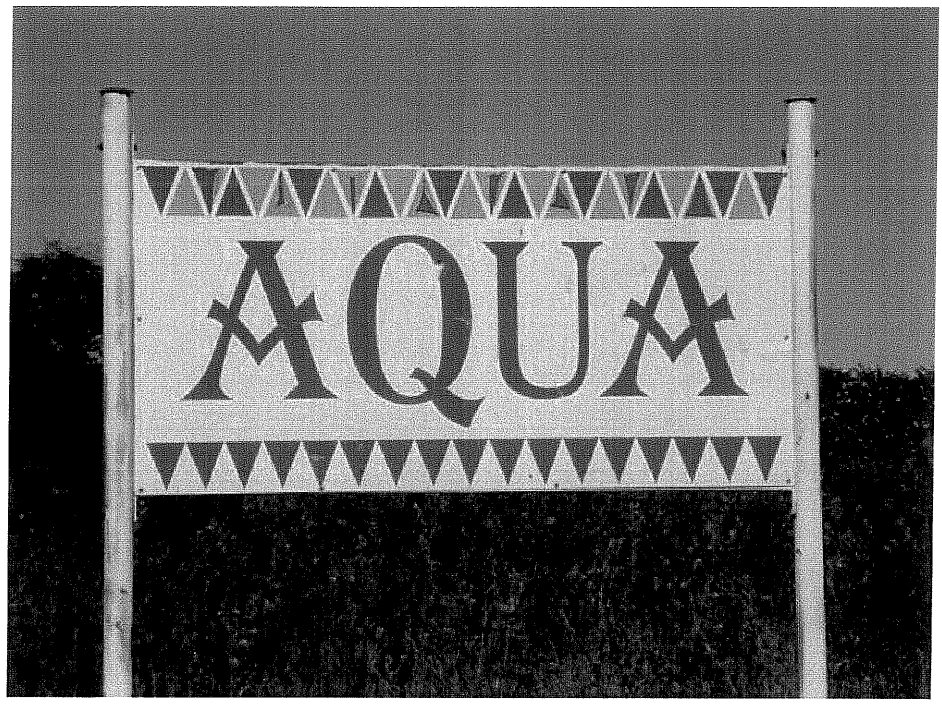
Phase 1 PIA and AIA of a proposed water pipeline between the farm Loverswalk 1063 and the Vaal River, Boshof District, FS.



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Executive Summary

- There are no major palaeontological or archaeological grounds to suspend the construction of the water pipeline between Loverswalk and the Vaal River.
- The footprint is not considered to be archaeologically or palaeontologically vulnerable with regard to surface finds, rock engravings, graves or historical structures.
- The section of pipeline most likely to be impacted (the 6km - section connecting points E, F G and H) has already been disturbed by prior construction activities.
- A moderate probability exists for locating capped Middle Stone Age artifacts within the Quaternary sands between points A and E, because of sporadic occurrences of high densities of Fauresmith blades previously recorded in the lower levels of superficial aeolian sands.
- It is advised that newly uncovered material found during the course of excavation activities along the footprint must be reported to SAHRHA, that excavations into *in situ* sediments should allow for inspection by a specialist at the appropriate time and that possible intact finds may require a Phase 2 rescue operation at the cost of the developer.

Contents

Introduction

A Phase 1 Palaeontological and Archaeological Impact Assessment were carried out along designated areas on the farms Loverswalk 1063, Holpan 260 and Smithskraal 1519 in the Boshof District, Free State Province. Anticipated development calls for the installation of a water pipeline between the farm Loverswalk 1063 and the Vaal River (**Fig. 1**). The pipe will have a diameter of 50cm and will be buried at an average depth of 2m below ground. Pipeline section A to C will be placed partly in open veld and partly at the side of an existing farm road. Pipeline section C to D will run on and alongside a firebreak and access road within a game enclosure. Pipeline section D to E will cut through ploughed land and crop fields. Pipeline section E to H will be placed directly beside an existing water pipeline that terminates at the Vaal River.
The survey is required as a prerequisite for new development in terms of the National Environmental Management Act and is also called for in terms of the National Heritage Resources Act 25 of 1999. A site visit and assessment took place in May 2011.

The assessment required:

- identification and recording of potential palaeontological and archaeological heritage resources in the proposed areas of impact and;
- recommendation of mitigation measures to minimize potential impacts associated with the proposed development.

Details of area surveyed

The affected area is located on the 1:50 000 scale topographic map 2825 AA Boshof **(Fig. 1)** Coordinates of the proposed water pipeline are presented as reference points in **Table 1.** The greater extent of the footprint consists of generally flat to undulating countryside that mainly covers agricultural land.

Methodology

A pedestrian survey was conducted along the proposed sections. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant geological, palaeontological and archaeological

information were assimilated for the report and integrated with data acquired during the on-site inspection.

Table 1. General reference points of the proposed pipeline.

Feature		Coordinates
Pipeline	Point A	S28 12.847 E25 05.899
Pipeline	Point B	S28 13.234 E25 04.586
Pipeline	Point C	S28 12.072 E25 03.177
Pipeline	Point D	S28 09.662 E25 03.064
Pipeline	Point E	S28 07.524 E25 03.793
Pipeline	Point F	S28 06.046 E25 03.922
Pipeline	Point G	S28 05.917 E25 03.793
Pipeline	Point H	S28 04.210 E25 03.874

Geology

Landscape topography between Loverswalk and Smithskraal consists largely of coalescent planar surfaces incised by the Vaal River drainage. The geology of the area has been described by Bosch (1993). The area in question is underlain by Archaeozoic and Phanerozoic sediments (1: 250 000 scale geological map 2824 Kimberley, Council for Geoscience, Pretoria, 1991). These are sediments of widely different geological ages. From oldest to youngest, the geology in the region is made up of Archaeozoic Ventersdorp andesites and volcanic breccia (*Rr*), Permian Ecca shales (*Ppr*), Jurassic dolerite intrusions (*Jd*), Quaternary calcretes, calcified pandunes (*Qc*) and aeolian sands (*Qs*) (**Fig.2**).

Ventersdorp Supergroup andesites, volcanic breccias, tuff and chert outcrops of the Rietgat and Allanridge Formations are exposed on the farms Honigkop 1002 and Honiglaagte 1234, about 10 km east of Loverswalk 1063 and on the farm Fourteen Streams about 15 km west of Smithskraal, respectively. Ventersdorp Supergroup rocks are not palaeontologically significant. Karoo sediments represented by shales of the Lower Ecca Group (Prince Albert Frm.) are exposed at Pandam 467, about 15 km west of Loverswalk. In the main Karoo Basin the Ecca Group straddles the Early-Late Permian boundary with the Prince Albert Formation, which consists essentially of

mudrock, making up the basal part of the group. It conformably overlies the Dwyka Group, but locally it unconformably overlies pre-Karoo basement rocks where the Dwyka Group is absent. Fossils, including cephalopods, brachiopods, fishes, coprolites, wood, leaves (*Glossopteris*) and spores have been recorded in the lowermost part of the formation. Lower Ecca Group rocks will not be impacted by the proposed development.

The proposed pipeline route almost exclusively transects Jurassic age dolerite intrusions (*Jd*) as well as thick cappings of overlying Quaternary sediments (*Qc, Qs*). The latter is made up of undifferentiated deposits of unconsolidated to semi-consolidated sediments including aeolian sands, calcretes and surface limestones, with the characteristically red-brown Kalahari sands (Hutton sands) representing the latest geological phase.

At Smithskraal 1519, Late Tertiary gravel deposits occur laterally above the current riverbed of the Vaal River. These alluvial deposits, manifested as terrace exposures in the Lower Vaal River Basin are subdivided into Older and Younger gravels on the basis of lithological and topographical observations. It consists of grit to cobble grade conglomerate with granular to pebbly clasts that are composed mainly of quartz, quartzite, agate, chert or banded ironstone set in a matrix of dark red, fine to medium sand. Lateral distribution of Late Tertiary alluvial gravels along the Lower Vaal Basin is extensive. The oldest gravels occur between 75m and 100m above the present river level while the next group of more calcified older gravels occur at 60m – 21m levels. The younger gravels form the 8m to 15m - floodplain terrace above present river level and contain a sequence of alluvial deposits ranging in age from the Middle Pleistocene right up to the Late Pleistocene and Holocene.

Background

Archaeology

Stone Age archaeology

The lower Vaal River Basin has produced a wealth of archaeological finds from its fluvially deposited Pleistocene river gravels. Archaeological finds are exclusively derived from the Younger Gravels and include an abundance of Acheulian (Early Stone Age) handaxes, cleavers and core-axes, primarily made from quartzite. Gravel deposits are largely mantled by undifferentiated deposits of unconsolidated to semi-

consolidated sediments, including calcrete, aeolianites and Late Quaternary aeolian sands (*Qs*), of which the lower levels have shown evidence of high densities of Fauresmith blades, which is regarded as an important transitional stone tool industry at the beginning of the Middle Stone Age. The incidence of Later Stone Age artifacts as open-site surface scatters is common in the region.

No archaeological artifacts have been previously reported from the gravel deposits or younger overburdens at Smithskraal 1519, Loverswalk 1063 and Holpan 260. Several Early Stone Age handaxes have been found on the farm Cawoods Hope in exposures in the riverbed showing moderately coarse gravel layers capped by silt and clayey deposits (**Fig. 3**). Calcarous tufa is also found on exposed Dwyka beds and Ventersdorp bedrock, especially at Cawoods Hope and Catharina. Later Stone Age artifacts occur on these deposits at various places. A large portion of the river floodplain at Grasbult, Schoolplaats, Schoolplaats Annex and Pontdrift are composed of bands of silt, sands and clay that has been partly covered by aeolian sands (**Fig 3**).. A pebbly gravel layer, containing Middle Stone Age flakes, has been recorded at the base of the fluvial sand deposits at Schoolplaats and Schoolplaats Annex 4 (**Fig.3**).

Rock Art

Rock engravings have been recorded at Four Streams and Nazareth that include human figures, animals, therianthropes and geometric motifs. A total of 544 rock engravings have been recorded at Schoolplaats (**Fig 3**). There is currently no record of rock engravings on the farms affected by the proposed development.

Frontier history

The confluence of the Orange and Vaal rivers and its surrounding area became an important settlement area for the Khoikhoi groups in their search for new pastures. Koranna and Bushman bands occupied the Harts-Vaal valley as far west as Boshof by the beginning of the 19th century and competed for territory with the Tswana/Thlaping immigrants from the north.

Palaeontology

Extensive fossil fauna of uncertain provenance have been retrieved from the alluvial and terrace gravels between Bloemhof and the Vaal River's junction with the Orange River. No fossils have been explicitly reported from the Older Gravels, but more ancient forms of uncertain provenance have been retrieved together with the extensive

fossil fauna of the Younger Gravels. Gravel terraces between 21m and 30m above present river level, contain frequent sandy lenses and have yielded vertebrate fauna such as the extinct proboscidian, *Mammuthus subplanifrons* that are estimated to be ranging in age from 4.5 to 3.5 million years old. Other fossil remains include extinct suids and more proboscidian taxa, notably *Notochoerus capensis,* and *Elephas iolensis.* Quaternary fossils are abundant in the youngest river gravels along the river itself, but intrusive features within the gravels, such as fossilized hyaena dens, are also located higher up outside the present valleys along calcified pandunes. Finds from river silts near the Warrenton townlands include an upper right third molar of the plains zebra, *Equus burchelli,* a well-mineralized left mandibular ramus of the spotted hyaena, *Crocuta crocuta*, and a lower right first molar of the giant extinct buffalo, *Homoioceras antiquus*. No vertebrate fossil remains have been previously reported from the gravel deposits or younger riverbank overburdens at Smithskraal 1519 or Quaternary sands at Loverswalk 1063 and Holpan 260.

