SITE SENSITIVITY VERIFICATION REPORT (IN TERMS OF PART A OF THE ASSESSMENT PROTOCOLS PUBLISHED IN GN 320 ON 20 MARCH 2020)

PROPOSED DEVELOPMENT OF THE LOWER COERNEY BALANCING DAM ON PORTION 7 OF THE FARM SCHEEPERSVLAKTE NO. 98, FARM 713 AND FARM ENON MISSION 574 (REMAINING EXTENT OF FARM 40) NEAR ADDO, SUNDAYS RIVER VALLEY MUNICIPALITY, EASTERN CAPE PROVINCE.

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EXECUTIVE SUMMARY

The Department of Water and Sanitation, Pretoria, RSA is proposing to develop the Lower Coerney Balancing Dam on a site situated *c*. 12 km NW of Addo and *c*. 17 km ESE of Kirkwood in the Sundays River Valley Municipality of the Eastern Cape Province. The dam project area is underlain at depth by potentially fossiliferous continental and marine shelf sediments of the Cretaceous Uitenhage Group (Sundays River Formation and possibly also Kirkwood Formation). DFFE site sensitivity mapping suggests that the project area is of Very High Palaeosensitivity. A one-day site visit, backed-up by a previous combined desktop and field-based palaeontological heritage report for Farm Scheepers Vlakte 98 by Almond (2018), shows that Cretaceous bedrocks within or close to the new dam project area are very poorly exposed. Within the dam basin they are largely buried beneath thick sandy to gravelly alluvium of probable Quaternary to Recent age. The only fossils recorded here are sparse, poorly-preserved moulds and petrified blocks of fossil wood of low scientific and conservation value, while occasional subfossil land snail shells are found within the overlying mantle of Late Caenozoic alluvium. It is concluded that the project area is of LOW PALAEOSENSETIVITY overall and the original DFFE sensitivity mapping is therefore *contested*.

Anticipated impacts on local fossil heritage resources of scientific and conservation value due to the proposed dam development are likely to be of low significance and there are no objections on palaeontological heritage grounds to the proposed dam development. The potential for impacts on rare, largely unpredictable fossil sites (*e.g.* mammalian bones, teeth, horncores, non-marine molluscs, calcretised termitaria) of High Palaeosensitivity associated with older alluvial deposits hidden in the subsurface cannot be entirely discounted. If any fossiliferous deposits are exposed by surface clearance or excavations during the construction phase of the development, the Chance Fossils Finds Protocol outlined in Appendix 3 to this report should be fully implemented. These recommendations should be included within the EMPr for the Lower Coerney Balancing Dam.

Pending the discovery of significant new fossil finds before or during construction, no further specialist palaeontological studies, monitoring or mitigation are recommended for this project.

1. INTRODUCTION & PROJECT OUTLINE

The Department of Water and Sanitation, Pretoria, RSA is proposing to develop the Lower Coerney Balancing Dam on a site spanning Portion 7 of the Farm Scheepersvlakte No. 98, Farm 713 and Farm Enon Mission 574 (Remaining Extent of Farm 40), situated *c*. 12 km NW of Addo and *c*. 17 km ESE of Kirkwood in the Sundays River Valley Municipality of the Eastern Cape Province (Figs. 1 & 2). The approximate coordinates of the site are 33°26'29.77"S and 25°37'23.68"E. The proposed location of the Lower Coerney Balancing Dam is upstream of the Coerney Siphon outlet in a valley east of and adjacent to the existing Scheepersvlakte Dam. The site can be accessed from a gravel road which connects to the R336 approximately 4 km southwest of the site. There are currently no formal roads within the Scheepersvlakte farm. The footprint of the proposed Coerney Dam is approximately 77.1 hectares and a portion of this footprint overlaps with portions of the planned future development on Scheepersvlakte Farms for which a previous palaeontological heritage assessment study (PIA) has been submitted by Almond (2018).

According to the DFFE screening tool, the project area for the Lower Coerney Balancing Dam of Very High palaeosensitivity (Fig. 19). In accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, a combined field-based and desktop site sensitivity verification has therefore been undertaken in order to confirm or contest the environmental sensitivity of the proposed project area as identified by the DFFE National Web-Based Environmental Screening Tool.

The Independent Environmental Practitioner co-ordinating the various environmental impact assessment processes for the proposed development is GA Environment (Pty) Ltd, Midrand (Contact details: Mr Vukosi Glen Mabunda, GA Environment (Pty) Ltd., GladAfrica House, Hertford Office Park, 90 Bekker Road, Midrand, 1686, RSA. Tel: 27 11 312 2537/2584. Fax: +27 11 805 1950. E-mail: vukosim@gaenvironment.com).

2. DATA SOURCES

The palaeontological heritage site sensitivity verification report for the proposed Lower Coerney Balancing Dam near Addo is based on:

- A short project description, kmz file, DFFE screening report and other relevant background documentation provided by GA Environment (Pty) Ltd.

- A desktop review of (a) 1:50 000 scale topographic map (3325BC Barsheba) and the 1:250 000 scale topographic map (sheet 3324 Port Elizabeth), (b) Google Earth© satellite imagery, (c) published geological and palaeontological literature, including 1:250 000 geological map sheet 3324 Port Elizabeth and relevant sheet explanation (Toerien & Hill 1989), as well as (d) several previous desktop and field-based fossil heritage (PIA) assessments in the Kirkwood – Addo region by the author and colleagues, especially the recent combined desktop and field-based palaeontological study of the Remainder of Portion 7, Farm Scheepers Vlakte 98 by Almond (2018) as well as Almond (2019) covering an area shortly to the southwest (See also references therein).

- A one-day field survey of representative rock exposures within the broader dam project area by the author and an experienced field assistant on 28 January 2022. The season of the site visit did not have any marked influence on the observations made and conclusions reached in this study.

