Clearing Assessment Report – CPS 818

We're working for Western Australia.

Indian Ocean Drive Widening
SLK 219-253
Mid West Gascoyne
EOS 2359

D23#561925
September 2023

Contents

List of Figures

List of Tables

Document Control

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	[REDACTED] Project Consultant	Draft v1	21/04/2023
Reviewer:	[REDACTED] Technical Director	Draft v1	21/04/2023
Reviewer:	[REDACTED] Environment Contractor Main Roads	Draft v1	26/04/2023
Author:	[REDACTED] Project Consultant	Final v1	17/05/2023
Reviewer:	[REDACTED] Technical Director	Final v1	17/05/2023
Reviewer:	[REDACTED] Environment Contractor Main Roads	Final v1	1/06/2023
Author:	[REDACTED] Project Consultant	Final v2	11/06/2023
Reviewer:	[REDACTED] Principal Environmental Consultant	Final v2	13/06/2023
Author:	[REDACTED] Project Consultant	Draft v3	21/08/2023
Reviewer:	[REDACTED] Technical Director	Draft v3	25/08/2023
Reviewer:	[REDACTED] Environment Contractor Main Roads	Draft v3	05/09/2023
Author:	[REDACTED] Project Consultant	Final v3	12/09/2023
Author:	[REDACTED] Project Consultant	Final v4	29/09/2023
Reviewer:	[REDACTED] Environment Contractor Main Roads	Final v5	29/09/2023

1 PROPOSAL

1.1 Purpose and Justification

The purpose of this Clearing Assessment Report (CAR) is to provide a report detailing the assessment of native vegetation clearing that is proposed to be undertaken using Statewide Clearing Permit CPS 818 issued by Main Roads Western Australia (MRWA).

The CAR outlines the key activities associated with the Proposal, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the Proposal using the ten Clearing Principles, and the strategies used to manage vegetation clearing.

Indian Ocean Drive (IOD) is part of the State Road Network and is the major traffic artery extending along the coast from Yanchep through to its connection to the Brand Highway just south of Dongara. IOD has experienced an increase in traffic volumes since opening which has raised several safety issues for road users. The Indian Ocean Drive Proposal is approximately 33km in length, which will represent a substantial upgrade over several years.

To improve road user safety Main Roads Western Australia (MRWA) intends to widen Indian Ocean Drive (IOD) in stages over the next several years (the Proposal) between Straight Line Kilometre (SLK) 219.85 and 253.18 (Refer Figure 1). The Proposal will implement realignment where road curvature is excessive and is comprising the safety of road-users.

The Proposal will greatly reduce the estimates 'Killed or Seriously Injured' crash rate, as well as increase the efficiency of freight movements.

1.1.1 Main Roads Approach to Road Safety and the Environment

Main Roads is committed to minimising the environmental impacts of all of its activities, and manages the State road network to achieve balanced economic, social, safety and environmental benefits for the community. Main Roads recognises that Western Australia's environment is significant from a global perspective and the unique conservation values that are contained within its road reserve. Main Roads' road network often adjoins natural areas and, in some locations, the reserve itself hosts remnant vegetation with high environmental values. Although the reserves were not established for this purpose, Main Roads recognises that it has a responsibility to conserve the environmental values that occur within the State's road network and minimise the impact its proposals have on the environment. In addition to providing a safe and efficient road network for all people using the roads under its control, Main Roads is also committed to protecting and enhancing the natural environment.

In accordance with National and State Government road safety policies, Main Roads is also committed to substantially reducing road trauma on the road network through Safe System principles. The Safe System approach acknowledges that more than two thirds of all serious crashes are due to human error rather than deliberate risk taking (e.g. speeding or drink driving) and seeks to improve behaviour through education and enforcement while managing the safety of vehicles, speeds and the road and road infrastructure. It is shown that improving sub-optimal road formation will substantially reduce the likelihood and severity of road crashes. For example, according to the Road Safety Management Guideline, increasing the sealed shoulder from 0.5 m to 2 m will reduce Killed and Seriously Injured numbers by more than 50%.

As the statutory authority responsible for providing and managing a safe and efficient main road network in Western Australia, Main Roads focuses on improving road safety by thoroughly considering all environmental, economic and community benefits and impacts. It operates on a hierarchy of avoiding, minimising, reducing and then, if required, offsetting our environmental impacts. This has been achieved through changes in Proposal scope and design. Main Roads regularly reduces its clearing footprint by restricting earthworks limits for Proposals, steepening batters, installing barriers, establishing borrow pits in cleared paddocks and avoiding temporary clearing for storage, stockpiles and turn around bays to avoid and minimise its impacts.

Further details on measures to avoid, minimise and reduce are provided in Section 1.5.

1.2 Proposal Scope

Main Roads proposes to widen and upgrade IOD between 219.85 and 253.18 SLK. The upgrade will comprise the following:

- Clearing for construction.
- Road widening to achieve a 10m seal on 10m Pavement.
- Installation of audible edge lines.
- Various intersection upgrades.
- Re-alignment of several sections between SLK227 and 237.
- Addition of passing lanes at SLK 232 and 236.

For the section to be realigned, construction of new road may deviate from the existing alignment by up to 150m to reduce existing substandard horizontal and vertical alignment to increase road user safety, particularly through SLK 227.7- SLK 228.5.

1.3 Proposal Location

The Proposal is located on a section of the Indian Ocean Drive, extending from approximately 11km north of Leeman to 35km south of Port Denison (SLK 219.85 – SLK 253). The northern portion of the Proposal Area is located within the Shire of Irwin and the southern portion is within the Shire of Carnamah.

The location of the proposed works is shown at Figure 1 and detailed view of the Proposal Area is provided in Figures 3A-Q, 4A-Q, and 5A-Q (Appendix 2).

1.4 Clearing Details

Proposed Clearing to be undertaken using CPS 818:
The Proposal Area totals 114.90ha, of which up to 73.64ha of native vegetation clearing is proposed under the CPS 818 approval.

Areas of Native Vegetation Clearing:
A broad scale view of the clearing area is provided in Figure 1. Detailed view of the proposed clearing area is also provided in Figures 3A-Q, 4A-Q, and 5A-Q, where symbology indicates the populations of flora species, vegetation units and vegetation condition within the Proposal Area.

Type of Native Vegetation:
Eight vegetation units as identified by Focused Vision Consulting (2022) and four vegetation units as identified by Astron (2017) will be impacted by the proposed clearing. None of the vegetation units

represent listed Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs).

The types of vegetation to be cleared under this Proposal are identified in further detail in Section 4.

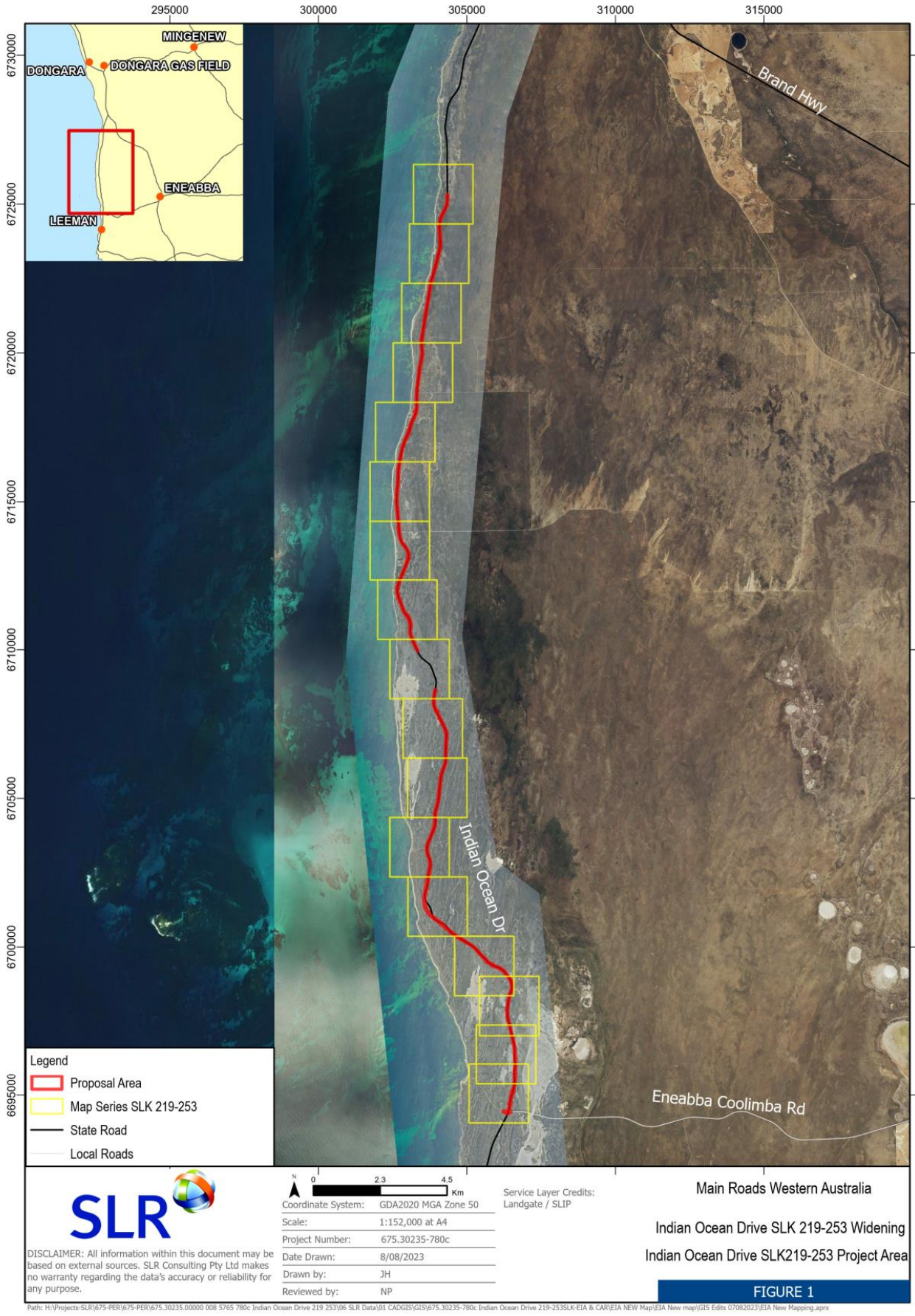


Figure 1. Proposal Area Indian Ocean Drive Widening SLK 219-253.

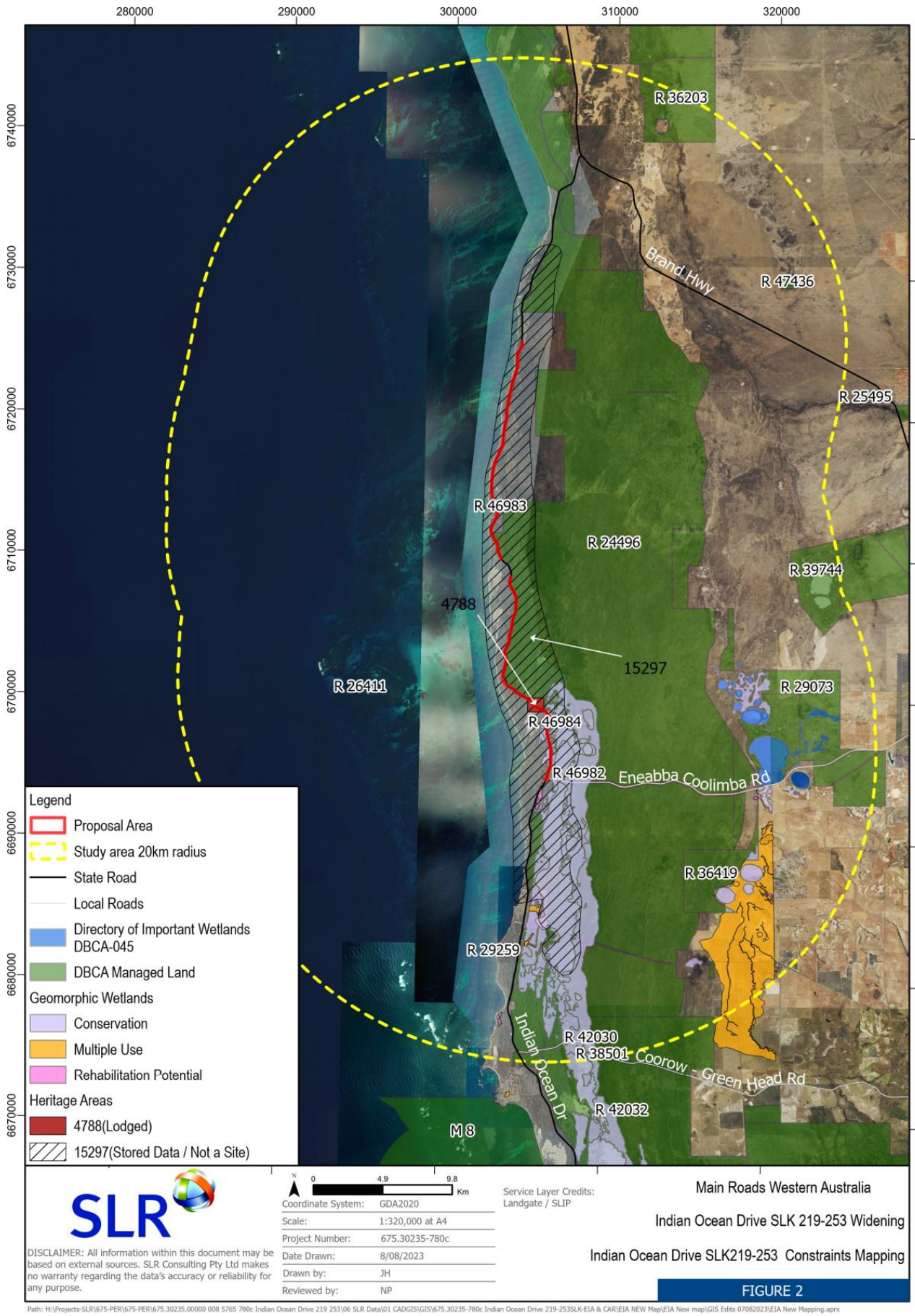


Figure 2. Indian Ocean Drive SLK 219-253 Constraints Mapping.

1.5 Alternatives to Native Vegetation Clearing Considered During Proposal Development

The following alternatives to clearing were considered during the development of the Proposal:

- Re-alignment to be placed entirely within previously cleared areas devoid of vegetation is not considered feasible as this constraint introduces more safety risks (e.g., sharp bends and corners).
- Not upgrading the road, however this will potentially result in a degradation of the road leading to a poorer safety outcome and may result in future fatalities or serious injuries.
- Alternatives to clearing were not feasible as the Proposal involves widening of the existing Indian Ocean Drive, however existing cleared areas along the roadside will be utilised where possible to reduce clearing of native vegetation.
- A balance between the materials required, safety requirements (i.e. reduce existing substandard horizontal and vertical curves to increase road user safety) and cost was undertaken resulting in the proposed Proposal Area.

1.6 Measures to Avoid, Minimise, Reduce and Manage Proposal Clearing Impacts

The design and management measures implemented to avoid and minimise the potential clearing impacts of the Proposal are provided in Table 1. In addition, the following measures have also been considered:

- The proponent will provide specific details for the site to contractors before they commence any works to reduce the risk of over clearing or clearing the wrong areas.
- Where Priority species are located directly adjacent to the proposed clearing, a botanist will be required on site to demarcate by flagging tape, Priority species and areas to avoid prior to clearing.
- GPS coordinates of the Native Vegetation Clearing Area boundary to be supplied to contractor/personnel undertaking the clearing activities.
- Prior to clearing of the Native Vegetation Clearing Area, the area will be demarcated by Survey Stakes, coloured flagging tape, or bunting and all personnel will be made aware of the requirement to protect and retain vegetation beyond permitted areas.
- Vegetation clearing will be scheduled to occur immediately before planned works to minimise the potential for dust emissions, where possible. The use of a watering cart will also be used for dust suppression where required.

Table 1. Measures Undertaken to Avoid, Minimise, Reduce and Manage the Proposal Clearing Impacts

Design or Management Measure	Discussion and Justification
Use of existing cleared areas for access tracks, construction storage and stockpiling.	Existing cleared areas consisting of an approximate 40.51ha total will be utilised in the Proposal Area where necessary for access tracks, storage, and stockpiling. The use of existing drainage infrastructure locations for four new culverts will reduce proposed clearing.
Alignment to one side of existing road	This is not a suitable measure as the works are being undertaken predominantly on the existing formation and within the maintenance areas where possible. Road user safety will be increased by the proposed realignment by up to 150m from the existing alignment particularly through SLK 227.7- SLK 228.5, to reduce existing substandard horizontal and vertical alignments. If the Proposal is not undertaken, this would likely result in no road user safety improvements, which is unacceptable to Main Roads on this dangerous stretch of road network.
Alternative alignment located within pasture or degraded areas	Existing cleared areas consisting of an approximate 40.51ha total will be utilised in the Proposal Area where necessary for the Indian Ocean Drive widening including access tracks, storage, and stockpiling. Where realignment is proposed particularly through SLK 227.7- SLK 228.5, the new road may deviate from the existing alignment by up to 150m to reduce existing substandard horizontal and vertical alignments to increase road user safety. Similar native vegetation is located within the area, including a DBCA managed nature reserve (Beekeepers Nature Reserve, R24496) conserving flora directly adjacent to the Proposal Area. Road widening to achieve a 10m wide seal on a 10m wide pavement.
Simplification of design to reduce number of lanes and/or complexity of intersections	Design has been reduced from "9m seal on 11m Pavement" to "10m seal on 10m Pavement". A significant amount of work has been done to balance the acceptable risk and design. Some Intersections have been redefined as driveways for the duration of works to reduce the complexity of intersections.
Stockpiling Topsoil	Topsoil containing seedbanks will be collected and stockpiled from the Proposal to be preferentially spread in degraded areas within the IOD Proposal where vegetation is regionally and similarly represented.

1.7 Approved Policies and Planning Instruments

The clearing of native vegetation in Western Australia is regulated under the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act, Main Roads has also had regard to the below instruments where relevant.

Other Legislation potentially relevant for assessment of clearing and planning/other matters:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Conservation and Land Management Act 1984* (WA) (CALM Act)
- *Country Areas Water Supply Act 1947* (WA) (CAWS Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Planning and Development Act 2005* (WA) (P&D Act)
- *Soil and Land Conservation Act 1945* (WA)
- *Rights in Water and Irrigation Act 1914*
- *Aboriginal Heritage Act 1972* (WA).
- *Aboriginal Cultural Heritage Act 2021* (WA).
- *Bush Fires Act 1954* (WA).

Environmental Protection Policies:

- Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992
- Environmental Protection (Western Swamp Tortoise Habitat) Policy 2011.

Other relevant policies and guidance documents:

- Environmental Offsets Policy (Government of Western Australia, 2011)
- A guide to the assessment of applications to clear native vegetation (Government of WA, December 2014)
- Procedure: Native vegetation clearing permits (Government of WA, October 2019)
- Environmental Offsets Guidelines (Government of Western Australia, 2014)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016)
- Technical guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)
- Approved conservation advice under section 266B of the EPBC Act for threatened flora/fauna/vegetation communities.
- Approved Recovery Plans for threatened species.
- Strategic advice – EPA

2 SCOPE AND METHODOLOGY OF CLEARING DESKTOP/ASSESSMENT

Native vegetation will be cleared to accommodate this Proposal. This clearing will be undertaken using the Main Roads Statewide Clearing Permit CPS 818.

To comply with CPS 818, Main Roads must prepare a Clearing Assessment Report (CAR).

The CAR outlines the key activities associated with the Proposal, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the Proposal using the ten Clearing Principles listed under s51 of the *Environmental Protection Act 1986* (EP Act) and strategies used to manage vegetation clearing.

2.1 Report Terminology and Sources

The following terms are used in this Clearing Report:

- **Native Vegetation Clearing Area** - The maximum amount of native vegetation to be cleared for the Proposal that will accommodate the designed earthworks and, typically, a nominal buffer to allow for the safe movement of machinery during construction.

- **Proposal Area** – The total footprint of the Proposal including both cleared and uncleared areas based on the current design. It includes a buffer to allow for constructability and the movement of machinery during construction.

- **Study Area** – Area covered by the Desktop Assessment. The Study Area for the Proposal is confined to a local area of a 20km radius.

- **Survey Area** – Area covered by the Biological Surveys.

2.2 Desktop Assessment

A desktop assessment of the Proposal Area was undertaken by viewing internal datasets and other government agency managed databases, and consulting with relevant stakeholders where necessary.

GIS layer viewing and mapping is done using ArcMap and/or Main Roads corporate mapping system known as iMaps. Referencing of the GIS layers accessed is done under the relevant methodology section of each clearing principle. Government managed databases were searched to locate additional information, which are found under References in Section 10.

2.3 Surveys and Assessments

The following surveys/assessments were undertaken to inform this CAR:

- Biological survey including a single-phase, detailed, and targeted flora, vegetation, and fauna assessment and a Black-Cockatoo habitat survey (Focused Vision Consulting, 2022).
- Biological assessment which included detailed and targeted surveys for flora, vegetation, and fauna as well as a Black-Cockatoo habitat survey (Astron, 2017).

A summary of the methodology and the results of the above surveys are provided in Section 3.

3 SUMMARY OF SURVEYS

3.1 Overview of Surveys

Main Roads commissioned biological surveys in 2017 and 2022 including a single-phase, detailed, and targeted flora, vegetation and fauna assessment and a Black-Cockatoo habitat survey. The biological surveys provided an understanding of the environmental values present within the Proposal Area. Biological and targeted surveys conducted for the Proposal are outlined in Table 2. A summary of the findings in these reports are presented in Sections 3.2.

Table 2. Summary of Biological and Targeted Surveys Relevant to the Proposal

Consultant & Survey Name	Survey Details
Focused Vision Consulting (2022) Biological Survey Indian Ocean Drive Widening, SLK 220-250	**Survey Area:** A 309.50ha Survey Area commencing near Freshwater Bay, extending approximately 32km south along Indian Ocean Drive to the Coolimba-Eneabba Road intersection. It includes approximately 2km of the Coolimba-Eneabba Road from the western coastline extending east. **Type:** *Biological assessment which included a single-phase, detailed and targeted flora, vegetation and fauna assessment as well as a Black-Cockatoo habitat survey.* **Timing:** Fieldwork conducted in 2021. **Survey Results Shapefile TRIM Ref:** D22#1138395 **Document TRIM Ref:** D22#1138975
Astron Environmental Services (Astron) (2017) Biological Survey Indian Ocean Drive: Passing Lane SLK 151 to 153.84 and Widening SLK 248 to 258	**Survey Area:** A 60.28ha Survey Area located south of Dongara at straight line kilometre 248-258. **Type:** *Biological assessment which included detailed and targeted surveys for flora, vegetation and fauna as well as a Black-Cockatoo habitat survey.* **Timing:** Fieldwork conducted in 2017. **Survey Results Shapefile TRIM Ref:** D23#924737 **Document TRIM Ref:** D17#494254

3.2 Summary of Flora and Vegetation Surveys

3.2.1 Focused Vision Consulting (2022)

The Indian Ocean Drive Widening SLK 220-250 Biological Survey was undertaken by Focused Vision Consulting in October 2021 and covered an area of 309.50ha. The survey included a desktop study of a 20km buffer around the Proposal Area, followed by detailed and targeted flora and vegetation survey, basic fauna survey and Black-Cockatoo habitat assessment.

The key findings of the biological field survey are detailed below.

Flora:

- A total of 216 flora species from 151 genera and 67 families were recorded. Of this, 186 (86.11%) were native species and 30 (13.88%) were weed species.
- Dominant families included Poaceae (21 taxa), Asteraceae (19 taxa) and Chenopodiaceae (13 taxa).
- No Threatened species under the EPBC Act or under the BC Act were recorded.
- Thirty weed species were identified, however no species were recorded as Weeds of National Significance (WoNS) and/or Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).
- Seven Priority flora species, six Priority 3 and one Priority 4 flora species were recorded in the Survey Area:
    - *Beyeria cinerea* subsp. *cinerea* (Priority 3) – two individuals.
    - *Calandrinia oraria* (Priority 3) – three individuals.
    - *Haloragis foliosa* (Priority 3) – 24 individuals.
    - *Hemiandra* sp. *Eneabba* [H. Demarz 3687] (Priority 3) – four individuals.
    - *Stylidium maritimum* (Priority 3) – 57 individuals.
    - *Thryptomene* sp. Lancelin (Priority 3) – 100 individuals.
    - *Grevillea olivacea* (Priority 4) – 205 individuals.

    - However, within the Proposal Area, only four Priority flora species were identified comprising Priority 3 flora species (Focused Vision Consulting, 2022; Astron, 2017):
        - *Haloragis foliosa* (Priority 3) – 24 individuals.
        - *Hemiandra* sp. Eneabba [H. Demarz 3687] (Priority 3) – one individual.
        - *Stylidium maritimum* (Priority 3) – 18 individuals.
        - *Thryptomene* sp. Lancelin (Priority 3) – 50 individuals.

- *Beyeria cinerea* subsp. *cinerea* (Priority 3), is known from 53 FloraBase records. Distributions range between Gregory to the north and Mandurah to the south, therefore it is not considered to be restricted to the Proposal Area and is not considered to be significantly impacted by the Proposal.

- *Calandrinia oraria* (Priority 3), is known from 14 FloraBase records and is distributed between Mandurah to the south and Port Denison to the north and is therefore not considered to be restricted to the Proposal Area. The closest DBCA-reported population is approximately 15km south south-west of the Proposal Area. Typical species habitat is likely to occur beyond the bounds of the Proposal Area (Focused Vision Consulting, 2022).

- *Haloragis foliosa* (Priority 3), is known from 12 FloraBase records and is distributed between Cervantes to the south and Port Denison to the north. DBCA records indicate the occurrence of

this species within 230m of the Proposal boundary. *Haloragis foliosa* is typically found on sandy clay over laterite, which is likely to extend along the coast outside of the Proposal Area and therefore, no significant impacts are expected from the Proposal (Focused Vision Consulting, 2022).

- *Hemiandra* sp. Eneabba (H. Demarz 3687) (Priority 3), is known from 35 FloraBase records and is distributed between Green Head to the south and Port Denison to the north. This species is typically found on sand and disturbed sites and suitable species habitat is likely to occur outside of the Proposal Area (Focused Vision Consulting, 2022).

- *Stylidium maritimum* (Priority 3), is known from 45 FloraBase records and is largely distributed along the coast between Preston Beach to the south and Port Denison to the north. *Stylidium maritimum* species habitat is considered to be widely distributed along the coast between the species current known range (Focused Vision Consulting, 2022).

- *Thryptomene* sp. Lancelin (Priority 3), is known from 29 FloraBase records and is distributed between Ledge Point to the south and Port Denison to the north and typically occurs on calcareous sand. The abundance of plants recorded outside the Proposal Area indicates likely suitable habitat and the population that extend beyond the bounds of the Proposal Area (Focused Vision Consulting, 2022).

- *Grevillea olivacea* (Priority 4) is known from 35 FloraBase records and is distributed between Woodman Point to the south and Geraldton to the north. An additional 17 individuals were recorded outside the Proposal Area, and it is considered likely for suitable habitat to occur beyond the Proposal Area (Focused Vision Consulting, 2022).

- Five range extension flora species were recorded within the Survey Area as exhibiting an extension beyond their currently known documented range, which ranged from 136 to 237km from Western Australian Herbarium records, however, the species are known to be widely distributed, may occur in associated vegetation types surrounding the Proposal, and are known from 18 to 143 FloraBase records (Focused Vision Consulting, 2022).

Vegetation:

- A total of eight (8) vegetation units were identified from the Survey Area (Focused Vision Consulting, 2022). The remnant vegetation units comprise of three Acacia/Melaleuca shrublands (AaAh, AaRpSa, AaRbSa) one Melaleuca shrubland (McTr), two Melaleuca woodlands (MlCp, MlDaBd), one Melaleuca forest (MlGtTd) and one Samphire Shrubland (TiFpTm).
- Only one vegetation unit was considered to represent Riparian Vegetation, Samphire Shrubland (TiFpTm).
- Acacia/Melaleuca Shrubland vegetation units (AaAh, AaRpSa and AaRbSa) collectively comprised of over 60.04% of the total Survey Area.
- AaRpSa encompasses the greatest portion of the Survey Area (95.25ha, 30.76%) and of the eight defined vegetation units, one unit is considered to be Riparian Vegetation (TiFpTm).
- Vegetation condition of the Proposal Area ranged from 'Completely Degraded' (CD) to 'Excellent' (E). The majority (34.20%) was identified as 'Cleared'. The remainder comprised of 'Good' vegetation (20.95%), followed by 'Good-Very Good' (13.49%), and 'Degraded – Good (11.88%).
- Existing cleared areas comprised a total of 52.83ha, however 36.63ha of existing cleared areas was located within the Proposal Area due to existing Indian Ocean Drive alignment and associated shoulders and adjacent tracks.

- Vegetation is not considered to contain a high level of diversity and no areas are gazetted as conservation estates or Environmentally Sensitive Areas (ESAs).
- No Ramsar Wetlands of International Importance are located within the Proposal.

Fauna:

- A total of 25 fauna species from 19 families were recorded in the Survey Area. Twenty-four were bird species from 18 families. No amphibian or mammal species were recorded (Focused Vision Consulting, 2022).
- One significant fauna species listed as OS (Other Specially Protected) under the EPBC Act was recorded during the field survey, the Osprey, which was recorded flying over the Proposal Area.
  - All fauna species recorded are considered relatively common and widespread (Focused Vision Consulting, 2022).
  - Five key habitats were identified in the Survey Area (Focused Vision Consulting, 2022; Figure 5A-5Q):
    - Acacia Shrubland: Habitat dominated by Acacia species, mainly with mid and ground storey, coastal shrubs, and herbs on sandy soils.
    - Coastal Heath: Habitat consists of a mix of low shrubs including Melaleuca, and Thryptomene species on limestone and sandy soils.
    - Melaleuca Shrubland: Habitat dominated by tall Melaleuca species with mid and ground storey coastal shrubs and herbs on sandy soils.
    - Mixed Shrubland: Habitat consists of mixed shrubland with scattered Eucalypts, Acacia and Melaleuca shrubs with ground storey coastal shrubs and herbs on sandy soils.
    - Salt Lake Margins: Habitat on the margins of salt lakes, consisting of characteristic low-lying salt lake species including Tecticornia on saline flats.
  - Water was present in small areas of the salt lake outside of the Proposal Area but the areas of the lake margin present within the Survey Area (but outside the Proposal Area) did not contain water and no waterbirds or shorebirds were recorded. The habitat is likely to be episodically inundated, which will provide shallow water for some waterbirds and wading bird species. However, a lack of vegetation structure limits its value to other fauna species. No suitable wetland habitat is present in the Proposal Area (Focused Vision Consulting, 2022).

Black-Cockatoo habitat survey:

- The Proposal Area supports very little, if any, suitable foraging habitat for Carnaby's Black-Cockatoo, with quality ranging from scores of 0 ('none/negligible') to 2 ('low') (Focused Vision Consulting, 2022).
- No confirmed or unconfirmed Black-Cockatoo breeding sites or roosting sites occur within the Proposal Area, and no trees with suitable hollows were recorded. Roosting sites within the Proposal Area are considered very unlikely (Focused Vision Consulting, 2022).
- One single tree (*Eucalyptus gomphocephala*) potentially suitable for Black Cockatoo breeding was recorded in the Survey Area, however, was not observed to contain hollows suitable for Black Cockatoos and due to the form of the tree, is considered unlikely to develop suitable hollows in the future (Focused Vision Consulting, 2022).
- Review of databases indicate the closest known roost to the Proposal is approximately 15km east (Focused Vision Consulting, 2022).

3.2.2 Astron (2017)

Main Roads commissioned Astron (2017) to conduct two biological surveys for two sections of Indian Ocean Drive, however only one biological survey is relevant to this Proposal (SLK 248-258). The Indian

Ocean Drive Widening SLK 248-258 Biological Survey was undertaken by Astron from 27 April to 8 May 2017 and covered an area of 60.28ha. The survey included a desktop study with a 5-40km buffer around the Proposal Area, followed by detailed and targeted flora and vegetation survey. A basic fauna survey and Black-Cockatoo habitat assessment was also undertaken.

The key findings of the biological field survey are detailed below.

Flora:

- A total of 102 confirmed vascular flora species from 39 families and 78 genera were recorded.
- Dominant families included Myrtaceae and Asteraceae and Acacia was the most frequently recorded genus.
- The dominant families and genera are consistent with what would be expected for the area (Astron, 2017).
- No Threatened species under the EPBC Act or under the BC Act were recorded.
- One individual of Priority 3 flora species was identified, *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) and is located within the Proposal Area.
- A moderate weed diversity was recorded with 19 weed species recorded. Three individuals of **Tamarix aphylla*, (Athel pine), a weed species, identified as a WoNS and a Declared Pest (s22) under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Under the BAM Act the weed species is subject to the C3 control category, which requires management to be applied to alleviate the harmful impact of the species, reduce its numbers or distribution, or prevent and contain the spread of the species. Physical and chemical methods of control are recommended (Astron, 2017).

Vegetation:

- A total of six (6) vegetation units were identified from the Survey Area representing 38.01ha of the Survey Area, while 22.27ha (37%) was mapped as 'cleared'. Within the Proposal Area 3.88ha was mapped as 'cleared'. Cleared areas included bitumen road, roadside verges and cleared sand tracks (Astron, 2017).
- Acacia Tall Scrub (SC01) comprised 14.34ha (23.8%) of the Survey Area, followed by Mixed Mallee and Acacia Scrublands (SM02) which comprised 10.74ha (17.8%). Mallee Woodlands (SM01) comprised 6.9ha (11.5%), Low Heathland (LH01) comprised 4.23ha (7%), Melaleuca Tall Scrub (SC02) comprised 1.05 (1.7%), and Low Shrubland (LS01) comprised 0.73ha (1.2%) of the Survey Area.
- Vegetation within the Survey Area is likely to be a small part of a larger distribution of communities located east of the Proposal Area, which is bordered by Beekeepers Nature Reserve.
- Vegetation condition within the Survey Area was mostly 'Completely Degraded' comprising 22.27ha (36.9%). Vegetation of 'Excellent' condition comprised 13.77ha (22.9%), 'Very Good' comprised 11.88ha (19.7%), and 'Good' comprised 12.35 (20.5%).
- No vegetation was described as matching any known EPBC Act listed MNES TECs or State-listed PECs.

Fauna:

- Four broad fauna habitats were recorded in the Survey Area:
    - Acacia Tall Scrub (20.3ha): Acacia tall scrub with occasional shrub mallee eucalypts present over Rhagodia scattered shrubs on sand dunes.
    - Low Open Heath (5.14ha): Acacia and Melaleuca dominated low shrubland to low open heath over forbs, grasses and sedges on sand dunes and sand plains.

  - Melaleuca Tall Scrub (0.62ha): Melaleuca dominated tall scrub to low open forest over Rhagodia scattered shrubs on lower slopes and swales of sand dunes.
  - Eucalyptus (mallee) Woodlands (11.96ha): Shrub to tree eucalypt mallee woodlands over Melaleuca and Rhagodia shrubs on sand dunes and sand plains.
- A total of 26 vertebrate species were opportunistically recorded in the Survey Area comprising of four species of reptile, 21 species of bird, and one species of mammal. Four introduced species were recorded.
- No fauna species recorded were of conservation significance.
- Two conservation significant species were classified as having a 'high' likelihood of occurrence in the Survey Area: Maleefowl (Vulnerable under the EPBC Act) and Black-striped Snake (P3). However, all habitats mapped within the Survey Area are likely to be a small part of a larger distribution directly adjacent, east of the Survey Area, which comprises Beekeepers Nature Reserve. As such, conservation significant fauna are unlikely to be dependent upon habitats present in the Survey Area (Astron, 2017).

Black-Cockatoo habitat survey:

- The Survey Area contains no known foraging resources for the Carnaby's Black-Cockatoo, but at least twelve flora species (*Acacia rostellifera*, *E. obtusiflora* and various Melaleuca species) were identified as being closely related to flora species known as foraging resources and may provide a low value foraging resource. However, no Banksia or Hakea species were recorded in the Survey Area, and it is unlikely that the Survey Area provides a high value of foraging habitat.
- None of the habitats within the Survey Area is considered as current or potential future breeding habitat, as no hollow bearing trees of appropriate species were present in the Survey Area.
- Trees identified in the Survey Area lacked appropriate height and canopy to be classified as potential roost sites. None of the trees showed signs of current or historic use as cockatoo roost sites (Astron, 2017).

4 VEGETATION DETAILS

4.1 Proposal Site Vegetation Description

Four Beard (1990) vegetation associations (125, 432, 1026, 255) occur within the Proposal Area. The National Objectives and Targets for Biodiversity Conservation recognise that it is important that ecological communities are maintained above the threshold level of 30% of pre-European extent for each community and therefore ecological communities with levels below 30% should be fully retained. Vegetation associations all exceed the 30% retention threshold at State and Regional contexts, however, one vegetation association (125) is represented by less than 30% of their original pre-European extent within the Shire of Carnamah. Analysis against the abundance of vegetation at all other scales indicates vegetation unit 125 exceeds the threshold level for remaining vegetation at the State (90.27%), Bioregion (68.75%) and Sub-region (96.81%) contexts.

The Proposal Area is mapped within four Pre-European Vegetation Units:

- 125: Bare areas; salt lakes.
- 432: Shrublands; *Acacia rostellifera* & *Melaleuca cardiophylla* thicket.
- 1026: Mosaic: Shrublands; *Acacia rostellifera*, *A. cyclops* (in the south) & *Melaleuca cardiophylla* (in the north) thicket / Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath.
- 255: Eucalypt shrubland *Eucalyptus eremophila*, *E. redunca*, E. spp.

Table 3 provides details of the Pre-European Vegetation Units and the remaining extents of the associations within the Proposal Area. Table 4 and Table 5 provides details of the vegetation types and extent including their condition within the Proposal Area.

Table 3. Pre-European Vegetation Associations within the Proposal Area.

