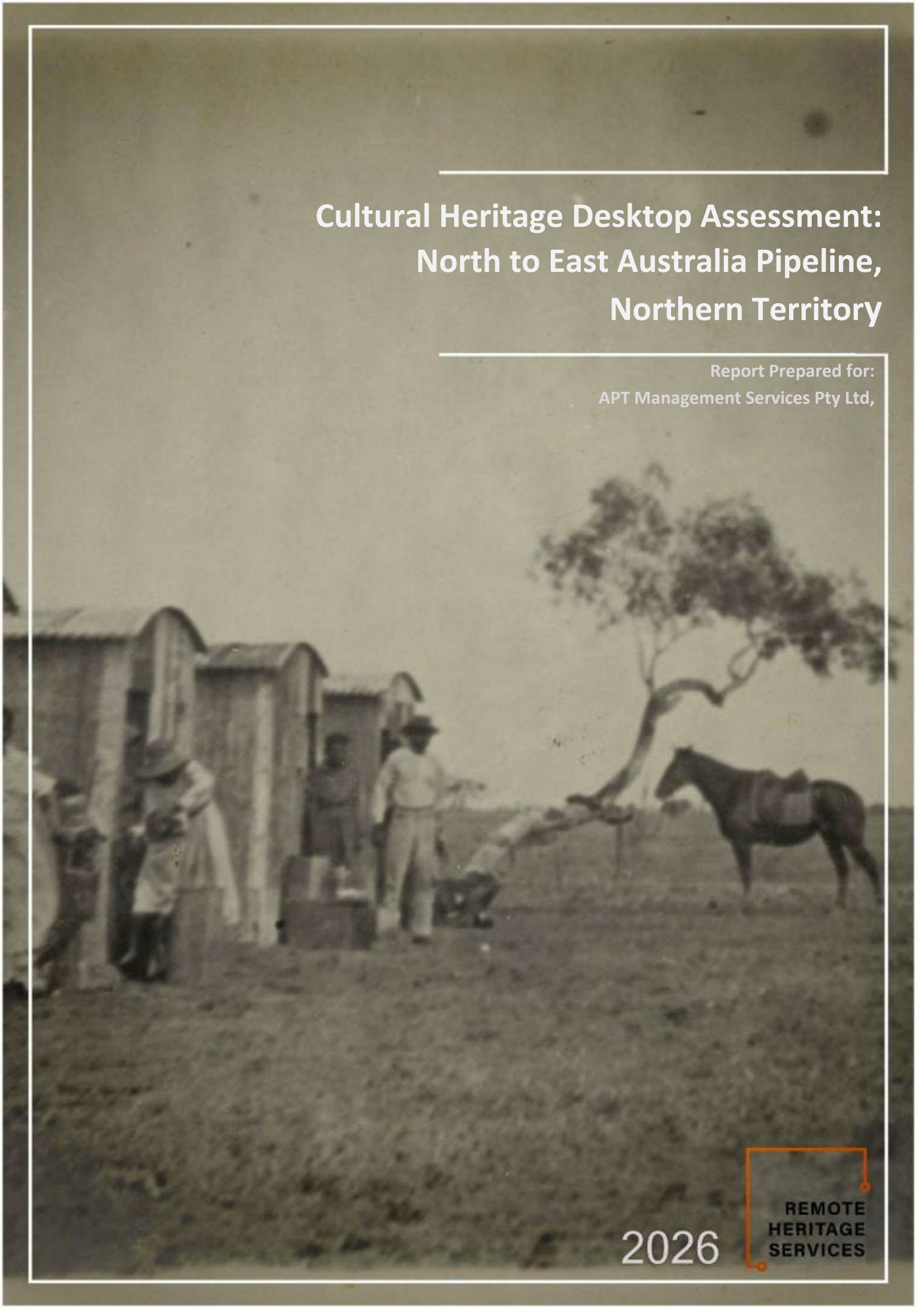
Cultural Heritage Desktop Assessment: North to East Australia Pipeline, Northern Territory

Report Prepared for:
APT Management Services Pty Ltd,



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REMOTE HERITAGE SERVICES

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Cultural Heritage Desktop Assessment:
North to East Australia Pipeline, Northern Territory

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REMOTE HERITAGE SERVICES

Cover Image: Aboriginal Station Quarters – Alexandria Station (n.d.)

EXECUTIVE SUMMARY

APT Management Services Pty Ltd (APT), a wholly owned subsidiary of APA Group, engaged Remote Heritage Services (RHS) to undertake a desktop Cultural Heritage Assessment for the proposed North to East Australia (NEA) Pipeline within the Northern Territory. The NEA Pipeline is a proposed open-access gas transmission pipeline spanning approximately 1,580 km from the Beetaloo Sub-basin to APA's South West Queensland Pipeline network. This assessment addresses the Northern Territory components of the project, encompassing approximately 580 km of the NEA alignment and the 79 km Collection Header that ties into the Shenandoah Facility. The NEA Assessment Areas were defined as a 1,000 m buffer around the pipeline corridor and a 500 m buffer around associated access tracks.

The assessment establishes a baseline of known Aboriginal and historic heritage places and values within the defined NEA Assessment Areas, identifies statutory obligations under Northern Territory and Commonwealth legislation, and develops an archaeological predictive model and sensitivity mapping to guide the design and prioritisation of field survey activities. The NEA Pipeline will require ground-disturbing works including vegetation clearing, topsoil stripping, trench excavation, pipe installation, backfilling, reinstatement, and trenchless crossings of sealed roads. Ancillary works will include temporary construction camps, access tracks, laydown areas, turkey nest dams, water bores, and cathodic protection anode beds. Borrow pits for road making (gravel extraction) will be identified and assessed separately to nominated pipeline construction and ancillary works.

Land Tenure and Native Title

The NEA Assessment Areas traverse multiple perpetual pastoral leases across the Northern Territory, including Shenandoah, Cooee Hills, Beetaloo, Mungabroom, Walhallow, Anthony Lagoon, Brunette Downs, Alexandria, East Ranken, Avon Downs, and Austral Downs. The NEA Assessment Areas also cross areas of Aboriginal freehold land (Wampaya), vacant Crown land, and Crown road reserves. Eleven Native Title Determinations and active Native Title Determination Applications intersect the NEA Assessment Areas, requiring consultation pathways through the Northern Land Council and relevant Registered Native Title Bodies Corporate.

Heritage Register Searches

Searches of National, Commonwealth, and Northern Territory heritage registers and the Aboriginal Areas Protection Authority (AAPA) Register of Sacred Sites identified the following:

No places listed on the World Heritage List, National Heritage List, Commonwealth Heritage List, or Northern Territory Heritage Register were identified within the NEA Assessment Areas. The Anthony Lagoon Aerodrome, listed on the Register of the National Estate, is located adjacent to a proposed access track approximately 900 m south of NEA KP 176, and the Anthony Lagoon Davey Paxman Steam Engine is located 360 m west of a proposed access track.

No known Aboriginal archaeological places were identified within the NEA Assessment Areas. However, 21 previously recorded Aboriginal archaeological sites exist within 25 km, and the Northern Territory Heritage Branch assessed the likelihood of unrecorded Aboriginal archaeological places within the NEA Assessment Areas as very high.

Registered and recorded sacred sites and Restricted Work Areas are present in the vicinity of the NEA Assessment Areas. Under the *Northern Territory Aboriginal Sacred Sites Act 1989*, it is an offence to enter or carry out works on a sacred site without authority.

Archaeological Predictive Model and Sensitivity Mapping

An archaeological predictive model and detailed sensitivity mapping methodology were developed based on environmental, cultural, and archaeological background research. The NEA Assessment Areas traverse three bioregions: the Sturt Plateau (Collection Header and NEA KP 0 to KP 67), the Gulf Fall and Uplands (NEA KP 67 to KP 140), and the Mitchell Grass Downs (NEA KP 140 to KP 582). Each bioregion presents distinct conditions for Aboriginal occupation and resource utilisation. Key predictions include:

- Water availability is the primary determinant of archaeological site location, with elevated likelihood of site occurrence near permanent and semi-permanent water sources, drainage corridors, and collecting landforms.
- Sandy rises, stream terraces, and well-drained landforms adjacent to water represent favourable occupation locations.
- Archaeological potential varies with geology, with alluvium and colluvium zones having high potential for raw materials suitable for stone artefact manufacture.
- There is potential for seed-processing evidence, particularly in the Mitchell Grass Downs, and for contact period Aboriginal cultural heritage sites associated with the Overland Telegraph Line and early pastoral activities.

Application of the sensitivity mapping methodology across the NEA Assessment Areas identified 133 Cultural Heritage Sensitivity Areas, containing a total of 3,014 individual landform features. Of these, 1,134 features were rated Almost Certain, 904 as Probable, 556 as Possible, and 420 as Unlikely.

Recommendations

Based on the predictive model, sensitivity mapping, and risk assessment, the recommendations are summarised below:

1. APA should obtain a Sacred Sites Authority Certificate under the *Northern Territory Aboriginal Sacred Sites Act 1989* prior to the commencement of construction activities. All recorded and registered sacred sites and Restricted Work Areas should be avoided in the interim.
2. Aboriginal cultural heritage field assessments should be undertaken prior to final pipeline route determination and commencement of construction, with survey coverage scaled to sensitivity ratings: 100% for Almost Certain areas, 75% minimum for Probable areas, 50% minimum for Possible areas, and 10 to 20% minimum for Unlikely areas.
3. Traditional Owners and Site Custodians should be engaged in Aboriginal cultural heritage management decision-making throughout the project.
4. A Cultural Heritage Management Plan should be prepared following field assessments, incorporating site-specific management measures, construction monitoring requirements, and a Unexpected Finds Protocol.
5. APA should develop and implement protocols for the management of unexpected finds, including Aboriginal archaeological sites and objects, and suspected human remains.

6. Workforce training and cultural awareness inductions should be implemented for all staff and contractors working on the NEA Pipeline Project.

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1 INTRODUCTION

APT Management Services Pty Ltd (APT), a wholly owned subsidiary of APA Group, engaged Remote Heritage Services (RHS) to undertake a desktop Cultural Heritage Assessment for the proposed North to East Australia (NEA) Pipeline within the Northern Territory.

This desktop report aims to map the baseline risk of encountering heritage values within the Project Areas, identify applicable regulatory requirements, and propose appropriate management approaches at the Project's outset. The assessment serves as a critical initial step to ensure compliance with heritage regulations and best practices, while mitigating potential risks associated with heritage encounters during the Project's execution.

The NEA Pipeline is proposed as an open-access pipeline with the potential to collect Beetaloo gas from multiple producers. The Project will involve:

- Construction of a buried, large diameter steel pipeline approximately 1,580 km in length, with approximately 580 km within the Northern Territory
- Construction of a 79 km long smaller diameter Collection Header that ties into the Shenandoah Facility
- In addition, the following associated infrastructure will likely be required for the construction and operation of the pipeline:
    - Compressor stations (2 in the NT)
    - Main Line Valves every 75km
    - Scraper Stations
    - Telemetry and monitoring equipment
    - Access track establishment and upgrade
    - Pipe stockpile sites
    - Anode beds
    - Temporary construction accommodation camp/s
    - Temporary laydown areas
    - Temporary access tracks
    - Water bores and temporary ‘turkey nest’ water storages
    - Gravel quarrying (borrow pits) – these will be assessed separately due to their isolation away from the rest of the pipeline corridor and associated infrastructure.

The NEA Pipeline complements APA's 37 km Sturt Plateau Pipeline (SPP), which connects Tamboran Resources' gas development in the southern Beetaloo Basin to the existing Amadeus Gas Pipeline.

For the purposes of spatial reference throughout this report, locations along the pipeline assessment corridor are described using Kilometre Points (KPs). KP values referenced herein correlate to the Revision 1 pipeline corridor, endorsed by APA for use in January 2026. It should be noted that KPs may be subject to change in subsequent corridor revisions as the pipeline route is further refined.

APA has received a pipeline permit from the Northern Territory Government to commence surveying a potential corridor for the NEA Pipeline. The Project is anticipated to become operational in the 2030s.

The construction process will involve several stages, including surveying the route, vegetation clearing, pipe delivery, bending and welding, field joint coating, trench excavation, pipeline installation, backfilling, hydrostatic testing, and site reinstatement. Open trench construction methods will be used for the majority of the pipeline route, with trenchless construction employed beneath sealed highways and in identified areas of environmental or cultural sensitivity where feasible. Given that these works will involve varying degrees of ground disturbance, it is necessary to consider the cultural heritage constraints that may apply under the *Heritage Act 2011* (NT), the associated *Heritage Regulations 2012* (NT) and *Northern Territory Aboriginal Sacred Sites Act 1989*.

1.1 SCOPE OF THE STUDY

As part of the NEA Pipeline Project planning study, Remote Heritage Services has completed a desktop Preliminary Cultural Heritage Assessment to identify potential cultural heritage constraints and risks associated with the Project. The findings of this desktop assessment, including the predictive model and sensitivity mapping, have been developed to inform the design and prioritisation of future physical heritage survey programs.

The Project comprises the NEA Pipeline corridor and associated access tracks. For the purposes of this assessment, a 1,000 m buffer has been applied to the pipeline corridor, and a 500 m buffer applied to the access tracks. The desktop assessment has included:

1. A summary of land ownership and native title status within the NEA Assessment Areas.
2. Register searches of Commonwealth, Northern Territory, and Queensland heritage registers, including mapping of known site locations within and proximate to the NEA Assessment Areas.
3. An environmental background review analysing land systems, surface geology, and hydrology to assess archaeological potential across the NEA Assessment Areas.
4. An ethnographic[1] and archaeological background review for the NEA Assessment Areas and surrounding environs.
5. The development of an archaeological predictive model and risk assessment to guide the physical heritage assessment and ensure future compliance with the *Heritage Act 2011* (NT).
6. The development of recommendations to guide future compliance with applicable heritage legislation.

1.2 PROJECT LOCATION AND LAND TENURE

1.2.1 Location

The North to East Australia (NEA) Pipeline is a proposed gas transmission project measuring approximately 1,580 kilometres from the Beetaloo Sub-basin in the Northern Territory to APA's existing South West Queensland Pipeline (SWQP) (Figure 1 and Figure 2). Originating approximately 600 km south-east of Darwin, the pipeline route traverses the Northern Territory from the Beetaloo region before crossing into Queensland, where it connects with the SWQP and, in turn, APA's East Coast gas grid. This assessment addresses only the Northern Territory components of the project,

[1] The ethnographic assessment remains broad pending consultation between the Northern Land Council and the relevant Native Title holders to determine specific cultural responsibilities and custodial obligations pertaining to the Project. Ethnographic information will be also be captured during the field assessment where it relates to cultural heritage values.

extending from the Beetaloo Sub-basin to approximately 80 km south of Camooweal, and encompasses approximately 580 km of the NEA alignment and the 79 km Collection Header.

The proposed pipeline corridor is subject to ongoing refinement as the project progresses through its regulatory and approvals stages. Corridor selection will be informed by environmental, heritage, and engineering assessments, as well as consultation with landholders, Traditional Owners, Native Title holders, and other key stakeholders. APA has committed to sustained engagement with affected communities and stakeholders throughout all stages of the Project, consistent with its obligations under the *Native Title Act 1993* (Cth), the *Aboriginal Land Rights (Northern Territory) Act 1976* (ALRA) and the Northern Territory regulatory framework.

1.2.2 Land Tenure

While the statutory heritage framework in the Northern Territory does not vary according to land tenure, an understanding of the underlying tenure is essential to land access arrangements, the identification of stakeholders and consultation obligations, and the design and sequencing of future physical heritage survey programs.

The NEA Assessment Areas traverse multiple pastoral leases, areas of freehold and Crown land, and intersects a number of determined native title areas and active native title applications. Crown Land includes the Tablelands Highway, Barkly Highway, Rankin Road, Austral Downs Road and the Barkly Stock Route. Identification of the relevant Native Title Determinations, Registered Native Title Bodies Corporate (RNTBCs), and any current Native Title Determination Applications (NTDAs) is required to establish appropriate consultation pathways and ensure compliance with the *Native Title Act 1993* (Cth) and the *Aboriginal Land Rights (Northern Territory) Act 1976* (ALRA). Where the pipeline corridor intersects Aboriginal freehold land held under ALRA, additional requirements relating to land access and consent through the Northern Land Council (NLC) will apply.

Table 1 below summarise the land tenure with native title interests relevant to the NEA Assessment Areas.

Table 1: Affected Land Tenue and Native Title

NEA Chainage	Property Name	Parcel Key	Owner / Lessee	Land Tenure	Native Title Determination(s) / Applications
Collection Header KP 0 to KP 25.5	Shenandoah	Lot 7026 / S 2009/182A–C	Gum Ridge Land Holdings Pty Ltd	Perpetual Pastoral Lease	Shenandoah Pastoral Lease (DCD2012/007)
Collection Header KP 25.5 to KP 79.7	Cooee Hills	Lot 1079 / S 000000	Bullwaddy Pastoral Co Pty Ltd	Perpetual Pastoral Lease	Amungee Mungee Pastoral Lease (DCD2012/003)
NEA KP 0.1 to KP 19.7	Beetaloo	Lot 702 / CP 5055	BB Barkly Pty Ltd, BB Barkly Unit Trust, John Dunnicliff Trust, Yarabala Pty Ltd	Perpetual Pastoral Lease	Beetaloo Pastoral Lease (DCD2012/012)
NEA KP 19.7 to KP 65.75	Mungabroom	Lot 308 / S 2009/009	BB Barkly Pty Ltd, BB Barkly Unit Trust, John Dunnicliff Trust, Yarabala Pty Ltd	Perpetual Pastoral Lease	Mungabroom Pastoral Lease (DCD2012/006)

NEA Chainage	Property Name	Parcel Key	Owner / Lessee	Land Tenure	Native Title Determination(s) / Applications
NEA KP 25.1 to KP 149.1	Walhallow	Lot 309 / S 87/1078	Colonial Agricultural Company Limited	Perpetual Pastoral Lease	Walhallow Pastoral Lease (DCD2015/011)
NEA KP 65.3 to KP 103.1	Wampaya	Lot 3927, 3933 & 3936 / S90/281	Wampaya Association Incorporated	Aboriginal Freehold	—
NEA KP 103.1 to KP 125.2; KP 149.1 to KP 194.6	Anthony Lagoon	Lot 3861 / S 79/1068	A A Company Pty Ltd	Perpetual Pastoral Lease	Anthony Lagoon Pastoral Lease #2 (DCD2014/006)
NEA KP 189.2 to KP 190.8	—	Lot 5153 / CP 5570	—	Vacant Crown Land	Anthony Lagoon Pastoral Lease #2 (DCD2014/006)
NEA KP 194.6 to KP 326.3	Brunette Downs	Lot 1483 / S 791094	Austcattle Holdings Pty Limited	Perpetual Pastoral Lease	Brunette Downs Pastoral Lease (DCD2014/003)
NEA KP 326 to KP 491.2	Alexandria	Lot 1, 3 & 4 / CP 004314; Lot 7500 / CP 5550	NAPCO Properties Pty Ltd, NAPCO Properties Trust	Perpetual Pastoral Lease	NTDA: Dalmore Downs (NTD6030/2001)
NEA KP 423.8 to KP 426.9	East Ranken	Lot 519 / CP 5551	NAPCO Properties Pty Ltd, NAPCO Properties Trust	Perpetual Pastoral Lease	NTDA: Dalmore Downs (DC2001/030)
NEA KP 476.8 to KP 478.1	—	Lot 000 04468	Crown	Vacant Crown Land	NTDA: Dalmore Downs (DC2001/030)
NEA KP 491.2 to KP 521.4	Avon Downs	Lot 298 / CP 004303	A A Company Pty Ltd	Perpetual Pastoral Lease	NTDA: Dalmore Downs (DC2001/030; KP491.2–KP499); NTDA: Burramurra (KP499–KP521.4)
NEA KP 521.4 to KP 582.17	Austral Downs	Lot 1605 / CP 5053	Waxahachie Pty Ltd	Perpetual Pastoral Lease	NTDA: Burramurra (DC2002/015)
Access Only	Eva Downs	Lot 244	A A Company Pty Ltd	Perpetual Pastoral Lease	Eva Downs Pastoral Lease (DCD2014/001)
Access Only	Sturt Plains	Lot 8012 S2022/079	Rain Cloud Land Holdings Pty Ltd	Perpetual Pastoral Lease	Hayfield Pastoral Lease (DCD2012/011)
Access Only	Rocklands	Lot 1482 / CP 004347	Stanbroke Pastoral Company Pty Ltd	Perpetual Pastoral Lease	Rocklands Pastoral Lease Proceeding (DCD2022/001)
Access Only	—	Lot 4464 / CP 5570	Crown	Reserve	Anthony Lagoon Pastoral Lease #2 (DCD2014/006)

1.3 CONSULTATION

APA's approach to Aboriginal cultural heritage assessment for the NEA Project includes structured engagement with relevant heritage stakeholders. Engagement with the NLC has commenced and will continue throughout the heritage assessment process to coordinate consultation with the relevant Native Title holders and Traditional Owners within the Project Area.

