Palaeontological Heritage: combined desktop and field-based Compliance Statement

PROPOSED LOXTON WIND ENERGY FACILITY 3, UBUNTU LOCAL MUNICIPALITY (PIXLEY KA SEME DISTRICT MUNICIPALITY) IN THE NORTHERN CAPE PROVINCE.

John E. Almond PhD (Cantab.)
***Natura Viva* cc**
PO Box 12410 Mill Street,
Cape Town 8010, RSA
naturaviva@universe.co.za

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EXECUTIVE SUMMARY

It is proposed to develop three commercial Wind Energy Facilities (WEFs) - known as Loxton WEF 1, Loxton WEF 2 and Loxton WEF 3 - and associated infrastructure on a site located *c*. 20-30 km north and east of Loxton within the Ubuntu Local Municipality (Pixley Ka Seme District Municipality) in the Northern Cape Province. The Loxton WEF 3 will involve up to 39 wind turbines with a contracted capacity of up to 240 MW and a permanent footprint of up to 65 ha. The project site covers approximately12 500 ha and comprises the following farm portions: Remaining Extent of the Farm Yzervarkspoort No. 139; Portion 1 of the Farm Yzervarkspoort No. 139; Remaining Extent of Farm 273; Remaining Extent of the Farm No. 262 and Remaining Extent of the Farm Erasmuskraal No. 269.

Historical palaeontological site mapping for the region between Loxton and Victoria West reveals a paucity of recorded vertebrate fossil sites within the Loxton WEF Cluster project area. This is supported by recent palaeontological field surveying, both here and in neighbouring WEF project areas, which shows that:

(1) Levels of Beaufort Group bedrock exposure are very limited here due to pervasive cover by Late Caenozoic superficial sediments; (2) Intensive intrusion by dolerite sills and dykes has compromised fossil preservation over large areas; (3) The Beaufort Group bedrocks represented here span the catastrophic end-Middle Permian Extinction Event which is associated with an unusually low abundance of well-preserved fossil remains.

Over the course of eight days, only a handful of fossil sites were recorded within the entire Loxton WEF Cluster project area, the majority of which are poorly preserved and of limited scientific or conservation significance. Even occasional small areas showing excellent, fresh mudrock exposure ideal for palaeontological recording yielded hardly any fossils. Almost no fossil sites were recorded within the Late Caenozoic superficial deposits. **Very few of the handful (~20) of new fossil sites recorded within the Loxton WEF 3 project area are of significant scientific or conservation value and no mitigation is recommended here with regard to these known sites (Appendix 1).** No known significant or unique palaeontological heritage sites are threatened by the proposed WEF development.

While additional, unrecorded fossil sites of high palaeontological and conservation value are likely to occur at and beneath the land surface within the Loxton WEF Cluster project areas, they are probably very sparse and sporadic in distribution and can be effectively handled in the Construction Phase through a Chance Fossil Finds Protocol (See Appendix 2). All the recorded sites can, if necessary, be effectively mitigated in the preconstruction phase.

It is concluded that the palaeosensitivity of the combined Loxton WEF Cluster project area is, in practice, LOW. The provisional palaeosensitivity mapping by the DFFE Screening Tool is accordingly *contested* in this report.

Despite the substantial WEF project footprints as well as the known occurrence of important vertebrate and other fossil sites elsewhere in the wider region between Loxton and Victoria West, **the impact significance of the proposed renewable energy developments on local palaeontological heritage – including the Loxton 3 WEF project considered in this report - is anticipated to be LOW.** These impacts, including cumulative impacts considering other renewable energy projects in the broader region (*e.g.* the adjoining Victoria West WEF Cluster), are expected to fall within acceptable limits. There are therefore no objections on palaeontological heritage grounds to authorisation of the Loxton WEF Cluster developments.

The potential for unrecorded palaeontological sites of scientific and conservation value cannot be completely excluded. These are best mitigated through the application of a Chance Fossil Finds Protocol by the ECO / ESO during the Construction Phase (See Appendix 1) which should be incorporated into the EMPrs for the WEF developments. The qualified palaeontologist responsible for mitigation work will need to apply for a Fossil Collection Permit for the Northern Cape from SAHRA. Minimum standards for PIA reports have been compiled by Heritage Western Cape (2021) and SAHRA (2013).

Given the inferred low overall site sensitivity and anticipated impact significance, formal palaeontological heritage impact assessment for the proposed Loxton WEF Cluster projects is not considered necessary. However, a combined desktop and field-based palaeontological heritage study outlining and mapping the recorded fossil sites, their scientific / conservation value and their geological context is provided in this report as part of the Heritage Assessment process for the proposed Loxton 3 WEF development.

1. Project outline

The applicant Loxton Wind Facility 3 (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF), to be known as Loxton WEF 3, and associated infrastructure on a site located approximately 15 km east of Loxton within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province.

Two additional WEF's are concurrently being considered on the surrounding properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained in Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Loxton WEF 1 and Loxton WEF 2.

A preferred project site with an extent of approximately 58 000 ha has been identified as a technically suitable area for the development of the three WEF projects. Loxton WEF 1 & Loxton WEF 3 comprise 42 and 39 turbines, each with a contracted capacity of up to 240 MW and a permanent footprint of up to 65 ha each whereas Loxton WEF 2 will have up to 61 turbines, with a contracted capacity of up to 480 MW and permanent footprint of up to 110 ha.

The Loxton WEF 3 project site covers approximately 12 500 ha and comprises the following farm portions situated some 15 km east of Loxton (see map Figure 1):

- Remaining Extent of the Farm Yzervarkspoort No. 139;

- Portion 1 of the Farm Yzervarkspoort No. 139;
- Remaining Extent of Farm 273;
- Remaining Extent of the Farm No. 262;
- Remaining Extent of the Farm Erasmuskraal No. 269.

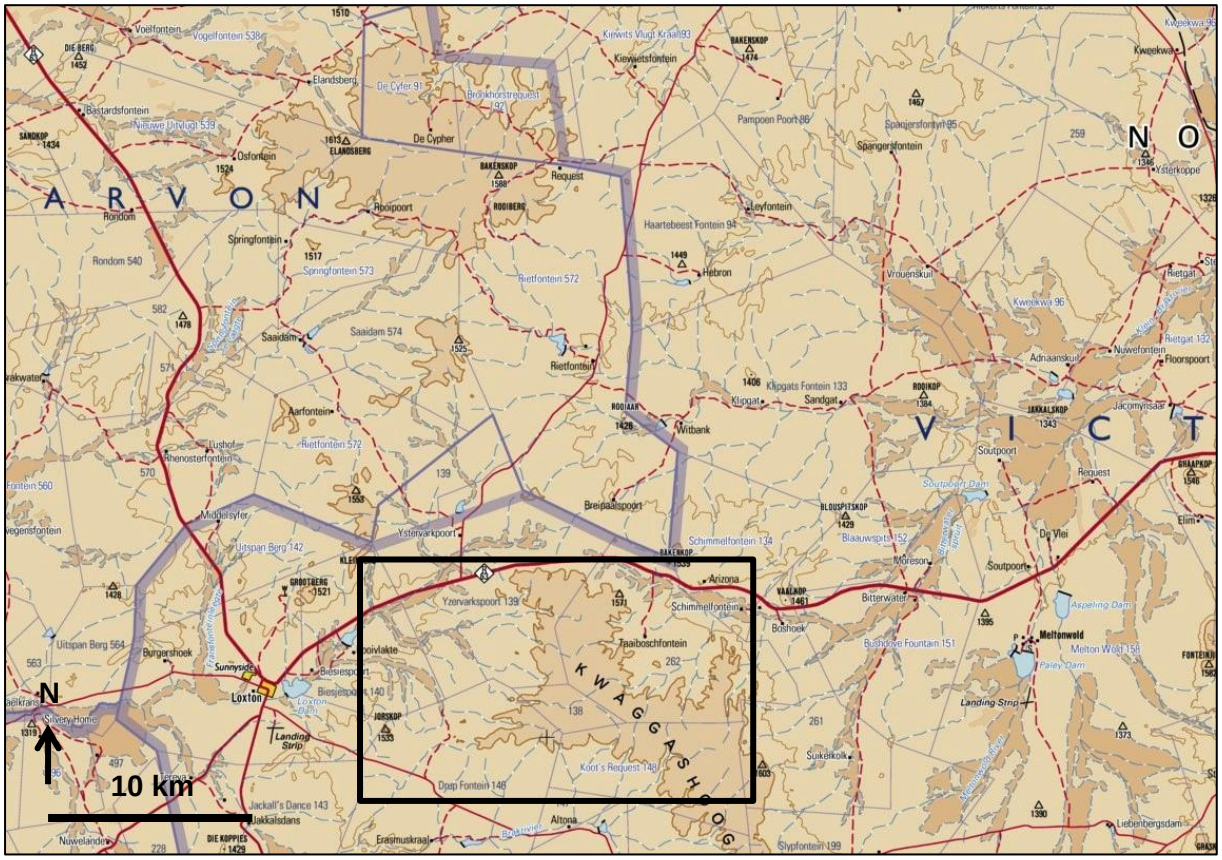

Figure 1: Extract from 1: 250 000 topographical sheet 3122 Loxton showing the *approximate* location of the Loxton WEF 3 project area (black rectangle) some 20 km to the NNE of Loxton, Ubuntu Local Municipality (Pixley ka Seme District Municipality), Northern Cape Province.

The Loxton WEF 3 project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 240 MW (see Appendix 1, Figure A1.1):

- Up to 38 wind turbines with a maximum hub height of up to 160 m and a rotor diameter of up to 200 m;
- A transformer at the base of each turbine;
- Concrete turbine foundations with a permanent footprint 9.1 ha;
- Each turbine will have a crane hardstand of 70 m x 45 m. The permanent footprint for turbine hardstands will be up to approximately 13 ha.
- Each turbine will have a temporary blade hardstand of 80 m x 45 m. The temporary footprint for blade hardstands will be up to approximately 15 ha.
- Temporary laydown areas (with a combined footprint of up to 25 ha) which will accommodate the boom erection, storage and assembly area;
- Battery Energy Storage System (with a footprint of up to approximately 5 ha);

- Medium voltage (33 kV) cables/powerlines running from wind turbines to the facility substations. The routing will follow existing/proposed access roads and will be buried where possible.
- One on-site substation of up to 4 ha in extent to facilitate the connection between the wind farm and the electricity grid;
- Access roads to the site and between project components inclusive of stormwater infrastructure. A 15 m road corridor may be temporarily impacted upon during construction and rehabilitated to 6 m wide after construction. The WEF will have a total road network of up to 50 km.
- A temporary site camp establishment and concrete batching plants (with a combined footprint of up to 2 ha); and
- Operation and Maintenance buildings (with a combined footprint of up to 2 ha) including a gate house, security building, control centre, offices, warehouses, parking bays, a workshop and a storage area.

The Electrical Grid Infrastructure (EGI) associated with the Loxton WEF considers a 300m wide corridor route from the Loxton Switching Station / Collector Station to the Gamma MTS near Hutchinson. The EGI will be located within the Central Strategic Powerline Corridor and therefore subject to a separate Basic Assessment process in accordance with GN 113 of 16 February 2018 listed under NEMA, 1998.

2. Data sources

The combined desktop and field-based palaeontological heritage study of the Loxton WEF Cluster project area is based on the following information resources:

1. A project outline, kmz files, screening report and maps provided by the project Applicant being Loxton Wind Facility 3 Pty Ltd.

2. A desktop review of:

(a) the relevant 1:50 000 scale topographic maps (3122AB Alarmkraal, 3122AD Loxton, 3122BC Schimmelfontein, 3122CB Slangfontein, 3122DA Slypfontein) and the 1:250 000 scale topographic map 3122 Victoria West);

(b) Google Earth© satellite imagery;

(c) published geological and palaeontological literature, including 1:250 000 geological map (3122 Victoria West) and the relevant sheet explanation (Le Roux & Keyser 1988), as well as

(d) several previous and on-going fossil heritage (PIA) assessments for renewable energy and transmission line projects in the Karoo region between Beaufort West, Loxton and Victoria West by the author (See References under Almond, especially Almond 2023 for the Victoria West Cluster WEFs which have a very similar geological setting to the present Loxton WEF Cluster projects).

3. The author's field experience with the formations concerned and their palaeontological heritage (*cf* Almond & Pether 2008 and PIA reports listed in the References); and

4. An eight-day palaeontological heritage survey of the combined Loxton WEF Cluster project area by the author and an experienced field assistant between 17 and 26 October 2022 of which approximately three days were spent within the Loxton WEF 3 project area . The season in which the site visit took place does not have a critical bearing on this palaeontological study. Extensive grass cover as well as locally impassable farm roads limited bedrock visibility and site access in some areas but these

constraints do not markedly affect the conclusions reached in this report, confidence levels for which are rated as Medium.

3. Legislative context

All palaeontological heritage resources in the Republic of South Africa are protected by the National Heritage Resources Act (Act 25 of 1999). Heritage resource management in the Northern Cape: is the South African Heritage Resources Agency (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za).