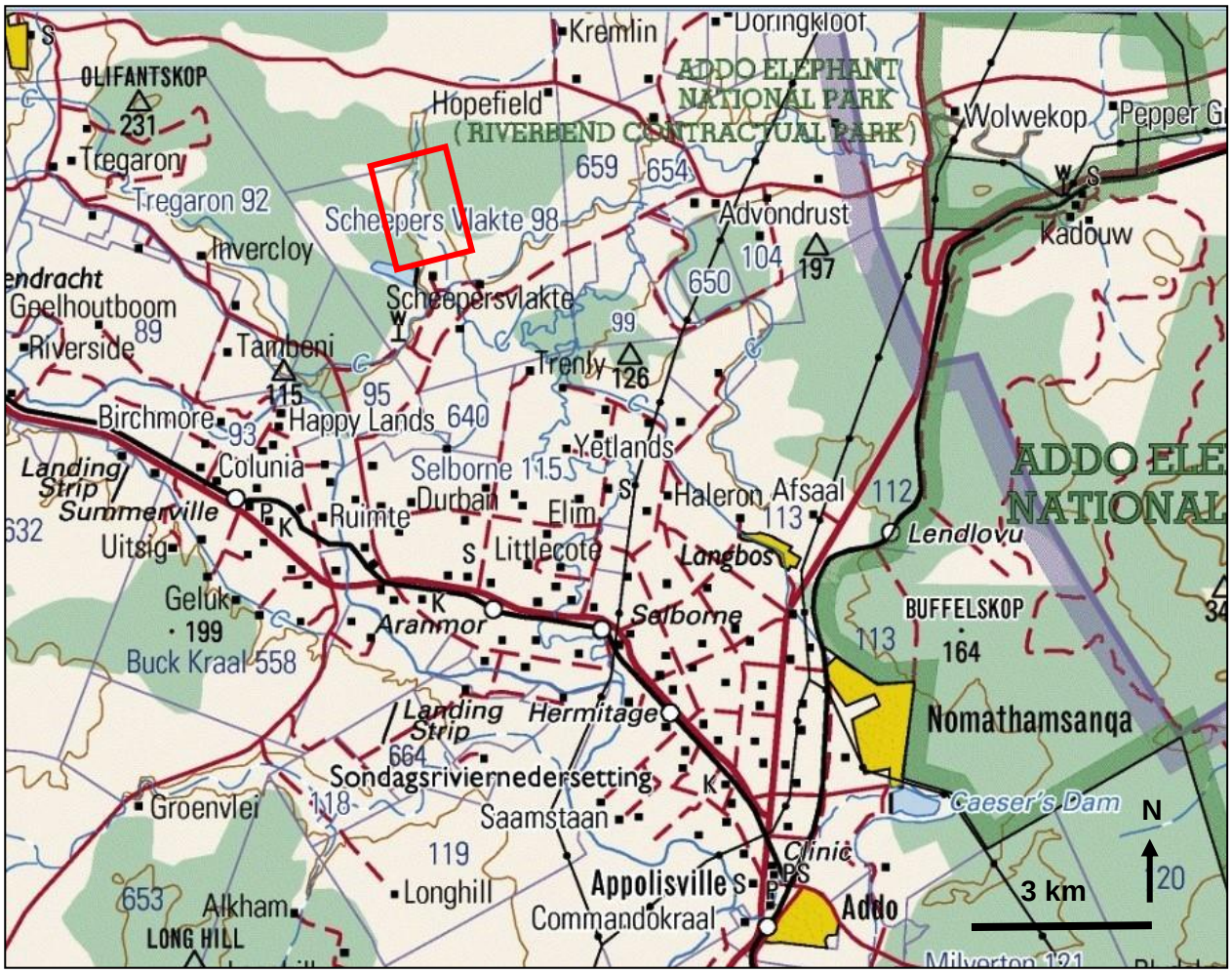

Figure 1: Extract from 1: 250 000 topographical sheet 3324 Port Elizabeth (courtesy of the Chief Directorate: National Geo-spatial Information, Mowbray) showing the approximate location (red rectangle) of the project area for the proposed Lower Coerney Balancing Dam on Portion 7 of the Farm Scheepersvlakte No. 98, Farm 713 and Farm Enon Mission 574 (Remaining Extent of Farm 40), situated *c.* 12 km NW of Addo and *c.* 17 km ESE in the Sundays River Valley Municipality of the Eastern Cape Province.