As this report represents the initial desktop assessment phase, consultation to date has been limited to establishing contact with key heritage stakeholders and providing preliminary project information to inform the scope and design of future field-based heritage survey programs. The stakeholders engaged during this phase are listed in *Table 2* below.

Subsequent stages of heritage consultation will be coordinated through the NLC to facilitate engagement with the relevant Native Title holders and Traditional Owners. This will include the identification of cultural knowledge holders to participate in physical heritage assessments, the development of survey methodologies appropriate to the cultural context of the Project Area, and the establishment of protocols for the management of any cultural heritage values identified during fieldwork.

Table 2: Stakeholder engagement summary

Stakeholder	Timing	Discussion / Agenda Summary
Aboriginal Areas Protection Authority	Meetings October 2025 and February 2026	Meetings to introduce the Project and receive guidance on methodology and preparation of fieldwork to form the basis of content required to apply for a Aboriginal Areas Protection Permit for the Project. Discussion included the pathways of undertaking ethnography and field based assessment. The application and evaluation process and associated cost and timing were also discussed.
Heritage Branch NT	Meetings October 2025 & February 2026	Project introduction and updates. Guidance on proposed survey methodology and timing.
Northern Land Council	Initiated project consultation July 2025. Regular interaction and formalised meeting pattern since.	Recurring monthly meetings to facilitate AAPA certificate, Heritage assessment and ILUA negotiation

1.4 THE AUTHORS

Project Archaeologist: Alan Hay

Alan holds a Bachelor of Archaeology with Honours from Flinders University, South Australia, and a Master of Archaeological Science from Australian National University. Alan has more than 10 years' experience in archaeology and cultural heritage management. He has a background in geographic information systems, archaeological survey and excavation, mitigation, historical research, and environmental impact assessment.

Archaeologist: Andrew Coe

Andrew holds a Bachelor of Arts (Archaeology) with Honours from the University of Southern Queensland. He has extensive experience in cultural heritage management within the oil and gas and mining sectors. A proud Wiradjuri man, Andrew maintains a strong focus on ethnographic research

and the development of strategies that integrate Indigenous perspectives into cultural heritage management practice.

Project Manager (Archaeology): Ben Keys

Ben holds a Bachelor of Archaeology with Honours from Flinders University, South Australia. He has over 15 years' experience in cultural heritage management, community and stakeholder consultation, and archaeological research across the Northern Territory and Queensland. His professional experience includes heritage leadership on major oil and gas, mining, and infrastructure projects, as well as broader project management, land access, and environmental compliance roles.

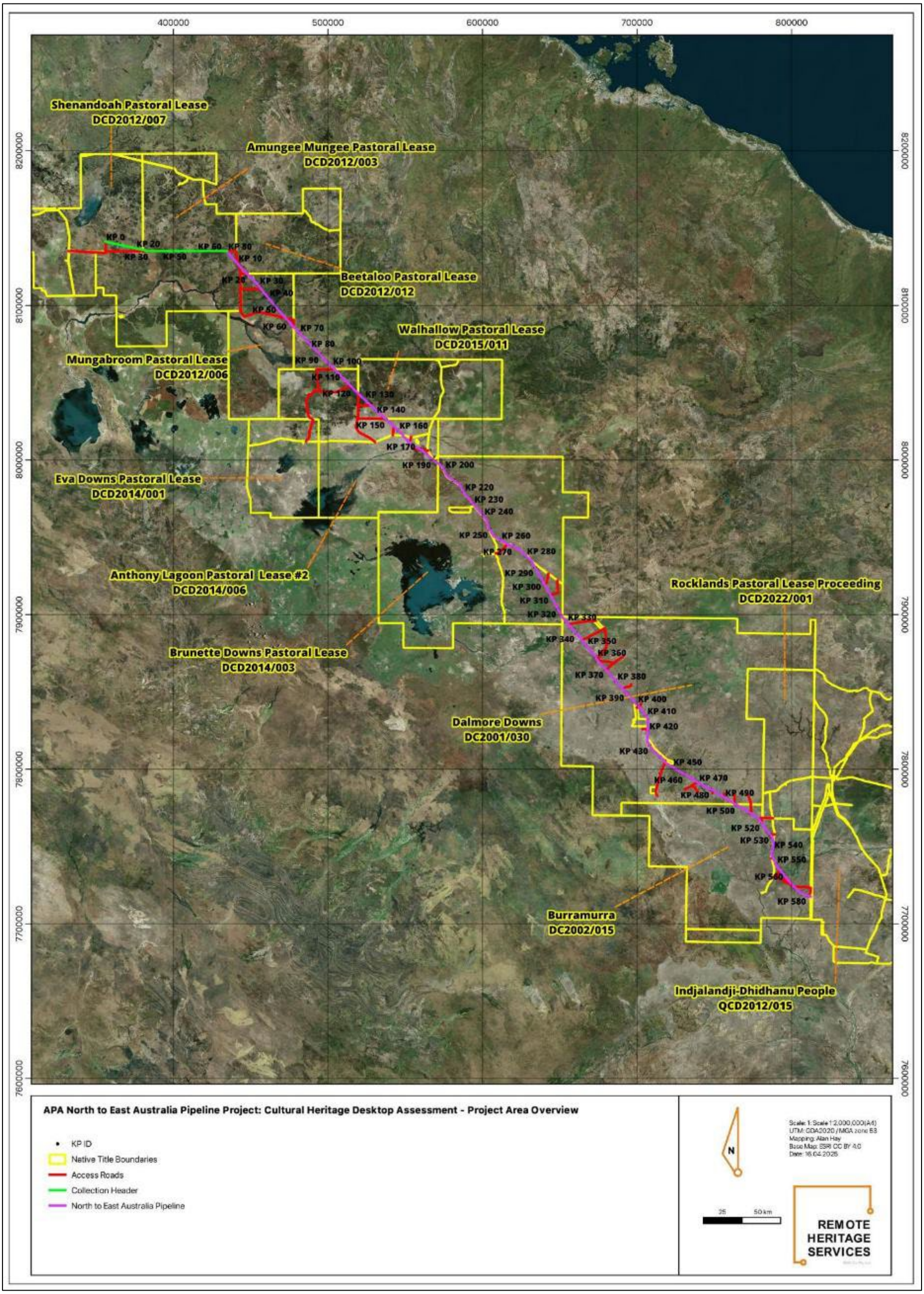

Figure 1: Overview of the Project Area showing the principal parts of the proposed development and Native Title Boundaries.

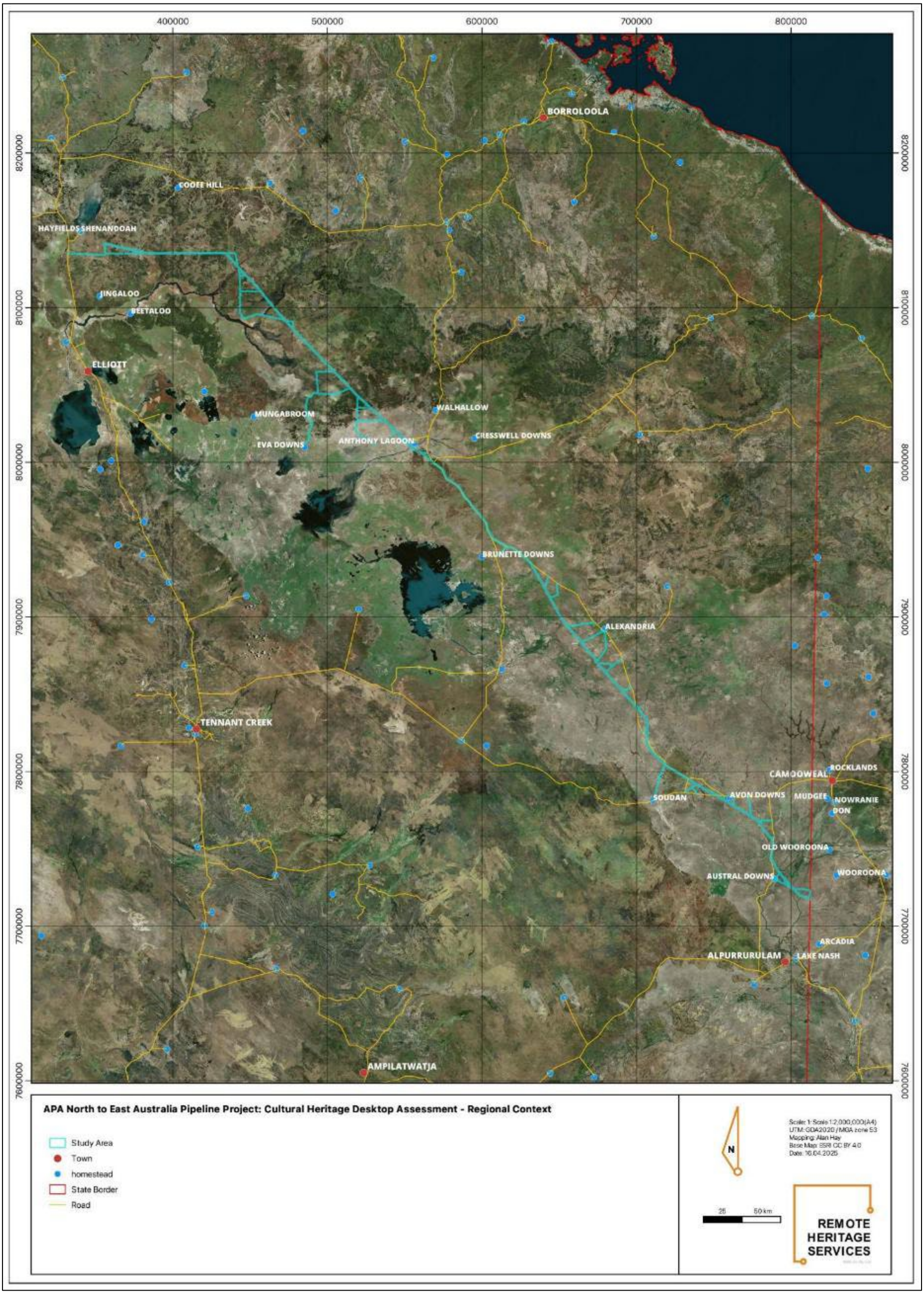

Figure 2: Overview of the NEA Assessment Areas showing nearby homesteads and towns.

2 LEGISLATIVE CONTEXT

2.1 THE LEGISLATIVE AND SOCIAL BASIS FOR CULTURAL HERITAGE PROTECTION

The significance of places and materials associated with the cultural record varies substantially, depending upon one or a combination of its aesthetic, historic, scientific, social, or spiritual values for past, present, and future generations (Australia ICOMOS Burra Charter, 2013). Through time, these values can change or be impacted upon by both natural mechanisms and human intervention. To ensure impacts to the potential cultural heritage values of a place or object are understood, protected or managed accordingly, a range of legislation has been enacted since the 1970s.

This legislation has been enacted at the state, territory, and national level. This is the result of the evolution of the Australian constitutional framework, particularly the inclusion of new themes - such as Aboriginality, heritage and the environment - into an existing regulatory framework. The result of this developmental change is that the Commonwealth retains responsibility for Indigenous issues, while the States and Territories retain control of land use and development approvals. Therefore, both Commonwealth and Northern Territory Acts may apply in particular circumstances within the Northern Territory.

2.1.1 Commonwealth Acts

Aboriginal Land Rights (Northern Territory) Act 1976 **(ALRA).** This Act changed Aboriginal reserves within the Northern Territory to freehold title held in trust. The Act mandated the formation of Land Councils to act in the interests of Northern Territory Aboriginal people in the areas of land, access to lands, employment and the development of businesses. The Act also defined Sacred Sites as ”sites that are sacred, or otherwise significant, in the Aboriginal Tradition”. The Act protected these sites from damage, whether accidental or intentional. The NT *Aboriginal Sacred Sites Act 1989* uses this definition of sacred in its purpose of protecting these sites outside of Land Trust lands. On pastoral lease lands, the general procedure is for the AAPA to conduct sacred site surveys with the relevant Site Custodians, then issue an Authority Certificate under the Act (see Section 2.1.2 below).

Native Title Act 1993**.** Native title is “the communal, group or individual rights and interests of Aboriginal people and Torres Strait Islander peoples in relation to land and waters, possessed under traditional law and custom, by which those people have a connection with an area which is recognised under Australian law (s 223 NTA) (NNTT 2016). The NTA establishes processes to determine where native title exists, how future acts that impact native title may proceed, and how compensation is provided where future acts extinguish or are inconsistent with native title rights and interests (DCP 2016). The Act gives Indigenous Australians who hold native title rights and interests (including native title claims) the right to access and use traditional lands, be consulted and, in some cases, to participate in decisions about activities proposed to be undertaken on the land.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984**.** This Act is a site protection Act of ‘last resort’, meaning that the Act is meant to provide emergency protection for Aboriginal and Torres Strait Islander heritage sites when all other avenues have been exhausted. Generally, an Aboriginal person, or group of persons, must apply to the Minister to have protective covenants placed over an area or site (DEE 2016). The power to provide such protection derives from Section 51 of the

Constitution, which confers upon the Commonwealth the power to make laws with respect to Indigenous peoples. Therefore, this Act may override all State and Territory cultural heritage acts.

The *Environment Protection and Biodiversity Conservation Act* (EPBC Act) commenced on 16 July 2000. The EPBC provides for a National Heritage List of natural, historic and Indigenous places that are of outstanding significance to the nation. The EPBC also provides for a Commonwealth List that includes natural, historic and Indigenous places of significance that are owned or controlled by the Commonwealth. Ownership or control of these places allows the Commonwealth to protect or manage these places according to the significance of the place. The Department of Climate Change, Energy, the Environment and Water (DCCEEW) administers the EPBC, including administration of the heritage lists and providing support to the Australian Heritage Council established under the Australian Heritage Council Act 2003. The Department maintains the Australian Heritage Database which includes places on both Commonwealth lists, all places on state registers and other places included in the former Register of the National Estate established in the 1970s.

2.1.2 Northern Territory Acts

***Aboriginal Sacred Sites Act 1989*.** The NT *Aboriginal Sacred Sites Act 1989* protects sites that are 'sacred and otherwise of significance in the Aboriginal Tradition'. Sacred Sites are protected whether the location of the site is known or not by any person or company seeking to do work on lands. The Act is administered by the Aboriginal Areas Protection Authority. The Authority can issue an Authority Certificate for an area upon application and payment of a fee. The Authority Certificate will contain conditions limiting or preventing works in and around registered and recorded sacred sites and will contain maps outlining any Restricted Work Areas within the area of application.

Heritage Act 2011 and Regulations. The *Heritage Act* (2011), replacing the Heritage Conservation Act (1991) provides for the conservation of the Territory's natural and cultural heritage, including places and objects within NT waters. The aim is achieved under the Act by:

(a) declaring places and objects of heritage significance to be heritage places and objects;
(b) declaring classes of places and objects of heritage significance to be protected classes of heritage places and objects;
(c) establishing the Heritage Council;
(d) providing for heritage agreements to encourage the conservation, use and management of heritage places and objects;
(e) regulating work on heritage places and objects;
(f) establishing enforcement and offence provisions.

Under Part 2.1 of the *NT Heritage Act 2011*, all Aboriginal and Macassan archaeological places and objects are afforded automatic protection under the Act, regardless of whether their existence or location is known. An Aboriginal or Macassan archaeological place is defined under the Act as a place that:

(a) relates to the past human occupation of the Territory by Aboriginal or Macassan people; and
(b) has been modified by the activity of those people.

An Aboriginal or Macassan archaeological object is defined as a relic that:

(a) relates to the past human occupation of the Territory by Aboriginal or Macassan people; and
(b) is: (i) in an Aboriginal or Macassan archaeological place; or
(ii) stored in a place in accordance with Aboriginal tradition

A relic is defined under the Act as:

(a) an artefact or thing given shape by a person; or
(b) human or animal skeletal remains; or
(c) something else prescribed by regulation.

Under Part 2.2. of the Heritage Act 2011 (NT), other places and objects – i.e., non-Aboriginal and non-Macassan places and objects – can be declared by the Minister as protected heritage places and objects.

A place is defined as an area of land, and includes:

(a) a building or, a part of a building, on the place; and
(b) an item historically or physically associated with the place if the primary importance of the item derives (completely or partly) from that association; and
(c) equipment, furniture, fittings and articles on, or historically or physically associated with, the place.