Results of Survey

Pipeline Section A to B

The section is located in open veld on the farm Loverswalk 1063 (**Fig. 4 and 5**). The survey revealed no evidence of palaeontological exposures, Stone Age archaeological material distributed as surface scatters on the landscape. There are also no indications of prehistoric structures or remains within or in the immediate vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Pipeline Section B to C

The section will be placed on and alongside a farm road on the farm Holpan 260 (**Fig. 4 and 6**). The survey revealed no evidence of palaeontological exposures, Stone Age archaeological material distributed as surface scatters on the landscape. There are also no indications of prehistoric structures or remains within the vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Pipeline Section C to D

The section is located on and alongside a firebreak and access road within a game enclosure, on the farm Holpan 260 (**Fig. 7 and 8**). The survey revealed no evidence of palaeontological exposures, Stone Age archaeological material distributed as surface scatters on the landscape. There are also no indications of prehistoric structures or remains within the vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Pipeline Section D to E

The section cuts through extensively - developed agricultural land and crop fields on the farm Smithskraal 1519 (**Fig. 9, 10 and 11**). The survey revealed no evidence of palaeontological exposures or Stone Age archaeological material distributed as surface scatters on the landscape. There are also no indications of prehistoric structures or remains within the vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Pipeline Section E to G

Section E to G is located partly on fallow agricultural land and partly alongside an existing firebreak and access road **(Fig. 12 and 13)**. The section will be placed directly alongside an existing water pipeline that terminates at the Vaal River. There are clear indications that the natural landscape has been extensively altered by prior excavation activities related to the construction of the existing pipeline. There are no indications of prehistoric structures or remains within the vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Pipeline Section G to H

The section is located on fallow agricultural land **(Fig. 14 and 15)**. The section will be placed directly alongside an existing water pipeline that terminates at a pump station the Vaal River (**Fig. 16**). The natural landscape has been extensively altered by prior excavation activities related to the construction of an existing pipeline. There are also no indications of prehistoric structures or remains within the vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Impact Statement and Recommendations

Assessment of the potential impact on archaeological and palaeontological resources within the inspected area is summarized in **Table 2**.

Table 2. Assessment of impact along the footprint.

Feature	Geological Unit	Palaeontological & Archaeological significance of footprint (surface features)	Palaeontological & Archaeological significance of footprint (subsurface finds)	Potential Impact	Irreplaceable loss of heritage resources?	Mitigation required
Section A to B	*Qs*	low	medium	low	no	monitoring of trench excavations
Section B to C	*Jd, Qs*	low	medium	low	no	monitoring of trench excavations
Section C to D	*Qs*	low	medium	low	no	monitoring of trench excavations
Section D to E	*Qs*	low	medium	low	no	monitoring of trench excavations
Section E to F	*Jd, Qs*	low	low	low	no	none
Section F to G	*Qs*	low	low	low	no	none
Section G to H	*Qc,Qs*	low	low	low	no	none

There are **no major palaeontological or archaeological grounds to suspend the construction** of the water pipeline between Loverswalk and the Vaal River. However,

any developments that may potentially destroy or damage fossils and archaeological remains or that conduct excavations exposing fresh superficial deposits are of conservation and research interest.

Impact Statement on surface features or exposures

- The footprint is not considered to be archaeologically or palaeontologically vulnerable with regard to surface finds, rock engravings, graves or historical structures.
- Impact on palaeontological remains or archaeological finds is therefore likely to be low.
- In accordance with the types and range of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999), there is no evidence of palaeontological exposures, building structures or material of cultural significance, places which are associated with living heritage, rock engravings, graves or archaeological sites within the demarcated area. **The surface terrain of the footprint represents no palaeontological or archaeological significance. The site has been sufficiently recorded, mapped and documented in terms of conditions necessary for a Phase 1 archaeological impact assessment and can be accessed for further development.**

Impact Statement on potential subsurface finds

- The younger terrace gravels of the Vaal River between Bloemhof and Barkley West is known for its robust Stone Age archaeological and late Cenozoic palaeontological footprint. However the section of pipeline most likely to be impacted (the 6km section connecting points E, F G and H) has already been disturbed by prior construction activities. Therefore impact on potential *in situ* fossil or archaeological material between points E and H is considered to be unlikely or low.
- The pipeline will be placed approximately 2 m below current surface. A moderate probability therefore exists for locating capped Middle Stone Age artifacts within the Quaternary sands between points A and E. For example, as previously demonstrated by sporadic occurrences of high densities of Fauresmith blades recorded in the lower levels of the Aeolian sands (*Qs*) in

the region, i*n situ* material may be present, but capped underneath the substantial Quaternary deposits (*Qs*) where trenching for the proposed pipeline will take place.

- In such a **case it is advised that newly uncovered material found during the course of excavation activities along the footprint must be reported to SAHRHA, that excavations into *in situ* sediments should allow for inspection by a specialist at the appropriate time and that possible intact finds may require a Phase 2 rescue operation at the cost of the developer.**

References

Beaumont, P. and Morris, D. 1990. *Guide to the archaeological sites in the Northern Cape.* SA3 Post-conference excursion guide.

Bosch, P.J.A. 1993. *Geologie van die gebied Kimberley.* Dept. van Mineraal en Energiesake. Pretoria.

Cooke, H.B.S. 1949. Fossil mammals of the Vaal River deposits. *Geological Survey of South Africa Memoir* 35: 1 – 109.

Helgren, D.M. 1977. Geological context of the Vaal River faunas. *S. Afr. Jnl Sci.* 73: 303-307

Helgren, D.M. 1978. Acheulian settlement along the Vaal River, South Africa. *Jnl. Arch. Sci* 5: 39-60.

Maglio, V.J. & Cooke, H.B.S. 1978. *Evolution of African Mammals.* Cambridge, Mass. Harvard University Press.

Morris, D *et al.* 1995. Dismantling a powerful place: the salvage of rock engravings near Warrenton, Northern Cape. *Southern African Field Archaeology* 4: 58-63.

Partridge, T.C. & Maud, R.R. 2000. *The Cenozoic of Southern Africa.* Oxford Monographs on Geology and Geophysics No. 40.

Sohnge, P.G. *et al.* 1937. *The geology and archaeology of the Vaal River Basin.* Memoir no. 35. Department of Mines, Geological Survey.

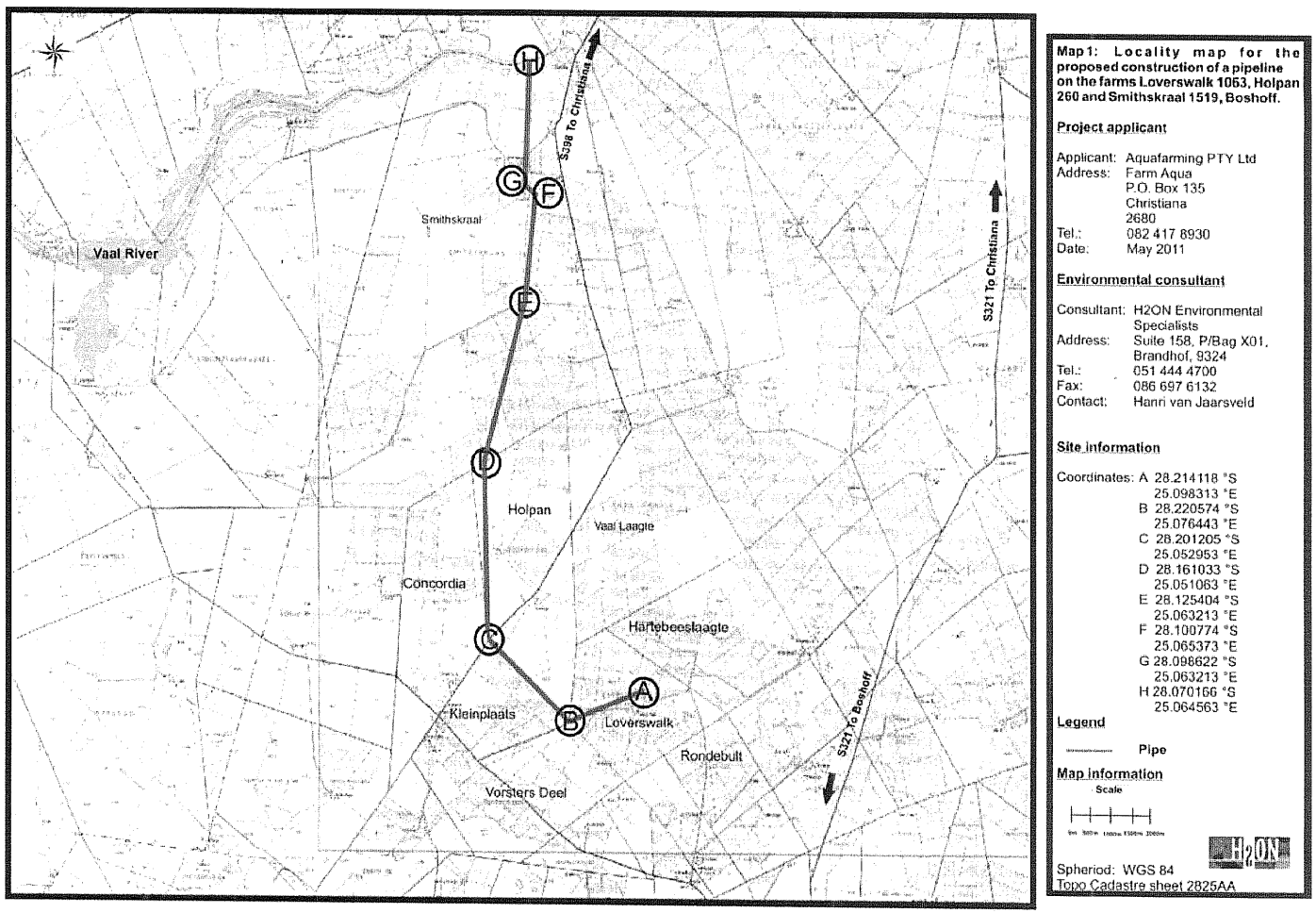


Figure 1. Portion of 1 to 50 000 scale topographic map of the area between Loverswalk 1063 and Smithskraal 1519 (2825 AA Boshof).

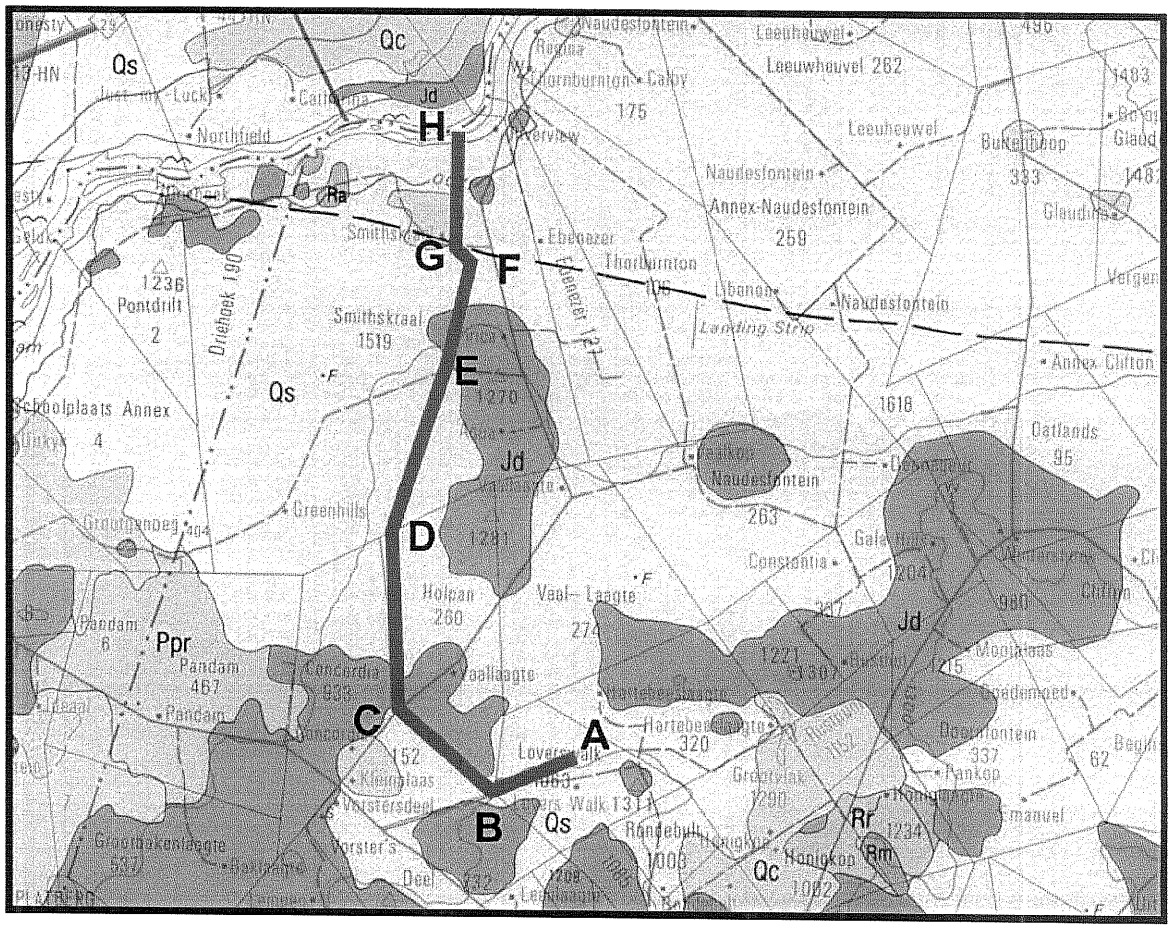


Figure 2. Portion of the 1 :250 000 scale geological map 2824 Kimberley showing bedrock geology of the study area. From oldest to youngest, strata consist of Archaeozoic Ventersdorp andesites and volcanic breccia (*Rr*), Permian Ecca shales (*Ppr*), Jurassic dolerite intrusions (*Jd*), Quaternary calcretes, calcified pandunes (*Qc*) and aeolian sands (*Qs*).

