The Karoo coordinated radio astronomy advantage areas to which these regulations are applicable have been declared in the Gazette number xxxx in accordance with section 11(1)(a) of the Act.

(2) Radiocommunications with transmitters located within the Karoo coordinated radio astronomy advantage areas which operate within the specified frequency band from 70 to 6000 MHz are identified activities that may only be undertaken as prescribed in these regulations.

(3) The geographical extent of the Karoo coordinated radio astronomy advantage areas are defined in the declaration and are the areas:

(a) Between Karoo central radio astronomy area 1 outer boundary and the borders of the Northern Cape, excluding Municipality Sol Plaatje, for the frequency band from 70 to 1710 MHz and for transmissions with an effective radiated power exceeding 60 dBm, herein referred to as annexure B.

(b) Between Karoo central radio astronomy area 2 outer boundary and Karoo central radio astronomy area 1 outer boundary for the frequency band from 1710 to 6000 MHz and for transmissions with an effective radiated power exceeding 60 dBm, herein referred to as annexure C.

(4) All the transmissions within the Karoo coordinated astronomy advantage areas as specified in subsection (3) must be coordinated to ensure that the radio frequency interference caused is below the applicable protection level prescribed in regulation 4 (7) or alternatively be reduced to an agreed level.

Offences and Penalties

8.

(1) Any person who contravenes these regulations may be found guilty of an offence in terms of section 52(1) of the Act.

(2) Any person found guilty of an offence in terms of subsection (1) shall be held liable in terms of section 52(2) of the Act.

Review of the regulations

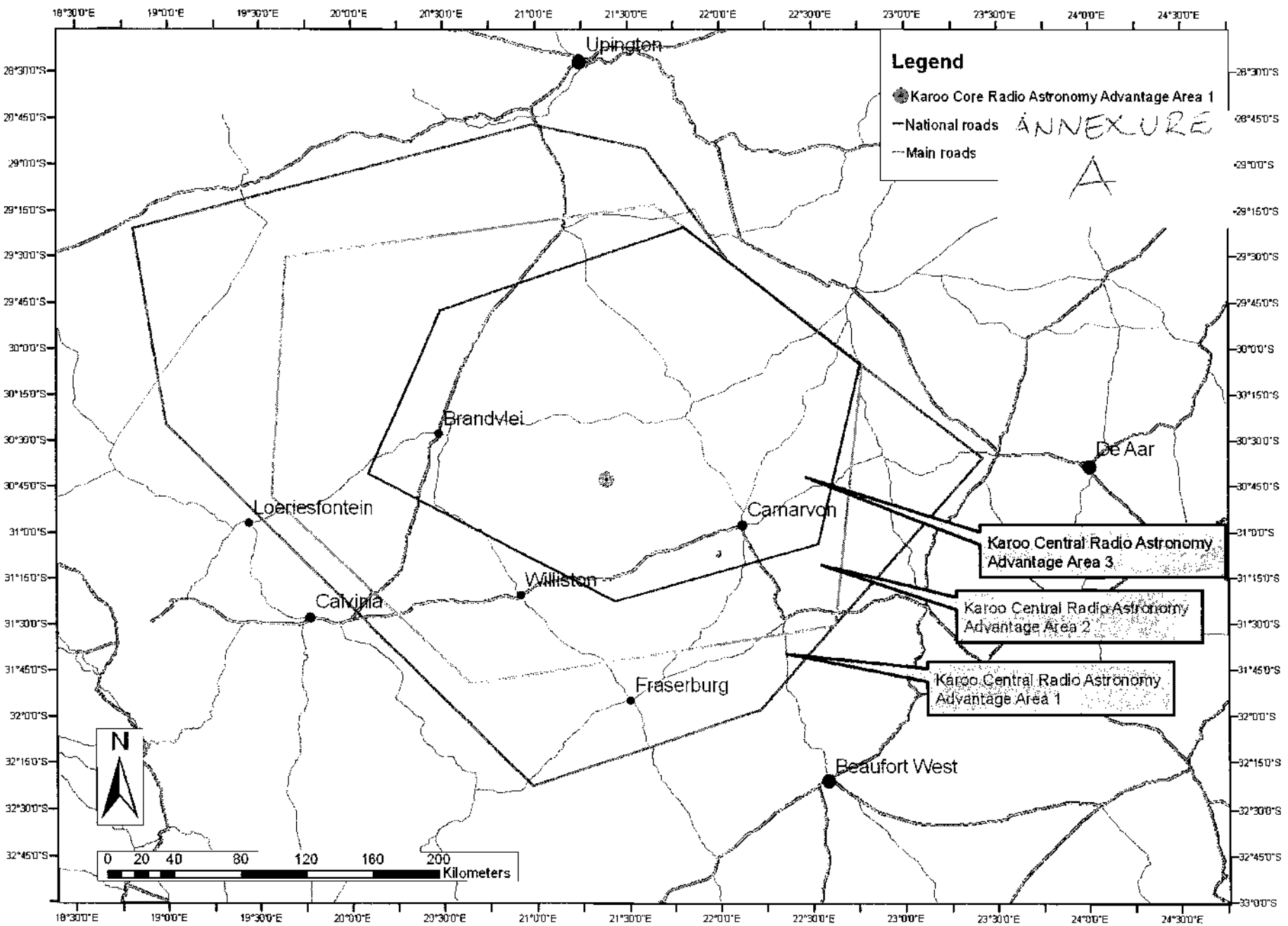
9.