The process for declaring heritage places and objects involves a nomination or Heritage Council initiation for assessment of the heritage significance – including aesthetic, historical, scientific, and social significance of a place or object. The Heritage Council then considers whether the place or object is of heritage significance and make a decision whether or not to recommend that the Minister declare the place or object to be a protected heritage place or object.

Under Part 5.5 of the Act, it is an offence to knowingly engage in conduct that results in damage to a heritage place or object, the removal of a part of the place, or the removal of a heritage object from the Northern Territory, unless the conduct is carried out in accordance with a relevant heritage agreement, work approval, repair order, or exemption. A work approval will generally only be issued if consultation with the relevant Traditional Owners or Custodians of the sites or their representatives has occurred. There are penalties for accidental or deliberate damage or destruction of these sites.

2.2 REGULATORY ORGANISATIONS

Northern Land Council (NLC). The NLC is an independent statutory authority of the Commonwealth, established under the ALRA, responsible for assisting Aboriginal peoples in the Top End to acquire and manage their traditional lands and seas. This includes assisting in Land Rights and Native Title Claims, managing traditional lands and protecting sites of significance in the Aboriginal Tradition. The NLC is also responsible for promoting the economic interests of Aboriginal peoples in the Top End. It does this by advocating for Traditional Owners interests in the development of resources on Land Trust and native title lands.

Aboriginal Areas Protection Authority (AAPA). The AAPA is an independent statutory authority established under the *Northern Territory Aboriginal Sacred Sites Act 1989*. The Authority is responsible

for the protection of Aboriginal sacred sites on land and sea across the Northern Territory. The AAPA seeks to implement a practical balance between sacred site protection and economic development.

Heritage Branch, Department of Lands, Planning and Environment (NT). Heritage Branch is the regulatory authority responsible for administering most sections of the NT *Heritage Act 2011*. Heritage Branch is also responsible for administering the NT Heritage Register, the NT Archaeological Database and providing logistical support for the NT Heritage Council.

Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). DCCEEW is the regulatory authority responsible for the *EPBC Act 1999*. DCCEEW is also responsible for administering the National Heritage List, the Commonwealth Heritage List, and the Australasian Underwater Cultural Heritage Database (AUCHD).

2.3 HERITAGE REGISTER SEARCHES

A heritage due diligence assessment was undertaken by Fox & Co Environmental Pty Ltd on behalf of APA Group in September 2024. This assessment included searches of Commonwealth and Northern Territory heritage registers and databases to identify known cultural heritage places and objects within and proximate to the NEA Assessment Areas. The results have been cross-checked and verified as part of the present assessment to account for minor refinements to the NEA alignment and the adoption of a 500 m buffer for access track assessment areas.

The searches conducted and their outcomes are summarised in Table 3

Table 3: Database Searches Conducted

Database/Search	Heritage Value	Date Conducted	Outcome
DCCEEW Australian Heritage Database	World Heritage, National Heritage, Commonwealth Heritage, Register of National Estate	03 Sept 2024 & 15 Dec 2025	1 place within access track assessment area
NT Heritage Branch Archaeological Database	Aboriginal or Macassan archaeological places and objects	03 Sept 2024	No known places; unrecorded places very likely
NT Heritage Register	Declared heritage places and objects	04 Sept 2024 & 15 Dec 2025	No places within NEA Assessment Areas
AAPA Register (Abstract of Records)	Aboriginal sacred sites	06 Sept 2024 & New Search Pending	Registered and recorded sites present; RWAs present

2.3.1 National and Commonwealth Heritage Lists

A search of the Australian Heritage Database, maintained by the DCCEEW, was conducted on 3 September 2024 and 15 Dec 2025. The search included heritage places listed on the World Heritage List, National Heritage List, Commonwealth Heritage List, and the Register of the National Estate within or proximate to the NEA Pipeline and Access Track Assessment Areas. The results are presented in Table 4.

Table 4: National and Commonwealth Heritage Places.

Place Name	Heritage Listing	Distance from Project Area	Place ID
Anthony Lagoon Aerodrome	Register of National Estate (listed)	Adjacent to access track (900 m south of NEA KP 176)	18789

Anthony Lagoon Aerodrome is the only place identified through this search within the NEA Assessment Area, located 900 m south of NEA KP 176 adjacent to a proposed access track (refer Figure 3). It is listed on the Register of the National Estate, which was closed in 2007 and no longer functions as a statutory list. The Register now serves solely as an archive of heritage information and carries no regulatory implications for the Project.

No places listed on the World Heritage List, National Heritage List, or Commonwealth Heritage List were identified within or proximate to the NEA Assessment Areas.

2.3.2 Northern Territory Heritage Register

A search of the Northern Territory Heritage Register was conducted on 4 September 2024 and updated on 15 December 2025. The Heritage Register lists declared and nominated heritage places and objects under the *Heritage Act 2011* (NT).

No declared or nominated heritage places were identified within the NEA Assessment Areas. However, the Anthony Lagoon Davey Paxman Steam Engine is located 360 m west of a proposed access track, approximately 22 km south of NEA Chainage 125. While this place falls outside the defined study area, its proximity to a proposed access track should be noted for construction planning purposes.

2.3.3 Northern Territory Heritage Branch Archaeological Database

The Heritage Branch of the Northern Territory Government administers the *Heritage Act 2011* (NT), under which all Aboriginal and Macassan archaeological places and objects are automatically protected, whether previously recorded or not. Protected items include stone tools, stone arrangements, fish traps, rock art, modified trees, shell middens, and ancestral remains. Under section 38 of the Act, there is an obligation to report the discovery of any such place or object to the Heritage Branch.

A request for information was submitted to the Heritage Branch on 3 September 2024 (Reference: HCD2024/00123), with a response received on 5 September 2024. The search outcomes are summarised in Table 5. To account for minor refinements to the NEA alignment and the adoption of a 500 m buffer for access track assessment areas, these areas were cross-checked against extracts of the NT Archaeological Database held by the consultant. No additional archaeological places were identified.

Table 5: NT Heritage Branch Search Outcomes

Search Conducted	Outcome
Northern Territory Heritage Register	No nominated, provisionally declared, or declared heritage places or objects within NEA Assessment Areas
Archaeological places within NEA Assessment Areas	No known Aboriginal or Macassan archaeological places and objects recorded
Archaeological places in proximity to NEA Assessment Areas	Known archaeological sites present in proximity to the NEA Assessment Areas
Likelihood of unrecorded archaeological places	Assessed as very likely, based on landscape features, known places in vicinity, and predictive tools

No previously recorded Aboriginal or Macassan archaeological places or objects were identified within the NEA Assessment Areas. However, the Heritage Branch noted that the proposed route passes through large regions of the Northern Territory that have not been subject to prior archaeological survey. The absence of recorded places in the database is therefore more likely attributable to a lack

of survey coverage than to an actual absence of archaeological material. Known archaeological sites are present in the broader vicinity of the NEA Assessment Areas, and the likelihood of unrecorded places was assessed as very likely based on landscape features and predictive modelling.

The Heritage Branch recommended that archaeological surveys be undertaken as part of ground-truthing assessments and that a Cultural Heritage Management Plan (CHMP) be prepared to identify and mitigate potential impacts to Aboriginal or Macassan archaeological places and objects.

2.3.4 Aboriginal Areas Protection Authority

An application for an Abstract of Records under regulation 7 of the Northern Territory Aboriginal Sacred Sites Regulations 2004 (NT) was submitted for the Project Area including a buffer. The Abstract was received on 6 September 2024 (Reference: RI2024/693, Quote: 202410187). The outcomes are summarised in *Table 6*.

A subsequent review of the Abstract identified gaps in coverage for portions of the alignment and associated Access Tracks. An Extract of Records request has been submitted to AAPA to extend coverage to include these gap areas and Access Tracks.

The AAPA does not provide spatial data of sacred site locations through the Abstract of Records process. The information provided cannot be relied upon as an exhaustive list of sacred sites; there may be other sacred sites of which the Authority is not yet aware. A person is only permitted to enter or remain on, carry out works on, or use a sacred site in accordance with an Authority Certificate issued by the Authority (ss 22 and 25 of the Act). Part IV of the Act establishes offences for the unauthorised entry onto a sacred site (s 33), carrying out work on or using a sacred site (s 34), and the desecration of a sacred site (s 35).

Table 6: AAPA Abstract of Records Summary

Sacred Site Category	Status within NEA Assessment Area
Registered sacred sites	No Registered Sacred Sites identified within the NEA Assessment Area
Recorded sacred sites	Present within the NEA Assessment Area
Restricted Work Areas (RWAs)	Present; provided for in previously issued Authority Certificates

2.3.5 Sacred Sites Constraints

A review of the AAPA Abstract of Records as of December 2025 identified a number of sacred site constraints along the NEA alignment within the Northern Territory. As noted above, gaps exist in the Abstract of Records coverage for portions of the alignment; an Extract of Records request has been submitted to AAPA to address these gaps and to include Access Tracks. Until the Extract is received, the constraints presented below should be considered preliminary. Table 7 presents the identified constraints by chainage.

Table 7: Sacred Sites Constraints along NEA Alignment

Chainage	Site Type	Constraint
[Redacted for cultural purposes]	RWA	*[Redacted for cultural purposes]*

[Redacted for cultural purposes]	Abstract gap[2]	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Recorded sacred site	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Recorded sacred site	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	RWA on watercourse	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Recorded sacred site	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Two recorded sacred sites	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Two recorded sacred sites + RWA	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Abstract gap	*[Redacted for cultural purposes]*
[Redacted for cultural purposes]	Registered sacred site + RWA	*[Redacted for cultural purposes]*

[2] An Extract of Records request has been submitted to AAPA to include these gap areas and Access Tracks

[Redacted for cultural purposes]

Figure 3: Anthony Lagoon Aerodrome

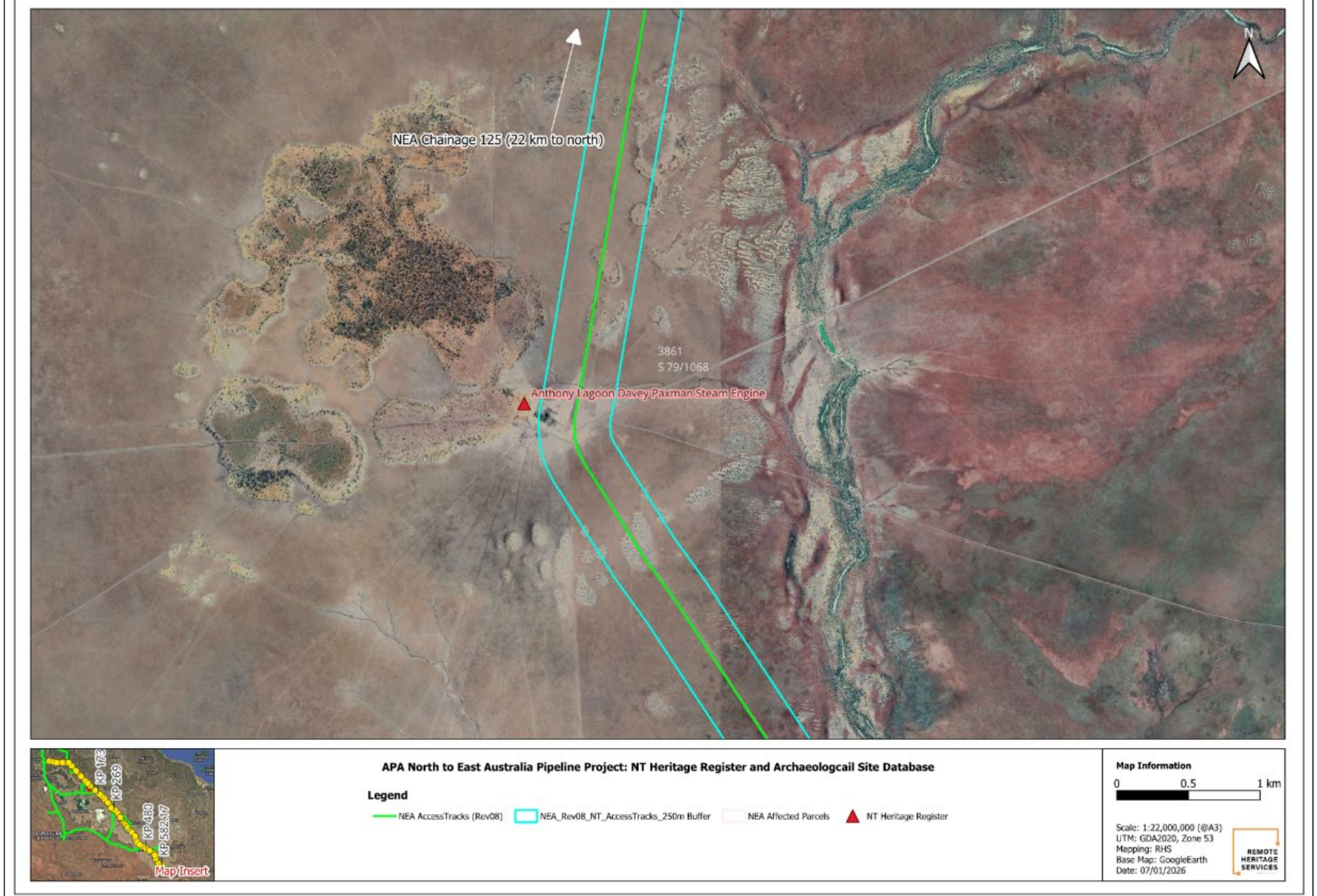

Figure 4: Anthony Lagoon Davey Paxman Steam Engine

3 RESEARCH METHODOLOGY

3.1 RESEARCH METHODOLOGY

This section describes the research and analysis methodology undertaken for the desktop Cultural Heritage Assessment. The assessment follows the standard Australian framework for cultural heritage desktop studies, consistent with the principles of the *Burra Charter* (Australia ICOMOS 2013) and applicable Northern Territory guidelines. The methodology is structured around a sequential analytical process: establishing the environmental context of the NEA Assessment Areas, compiling the cultural, ethnographic, and archaeological background, synthesising these datasets into an archaeological predictive model, and applying the predictive model through detailed sensitivity mapping to guide the design and prioritisation of future field survey activities.

The approach recognises that in the absence of previous systematic archaeological survey within the NEA Assessment Areas, the predictive model must rely on environmental proxies, regional archaeological analogues, and ethnohistorical evidence rather than known site distributions. The methodology is therefore designed to produce a conservative assessment of archaeological potential that can be tested and refined through subsequent field survey and Traditional Owner consultation.

3.2 DESKTOP RESEARCH AND ANALYSIS

3.2.1 Environmental Contextual Research

Environmental data was compiled to establish the physical setting of the Assessment Areas and to identify the environmental variables most likely to have influenced Aboriginal occupation, movement, and resource utilisation across the three bioregions traversed by the pipeline (Sturt Plateau, Gulf Fall and Uplands, and Mitchell Grass Downs). Data sources included climate records (temperature and precipitation patterns) from the Bureau of Meteorology; hydrological and ecological information from Northern Territory and Commonwealth agencies; geological mapping at 1:250,000 scale from the Bureau of Mineral Resources and Northern Territory Geological Survey; and geomorphological and broad palaeoenvironmental data.

The environmental data was analysed to assess how climate, hydrology, geology, and geomorphology may have shaped human settlement and land use patterns across the NEA Assessment Areas. Particular attention was directed to the distribution and reliability of surface water sources, the availability of lithic raw materials suitable for stone artefact manufacture, the character of landforms favourable for occupation (such as sandy rises, stream terraces, and elevated ground adjacent to water), and the post-depositional processes that affect the preservation and visibility of cultural heritage sites. The relationship between water availability and archaeological site location is the central organising principle of the predictive model, consistent with established models of Aboriginal land use in water-limited environments (Horton 1981; Veth 1989, 1993; Smith 1989).

3.2.2 Cultural and Ethnographic Background Research

No specific ethnographic research on the Aboriginal language groups or site custodians of the NEA Assessment Areas was undertaken as part of this desktop assessment. The identification of the specific Traditional Owner groups whose Country is traversed by the Project, and the determination of cultural responsibilities and custodial obligations pertaining to the NEA Assessment Areas, is the function of

the Northern Land Council's anthropological team working in consultation with the relevant Native Title holders. This process is ongoing and will inform the field assessment phase. It is anticipated that Traditional Owner knowledge will be a critical input during field survey, and that the predictive model may be refined based on that consultation.

The cultural background research undertaken for this assessment was limited to a broad review of previously published literature relating to pre-contact land use, subsistence economies, trade and exchange networks, and inter-group ceremonial connections across the wider Barkly Tableland region. This literature provides regional context for the predictive model but does not purport to represent the cultural knowledge or views of any specific Traditional Owner group.

Historical research was conducted through archival sources including the Northern Territory Archives Service, the National Archives of Australia, the Trove digitised newspaper database (National Library of Australia), the South Australia Museum, and various university libraries. Historical maps, pastoral station records, explorer journals, and previous cultural heritage studies were reviewed to establish the sequence of European exploration, pastoral development, and associated infrastructure within and adjacent to the NEA Assessment Areas, and to identify contact period heritage sites and landscape modification patterns relevant to archaeological preservation.

3.2.3 Regulatory and Heritage Database Searches

Searches were conducted of all relevant Commonwealth and Northern Territory heritage registers and databases to identify known heritage places within and proximate to the NEA Assessment Areas. The registers and databases searched included the Australian Heritage Database (World Heritage List, National Heritage List, Commonwealth Heritage List, and Register of the National Estate), the Northern Territory Heritage Register, the Northern Territory Heritage Branch Archaeological Database, and the Aboriginal Areas Protection Authority (AAPA) Register of Sacred Sites. An AAPA Abstract of Records was obtained to identify registered and recorded sacred sites and any Restricted Work Areas within or adjacent to the NEA Assessment Areas. The results of these searches are presented in Section 2.3.

3.2.4 Review of Existing Reports and Literature

Previously completed cultural heritage assessment and survey reports from the region were reviewed to establish the existing knowledge base for the NEA Assessment Areas and surrounding environs. This review encompassed consultant reports prepared for comparable linear infrastructure projects (including pipeline and road corridor surveys), regional archaeological studies, and academic publications addressing archaeological patterns in the Mitchell Grass Downs, Sturt Plateau, and Gulf Fall and Uplands bioregions. The review focused on identifying recorded site types, site densities, artefact assemblage characteristics, and the environmental contexts in which sites have been identified in comparable landscapes. These data provide the regional archaeological analogues against which the predictive model for the NEA Assessment Areas was calibrated.

Additional published sources, including academic literature, books, and external reports, were reviewed to incorporate a range of perspectives on the cultural heritage values of the region. This included literature on seed-processing and exchange networks, contact period archaeology, and the archaeological signature of pastoral and telegraph-era occupation.