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the National Heritage Resources Act (Act 25 of 1999) include, among others:

- geological sites of scientific or cultural importance;
- palaeontological sites; and
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the National Heritage Resources Act, dealing with archaeology, palaeontology and meteorites:
(1) The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources agency.
(2) All archaeological objects, palaeontological material and meteorites are the property of the State.
(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources agency, or to the nearest local agency offices or museum, which must immediately notify such heritage resources Agency.
(4) No person may, without a permit issued by the responsible heritage resources agency—
(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
(5) When the responsible heritage resources agency has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
(a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
(b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
(c) if mitigation is deemed by the heritage resources agency to be necessary, assist the person on whom the order has been served under paragraph *(a)* to apply for a permit as required in subsection (4); and
(d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Minimum standards for the palaeontological component of heritage impact assessment reports (PIAs) have recently been published by SAHRA (2013) and Heritage Western Cape (2021).

4. Geological context of Loxton WEF Cluster project area

The Loxton WEF Cluster project area comprises semi-arid, gently hilly, rocky to sandy and gravelly terrain of the Upper Karoo, situated at elevations between *c*. 1390 and 1580m amsl. to the north and east of the small town of Loxton and the Loxton – Carnarvon road (R63) as well as straddling the R63 road sector between Loxton and Victoria West (1: 250 000 sheet 3122 Victoria West; 1: 50 000 sheets 3122AB Alarmskraal, 3122 AD Loxton, 3122BC Schimmelfontein, 3122CB Slangfontein, 3122DB Slypfontein). Much of the terrain is of fairly subdued, rolling relief, with occasional dolerite-capped *koppies* and ridges, especially in the south (*e.g.* Kleinberg 1534 m, Die Rooikoppie 1514 m, Rooiaar dyke just east of the project area). There are no major rivers; much of the area is drained by a network of small, mostly unnamed, non-perennial streams (*e.g.* Springbokfontein se Leegte), variously draining SW into the Loxton Dam and Biesjespoort Dam and the Soutpoortrivier or eastwards into the Klein-Brakrivier and the Bitterwaterspruit.

The geology of the WEF Cluster project area is outlined on 1: 250 000 geological sheet 3122 Victoria West (Council for Geoscience, Pretoria) (Figure 2) with a short accompanying explanation by Le Roux & Keyser (1988). The area is largely underlain at depth by continental (fluvial / lacustrine) sediments of the **Lower Beaufort Group** (Karoo Supergroup) of Middle to Late Permian age (*c*. 260 to 256 Ma = million years ago) (Johnson *et al.* 2006). The sedimentary succession in the north-western sector of the Main Karoo Basin represented here broadly gets younger from north to south. The beds here are assigned to the **Abrahamskraal Formation** and the lowermost, sandstone-rich part of the **Teekloof Formation** (**Poortjie Member**), while the overlying mudrock-dominated **Hoedemaker Member** only crops out within the associated Grid Connection corridor towards Victoria West (to be separately assessed).

The fine-scale lithostratigraphy of the Lower Beaufort Group succession in this sector of the Main Karoo Basin - including the correlation of the main channel sandstone packages such as the Moordenaars Member and Poortjie Member - remains unresolved (*cf* Day & Rubidge 2020a, Almond 2023). A major sandstone package within the upper part of the Abrahamskraal Formation in the Loxton WEF Cluster project area is tentatively correlated here with the **Moordenaars Member** while a higher-lying, thick mudrock package may be equivalent to the **Karelskraal Member**. The outcrop area of the **Poortjie Member** has probably been underestimated on the published 1: 250 000 map with several small, unmapped outliers of Poortjie sandstone to the north of the main mapped outcrop area. Le Roux and Keyser (1988 p.6) note that the Moordenaars Member may pass directly up into the Poortjie Member in some areas of the Williston and Victoria West 1: 250 000 sheets, complicating mapping of the Abrahamskraal Formation – Teekloof Formation contact. However, a well-defined, thick Karelskraal Member package does appear to be present in the Loxton WEF 3 project area; it is recognisable on satellite images by its finely-striped outcrop area (numerous thin sedimentary cycles) which has been emphasized here by thermal metamorphism.

In this subregion of the Upper Karoo the Beaufort Group sediments are intruded by an extensive network of dyke and sill complexes of the Early Jurassic **Karoo Dolerite Suite**, especially in the southern sector of the combined WEF project area where a major dolerite sill – referred to here as the Kwaggashoogte dolerite sill - intrudes close to the Abrahamskraal / Teekloof Formation contact, probably within a thick mudrock package of the lower Poortjie Member (*e.g.* Kleinberg 1534 m, Die Rooikoppie 1514 m, Rooiaar dyke just east of the project area) (Chevallier & Woodford 1999, Duncan & Marsh 2006). These intrusions have thermally metamorphosed and altered considerable volumes of the adjoining country rocks (*e.g.* where these overlie shallow, saucer-shaped intrusions), locally

compromising fossil preservation as well as generating large volumes of tough quartzitic and doleritic colluvial and eluvial rubble (locally calcretised) that mantles the neighbouring potentially fossiliferous bedrocks. Kimberlite pipes or other intrusions are not mapped within the project area itself but do occur shortly to the east (small black diamond symbols on the geological map).

Interesting features that are probably related to dolerite intrusion include the network of shallow, occasionally branching channel-like features (*c*. 60-80 cm maximum diameter) incised into wave ripple-marked sandstone bed tops within the upper Abrahamskraal Formation exposed along a stream bed in the Bitterwaterspruit Valley north of Boobejaankrans (Farm 262). The Poortjie bedrocks shortly overlie a major dolerite intrusion in this area and an E-W trending doerite dyke runs some 30m to the south. The channels show a resistant, pale, densely silicified cortex and an infill of greyish, recessive weathering wacke containing fine flakes of pale, baked mudrock (Figures 32 to 36). They lack typical tetrapod burrow features such as superficial scratch marks. They are probably attributable to the confined circulation of hot, erosive hydrothermal fluids along the contact of sandstone bodies and impermeable overlying mudrocks within a thermal aureole during, or shortly following, dolerite intrusion.

Levels of tectonic deformation (including folding, cleavage development) within the wider region are probably low; satellite imagery suggests that the Beaufort Group sediments are fairly flat-lying while they are also cut by numerous small faults which are often picked out by dark lines of shrubs as well as by dolerite dykes. Regular sets of rectilinear joints are a prominent feature of quartzitic sandstone cappings in the region, the joints again being picked out on satellite images by dark shrubs.

The Permian and Jurassic bedrocks within the project area are extensively mantled by a range of **Late Caenozoic superficial deposits**, limiting exposure levels of fresh (unweathered), potentially fossiliferous Permian sediments. In addition to thick (up to several meters), gravelly to sandy alluvial sediments along numerous active or defunct drainage lines, these younger cover sediments include pan and spring deposits, gravelly debrite and inundite diamictites, colluvial (slope) and eluvial (downwasted) surface gravels dominated by clasts of quartzite, dolerite, hornfels and palaeocalcrete, pedocretes (*e.g.* calcrete hardpans, especially in doleritic terrain) *plus* a spectrum of mainly sandy to gravelly soils.

Illustrations of geological scenery and representative rock exposures within the Loxton WEF 3 project area are given below in Figures 3 to 44, together with explanatory figure legends.

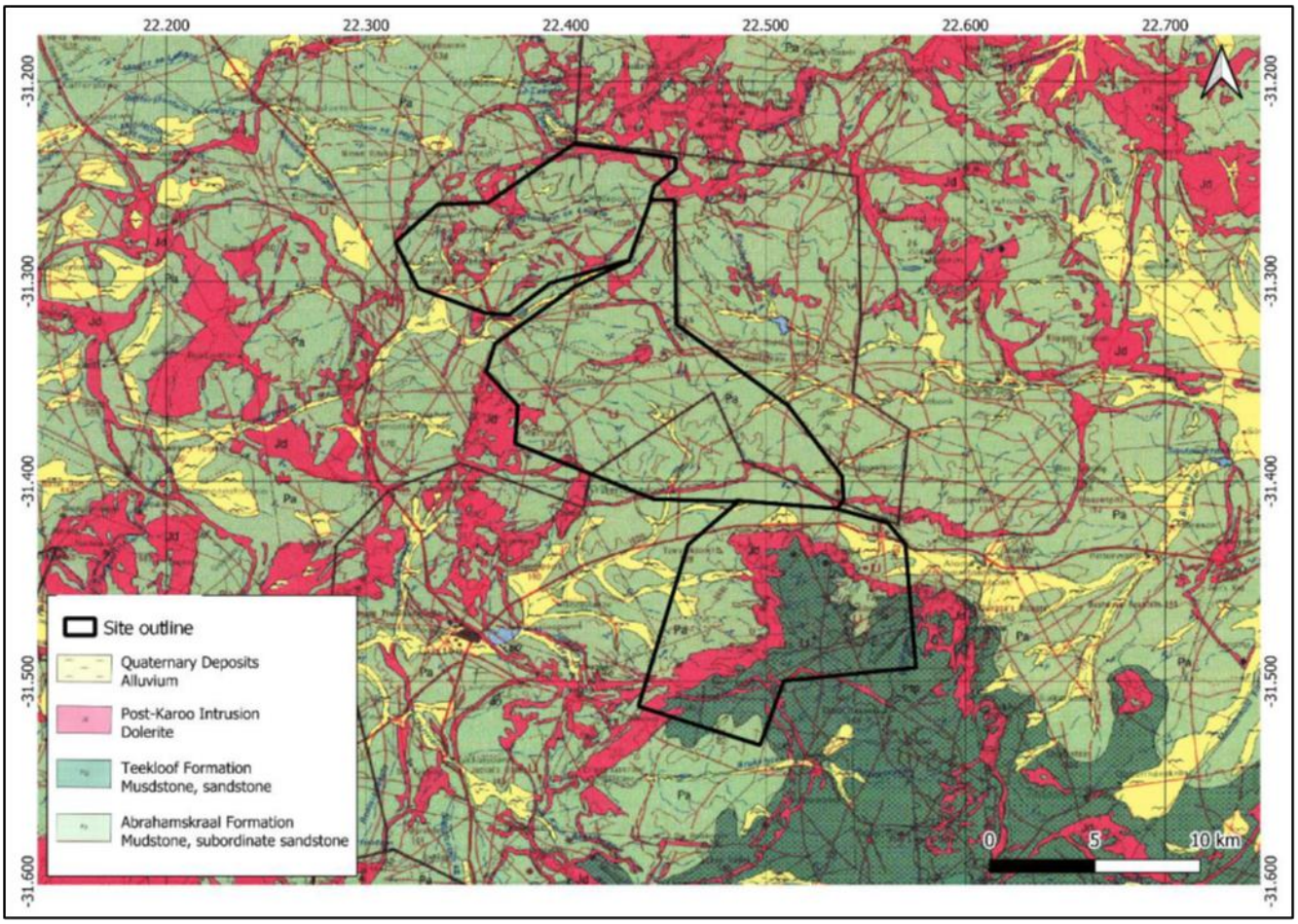

Figure 2: Extract from 1: 250 000 geology sheet 3122 Victoria West showing the location of the proposed Loxton WEF Cluster project areas between Loxton and Victoria West, Northern Cape (Base map published by the Council for Geoscience, Pretoria). The main rock units represented regionally include: Pa (pale green) = Middle to Late Permian Abrahamskraal Formation. Ptp (middle green with stipple) = Late Permian Poortjie Member, Teekloof Formation (Adelaide Subgroup). Pth (middle green without stipple) = Late Permian Hoedemaker Member, Teekloof Formation (Adelaide Subgroup). Jd (red) = dolerite sills and dykes of the Early Jurassic Karoo Dolerite Suite. Pale yellow with flying bird symbol = Late Caenozoic (Neogene / Pleistocene to Recent) alluvium. Small black diamonds – kimberlite pipes. *N.B.* The mapping of the various members within the Abrahamskraal and Teekloof Formations shown in this region is contested.

Figure 3: Gravel-strewn *vlaktes* in the north-western sector of the WEF project area on Biesiespoort 140, looking southwards with low hills of the Karelskraal and Poortjie Members on the skyline.

Figure 4: Dissected hilly terrain on Ystervarkspoort Farm 139/RE & 1 showing scattered small exposures of grey-green mudrocks of the Karelskraal Member in the Abrahamskraal – Teekloof Formation transition zone.

Figure 5: Benches of baked lower Poortjie Member channel sandstone units beneath the major Kwaggashoogte dolerite sill seen in the background, Ystervarkspoort Farm 139/RE & 1.

Figure 6: View westwards on Farm 262 showing the incised, north-facing escarpment capped by the Kwaggashoogte dolerite sill. Underlying Lower Beaufort Group sediments are blanketed by pervasive doleritic colluvium on steeper hillslopes and by sandy alluvial soils in the *vlaktes* (foreground).

Figure 7: Rugged doleritic scenery within the outcrop area of the Kwaggashoogte dolerite sill on the northern margins of Farm 273.

Figure 8: Typical rolling upland terrain underlain by baked Poortjie Member sediments beneath a major dolerite intrusion on Farm 273. Exposure of potentially fossiliferous Beaufort Group mudrocks is very limited in these areas which will receive a high proportion of WEF infrastructure.

