

Botanical Assessment

Proposed upgrading of road TR75/1 (N12 highway) near Oudtshoorn

March 2023



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Mark Berry is an independent botanical specialist with over 25 years of experience mainly in the Western Cape, but also in the adjacent provinces, Free State and KwaZulu-Natal. He is also experienced in undertaking/compiling Environmental Impact Assessments (EIA's), Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties, audits, land use surveys, etc. CV is available upon request.

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Declaration of Independence

I Mark Gerald Berry, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
 - **other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity;** or
 - am not independent, but another specialist (the “Review Specialist”) that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the Specialist:



Name of Company:

Mark Berry Botanical Surveys

Date:

24 March 2023

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1. Introduction

Proposed development and area assessed

The applicant (Western Cape Government: Dept. of Public Works) wishes to upgrade a section of road TR75/1 (N12 highway) southeast of Oudtshoorn (**Figure 1-1**). The road section comprises a 14.8 km long asphalt road that links Oudtshoorn with George across the Outeniqua Mountain range (**Figure 1-2**). The road is currently in a poor condition and has no shoulder (unsafe) and poor stormwater drainage.

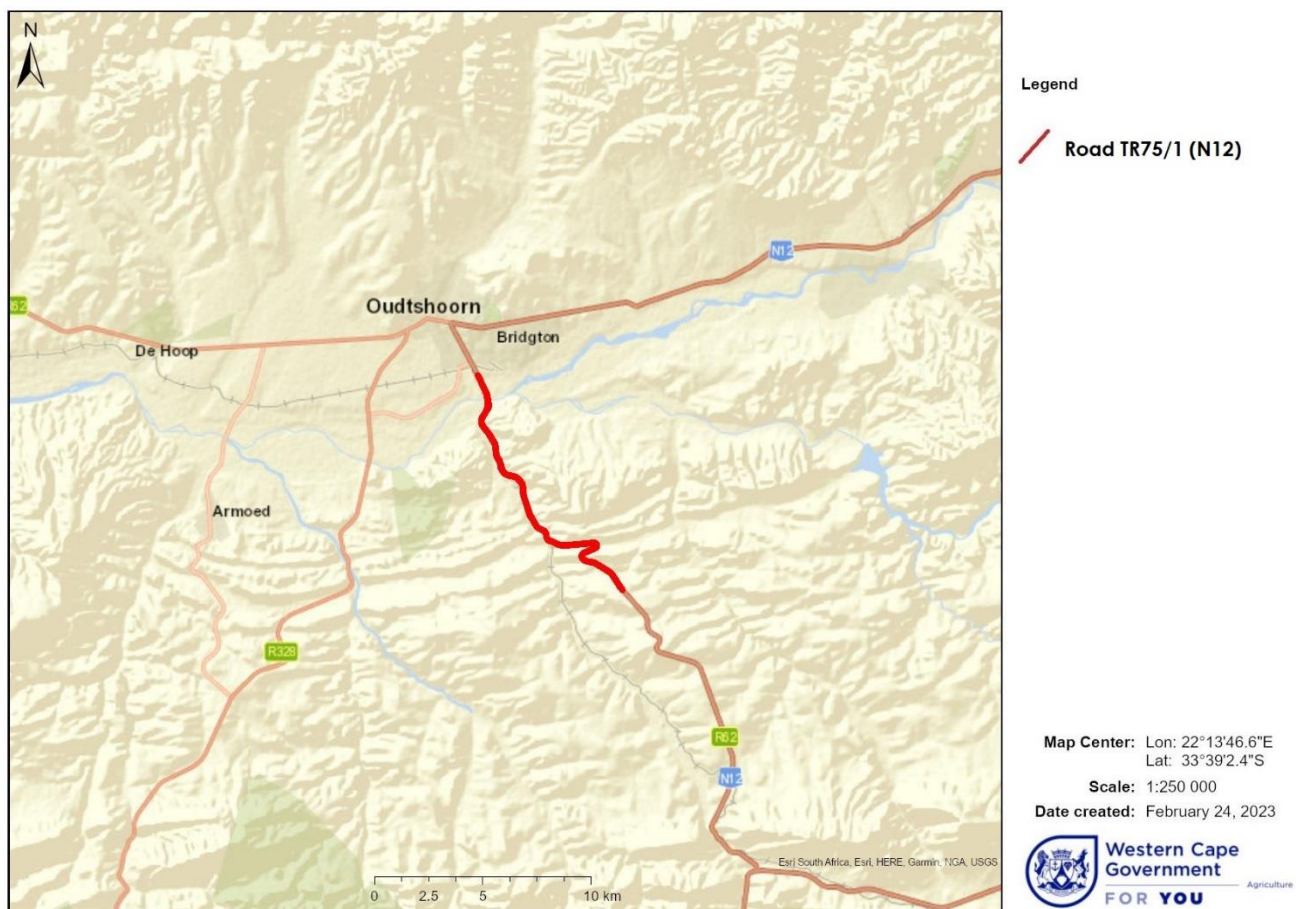


Figure 1-1: Location of road southeast of Oudtshoorn.

Project details, as supplied by the EAP (Sharples Environmental Services), are as follows:

1. General

- a. The establishment of Contractor's campsite and offices on site for the Engineer and his site staff.
- b. The supply of plant, labour, tools, equipment and materials necessary to complete the work.
- c. Setting out the works.
- d. Accommodation of traffic.

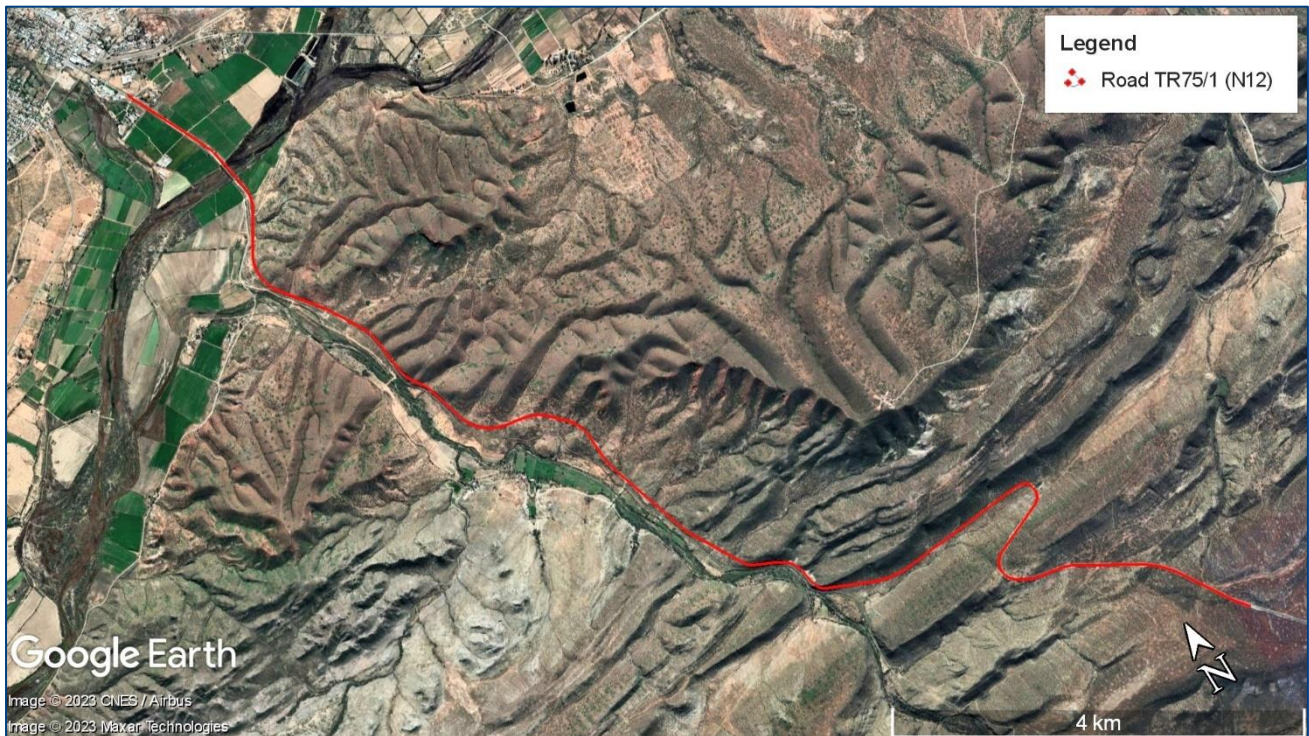


Figure 1-2: Section of road TR75/1 proposed for rehabilitation.