3.2.5 Stakeholder Engagement

Stakeholder consultation during the desktop phase was limited to the engagement completed by APA, a summary of which is presented in Section 1.3. Direct consultation with Traditional Owners and Native Title holders was not undertaken as part of the desktop assessment, as this process is being managed through the Northern Land Council in accordance with the *Native Title Act 1993* (Cth) and the *Aboriginal Land Rights (Northern Territory) Act 1976*. It is recognised that Traditional Owner consultation will be essential to the field assessment phase and that ethnographic and cultural information provided by Traditional Owners may identify heritage values, site locations, and cultural constraints not captured by the desktop assessment or predictive model. Where such information conflicts with the desktop predictions, the most conservative assessment of heritage potential will be adopted.

3.2.6 Archaeological Predictive Model and Sensitivity Mapping

The desktop research outputs described above were synthesised into an archaeological predictive model that identifies the types, locations, and likelihood of Aboriginal cultural heritage sites across the NEA Assessment Areas. The predictive model is based on the intersection of environmental variables (principally water availability, landform type, geology, and soil characteristics) with the ethnographic, archaeological, and historical evidence for Aboriginal occupation and land use. The model identifies water availability as the primary determinant of archaeological site location, consistent with established Australian models for arid and semi-arid landscapes.

The predictive model was operationalised through a detailed sensitivity mapping methodology applied across the full extent of the NEA Assessment Areas. This methodology involved the systematic identification and classification of individual landform features within the study corridor, the assignment of sensitivity ratings (Almost Certain, Probable, Possible, or Unlikely) to each feature based on its environmental and cultural characteristics, and the delineation of Cultural Heritage Sensitivity Areas that group related features for field survey planning. Buffer distances were assigned to each feature based on its size classification, and contextual adjustments were applied to account for factors such as proximity to water, landform elevation, and post-depositional disturbance. The full methodology, including the classification framework, sensitivity rating definitions, buffer assignments, and contextual adjustments, is presented in Section 6.

3.2.7 Gap Analysis and Limitations

A gap analysis was undertaken to identify where the existing information base is insufficient to support confident predictions about cultural heritage values within the NEA Assessment Areas. The principal gaps identified include the absence of any previous systematic archaeological survey within the NEA Assessment Areas; the absence of recorded Aboriginal archaeological sites within the NEA Assessment Areas in the Heritage Branch database (noting that 21 sites are recorded within 25 km); the preliminary nature of the ethnographic assessment pending Northern Land Council consultation with Traditional Owners; and the reliance on geological mapping at 1:250,000 scale, which may not capture localised variations in lithic raw material availability or landform character at the scale relevant to individual site locations.

The inherent limitations of a desktop assessment are also acknowledged. The sensitivity ratings and predictions presented in this report have not been ground-truthed through field inspection, and the

actual density and distribution of cultural heritage sites within the Assessment Areas may differ from the modelled predictions. The predictive model is designed to be conservative, meaning it is more likely to overestimate than underestimate archaeological potential. Field observations and consultation with Traditional Owners during the survey phase may identify areas of higher or lower sensitivity than the desktop model predicts; where such conflicts arise, the most conservative assessment will be adopted.

The AAPA Abstract of Records identifies registered and recorded sacred sites and Restricted Work Areas in the vicinity of the NEA Assessment Areas, but the precise boundaries and conditions associated with these sites are subject to the Authority Certificate process. Additional sacred sites not currently on the Register may be identified through that process, and the scope of avoidance requirements may therefore change.

3.2.8 Recommendations Development

Management recommendations were developed based on the outputs of the predictive model, sensitivity mapping, and identified gaps. The recommendations address sacred site compliance, field survey design and coverage, Traditional Owner engagement, post-assessment reporting, heritage management planning, unexpected finds protocols, and workforce training. They are structured to ensure compliance with the *Heritage Act 2011* (NT), the *Northern Territory Aboriginal Sacred Sites Act 1989*, and the *Native Title Act 1993* (Cth), and are consistent with best-practice cultural heritage management principles as set out in the *Burra Charter* (Australia ICOMOS 2013).

4 PHYSICAL AND ENVIRONMENTAL SETTING

The environmental setting of a region is fundamental to analysing past human settlement behaviour and interpreting the distribution of Aboriginal cultural heritage. In arid and semi-arid landscapes, hydrology and climate are the primary environmental variables influencing where people could live, how they moved across country, and where cultural material is likely to have accumulated and been preserved. Water availability, in particular, has been identified as the single most significant constraint on human dispersal and occupation across the Australian interior (Horton 1981; Bird et al. 2013). The following section outlines the climate, hydrology, geology, geomorphology, and ecology of the NEA Assessment Areas, structured around the three bioregions traversed by the pipeline corridor: the Sturt Plateau (Collection Header and NEA Pipeline KP 0 to KP 67), the Gulf Fall and Uplands (KP 67 to KP 140), and the Mitchell Grass Downs (KP 140 to KP 582). For each bioregion, the climatic regime and the character of surface drainage are described first, with particular attention to the distribution and reliability of water sources, followed by geology, geomorphology, and ecology. The chapter concludes with a discussion of land disturbance factors that influence the preservation and visibility of cultural heritage across the NEA Assessment Areas.

4.1 CLIMATE AND HYDROLOGY

This section describes the climatic regime and the character of surface drainage for each of the three bioregions, with particular attention to the distribution and reliability of water sources. It concludes by considering the relationship between hydrology and cultural heritage, drawing on established models of Aboriginal land use in water-limited environments (Horton 1981; Veth 1989, 1993; Smith 1989).

4.1.1 Climate

The region is characterised by a distinct wet-dry tropical to semi-arid climate regime. The wet season extends from November to March, during which the northern monsoon delivers the majority of annual rainfall. The dry season spans April to October, with negligible precipitation and persistent south-easterly winds. Monsoonal influence diminishes with increasing distance from the coast, and the Mitchell Grass Downs bioregion occupies the semi-arid periphery of this system (Fisher et al. n.d.; Fisher 2001).

The nearest Bureau of Meteorology station recording both rainfall and temperature data to the Sturt Plateau and Gulf Fall and Uplands NEA Assessment Areas is Daly Waters Airport (Station 014902), located approximately 65 km north of Collection Header KP0. This station records a mean annual rainfall of approximately 570 mm. Mean maximum temperatures range from approximately 29°C in June to 38°C in November, with mean minima of approximately 12°C in July rising to 24°C in December (BoM 2025). The Gulf Fall and Uplands bioregion is climatically transitional between the Sturt Plateau and Mitchell Grass Downs, with rainfall declining to the south and east as monsoonal influence weakens.

The nearest station to the Mitchell Grass Downs NEA Assessment Area is Brunette Downs (Station 015085), located approximately 15 km southwest of NEA Chainage KP 260. This station has recorded data since 1891. Brunette Downs records a median annual rainfall of 352 mm and a mean of 399 mm, reflecting the positive skew characteristic of semi-arid rainfall distributions. Mean maximum

temperatures range from approximately 26°C in June to 38°C in October, with mean minima of approximately 11°C in July rising to 25°C in December (BoM 2025). Rainfall is highly seasonal, with January and February each recording mean monthly totals of approximately 110 mm, while dry season months (May to October) typically receive less than 10 mm per month. Annual rainfall variability is high, with a coefficient of variation of approximately 50%. This variability has direct implications for water availability and patterns of human land use, both past and present. Table 8, below provides a summary of climate data across the three bioregions.

Table 8: Climate summary by bioregion.

Bioregion	BoM Station	NEA Chainage	Mean Annual Rainfall	Mean Max Temp Range	Mean Min Temp Range
Sturt Plateau	Daly Waters Airport (014902)	KP 0 to KP 67	570 mm	29°C to 38°C	12°C to 24°C
Gulf Fall and Uplands	Daly Waters Airport (014902)	KP 67 to KP 140	500 to 570 mm	29°C to 38°C	12°C to 24°C
Mitchell Grass Downs	Brunette Downs (015085)	KP 140 to KP 582	352 mm (median) / 399 mm (mean)	26°C to 38°C	11°C to 25°C

4.1.2 Regional Drainage Systems

- **Sturt Plateau (Collection Header and NEA Pipeline KP 0 to KP 67)**

The Sturt Plateau NEA Assessment Areas transect a small number of poorly defined watercourses and drainage features. Yaroo Creek and Gravel Creek are the only named drainage features within this section, and both are characterised as large, wide, shallow drainage depressions rather than defined watercourses (see Figure 5). A defined watercourse intersection has been noted along the Collection Header at KP 15, and a small series of channels with extensive areas of deflation and erosion have been recorded between NEA Pipeline Chainage KP 26 and KP 29.

Drainage through this section discharges generally to the southwest, into large seasonal depressions which are internally drained by Newcastle Creek and several small ephemeral watercourses, eventually feeding into Lake Woods, located approximately 100 km south of Collection Header KP 0. Discrete swamps and wetlands (100 to 200 m in diameter) have been recorded adjacent to NEA KP 15.3 (APA Site ID: WL-01) and between NEA KP 36 and KP 37 (APA Site ID: WL-02 to WL-05). Amungee Mungee Lagoon, is located approximately 8 km north of Collection Header Chainage KP 40.

Surface drainage across the Sturt Plateau bioregion is poorly defined, reflecting the low topographic relief and the presence of extensive laterite hardpans that impede deep infiltration (Day et al. 1985; DLPE 2002). During wet season rainfall events, surface runoff typically moves as shallow overland flow, with ponding observed at numerous locations along minor drainage paths (AECOM 2024). Watercourses in the region are predominantly low-order (first- and second-order) ephemeral streams and drainage depressions that carry flow only during and immediately following significant rainfall (AECOM 2024; RHS 2024). These drainage lines are generally shallow, lack well-defined channel banks, and support flow for limited durations before drying out as the wet season concludes.

The lateritised surface of the plateau also hosts a number of distinctive karst-like features, including sinkholes (dolines) up to 50 m in diameter and 15 m deep, potentially formed through dissolution and

collapse within the siliceous Mullaman Beds (Twidale 1987). These features, influenced by fracture patterns and historical water table fluctuations, are found both on the open plateau surface and at the margins of old drainage lines (Twidale 1987; Grimes 2009). One such sinkhole has been identified within the NEA Assessment Area at Collection Header KP 43 (APA Site ID: SK-02).

- **Gulf Fall and Uplands (NEA Chainage KP 67 to KP 140)**

The NEA Assessment Area through this section crosses no defined watercourses within the pipeline corridor, with the exception of the access track running south of NEA Chainage KP 119, which crosses the upper reaches of Sandy Creek, Eva Creek, and a number of small unnamed watercourses (see Figure 6).

Comparable to the Sturt Plateau, hydrology through this section is dominated by shallow ephemeral drainage depressions and floodout zones. The poorly defined nature of drainage reflects the transitional landscape between the lateritised plateau to the north and the cracking clay plains of the Mitchell Grass Downs to the south. A single sinkhole has been recorded approximately 300 m southwest of NEA Chainage KP 91.5 (APA Site ID: SK-01). A discrete swamp has been noted along the access track adjoining the Pipeline Assessment Area at KP 103 (APA Site ID: AC-WL-01).

Where the Gulf Fall and Uplands bioregion transitions to the Mitchell Grass Downs at approximately NEA Chainage KP 137, there is an extensive floodplain which drains into Tarrabool Lake, located approximately 50 km to the southwest. This floodplain represents the beginning of the Tarrabool Lake terminal drainage system described below.

- **Mitchell Grass Downs (NEA Chainage KP 140 to KP 582)**

The Mitchell Grass Downs NEA Assessment Area falls within three distinct drainage systems on the Barkly Tableland (see Figure 7 to Figure 10): the Tarrabool Lake terminal wetland system, the Lake Sylvester terminal wetland system, and the Georgina River drainage basin, which forms part of the broader internally draining Lake Eyre Basin. The Tarrabool Lake system (approximately 50 km southwest of the NEA Assessment Area) and the Lake Sylvester system (approximately 30 km west of the NEA Assessment Area) function as independent closed drainage features on the Tableland, with no outflow connection to the Georgina River or the Lake Eyre Basin (Baker et al. 2002).

Waterways across the Barkly Tableland are generally small and poorly defined, as the flat terrain and heavy cracking clay soils promote broad overland sheet flow rather than incised channel drainage (Baker et al. 2002). Much of the limited surface water drains into the porous limestone substrate, sometimes forming salt lakes and ephemeral playa features (DEE 2008a). All watercourses identified within this section are non-perennial, carrying flow only during and immediately following significant rainfall events and remaining dry, often for extended periods, between flow events. Meteorological records confirm that there have been multiple years of zero runoff across the entire Georgina Basin (Randal 1978).

Notwithstanding the ephemeral nature of surface flow, residual water may persist for considerable periods within billabongs and deeper pools along major watercourses, sustained by sheltered channel geometry and reduced exposure to evaporative loss. In addition, where watercourse beds comprise loose sands and gravels, sub-surface water may continue to be present within the shallow alluvial aquifer well after surface flow has ceased (Randal 1978).

Desktop assessment and APA's preliminary field inspection identified a total of 19 major waterway crossings and numerous minor waterway crossings within the Pipeline Corridor and associated access tracks, in addition to waterholes, closed depressions, and swamp features. Named watercourses within the Mitchell Grass Downs NEA Assessment Area are summarised in Table 9 and described by drainage system in the following sections.

Table 9: Named watercourses within the Mitchell Grass Downs NEA Assessment Area, ordered by NEA chainage within each drainage system.

Watercourse	NEA Chainage	Drainage System	Hierarchy	Waterholes Noted	Assessment Area
Creswell Creek	KP 173	Tarrabool Lake	Major	Yes	Pipeline Corridor
Six Mile Creek	KP 161 to 165	Tarrabool Lake	Minor	Yes	Pipeline Corridor
Cobb Creek	Access track (south of KP 125)	Tarrabool Lake	Major	No	Access Track
Lignum Creek	Access track (37 km south of KP 125)	Tarrabool Lake	Major	No	Access Track
Corella Creek	KP 231.7	Lake Sylvester	Major	No	Pipeline Corridor
Brunette Creek	KP 267.7	Lake Sylvester	Major	Yes	Pipeline Corridor
Boree Creek	KP 304	Lake Sylvester	Major	No	Pipeline Corridor and Access Track
Playford River	KP 345	Lake Sylvester	Major	Yes	Pipeline Corridor
Buchanan Creek	KP 359.8 to 360.5	Lake Sylvester	Major	Yes	Pipeline Corridor
Ranken River	KP 408	Georgina River	Major	No	Pipeline Corridor
Blue Bush Creek	KP 428	Georgina River	Major	Yes	Pipeline Corridor and Access Track
Lorne Creek	KP 444.5	Georgina River	Major	Yes	Pipeline Corridor
Six Mile Creek	KP 472.3	Georgina River	Minor	Yes	Pipeline Corridor
James River	KP 493	Georgina River	Major	Yes	Pipeline Corridor
Shakespeare Creek	KP 516 to 518	Georgina River	Major	Yes	Pipeline Corridor and Access Track
Happy Creek	KP 551 to 553	Georgina River	Major	No	Pipeline Corridor

Watercourse	NEA Chainage	Drainage System	Hierarchy	Waterholes Noted	Assessment Area
Georgina River	KP 553 to 554	Georgina River	Major	Yes	Pipeline Corridor and Access Track
Twelve Mile Creek	KP 576 to 577	Georgina River	Minor	No	Pipeline Corridor

- **Tarrabool Lake Terminal Wetland System**

A subset of watercourses within the NEA Assessment Area drain to the southwest into Tarrabool Lake (see Figure 7). Located on the western fringe of the Barkly Tableland, Tarrabool Lake is the largest wooded swamp in tropical Australia when completely filled, receiving most of its runoff from Creswell Creek (DEE 2008a). During exceptional flood events, Tarrabool Lake can connect with the adjacent Eva Downs Swamp to form a single extensive freshwater wetland.

Creswell Creek (NEA Chainage KP 173) is the principal feeder of Tarrabool Lake and a major non-perennial watercourse crossed by the Pipeline Corridor. It is historically notable for containing the permanent water hole at Anthony Lagoon, once one of the most important and reliable watering points on the Barkly Tableland (Baker et al. 2002). A waterhole associated with Creswell Creek was identified within the NEA Assessment Area. Six Mile Creek (NEA Chainage KP 161 to 165) is a non-perennial watercourse also draining into the Tarrabool Lake system, with a waterhole identified within the NEA Assessment Area. Cobb Creek and Lignum Creek are major non-perennial watercourses transected by the access track south of NEA KP 125.

- **Lake Sylvester Terminal Wetland System**

A number of watercourses crossed by the NEA Assessment Area drain into the Lake Sylvester system (see Figure 8). The system encompasses several interconnected basins including Lake Sylvester, Lake de Burgh, and Corella Lake, covering a combined area of approximately 2,272 km^2 (Baker et al. 2002). These seasonally inundated lakes form discrete bodies during normal conditions but merge into a single expansive water body exceeding 200,000 hectares during exceptional flood events, retaining water for over 12 months in semi-permanent billabongs (Baker et al. 2002).

Corella Creek (NEA Chainage KP 231.7) and Brunette Creek (NEA Chainage KP 267.7) are the principal feeders of the Lake Sylvester system. Corella Creek drains into Corella Lake, where associated billabongs can retain water as semi-permanent features for extended periods following major inundation (Baker et al. 2002). Waterholes have been recorded along Brunette Creek within the NEA Assessment Area. Boree Creek (NEA Chainage KP 304) is a major non-perennial watercourse crossed by both the Pipeline Corridor and the access track at multiple points. The Playford River (NEA Chainage KP 345) is a major non-perennial watercourse with waterholes noted within the NEA Assessment Area. Buchanan Creek (NEA Chainage KP 359.8 to 360.5) is crossed by the Pipeline Corridor at multiple points, reflecting the braided and poorly defined nature of its channel system, with waterholes recorded within the NEA Assessment Area.

- **Georgina River Drainage Basin**

The Georgina River is the principal drainage feature of the region and the northwesternmost of the three major river systems of the Channel Country (Randal 1978). With its headwaters on the Barkly Tableland, the Georgina is formed from numerous smaller streams and is joined by more than 35 tributaries as it flows south through the Channel Country, ultimately reaching Lake Eyre during years of exceptional flow (Randal 1978). Water levels vary enormously from completely dry to significant flooding, and flow is typically of short duration before dissipating through evaporation, infiltration, and ponding in localised depressions and billabongs.

The Ranken River (NEA Chainage KP 408) is a significant tributary of the Georgina River and a major non-perennial watercourse crossed by the Pipeline Corridor. Blue Bush Creek (NEA Chainage KP 428) is a major non-perennial watercourse crossed at several points, with a shallow waterhole noted within the Assessment Area. Lorne Creek (NEA Chainage KP 444.5) is a major non-perennial watercourse with waterholes recorded within the Assessment Area. A second Six Mile Creek (NEA Chainage KP 472.3), distinct from the watercourse of the same name within the Tarrabool Lake system, is a minor non-perennial watercourse with a waterhole identified in the vicinity of the Assessment Area.