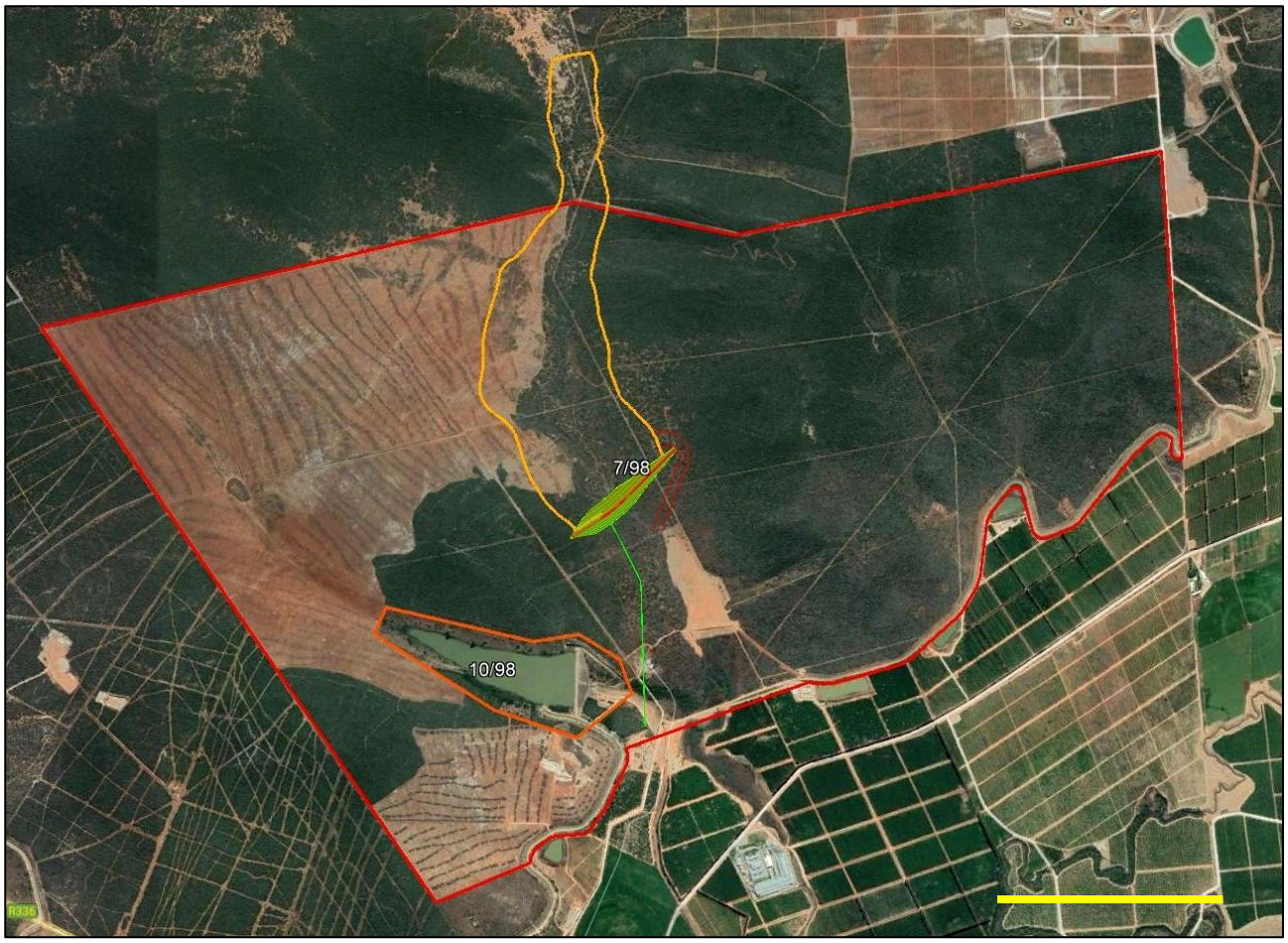

Figure 2: Google Earth© satellite image of the Lower Coerney Balancing Dam project area superimposed on the outline of Farm Scheepers Vlakte 7/98 near Addo (red polygon). The dam wall is shown in yellow-green, dam overflow channel in red, a gravity line to the Lower Coerney in pale green and the maximum reservoir extent in ochre. Most of the proposed reservoir area comprises dense, disturbed thicket and valley floor vegetation and ploughed agricultural lands with thick gravelly alluvial soils and very limited bedrock exposure in the immediate region. A further small new dam basin is visible in the same shallow valley, just to the south of the proposed new dam wall. The small area containing the existing Department of Water and Sanitation Scheepersvlakte Dam (orange polygon) belongs to a separate land portion. Scale bar = 1 km. N towards the top of the image.

3. GEOLOGICAL CONTEXT

The project area for the Lower Coerney Balancing Dam is situated in a shallow valley at *c*. 90-100m amsl. – a tributary valley of the Coerney River. This is flanked by low hilly terrain on the northern side of the Sundays River Valley, some 3.5 km NE of the course of the Sundays River itself. As well seen in satellite images (Fig. 2) and site photos (Figs. 4, 5), much of the project area – including the proposed dam wall site - is covered by dense subtropical thicket and succulent, disturbed valley floor vegetation traversed by a few farm tracks while portions of the western margins of the reservoir area comprise disturbed, ploughed agricultural lands. Levels of bedrock exposure within the dam project area are very low indeed due to extensive cover by alluvium and eluvial surface gravels, soils and vegetation.

The geological context of the dam project area has already been covered in the illustrated report for Scheepers Vlakte 98 by Almond (2018) and will not be repeated in detail here. The geology of the Addo area is shown on 1: 250 000 geological map 3324 Port Elizabeth (Council for Geoscience, Pretoria; Toerien & Hill 1989) (Fig. 3). The area lies towards the northern edge of the extensive Algoa Basin that is infilled with a 3.5 km thick succession of alluvial fan, fluvial and estuarine to marine shelf sediments of Late Jurassic to Early Cretaceous age (*c*. 150-125 Ma) that are referred to the **Uitenhage Group** (McLachlan & Anderson 1976, Shone 2006). According to the geological map the southern portion of the project area on Scheepers Vlakte 7/98 is underlain by marine sediments of the **Sundays River Formation** (Ks, red in Fig. 3) that are mapped as passing palaeoshorewards into fluvial sediments of the **Kirkwood Formation** (J-Kk, orange in Fig. 3) towards the north. It is likely that the continental and marine facies of the Uitenhage

Group show an inter-fingering relationship along the basin margin (*e.g.* Muir *et al.* 2017). Since the Kirkwood beds, if they are indeed present, are not encountered at surface within the project area and are unlikely to be significantly impacted by the proposed development, they are not treated further here. High Level Terrace Gravels of the Kudus Kloof Formation (Hattingh 1994, 2001) are not mapped within the present project area but do occur at higher elevations elsewhere on Scheepers Vlakte 98 (Almond 2018).

Representative exposures of the main bedrock and superficial sediment units encountered within the project area are illustrated below in Figures 4 to 13 with explanatory figure legends.

Well-sorted, grey-green to olive and buff sandstones provisionally attributed to the Sundays River Formation are locally exposed *in situ* along the lower margins of the valley sides, for example *c*. 400-60 m SE of the dam wall location as well as in a low, east-facing sandstone scarp or *kranz* towards the south-eastern edge of reservoir area (Figs. 6 & 7). *Ex situ* blocks of Sundays River sandstone are also seen along the eastern edge of a newly excavated small dam. The sandstones are generally well-sorted, medium-grained, massive to thin- or medium-bedded with a dark brown weathering patina and blocky to rubbly jointing pattern. Rounded corestones result from protracted exfoliation weathering under humid, subtropical conditions. Lenticular channel bodies with pebbly lenses and associated with multi-hued pinkish / lilac mudrocks such as are typical of the Kirkwood Formation were not observed during the site visit.

Pebbly to sandy alluvium and darker overlying soils are locally exposed along valley floor, for example in test pits within dam reservoir project area (Fig. 11). Thick (several meters) orange-brown, gravelly to sandy alluvial deposits are well-exposed in a recently excavated section (dam overflow channel) situated outside the immediate project area some 600m SE of proposed new dam wall location (Figs. 8 & 9). Cross-bedded gravel lenses within the valley floor alluvium are largely made up of subangular to well-rounded, pale grey, pebbly and cobbly clasts of Cape Supergroup quartzite with some small reworked calcrete lumps and occasional darker sandstone clasts that have probably been reworked from the Uitenhage Group. Some of the *in situ* gravel clasts appear to be anthropogenically flaked, so these deposits are probably Qauetrnary (Pleistocene or Holocene) in age for the most part.

Eluvial surface gravels overlying sandy to calcretised alluvial soils on lower valley slopes are likewise dominated by pale grey quartzite clasts and are often anthropogenically flaked (Figs. 12 & 13). Other clast lithologies include white vein quartz, reddish ferruginous quartzite and creamy calcrete. Partially calcretised gravelly soils are exposed by ploughing in disturbed areas along the western margins of the reservoir area (Fig. 10).