Pre-European Vegetation Association	Scale	Pre–European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent in DBCA Managed Land (proportion of pre-European Extent)
Veg Assoc No. 125	**Statewide** *Western Australia*	3,485,785.49	3,146,487.22	90.27	8.45
	IBRA Bioregion Geraldton Sandplain (GES)	8,651.12	5,947.43	68.75	89.55
	IBRA Sub-region Lesueur Sandplain (GES02)	5,746.59	5,563.10	96.81	95.74
	Local Government Authority Shire of Carnamah	14,471.80	1,678.56	11.60	83.51
Veg Assoc No. 432	**Statewide** *Western Australia*	5,732.45	5,101.01	88.98	58.83
	IBRA Bio region Geraldton Sandplain (GES)	5,636.04	5,101.00	90.51	58.83
	IBRA Sub-region Lesueur Sandplain (GES02)	5,636.04	5,101.00	90.51	58.83

Pre-European Vegetation Association	Scale	Pre–European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent in DBCA Managed Land (proportion of pre-European Extent)
	Local Government Authority *Shire of Carnamah*	2,844.99	2,818.86	99.08	97.27
	Local Government Authority *Shire of Irwin*	2,887.45	2,282.15	79.04	10.50
Veg Assoc No. 1026	**Statewide** *Western Australia*	70,700.48	65,560.67	92.73	55.07
	IBRA Bioregion Geraldton Sandplain (GES)	11,426.90	10,729.87	93.90	51.84
	IBRA Sub-region Lesueur Sandplain (GES02)	11,426.90	10,729.87	93.90	51.84
	Local Government Authority Shire of Carnamah	5,329.93	4,964.45	93.14	49.35
Veg Assoc No. 255	**Statewide** *Western Australia*	3,176.54	2,933.27	92.34	51.33
	IBRA Bioregion Geraldton Sandplain (GES)	3,064.34	2,933.06	95.72	51.34
	IBRA Sub-region Lesueur Sandplain (GES02)	3,064.34	2,933.06	95.72	51.34
	Local Government Authority Shire of Irwin	3,176.54	2,933.27	92.34	51.33

Table 4. Vegetation Units within the Proposal Area

Vegetation Type	Extent within Proposal Area (ha)	Total Extent Mapped (ha) within Survey Area	% of Surveyed Extent being cleared
Focused Vision Consulting (2022)			
Acacia /Melaleuca Shrubland (AaAh): *Acacia aestivalis* and *Melaleuca cardiophylla* Tall Open Shrubland over *Alyogyne huegelii* Tall Sparse Shrubland over *Acanthocarpus preissii, Avena barbata* and **Bromus madritensis* Open Grassland.	22.05	49.33	44.7%
Acacia /Melaleuca Shrubland (AaRpSa): *Acacia aestivalis, Melaleuca huegelii subsp. huegelii* and *Melaleuca cardiophylla* Tall Open Shrubland over *Rhagodia preissii subsp. obovata* and *Rhagodia baccata* Low Sparse	23.48	95.25	24.65%

Vegetation Type	Extent within Proposal Area (ha)	Total Extent Mapped (ha) within Survey Area	% of Surveyed Extent being cleared
Shrubland over *Schoenus ?asperocarpus* Low Sparse Sedgeland over *Threlkeldia diffusa* Low Sparse Herbland.			
Acacia /Melaleuca Shrubland (AaRbSa): *Acacia aestivalis*, *Melaleuca systena* and *Acacia rostellifera* Mid Open Shrubland over *Rhagodia baccata*, *Acacia lasiocarpa var. lasiocarpa* and *Scaevola crassifolia* Low Sparse Shrubland over *Schoenus asperocarpus* Low Sparse Sedgeland over **Bromus diandrus, Austrostipa elegantissima* and **Lolium rigidum* Sparse Grassland.	13.05	40.94	31.88%
Melaleuca Shrubland (McTr): *Melaleuca cardiophylla, Melaleuca systena* and *Melaleuca huegelii subsp. huegelii* Mid Open Shrubland over *Thryptomene racemulosa* and *Dodonaea aptera* Low Sparse Heathland.	6.55	29.11	22.5%
Melaleuca Woodland (MlCp): *Melaleuca lanceolata* Low Woodland over *Melaleuca cardiophylla* and *Melaleuca huegelli subsp. huegelii* Low to Mid Open Shrubland over *Cryptandra pungens, Thryptomene racemulosa* and *Templetonia retusa* Open Heathland.	4.63	28.08	16.49%
Melaleuca Woodland (MlDaBd): *Melaleuca lanceolata* Low Woodland over *Dodonaea aptera* Sparse Shrubland over **Bromus diandrus* and **Avena barbata* Sparse Grassland over *Desmocladus asper* sparse Herbland.	0.36	3.17	11.36%
Melaleuca Forest (MlGtTd): Melaleuca lanceolata Mid Closed Forest over *Gahnia trifida* Mid Sparse Sedgeland over *Threlkeldia diffusa* Low Sparse Herbland.	0.18	1.48	12.16%
Samphire Shrubland (TiFpTm): *Tecticornia indica subsp. bidens, Tecticornia halocnemoides* and *Tecticornia sp.* Low to Tall Open Chenopod Shrubland over *Frankenia pauciflora* Low Open Samphire Shrubland over *Triglochin mucronata* Low Sparse Herbland. Riparian Vegetation.	0.19	9.31	2.04%
Cleared Areas: Existing cleared vegetation.	36.63	52.83	69.34%
Astron (2017)			
Mixed Mallee and Acacia Shrublands (SM02): *Eucalyptus obtusiflora* very open shrub mallee to tree mallee, with *Acacia rostellifera*, *Acacia xanthina* and/or *Melaleuca cardiophylla* tall open shrubland to tall open scrub, over *Rhagodia preissii* subsp. *obovata* and/or *Melaleuca cardiophylla* open shrubla.	0.95	4.23	22.46
Mallee Woodlands (SM01): *Eucalyptus obtusiflora* shrub mallee to tree mallee, over *Melaleuca cardiophylla* and *Rhagodia preissii* subsp. *obovata* low open shrubland to tall open shrubland	0.30	0.73	41.10

Vegetation Type	Extent within Proposal Area (ha)	Total Extent Mapped (ha) within Survey Area	% of Surveyed Extent being cleared
Acacia Tall Scrub (SC01): *Acacia rostellifera* tall shrubland to tall closed scrub, over mixed scattered shrubs to shrubland, over *Acanthocarpus preissii* very open to open forbland, often with *Austrostipa elegantissima* or other grass species scattered grasses to closed grassland	1.85	14.34	12.90
Melaleuca Tall Scrub (SC02): Melaleuca lanceolata tall scrub to low open forest, over *Rhagodia preissii* subsp. *obovata* scattered shrubs to open heath	0.05	1.05	4.76
Low Heathland (LH01): *Acacia rostellifera, Exocarpos sparteus* and/or *Templetonia retusa* scattered shrubs to tall open shrubland, over *Melaleuca systena* and/or *Acacia lasiocarpa* var. *lasiocarpa* low shrubland to low open heath, often over *Acanthocarpus preissii* very open forbland, over scattered grasses and sedges	-	-	-
Low Shrubland (LS01): *Melaleuca cardiophylla* and *Acacia lasiocarpa* var. *lasiocarpa* low shrubland over *Gahnia* sp. South West very open sedgeland	-	-	-
Cleared	3.88	22.27	17.42

Note: Small portions of the Proposal Area were not surveyed by Astron (2017) or Focused Vision Consulting (2022). This area comprises approximately 0.79ha. Furthermore, existing cleared areas identified within the Proposal Area total 40.51ha.

Table 5. Vegetation Condition contained within the Proposal Area

Vegetation Condition Rating	Proposal Area (ha)	Survey Area (ha)	% of Proposal Area
Focused Vision Consulting (2022)			
Excellent	12.61	65.47	11.77%
Very Good – Excellent	2.86	7.87	2.67%
Very Good	5.40	13.2	5.04%
Good – Very Good	14.45	53.96	13.49%
Good	22.44	97.53	20.95%
Degraded – Good	12.72	17.6	11.88%
Degraded	-	0.53	0%
Completely Degraded	-	0.51	0%
Cleared	36.63	52.83	34.20%

Total	**107.11**	**309.50**	**100%**
Astron (2017)			
Excellent	0.30	13.77	4.27%
Very Good	1.58	11.88	22.51%
Good	1.25	12.35	17.81%
Completely Degraded	3.88	22.27	55.27%
Total	**7.02**	**60.27**	**100%**

5 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

In assessing whether the Proposal's proposed clearing is likely to have a significant impact on the environment, the Proposal was assessed against the ten Clearing Principles (EP Act, Schedule 5).

Each principle has been assessed in accordance with the former Department of Environment Regulation (now Department of Water and Environmental Regulation (DWER) '*A Guide to the Assessment of Applications to Clear Native Vegetation*' (Department of Environment Regulation, 2014) and other relevant clearing permit application decision reports prepared by DWER.

The proposed clearing is not at variance with Clearing Principles c, d, i, and j. The proposed clearing is not likely to be at variance with Clearing Principles b, e, g, and h. The proposed clearing may be at variance with Clearing Principle (a) and is at variance to Clearing Principle (f).

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Proposed clearing may be at variance to this Principle.

Assessment

Focused Vision Consulting completed a single-phase, detailed and targeted flora, vegetation and fauna assessment as well as a Black-Cockatoo habitat survey in October 2021. The Proposal involves the clearing of up to 73.64ha of native vegetation and is comprised of eight vegetation types (Focused Vision Consulting, 2022), illustrated in Appendix 1.

- Acacia /Melaleuca Shrubland (AaAh): *Acacia aestivalis* and *Melaleuca cardiophylla* Tall Open Shrubland over *Alyogyne huegelii* Tall Sparse Shrubland over *Acanthocarpus preissii, Avena barbata* and **Bromus madritensis* Open Grassland.
- Acacia /Melaleuca Shrubland (AaRpSa): *Acacia aestivalis, Melaleuca huegelii subsp. huegelii* and *Melaleuca cardiophylla* Tall Open Shrubland over *Rhagodia preissii subsp. obovata* and *Rhagodia baccata* Low Sparse Shrubland over *Schoenus asperocarpus* Low Sparse Sedgeland over *Threlkeldia diffusa* Low Sparse Herbland.
- Acacia /Melaleuca Shrubland (AaRbSa): *Acacia aestivalis, Melaleuca systena* and *Acacia rostellifera* Mid Open Shrubland over *Rhagodia baccata, Acacia lasiocarpa var. lasiocarpa* and *Scaevola crassifolia* Low Sparse Shrubland over *Schoenus asperocarpus* Low Sparse Sedgeland over **Bromus diandrus, Austrostipa elegantissima* and **Lolium rigidum* Sparse Grassland.
- Melaleuca Shrubland (McTr): *Melaleuca cardiophylla*, *Melaleuca systena* and *Melaleuca huegelii subsp. huegelii* Mid Open Shrubland over *Thryptomene racemulosa* and *Dodonaea aptera* Low Sparse Heathland.
- Melaleuca Woodland (MlCp): *Melaleuca lanceolata* Low Woodland over *Melaleuca cardiophylla* and *Melaleuca huegelli subsp. huegelii* Low to Mid Open Shrubland over *Cryptandra pungens, Thryptomene racemulosa* and *Templetonia retusa* Open Heathland.
- Melaleuca Woodland (MlDaBd): *Melaleuca lanceolata* Low Woodland over *Dodonaea aptera* Sparse Shrubland over **Bromus diandrus* and **Avena barbata* Sparse Grassland over *Desmocladus asper* sparse Herbland.
- Melaleuca Forest (MlGtTd): *Melaleuca lanceolata* Mid Closed Forest over *Gahnia trifida* Mid Sparse Sedgeland over *Threlkeldia diffusa* Low Sparse Herbland.
- Samphire Shrubland (TiFpTm): *Tecticornia indica subsp. bidens*, *Tecticornia halocnemoides* and *Tecticornia sp.* Low to Tall Open *Chenopod* Shrubland over

Frankenia pauciflora Low Open Samphire Shrubland over *Triglochin mucronata* Low Sparse Herbland.

Astron (2017) completed a Biological Survey for the northern section of Indian Ocean Drive (SLK 248-258) and mapped four vegetation types within the Proposal Area:

- Mixed Mallee and Acacia Shrublands (SM02): *Eucalyptus obtusiflora* very open shrub mallee to tree mallee, with *Acacia rostellifera*, *Acacia xanthina* and/or *Melaleuca cardiophylla* tall open shrubland to tall open scrub, over *Rhagodia preissii* subsp. *obovata* and/or *Melaleuca cardiophylla* open shrubland.
- Mallee Woodlands (SM01): *Eucalyptus obtusiflora* shrub mallee to tree mallee, over *Melaleuca cardiophylla* and *Rhagodia preissii* subsp. *obovata* low open shrubland to tall open shrubland.
- Acacia Tall Scrub (SC01): *Acacia rostellifera* tall shrubland to tall closed scrub, over mixed scattered shrubs to shrubland, over *Acanthocarpus preissii* very open to open forbland, often with *Austrostipa elegantissima* or other grass species scattered grasses to closed grassland.
- Melaleuca Tall Scrub (SC02): *Melaleuca lanceolata* tall scrub to low open forest, over *Rhagodia preissii* subsp. *obovata* scattered shrubs to open heath.

Vegetation condition mapped by Focused Vision Consulting (2022) and Astron (2017) identified the Proposal Area was dominated by existing cleared areas (40.51ha) due to the existing Indian Ocean Drive alignment. The majority of the Proposal Area surveyed by Focused Vision (2022) was identified as 'Cleared' (34.20%). The remainder comprised of 'Good' vegetation (20.95%), followed by 'Good-Very Good' (13.49%), 'Excellent' (11.77%), 'Degraded-Good' (11.88%), 'Very Good' (5.04%) and 'Very Good to Excellent' (2.67%). Astron (2017) identified the majority of the northern section of the Proposal Area was in Completely Degraded (55.27%) condition. The remainder of the Proposal Area within the Astron (2017) Survey comprised 22.51% in 'Very Good' condition, 17.81% in 'Good' condition and 4.27% in 'Excellent' condition.

Two hundred and sixteen (216) flora species from 151 genera and 67 families were recorded. Of this, 186 (86.11%) were native species and 30 (13.88%) were weed species (Focused Vision Consulting, 2022). Astron (2017) identified a total of 102 confirmed vascular flora species from 39 families and 78 genera were recorded in SLK 248-258).

None of the recorded vegetation units are considered to exhibit unusually high diversity (Focused Vision Consulting, 2022). Similarly, Astron (2017) identified that vegetation within the SLK 248-258 Survey Area is likely to be a small part of a larger distribution of communities located east of the Proposal Area, which is bordered by Beekeepers Nature Reserve (R24496). Thirty weed species were identified by Focused Vision Consulting (2022), however, three individuals of *Tamarix aphylla*, (Athel pine), a weed species identified as a WoNS and a Declared Pest (s22) under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) was recorded in SLK 248-258. Under the BAM Act the weed species is subject to the C3 control category, which requires management to be applied to alleviate the harmful impact of the species, reduce its numbers or distribution, or prevent and contain the spread of the species. Physical and chemical methods of control are recommended (Astron, 2017). Main Roads propose weed and hygiene management measures to reduce the risk and spread of weed species entering adjacent vegetated areas.

Seven Priority flora species were identified within the Focused Vision Consulting (2022) Survey Area comprising six Priority 3 and one Priority 4 flora species:

- *Beyeria cinerea* subsp. *cinerea* (Priority 3) – two individuals.
- *Calandrinia oraria* (Priority 3) – three individuals.
- *Haloragis foliosa* (Priority 3) – 24 individuals.
- *Hemiandra* sp. Eneabba [H. Demarz 3687] (Priority 3) – four individuals.
- *Stylidium maritimum* (Priority 3) – 57 individuals.
- *Thryptomene* sp. Lancelin (Priority 3) – 100 individuals.
- *Grevillea olivacea* (Priority 4) – 205 individuals.

However, within the Proposal Area, only four Priority flora species were identified comprising Priority 3 flora species (Focused Vision Consulting, 2022; Astron, 2017):

- *Haloragis foliosa* (Priority 3) – 24 individuals.
- *Hemiandra* sp. Eneabba [H. Demarz 3687] (Priority 3) – one individual.
- *Stylidium maritimum* (Priority 3) – 18 individuals.
- *Thryptomene* sp. Lancelin (Priority 3) – 50 individuals.

Haloragis foliosa (Priority 3), is known from 12 FloraBase records and is distributed between Cervantes to the south and Port Denison to the north. DBCA records indicate the occurrence of this species within 230 m of the Proposal boundary. *Haloragis foliosa* is typically found on sandy clay over laterite, which is likely to extend along the coast outside of the Proposal Area and therefore, no significant impacts are expected from the Proposal (Focused Vision Consulting, 2022).

Hemiandra sp. Eneabba (H. Demarz 3687) (Priority 3), is known from 35 FloraBase records and is distributed between Green Head to the south and Port Denison to the north. This species is typically found on sand and disturbed sites and suitable species habitat is likely to occur outside of the Proposal Area (Focused Vision Consulting, 2022).

Stylidium maritimum (Priority 3), is known from 45 FloraBase records and is largely distributed along the coast between Preston Beach to the south and Port Denison to the north. *Stylidium maritimum* species habitat is considered to be widely distributed along the coast between the species current known range (Focused Vision Consulting, 2022).

Thryptomene sp. Lancelin (Priority 3), is known from 29 FloraBase records and is distributed between Ledge Point to the south and Port Denison to the north and typically occurs on calcareous sand. The abundance of plants recorded outside the Proposal Area indicates likely suitable habitat and the population to extend beyond the bounds of the Proposal Area (Focused Vision Consulting, 2022).

An assessment of variance against Principle (a) for the factor of Priority flora species occurrence was assessed as per FloraBase records and opportunistic observations identified in the Focused Vision Consulting (2022) Biological Survey. FloraBase records indicated Priority species are distributed and extend beyond the proposed native vegetation clearing area. Furthermore, the Study Area indicated a DBCA managed nature reserve (Beekeepers Nature Reserve, R24496) specifically for the purpose of conserving flora which is located directly adjacent to the Proposal Area which is likely considered to contain a larger distribution of flora communities (Astron, 2017). It is therefore considered unlikely that populations of Priority species identified within the Proposal Area are limited to their recorded locations.

A desktop review of database searches (20km radius of the Proposal Area) identified that no vegetation representative of any Commonwealth or State listed Threatened Ecological Communities (TECs) was recorded. No Threatened flora species pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and/or gazetted as Threatened pursuant to the *Biodiversity and Conservation Act 2016* were identified within the Proposal Area. No Ramsar Wetlands of International Importance are located within the Proposal Area (Figure 2).

Highly alkaline limestone coastal sandy soils make *Phytophthera cinnamomi* presence unlikely, however, given the area is adjacent to DBCA managed land (Beekeepers Nature Reserve; WA24496), Main Roads propose dieback, weed and hygiene management measures are implemented to reduce the risk and spread of dieback, pathogens and weed species entering the vegetated areas.

Four Beard (1990) vegetation associations were mapped (125, 432, 1026, 255). The National Objectives and Targets for Biodiversity Conservation recognise that it is important that ecological communities are maintained above the threshold level of 30% of pre-European extent for each community and therefore ecological communities with levels below 30% should be fully retained. Vegetation associations all exceed the 30% retention threshold at State and Regional contexts, except one vegetation unit (125) which is represented by less than 30% of its original pre-European extent within the Shire of Carnamah. However, analysis against the abundance of vegetation at all other scales indicates vegetation unit 125 exceeds the 30% threshold level for remaining vegetation at the State (90.27%), Bioregion (68.75%) and Sub-region (96.81%) levels. The Proposal Area has a very narrow and linear geometry located within an existing 'Cleared' area comprising approximately 55.27% (SLK 248-258) and 34.20% of the surveyed Proposal Area (Astron, 2017; Focused Vision Consulting, 2022). The proposed clearing within vegetation unit 125, comprises approximately 1.91ha. However, given the remaining extent of this vegetation association at all scales (except Local Government Area), the proposed clearing is unlikely to significantly reduce ecosystem functionality. The proposed clearing of 1.91ha of this vegetation unit is considered a minor impact as vegetation is predominantly disturbed immediately adjacent to the existing road.

Conservation Category Wetlands (CCW) support a high level of ecological attributes and functions (generally having intact vegetation and natural hydrological processes), or that have a reasonable level of functionality and are representative of wetland types that are rare or poorly protected (Focused Vision Consulting, 2022).

Under the DWER principle, (Department of Environment Regulation, 2014) vegetation dependent on seasonally or intermittently waterlogged soils is considered to be part of a wetland, watercourse, or buffer (e.g., damplands and floodplains). As the vegetation units other than TiFpTM within the mapped CCW are present in other areas that are not subject to seasonally waterlogged soils, these other vegetation units are not dependent on seasonal waterlogged soils and therefore are not considered part of the wetland.

The Biological Survey completed in 2022 identified that vegetation units AaRpSa, McTr and TiFpTm partially intersect six mapped CCWs. However, of these only one unit was determined to represent Riparian Vegetation, Samphire Shrubland [TiFpTm] (Focused Vision Consulting, 2022). Proposed clearing will impact 0.19ha of Riparian Vegetation within the 9.31ha Survey Area. In consideration of regional context, a relatively small percentage comprises 2.04% loss of Riparian Vegetation within the Survey Area.

Focused Vision Consulting (2022) noted water was present in small areas outside the Proposal Area, however the areas of the lake margin present within the Survey Area (but outside the Proposal Area) did not contain water at the time. The area is likely episodically inundated and no waterbirds or shorebirds were recorded, although the area may provide shallow water on occasion for migrating waterbirds and wading bird species. However, a lack of vegetation structure limits its value to other fauna species (Focused Vision Consulting, 2022). Proposed clearing will impact 0.19ha of Riparian Vegetation within the 9.31ha Survey Area. The Proposed clearing will result in a relatively small percentage of 2.04% loss of fauna habitat within the Survey Area.

Existing culverts will be replaced to minimise impacts to hydrological features and Proposed clearing will result in no additional changes to surface water hydrology. The Proposal footprint will be minimised by using the existing alignment wherever possible, hence the Proposal is unlikely to cause significant impacts to surface water flows.

Unique Feature ID in WA	Management Category	Wetland Type	Inundation Frequency
GWCCC_0041	Conservation	Playa	intermittently inundated
GWCCC_0037	Conservation	Floodplain	seasonally inundated
GWCCC_0023	Conservation	Sumpland	seasonally inundated
GWCCC_0066	Conservation	Palusplain	seasonally waterlogged
GWCCC_0001	Conservation	Playa	intermittently inundated
GWCCC_0016	Conservation	Pirapi	intermittently inundated

Astron (2017) recorded no fauna species of conservation significance. Focused Vision Consulting (2022) survey results identified a total of 25 fauna species from 19 families recorded within the Survey Area. Twenty-four were bird species from 18 families and no amphibian or mammal species were recorded (Focused Vision Consulting, 2022). A non-significant, common reptile species, Buchanan's Snake-eyed Skink, and one significant species, Osprey, was recorded. No species are considered 'Likely to occur', one species is considered 'Possibly occurring' and 23 are considered 'Unlikely to occur' (Focused Vision Consulting, 2022). All species listed above are well represented in the surrounding areas of similar vegetation and have broad distributions.

- Conservation Significant, *Pandion haliaetus* (Osprey) listed as OS (Other Specially Protected) under the EPBC Act was recorded in the Survey Area. The species requires coasts and near-coastal wetland habitat, where it feeds mainly on fish, sea snakes and nesting seabirds (Focused Vision Consulting, 2022). This species may fly overhead and utilise the area, however the Proposal Area does not contain rocky cliff faces where this species can perch or build nests and does not contain wetland habitat required for feeding (Focused Vision Consulting, 2022).
- *Aspidites ramsayi* (Woma [south-west population]) listed as Priority 1 under the BC Act is associated with desert and semi-arid areas, predominantly found in sandy areas, but it is also found in spinifex grassland and in eucalypt and acacia woodlands on clay soils, rocky areas and other non-sandy areas (Focused Vision Consulting, 2022). The species is a

nocturnal, terrestrial snake. Suitable habitat in the way of acacia woodland on sandy soil is present, however a lack of records means the Woma is considered as only possibly occurring in the area (Focused Vision Consulting, 2022).

Astron (2017) concluded it is unlikely that the Survey Area (SLK 248-258) provides a high value of foraging habitat for Black-Cockatoos and none of the habitats within the Survey Area is considered current or potential future breeding habitat. No trees showed signs of current or historic use. Focused Vision Consulting (2022) concluded the Proposal Area supports very little, if any suitable foraging habitat for Carnaby's Black-Cockatoo, with quality ranging from scores of 0 ('none/negligible') to 2 ('low'). No confirmed or unconfirmed Black-Cockatoo breeding sites or roosting sites occur within the Survey Area, and no trees with suitable hollows were recorded. Roosting sites within the Proposal Area are considered very unlikely (Focused Vision Consulting, 2022). One single tree (*Eucalyptus gomphocephala*) potentially suitable for Black Cockatoo breeding was recorded in the Survey Area, however, was not observed to contain hollows suitable for Black Cockatoos and due to the form of the tree, is considered unlikely to develop suitable hollows in the future (Focused Vision Consulting, 2022). A review of databases indicates the closest known black cockatoo roost to the Proposal is approximately 15 km east (Focused Vision Consulting, 2022). The factor will not be at variance to this principle.

Portions of the Proposal Area were not surveyed by Astron (2017) or Focused Vision Consulting (2022). The unsurveyed areas comprise a total of approximately 0.79ha and are identified in several small areas along the Indian Ocean Drive Proposal. Database searches did not indicate any significant environmental features within these areas. The surveyed areas surrounding these unsurveyed areas appear to be of similar vegetation types, with no notable disturbances, therefore the 0.79ha unsurveyed areas are considered unlikely to be environmentally significant. Additionally, the Study Area indicated a DBCA managed nature reserve (Beekeepers Nature Reserve, R24496) specifically for the purpose of conserving flora, located directly adjacent to the Proposal Area.

The proposed clearing is may be at variance to this Principle.

Methodology

- Focused Vision Consulting (2022)
- Astron (2017)
- DCCEEW Protected Matters Search Tool Report
- Government GIS Shapefiles:
  - DBCA Threatened and Priority Flora, Fauna and Communities Shapefiles (Accessed 2023).
  - DBCA Threatened and Priority flora database search (Accessed 2023)
  - Bush Forever (Region Scheme - Special Areas) (Accessed 2023)
  - DBCA Legislated Lands and Waters (Accessed 2023).
- Statewide Vegetation Statistics (Government of Western Australia 2018).
- Aerial Imagery.
- Main Roads GIS Shapefiles.
- DBCA Carnaby's Black Cockatoo shapefiles.

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Proposed clearing is not likely to be at variance to this Principle.

Assessment

Focused Vision Consulting (2022) identified five key fauna habitats in the southern portion of the Survey Area:

- Acacia Shrubland: Habitat dominated by Acacia species, mainly with mid and ground storey, coastal shrubs and herbs on sandy soils.
- Coastal Heath: Habitat consists of a mix of low shrubs including Melaleuca, and Thryptomene species on limestone and sandy soils.
- Melaleuca Shrubland: Habitat dominated by tall Melaleuca species with mid and ground storey coastal shrubs and herbs on sandy soils.
- Mixed Shrubland: Habitat consists of mixed shrubland with scattered Eucalypts, Acacia and Melaleuca shrubs with ground storey coastal shrubs and herbs on sandy soils.
- Salt Lake Margins: Habitat on the margins of salt lakes, consisting of characteristic low-lying salt lake species including Tecticornia on saline flats.

Astron (2017) identified four key fauna habitats in the northern portion (SLK 248-258) of the Survey Area:

- Acacia Tall Scrub: Acacia tall scrub with occasional shrub mallee eucalypts present over Rhagodia scattered shrubs on sand dunes.
- Low Open Heath: Acacia and Melaleuca dominated low shrubland to low open heath over forbs, grasses and sedges on sand dunes and sand plains.
- Melaleuca Tall Scrub: Melaleuca dominated tall scrub to low open forest over Rhagodia scattered shrubs on lower slopes and swales of sand dunes.
- Eucalyptus (mallee) Woodlands: Shrub to tree eucalypt mallee woodlands over Melaleuca and Rhagodia shrubs on sand dunes and sand plains.

Water was present in small areas of the salt lake outside of the Proposal Area. Areas of the lake margin present within the Survey Area (but outside of the Proposal Area), did not contain water and no waterbirds or shorebirds were recorded. The habitat is likely to be episodically inundated, which will provide shallow water for some waterbirds and wading bird species. However, a lack of vegetation structure limits its value to other fauna species (Focused Vision Consulting, 2022).

Survey results identified a total of 25 fauna species from 19 families recorded within the Survey Area (Focused Vision Consulting, 2022). Twenty-four were bird species from 18 families and no amphibian or mammal species were recorded (Focused Vision Consulting, 2022). A non-significant, common reptile species, Buchanan's Snake-eyed Skink, and one significant species, Osprey, was recorded. No species are considered 'Likely to occur', one species is considered as 'Possibly occurring' (*Aspidites ramsayi*) and 23 are considered 'Unlikely to occur' (Focused Vision Consulting, 2022). All species listed above are well represented in the surrounding areas of similar vegetation and have broad distributions.

- *Pandion haliaetus* (Osprey) listed as OS (Other Specially Protected) under the EPBC Act was recorded in the Survey Area. The species requires coasts and near-coastal wetland habitat, where it feeds mainly on fish, sea snakes and nesting seabirds (Focused Vision

Consulting, 2022). This species may fly overhead and utilise the area, however the Proposal Area does not contain rocky cliff faces where this species can perch or build nests and does not contain wetland habitat required for feeding (Focused Vision Consulting, 2022).

- *Aspidites ramsayi* (Woma [south-west population]) listed as Priority 1 under the BC Act is associated with desert and semi-arid areas, predominantly found in sandy areas, but it also found in spinifex grassland and in eucalypt and acacia woodlands on clay soils, rocky areas and other non-sandy areas (Focused Vision Consulting, 2022). The species is a nocturnal, terrestrial snake. Suitable habitat in the way of acacia woodland on sandy soil is present, however a lack of records means the Woma is considered as Possibly occurring in the area (Focused Vision Consulting, 2022).

Astron (2017) concluded it is unlikely that the Survey Area (SLK 248-258) provides a high value of foraging habitat for Black-Cockatoos and none of the habitats within the Survey Area are considered current or potential future breeding habitat. No trees showed signs of current or historic use. The Proposal Area supports very little, if any suitable foraging habitat for Carnaby's Black-Cockatoo, with quality ranging from scores of 0 ('none/negligible') to 2 ('low') (Focused Vision Consulting, 2022). No confirmed or unconfirmed Black-Cockatoo breeding sites or roosting sites occur within the Survey Area, and no trees with suitable hollows were recorded. Roosting sites within the Proposal Area are considered very unlikely (Focused Vision Consulting, 2022). One single tree (*Eucalyptus gomphocephala*) potentially suitable for Black Cockatoo breeding was recorded in the Survey Area, however, was not observed to contain hollows suitable for Black Cockatoos and due to the form of the tree, is considered unlikely to develop suitable hollows in the future (Focused Vision Consulting, 2022). Review of databases indicate the closest known roost to the Proposal is approximately 15 km east (Focused Vision Consulting, 2022).

All Priority species recorded in the Survey Area are well represented in the surrounding areas of similar vegetation and have been recorded outside the Proposal Area. Clearing of up to 73.64ha of native vegetation is unlikely to significantly impact any of the species listed due to the abundance of similar habitat surrounding the Study Area.

The proposed clearing is not likely to be at variance to this Principle.

Methodology

- Focused Vision Consulting (2022).
- Astron (2017).
- DCCEEW Protected Matters Search Tool Report.
- Government GIS Shapefiles:
- DBCA Threatened and Priority Fauna database search (Accessed 2023).
    - DBCA Legislated Lands and Waters (Accessed 2023).
    - DBCA Carnaby's Black Cockatoo shapefiles.
- Species specific conservation listing advice and recovery plans

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.

Proposal is not at variance to this Principle.

Assessment

No recordings of Threatened flora under the *Biodiversity Conservation Act 2016* or under the *Environment Protection and Biodiversity Conservation Act 1999* was identified within or surrounding the Survey Area, and none are likely to occur (Focused Vision Consulting, 2022; Astron, 2017).

The proposed clearing is not at variance to this Principle.

Methodology

- Focused Vision Consulting (2022).
- Astron (2017).
- Florabase (Accessed 2023).
- Government GIS shapefiles:
- DBCA Threatened flora database search (Accessed October 2022)

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Proposed clearing is not at variance to this Principle.

Assessment

The Native Vegetation Clearing Area is not located within any mapped Threatened Ecological Communities (Focused Vision Consulting, 2022; Astron, 2017). A vegetation survey conducted by Focused Vision Consulting (2022) did not record any vegetation considered representative of a TEC, or PEC within the Native Vegetation Clearing Area. The clearing of up to 73.64ha of native vegetation will not impact on any TECs or vegetation necessary for the continued existence of a TEC.

Methodology

- Focused Vision Consulting (2022).
- Astron (2017).
- Government GIS shapefiles:
    - DBCA Threatened Ecological Community database search (Accessed October 2022).

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Proposed clearing is not likely to be at variance to this Principle.

Assessment

The Native Vegetation Clearing Area falls within the Geraldton Sandplains Bioregion of the Interim Biogeographic Regionalisation for Australia (GIS Dataset). Four pre-European vegetation associations were identified within the Proposal Area:

- 125: Bare areas; salt lakes.
- 432: Shrublands; *Acacia rostellifera* & *Melaleuca cardiophylla* thicket.
- 1026: Mosaic: Shrublands; *Acacia rostellifera*, A. *cyclops* (in the south) & *Melaleuca cardiophylla* (in the north) thicket / Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath.
- 255: Eucalypt shrubland *Eucalyptus eremophila*, *E.* redunca, *E.* spp.

Pre-European Vegetation Association	Scale	Pre–European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent in DBCA Managed Land (proportion of pre-European Extent)
Veg Assoc No. **125**	**Statewide** Western Australia	3,485,785.49	3,146,487.22	90.27	8.45
	IBRA Bioregion Geraldton Sandplain (GES)	8,651.12	5,947.43	68.75	89.55
	IBRA Sub-region Lesueur Sandplain (GES02)	5,746.59	5,563.10	96.81	95.74
	Local Government Authority Shire of Carnamah	14,471.80	1,678.56	11.60	83.51
Veg Assoc No. **432**	**Statewide** Western Australia	5,732.45	5,101.01	88.98	58.83
	IBRA Bio region Geraldton Sandplain (GES)	5,636.04	5,101.00	90.51	58.83
	IBRA Sub-region Lesueur Sandplain (GES02)	5,636.04	5,101.00	90.51	58.83
	Local Government Authority Shire of Carnamah	2,844.99	2,818.86	99.08	97.27
	Local Government Authority Shire of Irwin	2,887.45	2,282.15	79.04	10.50
Veg Assoc No. **1026**	**Statewide** Western Australia	70,700.48	65,560.67	92.73	55.07
	IBRA Bioregion Geraldton Sandplain (GES)	11,426.90	10,729.87	93.90	51.84

	IBRA Sub-region Lesueur Sandplain (GES02)	11,426.90	10,729.87	93.90	51.84
	Local Government Authority Shire of Carnamah	5,329.93	4,964.45	93.14	49.35
Veg Assoc No. **255**	**Statewide** *Western Australia*	3,176.54	2,933.27	92.34	51.33
	IBRA Bioregion Geraldton Sandplain (GES)	3,064.34	2,933.06	95.72	51.34
	IBRA Sub-region Lesueur Sandplain (GES02)	3,064.34	2,933.06	95.72	51.34
	Local Government Authority Shire of Irwin	3,176.54	2,933.27	92.34	51.33

The National Objectives and Targets for Biodiversity Conservation recognise that it is important that ecological communities are maintained above the threshold level of 30% of pre-European extent for each community and therefore ecological communities with levels below 30% should be fully retained. Vegetation associated with levels below this threshold, exponentially accelerates the loss of species and this level should not be permitted. Vegetation associations all exceed the 30% retention threshold at State and Regional contexts, except one vegetation unit (125) which is represented by less than 30% of its original pre-European extent within the Shire of Carnamah. However, analysis against the abundance of vegetation at all other scales indicates vegetation unit 125 exceeds the thresholds levels for remaining vegetation at the State (90.27%), Bioregion (68.75%) and Sub-region (96.81%) levels. The Proposal Area has a very narrow and linear geometry located within an existing 'Cleared' alignment comprising approximately 55.27% (SLK 248-258) and 34.20% of the surveyed Proposal Areas (Focused Vision Consulting, 2022; Astron, 2017).

The proposed clearing of 1.91ha of vegetation association 125 is considered a minor impact as it is located in a largely vegetated area that is not considered a significant remnant.

Methodology

- Government GIS shapefiles:
- Pre-European vegetation (2022).
- Vegetation complexes (2022).
- Statewide Vegetation Statistics (Government of Western Australia 2018)
- Aerial photography
- Focused Vision Consulting (2022)
- Astron (2017).

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Proposed clearing is at variance to this Principle.

Assessment

Conservation Category Wetlands (CCW) support a high level of ecological attributes and functions (generally having intact vegetation and natural hydrological processes), or that have a reasonable level of functionality and are representative of wetland types that are rare or poorly protected (Focused Vision Consulting, 2022). Database searches indicate the Proposal Area partially intersects six CCW in the southern section of the existing Indian Ocean Drive alignment (see table below and Figures 2, 3N-Q).

Under the DWER principle, (Department of Environment Regulation, 2014) vegetation dependent on seasonally or intermittently waterlogged soils is considered to be part of a wetland, watercourse, or buffer (e.g., damplands and floodplains). As the vegetation units other than TiFpTM within the mapped CCW are present in other areas that are not subject to seasonally waterlogged soils, these other vegetation units are not dependent on seasonal waterlogged soils and therefore are not considered part of the wetland.

The Biological Survey completed in 2022 identified that vegetation units AaRpSa, McTr and TiFpTm partially intersect six mapped CCWs. However, of these only one unit was determined to represent Riparian Vegetation, Samphire Shrubland [TiFpTm] (Focused Vision Consulting, 2022). Proposed clearing will impact 0.19ha of Riparian Vegetation within the 9.31ha of this vegetation type mapped within the Survey Area. In consideration of regional context, 2.04% comprises a relatively small percentage loss of Riparian Vegetation within the Survey Area. Furthermore, extensive areas of this vegetation type are likely to extend outside the surveyed linear road corridor which was selected to avoid low lying areas suitable for road construction.

Focused Vision Consulting (2022) noted water was present in small areas outside the Proposal Area, however the areas of the lake margin present within the Survey Area (but outside the Proposal Area) did not contain water at the time. The area is likely episodically inundated and no waterbirds or shorebirds were recorded, although the area may provide shallow water on occasion for migrating waterbirds and wading bird species. However, a lack of vegetation structure limits its value to other fauna species (Focused Vision Consulting, 2022). Proposed clearing will impact 0.19ha of Riparian Vegetation within the 9.31ha Survey Area. The Proposed clearing will result in a relatively small percentage of 2.04% loss of fauna habitat within the Survey Area.

Existing culverts will be replaced to minimise impacts to hydrological features and Proposed clearing will result in no additional changes to surface water hydrology. The Proposal footprint will be minimised by using the existing alignment hence the Proposal is unlikely to cause significant impacts to surface water flows.

Unique Feature ID in WA	Management Category	Wetland Type	Inundation Frequency
GWCCC_0041	Conservation	Playa	Intermittently inundated

GWCCC_0037	Conservation	Floodplain	Seasonally inundated
GWCCC_0023	Conservation	Sumpland	Seasonally inundated
GWCCC_0066	Conservation	Palusplain	Seasonally waterlogged
GWCCC_0001	Conservation	Playa	Intermittently inundated
GWCCC_0016	Conservation	Pirapi	Intermittently inundated

No Ramsar Wetlands of International Importance are located within the Proposal. Review of DBCA databases of Directory of Important Wetlands in Australia identified Lake Logue – Indoon System (Ref. Code: 36) located approximately 12.5km east from the Proposal Area.