The James River (NEA Chainage KP 493) is a major non-perennial watercourse with waterholes recorded within the Assessment Area. Shakespeare Creek (NEA Chainage KP 516 to 518) is a major non-perennial watercourse crossed by both the Pipeline Corridor and the access track, with waterholes identified at KP 516.5 and at an unnamed tributary at KP 522. Happy Creek (NEA Chainage KP 551 to 553) is a major non-perennial watercourse comprising several channels and crossed by the Assessment Area at several points. The Georgina River itself (NEA Chainage KP 553 to 554) is crossed by the NEA corridor and an access track, and waterholes are noted within the Assessment Area. Twelve Mile Creek (NEA Chainage KP 576 to 577) is a minor non-perennial watercourse representing a smaller, lower-order drainage line.

- **Wetlands and Closed Depressions**

A number of wetland and closed depression features were identified within the Mitchell Grass Downs Assessment Area (see Figure 7 to Figure 10). Within the Pipeline Corridor, these include several small, closed depressions (WL-07 through WL-14, NEA Chainage KP 555.5 to 561.3) and moderate-sized swamp features (APA Site ID: WL-15, Chainage KP 562.8 and WL-16, Chainage KP 564.5). One small swamp (WL-06, NEA KP 271.5) was identified within the Assessment Area. Within the access track Assessment Areas, several swamp features of varying scale were recorded (AC-WL-03 through AC-WL-07), ranging from small swamps in close proximity to the access track to moderate-sized swamps where existing or proposed access routes intersect or skirt the margins of the feature (APA Site ID: AC-WL-06, access track adjoining NEA KP 326).

The closed depressions represent localised topographic lows within the cracking clay plains where surface water collects and ponds following rainfall. These features are analogous to the claypans and gilgai depressions found across the vertosol landscape, holding water for varying periods and potentially retaining sub-surface moisture beneath desiccated surface crusts after standing water has evaporated. The swamp features represent slightly larger areas of water accumulation associated with broad, shallow depressions, where episodic inundation supports distinctive vegetation communities.

- **Unnamed Minor Drainage Lines**

In addition to the named watercourses described above, all three bioregions contain numerous unnamed minor non-perennial drainage lines crossed by both the pipeline and access track Assessment Areas. These represent shallow, moderate to poorly defined, lower-order drainage features and floodout areas that carry flow only during or immediately following heavy localised rainfall. Flow durations are short and volumes are low, with water quickly dissipating through evaporation and absorption into the substrate. Despite their modest scale, these minor drainage features may retain localised ponding and sub-surface moisture in low points for periods following rainfall, and some are associated with waterholes identified during field survey.

4.1.3 Relevance to Cultural Heritage

The hydrological characteristics of the Assessment Area have direct implications for the distribution and preservation of cultural heritage sites across all three bioregions. The relationship between water availability and human occupation in arid and semi-arid Australia is well established in the archaeological and ethnographic literature. Horton (1981) proposed the "water and woodland" model of continental colonisation, arguing that upon arrival in northern Australia, people dispersed through the relatively wetter inland woodlands along riverine corridors, with the driest parts of the continental interior remaining unoccupied until climatic conditions improved. This model highlights the role of watercourses and their associated woodland ecosystems as the primary pathways and focal points for human movement and settlement across the Australian landscape. Bird et al. (2016) subsequently demonstrated, through least-cost pathway modelling, that 84% of archaeological sites older than 30,000 years are located within 20 km of modern permanent water, confirming that the distribution of potable water has been a primary constraint on human dispersal and settlement throughout Australian prehistory.

Veth (1989, 1993) extended this understanding through his "Islands in the Interior" model, which applies biogeographic principles to the patterning of human occupation in Australia's arid zone. This model identifies three landscape categories relevant to human settlement during periods of climatic stress: refugia, being well-watered ranges and major riverine systems where populations could persist; corridors, being intervening landscapes that allowed opportunistic movement between refugia during favourable conditions; and barriers, being the most arid landscapes where sustained occupation was not viable (Veth 1989; Williams et al. 2013). Within the context of the Assessment Areas, the major watercourses and their associated waterholes — particularly along Creswell Creek, Lorne Creek, Brunette Creek, the James River, and the Georgina River — together with the terminal wetland features of Tarrabool Lake and the Lake Sylvester system, would have functioned as refugia, providing the reliable water necessary for sustained occupation, resource gathering, and ceremonial activity.

Early European exploration accounts from the Assessment Areas provide direct observational evidence of this pattern. Ernest Favenc, recounting his 1878 expedition across the Barkly Tableland, identified Corella Lagoon, Brunette Creek, and Anthony's Lagoon as the principal permanent water sources of the region, observing that during a particularly dry season Aboriginal people were concentrated at these waters in large numbers:

> *"The real permanent waters of the belt of downs are the 'Corella' Lagoon, 'Brunette' Creek, and 'Anthony's Lagoon'… on our trip in 1878 we experienced a very dry season and found most of the natives congregated at these waters, which they appeared to consider their principal*

stand-by. In some places we found as many as from 100 to 200 of them camping round these waters. As it is not usual for them to congregate in such large numbers unless for some special reason, it shows how much they relied on the permanency of these supplies" (Favenc, in Brisbane Courier, 12 November 1883, p. 3).

Favenc further noted that away from these permanent waters, camps had been abandoned during the dry period, observing that "we saw very few of them. In some places we found huge camps which had been deserted by them owing to the lack of rain" (Favenc, in Brisbane Courier, 12 November 1883, p. 3). He also described how fire was used to navigate between water sources, noting that the only indications of water his party could find on the return journey "were obtained by picking up patches of country burnt by the natives on their route from one waterhole to another" (Favenc, in Brisbane Courier, 12 November 1883, p. 3). These observations directly illustrate the refugia model described by Veth (1989), with populations contracting to reliable water sources during dry periods and using fire-managed corridors to move between them.

Similar observations were recorded by William Landsborough during his 1862 expedition from the Gulf of Carpentaria to Victoria in search of Burke and Wills. On 29 December 1861, Landsborough noted in his journal that his party camped on a billabong of the Herbert River, now known as the Georgina River, near present-day Camooweal, and observed a camp of at least 100 Aboriginal people (Landsborough 1862). The consistency of these independent accounts, separated by nearly two decades and occurring at different locations along the same river systems crossed by the Assessment Areas, reinforces the significance of major watercourses and their associated waterholes as focal points for Aboriginal occupation on the Barkly Tableland.

The ephemeral watercourses and drainage depressions that characterise the intervening landscape would have functioned as corridors, allowing movement across country during and immediately following rainfall events. Smith (1989) notes that the density of accessible water sources was vital for enabling human occupation, along with the resource base that those water sources supported. Ethnographic research across arid and semi-arid Australia indicates that remote ephemeral water sources were prioritised for foraging immediately following rainfall events, before groups would settle closer to more permanent water resources as ephemeral sources dried out (Gould 1969, in Bird et al. 2013). Conversely, while permanent wells and water sources served as refuges during drought, the food supplies in their vicinity would soon become exhausted, necessitating movement once conditions allowed (Macfarlane & McConnell 2017). Favenc's observation that large camps near permanent water were occupied during drought, while camps away from water were deserted, aligns closely with this ethnographic pattern. Given the ephemeral and unreliable nature of water resources across the NEA Assessment Areas, particularly within the Mitchell Grass Downs and Gulf Fall and Uplands bioregions, the landscape between major watercourses would have been a high-risk environment to traverse outside of significant rainfall events.

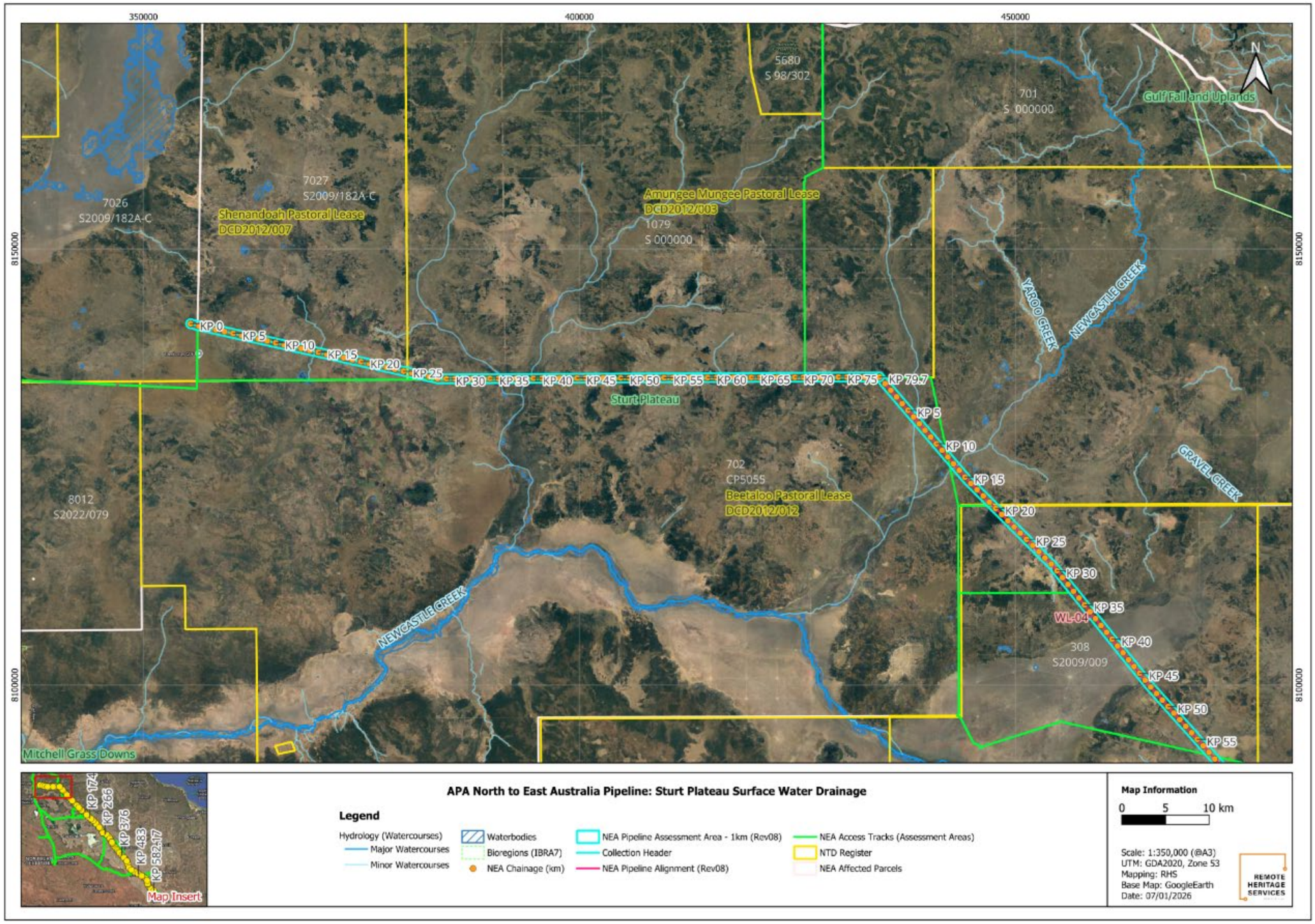

Figure 5: Sturt Plateau Surface Water Drainage

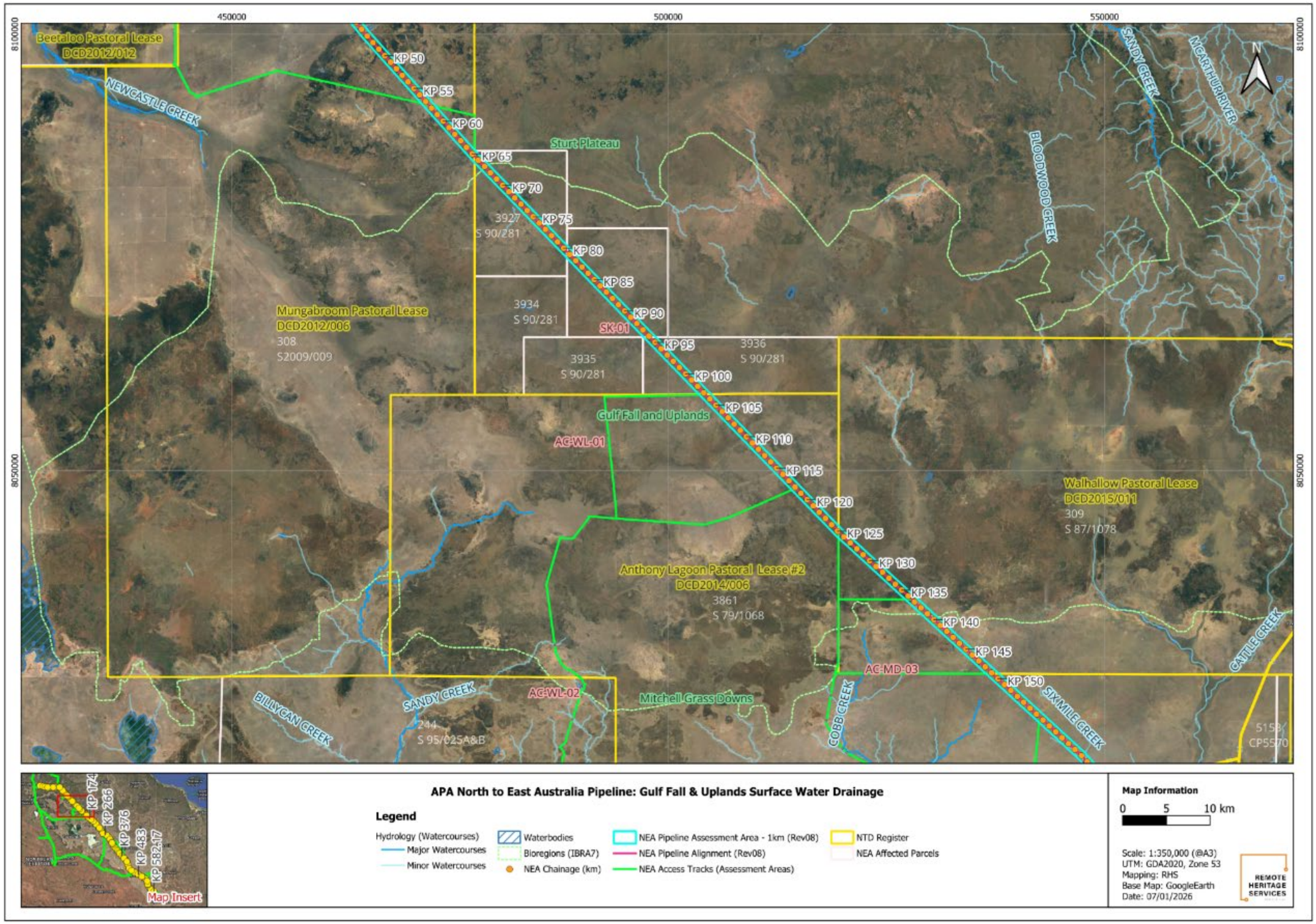

Figure 6: Gulf and Uplands Surface Water Drainage

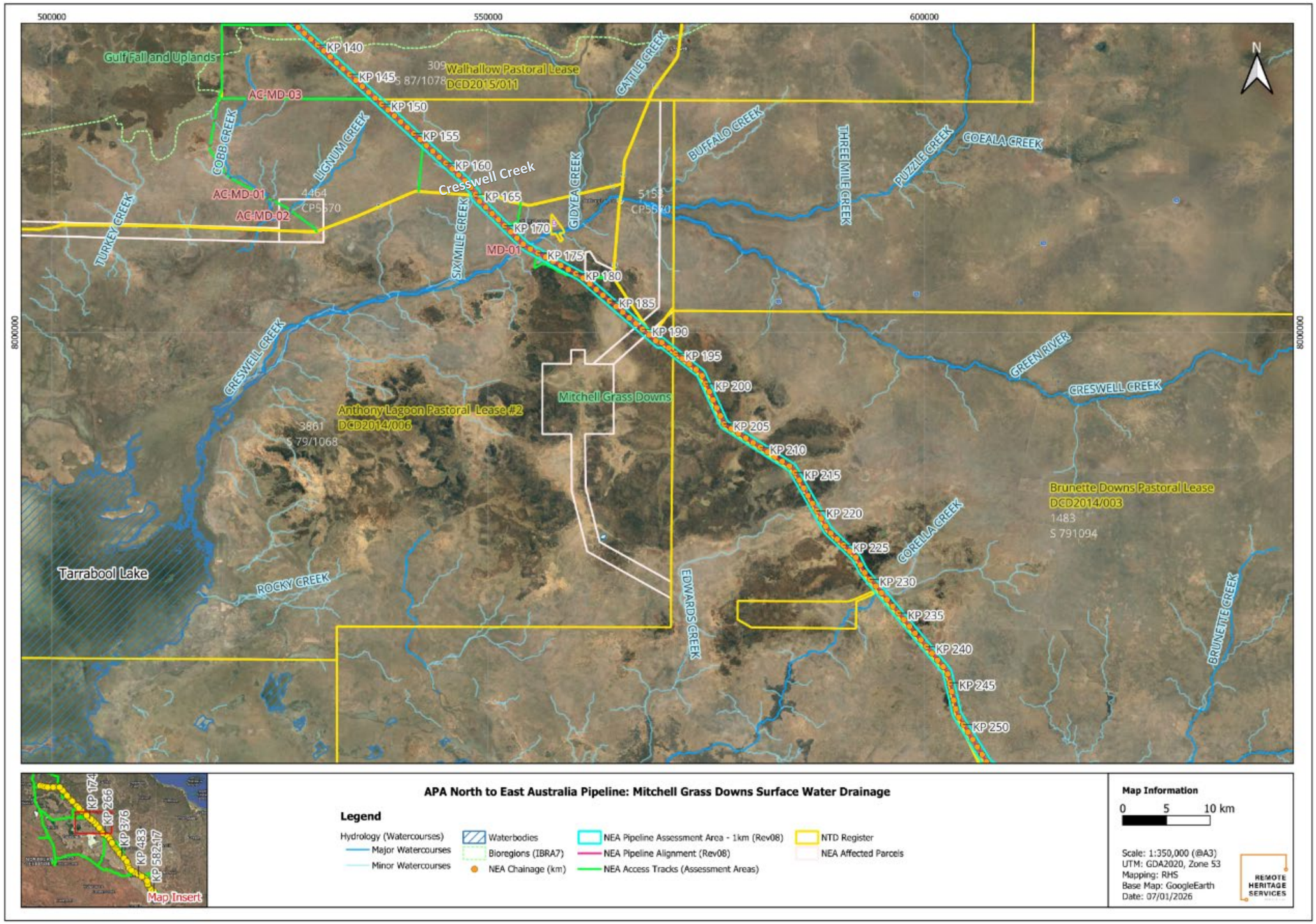

Figure 7: Mitchell Grass Downs Surface Water Drainage (NEA KP 155 to 275)