2. Road works

- a. Rehabilitation of the existing road cross-section to include surfaced shoulders. The cross-section will require widening of the existing road prism at selected locations. The road rehabilitation will require widening of existing cut and fill slopes; in-situ reconstruction of the existing pavement layers as the upper selected layer; construction of new subbase and base layers; and construction of a new surfacing seal.
- b. Construction of auxiliary (passing and climbing) lanes at selected locations.
- c. Rehabilitation of selected accesses to main or minor farm access standards as applicable.
- d. Extension of existing minor culverts.
- e. Maintenance of existing minor culvert inlet and outlet structures.

3. Structures

- a. Widening or raising head and wing walls at major culverts if required due to cross-section rehabilitation or introduction of auxiliary lanes.
- b. Maintenance to major culverts including concrete crack repair and scour repair.
- c. Maintenance to B4691 over the Olifants River including repair of honeycombing in concrete and replacement of bridge joints.

4. Appurtenant works

- a. Construction of concrete lined drains.
- b. Installation of road signs.
- c. Painting of road marking.

- d. Installation of guardrails.
- e. Installation of fencing, including clearing the fence line.

According to the Screening Report, generated by the EAP on 12 January 2023, the site has been mapped as Medium sensitive in the plant species theme. With regards to the terrestrial biodiversity theme, it has been mapped as Very High sensitive. The Very High sensitivity is ascribed to the possible presence of a threatened ecosystem and the position of the road inside the biodiversity network (CBA and ESA's). As a result, Mark Berry Botanical Consulting was contracted to undertake a botanical survey of the site.

Terms of Reference

The terms of reference agreed upon for this botanical study include:

- Adhere to the EAP's terms of reference for the study, including a *status quo* assessment, followed by either a Compliance Statement or a Botanical Assessment Report, depending on the outcome of the *status quo* assessment;
- Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities and threatened/vulnerable ecosystems), at species level (Species of Conservation Concern and protected species) and in terms of significant landscape features;
- Describe the sensitivity of the site and its immediate surroundings;
- Map or describe the presence of invasive alien plants;
- Review the relevant biodiversity plans compiled in terms of the National Environmental Management Biodiversity Act (Act 10 of 2004);
- Make recommendations with regards to the protection/management of biodiversity; and
- Adhere to the NEMA and CapeNature guidelines/protocols for biodiversity assessments.

Limitations and Assumptions

The following limitations and assumptions apply to the study:

- Fieldwork was carried out in the autumn season, considered to be an unsuitable time for many flowering species in the Southern Cape/Little Karoo. Plants that only flower at other times of the year (e.g. winter to spring), such as certain bulbs (Iridaceae and Orchidaceae), may have been missed. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be fair to good.

Notwithstanding the above limitation and the fact that the vegetation alongside the road is often degraded or modified, the specialist is of the opinion that the survey and findings are adequate to aid decision making.

Use of this report

This report reflects the professional judgment of its author(s). The information and recommendations presented in this report are specific to the project and site at hand and do not extend to future developments or neighbouring sites. Use of this report is therefore restricted.

2. Site Sensitivity Verification

The Department of Environmental Affairs online Environmental Screening Tool indicates that the plant species theme is of Medium sensitivity for the site. **Table 2-1** lists the threatened species and their sensitivity from the Screening Report.

Table 2-1: Threatened plant species as listed in the Screening Report. The names of sensitive species are not disclosed.

Sensitivity	Feature(s)
Medium	<i>Glottiphyllum linguiforme</i>
Medium	<i>Glottiphyllum regium</i>
Medium	<i>Aspalathus pedunculata</i>
Medium	<i>Selago ferruginea</i>
Medium	<i>Syringodea derustensis</i>
Medium	Sensitive species 537
Medium	<i>Erica zebrensis</i>
Medium	Sensitive species 155
Medium	Sensitive species 111
Medium	Sensitive species 842
Medium	Sensitive species 54
Medium	Sensitive species 187
Medium	<i>Adromischus mammillaris</i>

The Screening Reports further indicate that the terrestrial biodiversity theme is of Very High sensitivity for the site. This rating is ascribed to the possible presence of a critical biodiversity area (CBA1), an ecological support area (ESA1), a degraded ecological support area (ESA2), and an endangered ecosystem (i.e. Muscadel Riviere). In circumstances where the *status quo* assessment proves the contrary to the above (i.e. where the site is deemed to be of Low sensitivity in respect of both themes, the GN320 of 2020 requires that a Terrestrial Biodiversity Compliance Statement is submitted as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations

of 2020 (as amended). If the above is confirmed, then a biodiversity assessment will be required.

3. Methodology

The methodology used in this terrestrial biodiversity assessment, including a desktop background assessment and one site visit, is outlined in the subsections below.

Desktop assessment

A brief review of online (e.g. Google Earth, iNaturalist.org and CapeFarmMapper) and desktop resources (available literature and reports) was undertaken to determine the nature of the site, the expected vegetation type(s), the presence of natural vegetation remnants and species of conservation concern (SCC), hydrological features, and the significance of the site in terms of biodiversity planning.

Site survey

A botanical survey of the road was undertaken on 7 and 8 March 2023 by the author. A qualitative assessment of the type and condition of affected vegetation along the road, disturbances and presence of alien species, SCC and protected tree species was carried out. The waypoints from where botanical data was obtained during the survey are shown in **Figure 3-1**. Plant species not identified in the field, were collected and/or photographed and identified at the office and Compton (Kirstenbosch) Herbarium. The 2018 South African Vegetation Map and the latest floristic taxonomic literature and reference books were used for the purpose of this specialist study. Any plants classified as rare or endangered in the Red List of South African Plants online database¹ are highlighted. The assessment follows the relevant national guidelines/protocols for biodiversity assessments as listed in the Government Gazette No. 43110 on 20 March 2020.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from agricultural fields (fallow land), or areas previously disturbed by road works, to an area that has been severely eroded or degraded as a result of bad land management or alien infestation.
2. Species diversity (alpha diversity). This refers to the numbers of different indigenous plant species occurring on site.
3. Species of Conservation Concern (SCC), endemics, as well as protected tree

¹ [Threatened Species Programme | SANBI Red List of South African Plants](#)

species occurring on site. This would include near threatened, rare, vulnerable, endangered or critically endangered species. SCC and protected tree species were mapped using Easy GPS v2.5 software on an iPhone. Accuracy is given as ± 4 m.

4. Identification of the vegetation type(s) and communities (if discernible) on the site. This would include trying to establish the distribution of a vegetation type and whether or not it is vulnerable, endangered or critically endangered.
5. Connectivity with (or isolation from) nearby natural vegetation.

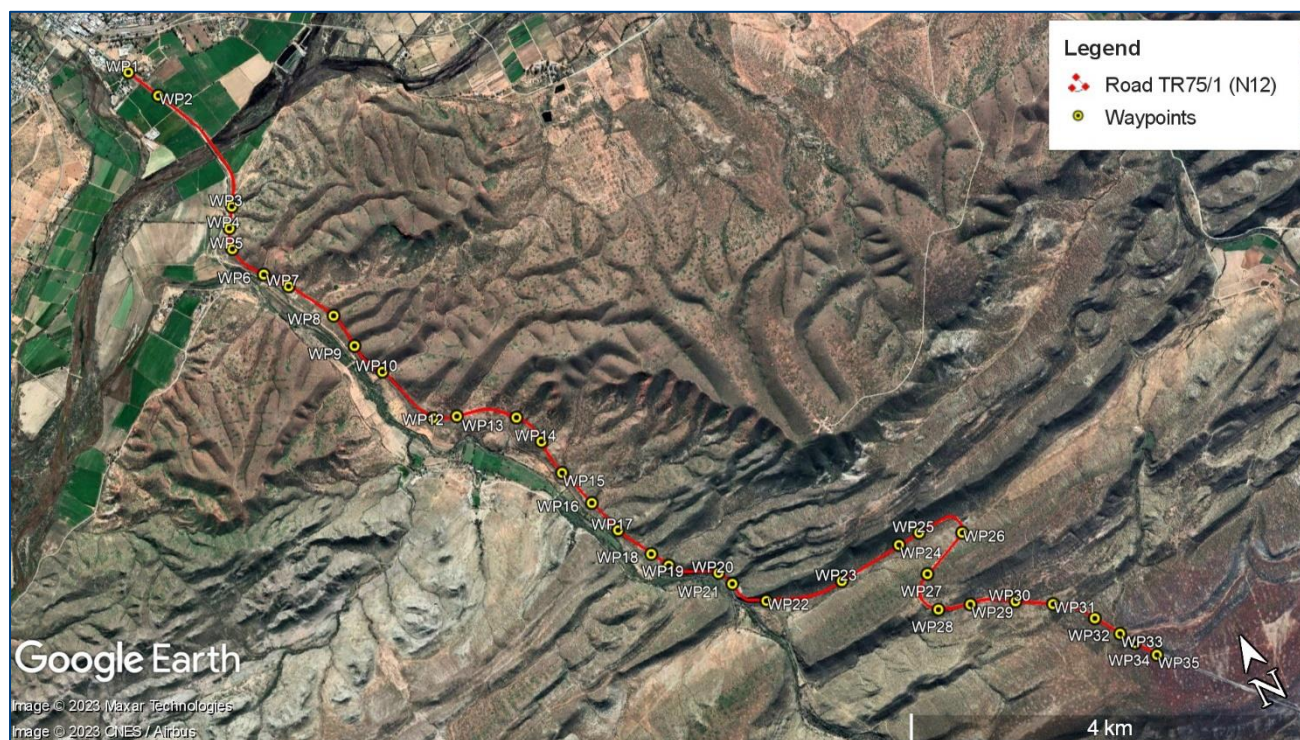


Figure 3-1: Satellite photo showing the waypoints (WP1-35) along the route (red).