Figure 9: Blocky eluvial gravels of tough-weathering quartzite generated by extensive baking of Poortjie Member sandstones carpet large areas of the higher-lying sectors of the WEF, as here on Farm 273.

Figure 10: Low relief, hilly terrain on Farm 262. Prospecting for fossil remains in such areas focussed mainly on occasional shallow drainage lines where the bedrocks are usually thoroughly baked.

Figure 11: Low, north-facing escarpment of upper Abrahamskraal Formation bedrocks – here probably the Moordenaars Member equivalents just south of the R63 on Ystervarkspoort Farm 139/RE & 1. The Karelskraal Member – Poortjie Member escarpment capped by dolerite is seen in the background.

Figure 12: Extensive development of calcrete-rich breccias and *koffieklip* ferruginous carbonate concretions within the upper Moordenars Member on Ystervarkspoort Farm 139/RE & 1. The breccias occasionally contain reworked fragments of fossil wood and bones (*cf* Figures 50 & 61). Hammer = 30 cm.

Figure 13: Thin-to medium bedded greyish mudrocks of the upper Moordenaars Member on Ystervarkspoort Farm 139/RE & 1 reflecting deposition on the distal floodplain.

Figure 14: Gentle-sloped escarpment of the mudrock-dominated Karelskraal Member capped by Poortjie Member sandstones on Ystervarkspoort Farm 139/RE & 1.

Figure 15: Thick, multi-cyclic, mudrock-dominated package provisionally correlated with the Karelskraal Member at the top of the Abrahamskraal Formation on Ystervarkspoort Farm 139/RE & 1. This stratigraphic level stands out as a finely striped zone beneath the lower Poortjie Member sandstones and main dolerite sills on satellite images (Appendix 1).

Figure 16: Baked purple-brown and grey-green mudrocks as well as thin channel sandstones within the Karelskraal Member exposed in a gullied escarpment on Ystervarkspoort Farm 139/RE & 1.

Figure 17: Good exposures of Karelskraal Member tabular-bedded mudrocks and thin, crevasse-splay sandstones along a stream gulley on Ystervarkspoort Farm 139/RE & 1. Equivocal tetrapod tracks have been recorded at this locality (*cf* Figure 53).

Figure 18: Deeply-incised valley cut into the steep Poortjie Member escarpment near Bobbejaankrans on the Eastern margins WEF project area on Farm 273, looking towards the north.

Figure 19: Thinly-bedded, tabular, yellowish-brown weathering channel sandstones of the Poortjie Member exposed along the escarpment illustrated above.

Figure 20: Interbedded, erosive-based sandstones and grey-green mudrocks beneath the base of the Poortjie Member, quarry exposure just south of the R63 on Ystervarkspoort Farm 139/RE & 1. Hammer = 30 cm.

Figure 21: Good sections through thick, lower Poortjie Member channel sandstones beneath the major Kwaggashoogte dolerite sill, quarry cut face just south of the R63 on Ystervarkspoort Farm 139/RE & 1.

Figure 22: Low, scabby exposures of pale, baked Poortjie Member quartzite overlain by rubbly alluvial gravels of quartzite seen in an upland plateau area on Farm 273 with a dolerite sill in the background. Such exposures show local evidence of karstic (solution) weathering and are unlikely to be fossiliferous.

Figure 23: Mudrocks in the same area as shown above have been baked to dark-weathering hornfels, together with paled baked calcrete concretions, compromising any fossils they may have originally contained. Hammer = 30 cm.

Figure 24: Stream bank exposure of baked, thin-bedded, mottled, grey-green mudrocks and thin sandstones of the Poortjie Member on Farm 273.

Figure 25: Well-developed pedogenic calcrete horizon within the Poortjie Member at the same locality as the previous illustration. The pale buff to grey hue of the palaeocalcrete here is due to thermal metamorphism. Hammer = 30 cm.

Figure 26: Palaeosol horizon within the upper Abrahamskraal Formation marked by dense development of pale, baked pedogenic calcrete concretions, stream bed exposure on Farm 262. Hammer = 30 cm.

Figure 27: Baked grey-green mudrocks of the Poortjie Member containing sections through pedogenic calcrete concretions with a secondary pale halo of neomorphic carbonate due to dolerite intrusion, stream bed exposure on Farm 273. Hammer = 30 cm.

Figure 28: Stream bed and bank exposure of Poortjie Member bedrocks close to the eastern boundary of the WEF project area on Farm 273. The dark grey mudrocks beneath the crevasse splay sandstone here contain fossils of transported plant material (*cf* Figures 62 to 64).

Figure 29: Extensive stream bed and bank exposures of highly-baked mudrock and sandstone facies of the Poortjie Member on Farm 262. Occasional baked tetrapod skeletal remains have been recorded from a similar setting nearby (*cf* Figures 48 & 49).

Figure 30: Well-jointed, baked fine-grained wackes of the Poortjie Member exposed in a shallow stream bed on Farm 273. Equivocal tetrapod tracks and disarticulated fish remains have been recorded from this locality (*cf* Figures 51 & 52).

Figure 31: Heterolithic package of tabular sandstones and dark grey mudrocks within the upper Abrahamskraal Formation exposed in a stream bank along the upper reaches of the Bitterwaterspruit Valley north of Bobbejaankrans, Farm 262. This succession overlies a major dolerite sill while an E-W trending dolerite dyke runs some 300m to the south.

Figure 32: Streambed exposure within the heterolithic package illustrated above showing a wave-rippled topped sandstone intersected by a well-defined, linear feature infilled with darker, greyish wacke with fine mudflakes. Hammer = 30 cm. The arrowed surface shows possible bioturbation by burrowing invertebrates.

Figure 33: Close-up of channel showing pale flakes of reworked, baked mudrock within the darker grey infill. Hammer = 30 cm.

Figure 34: Shallow, branching, trough-like feature at the same locality with well-defined margins, a resistant outer cortex and recessive-weathering infill of darker greyish material. Note the absence of any superficial scratch marks. Hammer = 30 cm.

Figure 35: Another shallow, branching feature from the same locality. The side-branch has a markedly smaller width than the main channel. Hammer = 30 cm.

Figure 36: Rippled sandstone bed surface traversed by a shallow rectilinear channel *c*. 60-80cm wide, same locality as previous five figures.

Figure 37: Dissected escarpment on Ystervarkspoort Farm 139/ RE & 1 showing thick, baked channel sandstones of the lower Poortjie Member capped by the Kwaggashoogte dolerite sill.

Figure 38: Foothills of the dolerite-capped escarpment on Ystervarkspoort Farm 139/ RE & 1 with an apron of coarse doleritic colluvial rubble mantling the pale, baked and weathered Lower Beaufort Group country rocks in the foreground.

Figure 39: Typical rubbly dolerite scenery with the outcrop area of the major Kwaggashoogte sill on Farm 262.

Figure 40: Dolerite corestones on the northern margins of Farm 273, probably generated through karstic weathering of the extensive Kwaggashoogte sill.

Figure 41: Wedge of well-consolidated gravelly diamictite of debris flow origin superimposed on a streambed exposure of Karelskraal Member bedrocks on Ystervarkspoort Farm 139/ RE & 1. Hammer = 30 cm. Note polygonal fractures picked out by calcrete veins within the debrite deposit which is probably of Pleistocene age or younger (post-dating stream incision) and is overlain by coarse, calcretised colluvial gravels.

Figure 42: Close-up of consolidated debrite diamictite on Ystervarkspoort Farm 139/ RE & 1 illustrated above showing angular dispersed gravels of hornfels and quartzite within a gritty calcretised matrix. Scale = 15 cm.

Figure 43: Coarse rubbly alluvium (possible inundite / debrite) with poorly-sorted, angular gravel casts exposed in the banks of a stream on Farm 273.

Figure 44: Gullied mantle of gravelly colluvial sands overlying coarse, quartzitic gravels along the escarpment foot on Ystervarkspoort Farm 139 / RE & 1.

5. Palaeontological heritage context

The Middle to Late Permian Abrahamskraal and Teekloof Formation bedrocks in the combined Loxton Cluster study area are characterised by fossil assemblages of the ***Tapinocephalus* and *Endothiodon* Assemblage Zones** (the latter was previously termed the *Pristerognathus* and *Tropidostoma* Assemblage Zones (Kitching 1977, Keyser & Smith 1977-78, Rubidge 1995, Rubidge 2005, Van der Walt *et al.* 2010, Smith *et al.* 2012, Smith *et al.* 2020, Day & Rubidge 2020b, Day & Smith 2020) (Figures 45 and 46). They include a wide range of fossil tetrapods - especially reptiles and therapsids ("mammal-like reptiles" or protomammals"") - as well as fish, amphibians, plant remains (*e.g.* petrified wood, plant compressions), microfossils and trace fossils (*e.g.* vertebrate and invertebrate burrows, trackways). These fossil assemblages and the sedimentary bedrocks within which they occur are of special scientific interest because they span the environmentally critical boundary between the Middle and Late Permian Periods which was associated with the catastrophic end-Capitanian Mass Extinction Event of *c*. 260 Ma (million years ago) (Day *et al.* 2015).

Only a few historical vertebrate fossil sites are mapped near Loxton on the published 1: 250 000 geological map and in the key early review by Kitching (1977). The Karoo fossil vertebrate site map of Nicolas (2007) shows low density of fossil records east of Loxton with just a few sites recorded south and north of the town (Figure 47). The region between Loxton and Victoria West is the subject of ongoing palaeontological research by Professor Bruce Rubidge of the Evolutionary Studies Institute (ESI), Wits University as well as Dr Mike Day of the Natural History Museum, London. Important concentrations of fossil sites are known *c.* 20 km east of the WEF project area near Melton Wold and west of Gamma Substation as a result of a long history of palaeontological fieldwork in the Biesiespoort area (close to the eastern sector of the associated Grid Connection Corridor). Recent palaeontological fieldwork by the present author for WEF and SEF project areas in the broader Loxton – Victoria West – Beaufort West region (*e.g.* Nuweveld WEFs, Hoogland WEFs, Modderfontein WEF, Victoria West WEF Cluster, Skietkuil / iLanga project areas – see References under Almond) and earlier research by other Karoo palaeontologists (*e.g.* Smith 1993) suggest that unrecorded fossil sites of scientific and conservation value are likely to occur here. However, vertebrate fossil records are often sparse in areas intruded by dolerite. New tetrapod fossil finds within the project area should help resolve outstanding lithostratigraphic ambiguities in the region as well as contributing to on-going scientific research concerning palaeoenvironmental and evolutionary events before and during the catastrophic end-Middle Permian Extinction Event of *c*. 260 million years ago as well as during the succeeding biotic recovery (Retallack *et al.* 2006, Day *et al.* 2015).

Most of the varied Late Caenozoic superficial sediments within the project area are largely of low palaeosensitivity. However, relict and often consolidated older (Neogene / Pleistocene) alluvial deposits along drainage lines might contain sporadic fossil assemblages of mammals (bones, teeth, horn cores), freshwater invertebrates (*e.g.* unionid bivalves) and trace fossils (*e.g.* calcretised termitaria, rhizoliths / plant root casts).

6. New palaeontological heritage data (Loxton WEF 3)

New fossil sites recorded within the Loxton WEF 3 project area are tabulated with gps data, brief description, provisional Field Rating and any recommended mitigation in Appendix 1 where the sites are also mapped with reference to the provisional WEF layout (Figures A1.1 and A1.2). Selected fossil sites are illustrated below in Figures 48 to 64, together with explanatory legends.

Only twenty or so fossil occurrences were recorded during the approximately 3-day site visit to the Loxton WEF 3 project area, indicating that this area is of low palaeosensitivity overall. Fieldwork mainly focussed on the very limited exposures of Lower Beaufort Group mudrocks mapped within the Abrahamskraal Formation and Poortjie Member (lowermost Teekloof Formation) outcrop areas but

representative exposures of Beaufort Group sandstones, older alluvial deposits and surface gravels were also examined for palaeontological material.

Tetrapod skeletal remains appear to be very rare within the Lower Beaufort Group bedrocks here, although this may be due in part to poor exposure levels of potentially fossiliferous mudrocks as well as extensive baking of sediments by dolerite intrusion. Within the upper Abrahamskraal Formation reworked, fragmentary bone material occurs within channel breccio-conglomerates (Figure 50) while white bone fragments are occasionally recorded from baked pedogenic calcrete concretions (Figures 48 & 49). The only vertebrate body fossils noted within the Poortjie Member comprise a few scattered, disarticulated skeletal elements of a bony fish – including delicate branchial bars with comb-like gill rakers - within thermally metamorphosed channel sandstones (Figures 51 and 52).

As noted within the adjoining Victoria West WEF Cluster project area (Almond 2023), tetrapod trace fossils may be the commonest evidence for vertebrates within thermally metamorphosed Lower Beaufort Group sediments between Loxton and Beaufort West. The track status and stratigraphic context of several potentially interesting tetrapod trace fossil sites recorded within the Loxton WEF 3 project area require further field-based confirmation, however. Several possible but equivocal track / trackways of large tetrapods (probably undertracks) are recorded from streambed exposures of the upper Abrahamskraal Formation within the Loxton WEF 3 project area (Figures 53 & 54). If valid, they most closely resemble tracks called *Brontopus* which have recently been ascribed to dinocephalian therapsids (*cf* Marchetti *et al.* 2019).