These regulations may from time to time be reviewed.

Short title

10.

These regulations are called the Karoo radio astronomy advantage areas regulations for the Square Kilometre Array radio telescope.


Legend
Karoo Core Radio Astronomy Advantage Area 1
National roads
Main roads
ANNEXURE
A
Upington
Brandvlei
De Aar
Loeriesfontein
Carnarvon
Williston
Calvinia
Fraserburg
Beaufort West
Karoo Central Radio Astronomy Advantage Area 3
Karoo Central Radio Astronomy Advantage Area 2
Karoo Central Radio Astronomy Advantage Area 1
N
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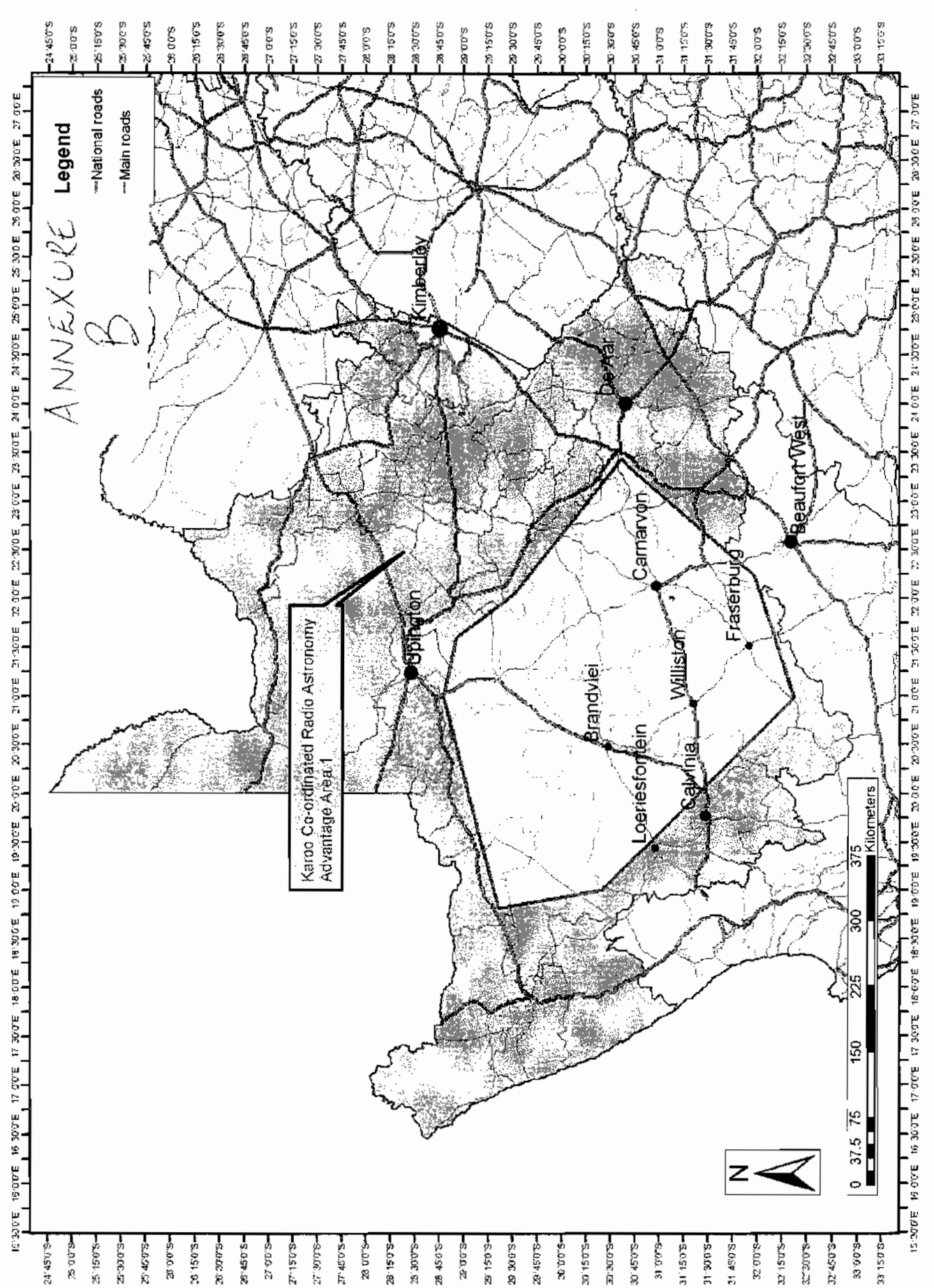