4. Literature Study

A desktop literature review was undertaken during the biodiversity compliance assessment using both online resources and existing maps and reports. A summary of the most relevant information to this assessment is presented below. Some of the information was ground truthed during the site survey.

Location, topography & land use

From Oudtshoorn the road runs south-eastwards along a river valley (Kliprivier) through a series of hills before it veers to the left (eastwards) to ascend a hillslope. The route ends on a flattish hilltop a few kilometres further on. Altitude ranges from about 290 masl at the northern end in Oudtshoorn to 515 masl at the south-eastern end of route. The general area along the road can be described as hilly (**Figure 4-1**). The northern end is flat where it crosses the Olifantsrivier floodplain (**Figure 4-2**). The latter area is highly cultivated with almost no natural

elements remaining except for the river channel itself. Cultivation and a few farm dwellings were also noted along the Kliprivier section of the road (**Figure 4-3**). A railway line runs almost parallel to the road (often <50 m away) from the northern end to the point where the road veers eastwards. Other than the abovementioned land uses, the road is flanked by natural vegetation and game farms.

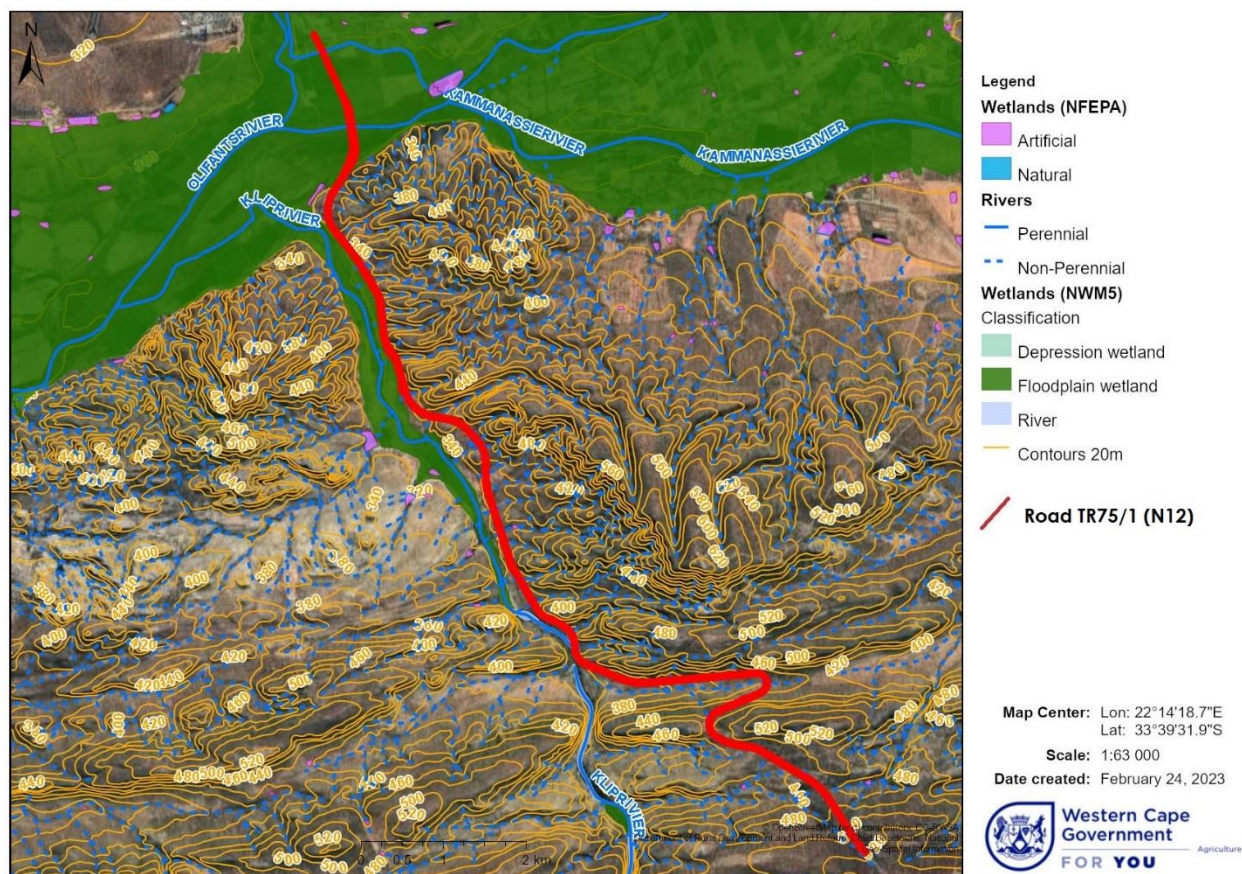


Figure 4-1: Combined topography and hydrology map.

Hydrology

The main hydrological features in the area are the Olifantsrivier, which the road crosses at the northern end, and the Kliprivier, located between 60 m and 400 m away from the road in the Kliprivier valley section. According to CapeFarmMapper, the road does not cross or encroach onto any NFEPA (National Freshwater Ecosystem Priority Area) wetlands. It does, however, cross the Olifantsrivier floodplain, as well as encroaching onto the Kliprivier floodplain in a few low-lying spots. The road crosses numerous non-perennial watercourses feeding into the Kliprivier from the hillslopes above the road (**Figure 4-4**). They are only flowing for a few days after rainfall events. All the watercourses have been included in the biodiversity network as CBA's and ESA's.



Figure 4-2: View across the Olifantsrivier floodplain from the northern end of the route.



Figure 4-3: Railway line and farming area next to the road.



Figure 4-4: One of several watercourses crossed by the road.

Climate

The mean annual rainfall for the area ranges between 218 mm and 305 mm (as per Cape Farm Mapper climatic data for 1950 to 2000). The peak rainfall periods are the months of March (autumn) and October/November (spring), while the summer months of December to February are the driest, i.e. a weak bimodal rainfall regime. The study area lies in the transition zone between the winter and summer rainfall regions. Mean monthly maximum and minimum temperatures are 30.7°C and 2.7°C for January/February and July, respectively (as per Cape Farm Mapper data). Frost incidence is about nine days per annum for Eastern Little Karoo (Mucina, 2006). The road is located inside two Köppen-Geiger climate zones, namely BSk (arid, steppe, cold) for its longest part and BWk (arid, desert, cold) for the northern end.

Geology

According to the 3322 Oudtshoorn 1:250 000 geological map, the road is underlain by three main geological units, namely (from north to south) alluvial valley deposits associated with the Olifantsrivier floodplain, followed by a ± 4 km stretch underlain by Enon conglomerate (Cretaceous to Tertiary age), and finally Bokkeveld Group sediments for the remainder of route (**Figure 4-5**). The latter, which belong to the Cape Supergroup, comprises shale, siltstone, sandstone and greywacke. Enon conglomerate and Bokkeveld

Group typically support succulent karoo vegetation in the area. The alluvial valley deposits support Muscadel Riviere, an azonal type, but which is now largely transformed by agriculture.



Figure 4-5: Exposed Enon conglomerate in a road cutting near WP10 (top), with exposed Bokkeveld shale (Karies Formation) at WP16 (bottom left) and a road cutting through sandstone/arenite (Boplaas Formation) between WP21 and WP22 (bottom right).