As the Proposal includes clearing of vegetation unit Samphire Shrubland (TiFpTm) located within the Proposal Area, the proposed clearing may be at variance to this Principle.

Methodology

- Government GIS shapefiles:
  - Geomorphic Wetlands (2023).
  - Ramsar Wetlands (2023).
  - Important Wetlands (2023).
  - Watercourses (2023).
  - RIWI Act Rivers (2023).
- Focused Vision Consulting (2022).

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Proposed clearing is not at variance to this Principle.

Assessment

Soil landscape and land system mapping of WA described broad soil and landscape characteristics from regional to local scales, ranging from 1:20,000 to 1:250,000 (Department of Agriculture and Food WA, 2012). The Native Vegetation Clearing Area intercepts three land system:

- Eatha System (221Ea): Lagoonal deposition parallel to, and just inland of, the West Midlands coast. Soils include salt lake soils and calcareous shallow and deep sands. No vegetation in the more saline areas, with halophytic species on the fringe areas.
- Quindalup Central System (221Qu): Coastal dune system, including foredunes, beach ridge plains, parabolic dunes, deflation basins and flats. No fixed drainage. Calcareous deep and shallow sands. Coastal heathlands and scrub.
- Tamala South System (221Ta): Rises and low hills with relict dunes and some limestone outcrop on coastal limestone north of Jurien Bay. Yellow deep sands common, with yellow/brown shallow sands and calcareous shallow and deep sands. Banksia woodlands and heathlands.

The table below indicates the assessment of flood risk, salinity, waterlogging, water erosion, wind erosion and acid sulphate soils (ASS).

Aspect	Risk
Flood Risk	Majority has <3% of the map unit has a moderate to high flood risk. Smaller sections have a 10-30% moderate to high flood risk.
Salinity	Majority has <3% moderate to high salinity risk. Smaller sections have 10-30% and greater than 70% moderate to high salinity.
Waterlogging	Majority has <3% moderate to very high waterlogging risk. Smaller southern sections 3%-10% and greater than 70% moderate to very high waterlogging risk.
Water Erosion	Northern sections has <3% high to extreme water erosion risk. Mid and southern sections has 10-30% high to extreme water erosion risk
Wind Erosion	Northern sections has greater than 70% as high to extreme winds. Smaller areas have 30-50% high to extreme wind erosion risk.
Acid Sulphate Soils (ASS)	An extremely low probability of occurring.

Appreciable land degradation is not expected as standard erosion and dust management procedures will be implemented as per previous projects conducted by MRWA in this area. Similar dust and erosion management procedures will be implemented for a similar outcome. Based on the above, the Proposal is not at variance with this principle.

Methodology

- Government GIS Shapefiles:
  - Soil landscape land quality – Water Erosion Risk (2023)
  - Soil landscape land quality – Wind Erosion Risk (2023)
  - Soil landscape land quality – Salinity Risk (2023)
  - Soil landscape land quality – Surface Acidity (2023)
  - Soil landscape land quality – Waterlogging Risk (2023)
  - Soil landscape land quality – Flood Risk (2023)

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Proposed clearing is not at variance to this Principle.

Assessment

No Environmentally Sensitive Areas (ESAs) are mapped within the Survey Area. The proposed Native Vegetation Clearing Area does not intersect any known conservation areas or DBCA managed lands, however a Nature Reserve is identified directly adjacent to the eastern portion of the Native Vegetation Clearing Area (Beekeepers Nature Reserve; R24496).

Thirty weed species were identified by Focused Vision Consulting (2022), however, three individuals of *Tamarix aphylla*, (Athel pine), a weed species identified as a WoNS and a Declared Pest (s22) under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) was recorded in SLK 248-258. Under the BAM Act this weed species is subject to the C3 control category, which requires management to be applied to alleviate the harmful impact of the species, reduce its numbers or distribution, or prevent and contain the spread of the species. Physical and chemical methods of control are recommended (Astron, 2017). Main Roads propose weed and hygiene management measures to reduce the risk and spread of weed species entering adjacent vegetated areas. No dieback was identified within or expected to be located outside the Survey Area (Glevan Consulting, 2022).

Highly alkaline limestone coastal sandy soils make *Phytophthera cinnamomi* presence unlikely, however, given the area is adjacent to DBCA managed land (Beekeepers Nature Reserve; WA24496), Main Roads propose dieback, weed and hygiene management measures be included for the proposed site to reduce the risk and spread of dieback, pathogens and weed species entering the vegetated areas. It is unlikely impacts to any buffers, ecological linkages, or conservation areas will result under this Proposal due to appropriate weed and hygiene management measures, and subsequently will not impact the environmental values of nearby conservation areas.

By applying standard management controls to prevent the introduction or spread of dieback, pathogens and weed species during construction, no impact on environmental values of the adjacent Beekeepers Nature reserve are likely and therefore, the proposed clearing is not at variance to this Principle.

Methodology

- Focused Vision Consulting (2022).
- Astron (2017).
- Government GIS Shapefiles:
- DBCA Legislated Lands and Waters & Lands of Interest (Accessed 2023)
- Geomorphic Wetlands (conservation category wetlands only) (Accessed 2023)
- Ramsar Wetlands (Accessed 2023)
- Important Wetlands (Accessed 2023)

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Proposed clearing is not at variance to this Principle.

Assessment

The long-term annual average rainfall is 533.1 mm (Jurien Bay, Site No.009131) per year (BoM 2023). A desktop search of the Study Area does not identify any major watercourses or water bodies intersecting the Proposal Area. The nearest river is Arrowsmith River, a major river located approximately 10km east. Impacts are not anticipated due to the distance from the Proposal.

The Proposal is within the Arrowsmith Groundwater Area (RIWI Act) Dongara Arrowsmith Sub-area and the following proclaimed Surface Water Area:

- Eneabba Coastal Tributaries.

The proposed clearing is adjacent to an existing road (Indian Ocean Drive) and it is not within surface water features; therefore, it is not expected to cause deterioration in the quality of surface water.

The Proposal does not intersect with a Country Areas Water Supply Act (CAWS) water catchment area. The nearest Public Drinking Water Source is Eneabba Water Reserve (Priority 1, 2, 3) located approximately 36km southeast. The proposed native vegetation clearing is not likely to alter groundwater quality for this area.

Groundwater in the superficial aquifer in the investigation area is likely to be 1 to 6 meters deep and mostly brackish to hypersaline with salinity of groundwater from Leeman Shallows bores near the coastline ranging from 2350 to 33,900 mg/L TDS (Global Groundwater, 2021). The proposed clearing is not expected to result in deterioration of the groundwater quality.

Based on the above, the Proposed Area is not at variance to this principle.

Methodology

- Government GIS Shapefiles:
  - RIWI Act, Surface Water Areas and Irrigation Districts (Accessed 2023)
  - CAWSA Part 2A Clearing Control Catchments (Accessed 2023)
  - RIWI Act, Groundwater Areas (Accessed 2023
  - Soil landscape land quality - Salinity Risk (Accessed 2023)
  - Groundwater Salinity Statewide (Accessed 2023)
  - Soil Mapping (Accessed 2023)
  - Acid Sulphate Soil risk mapping (Accessed 2023)
  - Soil landscape land quality – Subsurface Acidification Risk (Accessed 2023)

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Proposed clearing is not at variance to this Principle.

Assessment

The Proposal Area receives an average rainfall of 547mm (Jurien Bay, Site No. 009131) per year (BoM, 2023). The area has not been identified as a significant risk of flooding, waterlogging or erosion from soil landscape land quality analyses. The Proposal Area ranges approximately 10m (AHD) in elevation.

The Proposal is within the Arrowsmith Groundwater Area (RIWI Act) and Dongara Arrowsmith Subarea and the following proclaimed Surface Water Area:

- Eneabba Coastal Tributaries.

The nearest:

- River is over 10km east of the Proposal Area (Arrowsmith River)
- The Proposal does not intersect with a Country Areas Water Supply Act (CAWS) water catchment area.
- The nearest Public Drinking Water Source is Eneabba Water Reserve (Priority 1, 2, 3) located approximately 36km southeast.
- Conservation Category Wetlands (CCW) are included in the southern sections of the Proposal Area, however review of databases show the wetlands are intermittently inundated or seasonally waterlogged reducing the risk of flooding.

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology

- BoM Website (Accessed 2023)
- Government GIS Shapefiles:
    - Soil Mapping (Accessed 2023)
    - Contours (Accessed 2023)
    - Soil landscape land quality - Waterlogging Risk (Accessed 2023)
    - Soil landscape land quality - Flood Risk (Accessed 2023)

6 VEGETATION MANAGEMENT

Main Roads will avoid clearing native vegetation where possible. Where clearing cannot be avoided then this clearing is kept to a minimum. A Vegetation Management Plan (VMP) has been developed to manage and minimise vegetation clearing for the Proposal (refer to Appendix 3).

7 REHABILITATION, REVEGETATION & OFFSETS

7.1 Revegetation and Rehabilitation

No temporary clearing will be undertaken as part of the Proposal activities.

7.2 Offset Proposal

In accordance with CPS 818/16 condition 11(a), Main Roads is seeking an exemption from submitting an offset proposal.

8 STAKEHOLDER CONSULTATION

Main Roads will undertake stakeholder consultation in accordance with CPS 818 Condition 8. Main Roads received submissions from the following stakeholders:

- Department of Water and Environmental Regulation (DWER)

Table 6 details the key issues raised and Main Roads response to these key issues.

Table 6. Summary of Main Roads Responses to Stakeholder Submissions

Name of Stakeholder	Date of Consultation	Key Issue/Comment	Main Roads Response/Comment	TRIM Ref of Consultation
DWER	14 November 2023	DWER determined that the proposed clearing **may be at** variance with principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity. In relation to clearing principle (a), DWER note the proposed clearing area contains suitable habitat for Malleefowl (VU) and Black-striped Snake (P3), occurrence of vegetation representative of a Conservation Category Wetland (CCW) and the occurrence of four priority flora species. DWER noted that the clearing proposed of the four-priority flora are unlikely to be significant at the regional or species level due to populations recorded adjacent to the impact area and suitable habitat extends beyond the project area. Given the extent of clearing and availability of suitable habitat in the surrounding area, the impacts to the above CCW, flora and fauna are not considered to have a significant impact. Therefore, DWER considers the proposed clearing is unlikely to result in a significant residual impact to biodiversity. DWER agreed with Main Roads' determination that the proposal is unlikely to result in a significant residual impact given the scale, nature and location of the 0.19 ha of riparian vegetation to be cleared which is adjacent to an existing road.	In Section 5 "Assessment Against the Ten Clearing Principles", Clearing Principle (a) has been updated from 'not likely at variance' to 'may be at variance', in line with DWER's comments.	D23#1175558

9 COMPLIANCE WITH CPS 818

Table 7 summarises what further pre-clearing impact assessment is required in accordance with CPS 818.

Table 7. Summary of Additional Management Actions Required by CPS 818

Impact of Clearing	Yes/No or NA	Further Action Required
1. The CAR indicates that the clearing is 'At Variance' or 'May be at Variance' with one or more of the Clearing Principles.	**Yes**	**1.** Clearing Report to be published on website and submissions sought for 21 days. **2.** Submissions invited from relevant parties, including the LGA, the owner or occupier of the land and other stakeholders in accordance with Condition 8 of CPS 818. **3.** VMP has been completed, refer to Appendix 3. **4.** An offset proposal for approval by DWER will be prepared. **5.** Summary of submissions and a statement addressing each of those submissions to be published on website.
2. Clearing is at variance or may be at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality **or** (j) the incidence of flooding.	**No**	No further action required.
3. Clearing is at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality **and** (j) the incidence of flooding.	**No**	No further action required.
4. The Proposal involves clearing for temporary works (as defined by CPS 818).	**No**	No further action required.
5a. Proposal is within a Region that: • has rainfall greater than 400mm; and, • is South of the 26th parallel; and, • works are necessary in 'Other than dry conditions'; and, • works have potential for **uninfested** areas to be impacted.	**Yes**	Given the area is adjacent to DBCA managed land (Beekeepers Nature Reserve; WA24496), a Dieback Management Plan has been prepared and submitted to the DBCA for endorsement.
5b. Do the proposed works require clearing within or adjacent to DBCA managed lands in non-dry conditions?	**Yes**	Clearing is adjacent to DBCA managed Nature Reserve (Beekeepers Nature Reserve; WA24496). A Dieback Management Plan has been prepared and submitted for DBCA endorsement.

Impact of Clearing	Yes/No or NA	Further Action Required
6. Main Roads has been notified by DWER or an environmental specialist that the area to be cleared is susceptible to a pathogen other than dieback.	**No**	No further action required.
7. Weeds are likely to spread to and result in environmental harm to adjacent areas of native vegetation that are in good or better condition.	**No**	Main Roads propose dieback, weed and hygiene management measures to reduce the risk and spread of dieback, pathogens and weed species entering the vegetated areas.
8. Did an environmental specialist conduct the survey or field assessment?	**Yes**	The Environmental Specialist undertaking the biological assessments was suitably qualified and had more than three years' experience.
9. Did an environmental specialist prepare the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal?	**Yes**	The Environmental Specialist preparing the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal was suitably qualified and had more than three years' experience.

10 REFERENCES

Astron. (2017). Indian Ocean Drive: Passing Lane SLK 151-153.84 and Widening SLK 248-258 Biological Survey. Prepared for Main Roads WA.

Australian Museum (2023). Bar-tailed Godwit. Available online from https://australian.museum/learn/animals/birds/bar-tailed-godwit/ Accessed April 2023.

Beeston, G.R., Hopkins, A.J.M. and Shepherd, D.P. (2002). Land-use and vegetation in Western Australia. Department of Agriculture, Western Australia, Resource Management Technical Report 250.

Bureau of Meteorology Australia. (2023). Climate Averages for Australian Sites – Jurien Bay – Available online from http://www.bom.gov.au/climate/data/index.shtml Accessed March 2023. Commonwealth Scientific and Industrial Research Organisation, 2015. Australian Soil Resource Information System (ASRIS). Available online from http://www.asris.csiro.au Accessed March 2023.

CSIRO. (2015). Australian Soil Resource Information System (ASRIS). Available at https://www.asris.csiro.au/: Commonwealth Scientific and Industrial Research Organisation.

Department of Climate Change, Energy, the Environment and Water. (2023a). Calidris ferruginea in Species Profile and Threats Database. Department of the Environment, Canberra. Accessed April 2023.

Department of Climate Change, Energy, the Environment and Water (2020). Conservation Advice Falco hypoleucos Grey Falcon. Threatened species scientific committee. Available online from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice09072020.pdf

Department of Climate Change, Energy, the Environment and Water. (2022). Protected Matters Search Tool Report. Available online from: https://pmst.awe.gov.au/#/map?lng=131.50634765625003&lat=-28.671310915880834&zoom=5&baseLayers=Imagery,ImageryLabels. Accessed March 2023.

Department of Climate Change, Energy, the Environment and Water. (2022). Species Profile and Threats Database. Available online from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl / Accessed March 2023.

Department of Environment and Conservation (2014). A guide to the assessment of applications to clear native vegetation under Part V Division 2 of the Environmental Protection Act 1986. Department of Environment Regulation. Perth, Western Australia.

Department of the Environment (2013). Matters of National Environmental Significance, Significant Impact Guidelines 1.1, Environment Protection and Biodiversity Conservation Act 1999. Canberra, Australian Capital Territory.

Environmental Protection Authority (2016). Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment (eds. K Freeman, G Stack, S Thomas and N Woolfrey). Perth, Western Australia. Focused Vision Consulting (2022).

Environmental Protection Authority (2020). Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment. Perth, Western Australia.

Focused Vision Consulting. (2022). Indian Ocean Drive Widening SLK 220-250 Biological Survey. Prepared for Main Roads WA.

Global Groundwater (2021). Indian Ocean Drive SLK220-253 Hydrogeology Study Report - Global Groundwater 2021(Australian Bore Consultants Pty. Ltd. Hydrogeological Division).

Government of Western Australia. (2018). 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of April 2019. WA Department of Biodiversity, Conservation and Attractions, Perth. Available online from: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Government of Western Australia (2014a). A guide to the assessment of applications to clear native vegetation Under Part V Division 2 of the Environmental Protection Act 1986. Department of Environmental Regulation. Western Australian Herbarium. 1998– FloraBase - The Western Australian Flora. Department of Biodiversity, Conservation and Attractions. Available online from: https://florabase.dpaw.wa.gov.au/ Accessed March 2023.

Western Australian Herbarium (1998–) FloraBase - The Western Australian Flora. Department of Biodiversity, Conservation and Attractions. Available online from: https://florabase.dpaw.wa.gov.au/ Accessed 2023.

11 APPENDICES

Appendix 1: CPS 818/16 condition 8 (e) (iii) Biological Surveys and Field Assessment Executive Summary and Report Conclusions

Focused Vision Consulting (2022)
Biological Survey
Indian Ocean Drive Widening, SLK 220 – 250.

Astron Environmental Services (2017)
Biological Survey
Indian Ocean Drive: Passing Lane SLK 151 – 153.84 and Widening SLK 248 – 258.

EXECUTIVE SUMMARY

Main Roads Western Australia (Main Roads) intends to widen Indian Ocean Drive (IOD) between Straight Line Kilometre (SLK) 220 and 250 in stages over the next several years. As part of the project, Main Roads required a biological survey for the project, 32 km north of Eneabba along IOD (the project area), in accordance with relevant State guidelines and Technical Guides and Commonwealth survey guidelines.

Focused Vision Consulting Pty Ltd (FVC) was commissioned to undertake the biological assessment, which included a flora, vegetation and fauna assessment (including a targeted Black-Cockatoo habitat survey) of the project area. The outcome of the survey and information supplied in the biological assessment report will be used to avoid and minimise environmental impacts and support environmental approvals.

The scope of this study was to undertake a desktop assessment of the study area and a field flora, vegetation, fauna and habitat assessment of the project area to identify all biological features and constraints and to prepare a report compiling the findings.

A single-phase, detailed and targeted flora and vegetation assessment, with a basic fauna assessment and targeted Black-Cockatoo habitat survey was conducted by experienced botanists, ecologists and zoologists during spring 2021.

The key findings and conclusions arising from the flora, vegetation, fauna and habitat assessment within the project area are as follows:

- No Threatened flora listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were recorded.
- The following seven Priority flora species listed by the Department of Biodiversity, Conservation and Attractions (DBCA) were recorded:
    - *Beyeria cinerea* subsp. *cinerea* (Priority (P) 3)
    - *Calandrinia ? oraria* (P3)
    - *Haloragis foliosa* (P3)
    - *Hemiandra* sp. Eneabba (H. Demarz 3687) (P3)
    - *Stylidium maritimum* (P3)
    - *Thryptomene* sp. Lancelin (P3)
    - *Grevillea olivacea* (P4).
- Five flora species are considered to be exhibiting an extension beyond their currently documented range of occurrence, in accordance with records of the Western Australian Herbarium.
- Two of the recorded flora species were found to be undescribed (phrase name) species in accordance with records of the Western Australian Herbarium.
- None of the recorded introduced (weed) species are listed as Weeds of National Significance (WoNS) or Declared Pest (DP) plants as listed under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).
- The remnant vegetation units comprise of three *Acacia*/*Melaleuca* shrublands, one *Melaleuca* shrubland, two *Melaleuca* woodlands, one *Melaleuca* forest and one Samphire shrubland.
- The desktop assessment determined that one Threatened Ecological Community (TEC) is known to occur in the study area, although this community is not considered to be represented within the project area.
- The condition of the vegetation of the project area was found to range from 'Completely Degraded' to 'Excellent', with the majority (31.51%) found to be in 'Good' condition and 76.89% of the project area vegetation in 'Good' or better condition.

- No vegetation units defined and mapped within the project area were found to be of National or State significance, all eight units were found to be of regional significance, and three were found to be of local significance.
- A total of 25 fauna species from 19 families were recorded in the project area with all species considered relatively common and widespread and one species of conservation significance (Osprey) recorded during the field survey.
- A total of 25 fauna species of conservation significance resulted from the desktop assessment, with none considered likely to occur, one possibly occurring, 23 considered unlikely to occur and one species recorded within the project area during the field assessment.
- The field assessment recorded one reptile species and 24 bird species with no mammals or amphibians.
- The project area was found to support five fauna habitats: Acacia Shrubland, Coastal Heath, Melaleuca Shrubland, Mixed Shrubland, and Salt Lake Margins.
- The project area supports very little, if any suitable foraging habitat for Carnaby's Black-Cockatoo, with quality ranging from scores of 0 ('none/negligible') to 2 ('low').
- No confirmed Black-Cockatoo breeding sites occur within the project area, and no trees with suitable hollows were recorded during the field assessment.
- No evidence of Black-Cockatoo roosting was observed during the field assessment and roosting within the project area is considered very unlikely. The closest known roost to the project area is approximately 15 km to the east of the project area.

7 CONCLUSIONS

The key findings and conclusions arising from the flora, vegetation, fauna and habitat assessment within the project area are as follows:

- No Threatened flora listed under the BC Act or the EPBC Act were recorded.
- The following seven Priority flora species listed by DBCA were recorded:
  - *Beyeria cinerea* subsp. *cinerea* (P3)
  - *Calandrinia ? oraria* (P3)
  - *Haloragis foliosa* (P3)
  - *Hemiandra* sp. Eneabba (H. Demarz 3687) (P3)
  - *Stylidium maritimum* (P3)
  - *Thryptomene* sp. Lancelin (P3)
  - *Grevillea olivacea* (P4).
- Five flora species are considered to be exhibiting an extension beyond their currently documented range of occurrence, in accordance with records of the Western Australian Herbarium.
- Two of the recorded flora species were found to be undescribed (phrase name) species in accordance with records of the Western Australian Herbarium.
- None of the recorded introduced (weed) species are listed as WoNS or DP plants as listed under the BAM Act.
- The remnant vegetation units comprise of three *Acacia/ Melaleuca* shrublands, one *Melaleuca* shrubland, two *Melaleuca* woodlands, one *Melaleuca* forest and one Samphire shrubland.
- The desktop assessment determined that one TEC is known to occur in the study area, although this community is not considered to be represented within the project area.
- The condition of the vegetation of the project area was found to range from 'Completely Degraded' to 'Excellent', with the majority (31.51%) found to be in 'Good' condition and 76.89% of the project area vegetation in 'Good' or better condition.
- No vegetation units defined and mapped within the project area were found to be of National or State significance, all eight units were found to be of regional significance, and three were found to be of local significance.
- A total of 25 fauna species from 19 families were recorded in the project area with all species considered relatively common and widespread and one species of significance (Osprey) recorded during the field survey.
- A total of 25 fauna species of significance resulted from the desktop assessment, with none considered likely to occur, one possibly occurring, 23 considered unlikely to occur and one species recorded within the project area during the field assessment.
- The field assessment recorded one reptile species and 24 bird species with no mammals or amphibians.
- The project area was found to support five fauna habitats: Acacia Shrubland, Coastal Heath, Melaleuca Shrubland, Mixed Shrubland, and Salt Lake Margins.
- The project area supports very little, if any suitable foraging habitat for Carnaby's Black-Cockatoo, with quality ranging from scores of 0 ('none/negligible') to 2 ('low').
- No confirmed Black-Cockatoo breeding sites occur within the project area, and no trees with suitable hollows were recorded during the field assessment.
- No evidence of Black-Cockatoo roosting was observed during the field assessment and roosting within the project area is considered very unlikely. The closest known roost to the project area is approximately 15 km to the east of the project area.

Executive Summary

Astron Environmental Services was engaged to undertake a biological survey along Indian Ocean Drive, at two locations. One area is south of Jurien Bay at straight line kilometre 151-153.84, and is herein referred to as the Passing Lane survey area. The second section is south of Dongara at straight line kilometre 248-258 and is herein referred to as the Widening survey area.

The Passing Lane survey area included 7.82 hectares (89%) of native vegetation, with approximately 0.96 hectares (10.9%) cleared for road verges and rated as 'completely degraded'. The remainder of the vegetation in the Passing Lane survey area was rated as 'very good' condition. The Widening survey area included 38.01 hectares (63%) of native vegetation, with approximately 22.27 hectares (37%) cleared for existing roads, road verges and sand tracks. These cleared areas were rated as 'completely degraded'. Just over a third (36.2%) of remnant vegetation within the Widening survey area was rated as 'excellent' condition, while just under a third was rated as 'very good' (31.3%) and 'good' (32.5%) condition.

Six vegetation types were recorded and mapped with the survey areas. Two were recorded in the Passing Lane survey area, and all six were recorded in the Widening survey area. None of the vegetation identified within the survey areas is considered to match the description of any known *Environment Protection and Biodiversity Conservation Act 1999* listed Matters of National Environmental Significance threatened ecological communities or State-listed threatened or priority ecological communities.

No Threatened flora was recorded in either the Passing Lane or Widening survey areas. No Priority flora species were recorded in the Passing Lane survey area. One individual of the Priority 3 species *Thryptomene* sp. Lancelin (M.E. Trudgen 14000) was found within the Widening survey area. Following the survey, one Threatened (*Hemiandra gardneri*) and 26 Priority flora species are still considered to have potential to occur within either the Passing Lane or Widening survey areas.

One weed species, athel pine (**Tamarix aphylla*), recorded in the Widening survey area, is listed as a Weed of National Significance and as a Declared Pest under the *Biosecurity and Agriculture Management Act 2007*.

Four broad fauna habitat types were recorded and mapped within the survey areas. The most extensive fauna habitat type was the Acacia Tall Scrub habitat, which comprised 36% of the survey areas. The majority of the survey area was classified as 'high quality' fauna habitat. During the field survey, 32 vertebrate fauna species were opportunistically recorded. No fauna species of conservation significance were recorded in the survey area. Two conservation significant species have been classified as having a 'high' likelihood of occurring in the survey area: malleefowl (Vulnerable; Schedule 3) and black-striped snake (Priority 3).

The survey area contains no known foraging resources for the Carnaby's black-cockatoo and it is unlikely that habitats in the area provide valuable foraging habitat for this species. The survey area contained no trees classified in the referral guidelines as mature trees and none of the habitats within the survey area could be considered as current or potential future breeding habitat.

The *Eucalyptus* (mallee) woodland habitat type may provide habitat for the malleefowl, and soft sand on the dunes throughout all the habitat types within both survey areas may provide habitat for the black-striped snake. However, all the habitat types mapped within both survey areas are likely to be a small part of a larger distribution of these habitats to the east of these sites in the adjacent Southern Beekeepers and Beekeepers Nature Reserves. As such, the conservation significant fauna considered likely to occur in the survey area are unlikely to be reliant upon the habitats present.

5 Conclusions

Both the Passing Lane and Widening survey areas consist of a narrow linear corridor that occurs across sand dunes and some sandy plains/stabilised dunes. The Passing Lane survey area included 7.82 ha of native vegetation, with approximately 0.96 ha cleared for road verges and rated as 'completely degraded'. The remainder of the vegetation in the Passing Lane survey area was rated as 'very good' condition. The Widening survey area included 38.01 ha of native vegetation, with approximately 22.27 ha cleared for existing roads, road verges and sand tracks. These cleared areas were rated as 'completely degraded'. None of the vegetation identified within the survey area is considered to match the description of any known EPBC Act listed MNES TECs or State-listed PECs.

No Threatened flora was recorded in either the Passing Lane or Widening survey areas. No Priority flora species were recorded in the Passing Lane survey area. One individual of the P3 species *Thryptomene* sp. Lancelin (M.E. Trudgen 14000), was found within the Widening survey area.

One weed species, athel pine (**T. aphylla*), recorded in the Widening survey area, is listed as a WoNS (Australian Weeds Committee 2012) and as a Declared Pest (s22) listed under the BAM Act (Department of Agriculture and Food Western Australia 2017). Three individuals of this species were recorded at one location in the southern part of the Widening survey area.

The survey area contains no known foraging resources for the Carnaby's black-cockatoo. The survey area contained no trees classified in the referral guidelines as mature trees. None of the habitats within the survey area could be considered as current or potential future breeding habitat, as no hollow bearing trees of appropriate species were present in the survey area.

No fauna species of conservation significance were recorded in the survey area. Two conservation significant species have been classified as having a 'high' likelihood of occurring in the survey area; malleefowl (Vu; S3) and black-striped snake (P3).

The *Eucalyptus* (mallee) woodland habitat type may provide habitat for the malleefowl, and soft sand on the dunes throughout all the habitat types within both survey areas may provide habitat for the black-striped snake. However, all the habitat types mapped within both the Passing Lane and Widening survey areas are likely to be a small part of a larger distribution of these habitats to the east of these sites in the adjacent Southern Beekeepers and Beekeepers Nature Reserves. As such, the conservation significant fauna considered likely to occur are unlikely to be dependent upon the habitats present in the survey area.