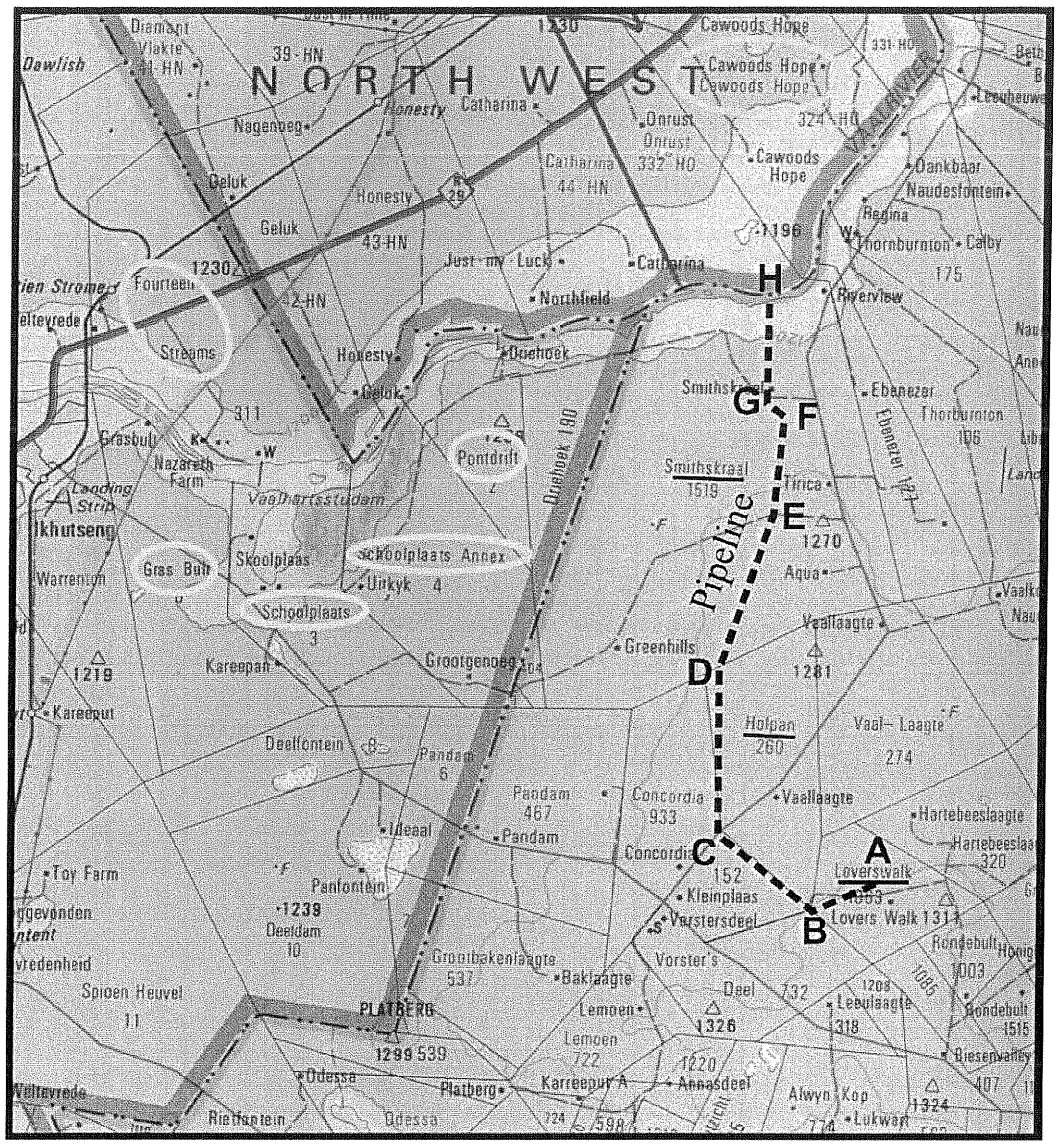


Figure 3. General map (1 to 250 00 scale) of the study area.

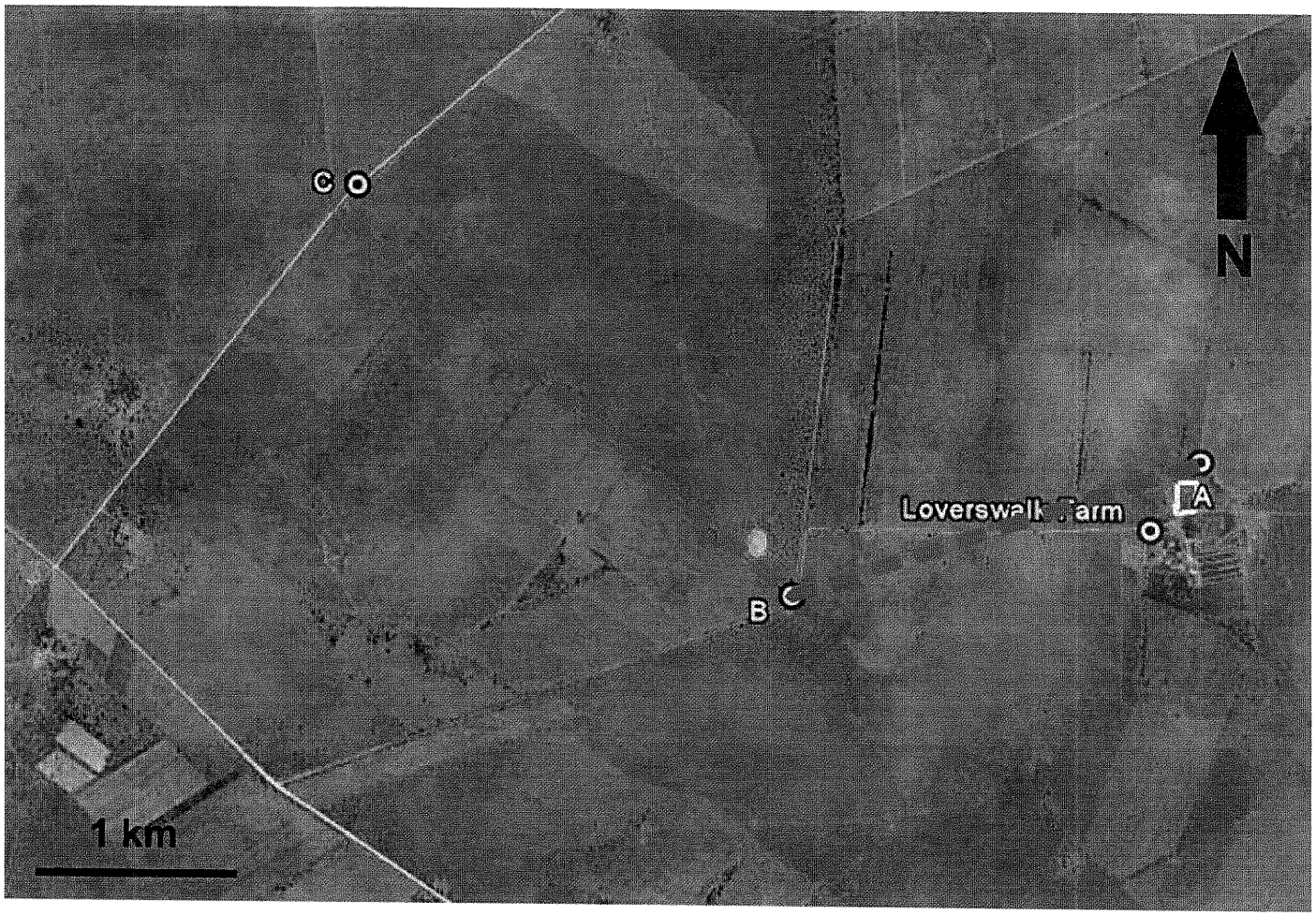


Figure 4. Aerial map of section A to C.

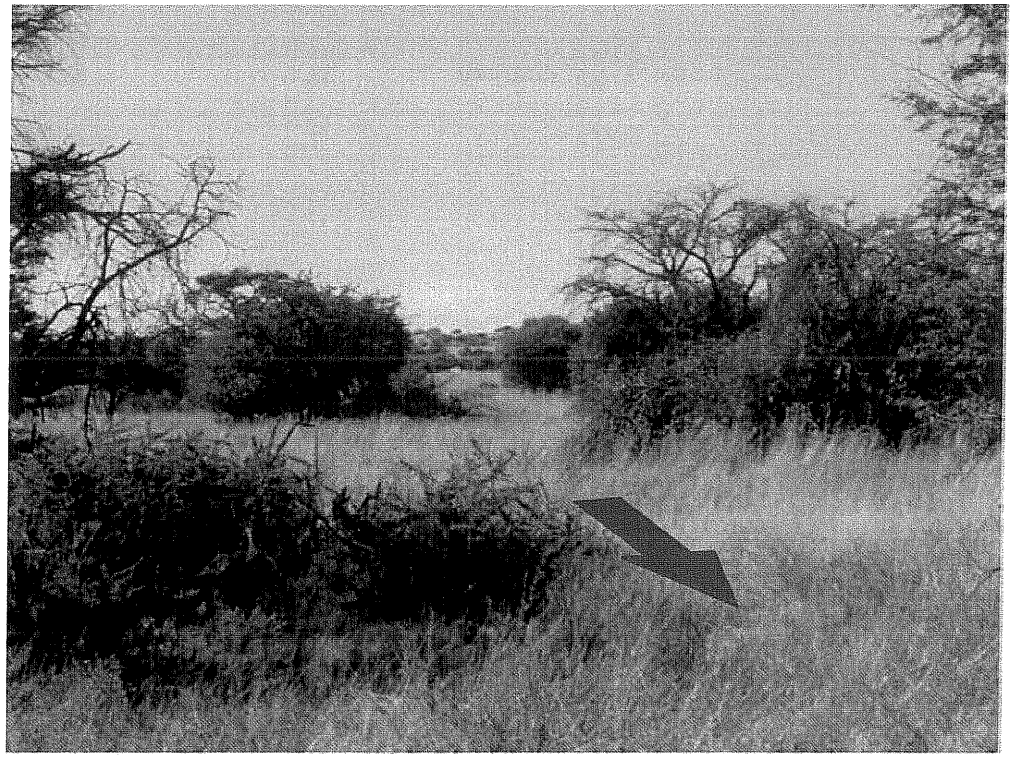


Figure 5. Section A to B. The pipeline cuts through 1 km of undeveloped veld (above) and terminates at a road junction.

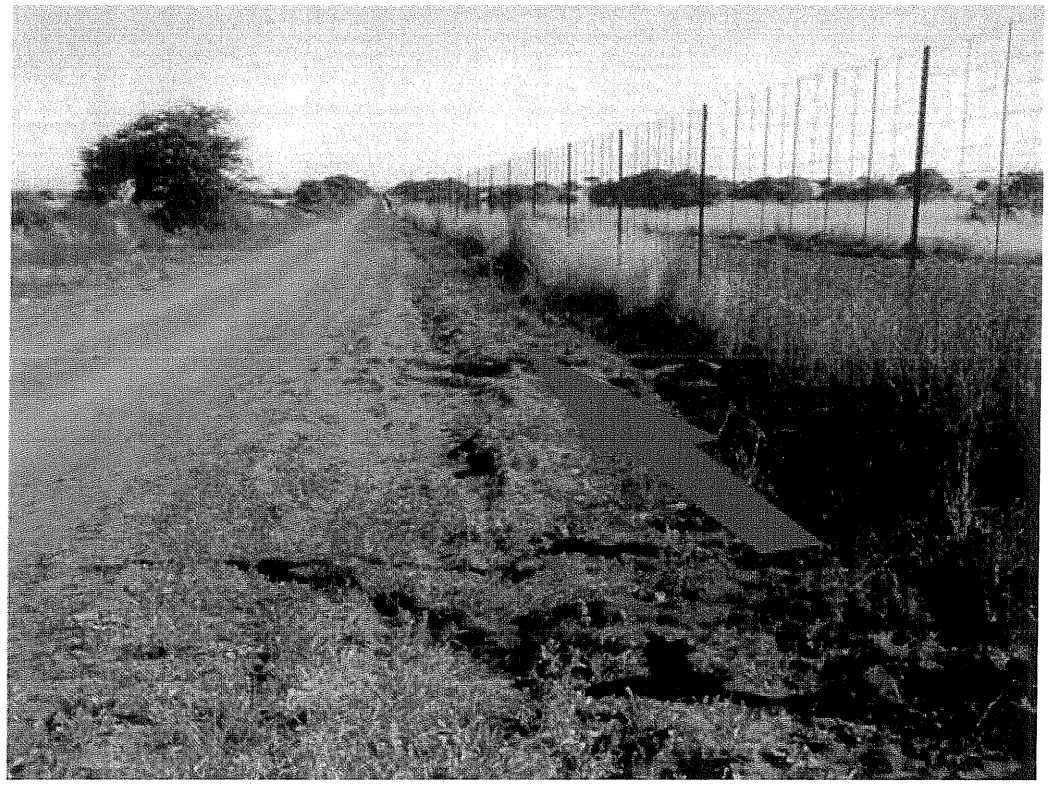


Figure 6. Section B to C. The pipeline will be placed alongside an existing farm road.