Biodiversity Planning Context

The study site is located inside a succulent karoo environment in the eastern Little Karoo. The indigenous species recorded along the road are typical succulent karoo species, such as *Leipoldtia schultzei*, *Tylecodon cacalioides*, *Crassula rupestris* and *Rhigozum obovatum*. According to the 2018 Vegetation Map of South Africa, the road is largely

located inside Eastern Little Karoo, with the northern end protruding into Muscadel Riviere (**Figure 4-6**). Eastern Little Karoo is found in the eastern basin of the Little Karoo from Calitzdorp in the west to Oudtshoorn in the east (Mucina, 2006). It then continues as a series of narrow belts from east of Oudtshoorn towards Uniondale and Willowmore. In the landscape, it is described as “irregularly flat plains and undulating piedmont hills covered by dense succulent shrubland dominated by Aizoaceae (*Ruschia* and *Drosanthemum*), Crassulaceae (*Cotyledon*, *Crassula* and *Tylecodon*) and non-succulent shrubs, such as *Nymanina*, *Pteronia* and *Searsia*” (Mucina, 2006). In a further refinement, Jan Vlok in his vegetation map of the Little Karoo² mapped it as De Rust Sandolien-Spekboomveld, Kandelaars Gannaveld, Kandelaars Arid Spekboomveld and Blossoms Asbos-Gwarrieveld, based on the prominence of certain species and location (**Figure 4-7**).

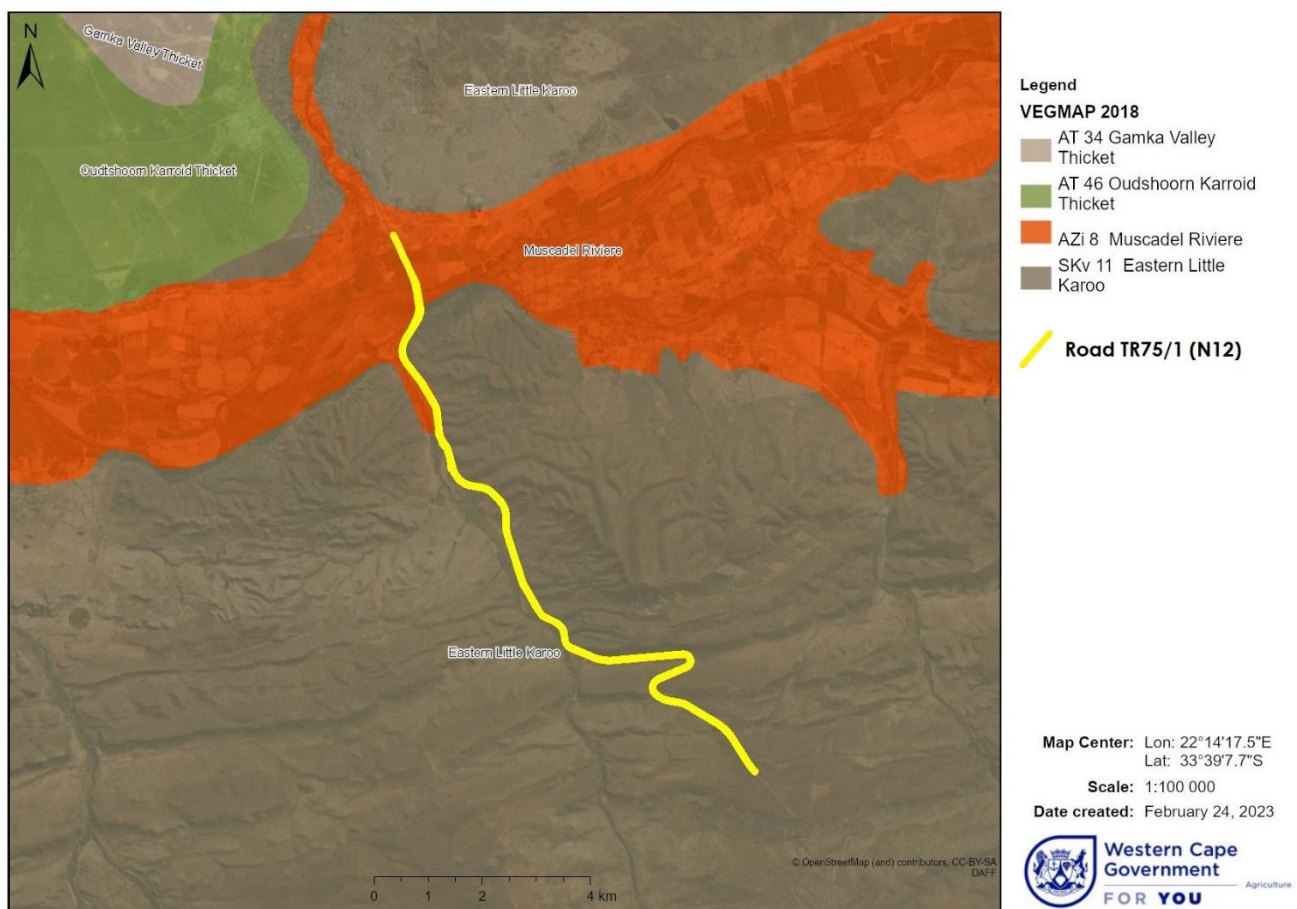


Figure 4-6: Extract of the 2018 SA Vegetation map.

Muscadel Riviere, an azonal vegetation type, is found on flat and often very broad river

² A composite vegetation map of the Riversdale, Little Karoo, Swartberg and Garden Route regions of the Southern Cape as classified by Jan Vlok, mapped at a scale of 1:50 000 for various projects (Vlok *et al.* 2005; Vlok, Euston-Brown & Wolf 2008; Vlok & de Villiers 2007) and combined into one continuous layer.

revised National List of Threatened Ecosystems (DEA, 2022). Only 37% of the unit is still left. It has been transformed mainly for cultivation (vineyards and orchards) and road building (Mucina, 2006). Small patches (<1%) are conserved at the Vrolijkheid Nature Reserve near McGregor and at Kammanassie Nature Reserve.

The majority of the road falls inside the Western Cape biodiversity network (**Figure 4-8**). It skirts two large terrestrial critical biodiversity areas (CBA's), while about half of the route runs through a terrestrial ecological support area (ESA). It also crosses numerous aquatic ESA's (non-perennial watercourses), including the Olifantsrivier which is indicated as a degraded ESA (ESA2). The non-perennial watercourse crossings itself are all indicated as degraded, presumably due to past earthworks associated with the road. All these form part of an extensive north-south orientated biodiversity corridor linking certain conservation areas and CBA's with the Kliprivier and Olifants.