Appendix 2: Vegetation within Proposal Area - Series of Figures

Figure 3 A: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

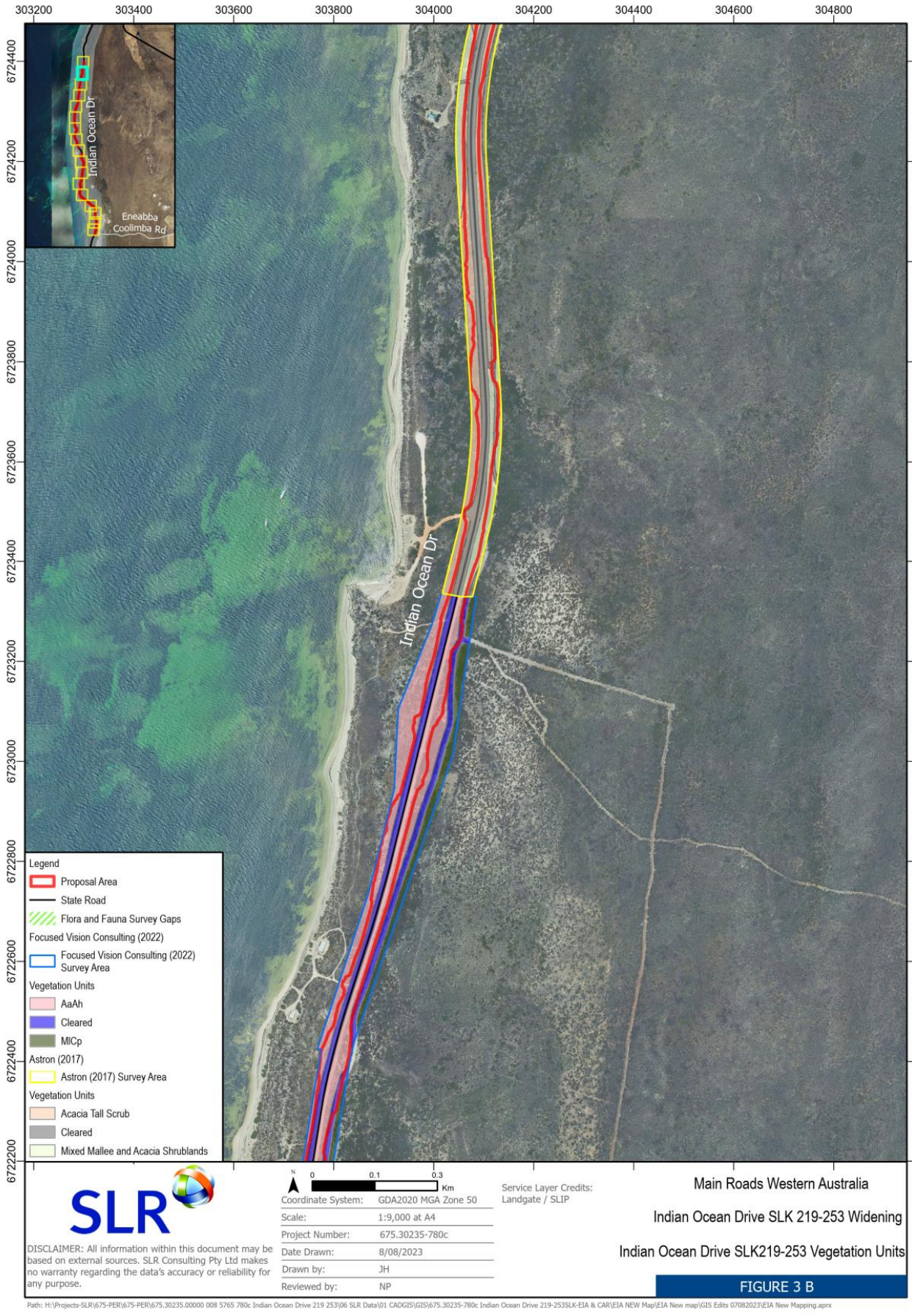


Figure 3 B: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

Figure 3 C: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

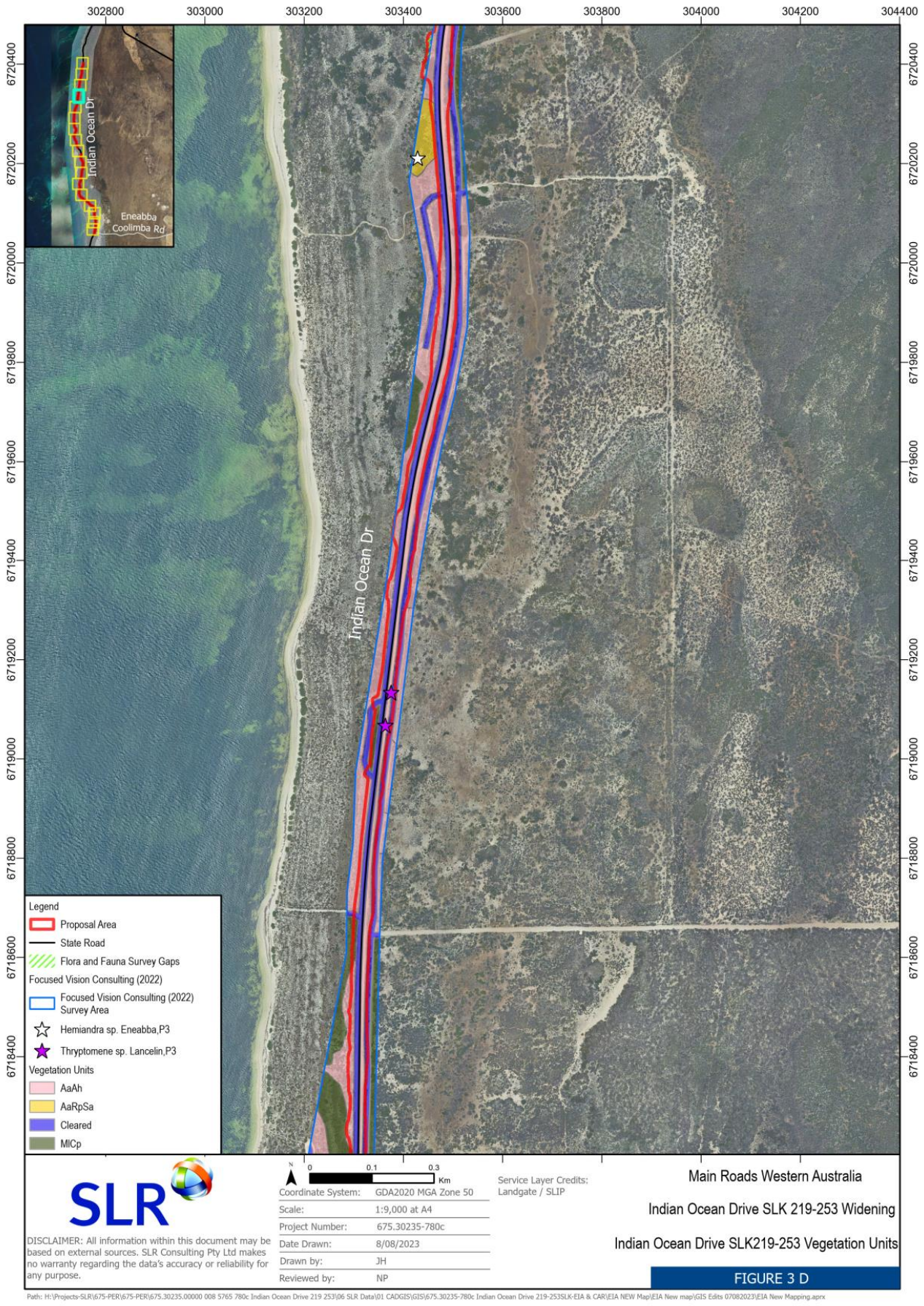


Figure 3 D: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

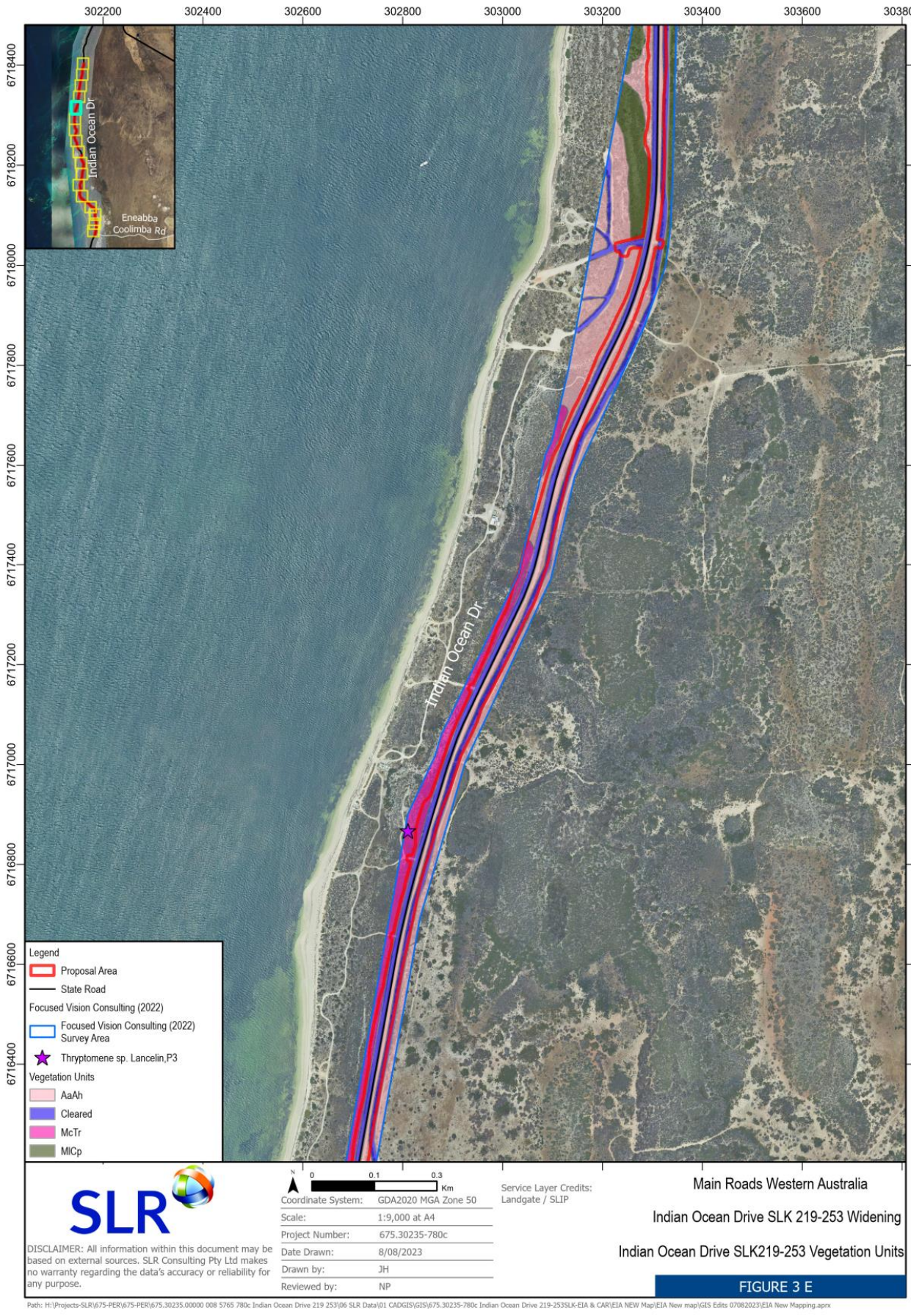


Figure 3 E: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

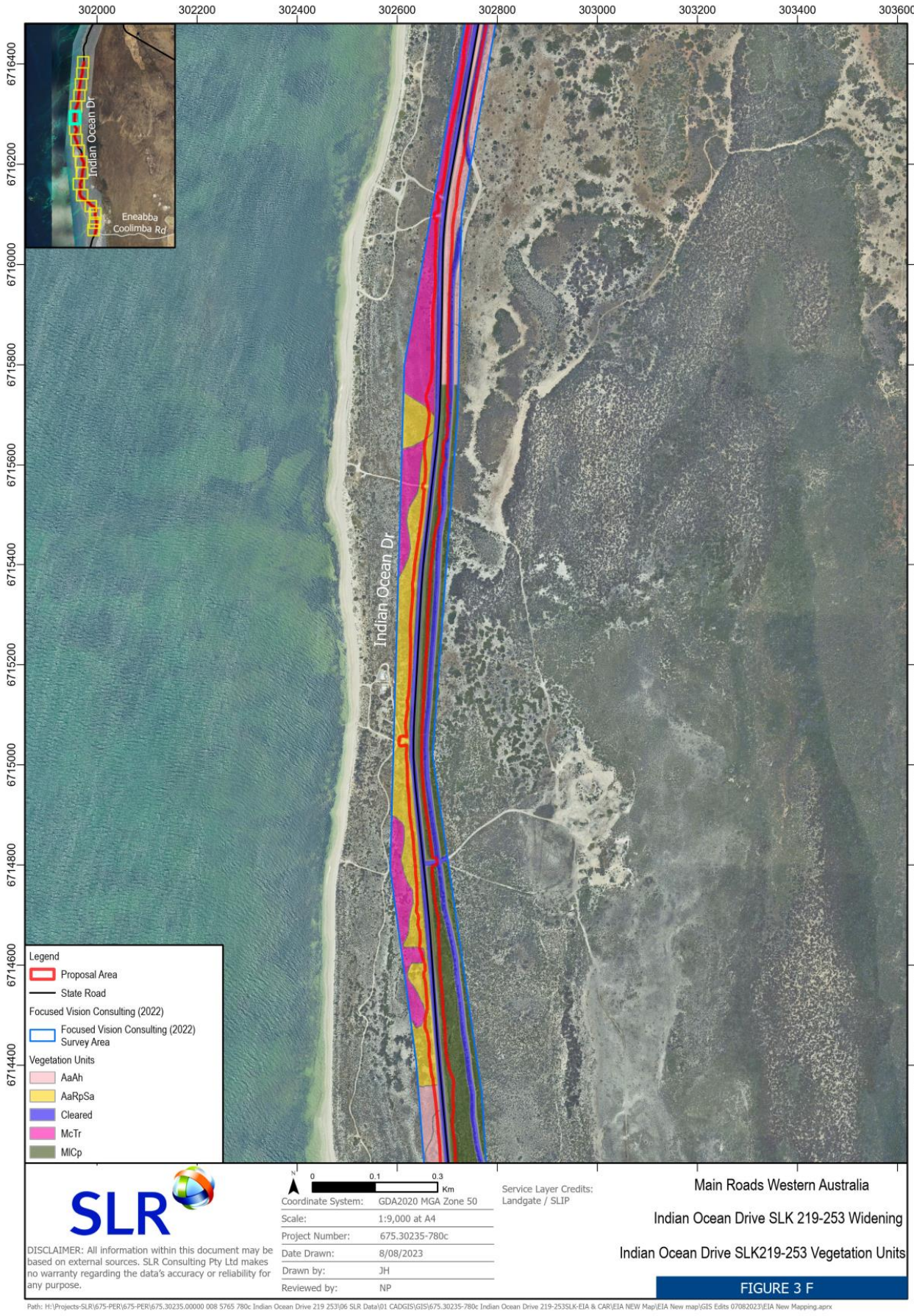


Figure 3 F: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

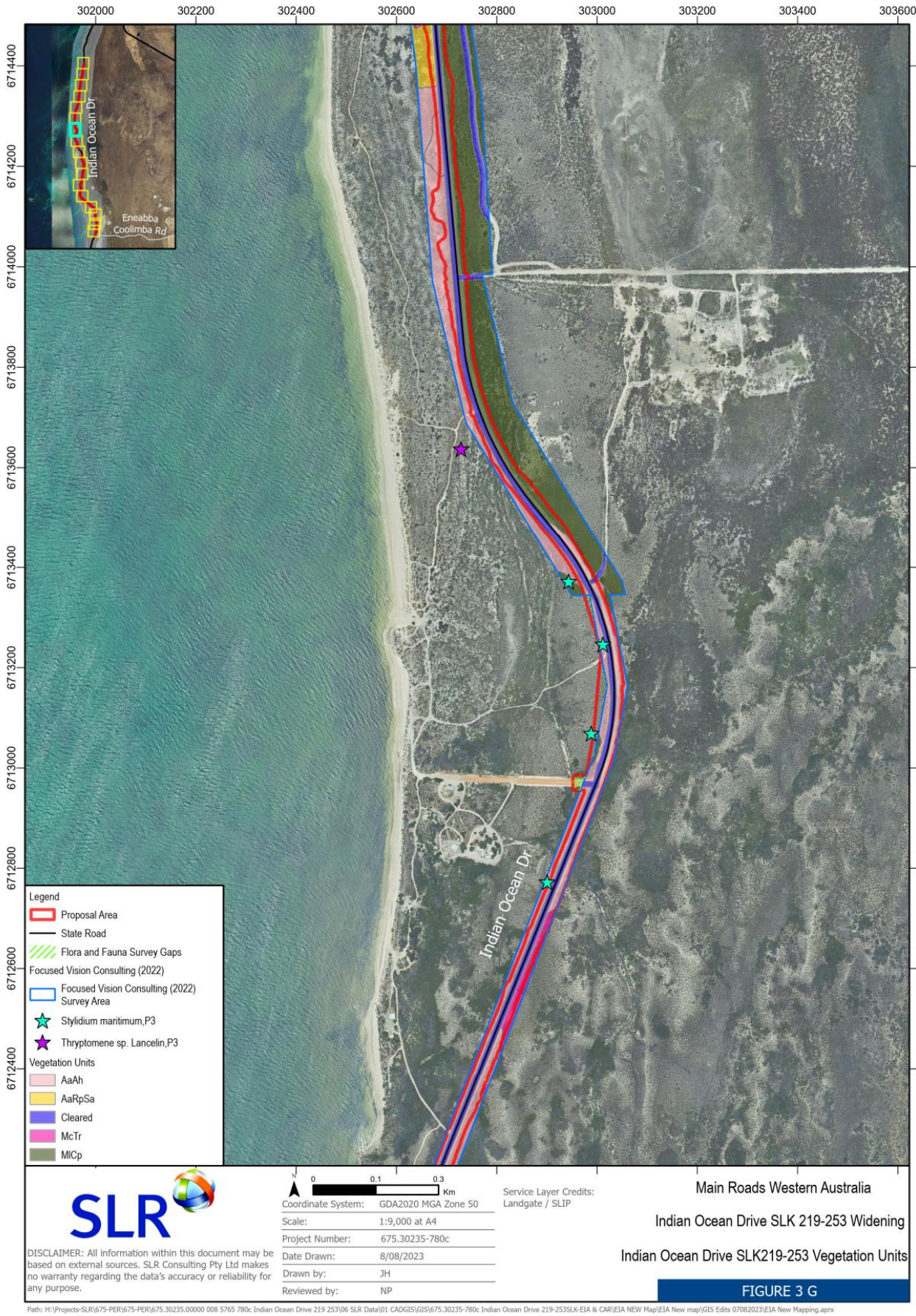


Figure 3 G: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

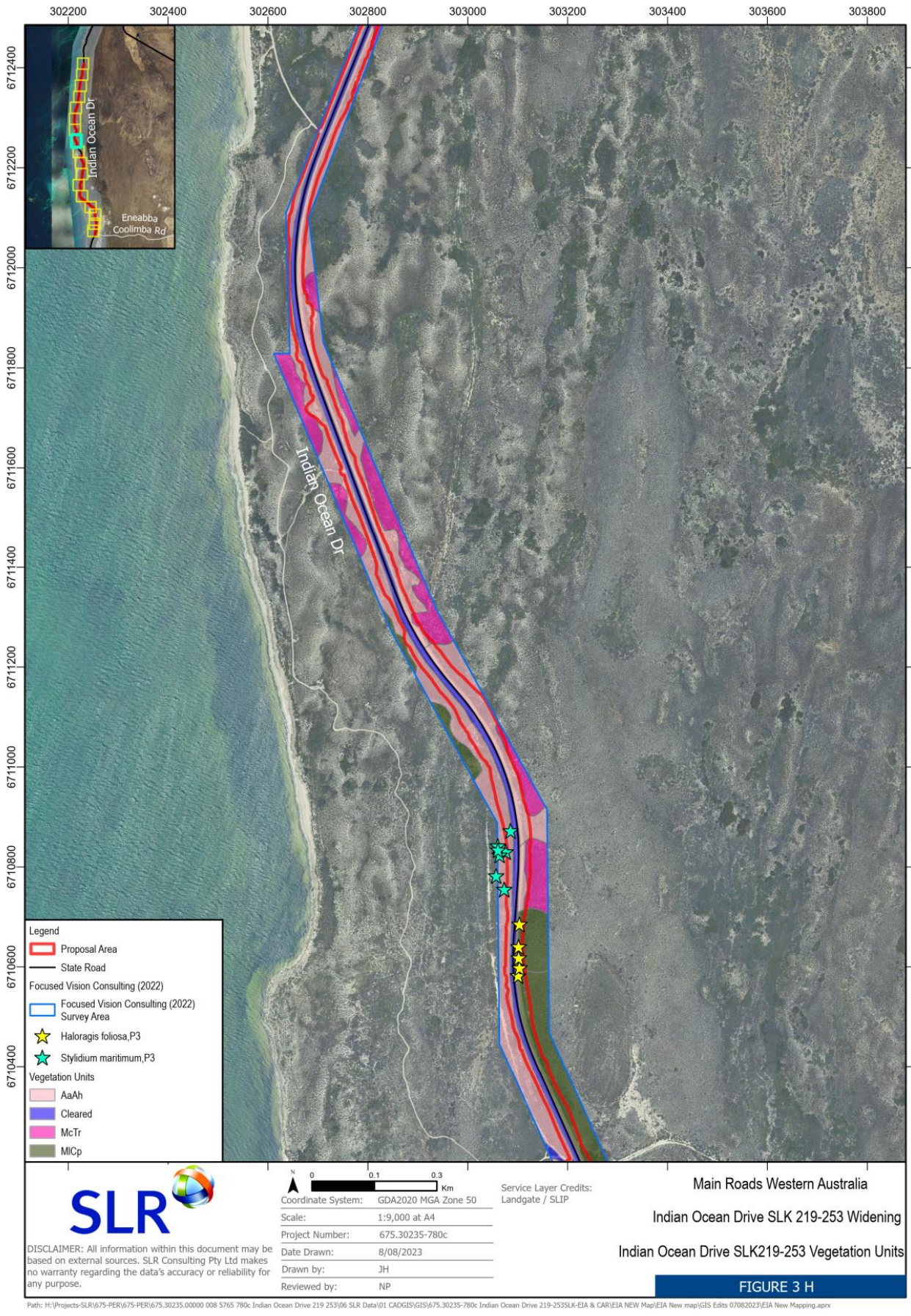


Figure 3 H: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

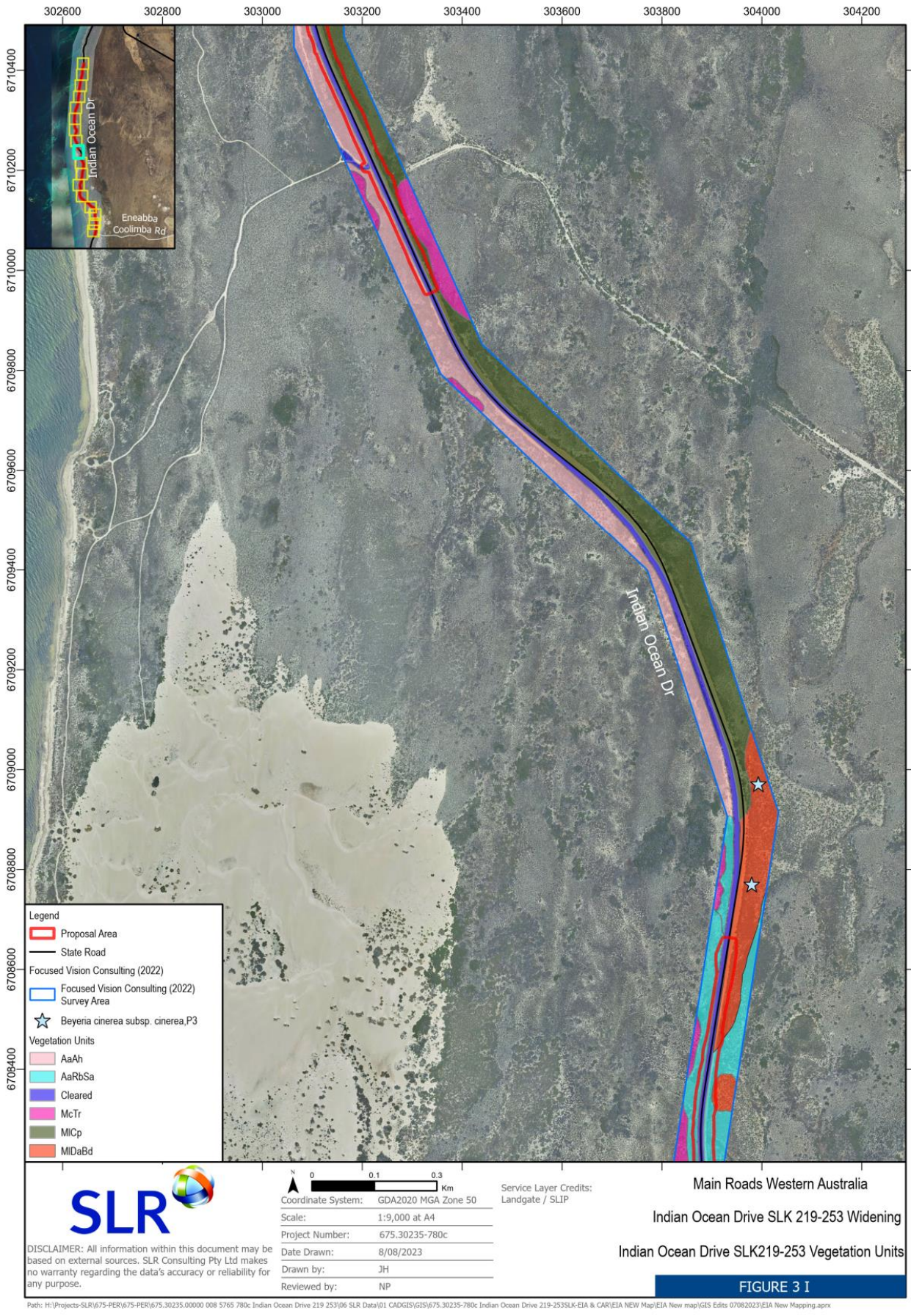


Figure 3 I: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

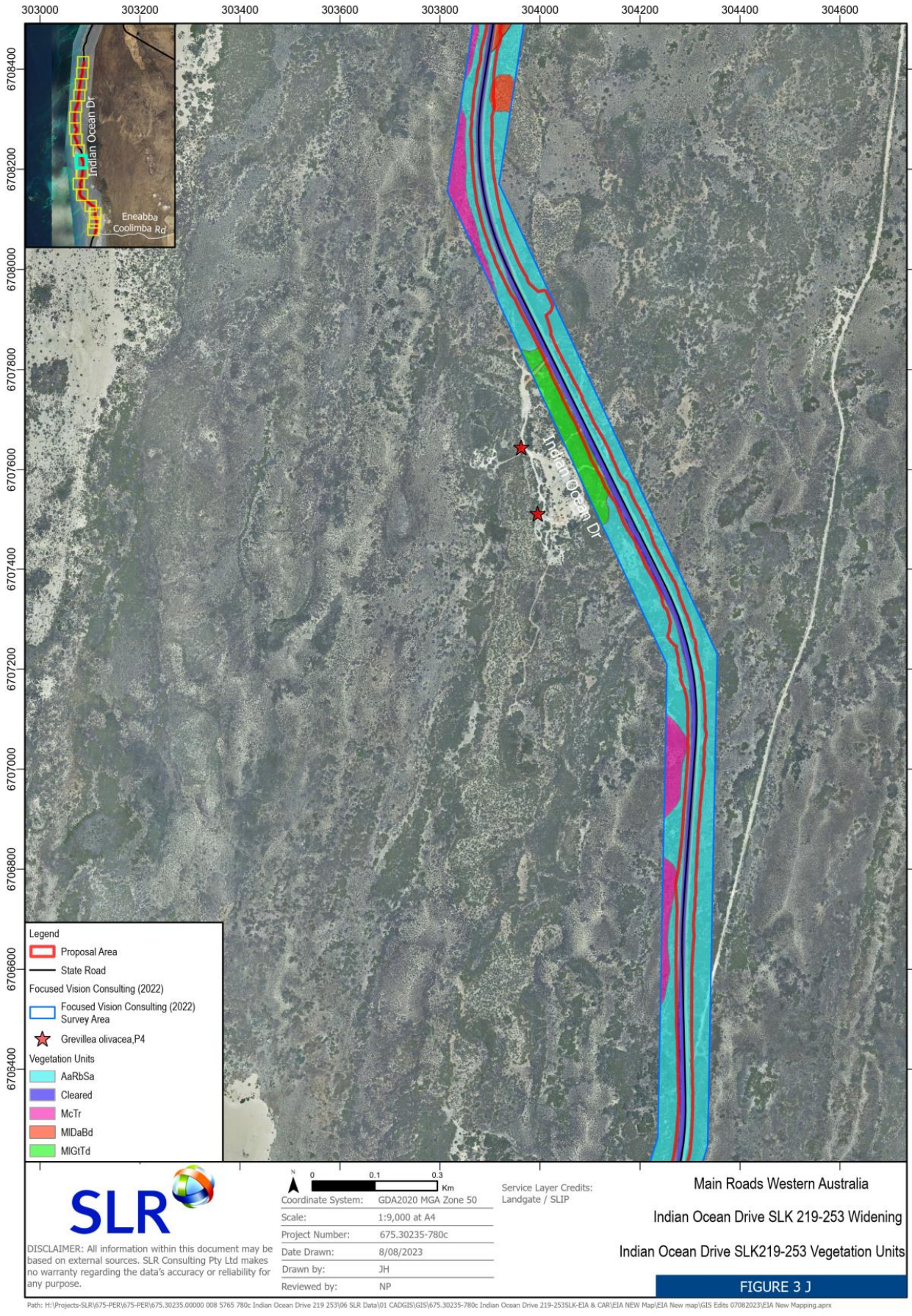


Figure 3 J: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

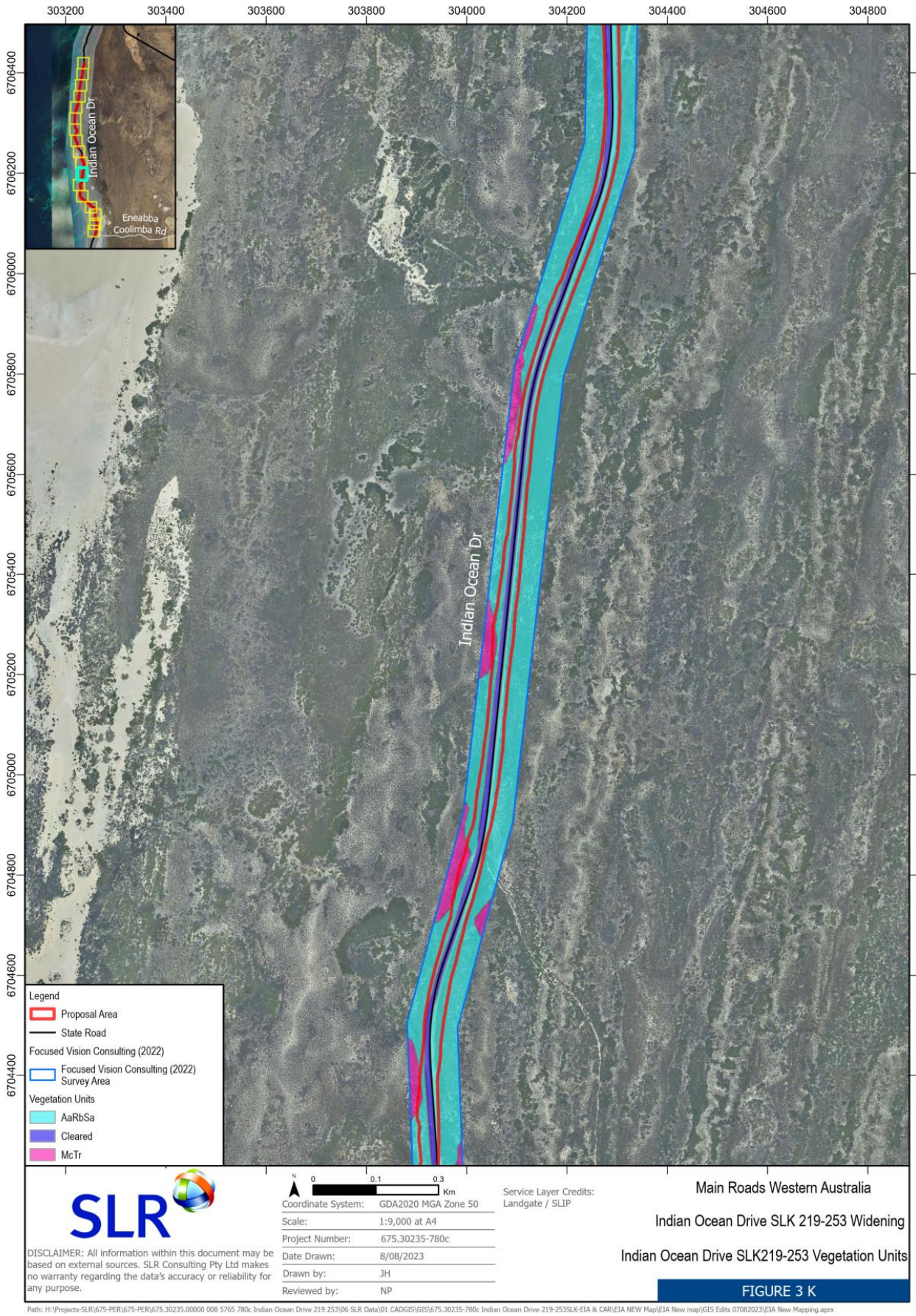


Figure 3 K: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

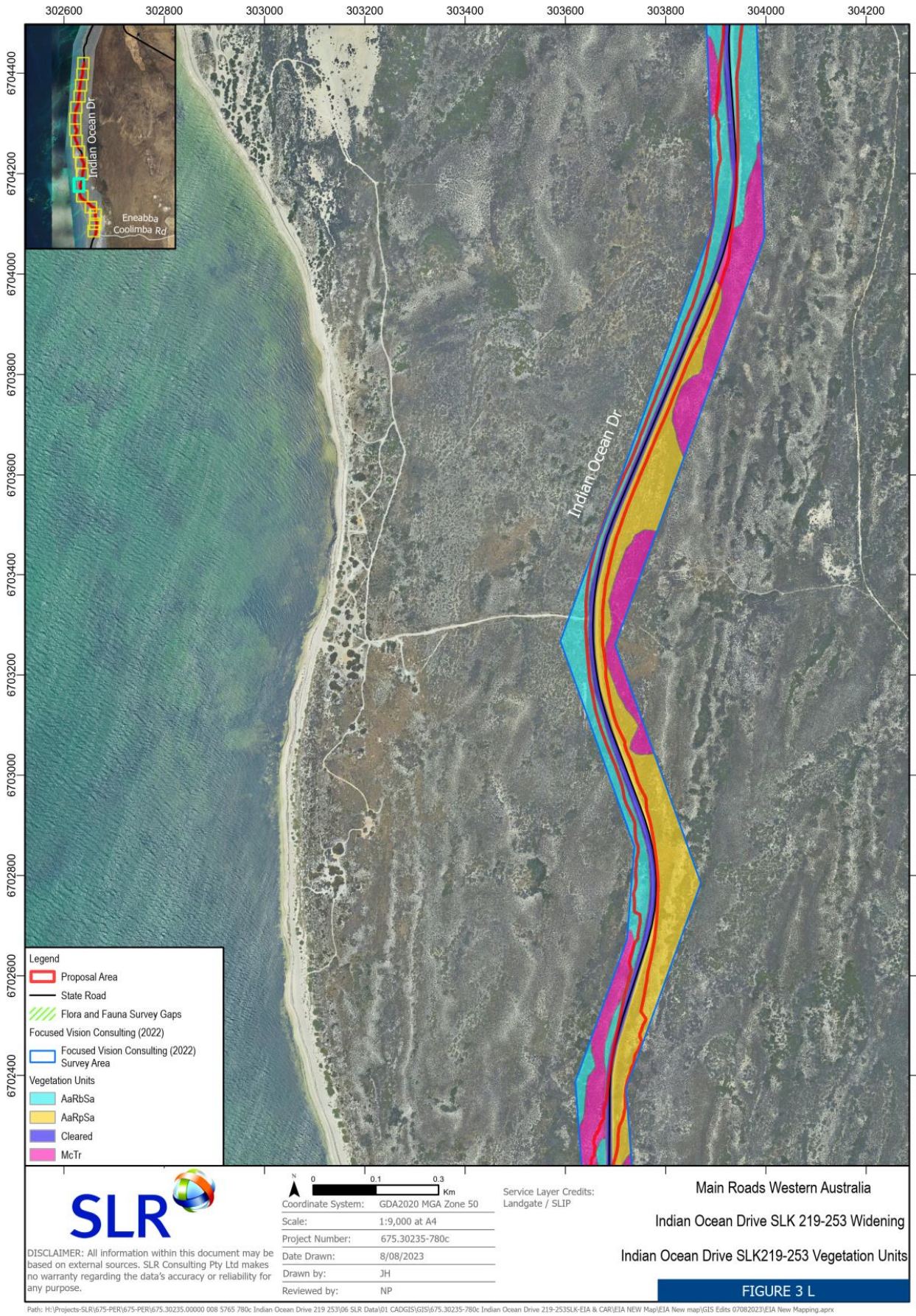


Figure 3 L: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

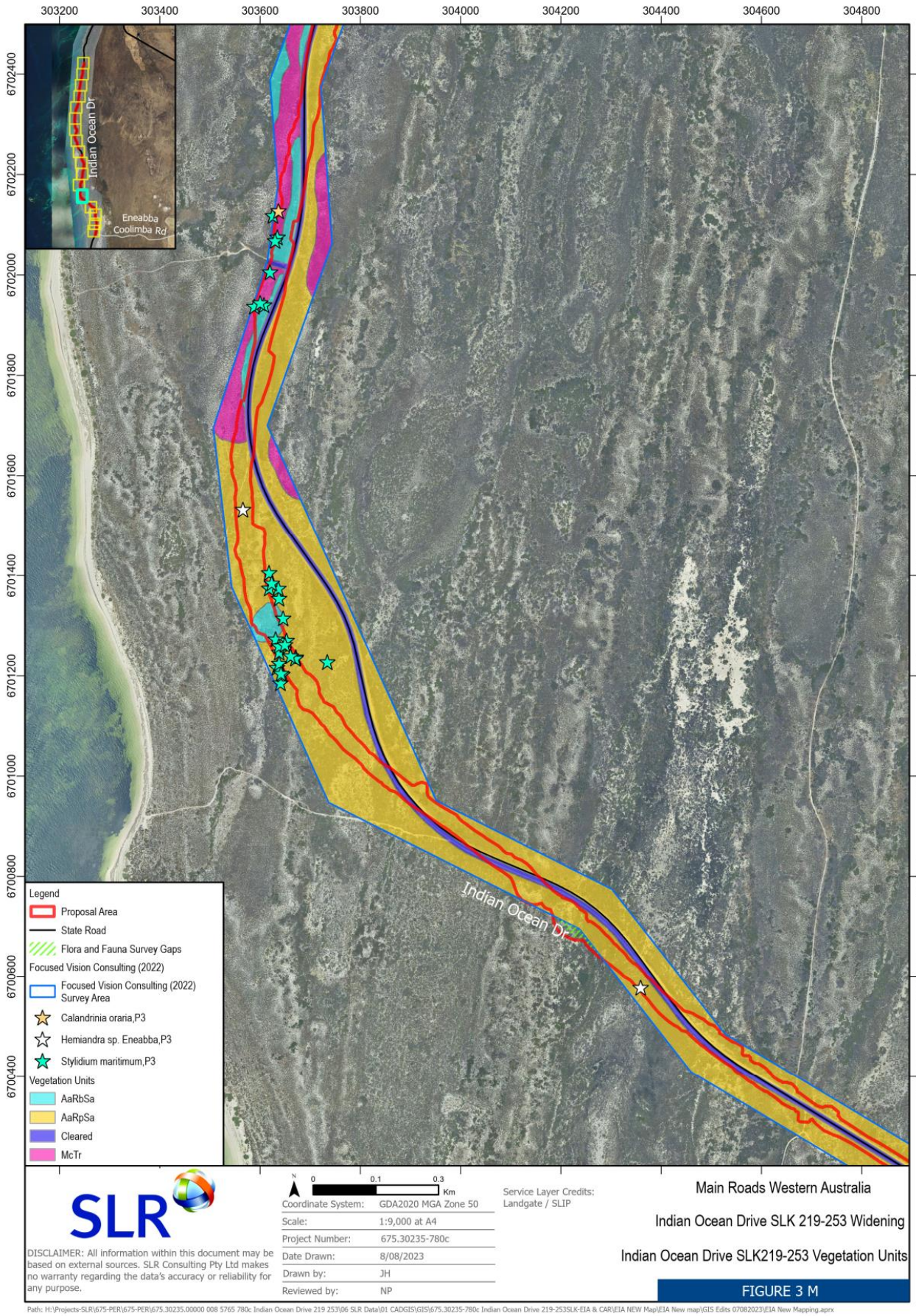


Figure 3 M: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

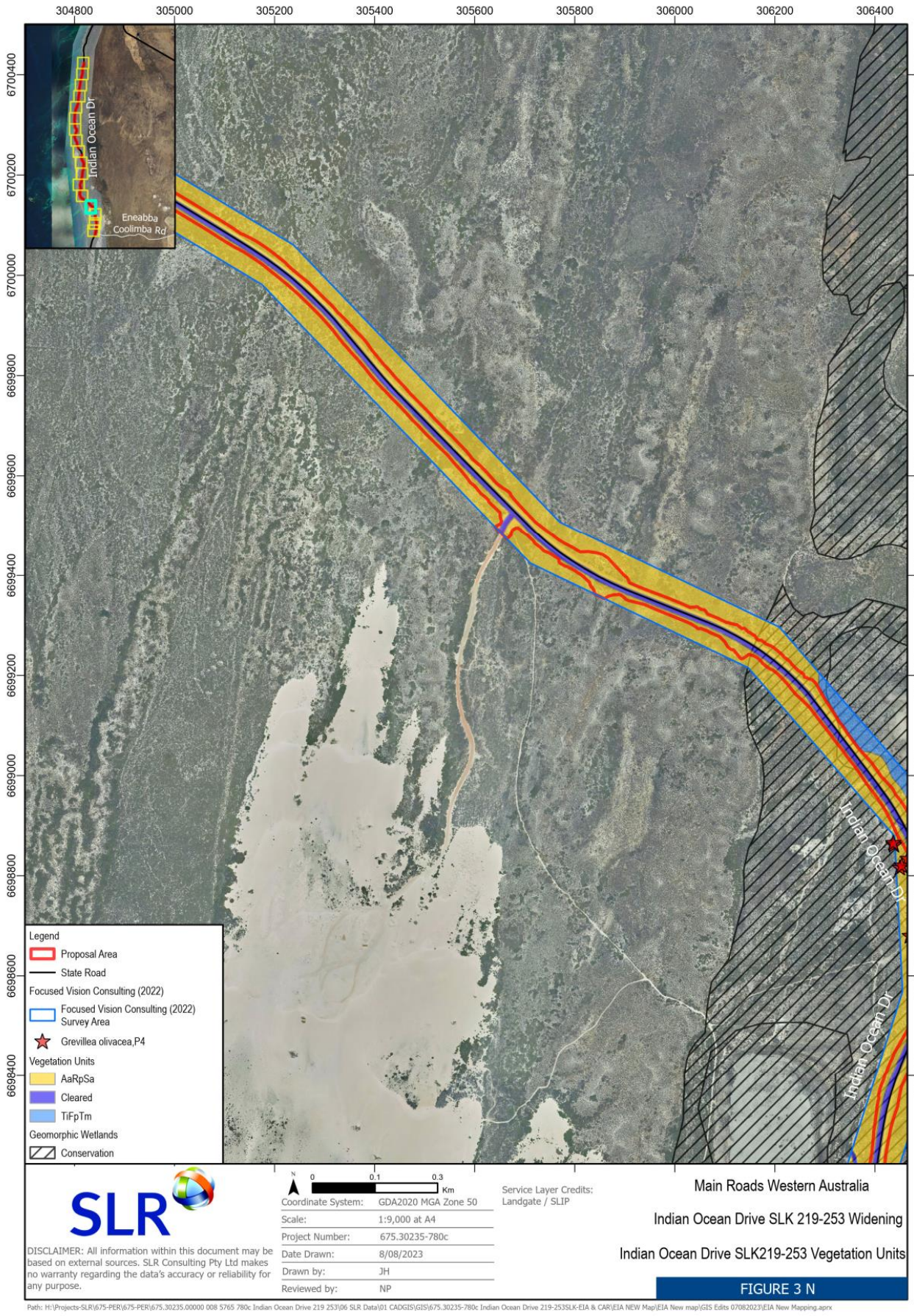


Figure 3 N: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

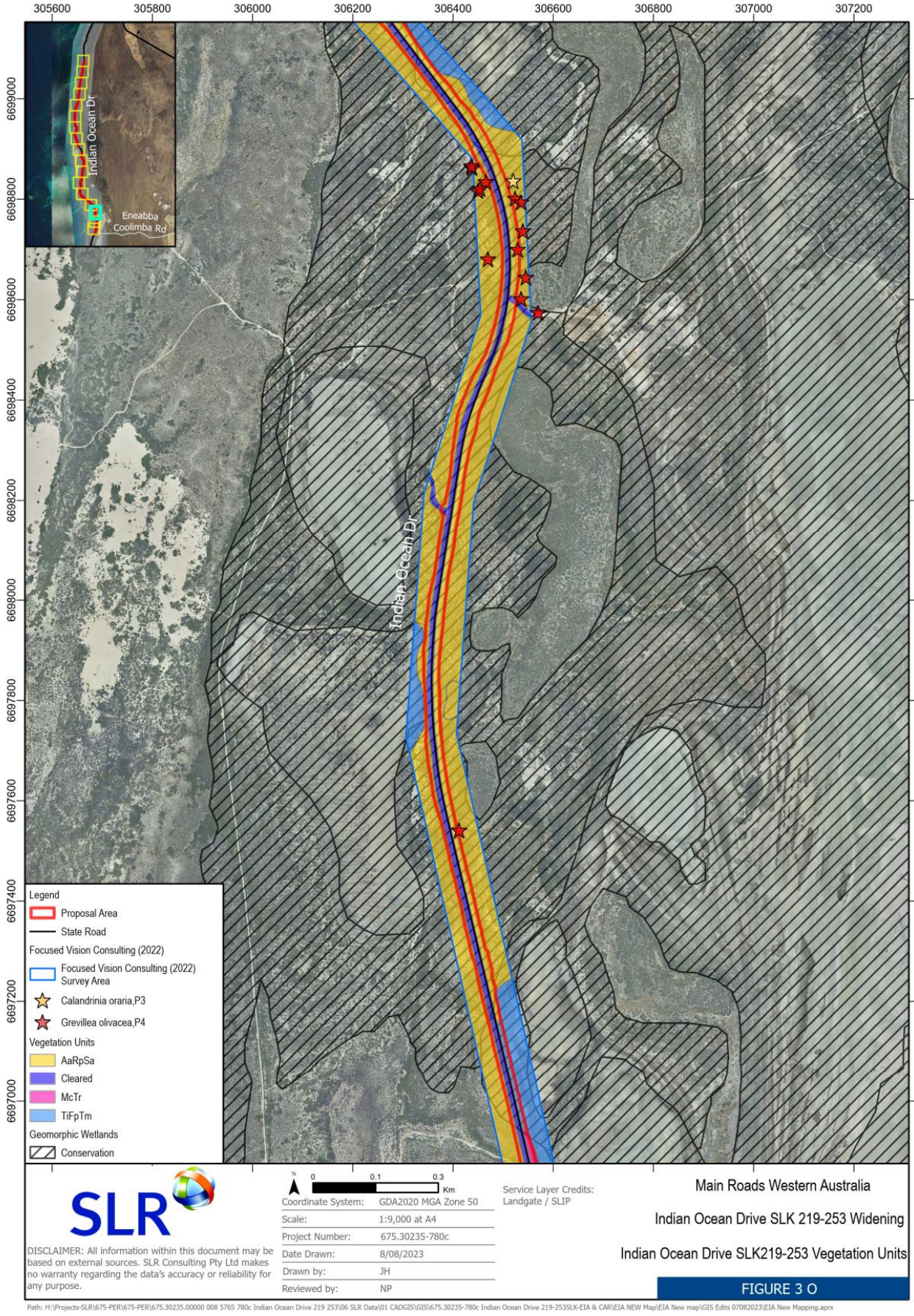


Figure 3 O: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

Figure 3 P: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

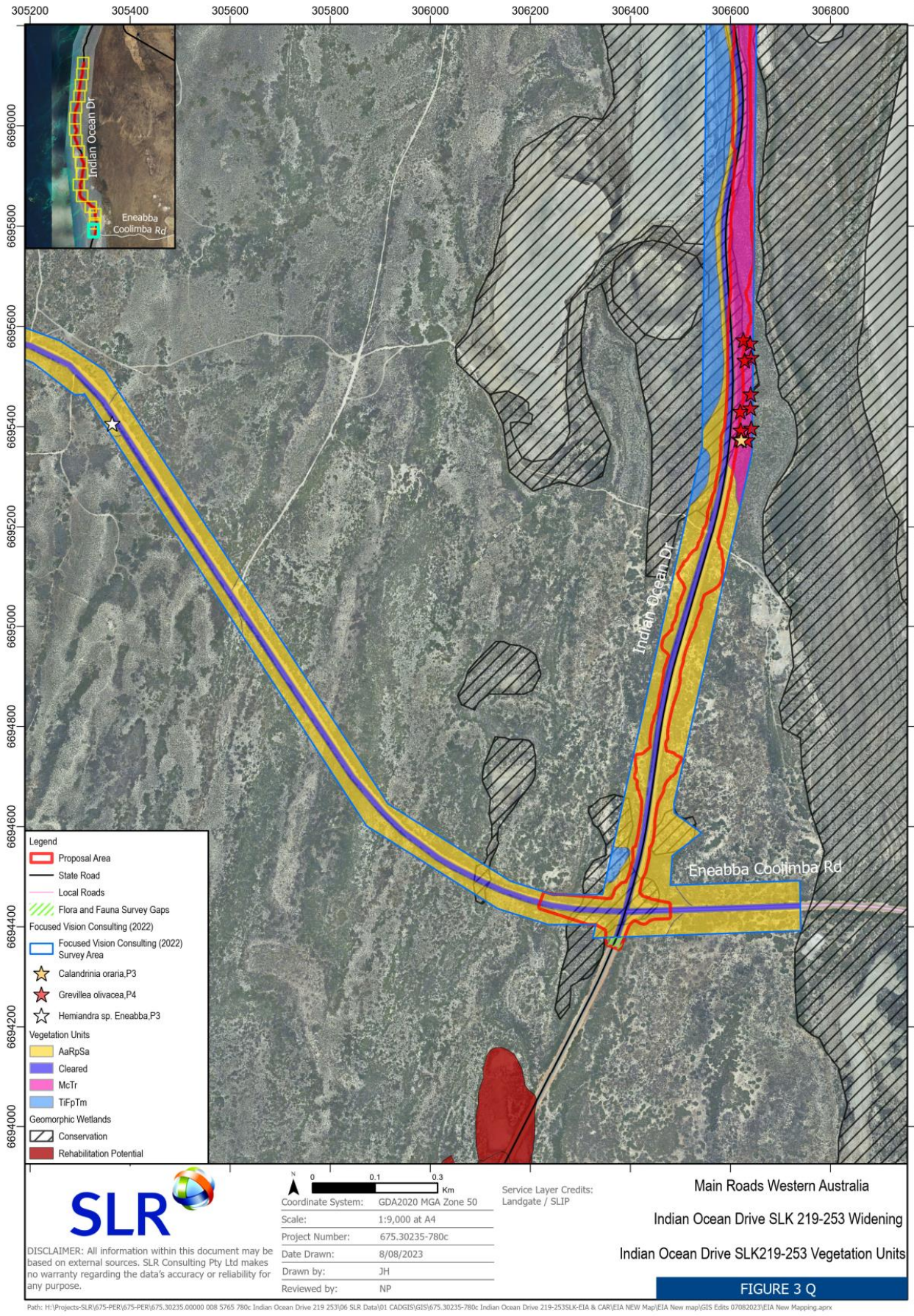


Figure 3 Q: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Units.