Possible tetrapod burrow casts have been noted within the lower Poortjie Member (Figure 55). The array of shallow channels on ripple-marked sandstone bed tops of the upper Abrahamskraal Formation illustrated in Figures 32 to 36 herein are of indirect palaeontological interest in so far as they mimic tetrapod burrow networks in some respects.

Laterally-persistent, thin (*c*. 20 cm thick) crevasse splay sandstone within the Karelskraal Member on Yzervarkspoort Farm 139/RE & 1 preserve a range of trace fossils on their soles (Figures 56 to 58). They include comb-like sets of digital furrows, partial imprints of hands / feet of sizeable temnospondyl amphibians as well as locally abundant microbial matt wrinkled surfaces and dense invertebrate traces. These traces were probably generated by smallish, crocodile-like rhinesuchid amphibians within a shallow playa lake on the ancient Karoo floodplain. They may comprise resting / swimming traces, such as push-offs and foot-drags, but the possibility that they might also reflect foraging for benthic invertebrate prey by temnospondyls should also be considered. Comparable temnospondyl traces have been recently recorded from the Lower Beaufort Group in the Victoria West WEF Cluster project area and elsewhere (*cf* Almond 2023).

Invertebrate burrows of the damp substrate *Scoyenia* Ichnofacies are found within the Karelskraal Member where they are associated with the rounded casts of reedy plant stems (probably sphenophytes) (Figures 59 & 50). Transported compressions or impressions of sphenophytes, probable lycopods with attached leaves (*cf Cyclodendron*; Anderson & Anderson 1985) and indeterminate root-like structures are found within channel breccio-conglomerates, overbank mudrocks and fine-grained wackes of the Abrahamskraal Formation and Poortjie Member (Figures 61 to 64); these plant fossil assemblages are probably grossly under-recorded in the Karoo.

No fossils were recorded from the Late Caenozoic superficial sediments within the Loxton WEF 3 project area.

Only a few of the new fossil sites recorded within the Loxton WEF 3 project area are of significant scientific or conservation value and none of the sites lies close to or within the proposed WEF footprint

(Appendix 1 table and satellite maps). No known significant or unique palaeontological heritage sites are threatened by the proposed development.

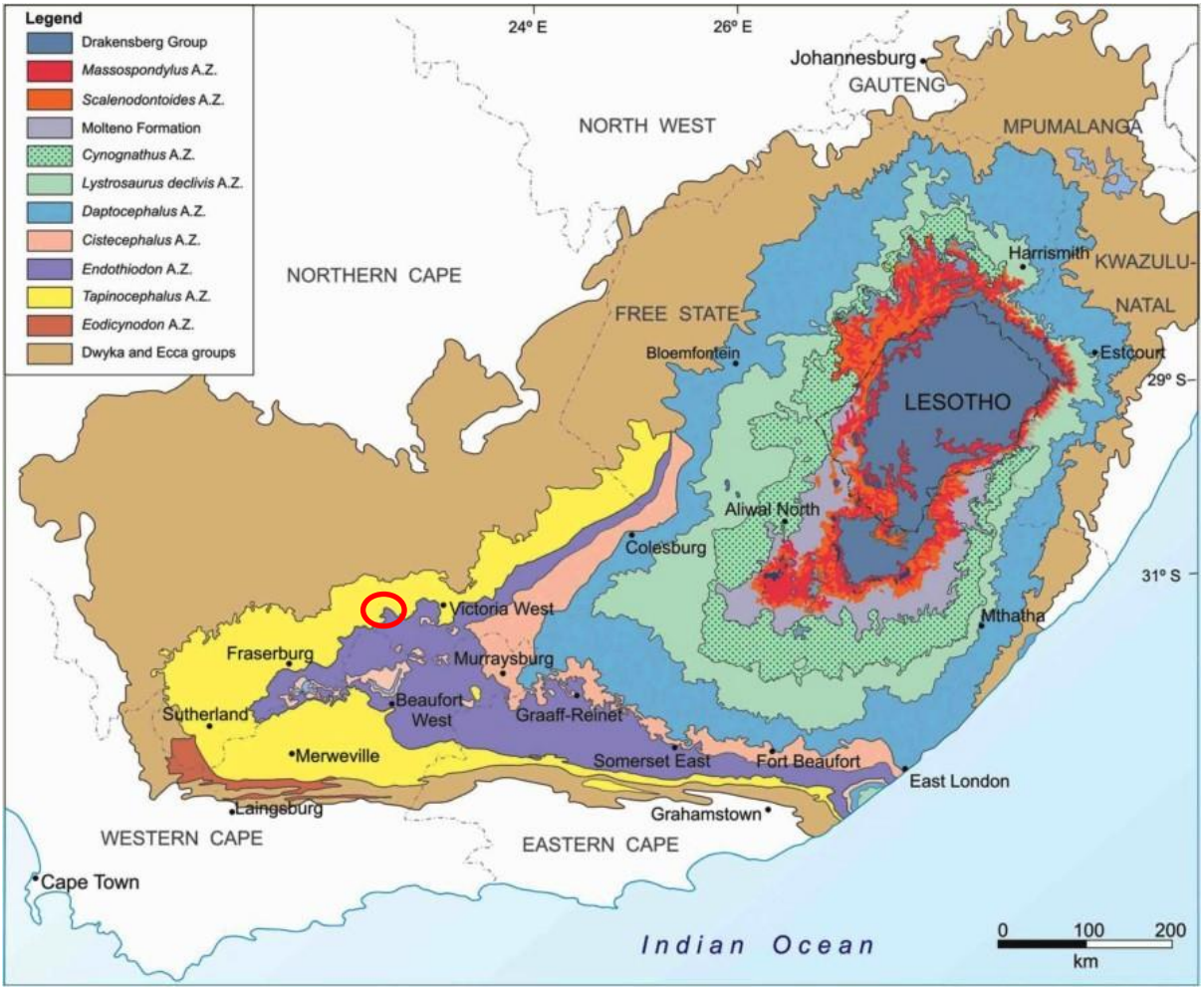

Figure 45: The latest fossil biozonation map for the Main Karoo Basin (Smith *et al.* 2020) shows the occurrence of Mid to Late Permian fossil assemblages of the *Tapinocephalus* Assemblage Zone and perhaps also the succeeding *Endothiodon* Assemblage Zone in the Loxton WEF Cluster project area (small red ellipse).

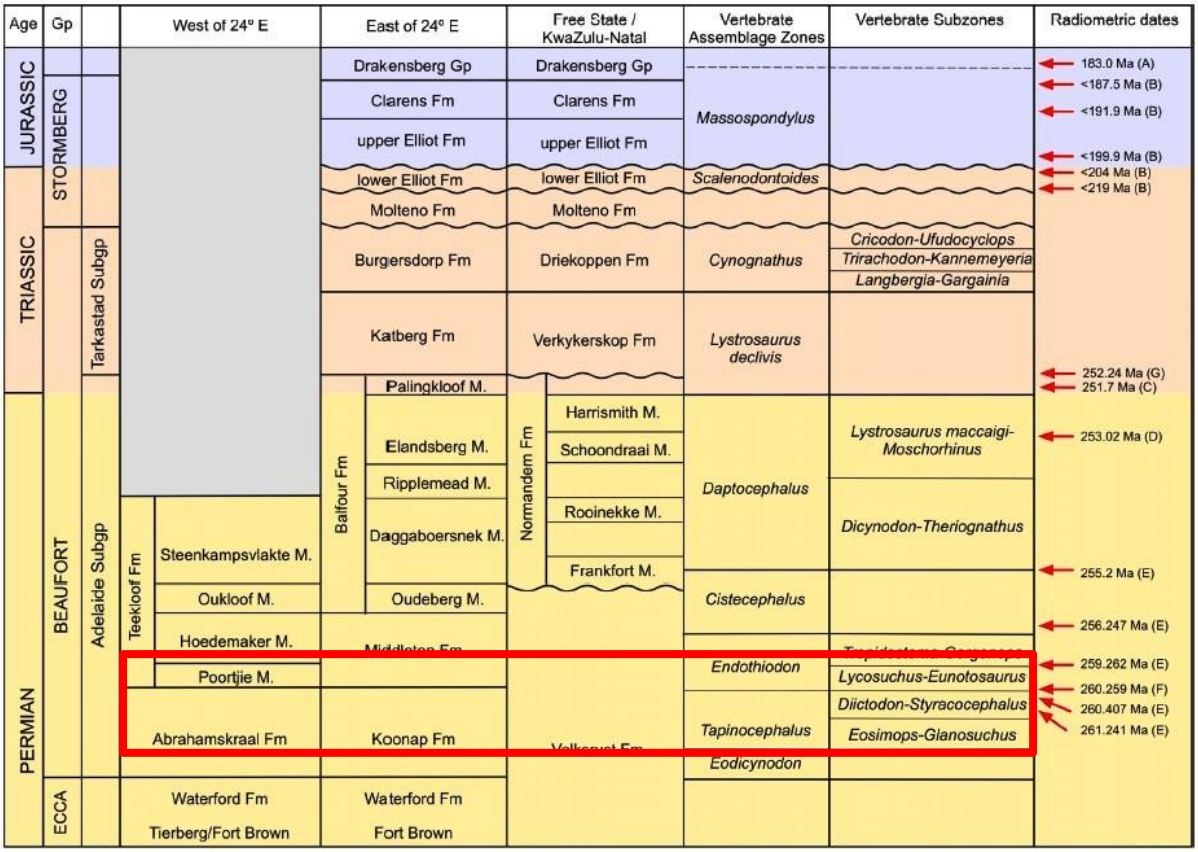

Figure 46: Chart showing the latest, revised fossil biozonation of the Lower Beaufort Group of the Main Karoo Basin (abstracted from Smith *et al.* 2020). Rock units and fossil assemblage zones mapped within the Loxton WEF Cluster project area are outlined in red respectively. The Hoedemaker Member is only present within the associated Grid Connection corridor (to be assessed separately). The detailed mapping of these lithostratigraphic and biostratigraphic units within the present project area between Loxton and Beaufort West is unresolved at present.

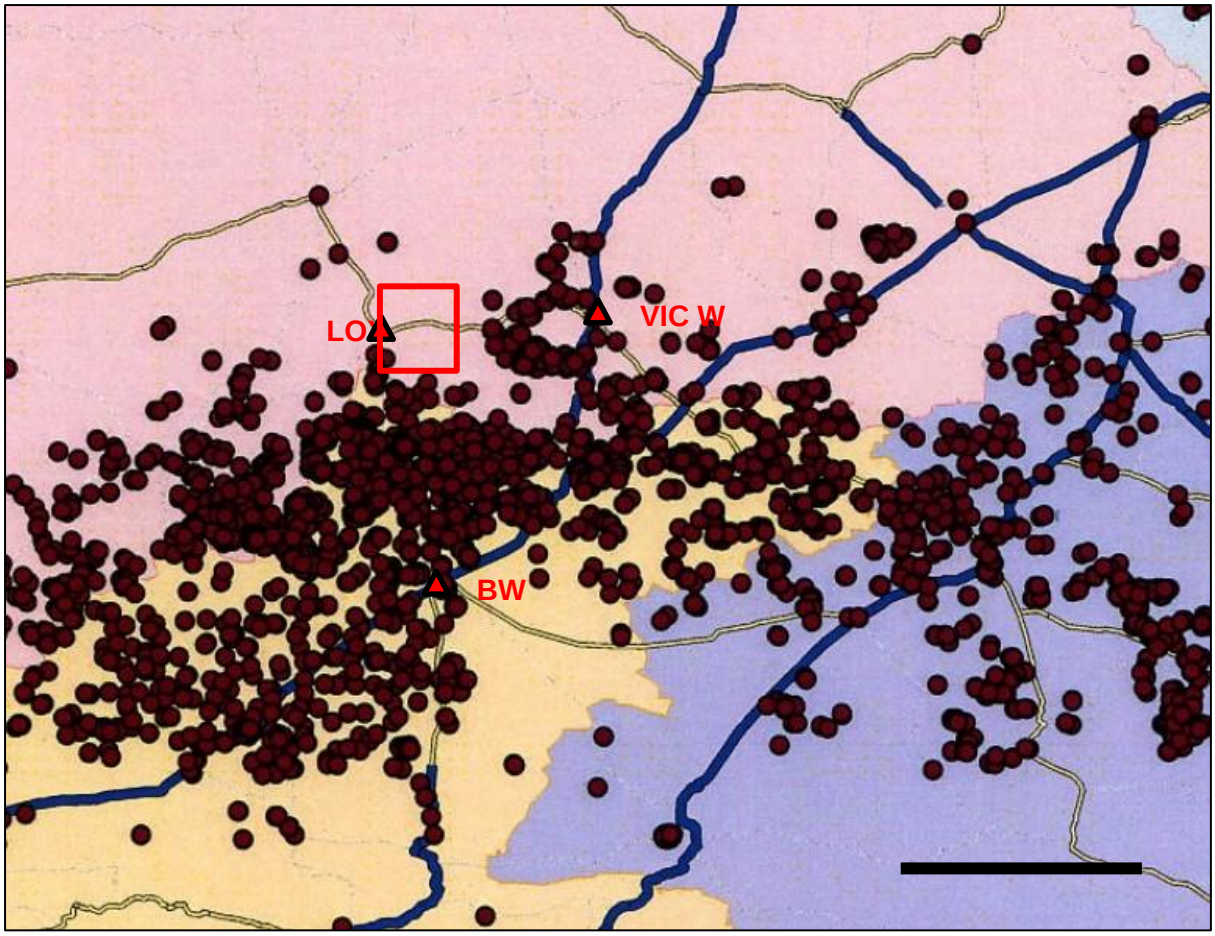

Figure 47: Distribution map of recorded vertebrate fossil sites within the Lower Beaufort Group of the Great Karoo between Loxton (LOX), Victoria West (VIC W) and Beaufort West (BW), showing the very *approximate* outline of the study area for the Loxton WEF Cluster within the red rectangle (map abstracted from Nicolas 2007). Note the scarcity of known sites in the area just to the east of Loxton, with a few sites recorded just to the north and south of the town. The abundance of known fossil sites close to the N1 to the northeast of Three Sisters and south of Victoria West reflects in part the long history (> 100 years) of fossil collection by both academics as well as knowledgeable amateurs at sites close to Biesiespoort Station. Scale bar = 10 km. N towards the top of the image.