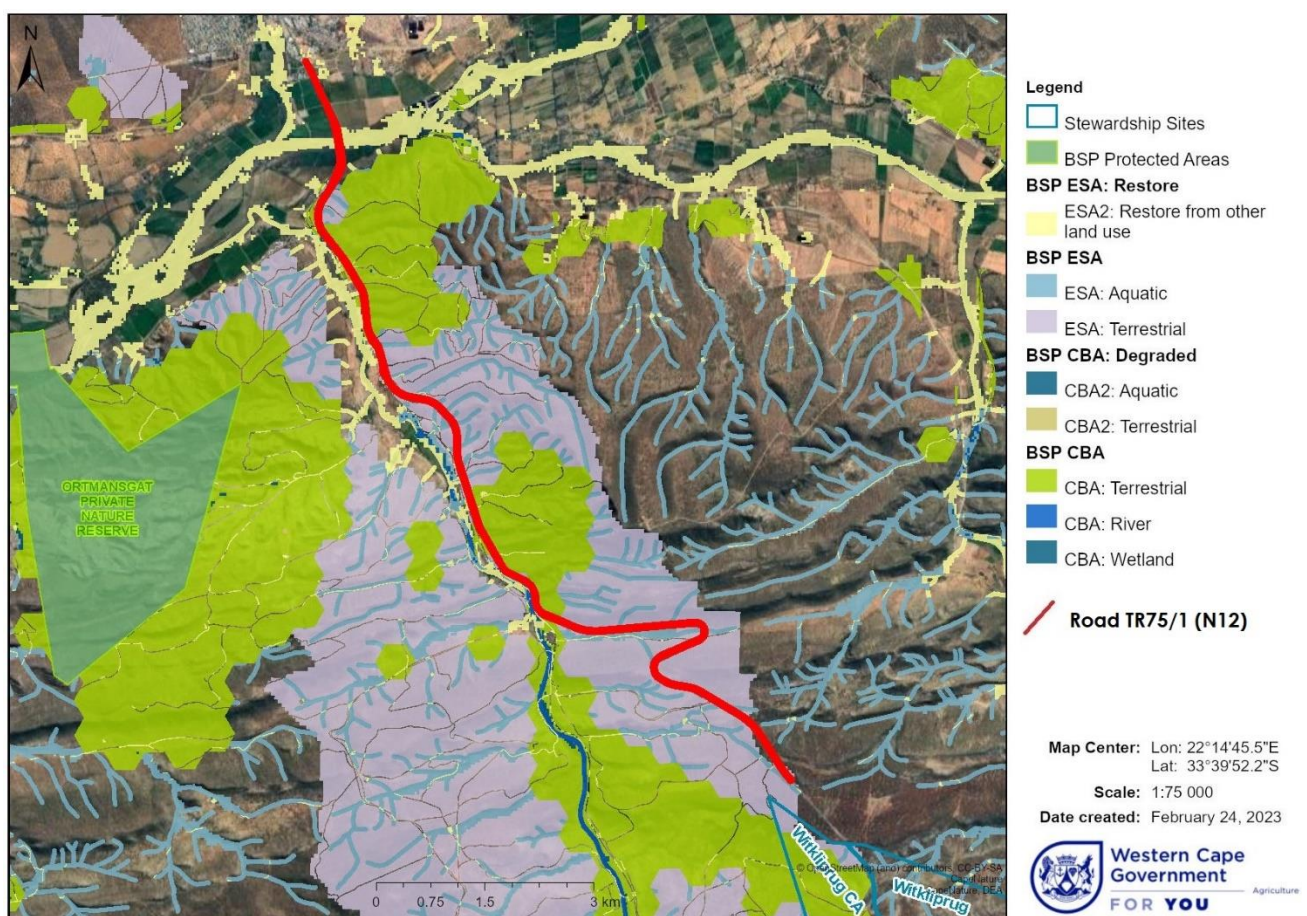


Figure 4-8: Extract of the Western Cape biodiversity network map.

Reasons for the importance of the CBA's and ESA's include the presence of SA vegetation types, threatened vegetation types (Eastern Little Karoo, Muscadel Riviere), threatened vertebrate habitat (Cape Mountain Zebra), ecological processes (FEPA river corridor), river types, wetland types and water resource protection (Gouritz, Southern Folded Mountains). The closest protected areas are the Witkliprug Conservation Area (CapeNature stewardship site) less than 0.5 km from the southern end of route and the Ortmansgat

Private Nature Reserve 2–3 km west of the road. The Doringrivier Wilderness Area is located more than 15 km away to the southwest.

CBA's are defined as areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet, 2017). These sites are selected for meeting national targets for species, habitats and ecological processes (Pool-Stanvliet, 2017). Many of these areas support known occurrences of threatened plant species, and/or may be essential elements of designated ecological corridors. Loss of designated CBA's is therefore not recommended. ESA's, on the other hand, are supporting zones required to prevent the degradation of CBA's and Protected Areas.

5. Results

In order to fulfil in the requirements of the terrestrial biodiversity and plant species protocols, this section describes the vegetation (terrestrial biodiversity) and plant species encountered in two subsections. In the plant species subsection specific reference is made to species of conservation concern (SCC).

Terrestrial biodiversity (vegetation)

Apart from a few patches of reed (*Phragmites australis*) and a few shrubs/trees, the Olifantsrivier floodplain in the vicinity of the road is highly transformed by agriculture and roadworks. Sections of the road through the hills are still flanked by good quality vegetation (Eastern Little Karoo), albeit modified in places. Some of it is regarded as highly sensitive where SCC were recorded. **Figures 5-1 to 5-5** show the botanical attributes of the road 'reserve' from north to south. The untuned sections of the road reserve are of low sensitivity due to a high degree of modification and lack of (or very little) biodiversity. This does not mean that these areas should be treated as such during the construction phase.

The vegetation inside the road 'reserve' (fenced-off area) is often highly modified due to past roadworks. Disturbances noted include cut-to-fill (along the steeper sections), infilling of watercourse crossings, road cuttings, lay-by's, farm entrances and stormwater trenches. Good (medium) quality vegetation is found along the length of the route from where the hills start just south of the Olifantsrivier floodplain. It includes areas slightly modified, as well as areas highly modified, but still covered with fair quality vegetation (secondary growth). Alien infestation is minimal, with only a few scattered invaders encountered, such as *Opuntia ficus-indica* and *Prosopis glandulosa*. **Figures 5-6 to 5-18** give a glimpse of the vegetation and disturbances encountered along the route (from north to south).

Structurally, the vegetation (Eastern Little Karoo) can be described as a low open to mid-dense succulent shrubland following Campbell's classification (Campbell, 1981). As noted

above the vegetation is highly modified in places, which affected its structural form and cover notably. Emergent species, such as *Euclea undulata*, *Portulacaria afra* and *Dodonaea viscosa*, are also prominent.

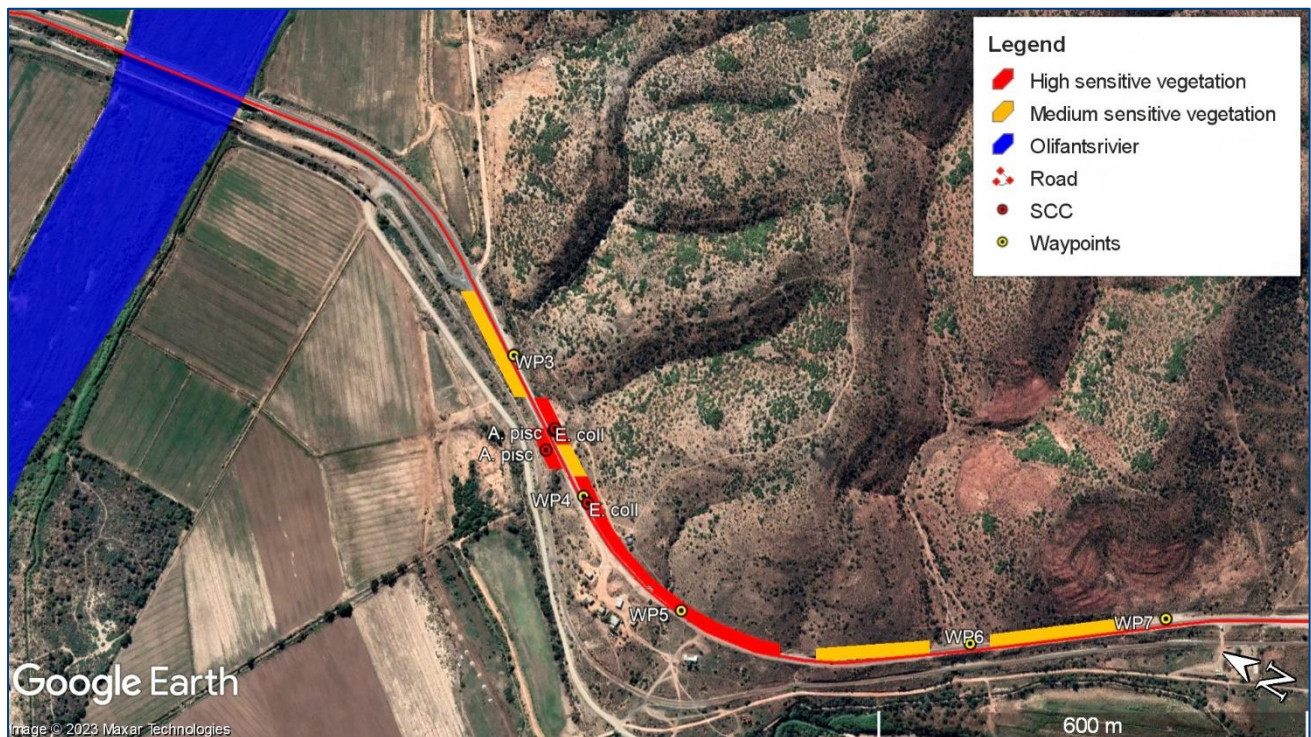


Figure 5-1: Botanical attributes of road reserve (WP3-WP7).



Figure 5-2: Botanical attributes of road reserve (WP8-WP12).