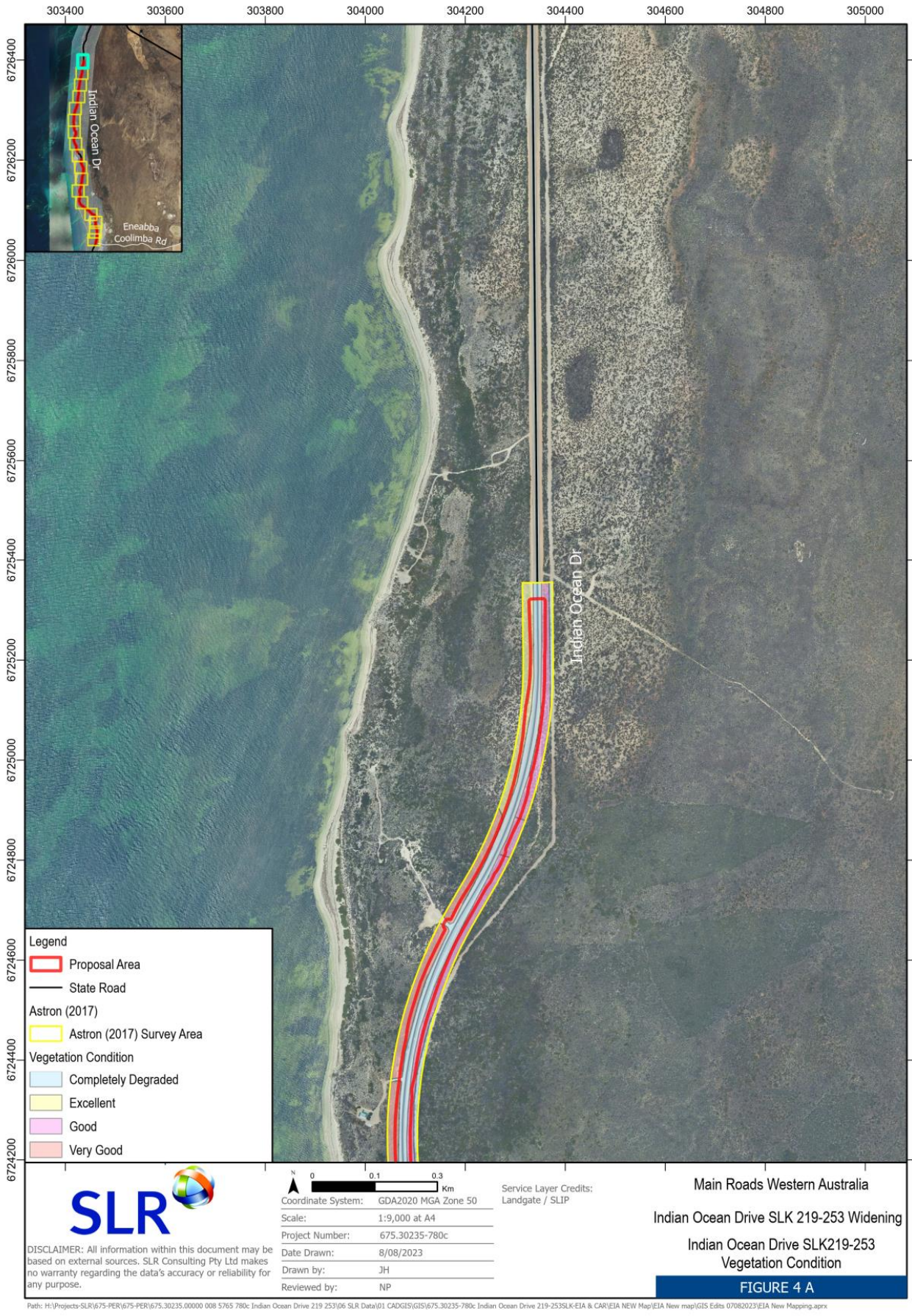


Figure 4 A: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

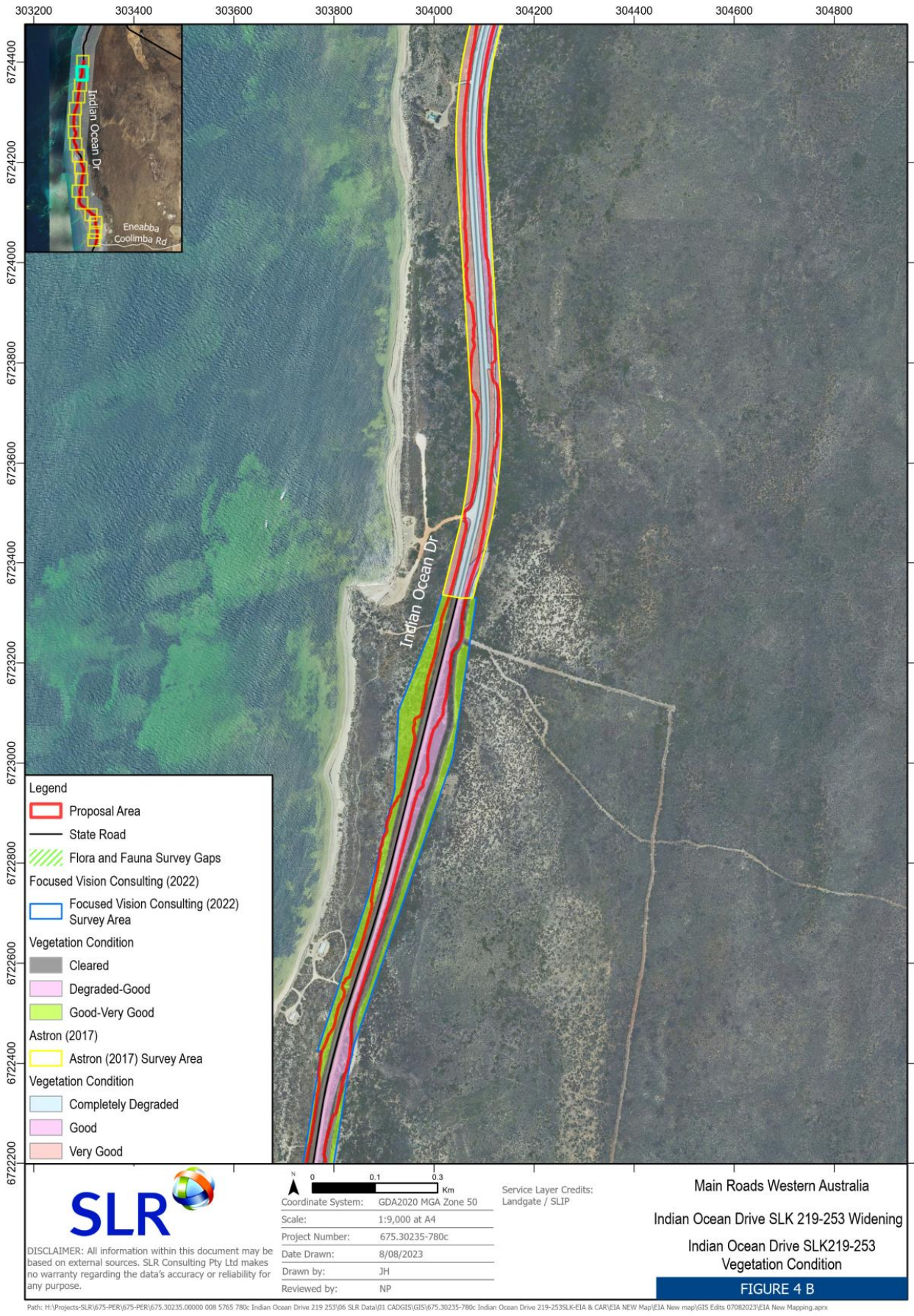


Figure 4 B: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

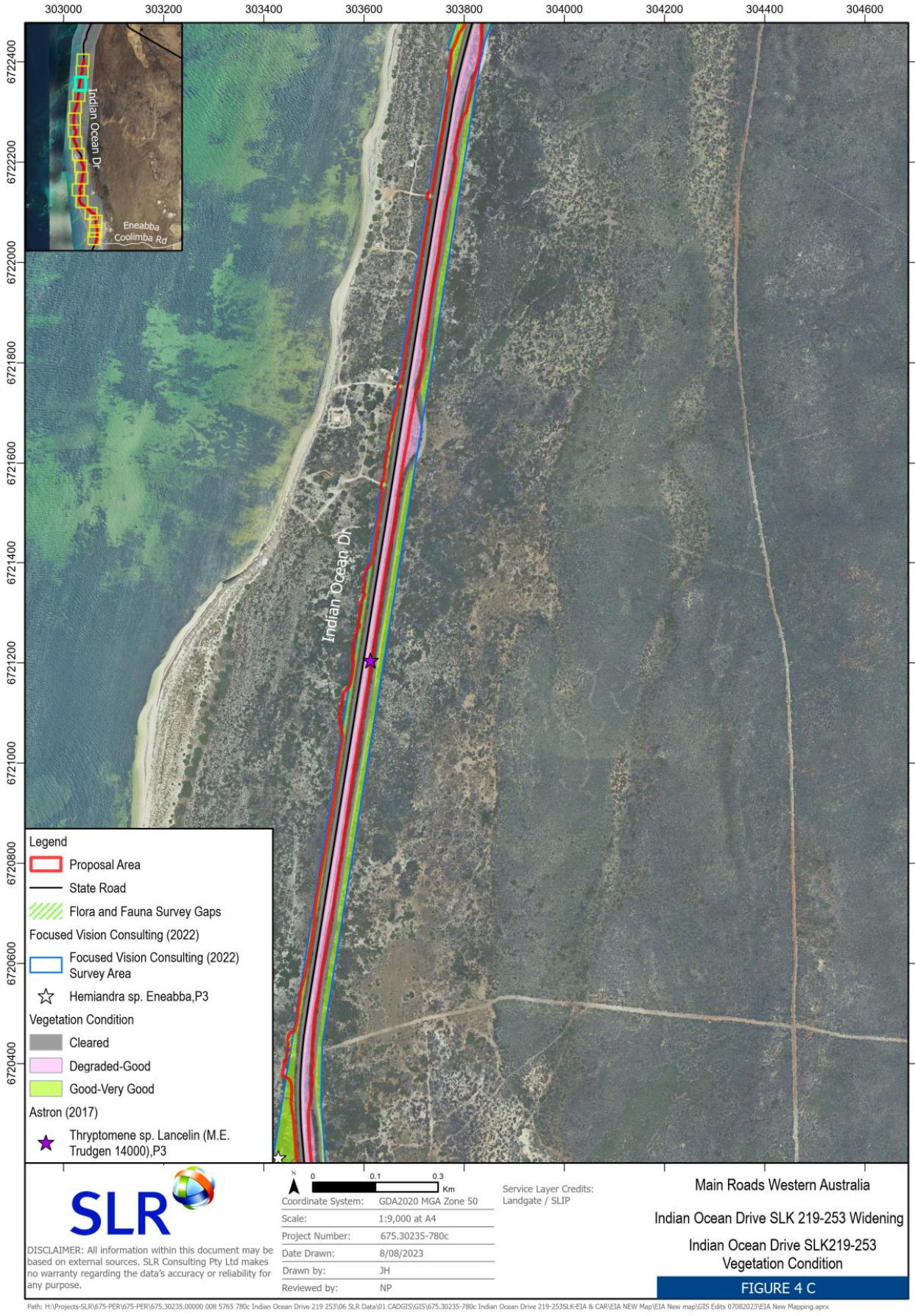


Figure 4 C: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

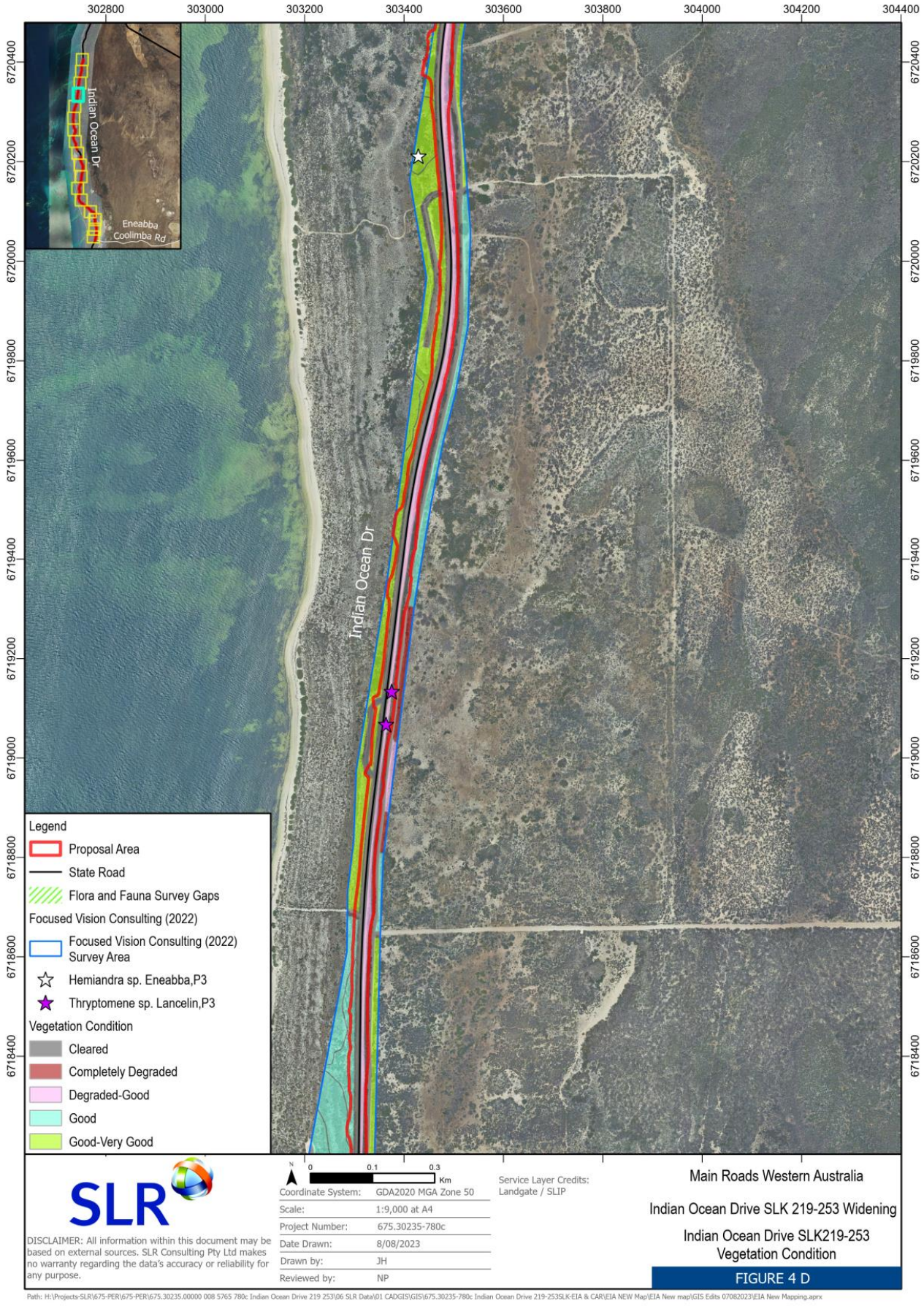


Figure 4 D: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

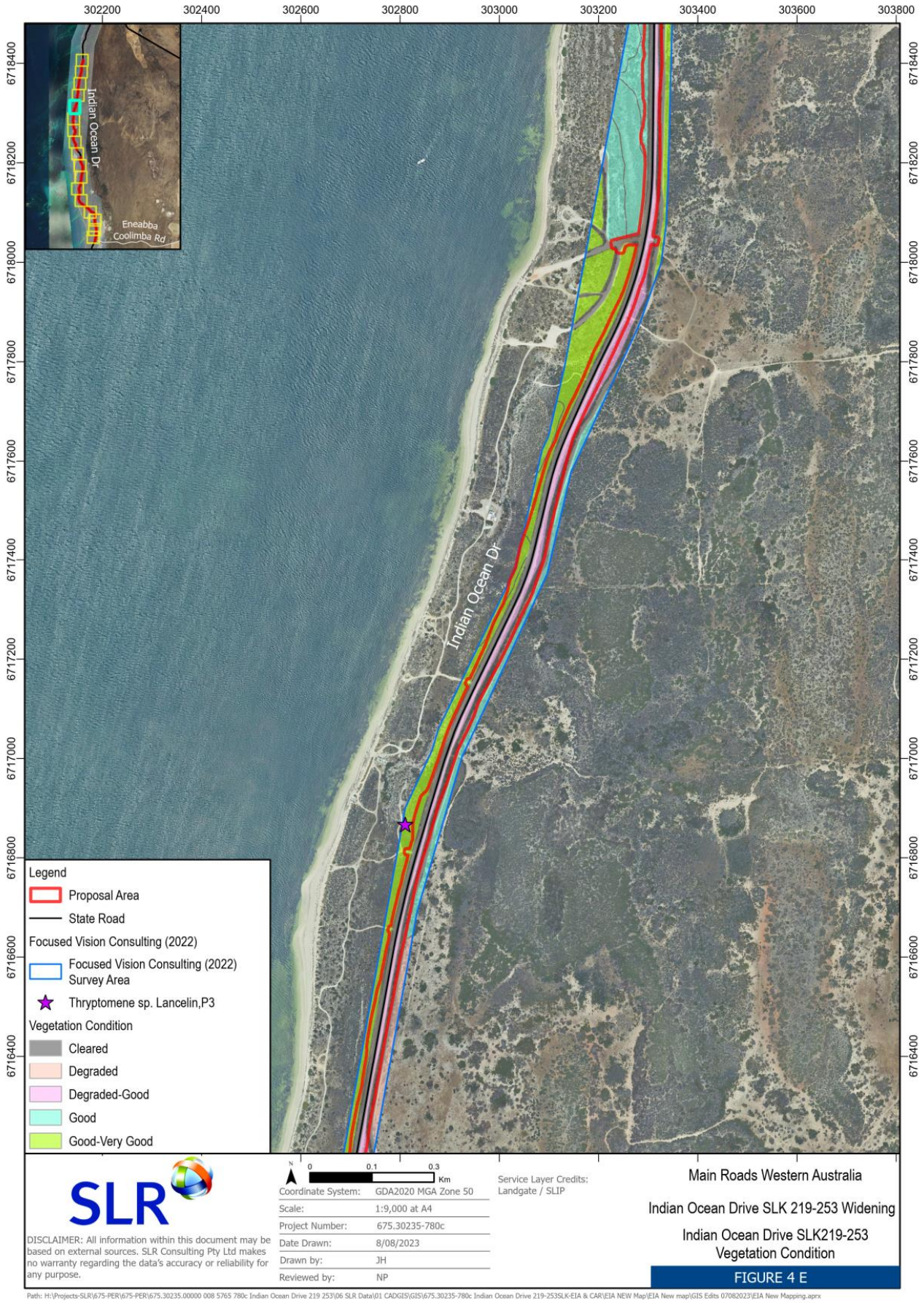


Figure 4 E: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

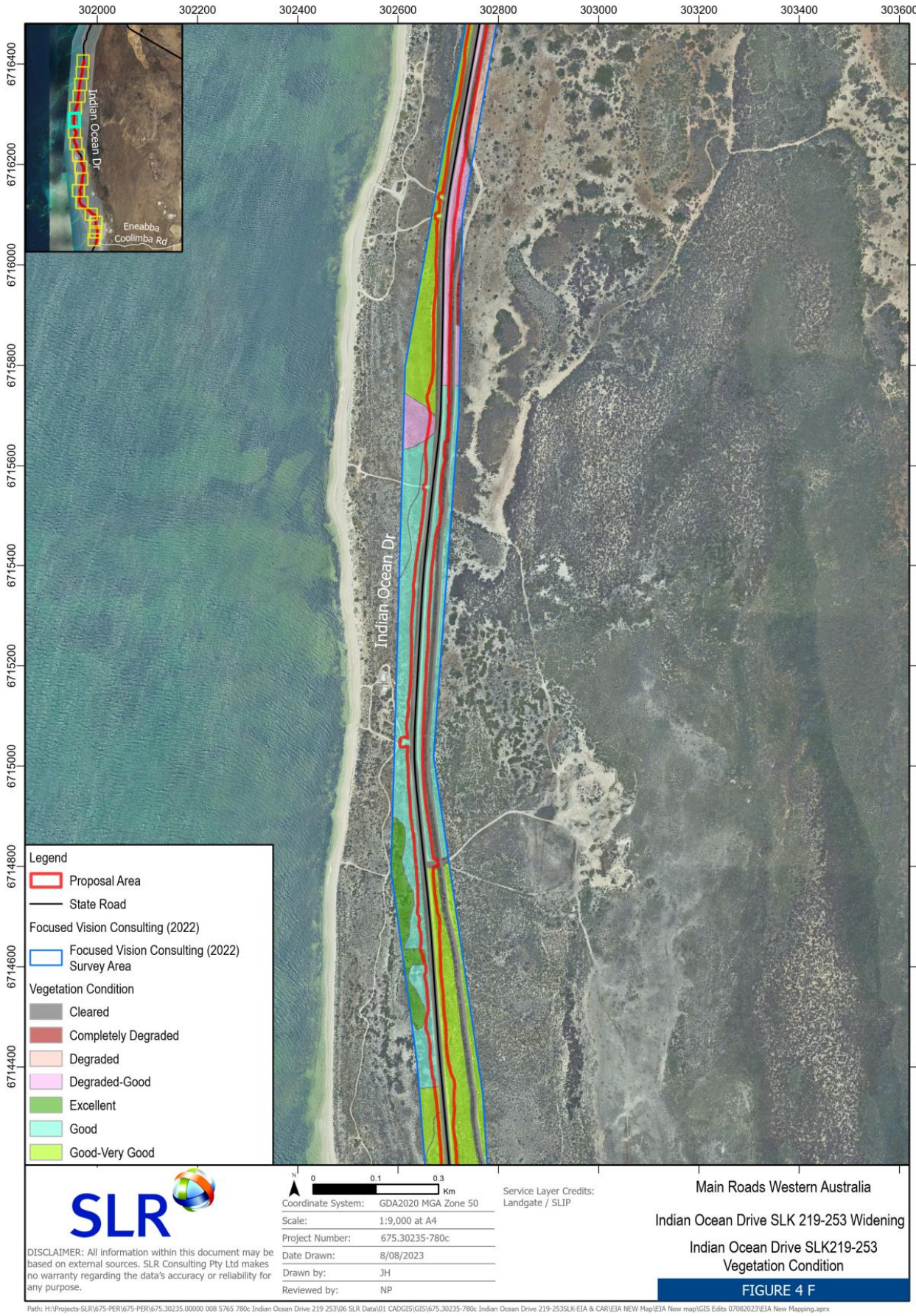


Figure 4 F: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

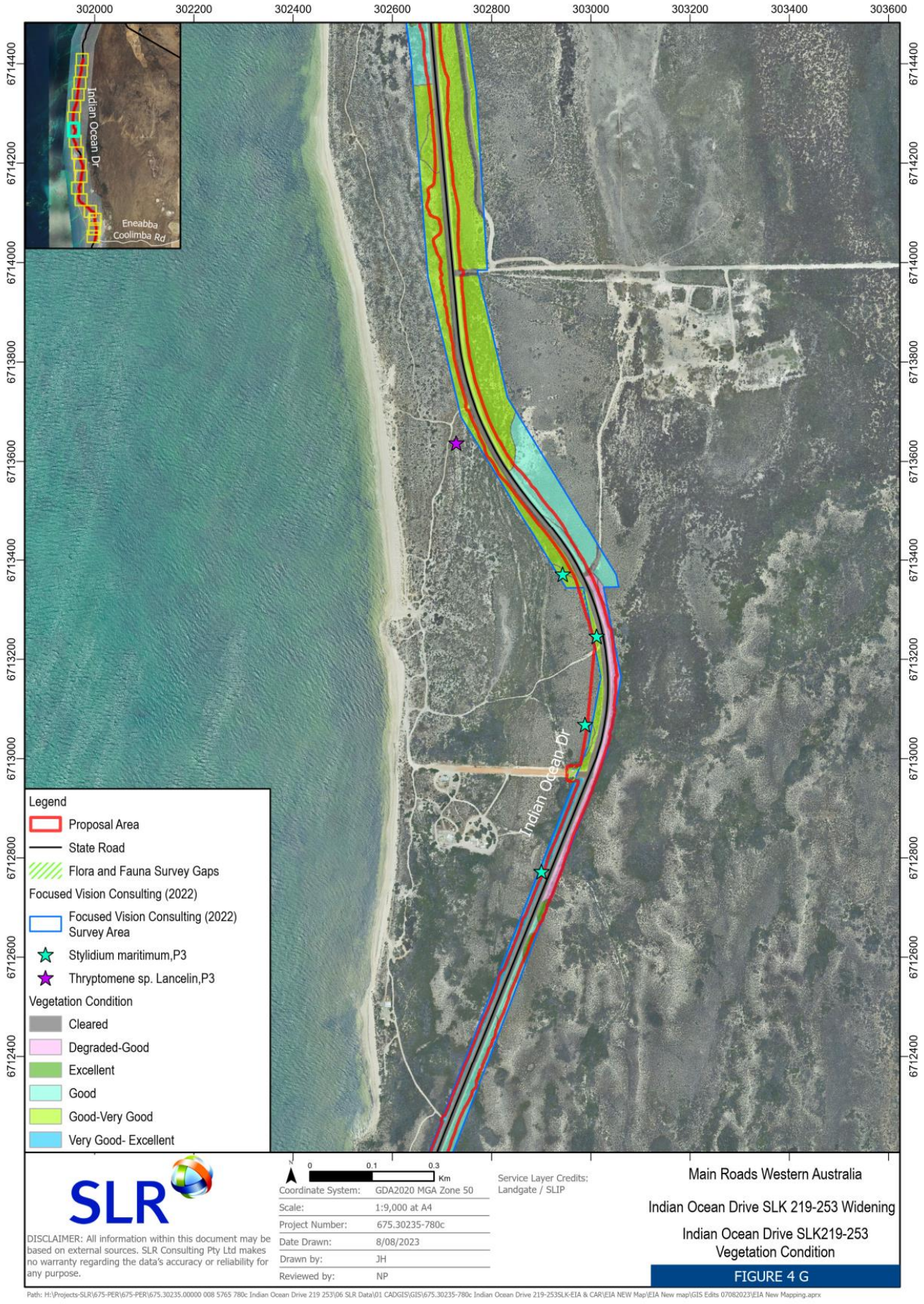


Figure 4 G: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

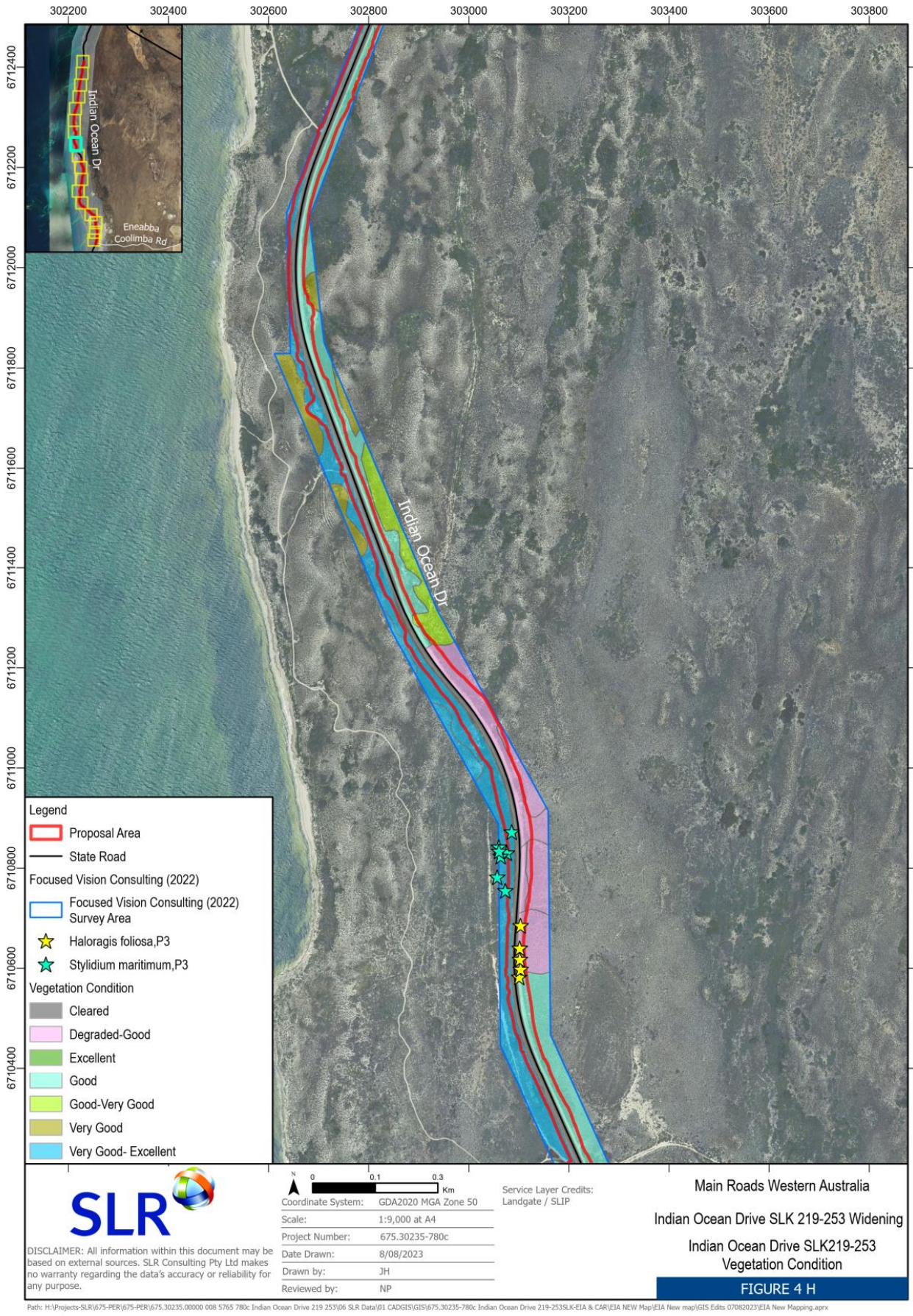


Figure 4 H: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

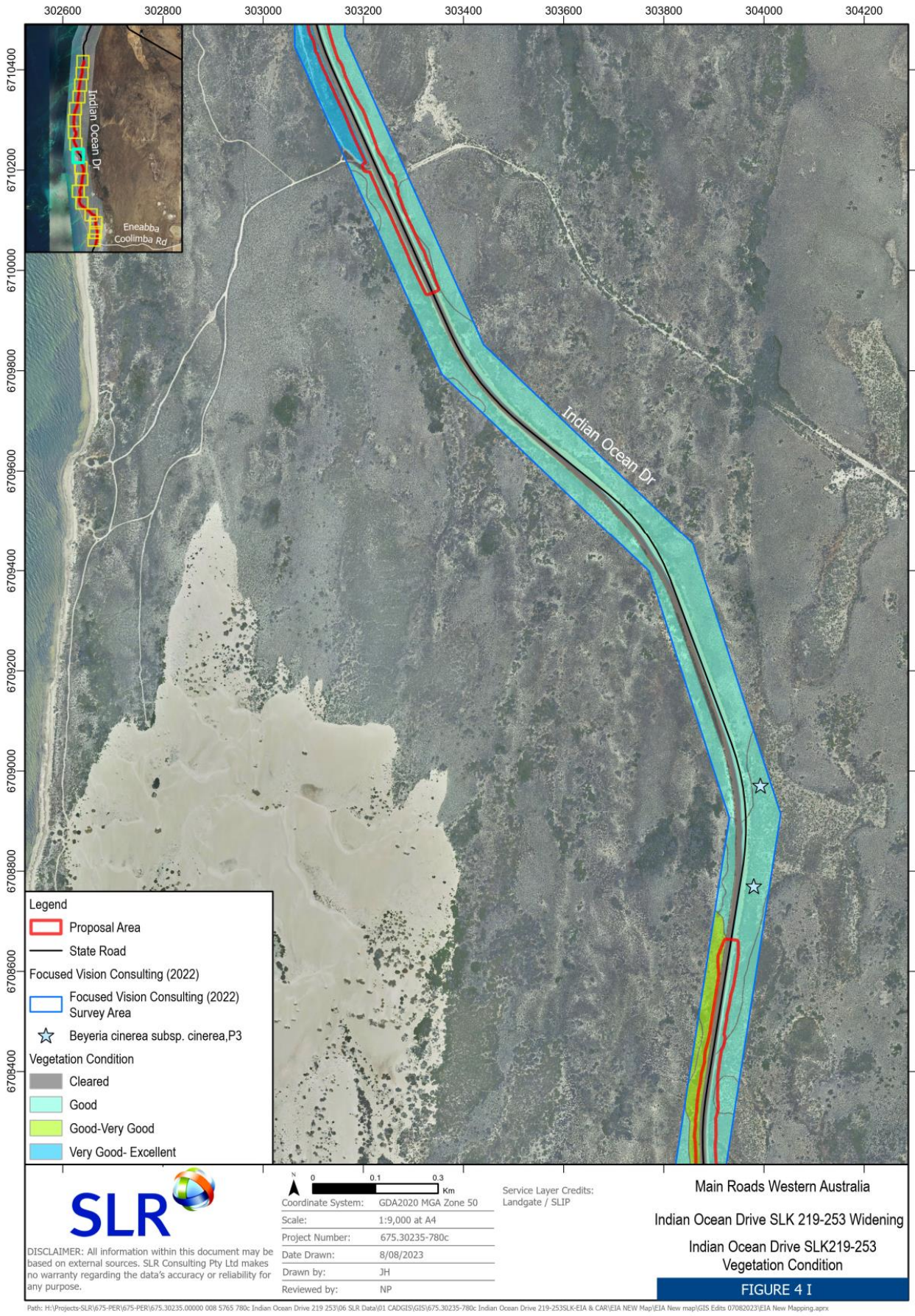