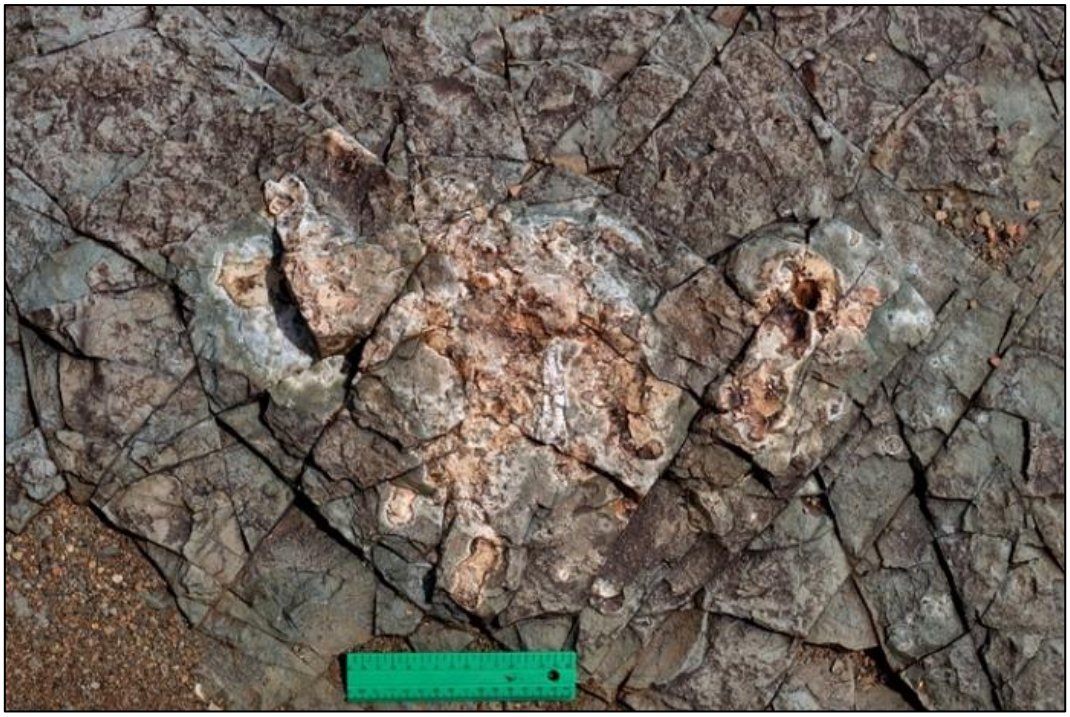

Figure 48: Streambed exposure of baked mudrocks of the upper Abrahamskraal Formation on Farm 262 with pale pedogenic calcrete concretions containing disarticulated fragments of whitish baked bone (Loc. 146). Scale in cm. See following figure for detail and Figure 26 for context.

Figure 49: Close-up of fragmentary, whitish baked bone (*c*. 6.5 cm long) within the pedogenic calcrete concretion illustrated above (Loc. 146).

Figure 50: Small block (*c*. 1cm thick x 5 cm wide) of reworked, robust tetrapod bone embedded within a ferruginised channel breccio-conglomerate of the upper Abrahamskraal Formation (probably Moordenaars Member) on Yzervarkspoort Farm 139/RE & 1 (Loc. 136).

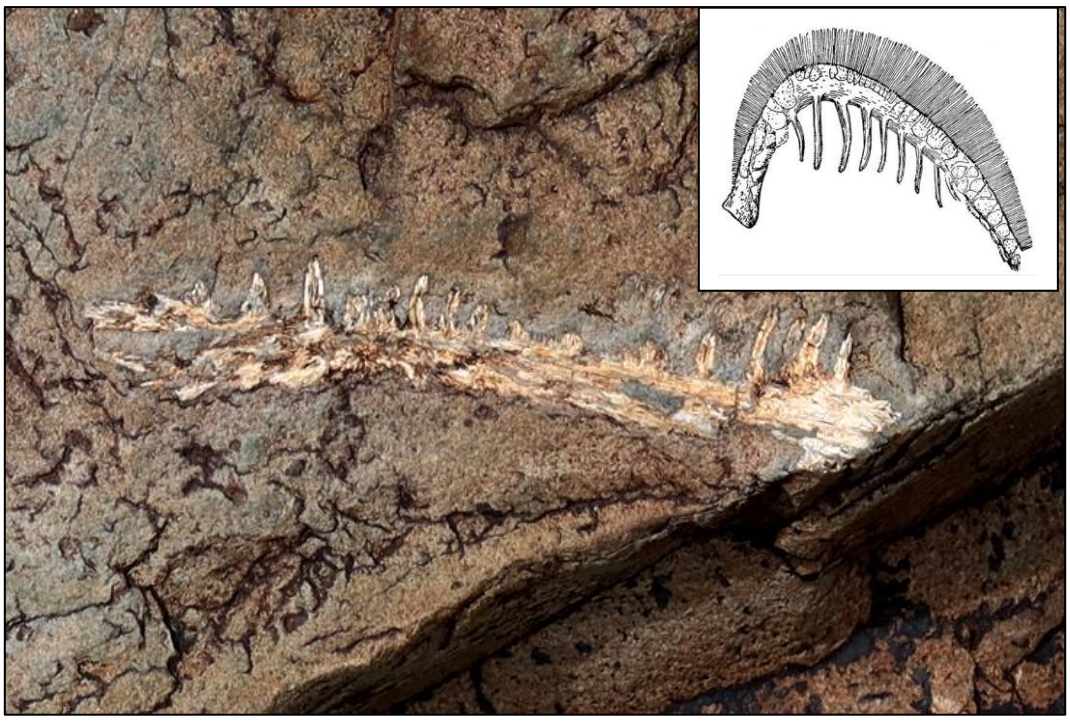

Figure 51: Delicate, toothed bony structure *c*. 5 cm long within baked channel wackes of the lower Poortjie Member on Farm 273 (Loc. 162). This probably is the branchial (gill) arch of a bony fish with long, tooth-like gill rakers (inset). See Figure 30 for context.

Figure 52: One of several additional small bone fragments from Loc. 162 on Farm 273 which are considered to be skeletal remains of a bony fish (scale in cm and mm).

Figure 53: Possible but *equivocal* trackways of one or more large-bodied tetrapods on a baked wacke surface within the Karelskraal Member exposed in a stream section on Yzervarkspoort Farm 139/RE & 1 (Loc. 118). Hammer = 30 cm.

Figure 54: Streambed exposure of finely-jointed upper Abrahamskraal Formation wackes with possible but *equivocal* trackways of a large-bodied tetrapod (*cf Brontopus*, attributed to dinocephalian therapsids), Farm 273 (Loc. 153). The stratigraphic horizon and trackway nature of these features remain to be confirmed. Hammer = 30 cm.

Figure 55: Possible but *equivocal* baked sandstone casts of tetrapod burrows (arrowed) enclosed within mudrocks of the lower Poortjie Member, stream bed exposure on Yzervarkspoort Farm 139/RE & 1 (Loc. 125). Hammer = 30 cm.

Figure 56: Laterally-persistent, thin (c. 20 cm) crevasse splay sandstone within the Karelskraal Member on Yzervarkspoort Farm 139/RE & 1. Several trace fossils generated by temnospondyl amphibians are preserved on the soles of downwasted sandstone blocks here (Loc. 119-121). See also the following two figures.

Figure 57: Downwasted block of the crevasse-splay sandstone bed illustrated above (scale = 15 cm). In section the bed is composed of several amalgamated thin units showing small-scale current ripple cross-lamination and scours.

Figures 58 A-F: Sole surfaces of crevasse splay sandstone blocks from closely-spaced Locs. 119-121 on Yzervarkspoort Farm 139/RE & 1 that are illustrated in the previous two figures. Scale bars = *approximately* 4 cm. The traces shown here are ascribed to aquatic temnospondyl amphibians (probably rhinesuchids) which were impressed into bottom muds of a shallow water body (*e.g.* playa lake) which also featured microbial mats and infaunal burrowing invertebrates. The temnospondyl traces might simply reflect bottom resting or locomotion (*e.g.* push-offs). Alternatively they might suggest foraging of amphibians on benthic invertebrate prey.

A, B - comb-like set of digital furrows of a temnospondyl.

C, D – digital scrapes as well as partial pes or manus impressions.

E – bioturbated sole surface featuring a high density of burrows of invertebrates (potential prey?).

F – Wrinkled microbial mat textures with slightly coarser set of digital scrape marks.

Figure 59: Sole surface of a thin crevasse-splay sandstone within the Karelskraal Member showing string-like horizontal *Scoyenia* burrows attributed to infaunal invertebrates such as arthropods (*e.g.* insects) in damp settings, Yzervarkspoort Farm 139/RE & 1 (Loc. 113). The burrows are *c*. 8 mm wide.

Figure 60: Upper bedding plane of greyish wacke within the Karelskraal Member showing rounded stem casts of reedy plant stems as well as vague horizontal burrows of the *Scoyenia* Ichnofacies on Yzervarkspoort Farm 139/RE & 1 (Loc. 137). Scale in cm.

Figure 61: Poorly-preserved, ferruginised moulds of transported woody plant material within channel breccio-conglomerates of the Moordenaars Member on Yzervarkspoort Farm 139/RE & 1 (Loc. 133). Scale in cm and mm.

Figure 62: Poorly-preserved plant stem axis (*c*. 4.5 cm wide) with vague preservation of radiating to recurved, narrow, strap-like leaves – possibly a lycopod like *Cyclodendron,* wacke block of the Poortjie Member on Farm 273 (Loc. 168).

Figure 63: Compressions of plant stem axes, or possibly roots, up to *c*. 1 cm wide, within grey-green wackes at Loc. 168, Farm 273.

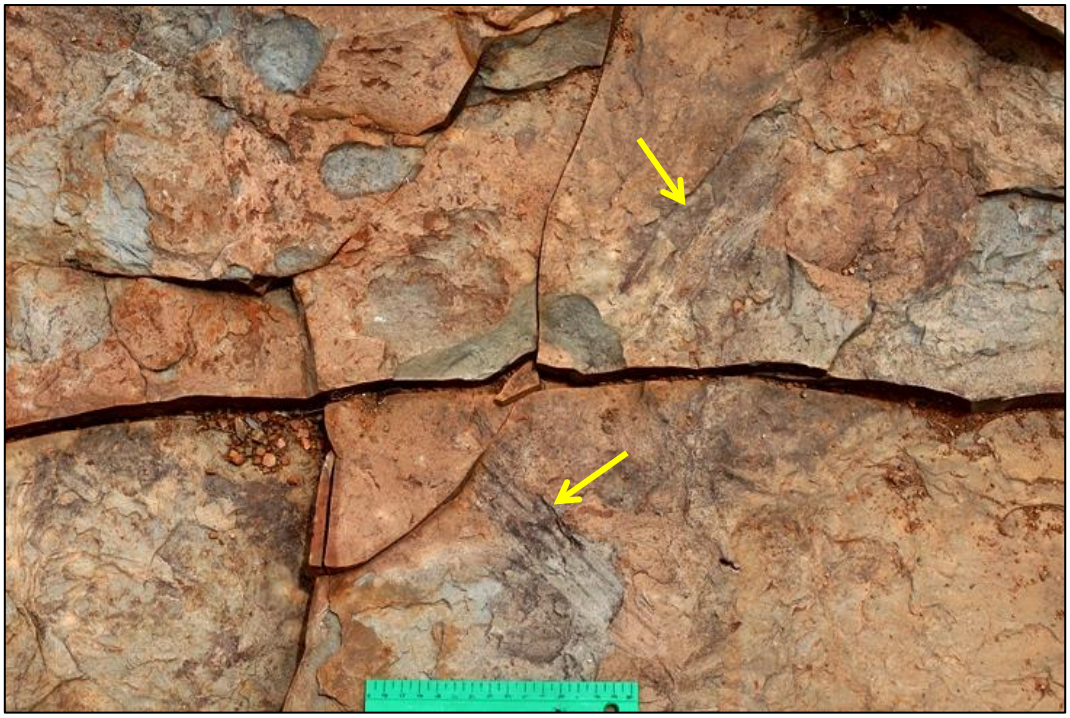

Figure 64: Transported debris of sphenophyte ferns (arrowed) within greyish wackes of the Poortjie Member on Farm 273 (Loc. 168). Scale in cm. See Figure 28 for context.