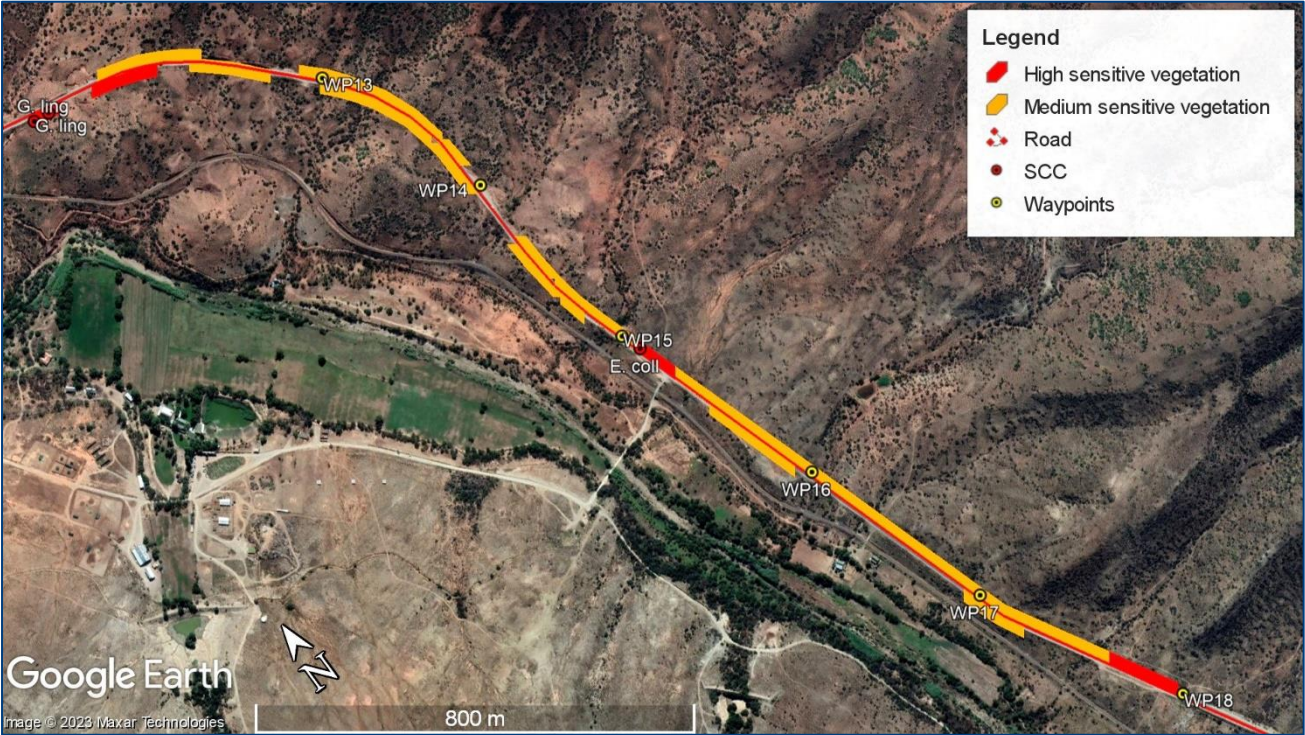


Figure 5-3: Botanical attributes of road reserve (WP12-WP18).

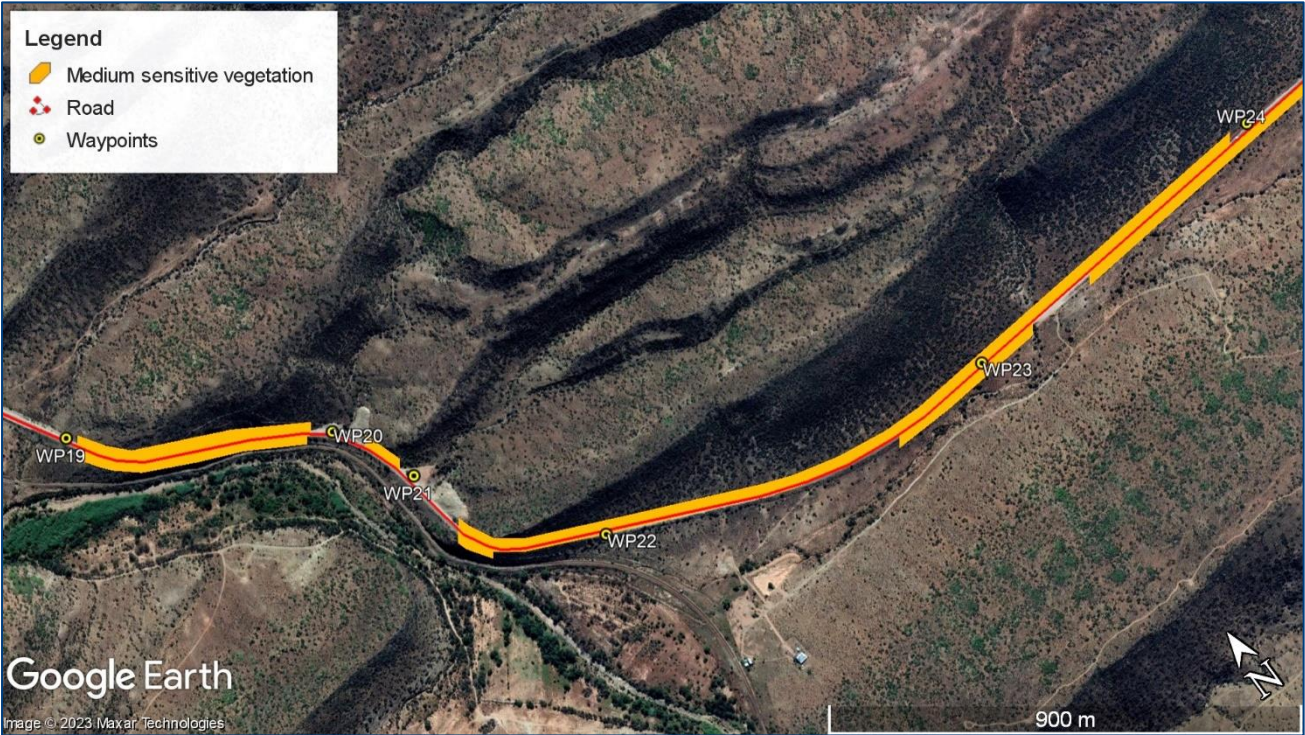


Figure 5-4: Botanical attributes of road reserve (WP19-WP24).

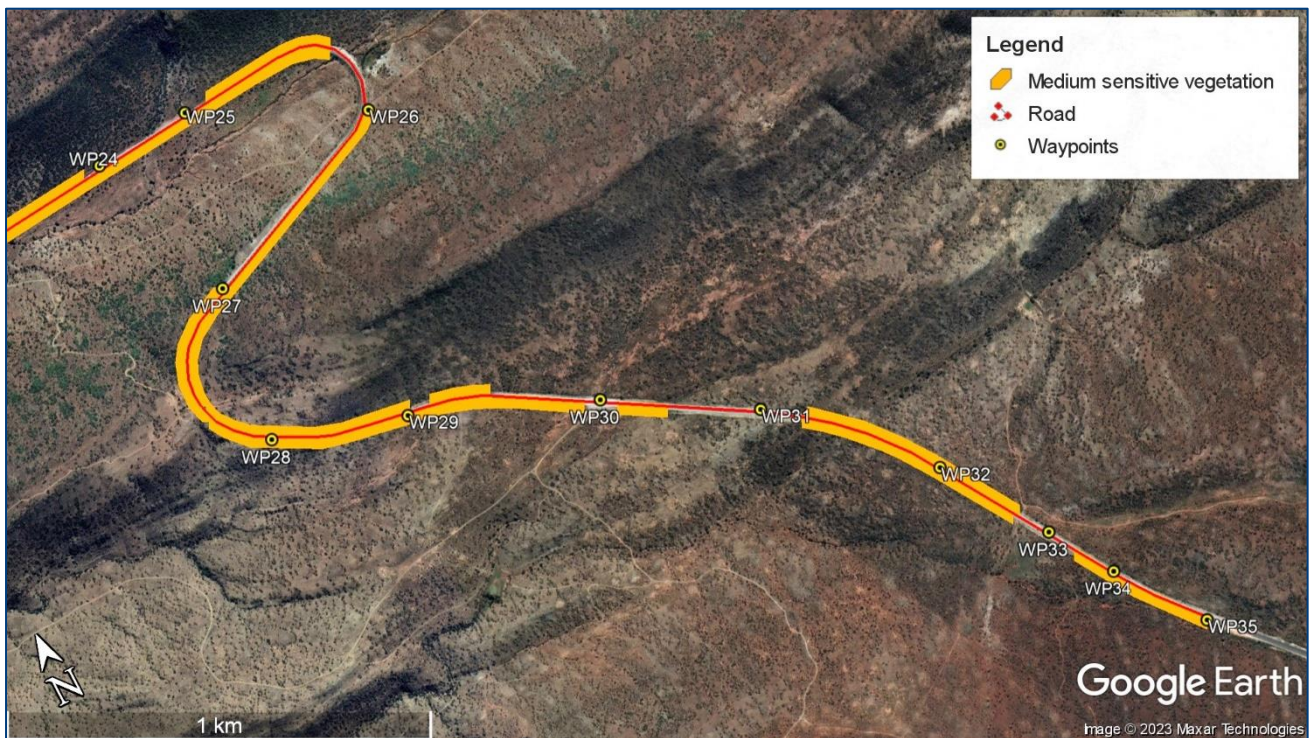


Figure 5-5: Botanical attributes of road reserve (WP24-WP35).