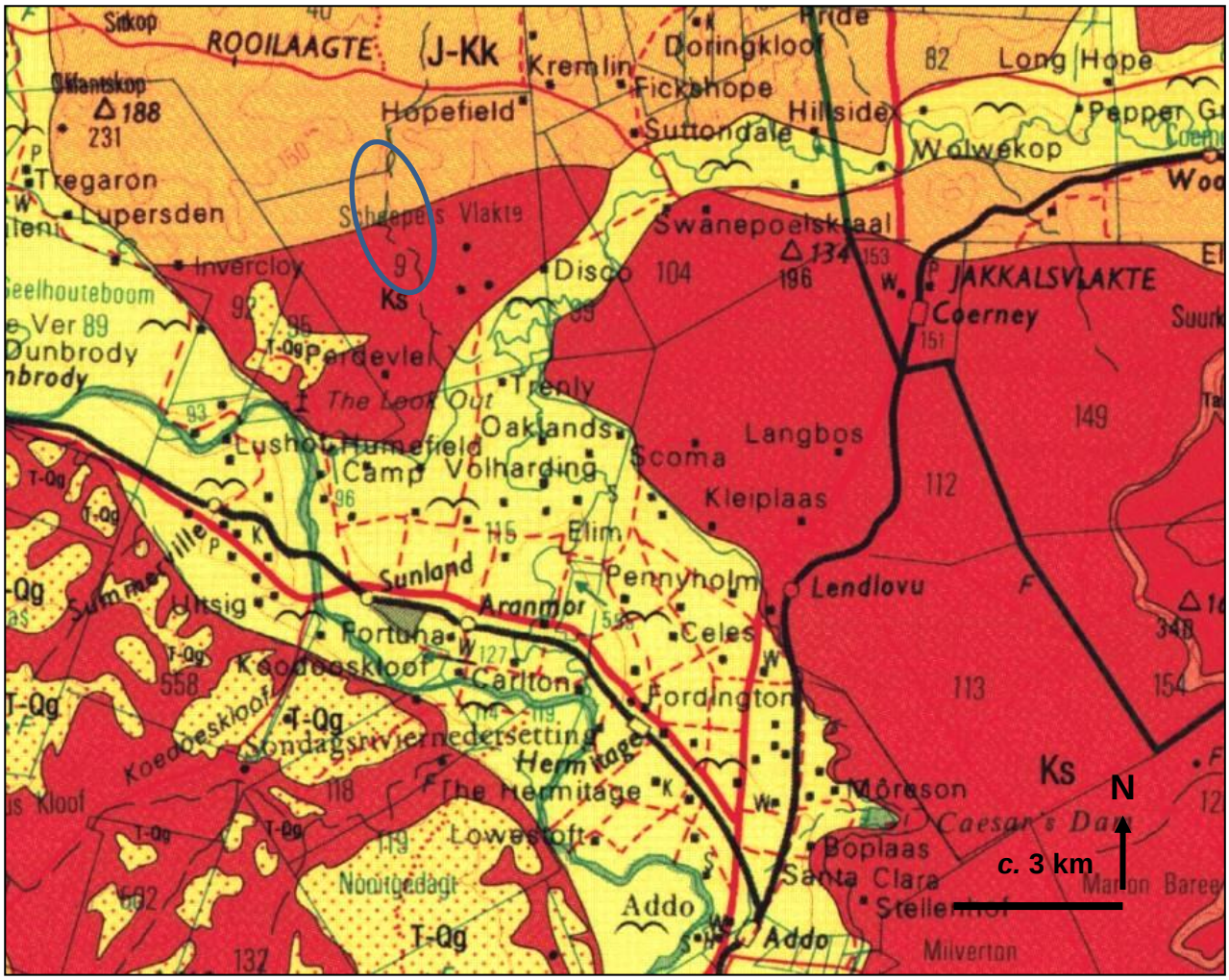

Figure 3: Extract from 1: 250 000 geological map sheet 3324 Port Elizabeth (Council for Geoscience, Pretoria). The study area for the proposed Lower Coerney Balancing Dam near Addo, Eastern Cape (approximately indicated by the blue ellipse), lies on the northern side of the Sundays River Valley. The majority of the area is underlain at depth by Early Cretaceous marine sediments of the Sundays River Formation (Ks, red) and possibly also by continental sediments of the Kirkwood Formation (J-Kk, orange). Within the study area these Cretaceous bedrocks are almost entirely mantled by gravelly to sandy alluvial deposits along the valley floor and adjoining lower hillslopes while Neogene (Late Tertiary) pediment gravels of the Kudus Kloof Formation (T-Qg, pale yellow with red stipple) also occur in higher-lying areas in the wider region but these are not fully shown on the geological map.

Figure 4: View westwards across the proposed new dam basin project area showing dense subtropical thicket vegetation and sandy alluvial soils on the shallow valley floor.

Figure 5: View northwards along the western sector of the dam basin project area showing calcretised sandy soils in areas already disturbed for agriculture.

Figure 6: Low scarp or *krans* of jointed, grey-green Sundays River Formation sandstone towards the SW edge of the dam basin project area showing typical dark brown weathering patina (hammer = 30 cm).

Figure 7: Blocky-weathering exposure of Sundays River Formation sandstones on the south-eastern edge of the stream valley, *c*. 470 m SE of the proposed dam wall site (hammer = 30 cm).

Figure 8: Vertical section through thick sandy alluvial deposits of the valley floor with cross-bedded gravel bars exposed by recent excavations *c.* 600 m SE of the proposed new dam wall site (hammer = 30 cm).