7. Palaeontological heritage site sensitivity verification

Provisional sensitivity mapping using the DFFE Screening Tool (Figures 65 and 66) as well as the SAHRIS palaeosensitivity map (SAHRIS Website) suggests that most of the combined Loxton WEF Cluster project area is of **Very High Palaeosensitivity**, primarily based on the presence here of potentially fossiliferous Lower Beaufort Group bedrocks. Thick alluvial deposits are assigned a **Medium Sensitivity** while dolerite intrusions are **Insensitive** (*i.e.* unfossiliferous). Based on (1) recent experience with WEF projects in the broader region (notably the Victoria West WEF Cluster immediately to the east), (2) desktop analysis of vertebrate fossil sites in the Main Karoo Basin, as well as the recent eight-day palaeontological heritage of the Loxton WEF Cluster project area, this preliminary palaeosensitivity mapping is critically re-assessed in this report.

Fossil site maps for the region between Loxton and Victoria West (*e.g.* Nicolas 2007; Figure 47 herein) show a paucity of sites within the Loxton WEF Cluster project area. This cannot be attributed simply to the lack of palaeontological fieldwork in the area, however. Recent palaeontological field surveying shows that:

(1) Levels of Beaufort Group bedrock exposure are very limited here due to pervasive cover by Late Caenozoic superficial sediments (*e.g.* colluvial and eluvial gravels, alluvial soils);

(2) Intensive intrusion by dolerite sills and dykes has altered the sedimentary country rocks through thermal metamorphism and hydrothermal activity (*viz*. circulation of hot, mineralizing ground waters) which has compromised fossil preservation over large areas;

(3) The Beaufort Group bedrocks represented here (uppermost Abrahamskraal Formation – Poortjie Member interval) span the catastrophic end-Middle Permian Extinction Event which is associated with an unusually low abundance of well-preserved fossil remains. Over the course of eight days, only a handful of fossil sites were recorded within Beaufort Group bedrocks underlying the WEF Cluster project area, the majority of which are poorly preserved and of limited scientific or conservation significance. Even occasional small areas showing excellent, fresh (*i.e.* unweathered) mudrock exposure ideal for palaeontological recording yielded hardly any fossils. Almost no fossil sites were recorded within the Late Caenozoic superficial deposits.

While additional, unrecorded fossil sites of high palaeontological and conservation value are likely to occur at and beneath the land surface within the Loxton WEF Cluster project areas, they are probably very sparse and sporadic in distribution and can be effectively handled in the Construction Phase through a Chance Fossil Finds Protocol (See Appendix 1). All the recorded sites can, if necessary, be effectively mitigated in the preconstruction phase.

It is concluded that the palaeosensitivity of the combined Loxton WEF Cluster project area is, in practice, LOW. The provisional palaeosensitivity mapping by the DFFE Screening Tool is accordingly *contested* in this report.

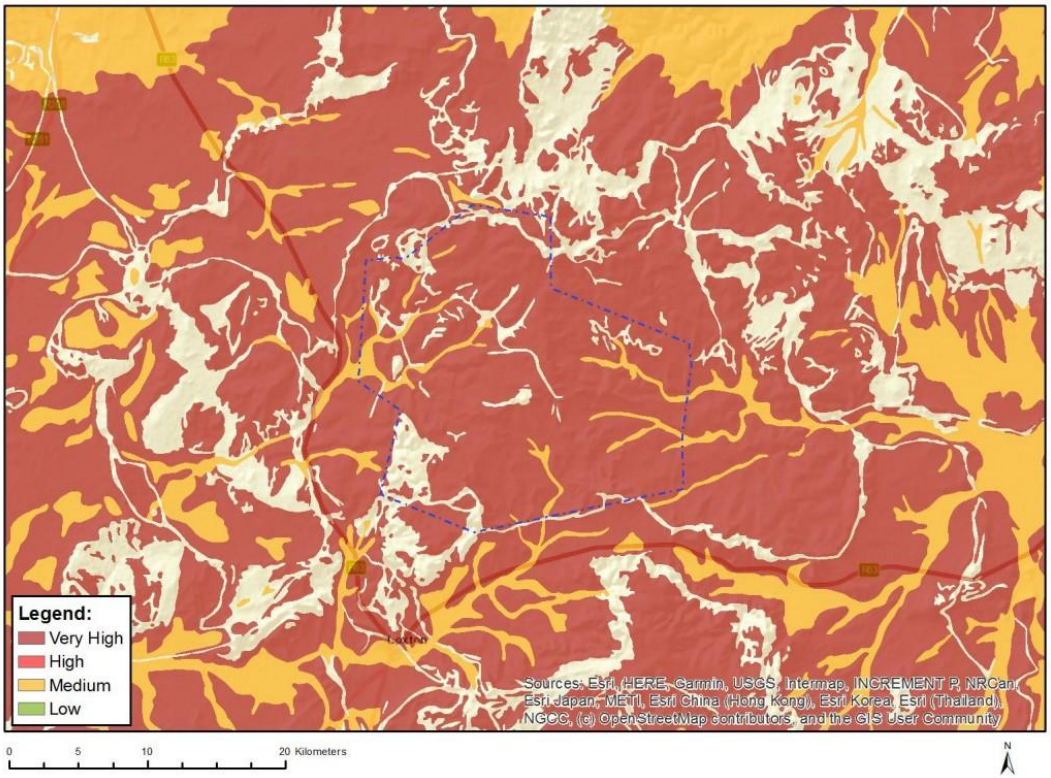

Figure 65: Provisional palaeosensitivity mapping of the northern sector of the Loxton WEF Cluster project area using the DFFE Screening Tool. The Very High sensitivity of most of the project area is *contested* in this report.

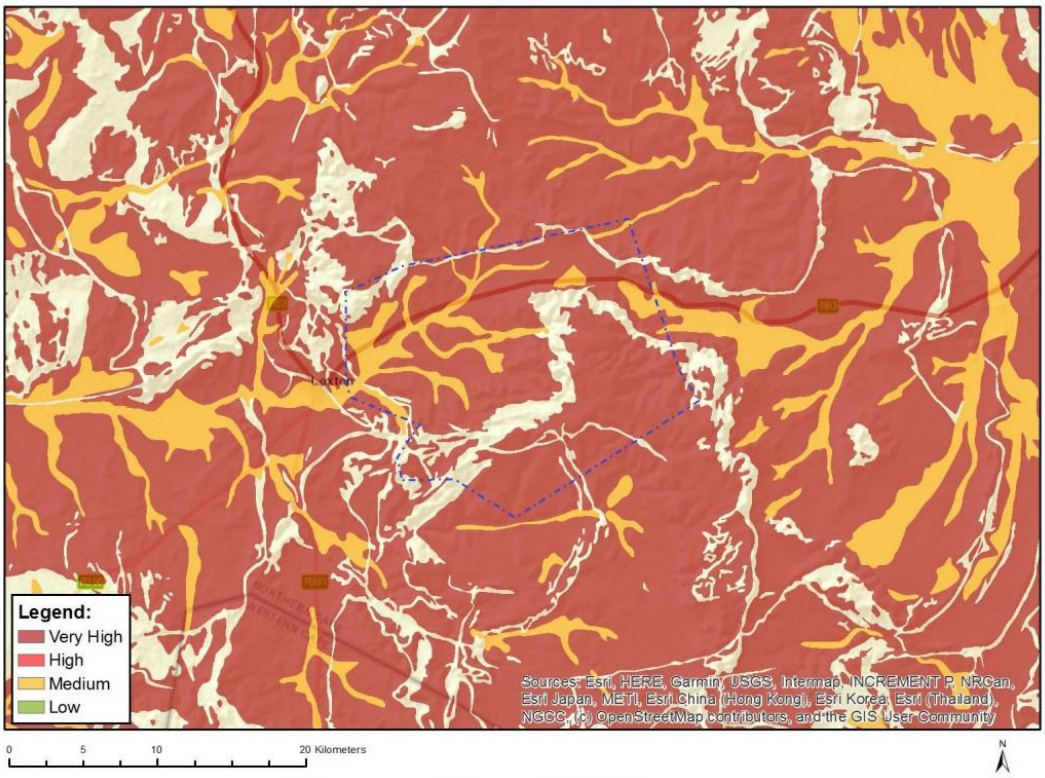

Figure 66: Provisional palaeosensitivity mapping of the southern sector of the Loxton WEF Cluster project area using the DFFE Screening Tool. The Very High sensitivity of most of the project area *contested* in this report.

8. Potential impacts on palaeontological heritage and mitigation

The proposed Loxton WEF Cluster projects will involve substantial surface clearance and bedrock excavations - for example for wind turbine foundations, access road networks, underground cables, construction laydown areas/camps, operation & maintenance buildings, on-site substations and electrical pylon footings - which may disturb, damage or destroy legally projected palaeontological heritage resources of scientific and conservation value.

Very few of the new fossil sites recorded within the Loxton WEF 3 project area are of significant scientific or conservation value (Appendix 1). None of the fossil sites lies within or close to (< 20 m) of the proposed WEF footprint and no known significant or unique palaeontological heritage sites are threatened by the proposed development.

Despite the substantial project footprints as well as the known occurrence of important vertebrate and other fossil sites elsewhere in the wider region between Loxton and Victoria West, **the impact significance of the proposed renewable energy developments on local palaeontological heritage is anticipated to be LOW.** This is based on the inferred Low Palaeosensitivity of the project area overall based on desktop and field-based data, as motivated above. These impacts, including cumulative impacts considering other renewable energy projects in the broader region (*e.g.* Victoria West WEF Cluster), are expected to fall within acceptable limits.

The potential for unrecorded palaeontological sites of scientific and conservation value cannot be completely excluded, however. These are best mitigated through the application of a Chance Fossil Finds Protocol by the ECO / ESO during the Construction Phase (See Appendix 2) which should be incorporated into the EMPrs for the WEF developments. The qualified palaeontologist responsible for mitigation work will need to apply for a Fossil Collection Permit for the Northern Cape from SAHRA. Minimum standards for PIA reports have been compiled by Heritage Western Cape (2021) and SAHRA (2013).

9. Conclusions and recommendations

Historical palaeontological site mapping for the region between Loxton and Victoria West reveals a paucity of recorded vertebrate fossil sites within the Loxton WEF Cluster project area. This is supported by recent palaeontological field surveying, both here and in neighbouring WEF project areas (e.g. Victoria West WEF Cluster studied by Almond 2023), which shows that:

(1) Levels of Beaufort Group bedrock exposure – especially the potentially most fossiliferous mudrock facies - are very limited here due to pervasive cover by Late Caenozoic superficial sediments;

(2) Intensive intrusion by dolerite sills and dykes has compromised fossil preservation over large areas;

(3) The Beaufort Group bedrocks represented here span the catastrophic end-Middle Permian Extinction Event which is associated with an unusually low abundance of well-preserved fossil remains. Over the course of eight days, only a handful of fossil sites were recorded within the entire WEF Cluster project area, the majority of which are poorly preserved and of limited scientific or conservation significance. Even occasional small areas showing excellent, fresh mudrock exposure ideal for palaeontological recording yielded hardly any fossils. Almost no fossil sites were recorded within the Late Caenozoic superficial deposits.

Very few of the very small number of new fossil sites recorded within the Loxton WEF 3 project area are of significant scientific or conservation value and no mitigation is recommended here

with regard to these known sites (Appendix 1). No known significant or unique palaeontological heritage sites are threatened by the proposed WEF development.

While additional, unrecorded fossil sites of high palaeontological and conservation value are likely to occur at and beneath the land surface within the Loxton WEF Cluster project areas, they are probably very sparse and sporadic in distribution and can be effectively handled in the Construction Phase through a Chance Fossil Finds Protocol (See Appendix 2) which should be incorporated into the Environmental Management Programmes for the Loxton Cluster WEF developments. All the recorded sites can, if necessary, be effectively mitigated in the preconstruction phase.

It is concluded that the palaeosensitivity of the combined Loxton WEF Cluster project area is, in practice, LOW. The provisional palaeosensitivity mapping by the DFFE Screening Tool is accordingly *contested* in this report.