Figure 5-6: Olifantsrivier floodplain with a patch of *Phragmites australis* (WP2).



Figure 5-7: Fair quality succulent karoo at the start of hilly section (WP3).



Figure 5-8: Highly sensitive gravelly vegetation above road (between WP3 and WP4).



Figure 5-9: Disturbed embankment between the road and railway line (WP6).



Figure 5-10: Lay-by between WP7 and WP8.



Figure 5-11: Partly vegetated slope above embankment with stormwater cut-off trench (WP8).



Figure 5-12: Unstable embankment with a population of *Aloe ferox* above (between WP10 and WP11).



Figure 5-13: Fair quality vegetation below embankment (nearby WP11).



Figure 5-14: Eroded slope above road between WP12 and WP13.



Figure 5-15: Good quality vegetation at one of the road cuttings (between WP13 and WP14).



Figure 5-16: Excessive infilling at a lay-by, partly inside a watercourse (WP21).



Figure 5-17: Slope (spekboomveld) populated by *Portulacaria afra* (WP27).



Figure 5-18: Asbos-gwarrieveld near the southern end of route (WP32).

Plant species

A fairly high number of indigenous shrub species were recorded, including *Pteronia incana* (dominant), *P. fasciculata*, *P. paniculata*, *P. pallens*, *Athanasia trifurcata*, *Felicia filifolia*, *Helichrysum zeyheri*, *Dicerotheramnus rhinocerotis* (dominant in places), *Senecio cotyledonis*, *Gazania krebsiana*, *Pentzia incana*, *Chrysocoma ciliata*, *Osteospermum cf incanum*, *O. sinuatum*, *Oedera humilis*, *Cuspidia cernua*, *Berkheya cuneata*, *Macledium spinosum*, *Gloveria integrifolia*, *Curio radicans*, *Ruschia pungens* (dominant), *R. cradockensis*, *Leipoldtia schultzei* (dominant), *Antimima piscodora*, *Glottiphyllum depressum*, *G. linguiforme*, *Hereroa odorata*, *H. muirii*, *Drosanthemum hispidum* (dominant), *D. praecultum*, *D. globosum*, *D. karroense*, *D. barkerae*, *Mesembryanthemum junceum*, *M. englishiae*, *M. splendens*, *M. tortuosum*, *M. cf aitonis*, *M. nitidum*, *Cerochlamys pachyphylla*, *Pleiospilos compactus* ssp. *compactus*, *Malephora lutea* (dominant), *Aizoon africanum* (dominant), *Cotyledon orbiculata*, *Tylecodon cacalioides*, *Adromischus triflorus*, *A. filicaulis* ssp. *marlothii*, *Crassula subaphylla*, *C. atropurpurea*, *C. capitella*, *C. rupestris*, *C. cotyledonis*, *C. muscosa*, *C. expansa*, *Aloe ferox*, *Gonialoe variegata*, *Astroloba spiralis*, *Euphorbia mauritanica*, *E. colliculina*, *E. heptagona*, *Anacampseros telephiastrum*, *A. arachnoides*, *Vachellia karroo*, *Lotononis pungens*, *Rhigozum obovatum*, *Gymnosporia buxifolia*, *Euclea undulata*, *Lasiosiphon deserticola*, *Nymanina capensis*, *Dodonaea viscosa*, *Lycium oxycarpum*, *L. cinereum*, *Carissa haematocarpa*, *Microloma sagittatum*, *Gomphocarpus fruticosus*, *Piarranthus geminatus* ssp. *geminatus*, *Grewia robusta*, *Roepera morgesana*, *Tetraena chrysopteros*, *Pappea capensis*, *Portulacaria afra* (dominant in places), *Searsia pallens*, *Pelargonium trifidum*, *P. cf laxum*, *Polygala myrtifolia* var. *pinifolia*, *Hermannia fillifolia*, *H. althaeifolia*, *Asparagus retrofractus*, *Tribulus terrestris*, *Lacomucinaea lineata* and *Aptosimum indivisum*. Hemicryptophytes and geophytes recorded include *Cenchrus setaceus*, *Albuca canadensis*, *Bulbine frutescens*, *Tulbaghia violacea*, *Oxalis stellata* and *Haemanthus coccineus*. **Figure 5-19** shows a few of the recorded indigenous species.

The majority of the recorded species are widespread and common in succulent karoo. Pioneer species, such as *Drosanthemum hispidum*, *Malephora lutea*, *Aizoon africanum* and the grass *Cenchrus setaceus*, cover the more disturbed areas directly next to the road. Floristic association with Eastern Little Karoo is strong with a large number of important taxa recorded, including *Leipoldtia schultzei*, *Glottiphyllum linguiforme*, *Astroloba spiralis*, *Tylecodon cacalioides*, *Euphorbia colliculina* and *Searsia pallens*. Three SCC were recorded, namely *Antimima piscodora* (DDD), *Glottiphyllum linguiforme* (VU) and *Euphorbia colliculina* (EN). In addition to these, *Berkheya cuneata*, *Hereroa muirii*, *Cerochlamys pachyphylla*, *Pleiospilos compactus* ssp. *compactus*, *Tylecodon cacalioides*, *Astroloba spiralis* and *Polygala myrtifolia* var. *pinifolia* are regional endemics. As far as the author can detect (from iNaturalist records), *Syringodea derustensis* is the only other listed SCC recorded within 5 km from the road (see **Table 2-1**). However, there is a good chance that others, such as sensitive species 54 and 842, may also occur in the area. No protected tree species were recorded or are expected to occur in the area.



Figure 5-19: A few indigenous species recorded on site, with *Glottiphyllum depressum* (top left), *Leipoldtia schultzei* (top right), *Macledium spinosum* (middle left), *Antimima cf piscodora* (middle right), *Euphorbia colliculina* (bottom left) and *Astroloba spiralis* (bottom right).

Alien species recorded include *Ricinus communis* (castor-oil plant, category 2), *Prosopis glandulosa* (honey mesquite, 1b), *Schinus molle* (pepper tree), *Opuntia ficus-indica* (prickly pear, 1b), *Trichocereus cf spachianus* (torch cactus) and *Nicotiana glauca* (wild tobacco, 1b) (**Figure 5-20**). As indicated above, four of these are Category 1b and 2 invaders. In terms of the National Environmental Management: Biodiversity Act (NEMBA)

(Act 10 of 2004) Alien and Invasive Species List (2016), category 1b invasive species require compulsory control as part of an invasive species control programme. Also, the harbouring of category 2 species, such as *Ricinus communis*, is prohibited without a permit. The presence of these species is not problematic yet but requires attention to curb future problems.



Figure 5-20: A few alien species recorded along the road, with *Opuntia ficus-indica* (top left), *Trichocereus spachianus* (top right), *Prosopis glandulosa* (bottom left) and *Ricinus communis* (bottom right).

6. Potential Impacts

Terrestrial biodiversity (vegetation)

The vegetation type inside the road 'reserve' has been identified as Eastern Little Karoo, a succulent karoo type currently listed as Endangered. The road also crosses the Olifantsrivier floodplain, mapped as Muscadel Riviere. However, the latter is highly transformed, and the project is not expected to result in a loss in that regard. The impact on Eastern Little Karoo itself is impossible to quantify with the information in hand. In other words, it is not known how much and where vegetation will need to be cleared. Secondary growth (regrowth) on modified surfaces will mostly be affected, i.e. the vegetated areas

above and below the steep embankments. However, there are a few highly sensitive areas (strips) next to the road. Disturbance of these areas should be avoided. **Table 6-1** summarises the impact on terrestrial biodiversity.

Table 6-1: Impact on terrestrial biodiversity.