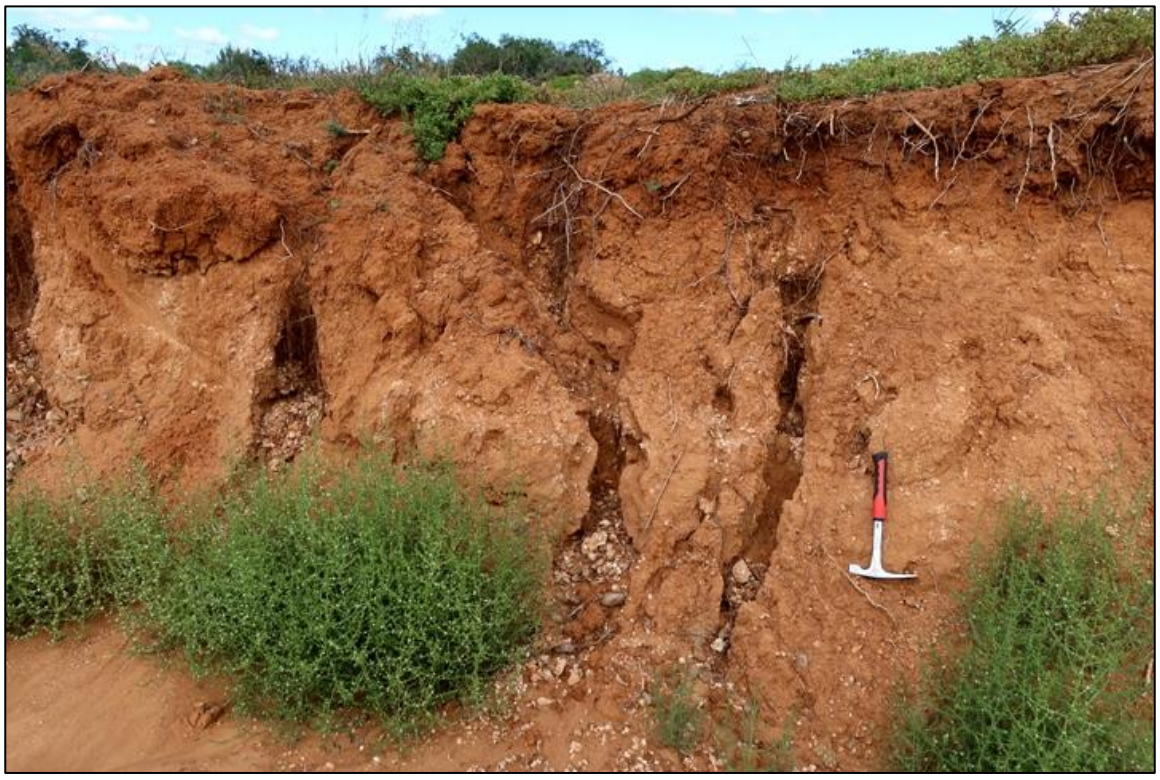

Figure 9: Extension of the excavation seen in the previous figure, here showing development of calcrete within the sandy alluvial deposits as well as darker overlying modern soils (hammer = 30 cm).

Figure 10: Calcretised alluvial sands exposed by ploughing along the western margins of the dam reservoir project area.

Figure 11: Gravelly to sandy alluvial deposits on the valley floor within the dam reservoir project area, here exposed in a shallow test pit.

Figure 12: Thin layer of eluvial (downwasted) surface gravels overlying sandy soils on the western margins of the dam reservoir project area.

Figure 13: Close-up of eluvial surface gravels seen in the previous illustration showing preponderance of pale greyish quartzite clasts, some flaked, as well as white vein quartz (scale in cm).

4. PALAEONTOLOGICAL HERITAGE

The fossil record of the Sundays River Formation has been briefly reviewed by Almond (2018, 2019) and in the well-illustrated, fully-referenced benchmark account of southern African Cretaceous fossils by Cooper (2018). Early records of Cretaceous fossil remains from the Sundays River Formation of the Algoa Basin near Addo – including several reports of fossil molluscs (ammonites, bivalves, gastropods) as well as tubiculous serpulid worms - have been collated by McLachlan and Anderson (1976). They include records of various molluscan taxa from The Look Out along the Sundays River just SW of the present study area (where a large petrified log is displayed) as well as a few sites to the northeast of Scheepersvlakte (See map figures and references in Almond 2018, 2019). It is noted that a previous field-based PIA study covering the Remainder of Portion 7, Farm Scheepers Vlakte 98 by Almond (2018) did not report any new fossil occurrences from the Uitenhage Group or Late Caenozoic superficial sediments. Furthermore, no fossiliferous Kirkwood Formation exposures were identified in the project area. Selected fossil and subfossil material recorded during the recent site visit is illustrated in Figures 14 to 18 below (See Appendix 2 and Figure A.1 therein for gps locality details).

No marine fossils were observed within the few sandstone exposures provisionally assigned to the Sundays River Formation that were observed within or close to the present study area. However, the weathered sandstone bodies here, as well as some *ex situ* blocks, do contain sparse moulds of woody plant axes (Figs. 14 to 18). These are mostly casts with little or no original woody fabric preserved, but ill-defined growth rings visible and coarse, woody textures are visible in some cases. Weathered-out log segments are locally present in surface float overlying the sandstone outcrop area. While more typical of the fluvial facies of the Kirkwood Formation, drifted logs and other plant material may also occur within the Sundays River beds and, as noted previously, it is likely that continental and marine facies of the Uitenhage Group interfinger along the Algoa Basin margin. None of the poorly-preserved fossil wood material observed (See Appendix 1) is considered to be of high scientific or conservation value while the majority of examples recorded lie outside the immediate project area (Fig. **).

The thick alluvial and eluvial superficial sediments of Late Caenozoic (probably Pleistocene / Holocene) age mantling the bedrocks over the great majority of the project area are largely or entirely unfossiliferous. Sparse subfossil shells of large land snail "*Achatina*" (*c.* 6 cm long) occur within the sandy alluvium (Fig. 18). Fossils including mammalian bones, teeth, horncores, non-marine molluscs and calcretised termitaria might also occur in the subsurface here, but have not been observed.

Figure 14: Small petrified log (8.5 cm maximum diameter) showing poorly-defined growth rings in cross section which has weathered out of a sandstone unit of the Sundays River Formation (Loc. 968).

Figure 15: Poorly-preserved segment of a petrified fossil log partially embedded within surface gravels overlying a sandstone body of the Sundays River Formation, *c*. 440 m SE of the proposed new dam wall location (Loc. 962) (hammer = 30 cm).

Figure 16: Coarsely banded petrified wood embedded within an *ex situ* block of Sundays River Formation sandstone *c.* 620 m SE of the proposed new dam wall location (Loc. 963) (field of view is *c*. 15 cm wide).

Figure 17: Mould of a woody plant axis preserved within an *ex situ* block of Sundays River Formation sandstone *c.* 620 m SE of the proposed new dam wall location (Loc. 963) (scale in cm and mm).

Figure 18: Subfossil shell of the large land snail "*Achatina*" extracted from semi-consolidated, sandy alluvial deposits of inferred Pleistocene or Holocene age *c*. 600 m outside the dam project area (Loc. 961).