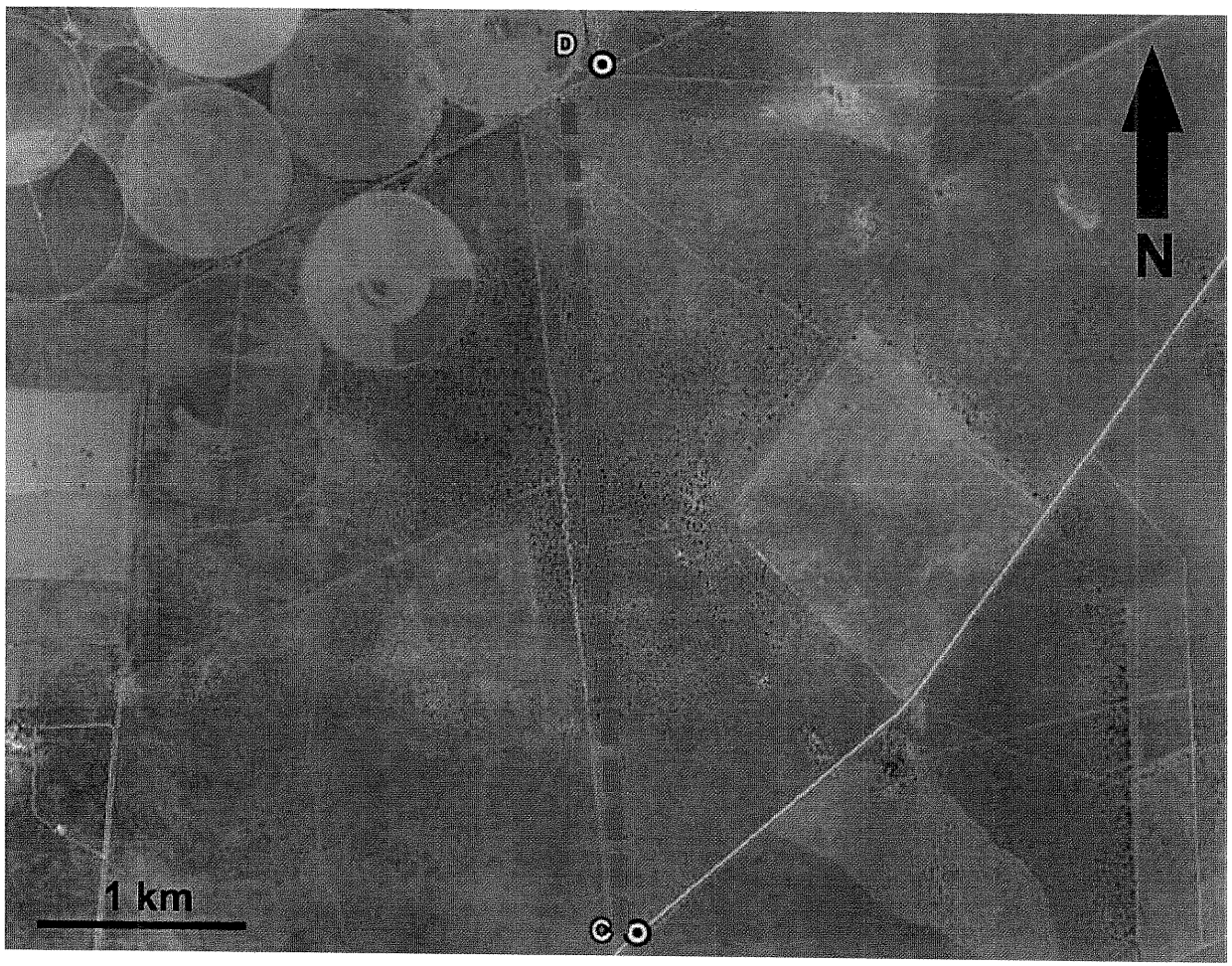


Figure 7. Aerial map of Section C to D. The pipeline will be placed on the inside of a game enclosure along a firebreak on the farm Holpan 260.

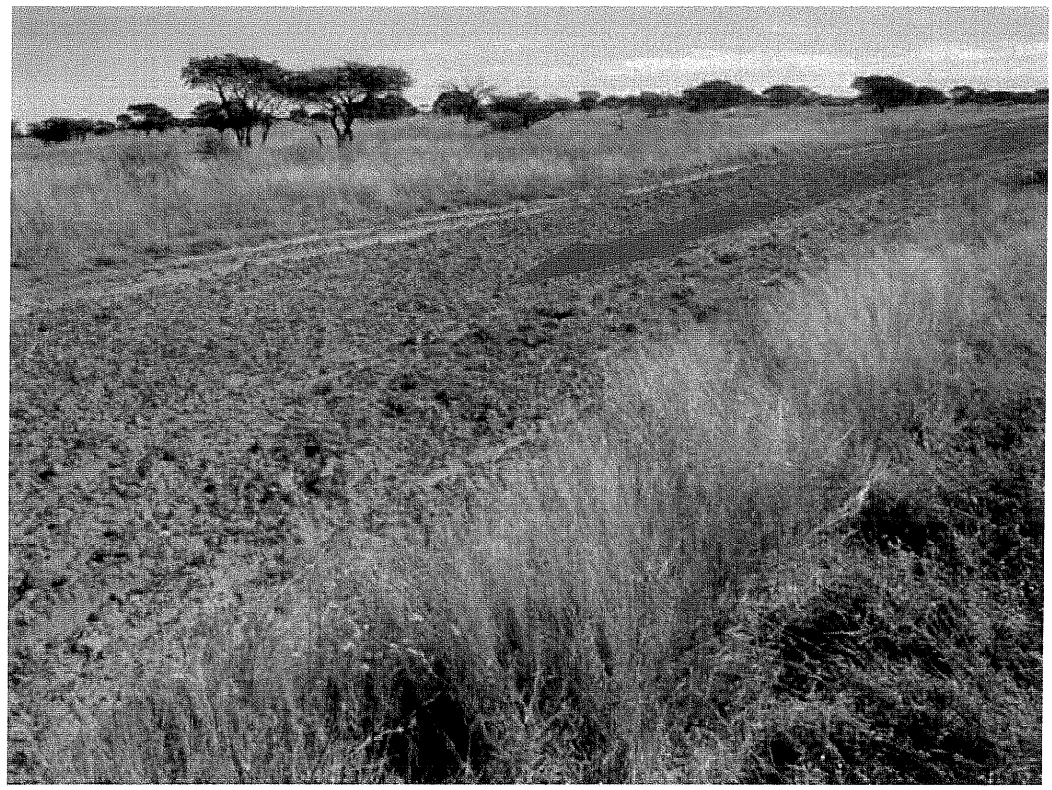


Figure 8. Section C to D. The game enclosure with firebreak (above, looking north) and the area where the section links up with Section D to E (below, looking southeast).

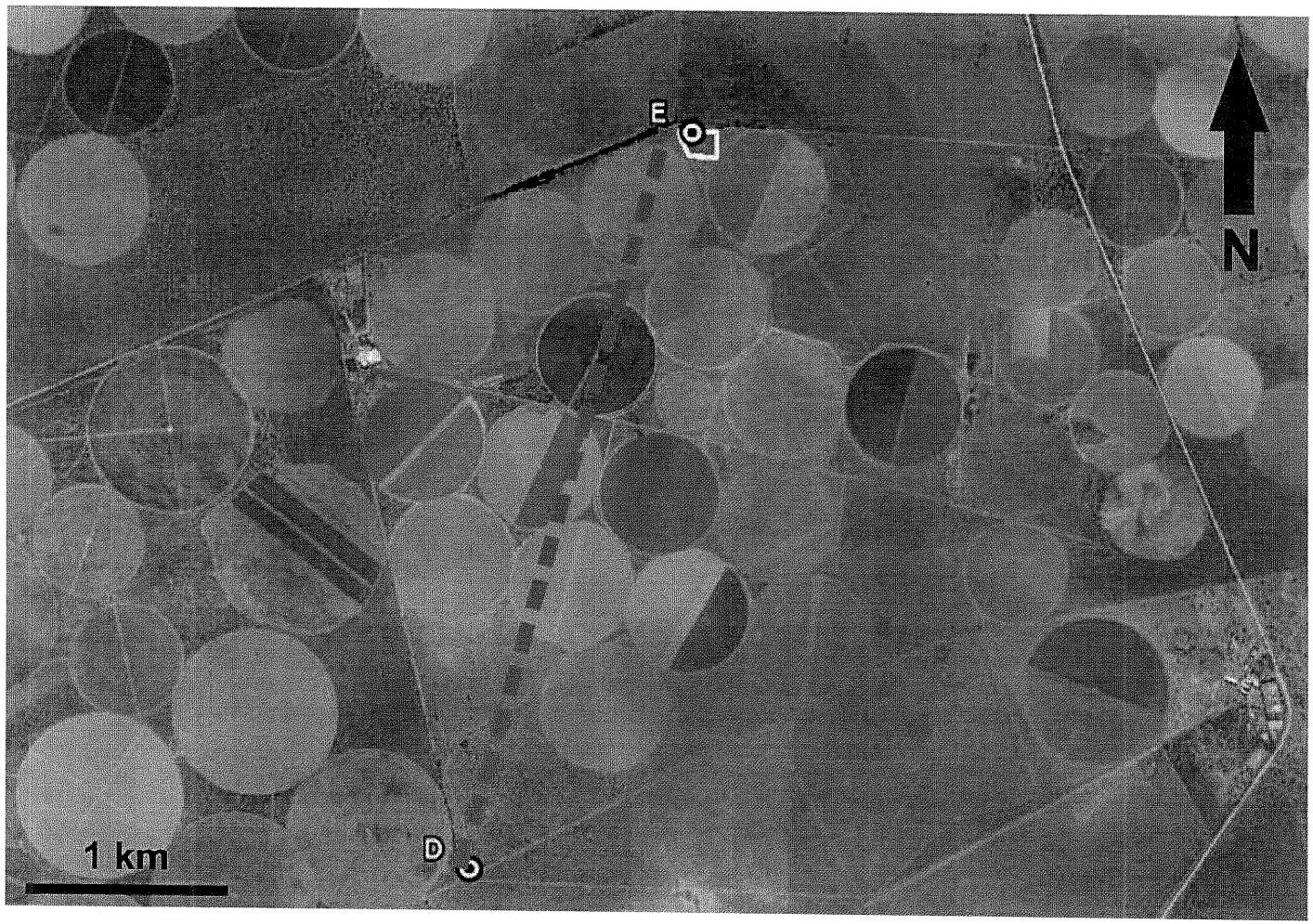
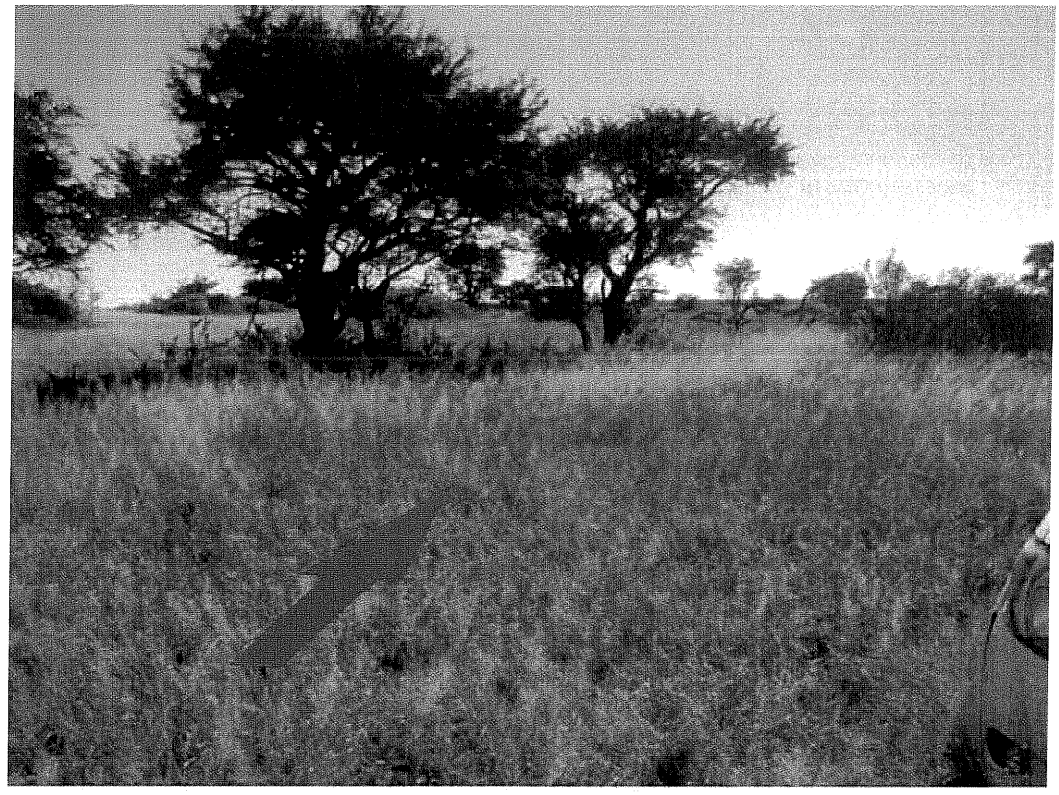


Figure 9. Aerial map of Section D to E. The transect runs through ploughed land and active crop fields.