Phase	Construction Phase	Operational Phase
Nature of impact(s)	<ul style="list-style-type: none"> - Vegetation loss, mostly modified (secondary) Eastern Little Karoo. Sections have been identified as highly sensitive. - Slight impact on biodiversity network. - Increased alien infestation. - Erosion due to poor rehabilitation efforts. 	<ul style="list-style-type: none"> - Increased alien infestation. - Erosion due to poor vegetation cover and poorly maintained stormwater infrastructure.
Extent of impact	Road reserve and immediate surroundings	Road reserve and immediate surroundings
Duration	Permanent	Long term
Intensity	High	Medium
Probability of occurrence	High	High
Degree of reversibility	Medium	High
Irreplaceability of resource	Medium	Medium-low
Mitigatory potential	High	High
Significance before mitigation	Medium-high	Medium-low
Significance after mitigation	Medium-low	Low
Mitigation		
<ul style="list-style-type: none"> • During the construction phase, demarcate/fence off the construction footprint. Restrict all construction activities, such as stockpiling and parking, to already disturbed lay-by's away from natural vegetation and watercourses. The contractor(s) must be made aware of the sensitive surroundings. The succulent karoo outside the road footprint must be declared a 'no-go' area and not be disturbed in any way. • Remove topsoil and seedbearing plant material from the vegetated areas to be disturbed for use in the rehabilitation of disturbed areas after construction. • Rehabilitate/revegetate all the disturbed surfaces, especially the newly created slopes directly above and below the road. Erosion prevention measures may be needed on the steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. • As a long-term maintenance requirement, engage in alien clearing, focussing on invasive species such as castor-oil plant, honey mesquite, prickly pear and wild tobacco. These species are category 1b and 2 invaders that require compulsory control as part of an invasive species control programme. • Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction. 		

The impact will involve extensive earthworks, including the widening of the current road surface to include surfaced shoulders and auxiliary lanes, widening of existing cut and fill slopes, and the enlargement of culverts and inlet/outlet structures. It is therefore expected that some vegetation will be lost. From the embankment excavation/fill details provided, it is estimated that about 150 m of high sensitive vegetation frontage and 2.65 km of medium sensitive vegetation frontage will be affected. The amount of vegetation loss is impossible to determine at this point in time. Care must be exercised to ensure that vegetation outside the works areas is not disturbed. Given the linear nature of the project and the modified state of the fringing vegetation, the impact on terrestrial biodiversity is of a medium to high concern.

For its longest section, the road passes through an extensive north-south orientated biodiversity corridor linking certain conservation areas and CBA's with the Kliprivier and Olifants. Apart from providing a backbone to the local biodiversity network, the corridor serves as an important passage along which fauna can migrate between the CBA's and conservation areas. With the road running through a largely intact part of the network albeit disturbed/degraded in places, one can expect a slight impact on its functionality. This impact should be temporary though. The impact on water resources (aquatic ESA's) should be minimal if further infilling at the watercourses is avoided. Improved stormwater drainage and management should improve the current situation.

The rehabilitation potential of the disturbed areas post construction should be good. Likely, most of the species which originally occurred along the road will return to the road reserve, including the aliens. As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of invasive alien species. The presence of invasives, such as castor-oil plant, honey mesquite and wild tobacco, will exacerbate this impact. Therefore, as an operational phase maintenance concern, keep the road reserve clear of invasive aliens. As stated earlier, it is a legal requirement for the landowner to clear/control the invasive aliens on their land.

Plant species

The impact on plant species, including SCC and regional endemics, is also expected to be of a medium-high concern. Threatened species that could potentially be affected by the project, include *Antimima piscodora* (DDD), *Glottiphyllum linguiforme* (VU) and *Euphorbia colliculina* (EN). These species have only been recorded in a few places along the road, which have been mapped as highly sensitive. In addition to these, *Berkheya cuneata*, *Hereroa muijii*, *Cerochlamys pachyphylla*, *Pleiospilos compactus* ssp. *compactus*, *Tylecodon cacalioides*, *Astroloba spiralis* and *Polygala myrtifolia* var. *pinifolia* are regional endemics. The possible presence of winter-spring flowering bulbs must not be excluded.

No protected tree species will be affected by the project. A strong mitigation measure will be to search and rescue plants from the construction area, which can then be used to

rehabilitate the disturbed areas post construction. This aspect needs to be managed by an experienced rehabilitation specialist. **Table 6-2** summarises the impact on plant species, including SCC and regional endemics.

Table 6-2: Impact of the project on indigenous flora and SCC.

Phase	Construction Phase	Operational Phase
Nature of impact(s)	- Loss of indigenous flora and SCC	- Alien infestation and resulting displacement of indigenous flora
Extent of impact	Road reserve and immediate surroundings	Road reserve and immediate surroundings
Duration	Long term	Long term
Intensity	Medium	Low-medium
Probability of occurrence	High	High
Degree of reversibility	Medium	High
Irreplaceability of resource	Medium	Medium
Mitigatory potential	High	High
Significance before mitigation	Medium-high	Medium-low
Significance after mitigation	Medium-low	Low
Mitigation		
<ul style="list-style-type: none"> During the staking out of the construction area take cognisance of the highly sensitive and medium sensitive areas next to the road. Try and avoid or minimise disturbance of these areas as far as practically possible. Search and rescue succulents and bulbs from the construction area for replanting in the disturbed or rehabilitation areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose, especially cuttings from succulents and <i>Pelargonium</i> species. Bulbs should be removed along with some soil, placed in gel, bagged and then taken to a nursery for temporary storage or transplanted directly in the receiving area. Search and rescue should be done at an appropriate time of the year, preferably when the soil is wet during the raining season. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering. Please note that a CapeNature permit is needed for the removal/relocation of indigenous plant species. A Search & Rescue and Rehabilitation Plan will be needed. 		

The **cumulative botanical impact** of the project is expected to be equivalent to the impact on terrestrial biodiversity described above, i.e. the continued erosion of Eastern Little Karoo and the biodiversity network as a result of road works. In this instance, the loss of biodiversity and resultant cumulative impact will be of medium-low significance (with mitigation) due to the nature of the project and the potential for rehabilitation.

7. Recommended Mitigation Measures

The following mitigation measures are required to ensure that the impact on terrestrial biodiversity and plant species is minimal:

- During the construction phase, demarcate/fence off the construction footprint. Restrict all construction activities, such as stockpiling and parking, to already disturbed lay-by's away from natural vegetation. The contractor(s) must be made aware of the sensitive surroundings. The succulent karoo outside the road footprint must be declared a 'no-go' area and not be disturbed in any way.
- During the staking out of the construction area take cognisance of the highly sensitive and medium sensitive areas next to the road. Try and avoid or minimise disturbance of these areas as far as practically possible.
- Remove topsoil and seedbearing plant material from the vegetated areas to be disturbed for use in the rehabilitation of disturbed areas after construction.
- Search and rescue succulents and bulbs from the construction area for replanting in the disturbed or rehabilitation areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose, especially cuttings from succulents and *Pelargonium* species. Bulbs should be removed along with some soil, placed in gel, bagged and then taken to a nursery for temporary storage or transplanted directly in the receiving area.
- Search and rescue should be done at an appropriate time of the year, preferably when the soil is wet during the raining season. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering. Please note that a CapeNature permit is needed for the removal/relocation of indigenous plant species.
- Rehabilitate/revegetate all the disturbed surfaces, especially the newly created slopes directly above and below the road. Erosion prevention measures may be needed on the steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. A Search & Rescue and Rehabilitation Plan will be needed.
- Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction.
- As a long-term maintenance requirement, engage in alien clearing, focussing on invasive species such as castor-oil plant, honey mesquite, prickly pear and wild tobacco. These species are category 1b and 2 invaders that require compulsory control as part of an invasive species control programme.

8. Conclusion & Recommendation

This report presents results from a desktop study, as well as a field survey conducted on

7 and 8 March 2022, to ascertain terrestrial biodiversity and plant species constraints and impacts associated with the proposed upgrading of road TR75/1 (N12 highway) southeast of Oudtshoorn.

The affected vegetation bordering on the road has been identified as Eastern Little Karoo, a succulent karoo type. Despite its threat (endangered) status and the position of the road inside the biodiversity network, it is highly degraded in places. Mostly secondary growth (regrowth) vegetation will be affected. However, there are a few highly sensitive strips next to the road. Disturbance of these areas should be avoided or minimised. Alien infestation is fortunately still minimal, but it requires attention. The majority of the recorded plant species are common and widespread in the region. Three SCC could potentially be affected by the project, including *Antimima piscodora* (DDD), *Glottiphyllum linguiforme* (VU) and *Euphorbia colliculina* (EN). In addition to these, several more regional endemics were recorded in the road 'reserve'. The feasibility of rehabilitation after construction is good, but a rehabilitation specialist needs to be contracted. All in all, the impact on both terrestrial biodiversity and plant species is expected to be of medium-low significance, with mitigation.

It is therefore recommended that the project be considered for approval, but subject to the proposed mitigation measures listed above.

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