Despite the substantial WEF project footprints as well as the known occurrence of important vertebrate and other fossil sites elsewhere in the wider region between Loxton and Victoria West, **the impact significance of the proposed renewable energy developments on local palaeontological heritage is anticipated to be LOW.** These impacts, including cumulative impacts considering other renewable energy projects in the broader region (*e.g.* the adjoining Victoria West WEF Cluster), are expected to fall within acceptable limits. **There are therefore no objections on palaeontological heritage grounds to authorisation of the Loxton WEF Cluster developments, including the Loxton WEF 3 project considered in this report.**

The potential for unrecorded palaeontological sites of scientific and conservation value cannot be completely excluded. These are best mitigated through the application of a Chance Fossil Finds Protocol by the ECO / ESO during the Construction Phase (See Appendix 2). The qualified palaeontologist responsible for mitigation work will need to apply for a Fossil Collection Permit for the Northern Cape from SAHRA. Minimum standards for PIA reports have been compiled by Heritage Western Cape (2021) and SAHRA (2013).

10. Acknowledgements

The Project Applicant is thanked for commissioning this palaeontological heritage study and for supplying the necessary project information. I am grateful to the landowner of the Farm Saaidam for facilitating the fieldwork as well as to Ms Madelon Tusenius of *Natura Viva* cc for logistical support, palaeontological input and companionship in the field.

11. Key references

ALMOND, J.E. & PETHER, J. 2008. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.

ALMOND, J.E. 2015. Proposed Noblesfontein 3 Wind Energy Facility near Three Sisters, Central Karoo District, Western Cape. Palaeontological specialist assessment: desktop study, 26 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2020a. Proposed Redcap Nuweveld North Wind Farm, Beaufort West Local Municipality, Central Karoo District Municipality, Western Cape. Palaeontological heritage assessment: combined desktop and field-based palaeontological report, 113 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2020b. Proposed Redcap Nuweveld East Wind Farm, Beaufort West Local Municipality, Central Karoo District Municipality, Western Cape. Palaeontological heritage assessment: combined desktop and field-based palaeontological report, 114 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2020c. Proposed Redcap Nuweveld West Wind Farm, Beaufort West Local Municipality, Central Karoo District Municipality, Western Cape. Palaeontological heritage assessment: combined desktop and field-based palaeontological report, 115 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2020d. Grid connection for the proposed Redcap Nuweveld Wind Farms, Beaufort West Local Municipality, Central Karoo District Municipality, Western Cape. Palaeontological heritage assessment: desktop and field-based palaeontological report, 95 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2021. Proposed Modderfontein Wind Energy Facility near Victoria West, Central Karoo and Pixley Ka-Seme Districts, Western Cape & Northern Cape Provinces. Palaeontological specialist assessment: combined desktop and field-based study, 68 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2022a. Northern Cluster: Hoogland 1 Wind Farm, Hoogland 2 Wind Farm and associated Hoogland Northern Grid Connection, Western Cape Province. Combined desktop and field-based palaeontological heritage assessment, 120 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2022b. Proposed Gamma 400 kV Gridline Project. Palaeontological Heritage, 76 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2023. Victoria West Renewable Energy Cluster, Ubuntu Local Municipality (Pixley ka Seme District Municipality), Northern Cape Province, RSA. Palaeontological Heritage: Combined Desktop and Field-based Assessment, 95 pp. Natura Viva cc, Cape Town.

ANDERSON, J.M. & ANDERSON, H.M. 1985. Palaeoflora of southern Africa. Prodromus of South African megafloras, Devonian to Lower Cretaceous, 423 pp. Botanical Research Institute, Pretoria & Balkema, Rotterdam.

CHEVALLIER, L. & WOODFORD, A. 1999. Morpho-tectonics and mechanism of emplacement of the dolerite rings and sills of the western Karoo, South Africa. South African Journal of Geology 102, 43-54.

DAY, M.O., RAMEZANI, J., BOWRING, S.A., SADLER, P.M., ERWIN, D.H., ABDALA, F. & RUBIDGE, B.S. 2015. When and how did the terrestrial mid-Permian mass extinction occur? Evidence from the tetrapod record of the Karoo Basin, South Africa. Proc. R. Soc. B 282: 20150834. http://dx.doi.org/10.1098/rspb.2015.0834

DAY, M.O. & RUBIDGE, B.S. 2020a. Biesiespoort revisted: a case study on the relationship between tetrapod assemblage zones and Beaufort lithostratigraphy south of Victoria West. Palaeontologia Africana 53, 51-65.

DAY, M.O. & RUBIDGE, B.S.. 2020b. Biostratigraphy of the *Tapinocephalus* Assemblage Zone (Beaufort Group, Karoo Supergroup), South Africa. South African Journal of Geology 123, 149 - 164.

DAY, M.O. & SMITH, R.M.S. 2020. Biostratigraphy of the *Endothiodon* Assemblage Zone (Beaufort Group, Karoo Supergroup), South Africa. South African Journal of Geology 123, 164 - 180.

DUNCAN & MARSH 2006. The Karoo Igneous Province. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 501-520. Geological Society of South Africa, Marshalltown.

HERITAGE WESTERN CAPE 2021. Guide for minimum standards for archaeology and palaeontology reports submitted to Heritage Western Cape - June 2021, 6 pp.

JOHNSON, M.R., VAN VUUREN, C.J., VISSER, J.N.J., COLE, D.I., WICKENS, H. DE V., CHRISTIE, A.D.M., ROBERTS, D.L. & BRANDL, G. 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson. M.R., Anhaeusser, C.R. & Thomas, R.J. (eds.) The geology of South Africa, pp. 461-499. Geological Society of South Africa, Johannesburg & the Council for Geoscience, Pretoria.

KEYSER, A.W. & SMITH, R.M.H. 1977-78. Vertebrate biozonation of the Beaufort Group with special reference to the Western Karoo Basin. Annals of the Geological Survey of South Africa 12: 1-36.

KITCHING, J.W. 1977. The distribution of the Karroo vertebrate fauna, with special reference to certain genera and the bearing of this distribution on the zoning of the Beaufort beds. Memoirs of the Bernard Price Institute for Palaeontological Research, University of the Witwatersrand, No. 1, 133 pp (incl. 15 pls).

LE ROUX, F.G. & KEYSER, A.W. 1988. Die geologie van die gebied Victoria-Wes. Explanation to 1: 250 000 geology Sheet 3122, 31 pp. Council for Geoscience, Pretoria.

MARCHETTI, L., KLEIN, H., BUCHWITZ, M., RONCHI, A., SMITH, R.M. & DE KLERK, W.J. 2019. Permian-Triassic vertebrate footprints from South Africa: Ichnotaxonomy, producers and biostratigraphy through two major faunal crises. Gondwana Research 72, 139-168.

NICOLAS, M.V. 2007. Tetrapod diversity through the Permo-Triassic Beaufort Group (Karoo Supergroup) of South Africa. Unpublished PhD thesis, University of Witwatersrand, Johannesburg.

RETALLACK, G.J., METZGER, C.A., GREAVER, T., HOPE JAHREN, A., SMITH, R.M.H. & SHELDON, N.D. 2006. Middle – Late Permian mass extinction on land. GSA Bulletin 118, 1398-1411.

ROSSOUW, L. 2019. Exemption from further Heritage Impact Assessment: Rectification in terms of Section 24G for Residential Development in Loxton, Northern Cape Province, 11pp. Palaeo Field Services, Langenhoven Park.

RUBIDGE, B.S. (Ed.) 1995. Biostratigraphy of the Beaufort Group (Karoo Supergroup). South African Committee for Biostratigraphy, Biostratigraphic Series No. 1., 46 pp. Council for Geoscience, Pretoria.

RUBIDGE, B.S. 2005. Re-uniting lost continents – fossil reptiles from the ancient Karoo and their wanderlust. 27th Du Toit Memorial Lecture. South African Journal of Geology 108, 135-172.

SAHRA 2013. Minimum standards: palaeontological component of heritage impact assessment reports, 15 pp. South African Heritage Resources Agency, Cape Town.

SMITH, R.M.H. 1993. Vertebrate taphonomy of Late Permian floodplain deposits in the southwestern Karoo Basin of South Africa. Palaios 8, 45-67.

SMITH, R., RUBIDGE, B. & VAN DER WALT, M. 2012. Therapsid biodiversity patterns and paleoenvironments of the Karoo Basin, South Africa. Chapter 2 pp. 30-62 in Chinsamy-Turan, A. (Ed.) Forerunners of mammals. Radiation, histology, biology. xv + 330 pp. Indiana University Press, Bloomington & Indianapolis.

SMITH, R. M. H., RUBIDGE, B. S., DAY, M. O., & BOTHA, J. 2020. Introduction to the tetrapod biozonation of the Karoo Supergroup. South African Journal of Geology 123(2), 131–140. doi:10.25131/sajg.123.0009

VAN DER WALT, M., DAY, M., RUBIDGE, B., COOPER, A.K. & NETTERBERG, I. 2010. A new GIS-based biozone map of the Beaufort Group (Karoo Supergroup), South Africa. Palaeontologia Africana 45, 1-5.

12. Outline of specialist's experience

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and the University of Tübingen in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa and Madagascar. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out numerous palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest Province, Mpumalanga, Gauteng, KwaZulu-Natal and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Dr John E. Almond
Palaeontologist
***Natura Viva* cc**

APPENDIX 1: LOXTON WEF 3 – NEW FOSSIL SITE DATA (October 2022)

All GPS readings were taken in the field using a hand-held Garmin GPSmap 64s instrument. The datum used is WGS 84.

See Figures A1.1 and A1.2 below for satellite maps showing the distribution of new fossil localities in relation to the proposed WEF infrastructure layouts.

Please note that:

- Locality data for South African fossil sites in *not* for public release, due to conservation concerns.
- The table does *not* represent all potential fossil sites within the WEF project area but only those sites recorded during the site visits. The absence of recorded fossil sites in any area therefore does *not* mean that no fossils are present there.
- The detailed stratigraphic data for each site is provisional (based in part on the published CGS 1: 250 000 geology sheet which requires revision) and has yet to be confirmed.

LOXTON WEF 3		
113	-31.468630° 22.469385°	Yzervarkspoort Farm 139/RE & 1 Thin crevasse-splay sandstone within the Karelskraal Member. Sole surfaces showing string-like horizontal *Scoyenia* burrows attributed to infaunal invertebrates such as arthropods (*e.g.* insects). Proposed Field Rating IIIB. No recommended mitigation.
118	-31.474480° 22.466342°	Yzervarkspoort Farm 139/RE & 1 Stream bed exposure of the Karelskraal Member. Possible but *equivocal* trackways of one or more large-bodied tetrapods (perhaps dinocephalians). Proposed Field Rating IIIB. No recommended mitigation.
119	-31.473227° 22.469915°	Yzervarkspoort Farm 139/RE & 1. Sole surface of crevasse splay sandstone blocks within the Karelskraal Member. Range of trace fossils ascribed to aquatic temnospondyl amphibians (probably rhinesuchids) which were impressed into bottom muds of a shallow water body (*e.g.* playa lake) which also featured microbial mats (MISS) and infaunal burrowing invertebrates. Proposed Field Rating IIIB. No recommended mitigation
120	-31.473045° 22.470093°	
121	-31.473026° 22.470211°	
125	-31.467109° 22.491652°	Yzervarkspoort Farm 139/RE & 1 Stream bed exposure of mudrocks of the lower Poortjie Member. Possible but *equivocal* baked sandstone casts of tetrapod burrows (*c*. 40 cm across). Proposed Field Rating IIIC. No recommended mitigation.
133	-31.425807° 22.471422°	Yzervarkspoort Farm 139/RE & 1 Channel breccio-conglomerates of the Moordenaars Member. Poorly-preserved, ferruginised moulds of transported woody plant material. Proposed Field Rating IIIC. No recommended mitigation.
134	-31.426078° 22.471019°	Yzervarkspoort Farm 139/RE & 1 Moordenaars Member channel wacke. Poorly-preserved moulds of woody plant axes. Proposed Field Rating IIIC. No recommended mitigation.
135	-31.427931° 22.468638°	
136	-31.429087° 22.464217°	Yzervarkspoort Farm 139/RE & 1 Upper Abrahamskraal Formation (probably Moordenaars Member). Small block (*c*. 1cm thick x 5 cm wide) of reworked, robust tetrapod bone embedded within a ferruginised channel breccio-conglomerate. Proposed Field Rating IIIC. No recommended mitigation.
137	-31.439507° 22.477481°	Yzervarkspoort Farm 139/RE & 1 Greyish wackes within the Karelskraal Member.