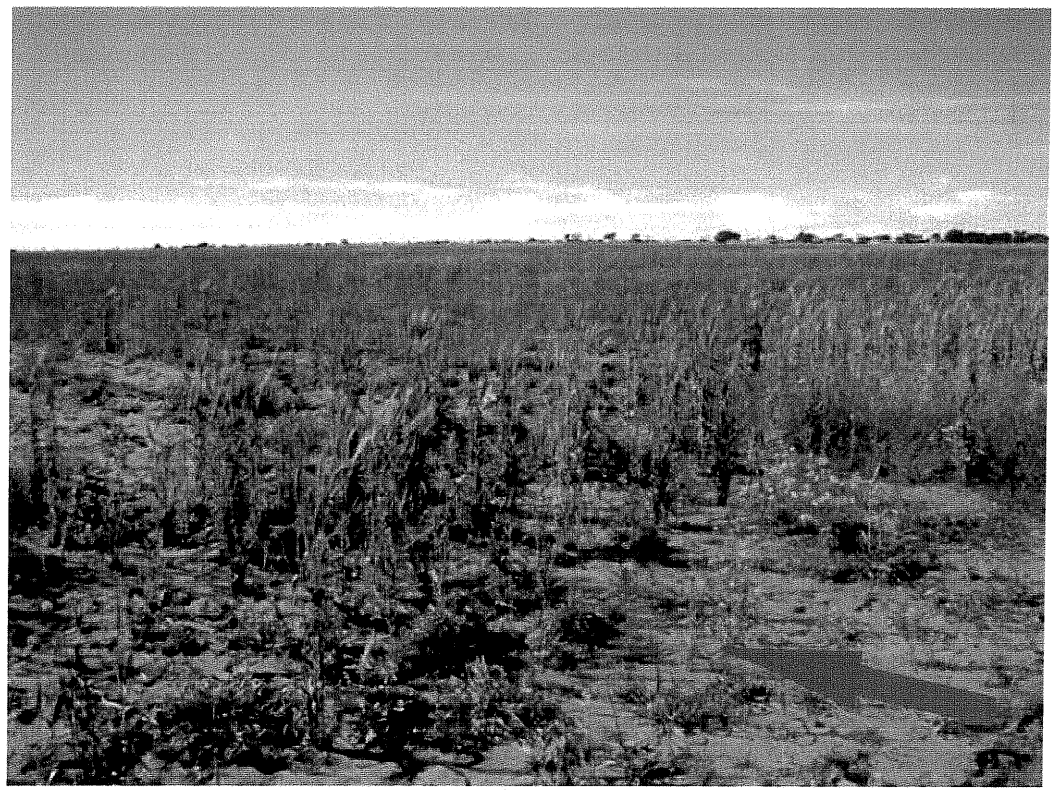


Figure 10. Section D to E. The section starts off in a small patch of open veld (above, looking north) and cuts through crop fields (below, looking east).

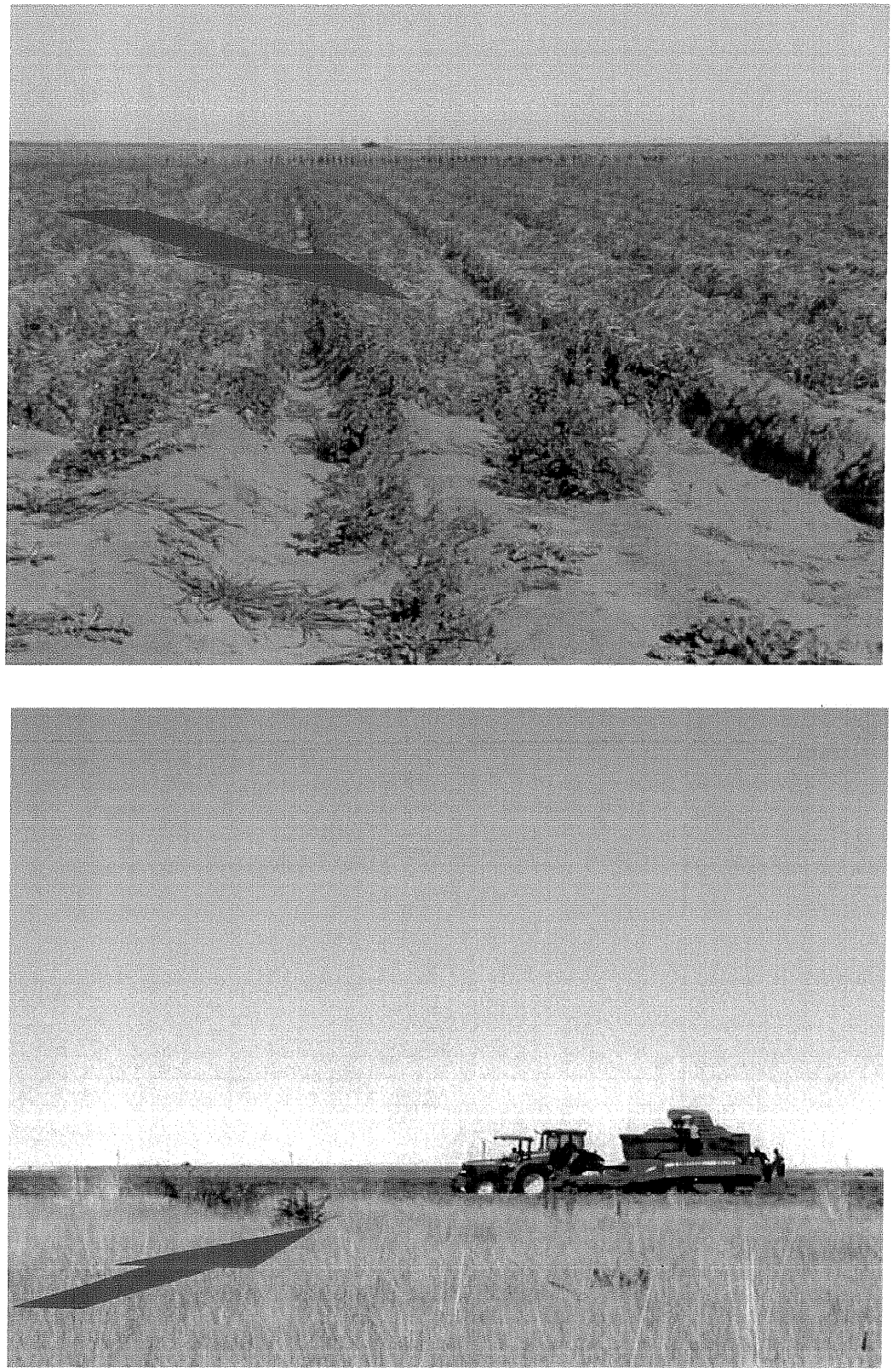


Figure 11. Section D to E. The pipeline will be placed in active agricultural land along the whole section.

Figure 12. Aerial map of Section E to G. The pipeline will run next to an existing water pipeline from here to where it terminates at the Vaal River (point H).

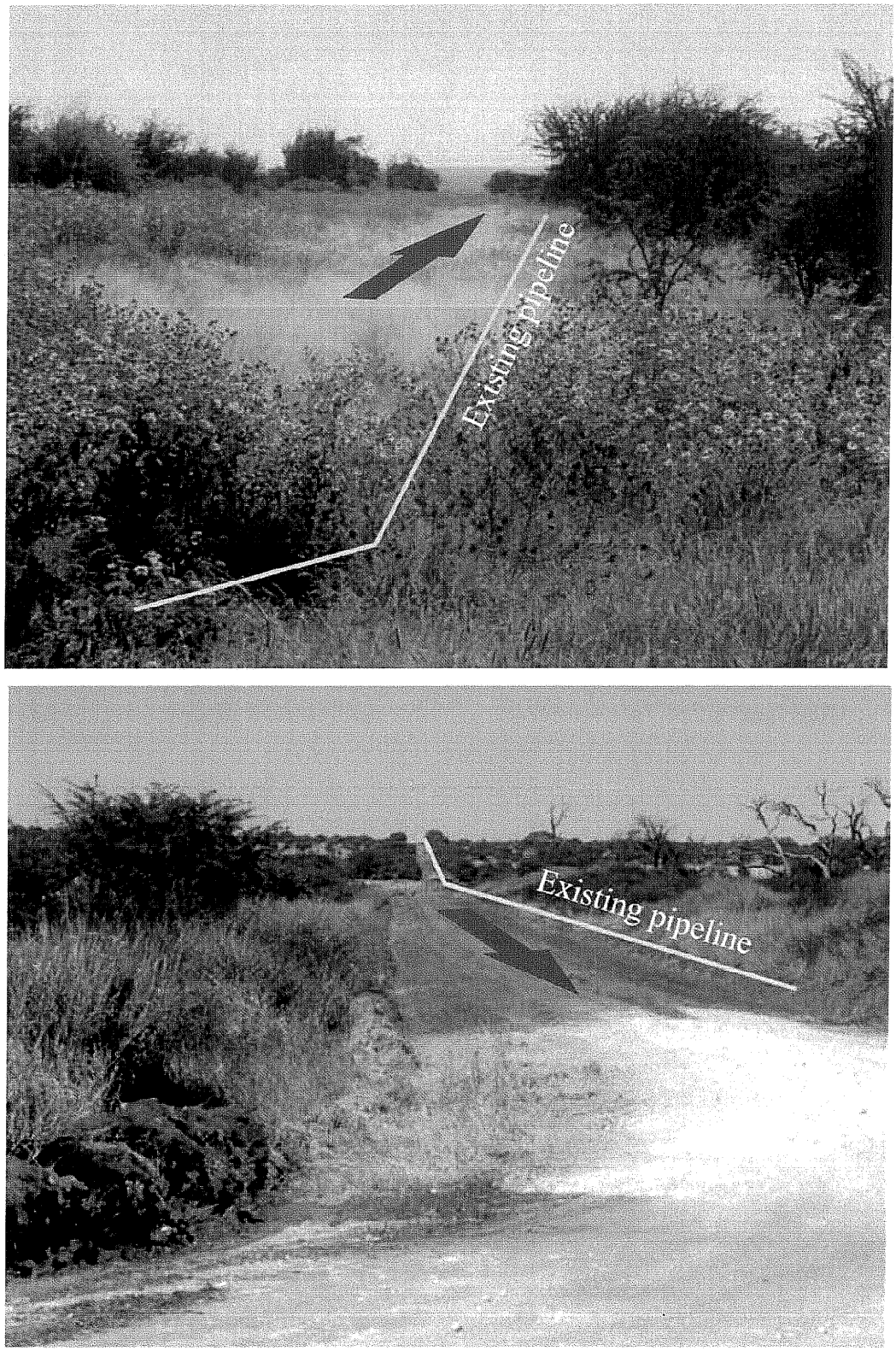


Figure 13. Section E to F The section follows an existing pipeline (above, looking north) and is partly underlain by dolerite bedrock (below, looking south).