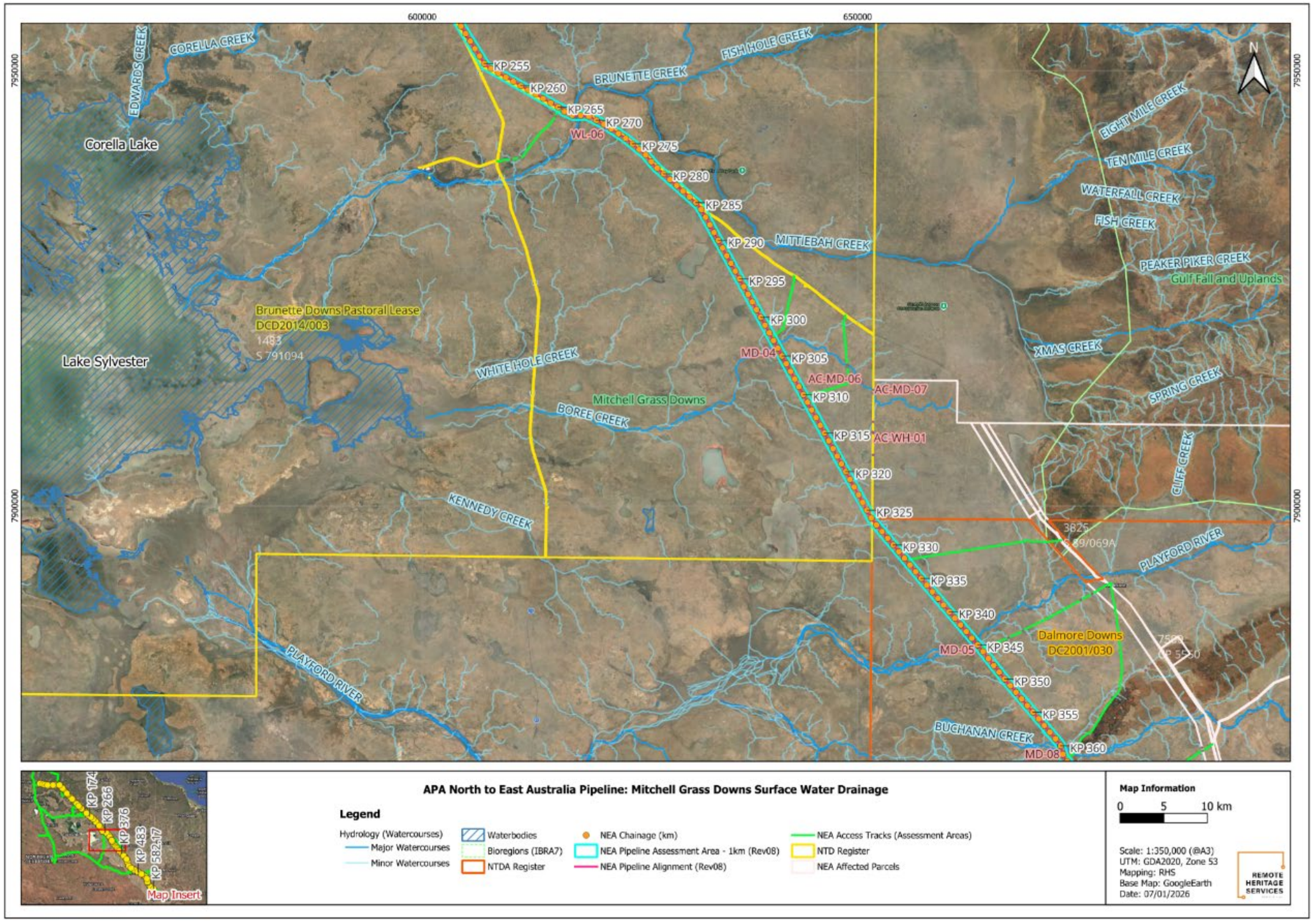

Figure 8: Mitchell Grass Downs Surface Water Drainage (NEA KP 255 to 365)

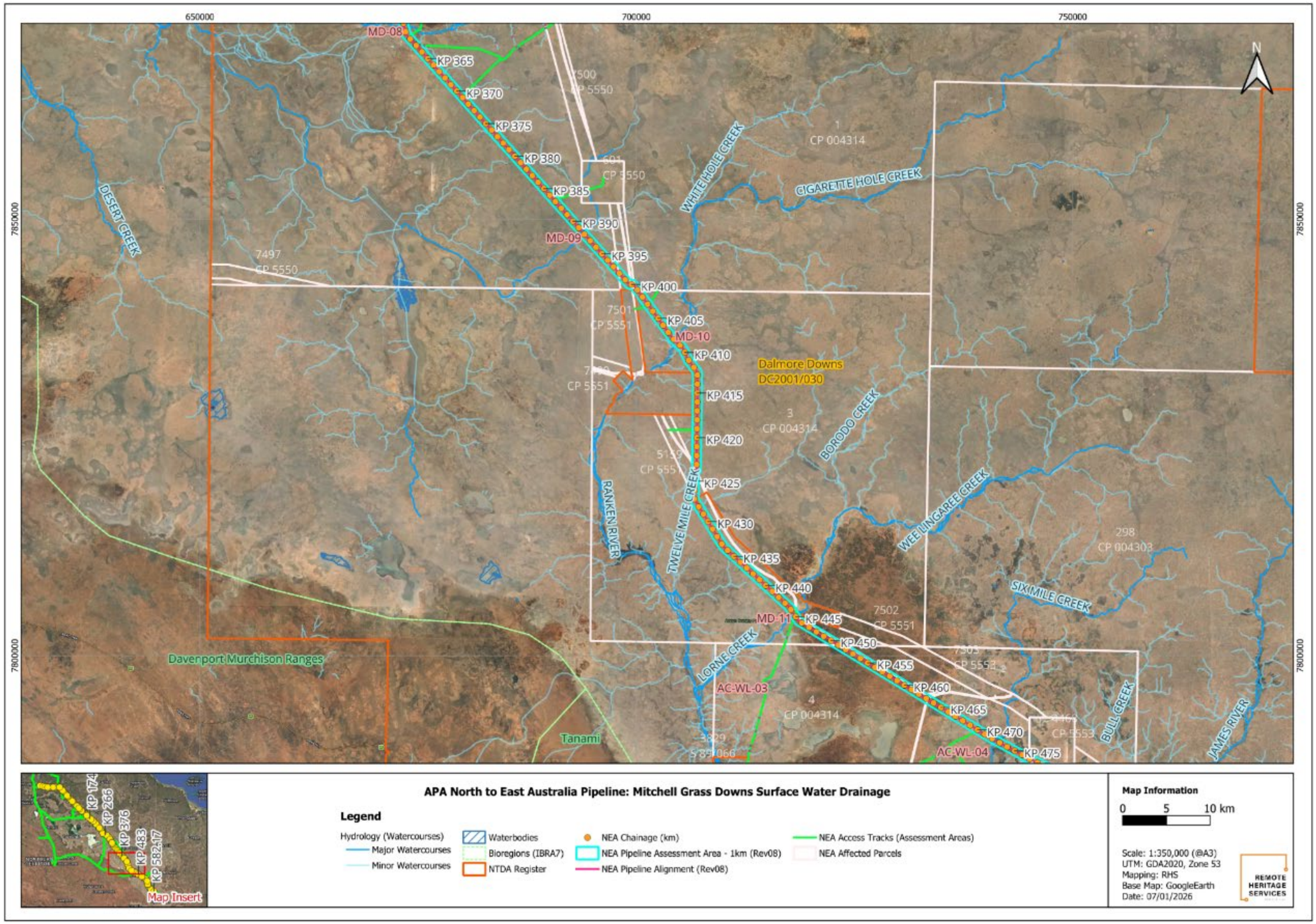

Figure 9: Mitchell Grass Downs Surface Water Drainage (NEA KP 365 to 485)

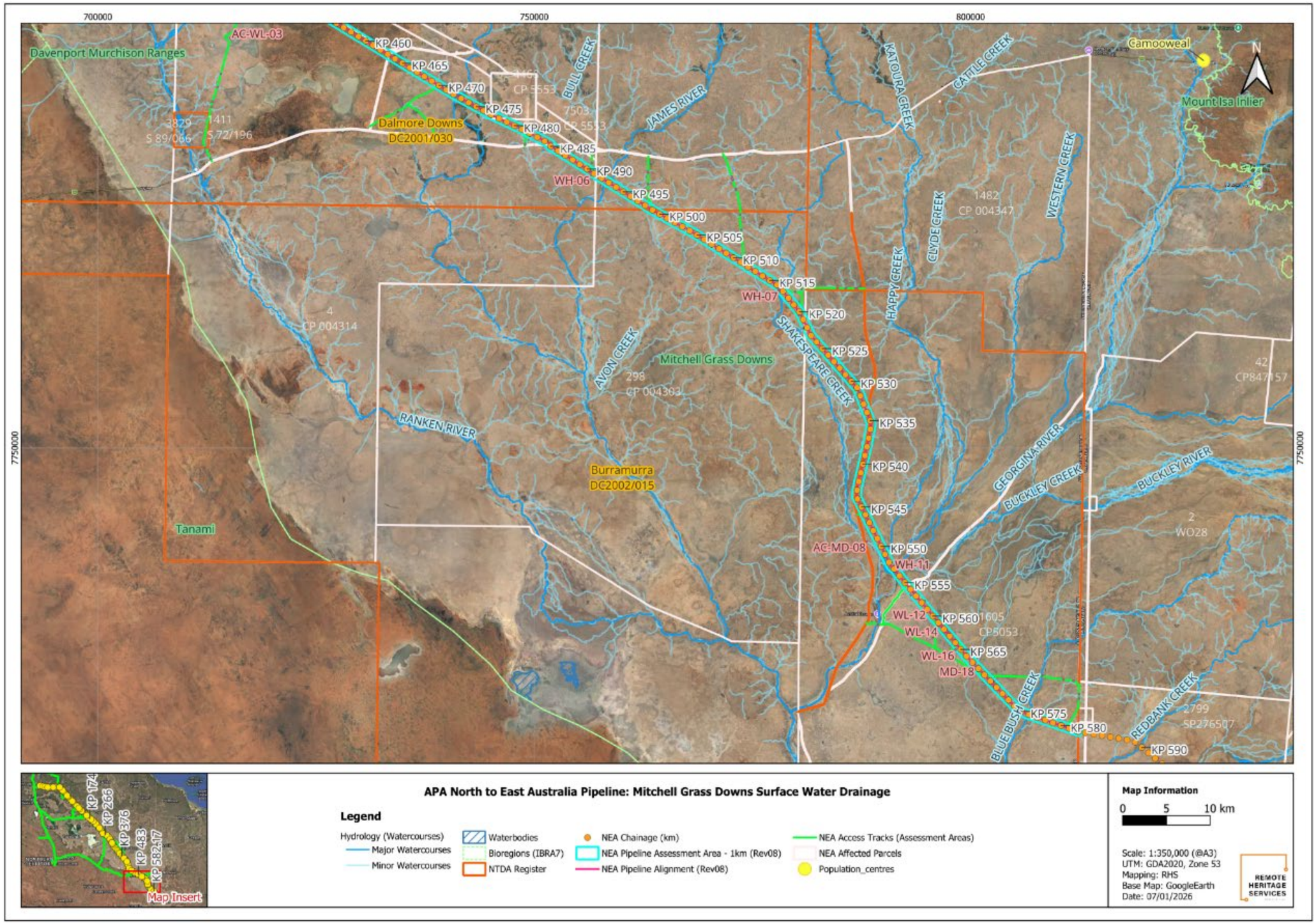

Figure 10: Mitchell Grass Downs Surface Water Drainage (NEA KP 455 to 582)

4.2 GEOLOGY AND GEOMORPHOLOGY

The geological and geomorphological setting of the NEA Assessment Areas directly influences the distribution of raw materials suitable for stone artefact manufacture, the preservation potential of archaeological deposits, and the location of landscape features attractive for past human occupation. The following section summarises the outcropping geology of each bioregion and land system (see Figure 11), with emphasis on these archaeologically relevant characteristics. The geological units within the NEA Assessment Areas are presented in Table 10 and **Error! Reference source not found.** to **Error! Reference source not found.**.

The Project Area lies within the Georgina Basin, a large sedimentary basin covering approximately 330,000 km² (Kruse et al. 2011). The oldest rocks at or near the surface are Cambrian-age limestones, dolomites, and cherts, which underlie the Barkly Tableland and are the original source of the chert gravels found widely across the clay plains. These older rocks are overlain in places by Tertiary-age freshwater limestones and hard ironstone crusts (laterite) that now survive as low rises and plateau remnants across the landscape. More recently, Quaternary-age processes have laid down alluvial deposits along watercourses and produced the deep cracking clay soils (vertosols) that characterise the open Mitchell grass plains.

These basin-wide geological processes have produced three distinct landscape settings within the NEA Assessment Areas, each with different implications for Aboriginal occupation and archaeological preservation.

4.2.1 Sturt Plateau (Collection Header and NEA Pipeline from Chainage KP 0 to KP 67)

The Sturt Plateau bioregion is a largely undissected, deeply weathered Tertiary surface covered predominantly by red and yellow earth soils (Wilson et al. 1990). The Beetaloo land system dominates, with the Joanundah system present in the southern portion. These land systems represent the residual Tertiary land surface that has undergone prolonged tropical weathering exceeding one million years (Kruse et al. 2011).

Hard ironstone crust (laterite) forms the dominant surface geology, occurring in various forms including pisoliths, nodules, and porous masses (Kruse et al. 2011). Younger colluvial and alluvial deposits occur throughout both land systems, with patches of black cracking clay where fine-textured materials have been transported onto the plateau surface, and localised lake deposits in depressions. A notable exception to the generally uniform laterite surface occurs between NEA Pipeline Chainage KP 21 and KP 30 and along parts of the adjoining access tracks, where discrete sediment sequences containing potential stone raw material sources, including quartz sandstone, pebbly sandstone, siltstone, and claystone, have been mapped within the NEA Assessment Area.

From an archaeological perspective, the Sturt Plateau presents a markedly different landscape from the plains to the south. The deeply weathered laterite surfaces, with their thin sandy or gravelly soils (Wilson et al. 1990), are notably lacking in primary sources of knappable stone suitable for flaked stone tool manufacture. With the exception of the localised sediment outcrops identified between KP 21 and KP 30, stone raw materials would generally have been imported from adjacent bioregions or sourced from small, scattered deposits. Aboriginal people in this landscape may also have relied more heavily on organic tool materials such as timber and bone, which rarely survive in the archaeological record without specific preservation conditions such as burial in sheltered or waterlogged deposits.

4.2.2 Gulf Fall and Uplands (NEA Pipeline from Chainage KP 67 to KP 140)

The Gulf Fall and Uplands is geologically transitional between the Sturt Plateau and the Mitchell Grass Downs. The Pollyarra/Creswell land system dominates this section, followed by Wonorah/Creswell and Creswell, with minor occurrences of Beetaloo, Yelvertoft, and Barkly 1 systems.

The surface geology shares the ironstone laterite character of the Sturt Plateau but is more varied. Cretaceous sediments occur extensively, forming bench topography that creates the most diverse landforms in the region. Patches of black cracking clay have developed where fine-textured materials overlie the older substrates (Stewart 1954), and younger colluvial and alluvial deposits occupy slopes and drainage depressions (Christian et al. 1954; Wilson et al. 1990). Several areas of sedimentary rock outcrop have also been mapped within the NEA Assessment Area, including quartz sandstone and ferruginous sandstone, pebbly sandstone, siltstone, and claystone, primarily between NEA Pipeline Chainage KP 72 and KP 73, around KP 105, and between KP 111 and KP 112, as well as along parts of the adjoining access tracks adjacent to Sandy Creek.

This greater geological variety gives the Gulf Fall and Uplands a somewhat more diverse range of archaeological settings than the Sturt Plateau. Lateritic uplands, alluvial plains, Cretaceous benches, and drainage systems all occur within relatively short distances, providing a slightly wider range of landform types and potential resource zones. While the bioregion generally shares the Sturt Plateau's scarcity of knappable stone (Wilson et al. 1990), the sedimentary rock outcrops and silicified Cretaceous sediments identified above may represent localised exceptions.

4.2.3 Mitchell Grass Downs (NEA Pipeline Chainage KP 140 to KP 582)

The Mitchell Grass Downs bioregion coincides with the Barkly Tableland's characteristic elevated plain of grey and brown cracking clay soils developed on Cambrian carbonate bedrock covered by Tertiary sediments (Christian et al. 1954; Stewart 1954). Dominant land systems include Barkly 1, Wonardo, and Austral, with minor occurrences of Barkly 2, Barkly 3, Creswell, Wonorah, and Yelvertoft systems.

The Cambrian carbonate bedrock comprises formations including the Anthony Lagoon Formation, Brunette Limestone, Ranken Limestone, Camooweal Dolostone, and Wonarah Formation. Natural silicification of limestone and mudstone within these formations has produced hard chert concretions that persist as surface gravel on the clay plains, particularly on low rises (Edgoose and Winstanley 1994; Kruse et al. 2011). These chert gravels coupled with other Cambrian sedimentary siltstones represent a widely distributed source of raw material suitable for stone artefact manufacture. Proterozoic sandstone, represented by the Mittiebah Sandstone, is exposed in low ridges throughout multiple land systems and may contain features such as grinding grooves/platforms or exploited as a source for portable grindstones.

Tertiary sediments overlie the carbonate bedrock. The Austral Downs Limestone is a freshwater limestone deposit in which silicification has produced chalcedony, a stone material suitable for artefact manufacture (Stewart 1954; Edgoose and Winstanley 1994). Hard ironstone crusts (laterite) formed through prolonged weathering on exposed Tertiary surfaces, and remnant laterite rises with ironstone rubble are scattered throughout the plains (Kruse et al. 2011). Younger alluvial deposits occur along watercourses, colluvium on slopes and rises, and lake deposits in association with the Barkly Internal Drainage Basin (Christian et al. 1954).

From an archaeological perspective, the deep cracking clay soils that dominate the Mitchell Grass Downs generally present poor contexts for site preservation, as seasonal shrink-swell processes

mechanically displace artefacts and destroy stratigraphic integrity. However, this generalisation does not hold uniformly across the bioregion. In some sections of the clay plains, the density of suitable stone raw materials at the surface, particularly chert gravels derived from the underlying carbonate formations, is sufficient to suggest that these areas were actively used for stone procurement and tool manufacture despite the challenging soil conditions (RHS, field observations). Furthermore, the margins of topographic highs within the black soil plains are typically characterised by sandier soils where regolith deposits have shed downslope, carrying stone raw materials with them. These sandy margins provide both favourable occupation surfaces and ready cleared areas with access to displaced stone resources, making them archaeologically sensitive locations.