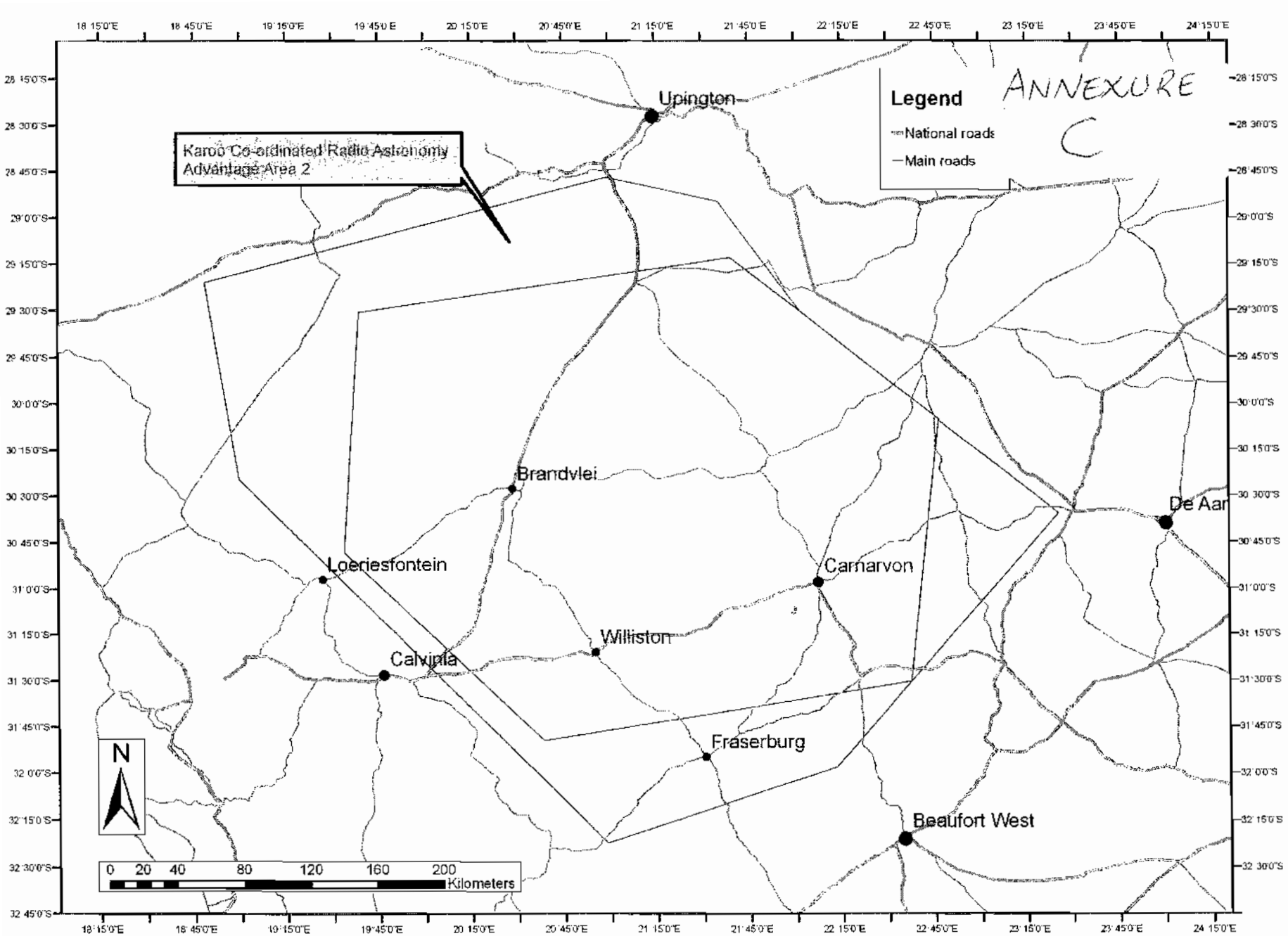
Kilometers


ANNEXURE B
Legend
National roads
Main roads
Karoo Co-ordinated Radio Astronomy Advantage Area 1
Kimberley
De Aar
Beaufort West
Carnarvon
Fraserburg
Williston
Brandvlei
Loeriesfontein
Calvinia
Upington
N
0 37.5 75 150 225 300 375
Kilometers


ANNEXURE C
Legend
National roads
Main roads
Karoo Co-ordinated Radio Astronomy Advantage Area 2
Upington
Brandvlei
Loeriesfontein
Carnarvon
De Aar
Williston
Calvinia
Fraserburg
Beaufort West
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28°15'0"S
28°30'0"S
28°45'0"S
29°0'0"S
29°15'0"S
29°30'0"S
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