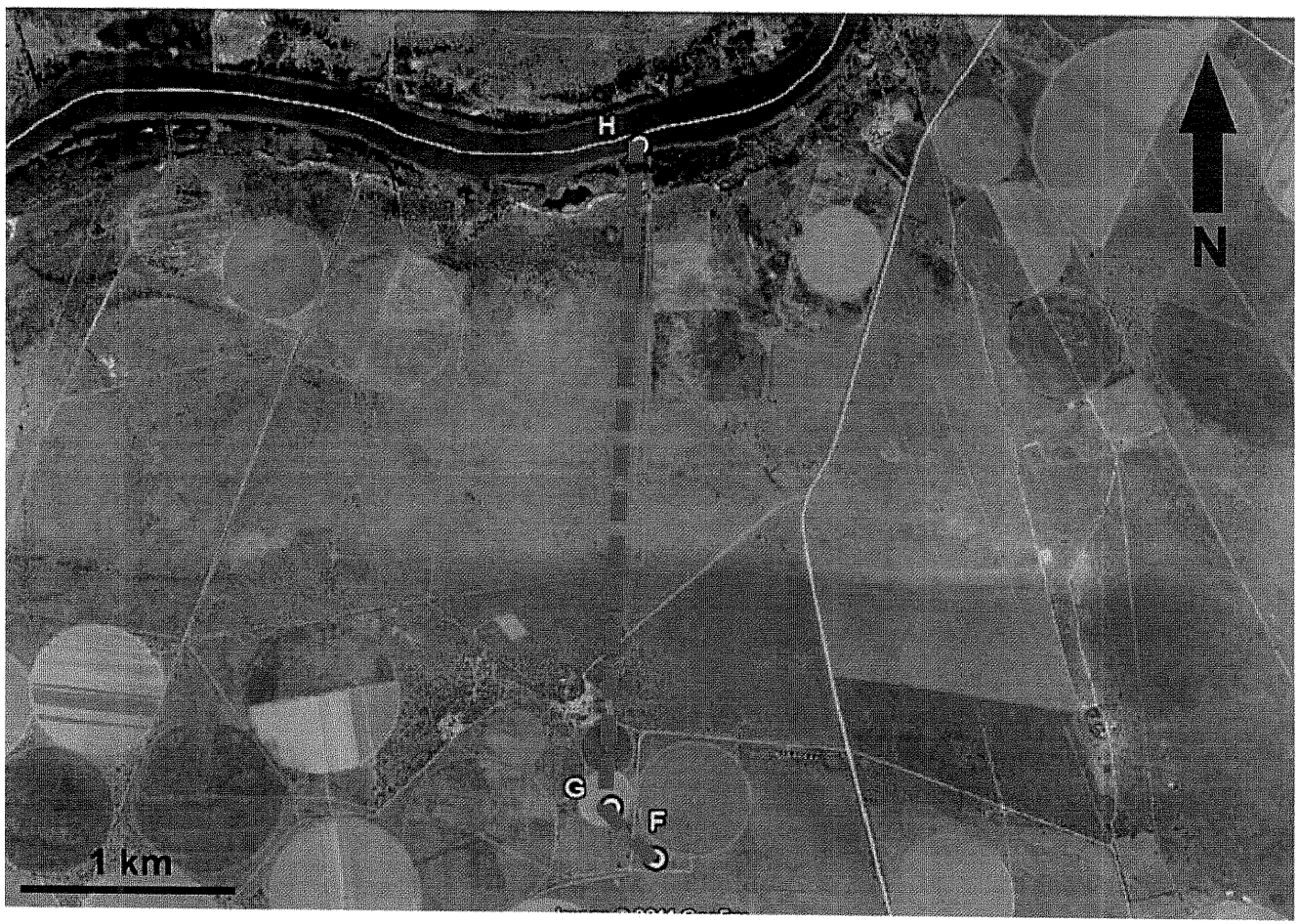
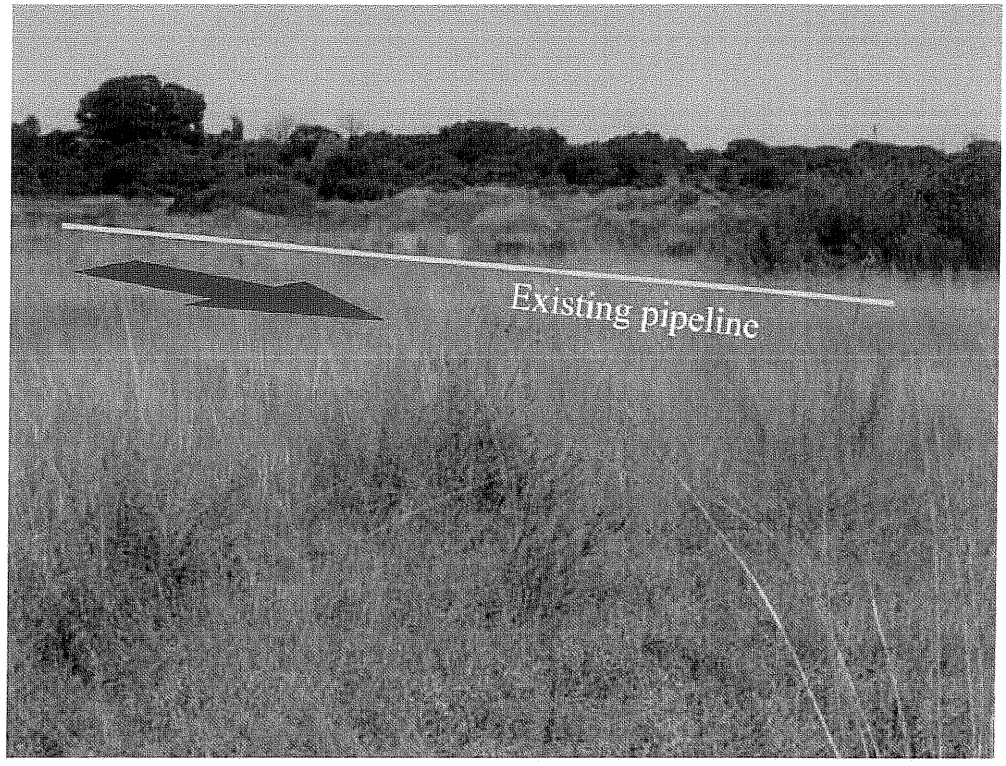


Figure 14. Aerial map of Section F to H. The pipeline will run next to an existing water pipeline from here to where it terminates at the Vaal River (point H).



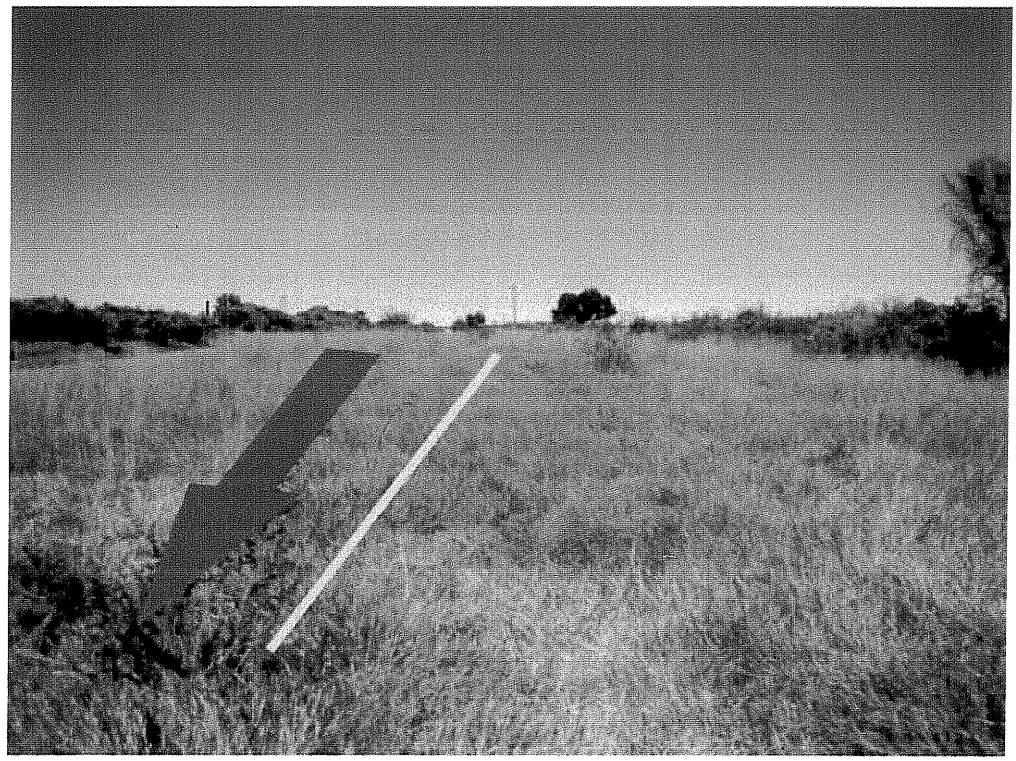
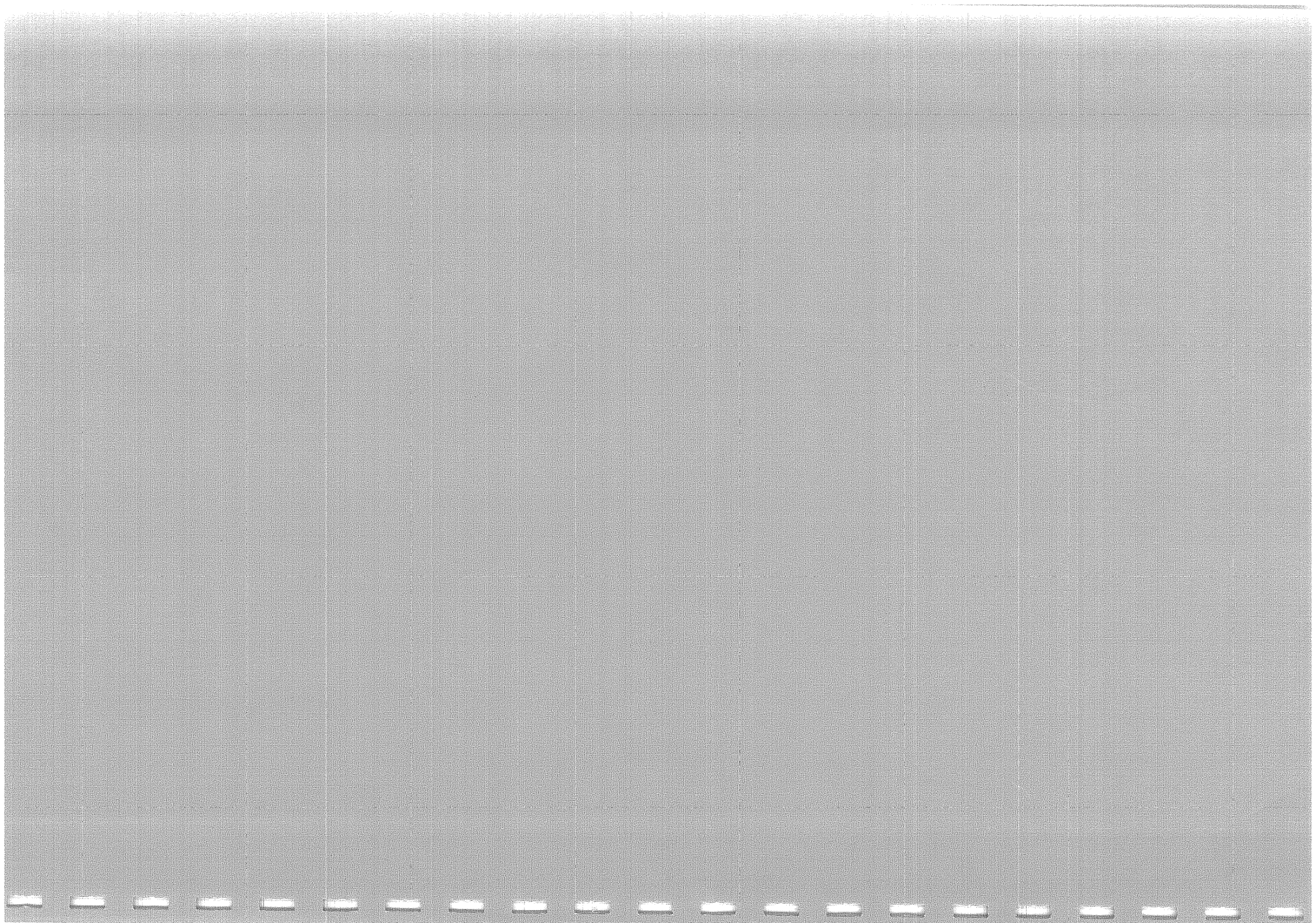


Figure 15. Section G to H. Extensive landscape alterations are evident at point G as a result of prior excavations for the existing pipeline (above, looking west). The section cuts along open veld and fallow farmland (below, looking south) before linking up with a pump station at the Vaal River.

Figure 16. The pipeline section terminates at a pump house facility(above) and electrical substation (below) at the Vaal River (point H).



Phase 1 PIA and AIA of two proposed dams on the farms Loverswalk 1063 and Smithskraal 1519, Boshof District, FS.