Figure 4 I: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

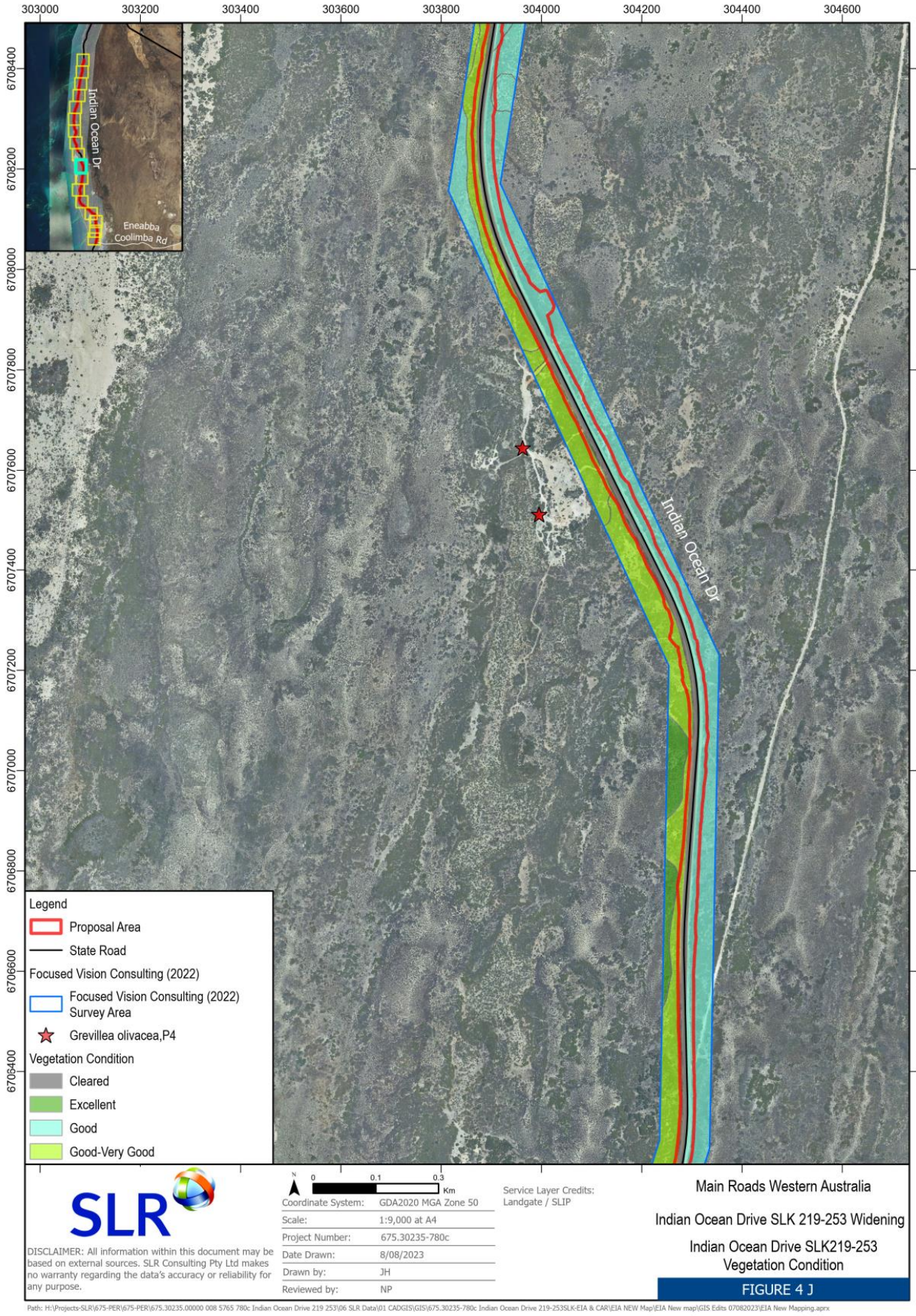


Figure 4 J: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

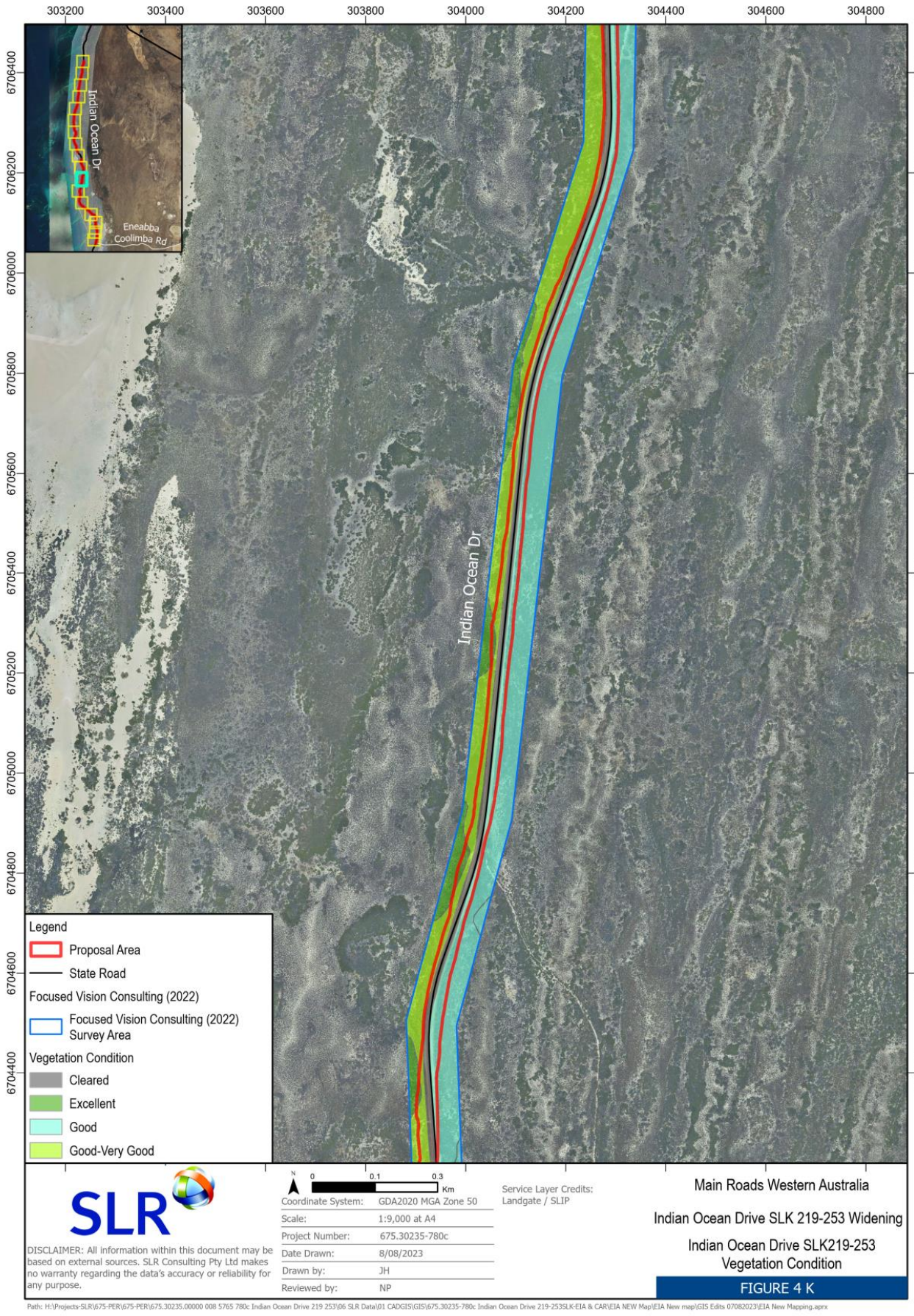


Figure 4 K: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

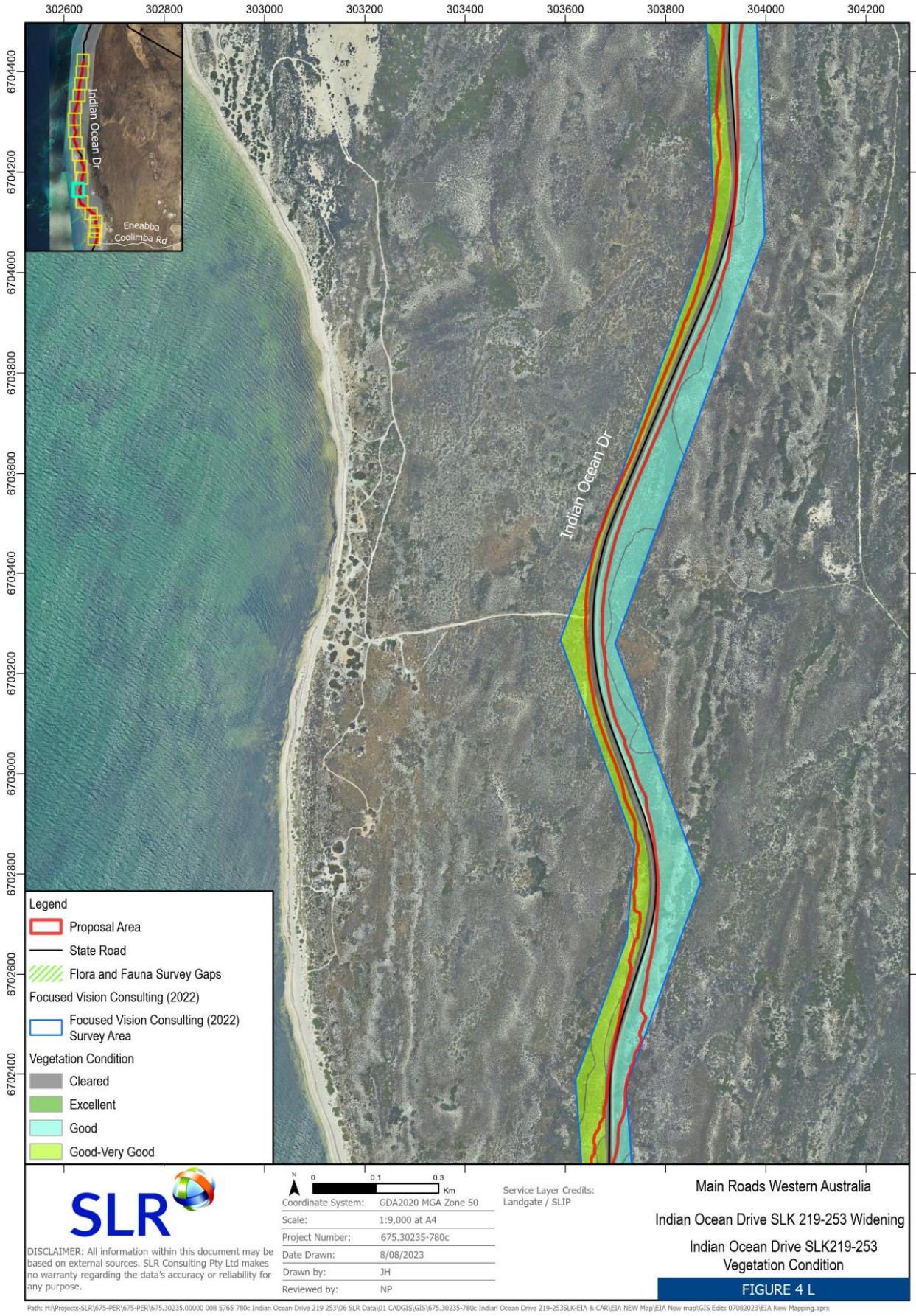


Figure 4 L: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

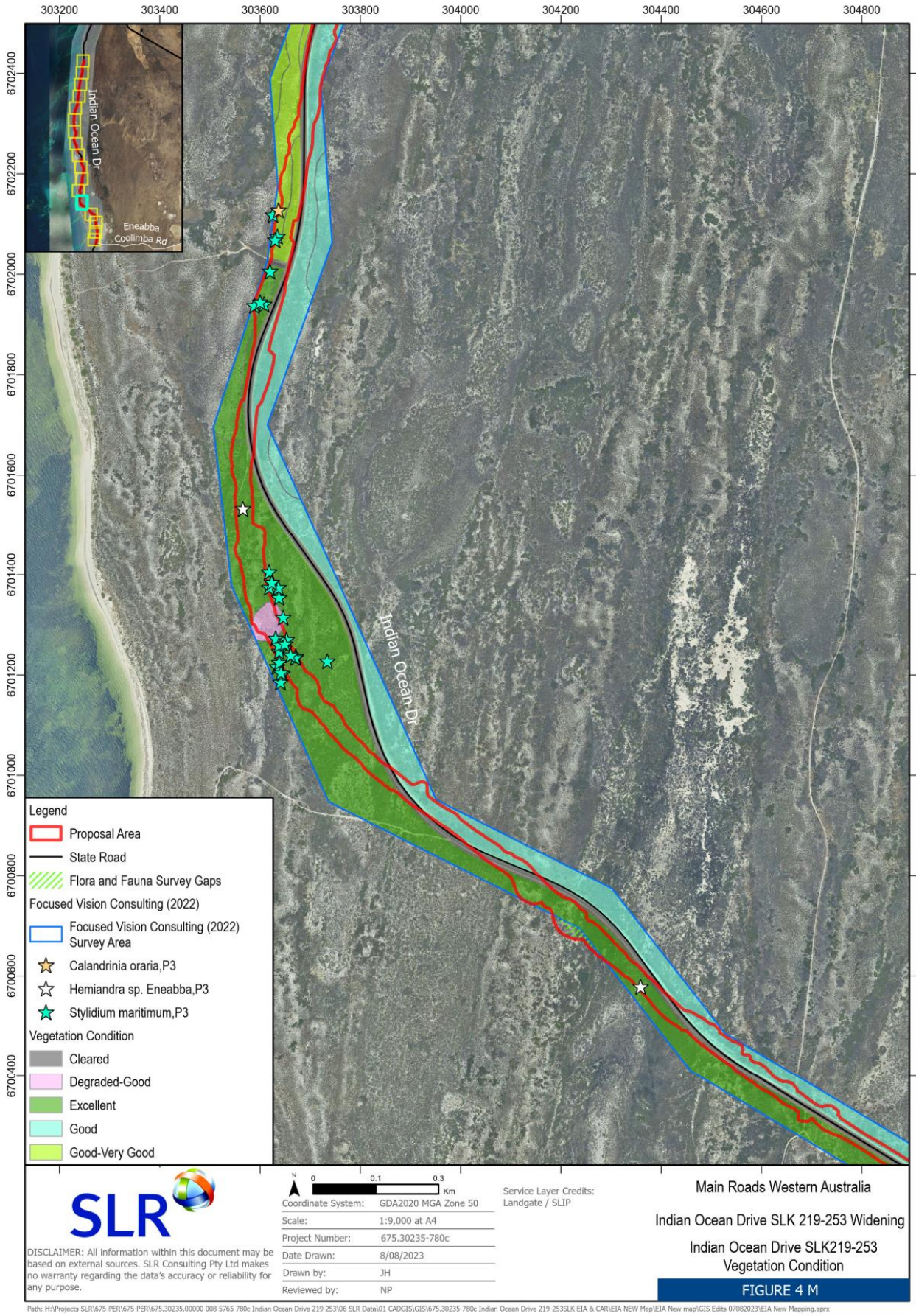


Figure 4 M: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

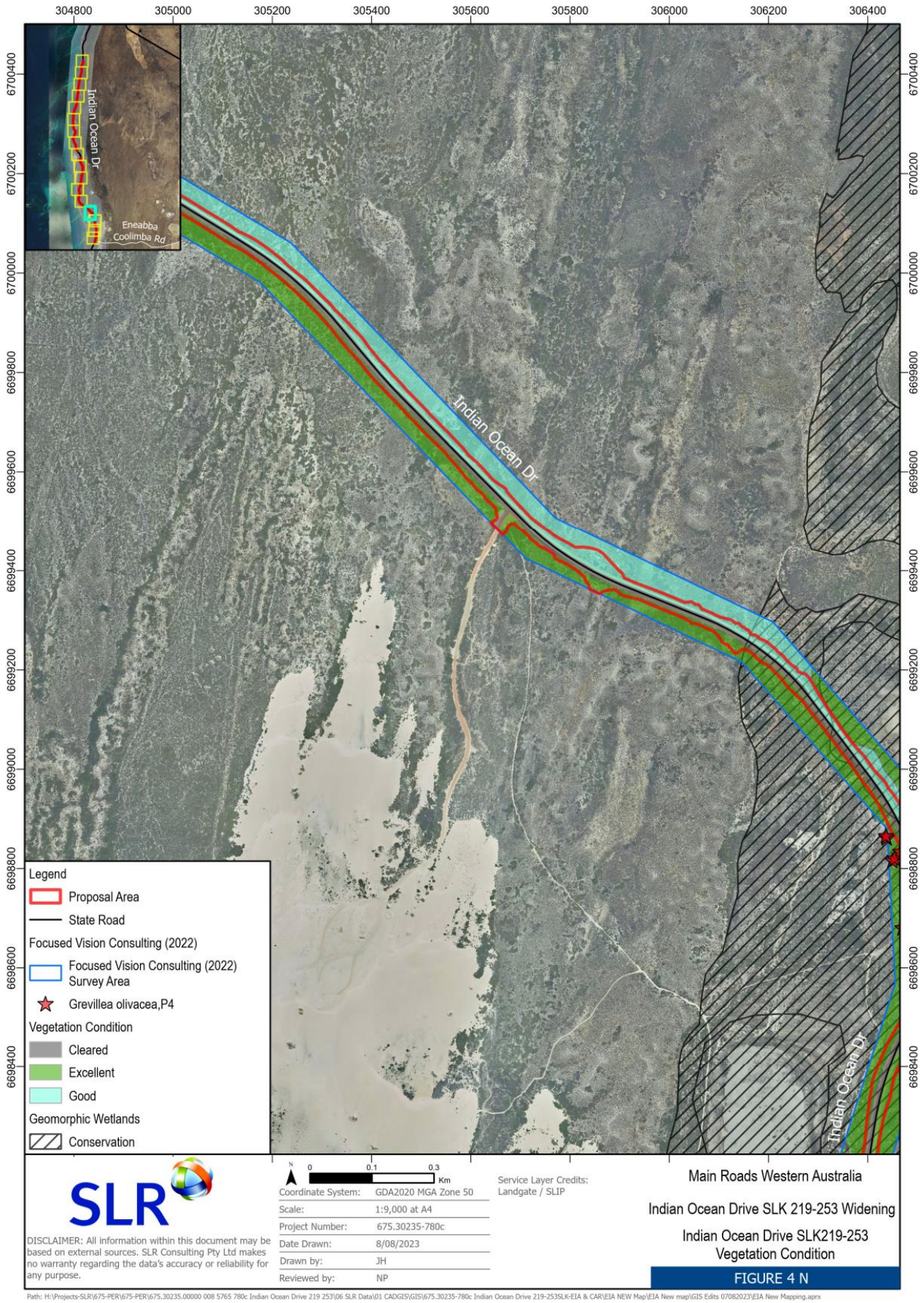


Figure 4 N: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

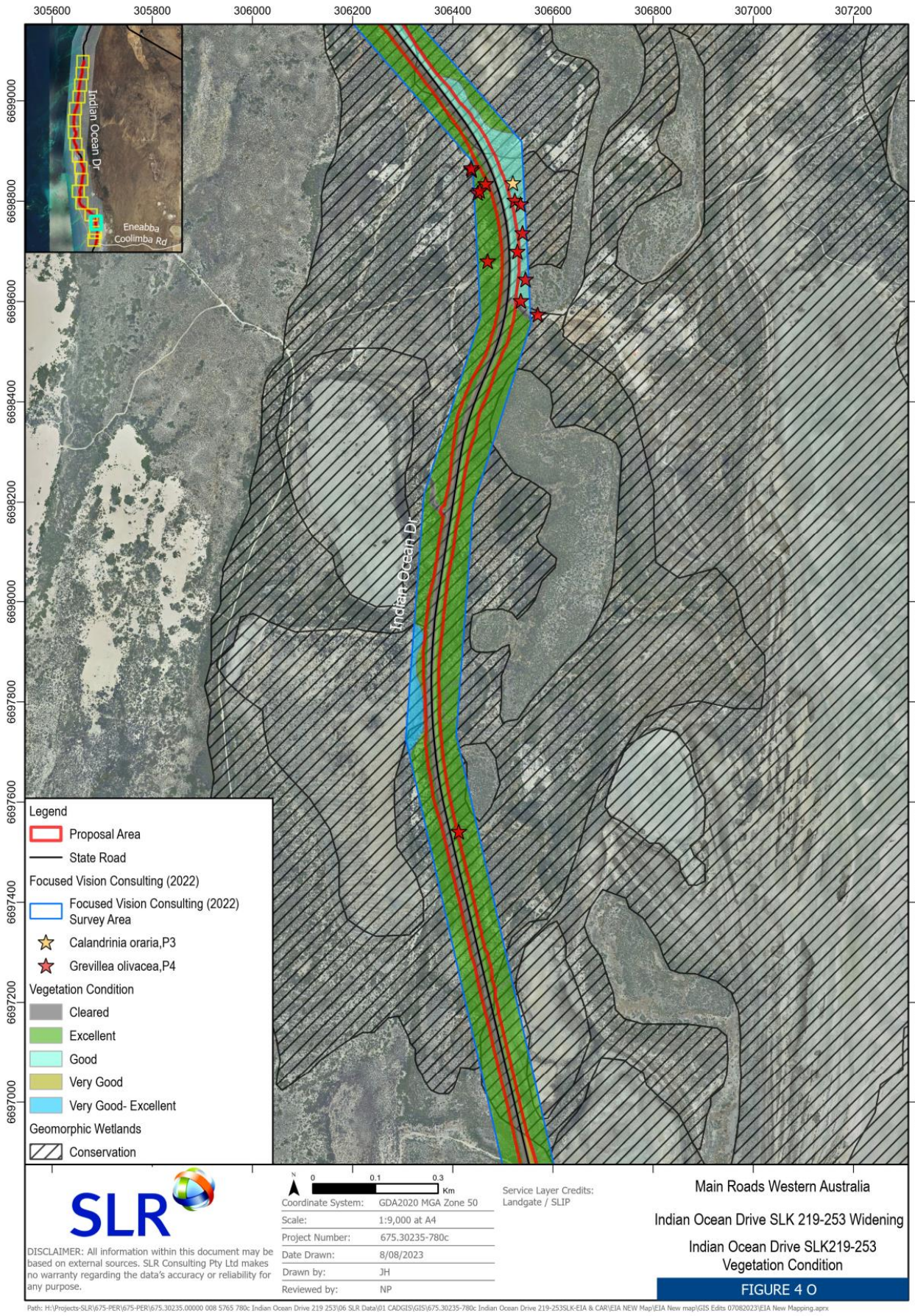


Figure 4 O: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

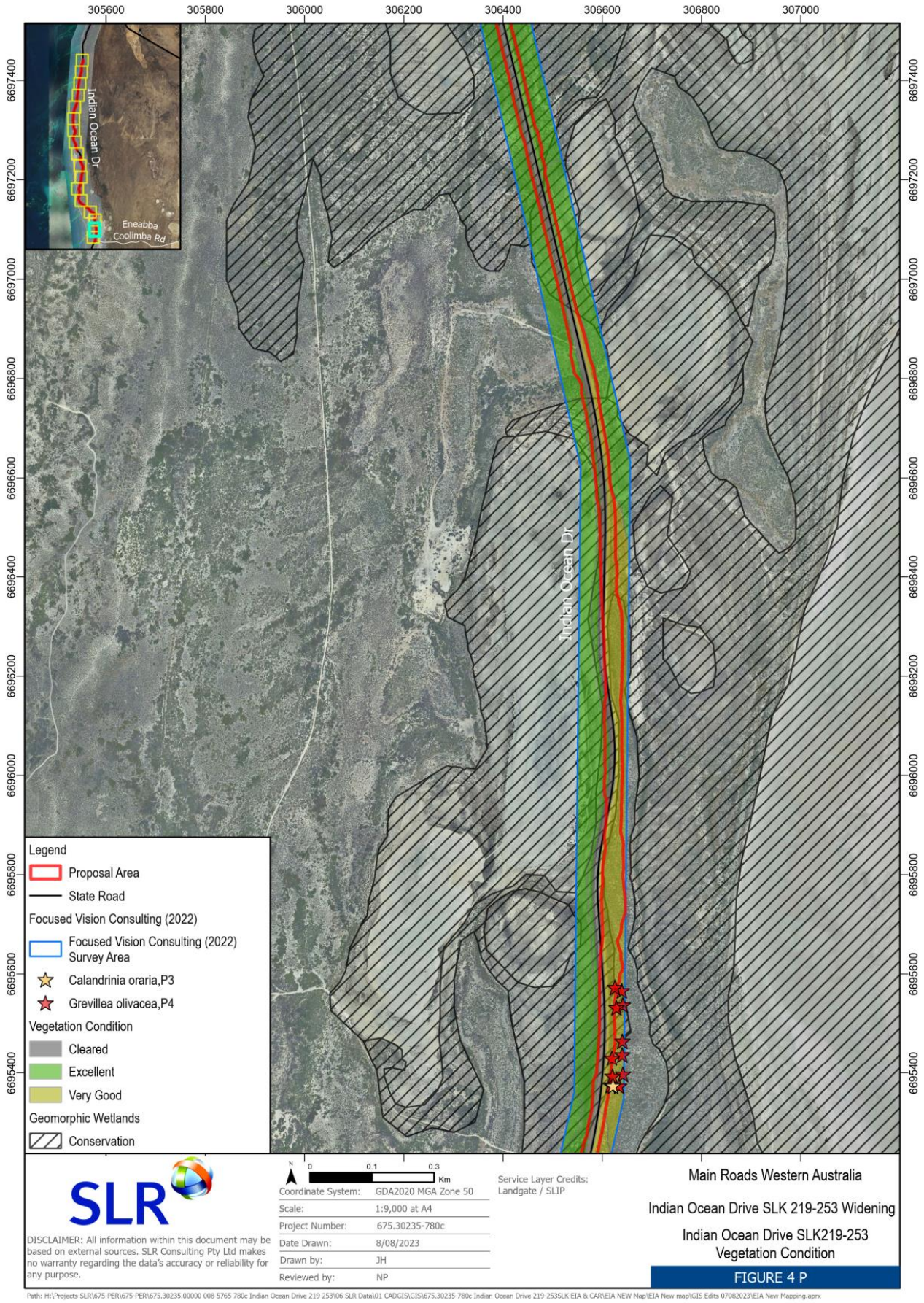


Figure 4 P: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

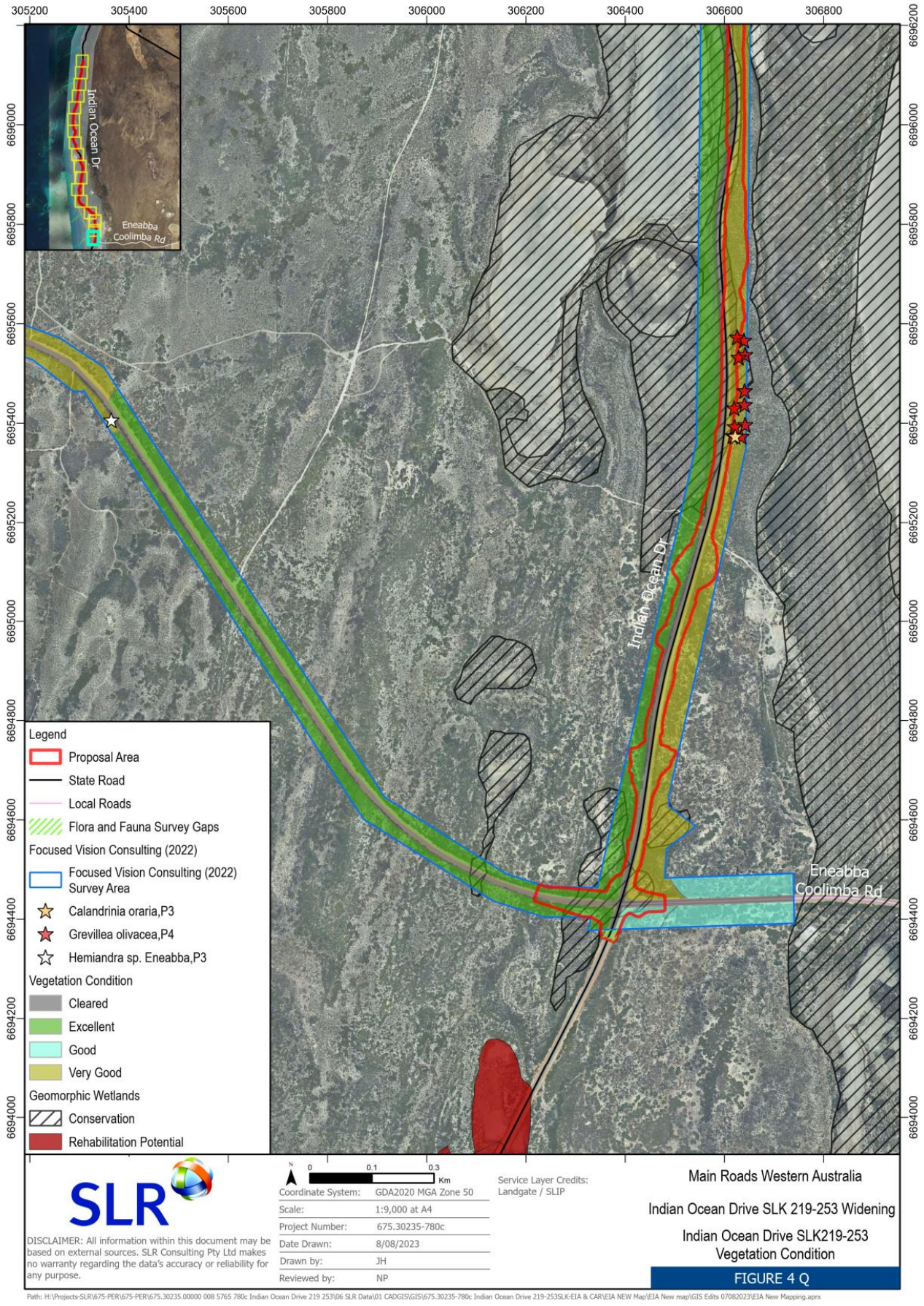


Figure 4 Q: Indian Ocean Drive SLK 219-253 Proposal Area Vegetation Condition.