5. SITE SENSITIVITY VERIFICATION

Site sensitivity mapping for palaeontological heritage prepared by the GA Environment (Pty) Ltd using the DFFE National Web-Based Environmental Screening Tool suggests that the Lower Coerney Balancing Dam project area is of Very High Palaeosensitivity due to the occurrence here at depth of potentially fossiliferous sediments of the Uitenhage Group (Figs. 19 and 3 respectively).

A previous field-based PIA study covering the Remainder of Portion 7, Farm Scheepers Vlakte 98 by Almond (2018) did not report any new fossil occurrences from the Uitenhage Group or Late Caenozoic superficial sediments. The recent site visit only yielded sparse occurrences of poorly-preserved fossil wood associated with limited exposures of sandstone facies of the Sundays River Formation, most of which lie *outside* the proposed balancing dam project area. No exposures of fluvial facies of the Kirkwood Formation were observed. Apart from occasion subfossil gastropod shells within Quaternary alluvium and reworked blocks of fossil wood among surface gravels, no fossils were recorded from the pervasive blanket of Late Caenozoic superficial deposits within the project area. All the recorded fossil remains are of low scientific and conservation value.

it is concluded that the Lower Coerney Balancing Dam project area is in fact of LOW PALAEOSENSITIVITY, although the potential for rare, largely unpredictable fossil sites of High Palaeosensitivity associated with Cretaceous sedimentary bedrocks and older alluvial deposits in the subsurface cannot be discounted. The DFFE-based palaeosensitivity mapping is accordingly *contested* here.

Figure 19: Palaeontological sensitivity map for the proposed Lower Coerney Balancing Dam project area near Addo (blue dotted polygon), abstracted from the DFFE Screening Report prepared by GA Environment (Pty) Ltd (November 2021). The entire project area is designated Very High Sensitivity here. This sensitivity mapping is *contested* in this report.

6. CONCLUSIONS

According to the published 1: 250 000 geological map (sheet 3324 Port Elizabeth) **t**he project area for the proposed Lower Coerney Balancing Dam, situated *c.* 12 km NW of Addo and *c.* 17 km ESE of Kirkwood in the Sundays River Valley Municipality of the Eastern Cape Province, is underlain at depth by potentially fossiliferous continental and marine shelf sediments of the Cretaceous Uitenhage Group. Site sensitivity mapping based on the DFFE National Web-Based Environmental Screening Tool suggests that the Lower Coerney Balancing Dam project area is of Very High Palaeosensitivity. A one-day site visit, backed-up by a previous combined desktop and field-based palaeontological heritage report for Farm Scheepers Vlakte 98, by Almond (2018) shows that Cretaceous bedrocks within or close to the new dam project area are very poorly exposed. Within the dam basin they are largely buried beneath thick sandy to gravelly alluvium of probable Quaternary to Recent age. The only fossils recorded here are sparse, poorly-preserved moulds and petrified blocks of fossil wood of low scientific and conservation value, while occasional subfossil land snail shells are found within the overlying mantle of Late Caenozoic alluvium. It is concluded that the project area is of LOW PALAEOSENSETIVITY overall and the original DFFE sensitivity mapping is therefore *contested*.

Anticipated impacts on local fossil heritage resources of scientific and conservation value due to the proposed dam development are likely to be of low significance and there are no objections on palaeontological heritage grounds to the proposed dam development. The potential for rare, largely unpredictable fossil sites (*e.g.* mammalian bones, teeth, horncores, non-marine molluscs, calcretised termitaria) of High Palaeosensitivity associated with older alluvial deposits hidden in the subsurface cannot be entirely discounted. If any fossiliferous deposits are exposed by surface clearance or excavations during the construction phase of the development, the Chance Fossils Finds Protocol outlined in Appendix 3 to this report should be fully implemented. These recommendations should be included within the EMPr for the Lower Coerney Balancing Dam. Pending the discovery of significant new fossil finds before or during construction, no further specialist palaeontological studies, monitoring or mitigation are recommended for this project.

7. REFERENCES

ALMOND, J.E. 2010. Palaeontological heritage assessment of the Coega IDZ, Eastern Cape Province, 112 pp. plus appendix. Natura Viva cc, Cape Town.

ALMOND, J.E. 2011. Palaeontological impact assessment: proposed windfarm on Grassridge 190, Geluksdal 590 and Bontrug 301, Nelson Mandela Bay Municipality, Eastern Cape Province, 45 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2012a. Proposed manganese export facility and associated infrastructure in the Coega Industrial Development Zone, Port of Ngqura and Tankatara area, Nelson Mandela Bay Municipality, Eastern Cape. Palaeontological heritage assessment, 47 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2012b. Expansion of River Bend Citrus Farm near Addo, Sundays River Valley Municipality, Eastern Palaeontological specialist study: desktop assessment, 12 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2013a. Venter Fert Composting and Fertiliser Plant, Farm 715 Division Uitenhage, Nelson Mandela Bay Municipality: Palaeontological Heritage Assessment, 41 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2013b. Proposed 16 Mtpa expansion of Transnet's existing manganese ore export railway line & associated infrastructure between Hotazel and the Port of Ngqura, Northern & Eastern Cape. Part 2: De Aar to the Coega IDZ, Northern and Eastern Cape. Palaeontological specialist assessment: combined desktop and field-based study, 76 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2013c. Expansion of agricultural activities on Portion 5 of the Farm Nooitgedacht No. 118, Sunland, near Addo, Sundays River Valley Municipality, Eastern Cape. Palaeontological specialist study: desktop basic assessment, 17 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2014a. Agricultural Development of Portion 16 & Portion 17 of the Farm 203 Logan Braes near Addo, Nelson Mandela Bay Municipality, Eastern Cape. Palaeontological specialist study: desktop basic assessment, 17 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2014b. Proposed Dassiesridge Wind Energy Facility near Uitenhage, Cacadu District, Eastern Cape. Palaeontological specialist assessment: combined desktop and field-based study, 66 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2014c. Proposed Bulk Water Supply and Waste Water Services for the Langbos Community north of Addo, Sunday's River Valley Municipality, Eastern Cape. Palaeontological specialist study: desktop basic assessment, 16 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2016. Proposed subdivision and agricultural development of Portion 413 of the Farm Strathsomers Estate 42 near Kirkwood, Sundays River Valley Municipality, Eastern Cape. Palaeontological specialist study: combined desktop & field-based assessment, 24 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2018. Proposed agricultural development of Remainder of Portion 7, Farm Scheepers Vlakte 98 near Addo, Sundays River Valley Municipality, Eastern Cape. Palaeontological specialist study: combined desktop & field-based assessment, 29 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2019. Proposed agricultural and residential developments on the Remainder of Portion 1 of the farm Vissers Vale No. 96 near Addo, Sundays River Valley Municipality, Eastern Cape. Palaeontological specialist study: combined desktop & field-based assessment, 34 pp. Natura Viva cc, Cape Town.