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Executive Summary

- There are no major palaeontological or archaeological grounds to suspend the construction of off-stream storage dams on the farms Loverswalk 1063 and Smithskraal 1519.
- Their footprint is not considered to be archaeologically or palaeontologically vulnerable with regard to **surface** finds, rock engravings, graves or historical structures.
- A moderate probability exists for locating capped Middle Stone Age artifacts within the Quaternary sands underlying the affected areas, because of sporadic occurrences of high densities of Fauresmith blades previously recorded in the lower levels of the Kalahari sands in the region.
- It is advised that newly uncovered material found during the course of excavation activities along the footprint must be reported to SAHRHA, that excavations into *in situ* sediments should allow for inspection by a specialist at the appropriate time and that possible intact finds may require a Phase 2 rescue operation at the cost of the developer.

Contents

Introduction

A Phase 1 Palaeontological and Archaeological Impact Assessment were carried out along designated areas on the farms Loverswalk 1063 and Smithskraal 1519 in the Boshof District, Free State Province. Anticipated development calls for the construction of two off-stream storage dams with specifications of 100 m x 150 m at a depth of 3 m. Dam 1 will be constructed next to existing residential and other outbuildings on the farm Loverswalk 1063, and Dam 2 next to active crop fields and a pump station on the farm Smithskraal 1519 (**Fig. 1**).

The survey is required as a prerequisite for new development in terms of the National Environmental Management Act and is also called for in terms of the National Heritage Resources Act 25 of 1999. A site visit and assessment took place in May 2011.

The assessment required:

- identification and recording of potential palaeontological and archaeological heritage resources in the proposed areas of impact and;
- recommendation of mitigation measures to minimize potential impacts associated with the proposed development.

Details of area surveyed

The affected areas is located on the 1:50 000 topographic map 2825 AA Boshof **(Fig. 1)** Coordinates of the proposed water pipeline and two off-stream dams are presented as reference points in **Table 1.** The greater extent of the footprint consists of generally flat to undulating countryside that mainly covers agricultural land.

Table 1. General reference points of the pipeline and two off-stream dams.

Feature		Coordinates
Dam 1	NW Corner	S28 12.981 E25 05.815
	NE Corner	S28 12.930 E25 05.873
	SW Corner	S28 12.997 E25 05.833

	SW Corner	S28 12.990 E25 05.895
Dam 2	NE Corner	S28 07.538 E25 03.837
	NW Corner	S28 07.526 E25 03.753
	SE Corner	S28 07.575 E25 03.851
	SW Corner	S28 07.590 E25 03.781

Methodology

A pedestrian survey was conducted along the proposed sections. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant geological, palaeontological and archaeological information were assimilated for the report and integrated with data acquired during the on-site inspection.

Geology

Landscape topography between Loverswalk and Smithskraal consists largely of coalescent planar surfaces incised by the Vaal River drainage. The geology of the area has been described by Bosch (1993). The area in question is underlain by Archaeozoic and Phanerozoic sediments (1: 250 000 scale geological map 2824 Kimberley, Council for Geoscience, Pretoria, 1991). These are sediments of widely different geological ages. From oldest to youngest, the geology in the region is made up of Archaeozoic Ventersdorp andesites and volcanic breccia (*Rr*), Permian Ecca shales (*Ppr*), Jurassic dolerite intrusions (*Jd*), Quaternary calcretes, calcified pandunes (*Qc*) and aeolian sands (*Qs*) (**Fig.2**).

Ventersdorp Supergroup andesites, volcanic breccias, tuff and chert outcrops of the Rietgat and Allanridge Formations are exposed on the farms Honigkop 1002 and Honiglaagte 1234, about 10 km east of Loverswalk 1063 and on the farm Fourteen Streams about 15 km west of Smithskraal, respectively. Ventersdorp Supergroup rocks are not palaeontologically significant. Karoo sediments represented by shales of the Lower Ecca Group (Prince Albert Frm.) are exposed at Pandam 467, about 15 km west of Loverswalk. In the main Karoo Basin the Ecca Group straddles the Early-Late Permian boundary with the Prince Albert Formation, which consists essentially of mudrock, making up the basal part of the group. It conformably overlies the Dwyka Group, but locally it unconformably overlies pre-Karoo basement rocks where the

Dwyka Group is absent. Fossils, including cephalopods, brachiopods, fishes, coprolites, wood, leaves (*Glossopteris*) and spores have been recorded in the lowermost part of the formation. Lower Ecca Group rocks will not be impacted by the proposed development.

The two proposed dam sites are located on a mantle of Quaternary sediments (*Qc, Qs*). These sediments are made up of undifferentiated deposits of unconsolidated to semi-consolidated sediments including aeolian sands, calcretes and surface limestons, with the characteristically red-brown Kalahari sands (Hutton sands) representing the latest geological phase.

Background

Archaeology

Stone Age archaeology

The lower Vaal River Basin has produced a wealth of archaeological finds from its fluvially deposited Pleistocene river gravels. Archaeological finds are exclusively derived from the Younger Gravels and include an abundance of Acheulian (Early Stone Age) handaxes, cleavers and core-axes, primarily made from quartzite. The base and lower levels of the characteristically red Hutton sands (*Qs*), which cover vast areas between Kimberley and Boshof, have produced localized densities of Fauresmith and Middle Stone Age artifacts. The Fauresmith types are regarded as an important transitional stone tool industry at the beginning of the Middle Stone Age. The incidence of Later Stone Age surface scatters is also common on the modern landscape.

No archaeological artifacts have been previously reported from intact Quaternary deposits (*Qc, Qs*) at Smithskraal 1519 and Loverswalk 1063.

Palaeontology

Extensive fossil fauna of uncertain provenance have been retrieved from the alluvial and terrace gravels between Bloemhof and the Vaal River's junction with the Orange River. Quaternary fossils are abundant in the youngest river gravels along the river itself, but intrusive features within the gravels, such as fossilized hyaena dens, are also located higher up outside the present valleys along calcified pandunes. No vertebrate

fossil remains have been previously reported from intact Quaternary deposits (*Qc, Qs*) at Smithskraal 1519 and Loverswalk 1063.

Results of Survey

Dam 1

The proposed dam area is located in open veld, next to farm laborer houses and other outbuildings on the farm Loverswalk 1063 (**Fig. 3**). The survey revealed no evidence of palaeontological exposures, Stone Age archaeological material distributed as surface scatters on the landscape. There are also no indications of prehistoric structures or remains within or in the immediate vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Dam 2

The proposed dam area is located in open veld, next to a pump station and is surrounded by ploughed fields on the farm Smithskraal 1519 **(Fig. 4)**. The survey revealed no evidence of palaeontological exposures, Stone Age archaeological material distributed as surface scatters on the landscape. There are also no indications of prehistoric structures or remains within or in the immediate vicinity of the survey area. There is no evidence of graves, graveyards or historical structures in the demarcated area.

Impact Statement and Recommendations

Assessment of the potential impact on archaeological and palaeontological resources within the inspected area is summarized in **Table 2**.

There are **no major palaeontological or archaeological grounds to suspend the construction** of the two off-stream storage dams. However, any developments that may potentially destroy or damage fossils and archaeological remains or that conduct excavations exposing fresh superficial deposits are of conservation and research interest.

<u>Impact Statement on surface features or exposures</u>

- The footprint is not considered to be archaeologically or palaeontologically vulnerable with regard to surface finds, rock engravings, graves or historical structures.

Table 2. Assessment of impact along the footprint.

Feature	Geological Unit	Palaeontological & Archaeological significance of footprint (surface features)	Palaeontological & Archaeological significance of footprint (subsurface finds)	Potential Impact	Irreplaceable loss of heritage resources?	Mitigation required
Dam 1	*Qs*	low	medium	medium	no	monitoring of fresh exposures / excavations
Dam 2	*Jd, Qs*	low	Medium (Qs)	medium	no	monitoring of fresh exposures / excavations

- Impact on palaeontological remains or archaeological finds is therefore likely to be low.
- In accordance with the types and range of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999), there is no evidence of palaeontological exposures, building structures or material of cultural significance, places which are associated with living heritage, rock engravings, graves or archaeological sites within the demarcated area. **The surface terrain of the footprint represents no palaeontological or archaeological significance. The two proposed sites has been sufficiently recorded, mapped and documented in terms of conditions necessary for a Phase 1 archaeological impact assessment and can be accessed for further development.**

Impact Statement on potential subsurface finds

- The dams will be excavated to a depth of 3 m. A moderate probability therefore exists for locating capped Middle Stone Age artifacts within the

Quaternary sands as previously demonstrated by sporadic occurrences of high densities of Fauresmith blades recorded in the lower levels of the Kalahari sands in the region. *In situ* material may be present, but capped underneath the substantial Quaternary deposits (*Qs*) where trenching for the proposed dams will take place.

- In such a **case it is advised that newly uncovered material found during the course of excavation activities along the footprint must be reported to SAHRHA, that excavations into *in situ* sediments should allow for inspection by a specialist at the appropriate time and that possible intact finds may require a Phase 2 rescue operation at the cost of the developer.**

References

Beaumont, P. and Morris, D. 1990. *Guide to the archaeological sites in the Northern Cape.* SA3 Post-conference excursion guide.

Bosch, P.J.A. 1993. *Geologie van die gebied Kimberley.* Dept. van Mineraal en Energiesake. Pretoria.

Cooke, H.B.S. 1949. Fossil mammals of the Vaal River deposits. *Geological Survey of South Africa Memoir* 35: 1 – 109.

Helgren, D.M. 1977. Geological context of the Vaal River faunas. *S. Afr. Jnl Sci.* 73: 303-307

Helgren, D.M. 1978. Acheulian settlement along the Vaal River, South Africa. *Jnl. Arch. Sci* 5: 39-60.

Maglio, V.J. & Cooke, H.B.S. 1978. *Evolution of African Mammals.* Cambridge, Mass. Harvard University Press.

Partridge, T.C. & Maud, R.R. 2000. *The Cenozoic of Southern Africa.* Oxford Monographs on Geology and Geophysics No. 40.

Sohnge, P.G. *et al.* 1937. *The geology and archaeology of the Vaal River Basin.* Memoir no. 35. Department of Mines, Geological Survey.

List of Figures

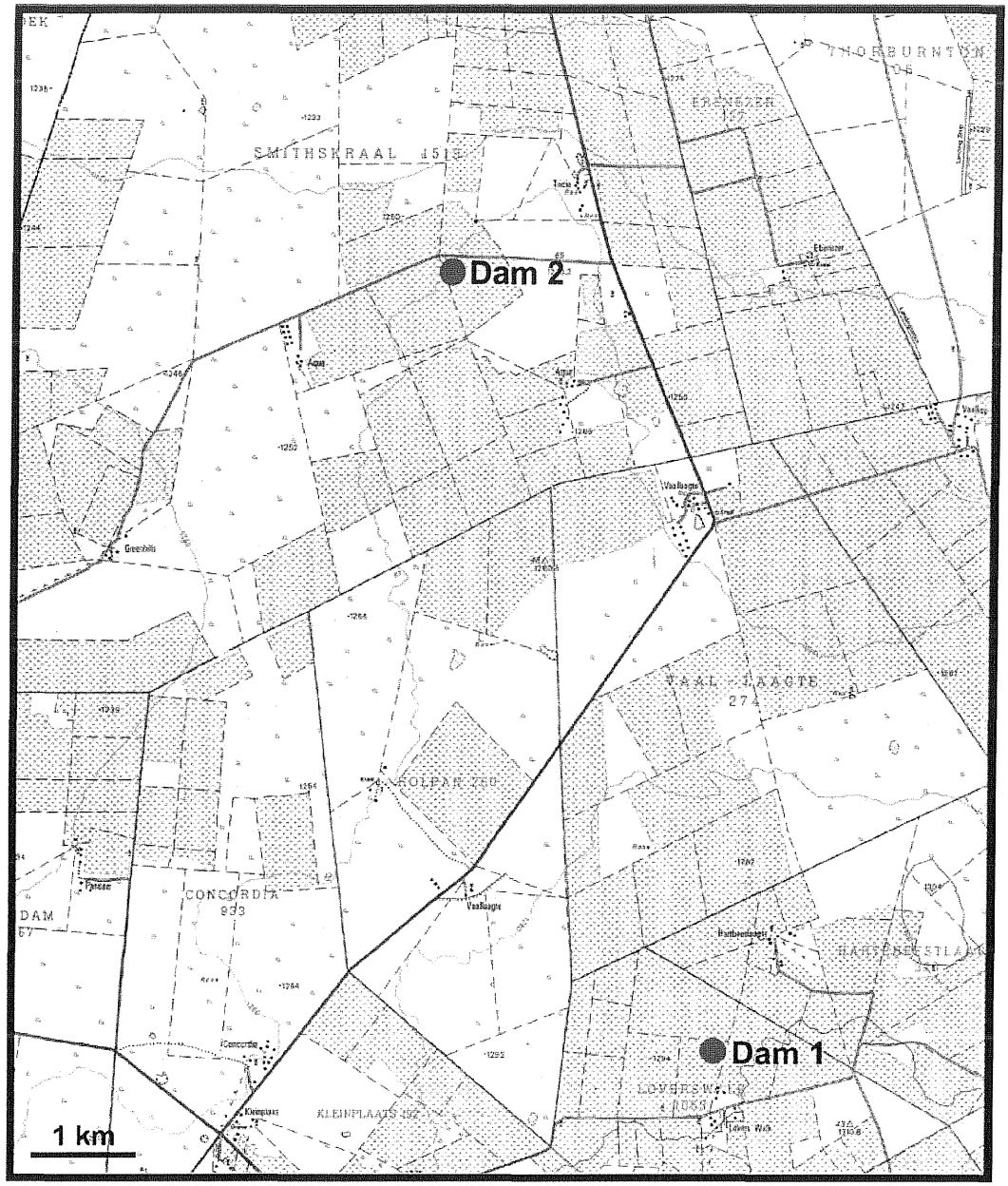

Figure 1. Portion of 1 to 50 000 scale topographic map of the area between Loverswalk 1063 and Smithskraal 1519 (2825 AA Boshof).