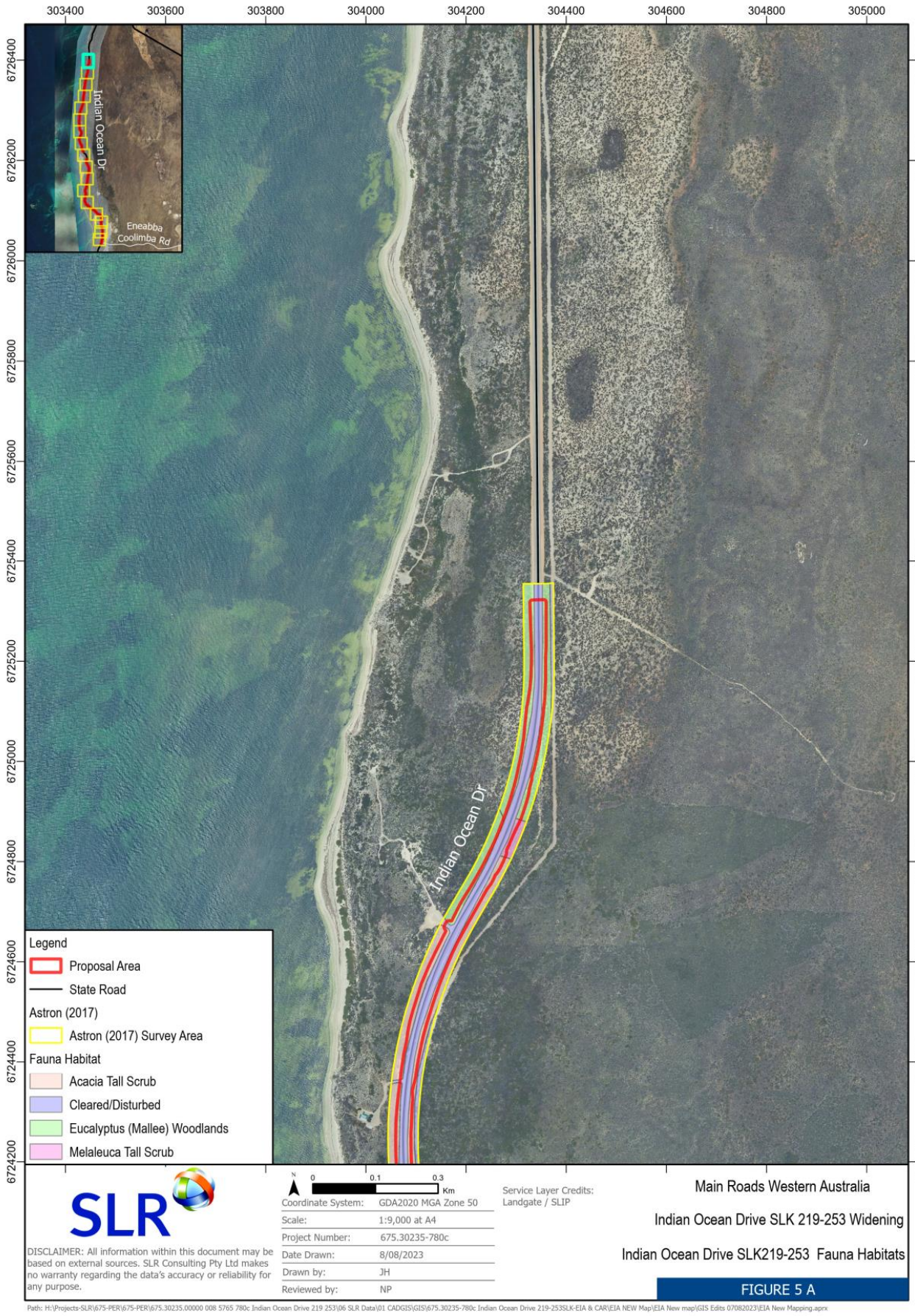


Figure 5 A: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

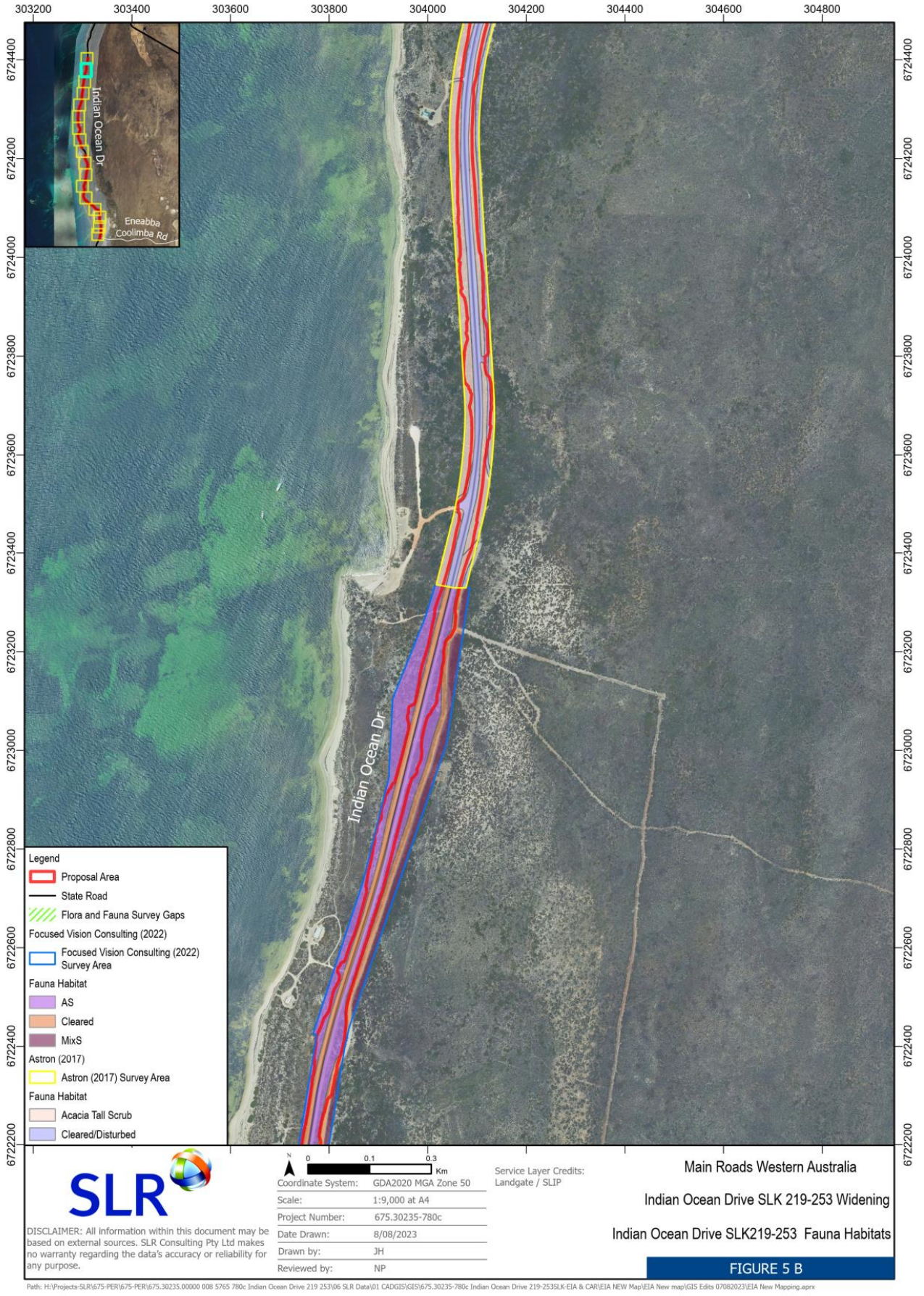


Figure 5 B: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

Figure 5 C: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

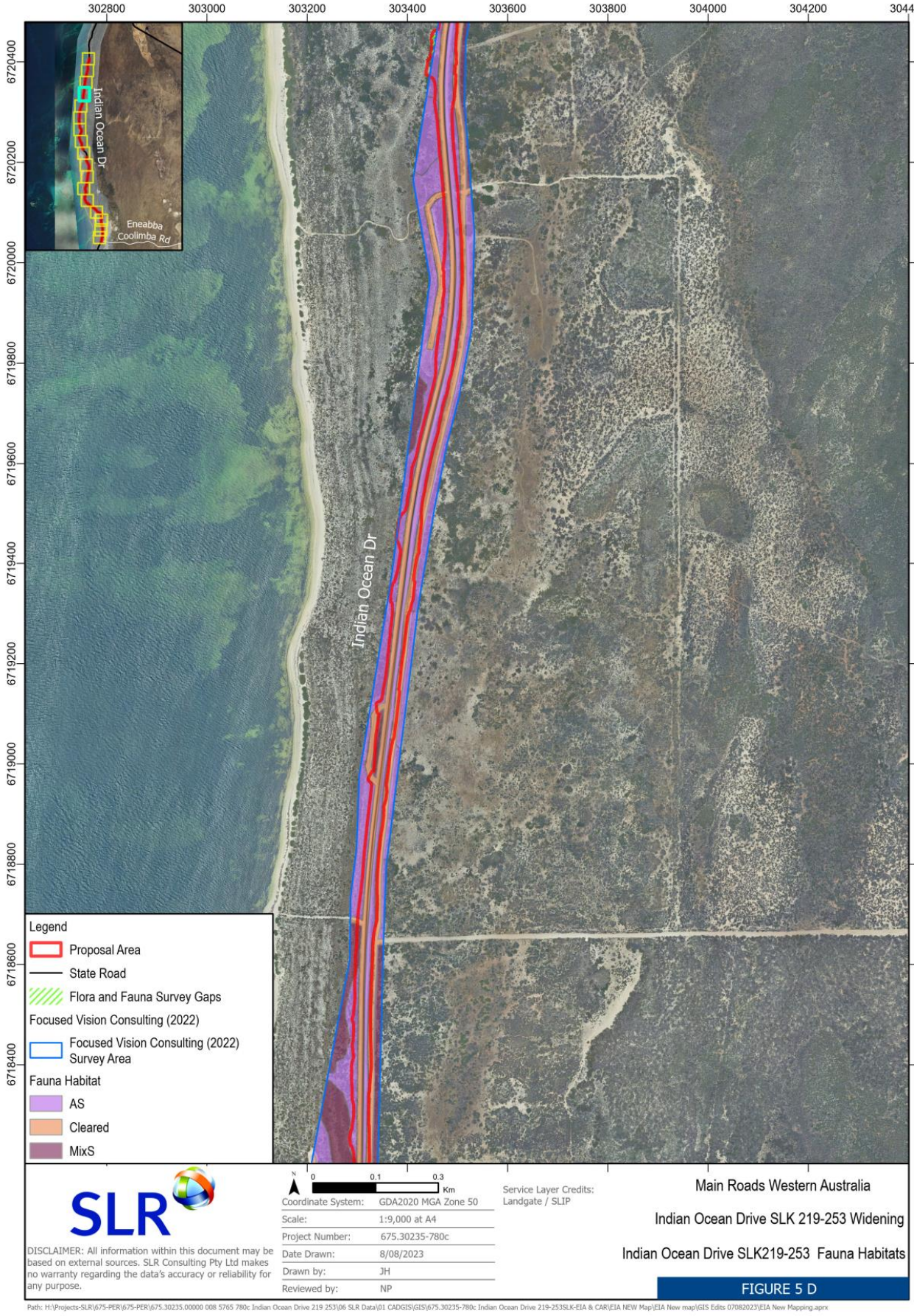


Figure 5 D: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

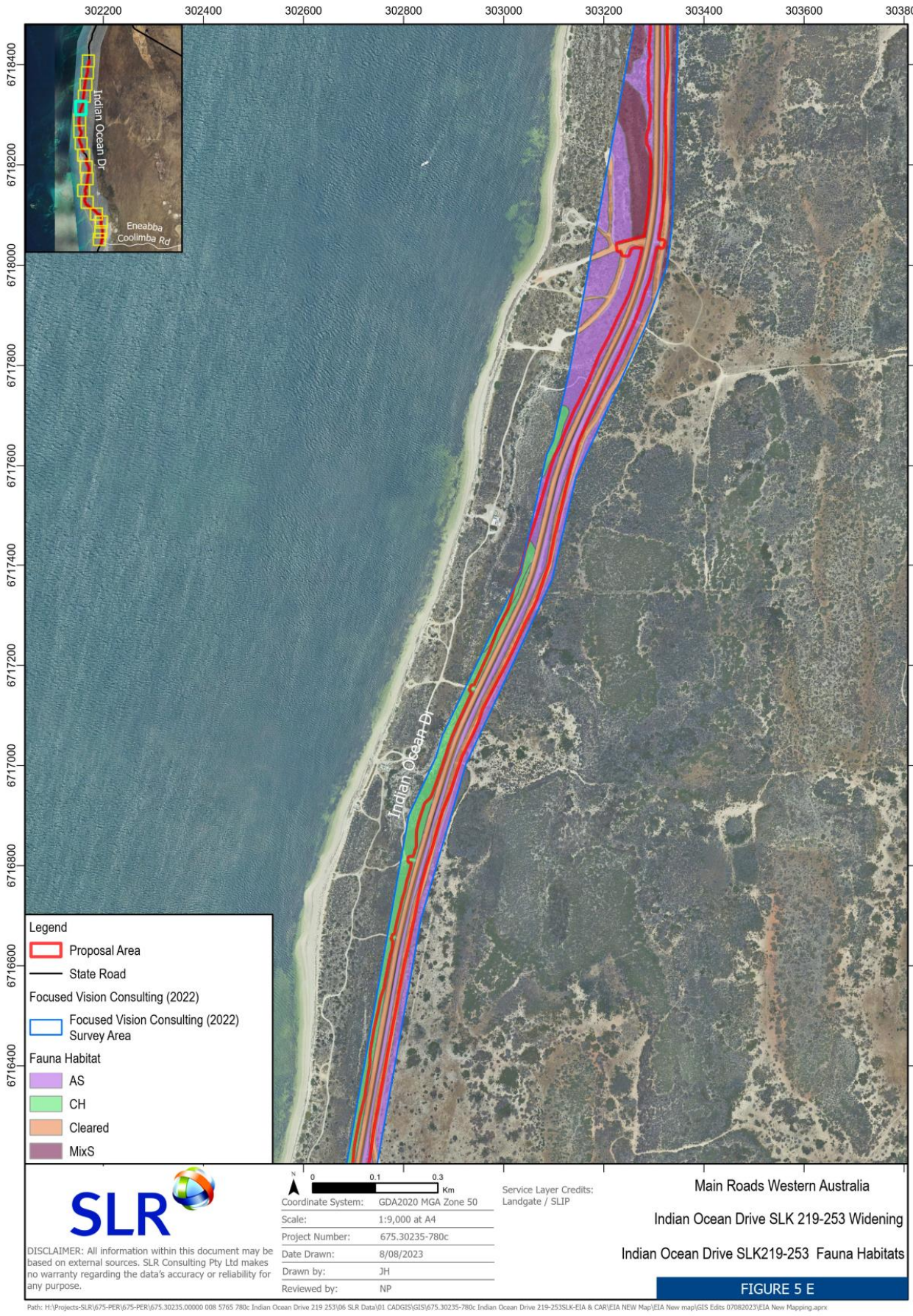


Figure 5 E: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

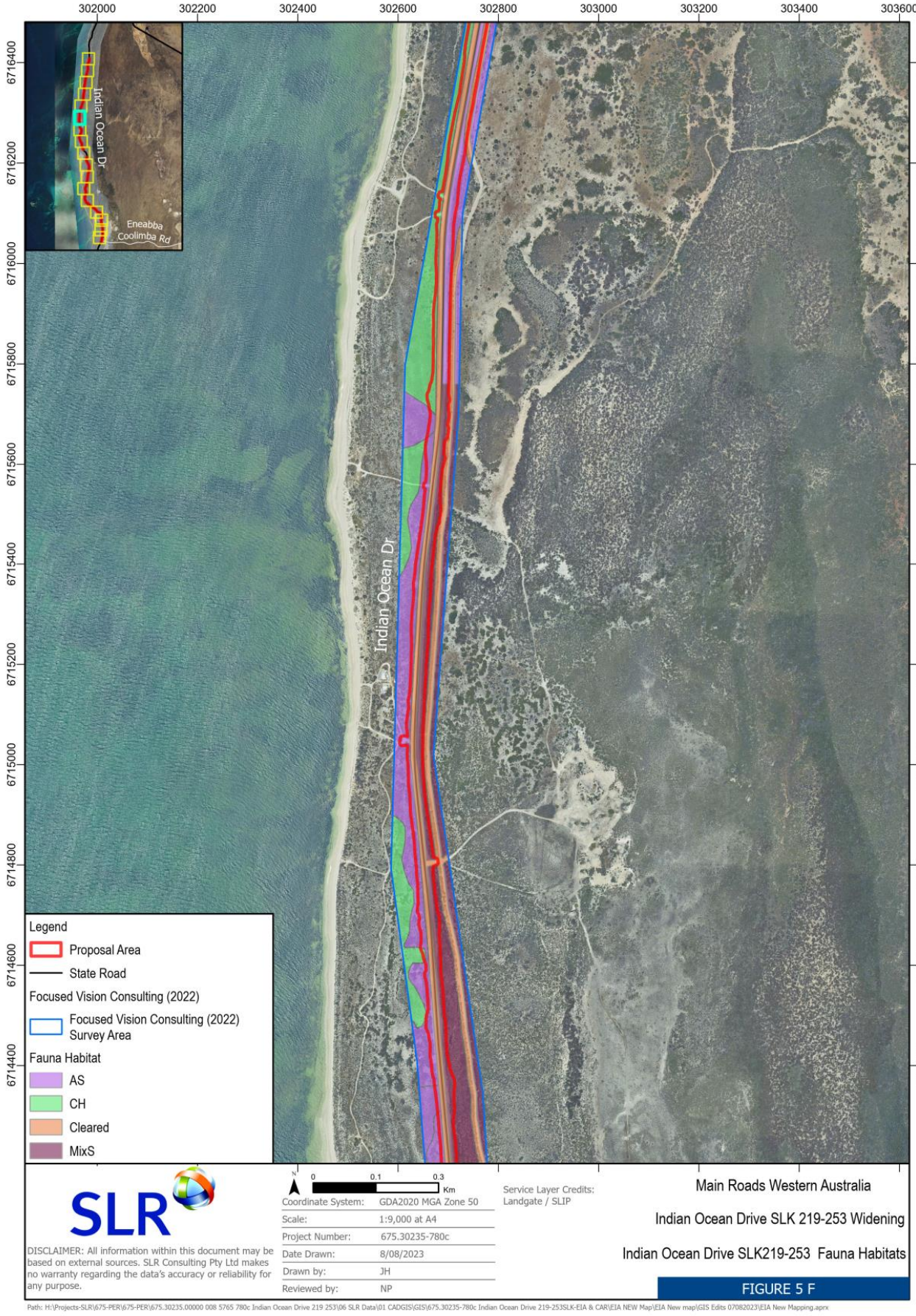


Figure 5 F: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

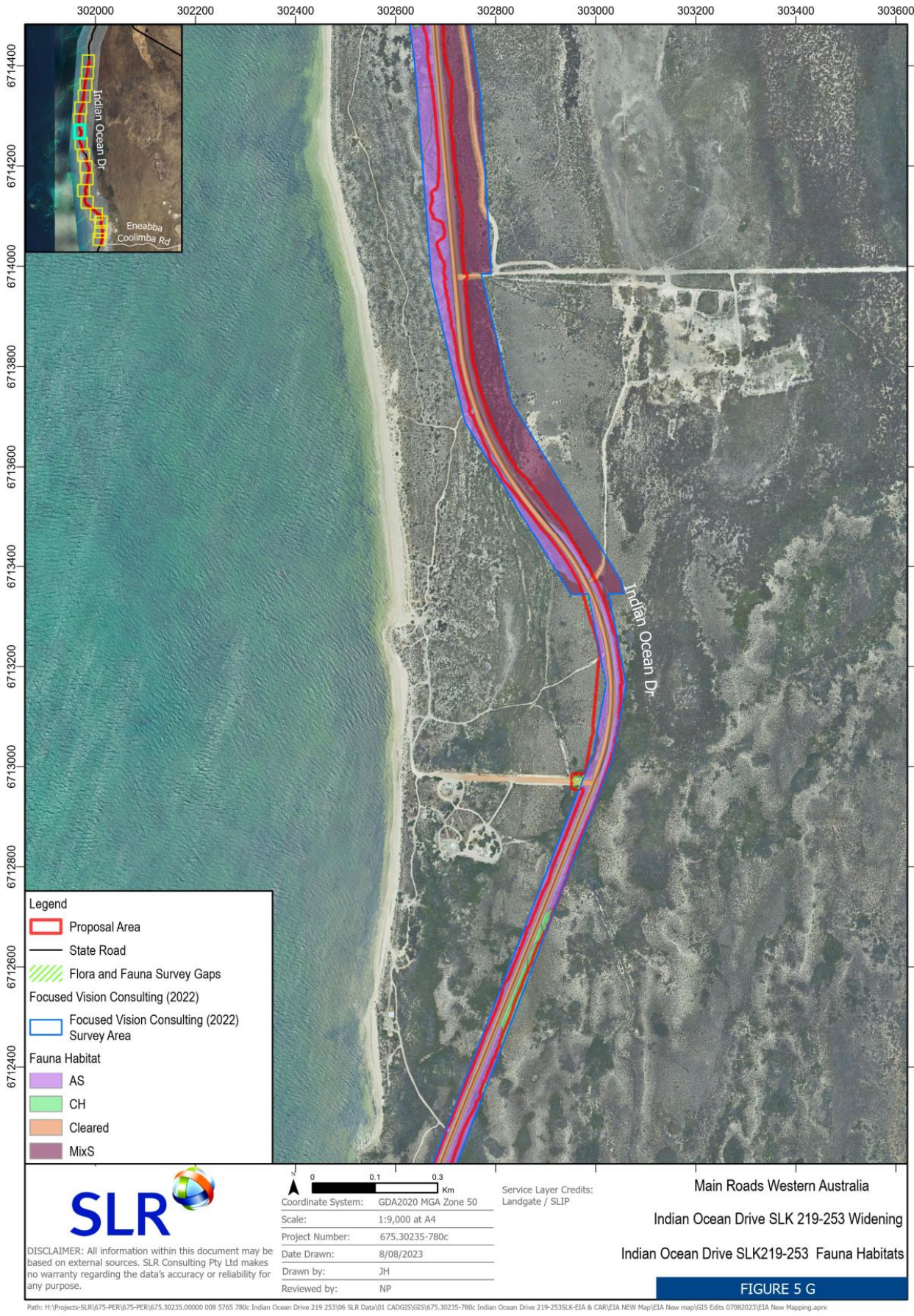


Figure 5 G: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

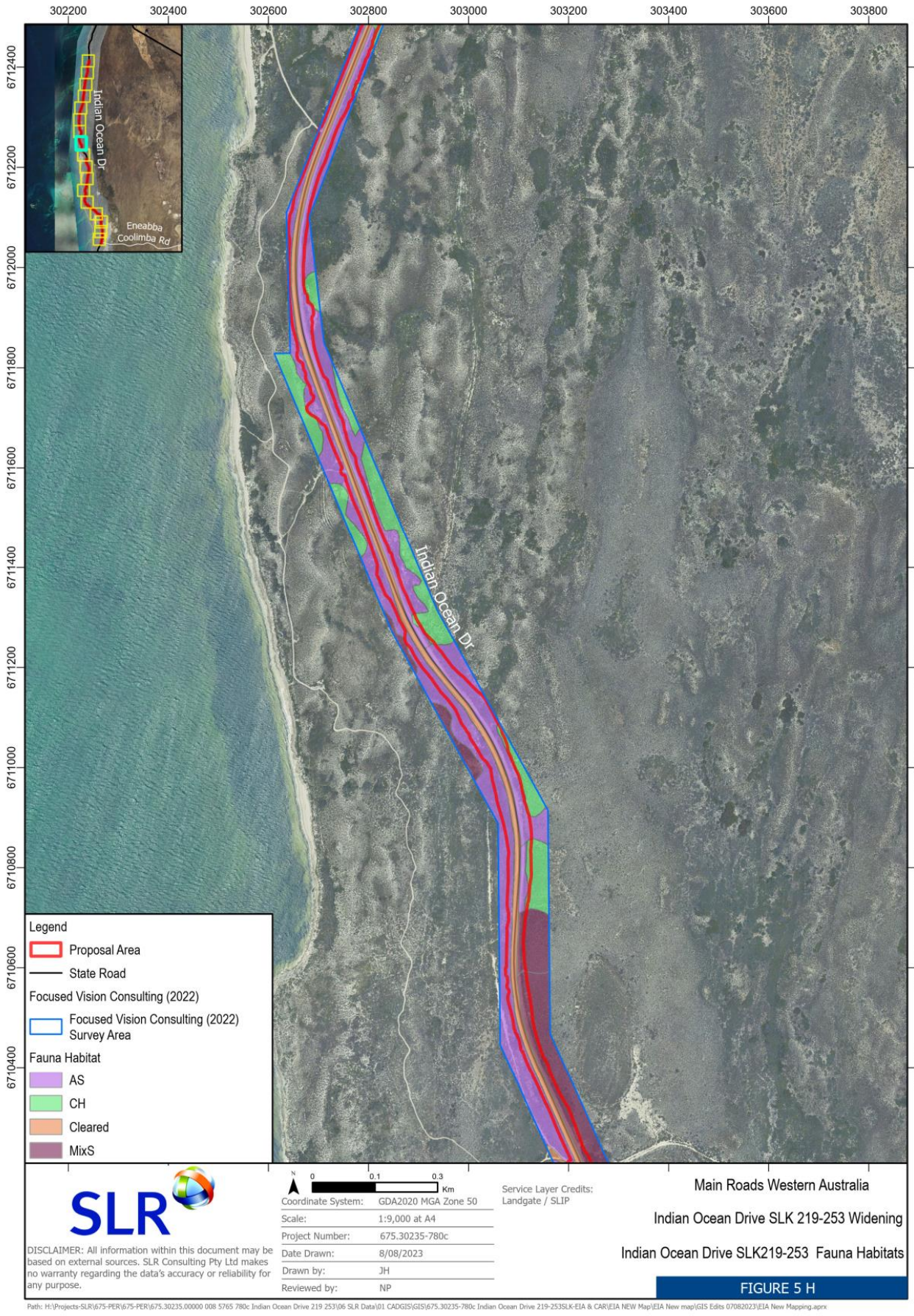


Figure 5 H: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

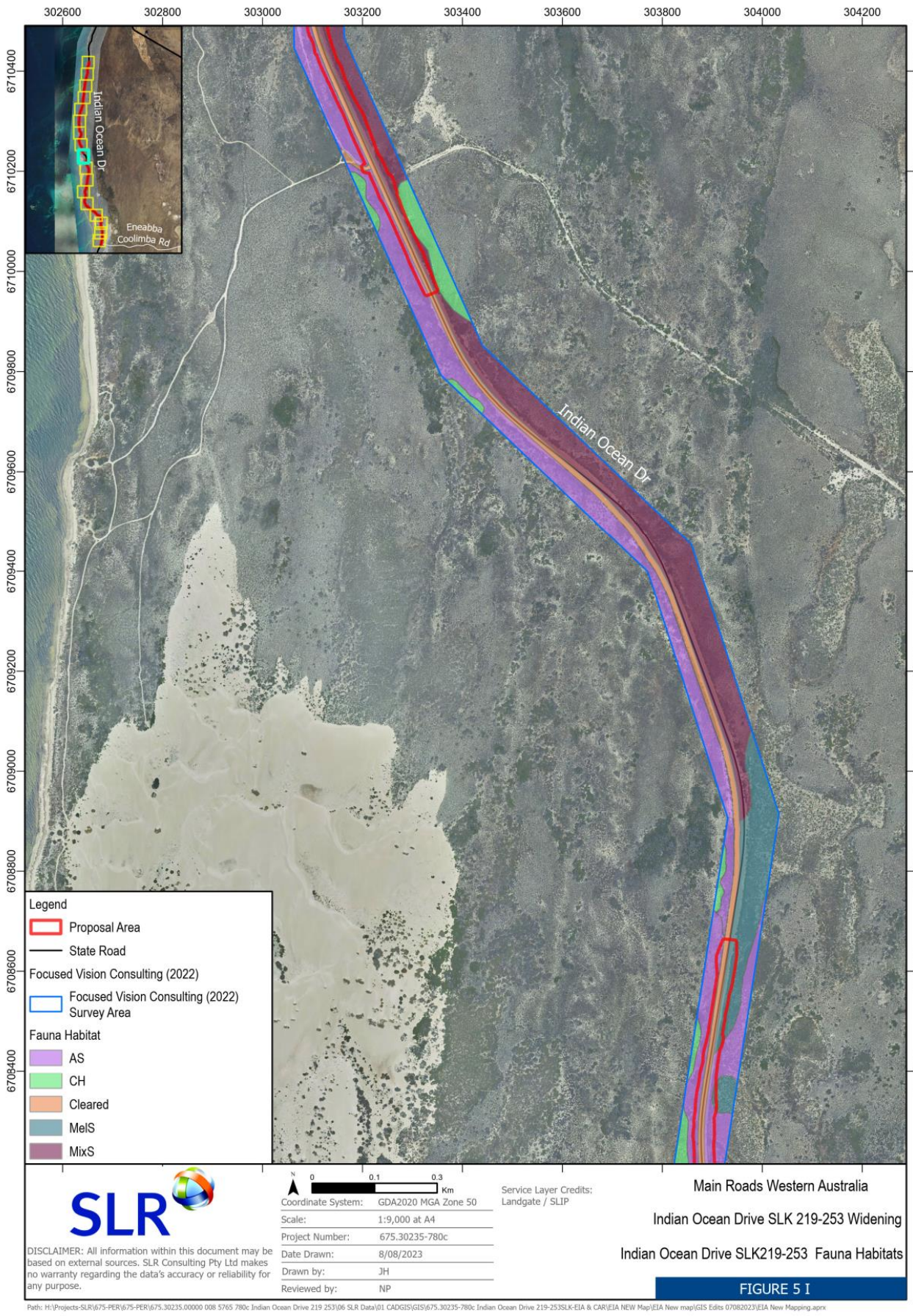


Figure 5 I: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

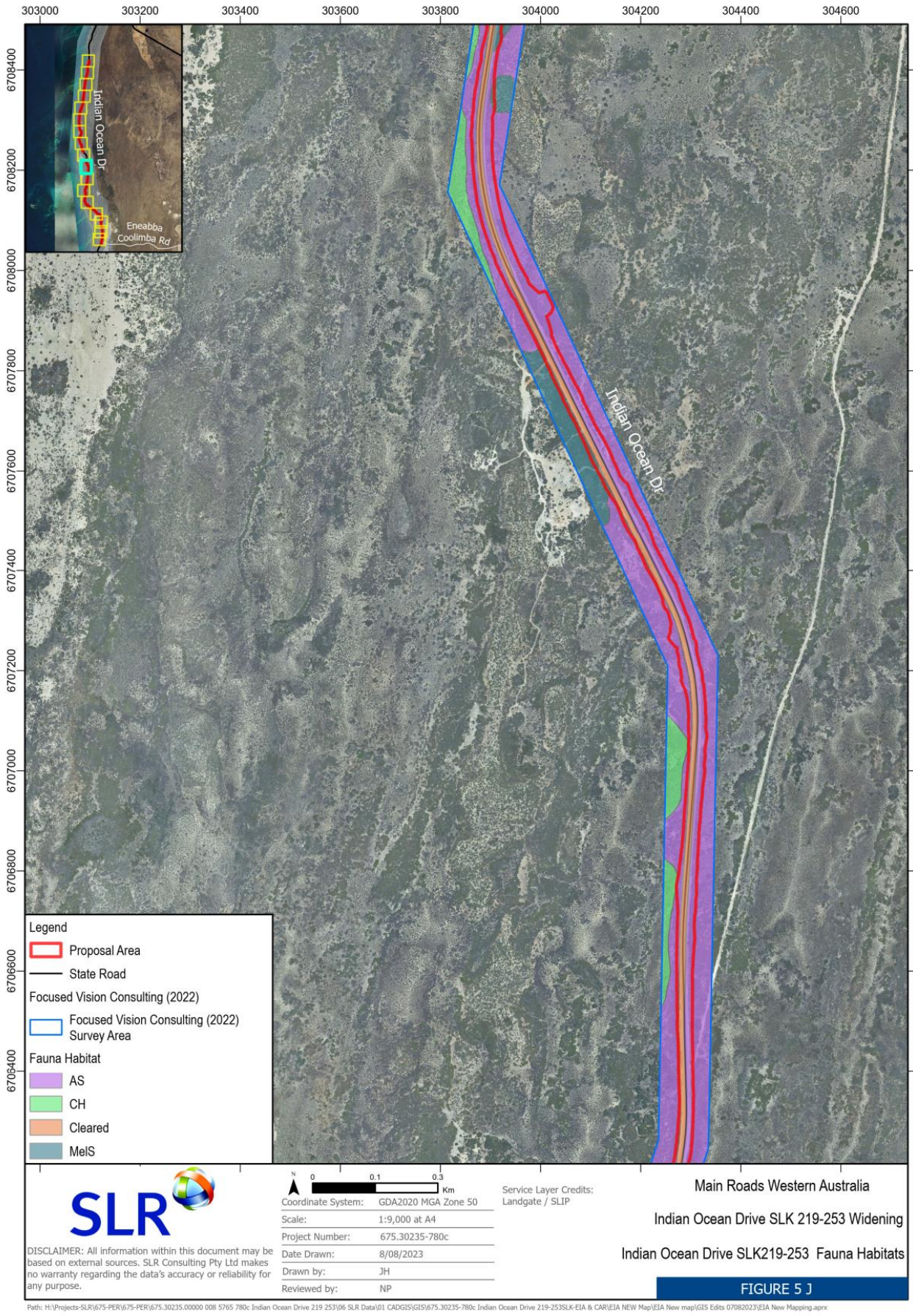


Figure 5 J: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

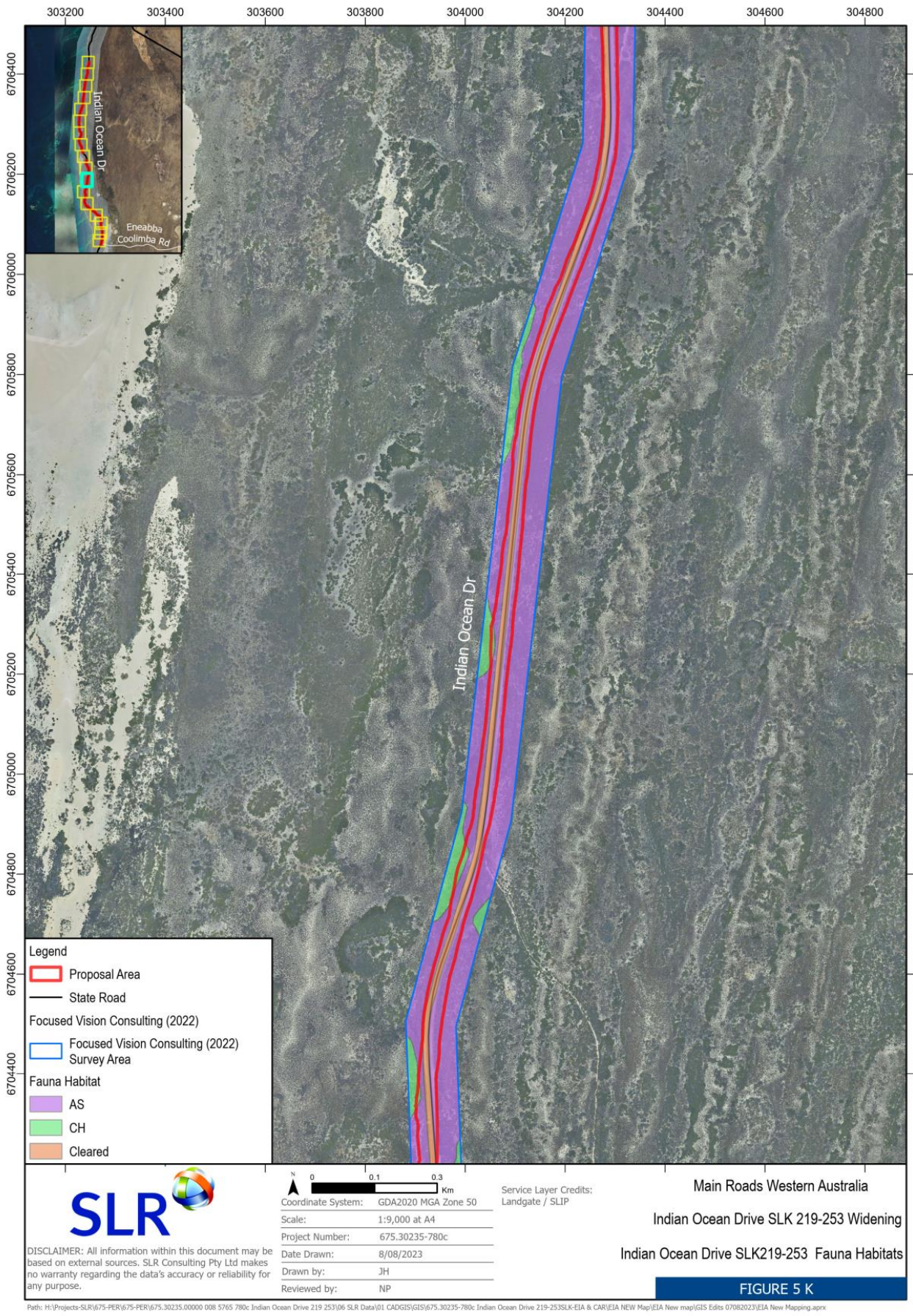


Figure 5 K: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

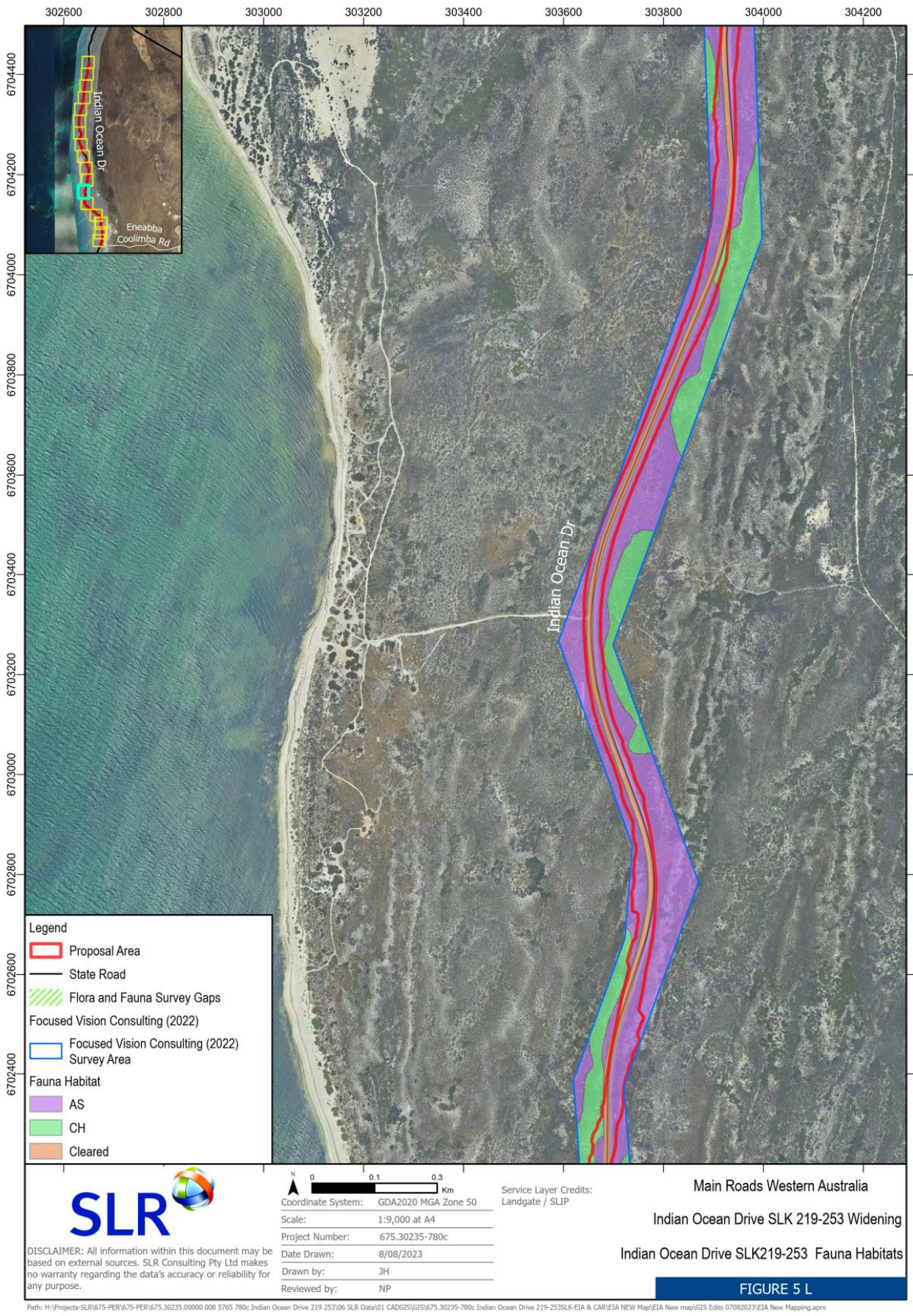


Figure 5 L: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

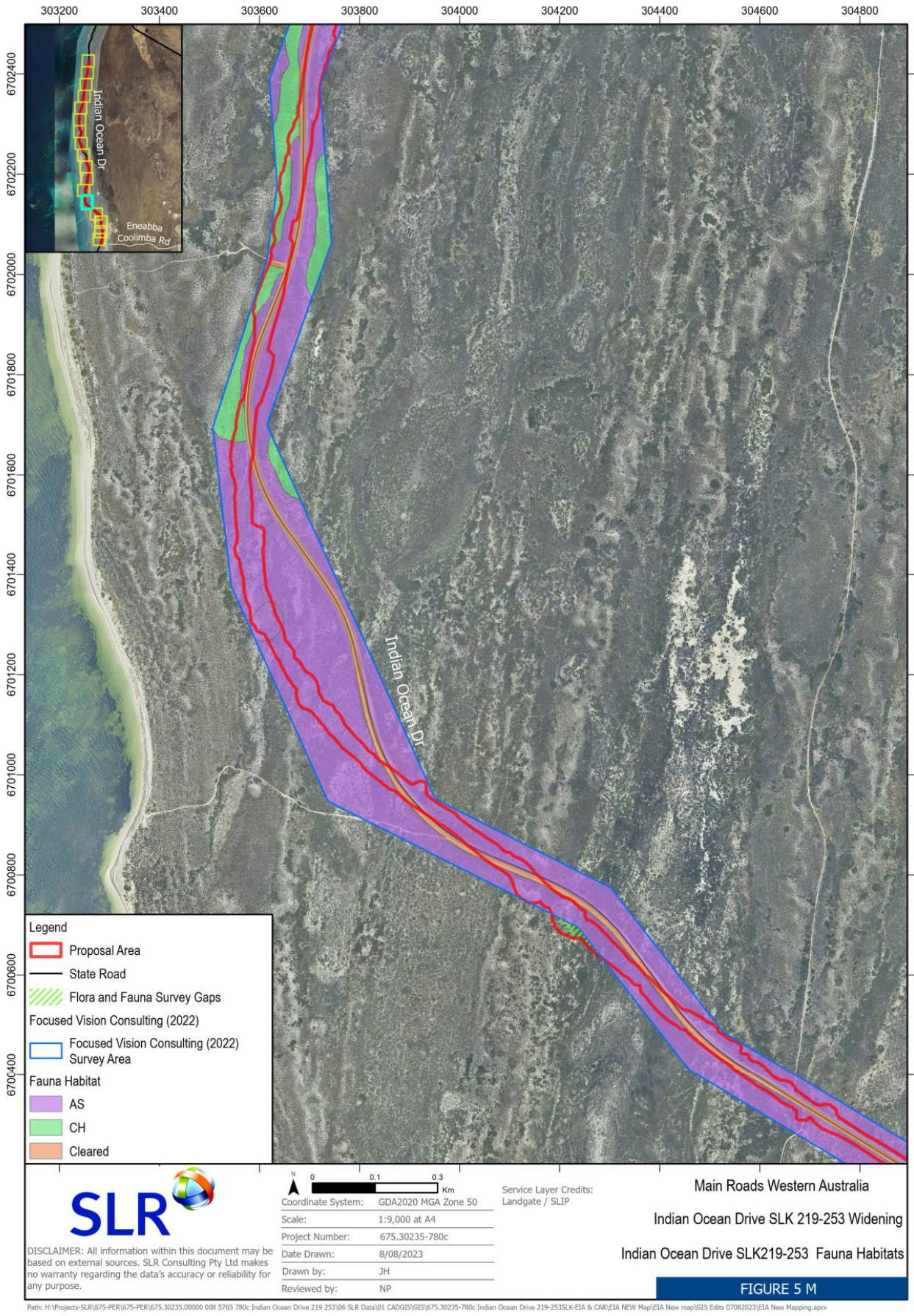


Figure 5 M: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

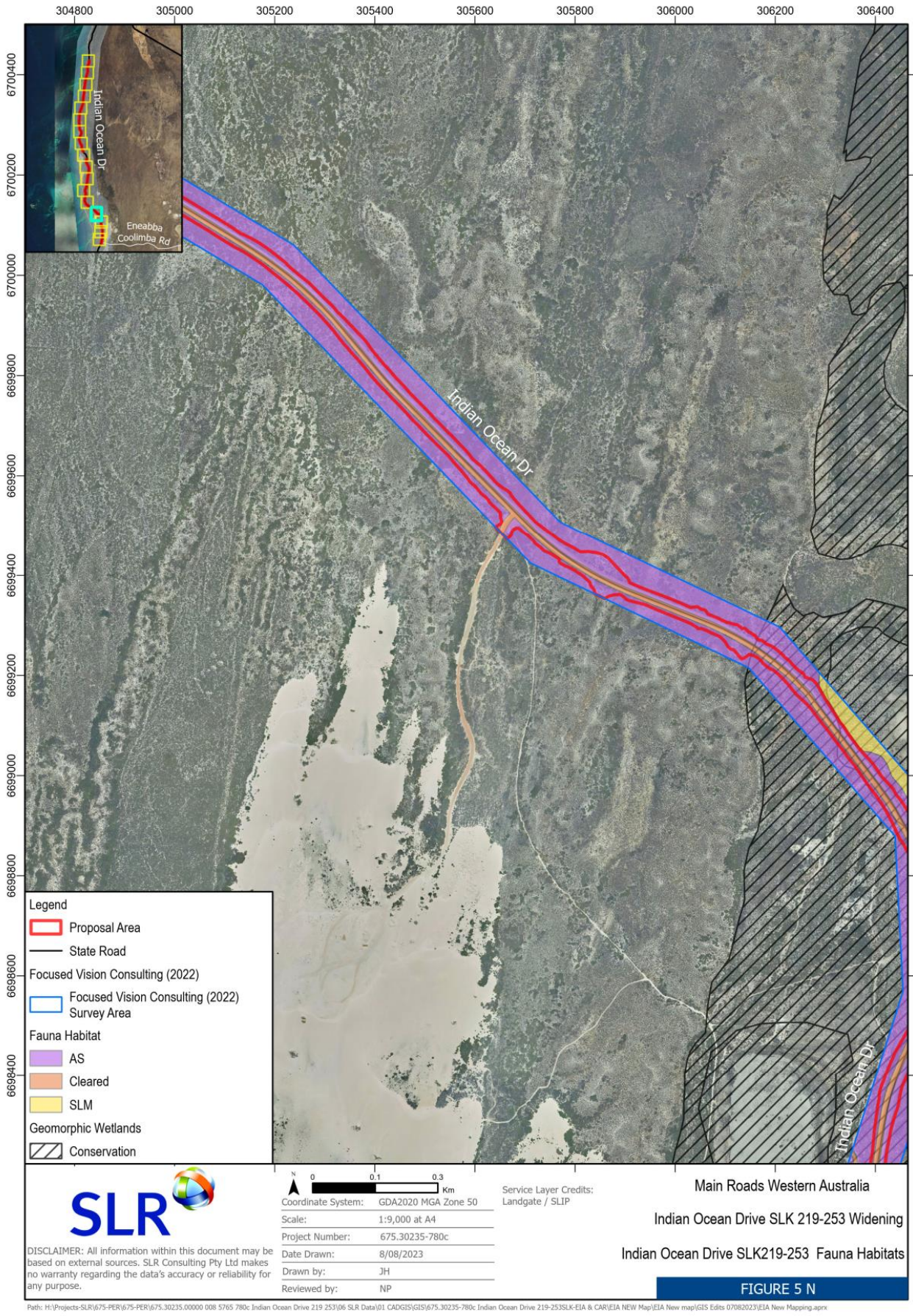


Figure 5 N: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

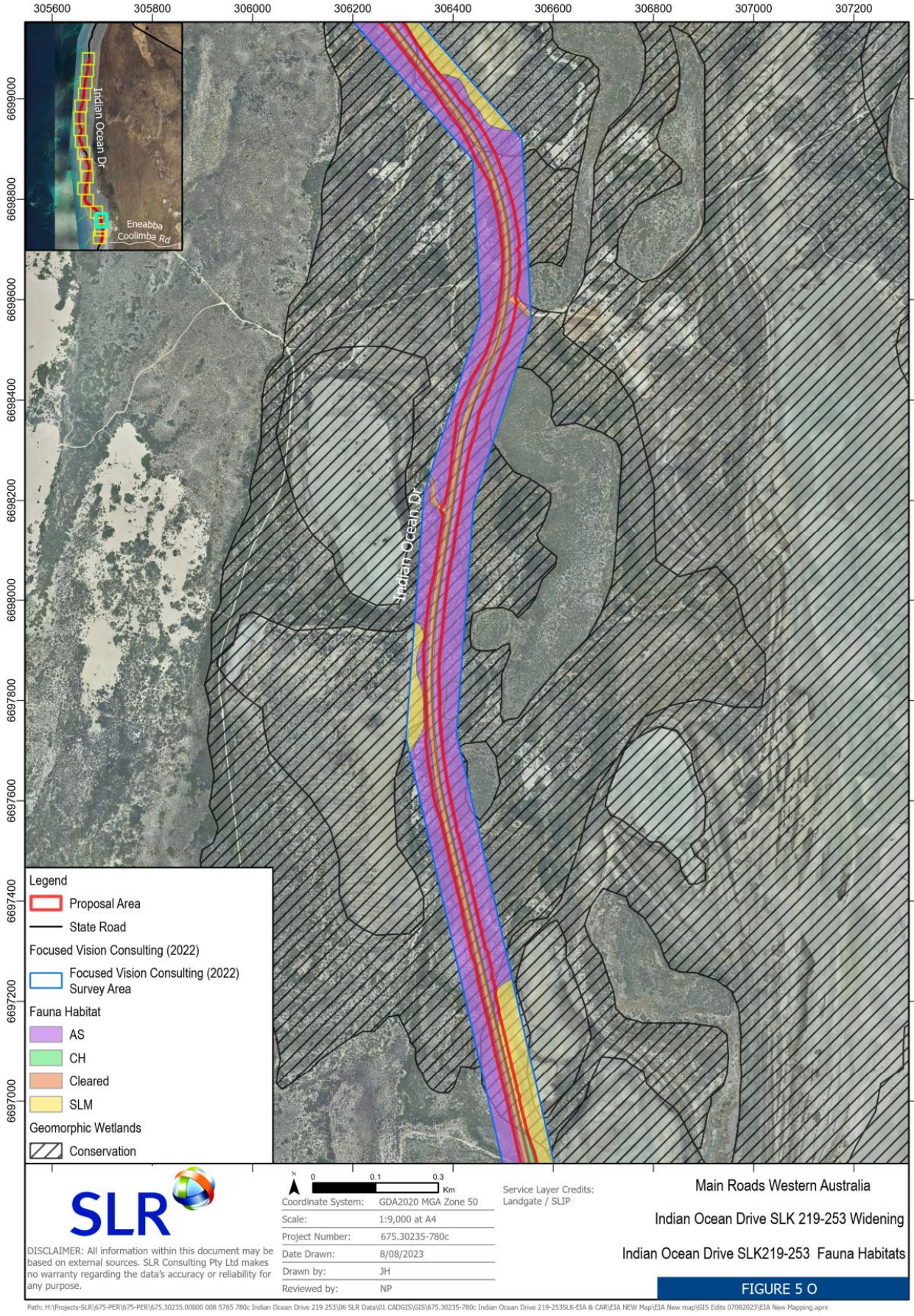


Figure 5 O: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

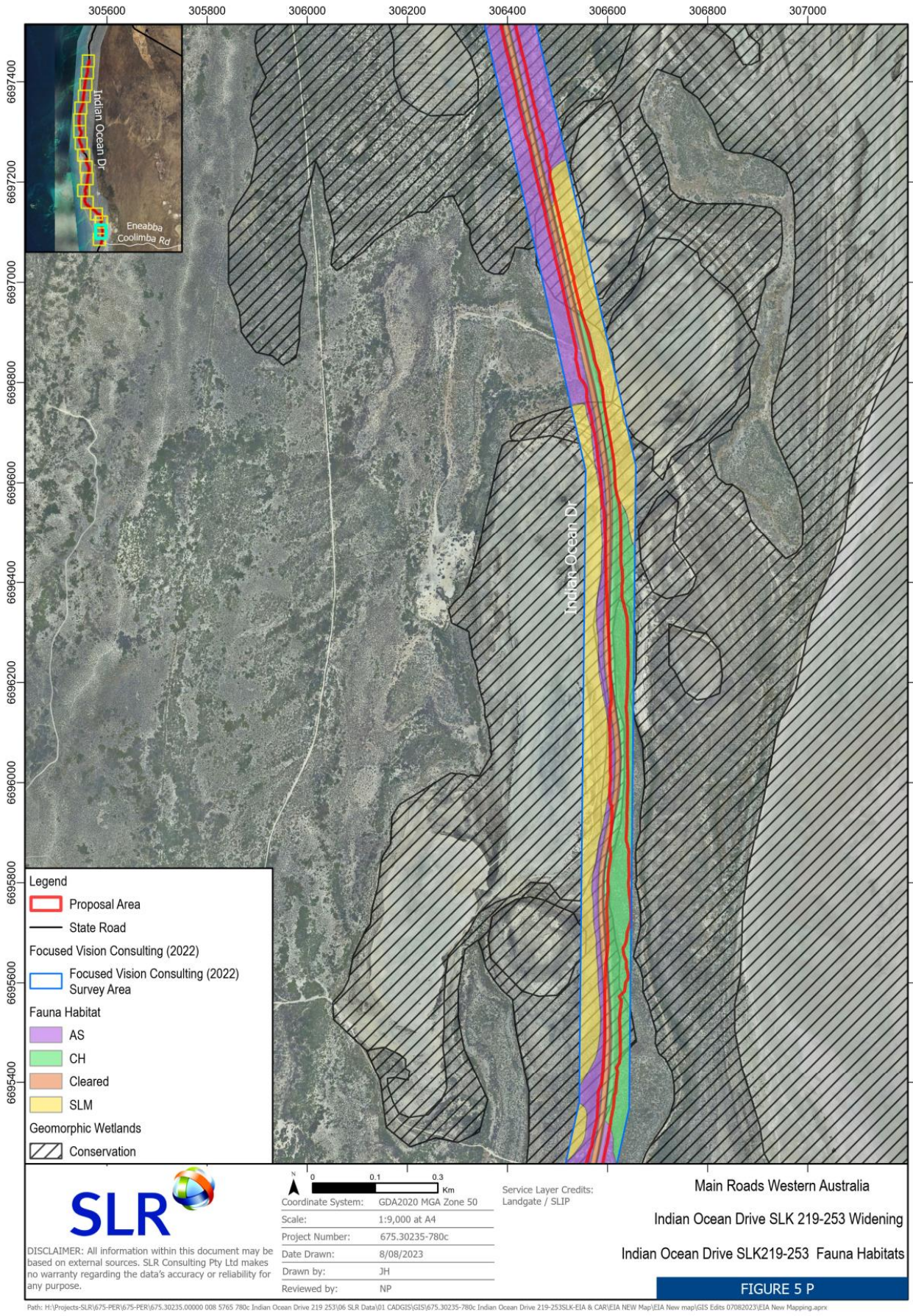


Figure 5 P: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

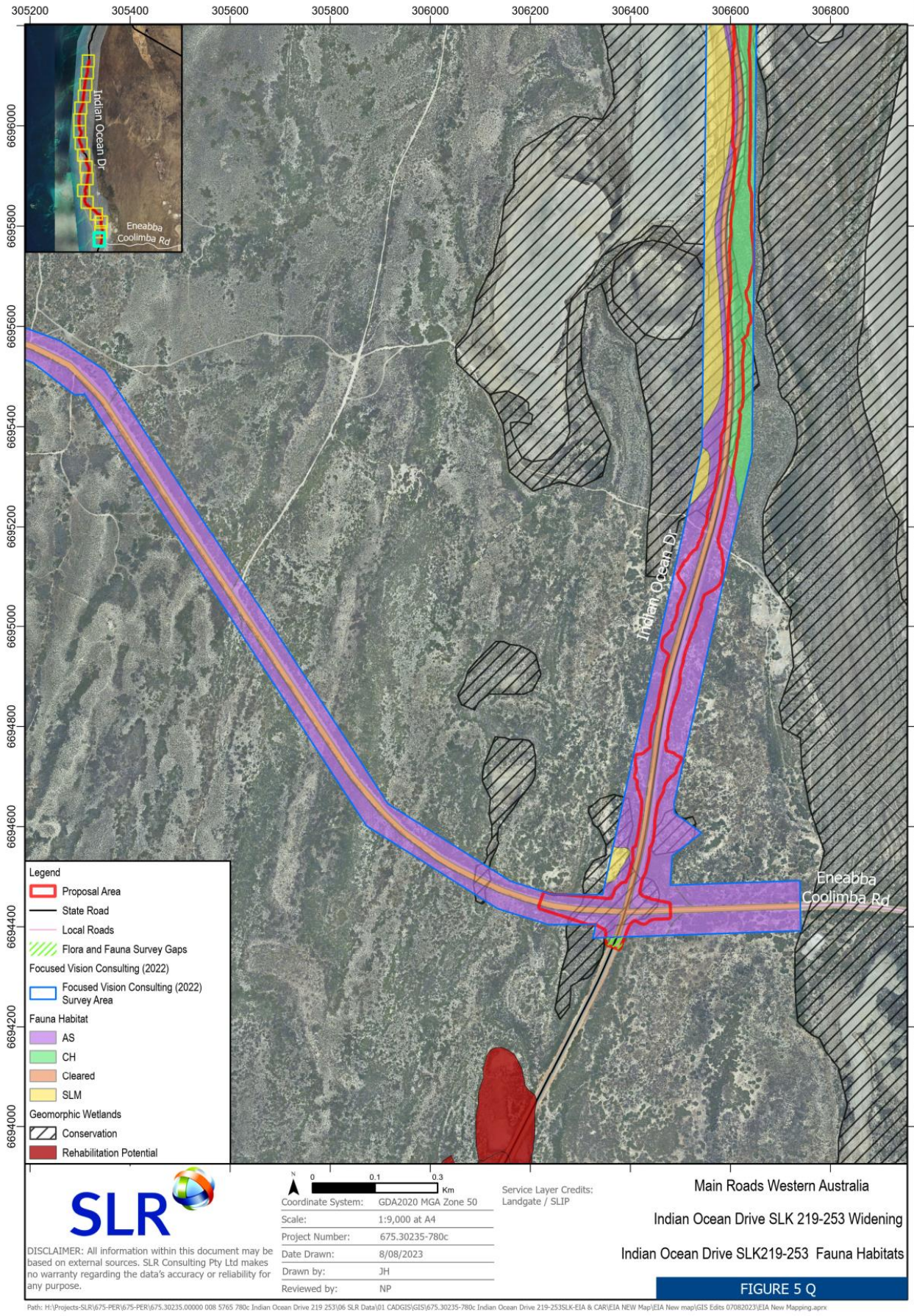


Figure 5 Q: Indian Ocean Drive SLK 219-253 Proposal Area Fauna Habitats.

Appendix 3: Vegetation Management Plan

INDIAN OCEAN DRIVE WIDENING SLK 219 – 253

1 PURPOSE AND SCOPE

This Vegetation Management Plan (VMP) has been prepared by Main Roads for the purpose of managing native vegetation clearing impacts associated with the Indian Ocean Drive Widening SLK 219 - 253.

Main Roads proposes to widen and upgrade IOD between 219.85 and 253.18 SLK. The upgrade will comprise the following:

- Clearing for construction.
- Road widening to achieve a 10m seal on 10m Pavement.
- Installation of audible edge lines.
- Various intersection upgrades.
- Re-alignment of several sections between SLK227 and 237.
- Addition of passing lanes at SLK 232 and 236.

For the section to be realigned, construction of new road may deviate from the existing alignment by up to 150m to reduce existing substandard horizontal and vertical alignment to increase road user safety, particularly through SLK 227.7- SLK 228.5.

In specified circumstances, Main Roads VMP is required to be approved by Department of Water and Environmental Regulation (DWER) as a condition of the Main Roads Statewide Clearing Permit CPS 818.

Actions, and their relevant timeframes, from this VMP will be documented within the relevant Tender Documentation (Specifications), such as:

- Specification 204 Environmental Management
- Specification 301 Vegetation Clearing and Demolition
- Specification 303 Materials and Water
- Specification 304 Rehabilitation of Disturbed Areas.

Once the Contract has been awarded, the Superintendent's Contract Management Team (or equivalent roles) are to ensure that the requirements are implemented by the Contractor.

2 AVOIDING, MITIGATING AND MANAGING THE IMPACTS OF CLEARING

A number of measures were undertaken to during the development and design of the proposal to reduce its impact the environment.

For further information on the alternatives that were considered during the proposal development, please go to Section 1.5 of the Clearing Assessment Report for the proposal.

For further information on the measures undertaken to avoid, minimise, reduce and manage the proposal's clearing impacts, please go to Section 1.6 of the Clearing Assessment Report for the proposal.

3 VMP ACTIONS

General vegetation management actions to be undertaken are shown in Table 1

Table 1. General vegetation management actions for clearing

Management Action	Responsibility	Timing
The Contractor must ensure plant, machinery and equipment, is cleaned down prior to arrival to the site.	Superintendent	During construction
Vehicle hygiene inspection checklists will be utilised to manage potential weed/dieback spread on earth-moving machinery.	Superintendent	During construction
No known dieback infested soil, mulch, fill or other material will be permitted into the works area.	Superintendent	During construction
All Clearing must be undertaken in such a way to allow fauna to move out of the Clearing area.	Superintendent	During construction
The Limits of Vegetation Clearing will be demarcated on site prior to the commencement of clearing to prevent entry into areas of native vegetation.	Superintendent	During construction
Natural drainage pathways will not be obstructed from stockpile gravel, crushed rock and excavated material.	Superintendent	During construction
All recently cleared, exposed and loose surface areas shall be protected from wind, water and soil erosion.	Superintendent	During construction
The Contractor will ensure that clearing of native vegetation is only undertaken in dry conditions, unless otherwise approved and / or directed by the Superintendent.	Superintendent	During construction
All Special Environmental Areas will be pegged in accordance with Main Roads' Drawing 201928-0001-1 Construction Peg Colour Code (https://www.mainroads.wa.gov.au/globalassets/technical-commercial/technical-library/standard-contract-drawings/vegetation/construction-environmental-management/201928-0001-construction-peg-colour-code-drawing.pdf?v=49bd3b).	Superintendent	During construction
The Contractor must develop and detail a Site induction training program as part of the CEMP that includes as a minimum, the significant environmental impacts, actual or potential, of work activities associated with the Contract.	Superintendent	During construction

The above actions will be documented within Specifications 204 and 301.

Main Roads' preclearing **Hold Point** applies to all projects that require vegetation clearing, as documented within Specification 301 (301.12 PRE-CLEARING PROCESS). Accordingly, all Hold Point actions must be signed off prior to clearing commencing. This Hold Point comprises the following actions:

1. Prior to the commencement of any clearing operations, the Contractor must certify for the Superintendent's verification and approval that the following activities have been completed in accordance with the relevant specification:

a) The pegging of Limits of Vegetation Clearing has been undertaken.

b) The pegged vegetation clearing area does not exceed the Limits of Vegetation Clearing.

c) Mature trees have been conserved as far as practicable.

d) The pegging of special environmental areas has been undertaken.

f) All pre-clearing weed control has been undertaken.

g) All pre-clearing fauna operational controls have been undertaken.

h) All pre-clearing dieback operational controls have been undertaken.

i) Suitable and unsuitable topsoil zones have been identified.

j) Vegetation and topsoil stockpile locations have been identified.

o) All clearing machinery is compliant with controls.

4 MONITORING AND MAINTENANCE PROGRAM

The Superintendent's Contract Management Team shall monitor the implementation of management actions that are a **Hold Point**. **Hold Point** actions must be signed off by the Superintendent's Representative to confirm it has occurred and recorded within the Superintendent's Contract Management Plan.

5 NON-COMPLIANCE

Non-compliance with management actions will trigger corrective actions, preventative actions and/or an incident investigation. Non-compliances will be recorded with Main Roads incident management system and reviewed by Main Roads Manager Environment.

The need for reporting non-compliances with VMP management actions to DWER will be determined as part of an incident investigation.

6 REVEGETATION

Revegetation will be undertaken in accordance with Condition 9 of CPS 818/16. Relevant requirements from Condition 9 have been incorporated into Project Revegetation Plan Template.

The elements to be implemented by the Contractor will be incorporated into the relevant Specification 304.

Principal Environmental Management Requirements (PEMRs)

Table 1: Clearing PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must prepare, implement and maintain processes to ensure that the movement of all vehicles, plant and machinery does not occur outside of the Limits of Vegetation Clearing. This must include all turnaround areas. 2. The Contractor must minimise vegetation clearing and the area of disturbance on ground by utilising existing cleared area where possible.
DURING WORKS 1. The Contractor must immediately notify the Superintendent of any damage to vegetation beyond the Limits of Vegetation Clearing, and report the damage as an Environment Incident. 2. The Contractor must ensure Movements are confined to the Limits of Vegetation Clearing during the works. 3. The Contractor must undertake the clearing in accordance with Fauna Management requirements of 204B.15.
POST WORKS **1.** Nil

SPECIFIC ENVIRONMENTAL MANAGEMENT REQUIREMENTS		
ENVIRONMENTAL MANAGEMENT REQUIREMENTS	**RESPONSIBILITY**	**HOLD POINT**
1. Clearing is only permitted within the Limits of Vegetation Clearing shown in Appendix 2 of Annexure 204A (CEMP) and provided in the Limits of Vegetation Clearing shapefiles.	**CONTRACTOR**	N
2. Contractor shall ensure Limits of Vegetation Clearing boundary is accurately pegged out by a qualified surveyor, in accordance with 204B.24 prior to the commencement of clearing activities.	**CONTRACTOR**	N
3. **At least 5 working days prior** to the commencement of clearing activities, the Contractor must provide for Superintendent verification (on advice of the Main Roads Environment Officer), a shapefile/s of the	**CONTRACTOR**	**Y**

surveyed pegged line proposed for clearing, in accordance with the Main Roads Environment and Heritage Data Management Standards (https://www.mainroads.wa.gov.au/OurRoads/Environment/Pages/environmentlinks.aspx).		
4. The Contractor must not commence vegetation clearing until the Superintendent (on advice of the MRWA Environment Officer) has provided written approval that the proposed trees for clearing have been clearly and accurately identified and marked.	**CONTRACTOR**	**Y**
5. The Contractor must ensure all works are confined to the existing cleared areas, or within the Limits of Vegetation Clearing.	CONTRACTOR	N
6. The Contractor must not clear any native vegetation outside of the Limits of Vegetation Clearing, unless authorised in writing by the Superintendent (on advice of the Main Roads Environment Officer).	CONTRACTOR	N
7. The Contractor must prepare, implement and maintain processes to ensure that the movement of all vehicles, plant and machinery does not occur outside of the Limits of Vegetation Clearing or existing cleared areas. This must include all turnaround areas.	CONTRACTOR	N
8. During clearing activities, daily pre-start meetings attended by all clearing crews must thoroughly review and discuss approved clearing area maps, planned clearing activities, methodologies and controls to prevent unapproved clearing. These pre-start meetings attendance forms must be signed by all in attendance and forwarded to the Superintendent each day.	CONTRACTOR	N
9. The Contractor must report any damage to vegetation beyond the Limits of Vegetation Clearing as an Environment Incident.	CONTRACTOR	N
10. The Contractor shall rehabilitate any damage to vegetation that has not been approved for clearing to the pre-clearing condition, in consultation with the MRWA Environment Officer.	CONTRACTOR	N
11. Contractor must have on-site at all times a copy of the CEMP, and other relevant management plans and clearing boundary maps.	CONTRACTOR	N
12. The Contractor shall provide within 10 working days of the clearing works being completed the following records;	**CONTRACTOR**	**Y**

i. Start and end date of clearing in a did/mm/yyyy format, ii. The total area in hectares of vegetation cleared in Ha, and iii. The location where the clearing occurred, to be provided as an "As Constructed" Clearing Footprint shapefile in GDA2020. Actual clearing area shapefile is to be surveyed by a qualified surveyor. Shapefiles are to be created in accordance with the MRWA Environment and Heritage Data Management Standards.		

Table 2: Dieback Management PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. Contractor's Pre-starts must detail the requirements from the DMP/HMP, where relevant, dieback management areas and the requirements of each area, maps of infested and uninfected locations, and hygiene requirements. 2. Where relevant a copy of the DMP/HMP must be onsite. This plan will include maps of management areas and obligatory control actions. 3. Contractor must prescribe where vehicles, machinery and plant are going to be stored/parked during the works. 4. Contractor must use the Hygiene Checklist or equivalent Hygiene form to check that all machinery and vehicles are clean on entry (i.e. free of soil and vegetation).
DURING WORKS 1. If required, locations of dieback infested or dieback free areas and hygiene control locations marked on site in accordance with contract HMP or DMP. 2. Hygiene works to be undertaken as per the HMP or DMP, where required. 3. Restrict movement of machines and other vehicles to the Limits of Vegetation Clearing. 4. Ensure no known weed affected soil, mulch, fill or other material is brought into the Limits of Vegetation Clearing. 5. Ensure cleared materials are stockpiled or disposed at waste at the locations approved by the Superintendent.
POST WORKS 1. Record that the project was undertaken in dry soil conditions (unless an approved DMP authorises otherwise). **2.** Use the Hygiene Checklist to check that all machinery and vehicles are clean on exit (i.e. free of soil and vegetation).

SPECIFIC ENVIRONMENTAL MANAGEMENT REQUIREMENTS		
ENVIRONMENTAL MANAGEMENT REQUIREMENTS	**RESPONSIBILITY**	**HOLD POINT**
1. All vehicles, machinery and tools shall arrive at site clean of soil, mud or vegetative material and will be inspected for compliance and sterilised prior to work if necessary (full hygiene clean down).	CONTRACTOR	N
2. Completed Hygiene Checklists will be required to be provided to the Superintendent within two weeks of completion of site works.	CONTRACTOR	N
3. Contractor will be required to adhere to site the approved DMP.	CONTRACTOR	N

4. Contractor will be required to implement the DMP including the establishment of up to 5 Clean on Entry (CoE) washdown stations, for dieback and weed washdown of vehicles and plant, prior to entering construction site, and/or other sensitive areas. The approximate SLK for each CoE station is to be at: • Indian Ocean Drive SLK 253.2 (southbound into construction site) • Indian Ocean Drive SLK 241.6 (southbound) • Indian Ocean Drive SLK 240.8 (northbound) • Indian Ocean Drive SLK 239.3 (southbound) • Indian Ocean Drive SLK 219.8 (northbound into construction site)	CONTRACTOR	**Y**