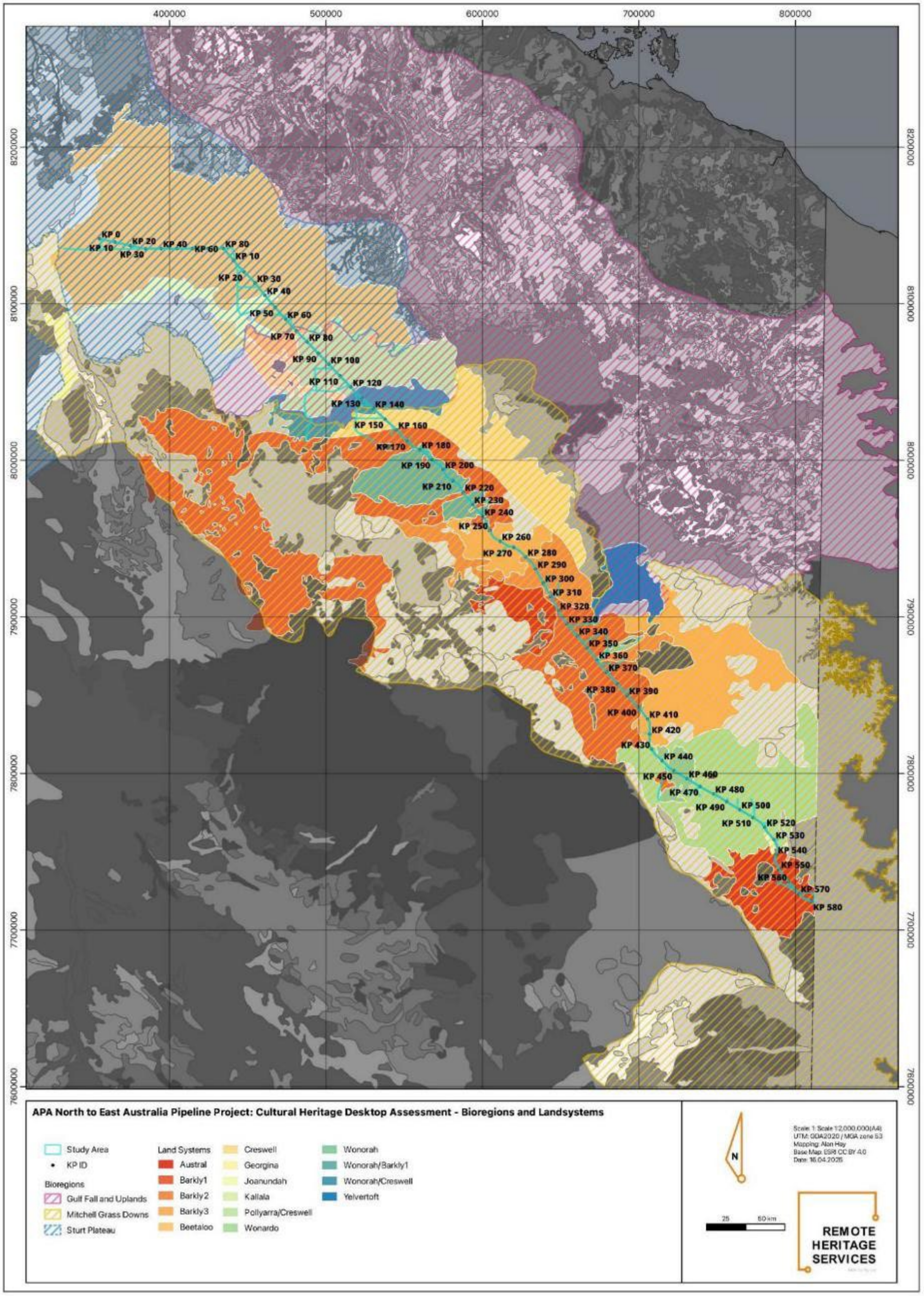

Figure 11: Project Area Bioregion and Land Systems.

Table 10: Outcropping geology table and interpretation within the Project Area.

Name	Bioregion	Land_Systems	Geology Description	Archaeological Interpretation
[Czia] **Austral Downs Limestone**	Mitchell Grass Downs	Austral	Austral Downs Limestone [Czia], a Middle Miocene lacustrine and spring-fed carbonate deposit forming part of the Tertiary freshwater/brackish transgression that mantled the Cambrian carbonate bedrock of the Barkly Tableland. Chalcedonic silicification indicates diagenetic alteration of the carbonate sequence. This formation is one of the Tertiary sedimentary units from which the deep grey cracking clays (vertosols) of the Tableland were derived through prolonged weathering (Stewart 1954; Edgoose & Winstanley 1994). Surface expression may include scattered flat limestone boulders and low irregular rises.	Moderate to high archaeological sensitivity. Chalcedonic silicification of the Austral Downs Limestone has produced siliceous raw material suitable for stone tool manufacture; surface exposures and low limestone rises represent potential quarry and reduction sites where primary flaking debris may be expected. Low irregular limestone rises provide slightly elevated positions above the surrounding clay plains, offering drier camping surfaces and vantage across the otherwise featureless landscape. Flat limestone boulders at the surface may have served as anvil stones or grinding platforms. Where these rises coincide with proximity to water sources (drainage lines, depressions, lakes), archaeological potential increases substantially, as the conjunction of raw material, elevated ground and water would concentrate occupation and activity.
[Czib] **Brunette Limestone**	Mitchell Grass Downs	Barkly 1 (also in Gulf Fall and Uplands); Barkly 2	Brunette Limestone [Czib], a Middle Miocene lacustrine carbonate forming part of the Tertiary freshwater/brackish transgression over the Barkly Tableland. Fossiliferous and nodular with partial silicification producing chert nodules and bands. One of the Tertiary sedimentary units from which the deep grey cracking clays of the Tableland were derived. Chert gravel at the surface represents remnants of the underlying carbonate rocks.	Moderate to high archaeological sensitivity. The Brunette Limestone is an important potential source of siliceous raw material for stone tool manufacture. Partial silicification has produced chert nodules and bands within the limestone, and surface chert gravel on overlying clay plains may include both naturally weathered nodules and cultural debitage , a distinction requiring careful field assessment of individual pieces for evidence of conchoidal fracture, platform preparation and controlled flaking. Low rises where Brunette Limestone is exposed at or near the surface represent potential quarry and primary reduction sites. These slightly elevated positions also provide drier camping surfaces above the surrounding cracking clays. Archaeological survey should pay particular attention to chert gravel concentrations on rises, which may represent in situ knapping floors or raw material procurement stations.
[Czl] **ferruginous duricrust**	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Barkly 1 (also in Gulf Fall and Uplands); Beetaloo (also in Gulf Fall and Uplands); Creswell (also in Gulf Fall and Uplands);	Ferruginous duricrust [Czl] (laterite) representing remnants of the extensively laterised Tertiary land surface. Where the Tertiary surface was not covered by lakes, it was extensively laterised and subsequently eroded. Rises of pisolithic ironstone rubble throughout the black-soil plains are remnants of this surface. These lateritic 'islands' are not areas of deep cracking clay but rather remnant gravelly mounds preserved above the surrounding	Moderate to high archaeological sensitivity. Lateritic rises represent elevated 'islands' within the surrounding clay plains, supporting eucalypt woodland on red earth soils that contrast markedly with the treeless Mitchell grasslands. These vegetated rises would have provided shade, timber for implements and shelter construction, and plant food resources (seeds, fruits, tubers from woodland species) unavailable on the open grasslands. The elevated, well-drained surfaces offer superior camping positions above seasonally waterlogged or boggy cracking clays, and provide vantage across the

Name	Bioregion	Land_Systems	Geology Description	Archaeological Interpretation
		Joanundah; Pollyarra/Creswell Wonorah/Creswell (also in Gulf Fall and Uplands)	landscape, supporting distinct vegetation communities (typically red earths with eucalypt woodland) that contrast with the surrounding treeless Mitchell grasslands on cracking clay.	surrounding flat landscape. Ironstone pisoliths and nodules from the duricrust may have been used as raw material for grinding implements, heat retainers in earth ovens, or expedient tools, though they are generally too coarse-grained for fine flaking. Where lateritic rises occur in proximity to water sources (drainage lines, depressions, lakes), the conjunction of elevated ground, shelter, diverse resources and water creates strong attractors for Aboriginal occupation. Archaeological material on lateritic surfaces is more likely to remain in near-original position than on adjacent cracking clays, as the red earth soils lack the vertic disturbance processes that displace artefacts on the black soil plains.
[Czrb] **black soil plain**	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Austral; Barkly 1 (also in Gulf Fall and Uplands); Barkly 2; Barkly 3; Beetaloo (also in Gulf Fall and Uplands); Creswell (also in Gulf Fall and Uplands); Georgina; Joanundah; Kallala; Pollyarra/Creswell; Wonardo; Wonorah; Wonorah/Barkly 1; Wonorah/Creswell (also in Gulf Fall and Uplands); Yelvertoft (also in Gulf Fall and Uplands)	Residual black soil plain [Czrb], the defining landform of the Mitchell Grass Downs bioregion. Deep grey and brown cracking clays (vertosols) derived from weathering of calcareous Tertiary sediments, or possibly from erosion of the adjacent Tertiary lateritic plain (Stewart 1954; Edgoose & Winstanley 1994). The soils crack widely in the upper profile upon drying, have a self-mulching surface, and commonly develop gilgai microrelief. Neutral to alkaline, calcareous and moderately fertile, with plant growth limited more by rainfall than nutrients (Orr & Holmes 1984). Clay contents exceed 40-50%, providing good water-holding capacity. Seasonal cracking mechanically shears roots of establishing trees, maintaining the characteristic treeless Astrebla grasslands.	Generally low archaeological sensitivity. The deep cracking clay vertosols that characterise the black soil plains present a poor context for archaeological site preservation. Vertic soil processes , seasonal shrink-swell cycling, self-mulching of the surface horizon, and gilgai microrelief development , mechanically displace artefacts through the soil profile, destroying stratigraphic integrity and spatial patterning of occupation evidence. The treeless Astrebla grasslands supported by these soils offer limited shade, shelter, timber or diverse food resources, reducing the attractiveness of these areas for sustained occupation. Archaeological material is not absent from these surfaces but is expected to occur as low-density, deflated surface scatters representing transit, opportunistic resource procurement (e.g. grass seed harvesting), or overflow from nearby higher-sensitivity landforms. Any artefacts present will have been vertically displaced by soil processes and cannot be considered in situ.
[Czs] **sand plain**	Mitchell Grass Downs	Barkly 1 (also in Gulf Fall and	[Czs] Cenozoic sand and gravel plains representing depositional products of the deeply weathered Tertiary	Moderate archaeological sensitivity with good preservation potential relative to adjacent cracking clay plains. Sandy substrates (red earths, quartz

Name	Bioregion	Land_Systems	Geology Description	Archaeological Interpretation
		Uplands); Wonardo; Wonorah; Wonorah/Barkly 1	landscape, including reworked alluvium and aeolian deposits. Quartz sand sheets commonly contain ferruginous pisoliths or pebbles derived from erosion of the lateritic surface. These sandy substrates support different vegetation communities from the surrounding clay plains, including eucalypt woodlands and spinifex grasslands on red earths.	sand sheets) lack the shrink-swell vertic processes that displace artefacts on the black soil plains, providing a more stable matrix for archaeological material. These sandy surfaces support eucalypt woodland and spinifex grassland vegetation communities that offer shade, timber and different plant food resources from the surrounding Mitchell grasslands. Ferruginous pisoliths and pebbles within the sand sheets are derived from erosion of the lateritic surface and may be confused with cultural material , field identification must distinguish naturally rounded pisoliths from culturally modified stone. Deflation of sandy surfaces can create lag concentrations of artefacts that represent palimpsest accumulations from multiple occupation episodes. Artefact visibility is generally good on sandy substrates, particularly on deflated surfaces and around tree bases where bioturbation exposes buried material.
[Elba] **Anthony Lagoon Formation**	Mitchell Grass Downs	Barkly 1 (also in Gulf Fall and Uplands); Barkly 3; Wonorah/Barkly 1	Anthony Lagoon Formation [Elba], part of the thick flat-lying Middle Cambrian carbonate bedrock underlying virtually the entire Mitchell Grass Downs bioregion. Principal bedrock unit from which the overlying Tertiary and Quaternary regolith has developed. The Cambrian carbonate sequence also hosts the sub-artesian groundwater basin (c. 30 to 200 m below surface) that provides stock water across the region. Evaporite and chert concretions indicate shallow marine to restricted basin depositional conditions.	Low to moderate archaeological sensitivity at surface level, but locally significant where exposed. The Anthony Lagoon Formation is the principal Cambrian carbonate bedrock underlying the Barkly Tableland and is generally deeply buried, placing it beyond direct archaeological relevance in most locations. However, where the formation is exposed at or near the surface in low rises or through erosion of overlying regolith, chert concretions within the dolomitic sequence represent a potential source of stone tool raw material. The sub-artesian groundwater hosted within this formation may discharge at springs where geological structures bring the aquifer close to the surface; such springs would be critical permanent or semi-permanent water sources and strong attractors for occupation in this water-limited landscape. Archaeological survey should note any surface exposures of this formation, particularly where chert concretions or evidence of spring discharge are present.
[Elbc] **Camooweal Dolostone**	Mitchell Grass Downs	Wonardo; Wonorah	Camooweal Dolostone [Elbc], a Cambrian carbonate unit outcropping in the east and south-east of the Mitchell Grass Downs, particularly in the Georgina Limestone province. Karst dissolution of dolostone and dolomitic limestone may contribute to localised sinkhole development. Microbial dololaminite and chert nodules indicate shallow-water depositional conditions. Surface outcroppings support calcareous soils and vegetation	Moderate to high archaeological sensitivity. The Camooweal Dolostone has particular archaeological significance due to two key attributes. First, karst dissolution of the dolostone produces localised sinkholes and solution features that may act as natural water catchments, providing critical water sources in the landscape; such features would be strong attractors for Aboriginal occupation. Second, chert nodules within the formation represent a source of stone tool raw material. Where the formation outcrops at the surface, the associated Gidgee (*Acacia georginae*) woodland provides a

Name	Bioregion	Land_Systems	Geology Description	Archaeological Interpretation
			communities including Acacia georginae (Gidgee) woodland.	distinct resource base including edible seeds and timber. Karst features may also provide natural shelter in the form of solution cavities, overhangs or shallow caves, with potential for preserved cultural deposits.
[Elbr] **Ranken Limestone**	Mitchell Grass Downs	Wonardo	Ranken Limestone [Elbr], a Middle Cambrian carbonate unit within the bedrock sequence of the eastern Barkly Tableland. Commonly chertified or ferruginised, with minor phosphorite and basal quartz sandstone. Contributes to the calcareous parent material from which overlying vertosols have developed and is part of the Cambrian carbonate aquifer system.	Moderate to high archaeological sensitivity. Chertification and ferruginisation of the Ranken Limestone have produced siliceous raw material suitable for stone tool manufacture, analogous to other chert-bearing carbonate formations on the Barkly Tableland. Where exposed at or near the surface, the formation represents a potential quarry source. The basal quartz sandstone unit may have provided material for grinding implements.
[Elbw] **Wonarah Formation**	Mitchell Grass Downs	Barkly 1 (also in Gulf Fall and Uplands); Yelvertoft (also in Gulf Fall and Uplands)	Wonarah Formation [Elbw], part of the Middle Cambrian carbonate bedrock sequence underlying the Barkly Tableland. Chertification of limestone and mudstone has produced resistant siliceous concretions that persist as surface chert gravel on the overlying clay plains, particularly on low rises. Contributes to the sub-artesian groundwater system.	Moderate to high archaeological sensitivity where exposed at surface. Chertification of the Wonarah Formation limestone and mudstone has produced resistant siliceous concretions that are an important source of stone tool raw material on the Barkly Tableland. Surface chert gravel derived from weathering of this formation persists on overlying clay plains, particularly on low rises, and represents a widely distributed raw material source. Concentrations of chert gravel on rises may include both naturally weathered concretions and cultural debitage from stone tool reduction. A careful field assessment is required to distinguish natural from cultural material. Where the formation is exposed in low rises, these locations may have functioned as quarry sites with associated primary reduction activity. The elevated, better-drained positions of these chert-bearing rises also provide more favourable camping surfaces than the surrounding cracking clays.
[Ks & Klm] **sediments**	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Barkly 1 (also in Gulf Fall and Uplands); Beetaloo (also in Gulf Fall and Uplands); Creswell (also in Gulf Fall and Uplands); Pollyarra/Creswell;	Cretaceous sediments [Ks] (sandstone, conglomerate, mudstone, siltstone) forming mesa and bench topography where preserved above the general level of the Tableland. Part of the sequence deposited during extensive Cretaceous marine transgressions across Central Australia. May be ferruginised or silicified. Where outcropping, these support different vegetation communities from the surrounding clay plains, typically eucalypt or Lancewood (Acacia shirleyi) woodlands.	High archaeological sensitivity. Mesa and bench topography formed by Cretaceous sediments creates the most topographically diverse landforms in the wider study area and has strong archaeological potential for several reasons. Rock overhangs and alcoves at mesa margins and bench edges may provide natural shelter, with potential for stratified occupation deposits, rock art and other cultural features. Mesa tops offer commanding vantage points across the surrounding plains. The base of escarpments and cliff lines acts as a natural water catchment zone where runoff concentrates, supporting distinct vegetation communities (eucalypt and Lancewood

Name	Bioregion	Land_Systems	Geology Description	Archaeological Interpretation
		Wonorah/Creswell (also in Gulf Fall and Uplands)		woodland) that provide shade, timber, and diverse plant food resources absent from the surrounding grasslands. Ferruginised and silicified Cretaceous sandstone and conglomerate represent potential raw material sources for grindstone and stone tool manufacture, particularly where silicification has produced fine-grained knappable stone.
[Mssi] **Mittiebah Sandstone**	Mitchell Grass Downs	Barkly 1 (also in Gulf Fall and Uplands); Barkly 2; Wonorah; Yelvertoft (also in Gulf Fall and Uplands)	Mittiebah Sandstone [Mssi], a Proterozoic (Calymmian, c. 1.4-1.6 Ga) siliciclastic unit predating the Cambrian carbonate sequence. Exposed in low ridges throughout the Barkly Tableland (e.g. south of Alexandria homestead). These sandstone outcrops support vegetation communities distinct from the surrounding clay plains, including acacia and eucalypt open-woodlands.	Moderate to high archaeological sensitivity. Proterozoic sandstone outcrops forming low ridges above the surrounding clay plains are significant landscape features with multiple dimensions of archaeological potential. Sandstone surfaces may preserve grinding grooves where Aboriginal people processed seeds, pigments or other materials against the abrasive stone. Where block topography or bedding-plane shelters have developed, these outcrops may provide natural shelter with potential for rock art, stratified deposits and other cultural features. Coarse-grained sandstone may have been quarried for use as grinding implements (millstones, mullers). The distinct acacia and eucalypt woodland vegetation on these outcrops provides different resources from the surrounding grasslands. As elevated features in an otherwise low-relief landscape, sandstone ridges also provide vantage points and route markers.
[Qa] **alluvium**	Mitchell Grass Downs; Sturt Plateau	Austral; Barkly 1 (also in Gulf Fall and Uplands); Barkly 2; Barkly 3; Beetaloo (also in Gulf Fall and Uplands); Wonardo; Wonorah	Holocene channel and flood plain alluvium [Qa] along watercourses that flow only for short periods after heavy rains. In the Mitchell Grass Downs, alluvial clays have been deposited along the Georgina, James and Ranken Rivers and their tributaries, and along short streams draining into the Barkly Internal Drainage Basin. Alluvial soils have lower nutrient levels than the residual clay plains but remain adequate for plant growth. Local calcrete development reflects the calcareous groundwater environment.	Moderate to high archaeological sensitivity. Watercourses and their associated alluvial corridors are primary landscape attractors in the semi-arid Barkly Tableland, providing the most reliable water sources outside of lake basins. Elevated channel margins, terraces and levee crests adjacent to active channels have the highest potential for camp sites, as they provide proximity to water while remaining above seasonal flood levels. Alluvial aggradation can bury and preserve occupation surfaces in stratigraphic sequence, potentially maintaining temporal separation between multiple occupation episodes constituting a rare preservation context in this landscape. However, active channel processes (bank erosion, flood scouring) can also transport artefacts into secondary contexts, producing mixed-age lag deposits of rolled and abraded stone artefacts within channel gravels. Riparian vegetation along watercourses provides shade, timber and plant food resources. Where alluvium is locally calcreted, cemented deposits may preserve artefact-bearing horizons but also reduce surface visibility. The braided stream channels noted in some ASRIS soil units indicate higher-energy fluvial environments where site reworking is more likely.