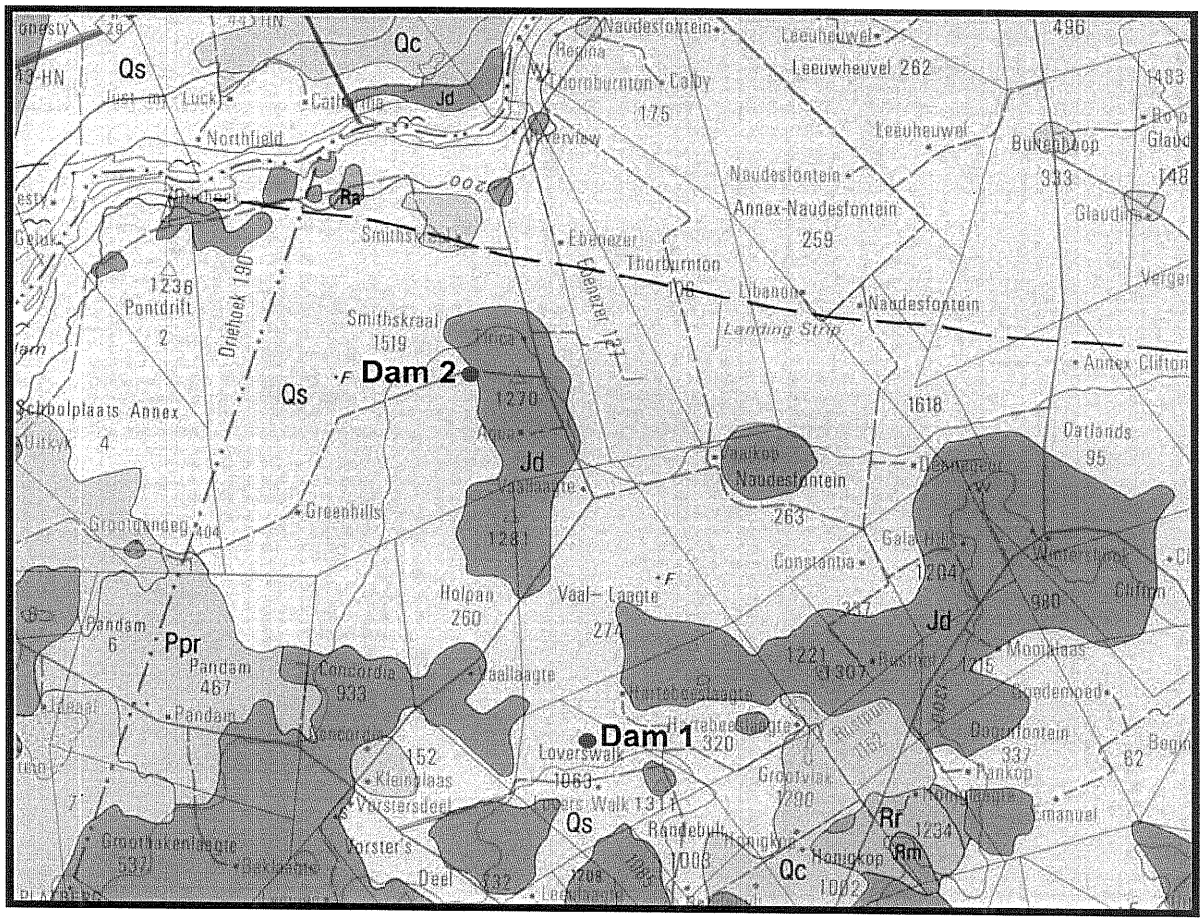

Figure 2. Portion of the 1 :250 000 scale geological map 2824 Kimberley showing bedrock geology of the study area. From oldest to youngest, strata consist of Archaeozoic Ventersdorp andesites and volcanic breccia (*Rr*), Permian Ecca shales (*Ppr*), Jurassic dolerite intrusions (*Jd*), Quaternary calcretes, calcified pandunes (*Qc*) and aeolian sands (*Qs*).

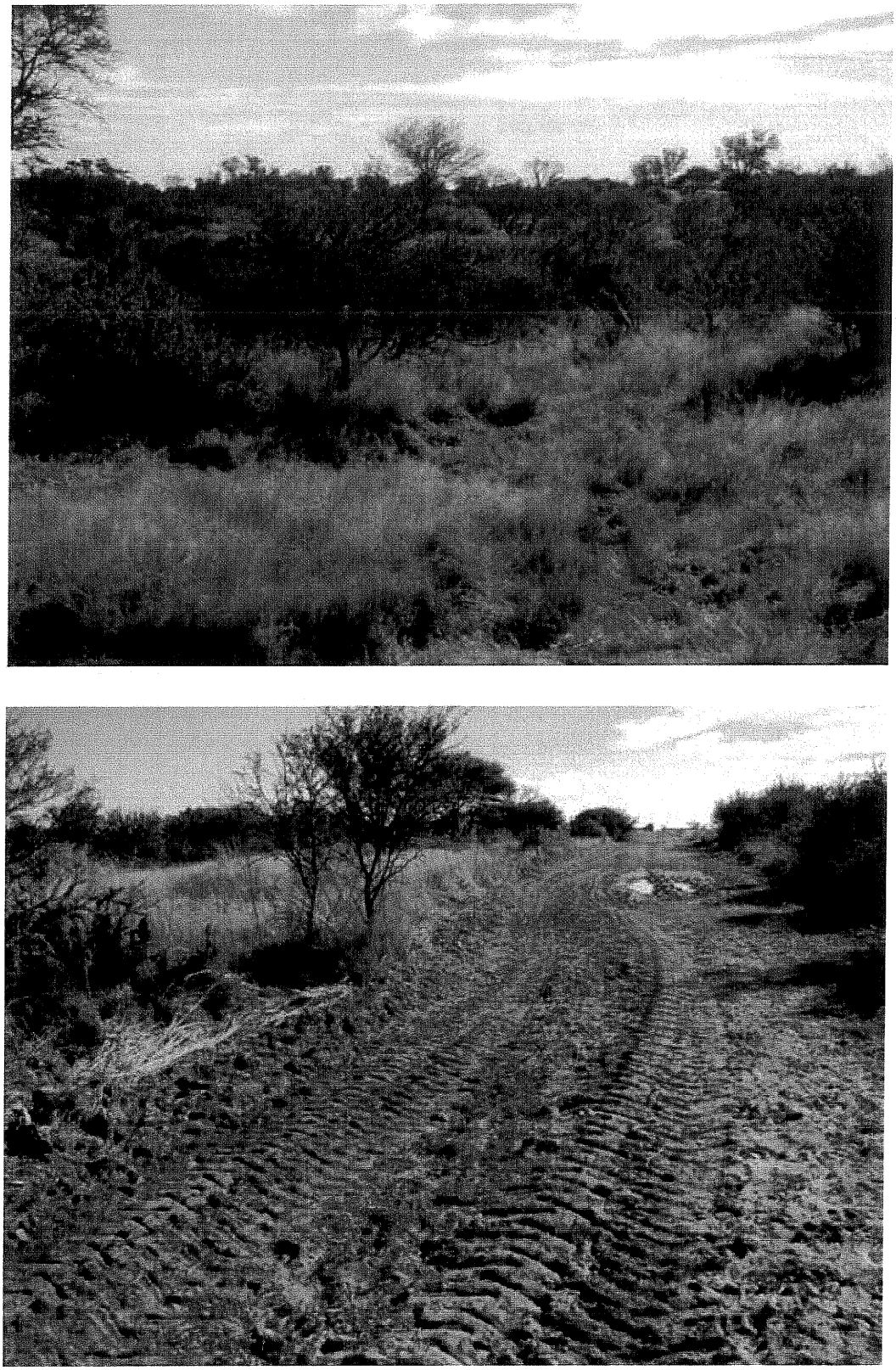

Figure 3. Dam 1 locality. The area consist of undeveloped veld (above) underlain by a thick mantle of Quaternary aeolian sand (below).

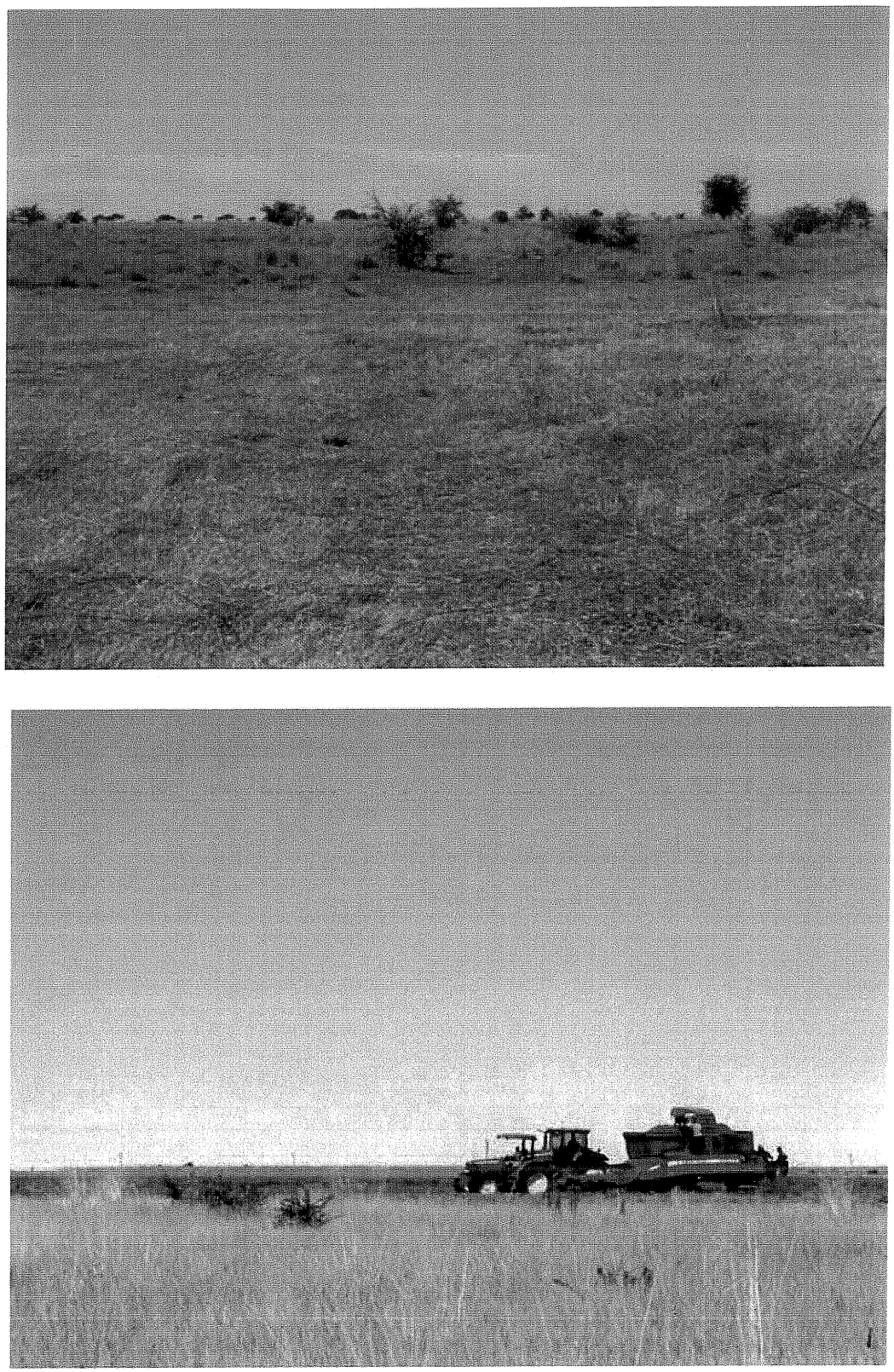

Figure 4. Locality of Dam 2. The dam will be constructed in in open veld (above) next to active crop fields (below).