5. All CoE points are to be established and clearly demarcated on site using flagging / bunting across the road verge and signage prior to commencement of works. Shapefile of demarcation locations and photographic evidence of demarcation will be required to be provided to the Superintendent prior to works commencing.	CONTRACTOR	**Y**
6. All plant, vehicles and machinery must pass through a CoE Hygiene washdown station as a condition of entry into the construction site.	CONTRACTOR	N
7. Contractor to keep a Hygiene washdown log/register, to record each vehicle/plant that passes through and is cleaned in each washdown bay location. This log/register is to be made available to Main Roads at any time on request.	CONTRACTOR	N
8. In dry conditions, dry clean (brush down/air blowing) is sufficient to clean machinery. However, in wet soil conditions when the machine becomes muddy, a wash down will be required and the effluent from the wash down must be directed into the location from which the dirt came.	CONTRACTOR	N
9. All run-off and potentially infested material from CoE points is to be retained on site and must not be permitted to dissipate into the surrounding vegetation.	CONTRACTOR	N
10. No known dieback-affected soil, mulch, fill, water or other material is to be imported to the works site at any time.	CONTRACTOR	N

11. Training (induction/toolbox) undertaken for site personnel including sub-contractors regarding dieback and the importance of preventing the spread of the pathogen. Training to also make personnel aware of location of works being adjacent to DBCA Nature Reserve.	CONTRACTOR	N

Table 3: Erosion and Sedimentation Control PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must develop, implement and maintain processes and procedures to ensure that: • The Contractor is responsive to and addresses incidents of erosion and sedimentation within and adjacent to the work areas. • Prevent water and wind soil erosion within and adjacent to the works areas. • Prevent the sedimentation and siltation of watercourses located within and adjacent to the works area. • Ensure that sedimentation and siltation of drainage lines due to the removal of riparian vegetation is avoided, minimised and mitigated. • Ensure that loose surfaces and recently cleared areas are protected from wind and soil erosion. • Minimise exposed soil working surfaces or protect them from stormwater erosion. • Ensure material such as gravel, crushed rock and excavated material is stockpiled away from drainage paths and covered to prevent erosion. • Ensure that water quality monitoring is undertaken when turbidity and sedimentation is an issue.
DURING WORKS 1. Implement, monitor and adhere to the sedimentation and erosion processes developed to address the requirements in the pre-works.
POST WORKS 1. If required, the Contractor must continue to monitor water quality until the turbidity/sedimentation dissipates. **2.** The Contractor must ensure that disturbed areas are stabilised as soon as is practicable after construction activities are completed.

SPECIFIC ENVIRONMENTAL MANAGEMENT REQUIREMENTS		
ENVIRONMENTAL MANAGEMENT REQUIREMENTS	**RESPONSIBILITY**	**HOLD POINT**
Where works are to impact a water body within a wetland area, a silt curtain is to be installed on the Limit of Vegetation Clearing boundary, to ensure sediment is contained to the works area and does not impact adjacent wetland areas.	CONTRACTOR	N

Table 4: Fauna Management PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must ensure that fauna management requirements are communicated to the crew undertaking the clearing works during the induction and pre-start meeting. **2.** Where active nests, burrows or dens are identified, works must not proceed until the Contractor obtains the Superintendents approval of the management of active nests, burrows or dens adheres to the Superintendents advice.
DURING WORKS 1. The Contractor must undertake the clearing (if required) in the following manner to allow fauna to move out of the clearing area: i. Prior to the clearing activities commencing, use machinery to tap large trees with habitat hollows to encourage any animals evacuate. ii. Undertake the clearing in one direction and towards areas of native vegetation to allow the animals to escape to adjacent habitat. 2. The Contractor must ensure that all onsite personnel undertake visual monitoring and are vigilant to the presence of fauna. Any sightings of fauna, including injury or fatality, must be reported as an Environmental Incident. 3. The Contractor must ensure that: i. No pets, traps or firearms are brought into the project area. ii. Fauna are not fed iii. Fauna are not intentionally harmed or killed iv. Fauna that venture into the work area are encouraged to leave in a manner that does not harm the animal or operator (loud noise, slowly approaching in a vehicle etc.) 4. The Contractor must ensure that in the event that sick, injured or orphaned native wildlife are located on the project site, the WILDCARE Helpline ((08) 9474 9055) will be contacted for assistance. The Contractor must maintain records of any animal taken to a wildlife carer.
POST WORKS 1. The Contractor must provide any records of fauna impact to the Superintendent.

Table 5: Machinery and Vehicle Management PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must ensure that all areas associated with the storage, parking, servicing, wash down and refuelling of all vehicles, plant and machinery is located within the Limits of Vegetation Clearing and approved by the Superintendent. 2. The Contractor must ensure that all vehicles, machinery and plant are clean on entry (i.e. free of all soil and vegetation material) and comply with the requirements of 204B.9 and 204B.32. 3. The Contractor must ensure that vehicle servicing and refuelling will be undertaken at designated areas approved by the Superintendent, in accordance with 204B.19. **4.** The Contractor must ensure that all staff suitably qualified and competent to undertake works, especially refuelling activities.
DURING WORKS 1. The Contractor must maintain records of checking all vehicles, machinery and plant are clean on entry, as per requirements of 204B.9.
POST WORKS 1. Records, registers and logs must be provided to Main Roads at the completion of works, and must be available at anytime throughout the duration of the works.

SPECIFIC ENVIRONMENTAL MANAGEMENT REQUIREMENTS		
ENVIRONMENTAL MANAGEMENT REQUIREMENTS	**RESPONSIBILITY**	**HOLD POINT**
1. The Contractor must complete the Hygiene Checklist to check all machinery, vehicles and equipment are clean on entry (i.e. free of soil and plant material), particularly on the tyres, mud flaps and underbody.	CONTRACTOR	N
2. The Contractor must ensure all machinery, vehicles and equipment comply with requirements specified in 204B.9 and the DMP.	CONTRACTOR	N
3. Copies of Hygiene Checklists to be provided to the Superintendent within two weeks of completion of site works.	CONTRACTOR	N

Table 6: Mulch and Topsoil Management PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must ensure that the movement of soil and vegetation is only undertaken in dry conditions unless otherwise approved and / or directed by the Superintendent. 2. The Contractor must ensure that poor quality topsoil and mulched vegetation does not contaminate the good quality topsoil and vegetation.
DURING WORKS 1. The Contractor must ensure that all machinery used in the removal of weed-infested topsoil must be cleaned down before and between operations to prevent the introduction and spread of weeds. 2. The Contractor must ensure the movement of large equipment over topsoil materials is avoided to minimise compaction. 3. The Contractor must ensure that Dieback and weed infected topsoil and mulch vegetation must be handled separately to minimise the risk of spreading dieback and weed species across the site and stockpiles. 4. The Contractor must ensure that stockpiling operations must occur in a manner to ensure that the properties of the topsoil are not degraded and the topsoil made unsuitable for use in revegetation.
POST WORKS NIL

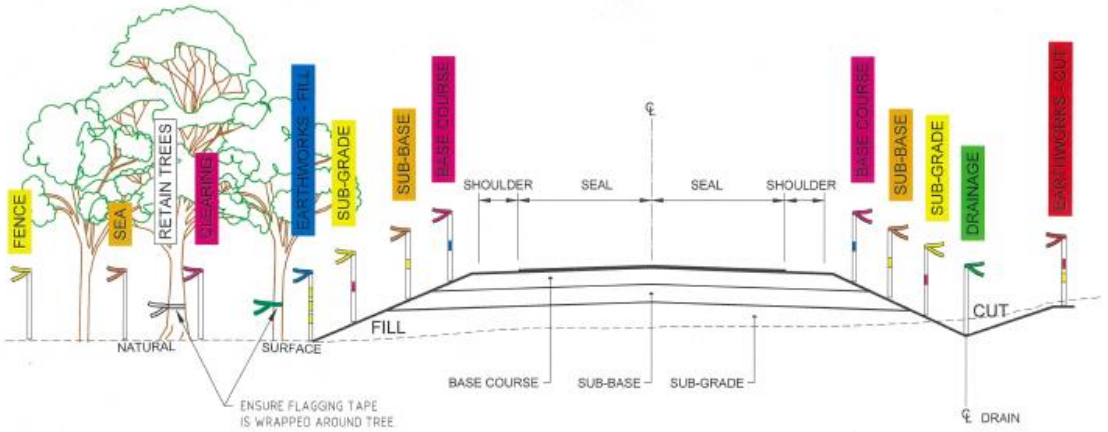
SPECIFIC ENVIRONMENTAL MANAGEMENT REQUIREMENTS		
ENVIRONMENTAL MANAGEMENT REQUIREMENTS	**RESPONSIBILITY**	**HOLD POINT**
1. The Contractor must identify for the purpose of revegetation works, suitable and unsuitable topsoil and cleared vegetation / mulch material. 2. The Contractor must conserve mulch and stockpile the good quality vegetation, during clearing, for reuse revegetation and rehabilitation works. 3. The Contractor must converse and stockpile good quality topsoil, during clearing, for reuse during revegetation works. 4. The Contractor must identify suitable locations for the storage and stockpiling of good quality and poor quality topsoil and mulch.	**CONTRACTOR**	N

5. The Contractor must ensure that good quality topsoil and mulched vegetation does not contaminate the poor quality topsoil and vegetation. 6. The Contractor must identify, for the Superintendents approval, suitable locations for the disposal of unsuitable topsoil, vegetation and spoil material. Non-weed infested vegetation will be mulched and stockpiled in weed free areas within the limits clearing. 7. Contractor must ensure that any stockpile is located within the Limits of Vegetation Clearing or within existing cleared areas approved by the Superintendent.		

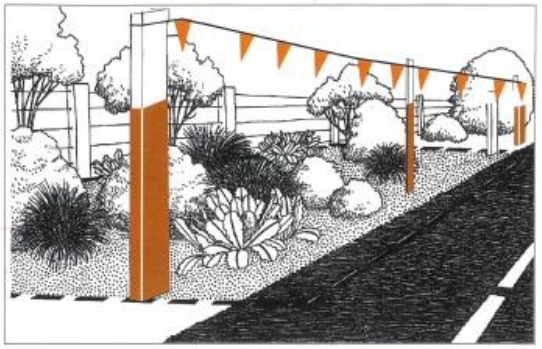
Table 7: Pegging and Flagging PEMRs

STANDARD MANAGEMENT REQUIREMENTS
1. Pegging must be done in accordance with the requirements detailed in Specification 301, and Figure 1. 2. The Contractor must clearly communicate, either at the pre-start meeting or equivalent to the crew undertaking the clearing works, through clear maps and other additional means, what the Pegging represents.
DURING WORKS 1. The Contractor must peg the Limits of Vegetation Clearing by PINK flagging tape. 2. The Contractor peg/demarcate vegetation proposed to be retained is demarcated by WHITE flagging tape. 3. The Contractor must ensure that the vegetation demarcated with PINK and WHITE flagging tape is consistent with the approved clearing areas.
POST WORKS 1. The Contractor is to remove, and dispose of appropriately, any demarcation, pegging or flagging once project works are completed.

SPECIFIC ENVIRONMENTAL MANAGEMENT REQUIREMENTS		
ENVIRONMENTAL MANAGEMENT REQUIREMENTS	**RESPONSIBILITY**	**HOLD POINT**
1. **At least 5 working days prior** to the commencement of clearing activities, the Contractor must provide for Superintendent verification (on advice of the Main Roads Environment Officer), shapefile/s of the pegged Limits of Vegetation Clearing Boundary and/or individual trees proposed for clearing, in accordance with the Main Roads Environment and Heritage Data Management Standards (https://www.mainroads.wa.gov.au/OurRoads/Environment/Pages/environmentlinks.aspx)	**CONTRACTOR**	**Y**



DETAIL (1) NTS PEG COLOUR CROSS SECTION



ROPE FLAGGING FOR SPECIAL ENVIRONMENT AREAS.

DETAIL (2) NTS

TAPES ON PEGS

There are two types of tapes on survey pegs. Flappers and Wraps.

Flappers are the long tapes that blow in the breeze. They are usually at the top of the pegs. They are used to show you what type of peg it is as per below.

YELLOW (outside earthworks)	Fence
ORANGE (outside earthworks)	SEA - Special Environment Area
PINK (in bush)	Clearing peg
PINK (on trees)	Remove tree
WHITE (on tree)	Retain tree
WHITE (on tree) and PINK (on tree limb)	Retain tree Remove limb
GREEN (on tree)	Reuse Vegetation
RED	Earthworks CUT peg
BLUE	Earthworks FILL peg
GREEN	Drainage peg
YELLOW	Sub-grade peg
ORANGE	Sub-base peg
PINK (on pavement)	Basecourse peg

Wraps are the short tied tapes on the pegs and they are used to show the required level to trim to or to reference the level that is needed to be achieved. The different colours are explained below.

BLUE	Finished level of basecourse
YELLOW	Finished level of sub base
PINK	Sub-grade level (can be on earthworks and on sub-grade pegs)
RED	500mm CUT of FILL depending on whether the Flapper is Red or Blue
YELLOW	1 metre CUT or FILL depending on whether the Flapper is Red or Blue

Example 1 - The earthworks peg which has a Red Flapper with a Red & Yellow Wrap means 1.5m CUT and it refers to the next point in from the top of batter, i.e. the drain.

Example 2 - The earthworks peg which has a Blue Flapper with 3 Yellow Wraps means 3m FILL and it refers to the next point in from the toe of batter, i.e. the sub-grade hinge point.

SCALES N.T.S. A3

No.	DESCRIPTION	APPROVED & DATE
1.	NOTES ADDED & PROTECTED AREA ROPE FLAGGING DIAGRAM INCLUDED	
2.	ADDED GREEN FLAGGING ON TREE AND AMENDED TABLE TO SHOW NEW FLAGGING DESCRIPTION	

AMENDMENTS

NOTES
1. SETOUT TO FOLLOW THE CONSTRUCTION SURVEYING GUIDELINE (D12#434555) ON MAIN ROADS' WEB SITE
2. FOR CLEARING LINE (PINK) ENSURE SUFFICIENT STAKES/PEGS TO MAINTAIN LINE-OF-SIGHT VISIBILITY, MAXIMUM 40M INTERVAL. INCLUDE STAKES/PEGS AT SIGNIFICANT VERTICES/CHANGES OF DIRECTION
3. FOR SPECIAL ENVIRONMENT AREAS (SEA – ORANGE) ROPE FLAGGING AS PER DETAIL 2 TO BE INSTALLED ALONG THE LENGTH OF THE SPECIAL ENVIRONMENT AREA

mainroads WESTERN AUSTRALIA
PLANNING AND TECHNICAL SERVICES DIRECTORATE
ENVIRONMENT BRANCH
Waterloo Crescent, East Perth 6004
Telephone (08) 9323 4111

DESIGNED	B. GRINTER	FEB 2013
DRAWN	A. SZELIGA	FEB 2013
VERIFIED	N. ROWE	01.09.2021
APPROVED	M. SCHELTEMA	01.09.2021
FILE NUMBER	12/3221	15/5/23

STANDARD DRAWING

CONSTRUCTION PEG COLOUR CODE

MRWA DRAWING NUMBER 201928-0001-2

Table 8: Weed Management PEMRs

STANDARD MANAGEMENT REQUIREMENTS
PRE WORKS 1. The Contractor must remove or kill any weeds growing in project area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition. 2. The Contractor must develop, implement and maintain procedures to identify and control declared and invasive weed species within the Contract areas, to the satisfaction of the Superintendent. 3. The Contractor must prepare a weed control program, for nominated weed species for control and disposal, to the satisfaction of the Superintendent. **4.** The Contractor must undertake weed management in Stockpiles as directed by the Superintendent.
DURING WORKS 1. The Contractor must implement the weed control procedures and management plan and record and manage records of its implementation. 2. The Contractor must treat nominated weed infestations as many times as necessary to control and eradicate the weed species in accordance with the approved weed control program. **3.** The contractor must ensure that no known weed, pest or diseased affected soil, mulch, fill or other material is brought into the Site.
POST WORKS 1. The relevant Vegetation Maintenance Record Sheets available at: https://www.mainroads.wa.gov.au/technical-commercial/contracting-to-main-roads/ must be completed and sent to the Superintendent.