ALMOND, J.E., DE KLERK, W.J. & GESS, R. 2008. Palaeontological heritage of the Eastern Cape. Interim technical report for SAHRA, 25 pp.

ANDERSON, J.M. & ANDERSON, H.M. 1985. Palaeoflora of southern Africa. Prodromus of South African megafloras, Devonian to Lower Cretaceous, 423 pp, 226 pls. Botanical Research Institute, Pretoria & Balkema, Rotterdam.

ANDREWS, C.W. 1910. Description of a new plesiosaur (*Plesiosaurus capensis* sp. nov.) from the Uitenhage beds of Cape Colony. Annals of the South African Museum 7, 309-323, pl. 18, 4 textfigs.

ATHERSTONE, W.G. 1857. Geology of Uitenhage. The Eastern Province Monthly Magazine 1, 518-532 and 580 -595.

BAMFORD, M.K. 1986. Aspects of the palaeoflora of the Kirkwood and Sundays River Formations, Algoa Basin, South Africa. Unpublished M.Sc. Thesis, Univ. Witwatersrand, 160pp.

COOPER, M.R. 1979. A new species of *Myophorella* (Bivalvia, Trigoniidae) from the Sunday's River Formation, South Africa. Annals of the South African Museum 78 (3), 21-27.

COOPER, M.R. 1981. Revision of the Late Valanginian Cephalopoda from the Sundays River Formation of South Africa, with special reference to the Genus Olcostephanus. Annals of the South African Museum 83: 147-366, 206 figs.

COOPER, M.R. 1983. The ammonite genus *Umgazaniceras* in the Sundays River Formation. Transactions of the Geological Society of South Africa 86(1):63-64.

COOPER, M.R. 1991. Lower Cretaceous Trigonioida (Mollusca, Bivalvia) from the Algoa Basin, with a revised classification of the order. Annals of the South African Museum 100:1-52.

COOPER, M.R. 2018. The Cretaceous fossils of South-Central Africa, iv + 163 pp. CRC Press, London etc.

DINGLE, R.V., SIESSER, W.G. & NEWTON, A.R. 1983. Mesozoic and Tertiary geology of southern Africa. viii + 375 pp. Balkema, Rotterdam.

DU TOIT, A.L. 1954. The geology of South Africa (3rd edition). 611 pp, 41 pls, geological map insert.

ENGELBRECHT, L.N.J., COERTZE, F.J. & SNYMAN, A.A. 1962. Die geologie van die gebied tussen Port Elizabeth en Alexandria, Kaapprovinsie. Explanation to geology sheet 3325 D Port Elizabeth, 3326 C Alexandria and 3425 B, 54pp., 8 pls. Geological Survey of South Africa / Council for Geosciences, Pretoria.

GESS, R. (undated) Paleontological Heritage Assessment for Kadouw Leisure Estate, Sundays River Valley, 5 pp.

HATTINGH, J. 1994. Kudus Kloof Formation. SA Committee for Stratigraphy, Catalogue of South African Lithostratigraphic Units 5, 35-36. Council for Geoscience, Pretoria.

HATTINGH, J. 2001. Late Cenozoic drainage evolution in the Algoa Basin with special reference to the Sundays River Valley. Council for Geoscience, South Africa Bulletin 128, 141 pp, appendices.

HATTINGH, J. & GOEDHART, M.L. 1997. Neotectonic control on drainage evolution in the Algoa Basin, Eastern Cape. South African Journal of Geology 100, 43-52.

HAUGHTON, S.H. 1928. The geology of the country between Grahamstown and Port Elizabeth. An explanation of Cape Sheet No. 9 (Port Elizabeth), 45 pp. Geological Survey / Council for Geoscience, Pretoria.

HAUGHTON, S.H. 1969. Geological history of southern Africa, 535 pp. Geological Society of South Africa, Johannesburg.

KITCHIN, F.L. 1908. The invertebrate fauna and palaeontological relationships of the Uitenhage Series. Annals of the South African Museum 7(2):21-250, pls. 2-11.

KLEIN, R.G. 1984. The large mammals of southern Africa: Late Pliocene to Recent. In: Klein, R.G. (Ed.) Southern African prehistory and paleoenvironments, pp 107-146. Balkema, Rotterdam.

KLINGER, H.C. & KENNEDY, W.J. 1979. Cretaceous faunas from southern Africa: Lower Cretaceous ammonites, including a new bochianitid genus from Umgazana, Transkei. Annals of the South African Museum 78: 11-19.

LAZO, D.G. 2007. Early Cretaceous bivalves of the Neuquén Basin, west-central Argentinia: notes on taxonomy, palaeobiogeography and palaeoecology. Geological Journal 42, 127-142.

LE ROUX, F.G. 2000. The geology of the Port Elizabeth – Uitenhage area. Explanation of 1: 50 000 geology Sheets 3325 DC and DD, 3425 BA Port Elizabeth, 3325 CD and 3425 AB Uitenhage, 3325 CB Uitenhage Noord and 3325 DA Addo, 55pp. Council for Geoscience, Pretoria.

MACRAE, C. 1999. Life etched in stone. Fossils of South Africa. 305pp. The Geological Society of South Africa, Johannesburg.

McLACHLAN, I.R. & McMILLAN, I.K. 1976. Review and stratigraphic significance of southern Cape Mesozoic palaeontology. Transactions of the Geological Society of South Africa. 79: 197-212.

McLACHLAN, I.R. & McMILLAN, I.K. 1979. Microfaunal biostratigraphy, chronostratigraphy and history of Mesozoic and Cenozoic deposits on the coastal margin of South Africa. In: Anderson, A.M. & Van Biljon, W.J. (Eds.) Some sedimentary basins and associated ore deposits of South Africa. Special Publication of the Geological Society of South Africa 6, 161-181.

McMILLAN, I.K. 1990. A foraminiferal biostratigraphy and chronostratigraphy for the Pliocene to Pleistocene upper Algoa Group, Eastern Cape, South Africa. South African Journal of Geology 93: 622-644.