		Rounded stem casts of reedy plant stems as well as vague horizontal burrows of the *Scoyenia* Ichnofacies. Proposed Field Rating IIIC. No recommended mitigation.
138	-31.439633° 22.477907°	Yzervarkspoort Farm 139/RE & 1. Karelskraal Member. Possible but *equivocal* finger prods of a temnospondyl amphibian on wacke sole surface. Proposed Field Rating IIIC. No recommended mitigation.
146	-31.462409° 22.553181°	Farm 262 Upper Abrahamskraal Formation. Streambed exposure of baked mudrocks with pale pedogenic calcrete concretions containing disarticulated fragments of whitish baked bone. Proposed Field Rating IIIC. No recommended mitigation.
148	-31.471412° 22.555173°	Farm 262 Heterolithic package of tabular sandstones and dark grey mudrocks within the upper Abrahamskraal Formation exposed in a stream bank along the upper reaches of the Bitterwaterspruit Valley north of Boobejaankrans. Network of linear, branching channel-like features incising baked, wave ripple-topped wackes and with a superficial resemblance to tetrapod burrows – probably generated by circulating hot fluids during dolerite intrusion. Proposed Field Rating IIIC. No recommended mitigation.
149	-31.471449° 22.555338°	
153	-31.483970° 22.552831°	Farm 273 Streambed exposure of finely-jointed wackes, possibly within the upper Abrahamskraal Formation. Possible but *equivocal* trackways of a large-bodied tetrapod (*cf Brontopus*, attributed to dinocephalian therapsids). Proposed Field Rating IIIB. No recommended mitigation.
162	-31.483476° 22.572825°	Farm 273 Lower Poortjie Member Several dispersed small bones within baked channel wackes including delicate, toothed bony structure *c*. 5 cm long that is probably the branchial (gill) arch of a bony fish with long, tooth-like gill rakers. Proposed Field Rating IIIB. No recommended mitigation.
163	-31.482976° 22.572938°	Farm 273 Stream bed exposure of baked wackes of the Poortjie Member. Possible but *equivocal* tracks of a large-bodied tetrapod. Proposed Field Rating IIIC. No recommended mitigation.
167	-31.485210° 22.571831°	Farm 273. Crevasse splay wacke blocks of the Poortjie Member. Poorly-preserved plant stem axis (*c*. 4.5 cm wide) with vague preservation of radiating to recurved, narrow, strap-like leaves – possibly a lycopod like *Cyclodendron,* as well as possible plant root traces, reworked sphenophyte stem debris. Proposed Field Rating IIIB. No recommended mitigation.
168	-31.485245° 22.572026°	
169	-31.484700° 22.572044°	Farm 273. Stream bed exposure of baked wackes of the Poortjie Member (or possibly upper Abrahamskraal Fm). Possible but *equivocal* tracks of a large-bodied tetrapod. Proposed Field Rating IIIC. No recommended mitigation.

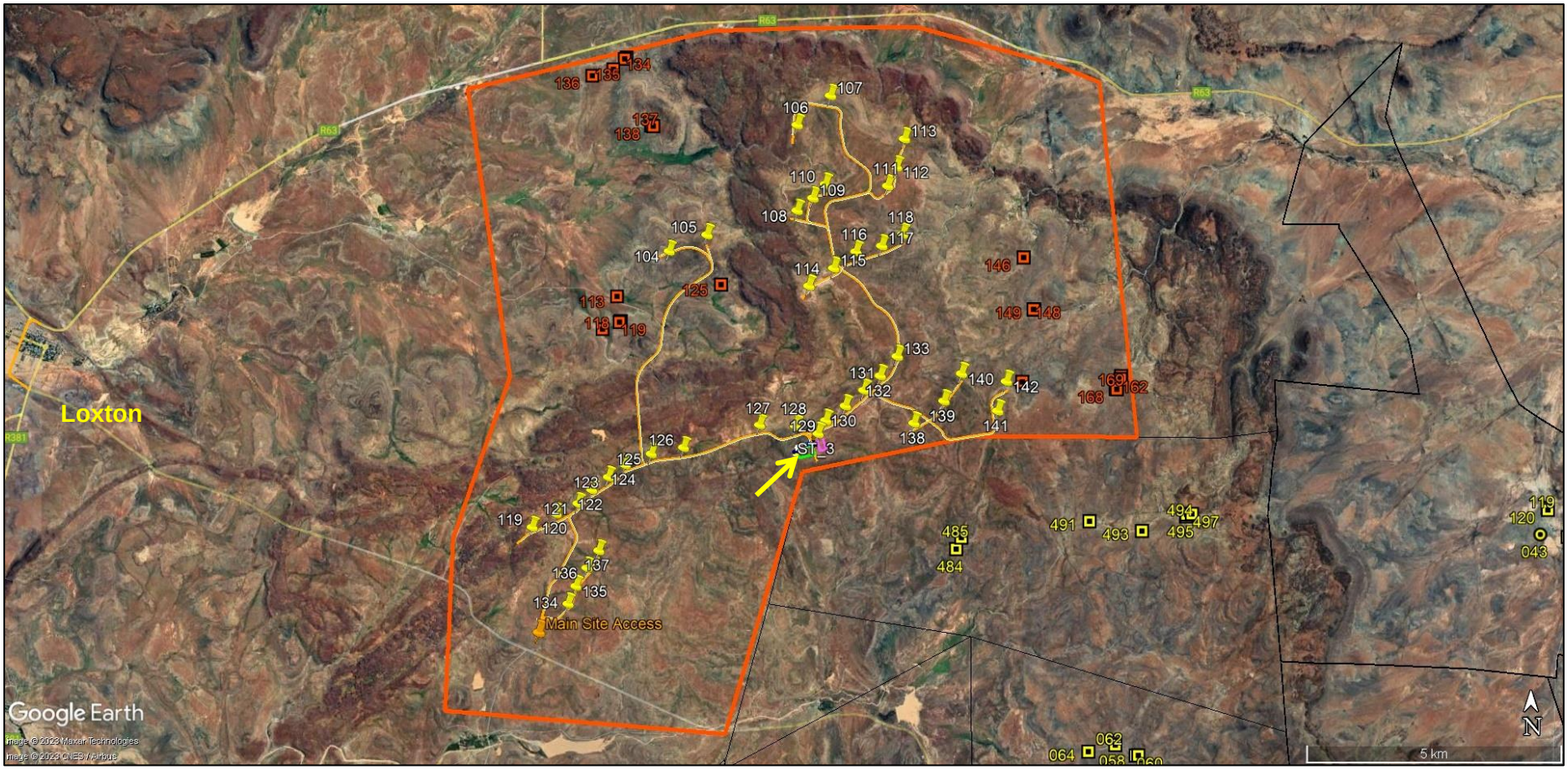

Figure A1.1: Google Earth© satellite image of the Upper Karoo region east of Loxton, Northern Cape showing the Loxton WEF 3 project area (orange polygon) and fossil sites (numbered orange squares) in relation to the provisional WEF layout (numbered yellow pins = wind turbine locations; pale orange lines = access road network; arrowed cluster of rectangles = laydown area, O&M building, on-site substation, BESS *etc*). Very few of the recorded fossil sites are of significant scientific or conservation value (see table above). None of the known sites lies within or close to (< 20m) the WEF project footprint and no mitigation is recommended here with regard to any of these sites. The sparseness of recorded fossil sites indicates that the WEF project area is of LOW palaeosensitivity overall.

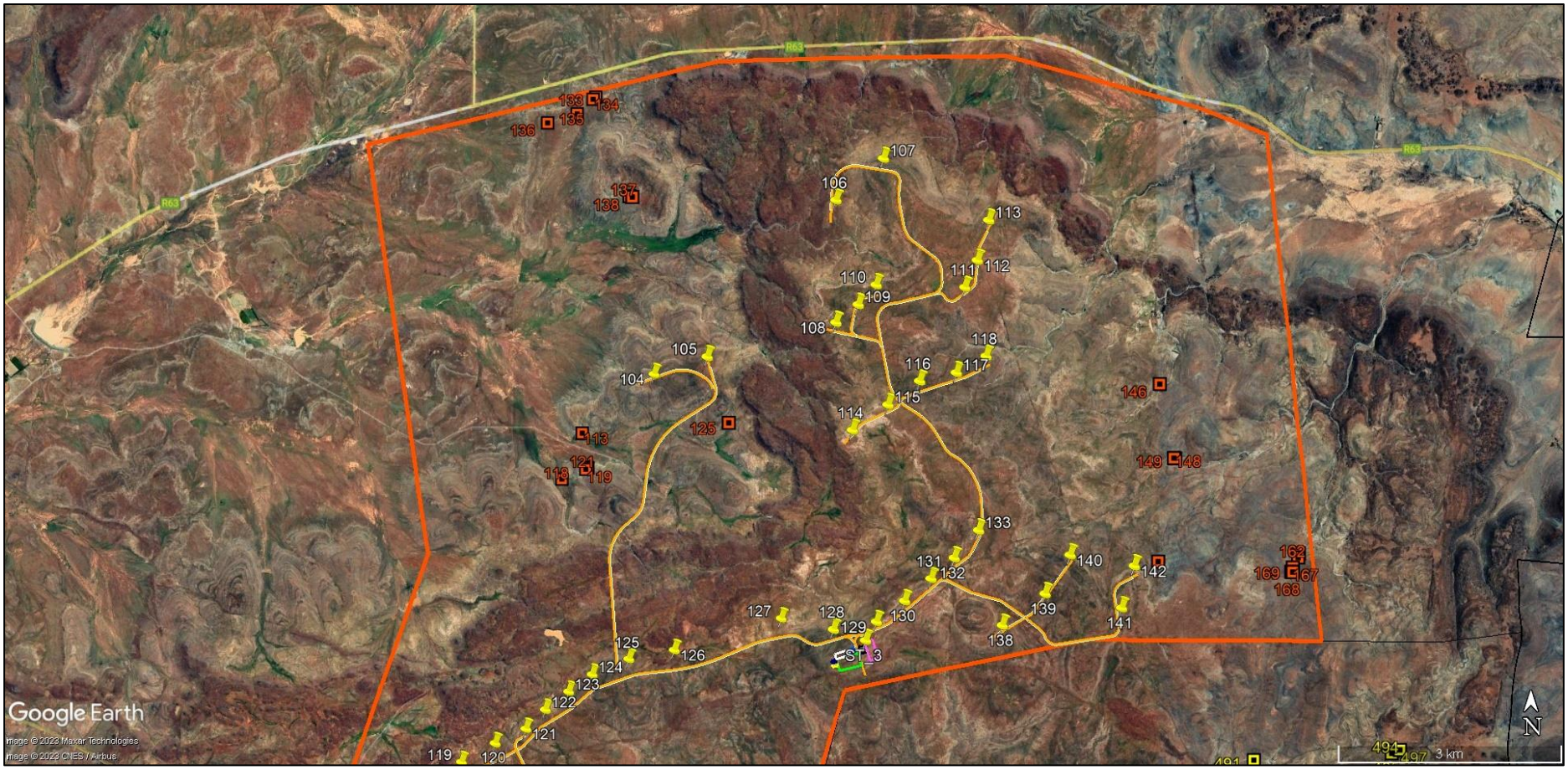

Figure A1.2: Google Earth© satellite image of the northern sector of the Loxton WEF 3 project area (orange polygon) showing in more detail the location of known fossil sites in relation to the proposed WEF infrastructure layout.

<table>
<tr><th colspan="3">APPENDIX 2 - CHANCE FOSSIL FINDS PROCEDURE: Loxton WEF Cluster near Loxton, Northern Cape Province</th></tr>
<tr><td>Province & region:</td><td colspan="2">Northern Cape (Pixley Ka-Seme District, Ubuntu Local Municipality)</td></tr>
<tr><td>Responsible Heritage Management Agencies</td><td colspan="2">SAHRA for N. Cape: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Abrahamskraal Formation and Teekloof Formation (Lower Beaufort Group), Late Caenozoic alluvium.</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Fossil skulls, postcrania of tetrapods, amphibians, fish as well as rare petrified wood, vertebrate and invertebrate burrows within bedrocks. Mammalian bones, teeth & horn cores, freshwater molluscs, calcretised trace fossils & rhizoliths and plant material in alluvium.</td></tr>
<tr><td rowspan="5">ECO / ESO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
Context – describe position of fossils within stratigraphy (rock layering), depth below surface
Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
Photograph fossils against a plain, level background, with scale
Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Apply for Fossil Collection Permit Record / submit Work Plan to the relevant Heritage Resources Agency. Describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.</td></tr>
</table>

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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

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

PROJECT TITLE

PROPOSED LOXTON CLUSTER WEF, NORTHERN CAPE PROVINCE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Project Specialist:	Dr John Edward Almond		
Trading name (if any):	Natura Viva cc		
Business reg. no./ID. no.:	5905275218183		
Contact person:	As above		
Physical address:	76 Breda Park, Breda Street, Oranjezicht, CAPE TOWN		
Postal address:	As above		
Postal code:	8001	**Cell:**	071 947 0577
Telephone:	021 462 3622	**Fax:**	n/a
E-mail:	naturaviva@universe.co.za		
Qualifications:	PhD (palaeontology) University of Cambridge, UK		
Professional affiliation (s) (if any)	Palaeontological Society of Southern Africa Association of Professional Heritage Practitioners (Western Cape)		

2. DECLARATION BY THE SPECIALIST

I, **Dr John Edward Almond**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

John E Almond

Signature of the Specialist

NATURA VIVA CC

Name of Company

19 April 2023

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, **Dr John Edward Almond**, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

John E Almond

Signature of the Specialist

NATURA VIVA CC

Name of Company

19 April 2023

Date

Signature of the Commissioner of Oaths

SOUTH AFRICAN POLICE SERVICE
STATION COMMANDER
CAPE TOWN
19 APR 2023
CAPE TOWN
STATION COMMANDER
SOUTH AFRICAN POLICE SERVICE

Date 2023-04-19