McMILLAN, I. K., 2003. The Foraminifera of the Late Valanginian to Hauterivian (Early Cretaceous) Sundays River Formation of the Algoa Basin, Eastern Cape Province, South Africa. Annals of the South Africa Museum 106:1-274, 84 figs, 4 tables.

MOSTOVSKI, M. & MULLER, B. 2010. [Untitled article on fossil insects from the Sundays River and Kirkwood Formations]. PalNews 17 (3), 9-10.

MUIR, R.A., BORDY, E.M., REDDERING, J.S.V. & VILJOEN, J.H.A. 2017b. Lithostratigraphy of the Kirkwood Formation (Uitenhage Group), including the Bethelsdorp, Colchester and Swartkops Members, South Africa. South African Journal of Geology 120, 281-293.

PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Geological Society of South Africa, Marshalltown.

RAATH, M., HILLER, N. & BAMFORD, M. 1998. Palaeontology, pp. 27-40 in Lubke, R. & De Moor, I. Field guide to the eastern and southern Cape coast. University of Cape Town Press, Cape Town, xxx + 561 pp, 49 pls.

RIGASSI, D.A. & DIXON, G.E. 1972. Cretaceous of the Cape Province, Republic of South Africa. Proceedings, Conference on African geology, Ibadan Dec. 1970, pp. 513-527.

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

SEWARD, A.C. 1903. Fossil floras of Cape Colony. Annals of the South African Museum 4, 1-122. CHECK PLS

SHARPE, D. 1856. Description of fossils from the secondary rocks of Sundays River and Zwartkops River, South Africa, collected by Dr. Atherstone and A. G. Bain, Esq. Transactions of the Geological Society, London (2nd Series) 7(4):193-203.

SHONE, R.W. 1976. The sedimentology of the Mesozoic Algoa Basin. Unpublished MSc thesis, University of Port Elizabeth, 48 pp.

SHONE, R.W. 1986. A new ophiuroid from the Sundays River Formation (Lower Cretaceous), South Africa. Journal of Paleontology 60, 904-910.

SHONE, R.W. 2006. Onshore post-Karoo Mesozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 541-552. Geological Society of South Africa, Marshalltown.

SPATH, L. F. 1930. On the Cephalopoda of the Uitenhage beds. Annals of the South African Museum 28(2):131-157, pls. 13-15, 1 text fig.

TANKARD, A.J., JACKSON, M.P.A., ERIKSSON, K.A., HOBDAY, D.K., HUNTER, D.R. & MINTER, W.E.L. 1982. Crustal evolution of southern Africa – 3.8 billion years of Earth history, xv + 523 pp., pls. Springer Verlag, New York.

TATE, R. 1867. On some secondary fossils from South Africa. Proceedings of the Quarterly Journal of the Geological Society of London 23, 139-175.

TOERIEN, D.K. & HILL, R.S. 1989. The geology of the Port Elizabeth area. Explanation to 1: 250 000 geology Sheet 3324 Port Elizabeth, 35 pp. Council for Geoscience. Pretoria.

WINTER, H. DE LA R. 1973. Geology of the Algoa Basin, South Africa. In: Blant, G. (Ed.) Sedimentary basins of the African coast. Part, 2 South and East Coast, pp. 17-48. Association of African Geological Surveys, Paris.

APPENDIX 1: JOHN ALMOND SHORT CV

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 2: FOSSIL SITE DATA – JANUARY 2022

All GPS readings were taken in the field using a hand-held Garmin GPSmap 64s instrument. The datum used is WGS 84. 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 project area but only those sites recorded during the 1-day field survey. The absence of recorded fossil sites in any area therefore does *not* mean that no fossils are present there.
- The stratigraphic data for each site is provisional and have yet to be confirmed.

961	S33° 27' 10.4" E25° 37' 44.1"	Scheepers Vlakte 98. Good vertical section through Late Caenozoic (probably Pleistocene / Holocene) sandy alluvium with cross-bedded pebbly to cobbly gravel lenses. Occasional flaked quartzite artefacts and subfossil shells of large land snail "*Achatina*". Proposed Field Rating IIIC Local Resource. Outside project footprint. No mitigation required.
962	S33° 27' 02.2" E25° 37' 46.3"	Scheepers Vlakte 98. Low exposure of weathered, jointed, medium-grained olive to brownish sandstones of the Sundays River Formation. Occasional weathered-out, poorly-preserved blocks of fossil wood (cast) in surface float. Proposed Field Rating IIIC Local Resource. Outside project footprint. No mitigation required.
963	S33° 27' 07.0" E25° 37' 50.9"	Scheepers Vlakte 98. Heap of *ex situ* blocks of medium-grained olive to brownish sandstones of the Sundays River Formation. Occasional moulds of wood plant axes as well as possible petrified logs. Proposed Field Rating IIIC Local Resource. Outside project footprint. No mitigation required.
968	S33° 26' 41.9" E25° 37' 15.1"	Scheepers Vlakte 98. Low east-facing scarp of dark brown-weathering sandstones of the Sundays River Formation. Occasional weathered-out, poorly-preserved block of pale grey fossil wood in surface float, sometimes showing poorly-defined seasonal growth lines. Proposed Field Rating IIIC Local Resource. No mitigation recommended.

Figure A1: Google Earth© satellite image of the Lower Coerney Dam project area near Addo showing the location of new fossil or subfossil sites recorded during the recent site visit (numbered yellow circles). See table above for gps details and short description.

<table>
<tr><td colspan="3">APPENDIX 3: Lower Coerney Balancing Dam on Portion 7 of the farm Scheepersvlakte No. 98, Farm 713 and Farm Enon Mission 574 (Remaining Extent of Farm 40), near Addo</td></tr>
<tr><td>Province & region:</td><td colspan="2">Eastern Cape, Sundays River Valley Municipality</td></tr>
<tr><td>Responsible Heritage Resources Agency</td><td colspan="2">ECPHRA (Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; Email: smokhanya@ecphra.org.za).</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Early Cretaceous Sundays River Formation (Uitenhage Group) and possibly also Kirkwood Formation, Late Caenozoic alluvium</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Shelly invertebrates, petrified wood, rare dinosaur bones and teeth, trace fossils in Sundays River beds.
Freshwater molluscs, calcretised trace fossils, possible bones and teeth of mammals in Caenozoic alluvium.</td></tr>
<tr><td rowspan="5">ECO 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">Record, 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>