Name	Bioregion	Land_Systems	Geology Description	Archaeological Interpretation
[Qrc] **colluvium**	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Barkly 1 (also in Gulf Fall and Uplands); Barkly 2; Barkly 3; Beetaloo (also in Gulf Fall and Uplands); Creswell (also in Gulf Fall and Uplands); Joanundah; Pollyarra/Creswell; Wonorah/Barkly 1; Wonorah/Creswell (also in Gulf Fall and Uplands)	[Qrc] Quaternary colluvial deposits (sheetwash, talus, scree) on slopes below lateritic breakaways, mesa remnants and elevated surfaces. Derived from erosion of lateritic duricrust, siliceous duricrust and underlying bedrock; may incorporate reworked laterite and local calcrete. These colluvial aprons represent transitional zones between elevated landforms and the surrounding clay plains.	Moderate archaeological sensitivity. Colluvial aprons and slope deposits at the base of lateritic breakaways, mesa remnants and other elevated landforms occupy transitional positions in the landscape that are archaeologically significant for several reasons. The base-of-slope setting provides proximity to both elevated ground (offering shelter, shade and vantage) and lower-lying areas where water may collect after rain. Colluvial processes can bury occupation surfaces, preserving them below the modern surface, but slopewash can also transport artefacts downslope from primary contexts on elevated landforms, producing mixed-age assemblages in secondary positions. Reworked laterite and calcrete within the colluvium may include culturally modified stone, and the colluvial matrix itself may contain artefacts redeposited from higher in the landscape.
[Qt] **lake deposits**	Mitchell Grass Downs; Sturt Plateau	Austral; Barkly 1 (also in Gulf Fall and Uplands); Beetaloo (also in Gulf Fall and Uplands); Wonardo; Wonorah	[Qt] Quaternary lake and swamp deposits associated with the large intermittent freshwater lakes of the Barkly Internal Drainage Basin. These lakes flood to cover extensive areas in wet seasons, fed by short rivers and indistinct drainage lines from the surrounding Tableland. Muds, silts and evaporites accumulate in these depressions, with minor limestone precipitation. Associated vegetation typically includes Coolibah (Eucalyptus microtheca) low open-woodland and Chenopodium auricomum (Bluebush) shrubland swamps.	High archaeological sensitivity, particularly at lake margins and on elevated ground immediately adjacent to lake basins. Intermittent freshwater lakes of the Barkly Internal Drainage Basin represent critical seasonal water sources in an otherwise water-limited landscape, and would have been primary attractors for Aboriginal occupation during and after wet season filling. The margins of these water bodies , particularly slightly elevated ground overlooking lake basins , have the highest potential for camp sites, processing areas and hearth features. Fringing Coolibah woodland and Bluebush shrubland provide shade, timber for implements and shelter construction, and plant food resources absent from the surrounding treeless grasslands. Lacustrine sediments may bury and preserve occupation evidence below the modern surface, but the waterlogged interior of lake basins is less likely to contain in situ occupation deposits than adjacent elevated margins. Faunal resources (waterbirds, fish, freshwater mussels, macropods attracted to water) would concentrate around these features.

4.3 ECOLOGY

The ecological setting of the NEA Pipeline Assessment Corridor is directly relevant to understanding past Aboriginal land use, as the distribution of plant and animal resources shaped patterns of occupation, movement, and subsistence. The following section summarises the ecology of each bioregion within the NEA Assessment Areas, with emphasis on vegetation communities and resource species relevant to Aboriginal cultural heritage. The ecological communities in and around the NEA Assessment Areas are shown in Appendix 1 and discussed in Table 11.

4.3.1 Sturt Plateau Ecology (Collection Header and NEA Pipeline KP 0 to KP 67)

The Sturt Plateau bioregion is characterised by a deeply lateritised Tertiary erosion surface forming an extensive plateau. The vegetation is dominated by eucalypt woodlands over perennial grass understorey, with greater structural complexity than the bioregions to the south. Darwin stringybark (*Eucalyptus tetrodonta*) and red bloodwood (*Corymbia dichromophloia*) form the characteristic canopy on plateau positions (Day et al. 1985), while Darwin box (*Eucalyptus tectifi*ca) is prevalent across the broader bioregion. Lancewood (*Acacia shirleyi*) open forests occupy lateritic breakaways and upper slopes. Coolibah–guttapercha woodlands occupy drainage lines, featuring coolibah (*E. microtheca*) and guttapercha (*Atalaya hemiglauca*) with diverse forb assemblages. Paperbark (Melaleuca spp.) woodlands occupy drainage lines and seasonally inundated depressions.

Vertebrate species richness on the Sturt Plateau is notably higher than on the Mitchell Grass Downs, reflecting the greater habitat structural diversity and resource availability provided by the woodland communities (Fisher 2001).

Aboriginal resource use[3]*:* Soft spinifex (T. pungens) provided thermoplastic resin for tool manufacture (Latz 1995). Northern ironwood (*Erythrophleum chlorostachys*) provided dense timber for implements including digging sticks, fighting sticks, and fire-hardened spear points (Latz 1995). Coolibah seeds were ground into edible paste, and coolibah bark provided materials for containers and shelter (O'Connell et al. 1983). Paperbark sheeting from Melaleuca species furnished materials for wrapping food, constructing temporary shelters, and manufacturing containers (Latz 1995). Hollow-bearing trees supplied nest sites for possums and arboreal mammals, which were hunted as food sources.

4.3.2 Gulf Fall and Uplands Ecology (NEA Pipeline KP 67 to KP 140)

The Gulf Fall and Uplands bioregion occupies transitional terrain between the Sturt Plateau and the Mitchell Grass Downs (Aldrick and Wilson 1990). The IBRA bioregion description characterises it as undulating terrain with scattered low, steep hills on Proterozoic and Palaeozoic sedimentary rocks, often overlain by lateritised Tertiary material, supporting eucalypt woodland with a spinifex or tussock grass understorey (DEE 2008b).

Vegetation is strongly influenced by soil type. Mitchell grass grasslands occupy clay-textured substrates, representing southern extensions of the cracking clay biome. Snappy gum and silver box

[3] Consultation with Traditional Owners would be required to better understand Traditional use of the ecological recourses through the Assessment Areas.

woodlands dominate lateritic rises and gravelly plains over hummock grass understorey. Coolibah–bauhinia woodlands occupy clay plains and drainage depressions, representing transitional assemblages combining elements from Mitchell grassland and higher-rainfall woodland floras. Lancewood (*Acacia shirleyi*) communities become increasingly prominent in eastern portions on well-drained red earth soils (Woinarski and Fisher 1995).

Aboriginal resource use: Soft spinifex (Triodia pungens) provided thermoplastic resin used as a cementing agent for hafting stone tools and manufacturing composite implements (Latz 1995). Acacia species including lancewood and bramble wattle contributed seeds, wood for implements, and shelter materials (Latz 1995). Bauhinia (*Lysiphyllum cunninghamii*) seeds were eaten (Latz 1995). Eucalypt species provided wood for fire-making, bark for containers and shelters, and habitat for edible insect larvae.

4.3.3 Mitchell Grass Downs Ecology (NEA Pipeline KP 140 to KP 582)

The Mitchell Grass Downs bioregion is dominated by the treeless Mitchell grass (Astrebla spp.) grasslands plains on deep grey clays, with *A. pectinata* occupying approximately 56,200 km² as pure or near-pure stands (Fisher 2001). Mitchell grasses are deeply rooted, long-lived perennial grasses that exhibit drought tolerance through deep root systems and rapid vegetative regeneration following rainfall (Fisher 2001; DEE 2008a). Coolibah (*Eucalyptus microtheca*) low open-woodlands occupy drainage depressions and poorly drained plains, particularly within the Barkly Lakes province, with understorey comprising Mitchell grasses and bluebush (*Chenopodium auricomum*) in saline microsites (Fisher et al. 2002). Gidgee (*Acacia georginae*) woodlands dominate calcareous substrates in the Georgina Limestone province. Residual lateritic rises within Wonorah and Wonorah/Barkly 1 land systems support eucalypt woodlands, including snappy gum (*Eucalyptus leucophloia*) and silver box (*E. pruinosa*) over soft spinifex (*Triodia pungens*), representing erosional remnants of formerly extensive Tertiary lateritic surfaces (Fisher 2001).

Vertebrate diversity is relatively low compared to the bioregions to the north, reflecting the structural simplicity of the treeless grasslands and the limited habitat variety on the cracking clay plains (Fisher 2001; Fisher et al. 2002). Wetland systems within the Barkly Lakes province, including the Lake Sylvester system, support nationally significant waterbird populations during flooding events (Baker et al. 2002; DEE 2008a).

Aboriginal resource use: Bramble wattle (*Acacia victoriae*) seeds were roasted to remove toxic compounds, then ground with stone implements to produce flour (O'Connell et al. 1983). Coolibah seeds were ground into paste without prior treatment, and coolibah wood was used for implements, shelter construction, and bark for various applications (O'Connell et al. 1983). Resinous exudates from several acacia species furnished adhesives for hafting stone implements to wooden handles (Latz 1995). Native grass seeds were harvested in abundance and ground into flour for use and trade.

Table 11: National Vegetation Information System Explanatory Table

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
Gidgee (Calcareous)	Mitchell Grass Downs	Austral; Georgina; Kallala; Wonardo	Gidgee (*Acacia georginae*) forms a low open woodland canopy over a mid-height sparse shrubland and a low open tussock grassland dominated by barley Mitchell grass (*Astrebla* pectinata) and button grass (Dactyloctenium radulans), though co-dominance may vary in disturbed or more open areas. Other characteristic species include *Acacia stowardii*, dead finish (*Acacia tetragonophylla*) and five-minute grass (*Tripogon loliiformis*). The community occurs on clay loam to heavy clay calcareous soils, often with occasional limestone outcrops, in the Georgina Limestone province and south-eastern margins of the *Barkly Tableland*. *A. georginae* forms virtually pure canopy stands over an understorey floristically similar to adjacent Mitchell grasslands, with *A. pectinata* and *Dactyloctenium* radulans as principal ground-layer species. Soils are generally characterised by less strongly cracking than typical Barkly vertosols, with fewer and narrower cracks (Fisher 2001). An arid-zone floristic element (e.g. *Sclerolaena spp*., *Ptilotus obovatus*, *Enchylaena tomentosa*) is more prominent here than in the treeless Mitchell grasslands to the north, becoming most evident on loamier calcareous soils toward the southern bioregion margin. Gidgee woodland and Mitchell grassland form a mosaic in this zone, with woodland extent probably linked to lower rainfall and the presence of calcareous substrates derived from Cambrian limestone and dolomite. Tripogon loliiformis is a characteristic short-lived perennial grass of skeletal calcareous surfaces within this community. Sites in gidgee woodland tend to support higher species richness than open Mitchell grassland, including shrub and facultative perennial grass species absent from the treeless downs (Fisher 2001).	The dominant canopy species Acacia georginae produces poisonous seeds that were not eaten (Latz 1995; O'Connell et al. 1983), yet the tree was otherwise highly valued. Edible grubs were extracted from its roots and trunk, an edible resin was gathered from the trunk, and root shavings were boiled in water as a tea substitute (Latz 1995). The hard, slow-burning wood served as fuel and was used for boomerangs and throwing sticks (Latz 1995; O'Connell et al. 1983). Dead finish (*Acacia tetragonophylla*) produced limited seed; green seeds were cooked in the pod, and where plants were abundant dry seeds were also collected (Latz 1995). Grubs were taken from its roots and the hard, fine-grained wood was used for artefacts (Latz 1995). Elsewhere in Australia a bark decoction treated coughs, and droppings from finches' nests in the thorny shrub were considered medicinal (Latz 1995). In the ground layer, button grass (*Dactyloctenium radulans*) seed was processed by foot-threshing in the Boulia district of western Queensland, where collected seed was placed in a pit and trampled to separate grain from husk before winnowing and grinding into meal (Clarke 2007). This grass required more labour-intensive processing than many other seed species due to the pit-threshing step (O'Connell et al. 1983). The calcareous clay substrates and scattered woodland canopy concentrate resources around gidgee trunks, where grub-bearing roots, resin and shade co-occur, while the open grass layer between trees provides access to Dactyloctenium seed patches following seasonal rain.
Mitchell Grass (Grey Clay)	Gulf Fall and Uplands; Mitchell Grass Downs	Austral; Barkly 1 (also in Gulf Fall and Uplands); Barkly 2; Barkly 3; Creswell (also in Gulf Fall and Uplands); Georgina; Pollyarra/Creswell; Wonardo; Wonorah; Wonorah/Barkly 1; Wonorah/Creswell (also in Gulf Fall and Uplands); Yelvertoft (also in Gulf Fall and Uplands)	A treeless tussock grassland dominated by barley Mitchell grass (*Astrebla pectinata*) and Flinders grass (*Iseilema membranaceum, I. vaginiflorum*), with a patchy tall sparse shrubland of mimosa bush (*Acacia farnesiana*) and bramble wattle (*Acacia victoriae*). This is the most extensive vegetation type in the Mitchell Grass Downs bioregion, occurring on deep grey cracking-clay vertosols (self-mulching black soil) overlying calcareous Tertiary sediments and Cambrian carbonate rocks. *A. pectinata* and *A. elymoides* co-dominate across the Barkly Tableland, with A. pectinata most prevalent in the drier south-east and A. elymoides in slightly moister microhabitats (Fisher 2001; Wilson et al. 1990). *Iseilema spp*. are the characteristic annual grasses and may become locally dominant, particularly near watering points or after prolonged grazing removes perennial tussocks. Soils crack widely upon drying and have a loose self-mulching surface; they are neutral to alkaline, calcareous, and commonly deeper than 1 m, with gilgai micro-relief (Hubble et al 1983). The general absence of trees is attributed to to a combination of factors including mechanical shearing of roots by soil cracking and the inability of seedlings to sequester soil moisture, seasonal water availability, and disturbance regimes that limit tree establishment (Groves & Williams 1981; Orr & Holmes 1984). Mitchell grasses are deeply rooted, long-lived C4 perennial grasses; tussocks are typically 50–60 cm tall with leafy crowns 30–60 cm in diameter. The climate is semi-arid and strongly seasonal, with almost all rainfall between November and March and high inter-annual variability (CV ~50%). A sparse shrub layer of A. farnesiana and A. victoriae may be patchily present, presumably in response to subtle edaphic variation (Fisher 2001).	The sparsely shrubbed Mitchell grass plains offer a limited woody plant resource base but contain two acacias of ethnobotanical significance. Bramble wattle (*Acacia victoriae*) was a food source: green pods were lightly roasted before the seeds were eaten, while mature hard-coated seeds were parched, pounded with a hammerstone and ground into a paste (Latz 1995; O'Connell et al. 1983). A white trunk gum was also eaten, edible grubs were found in roots and trunk, and the wood was used for hunting spear blades (Latz 1995). A. victoriae is most common on river flats but also occurs on limestone and saline substrates, and its seeds ripen later than most other acacias, sometimes persisting on the bush for extended periods (Latz 1995). Mimosa bush (*Acacia farnesiana*), restricted to clayey soils near watercourses, was not generally eaten for its seed, but the wood served for axe handles and music sticks, and the large thorns were used as splinter-removal tools (Latz 1995; O'Connell et al. 1983). The deep cracking-clay vertosols constrain root-vegetable harvesting owing to the mechanical difficulty of digging in heavy clay, and the absence of trees limits firewood, shade and grub-bearing root systems. Ethnobotanical resources on these plains would have been concentrated along subtle drainage features where A. farnesiana and A. victoriae form sparse shrub patches.
Snappy Gum (Lateritic)	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Barkly 1 (also in Gulf Fall and Uplands); Beetaloo (also in Gulf Fall and Uplands); Pollyarra/Creswell; Wonorah/Barkly 1; Wonorah/Creswell (also in Gulf Fall and Uplands);	Snappy gum (*Eucalyptus leucophloia*) forms a low open woodland over a sparse to mid-dense hummock grassland of curly spinifex (*Triodia bitextura*) and soft spinifex (*Triodia pungens*), with a mid-stratum of conkerberry (*Carissa lanceolata*) and quinine bush (*Petalostigma quadriloculare*). Silver box (*Eucalyptus pruinosa*) and desert bloodwood (*Eucalyptus terminalis*) are common canopy associates, and ribbon grass (*Chrysopogon fallax*) occurs as a tussock component among the hummock grasses. The community occurs on lateritic surfaces, typically remnant Tertiary land surfaces with pisolithic ironstone rubble and shallow gravelly soils. These lateritic rises are remnant mounds preserved above the surrounding cracking-clay or alluvial landscapes, representing a deeply weathered Tertiary erosion surface that pre-dates the deposition of the surrounding vertosols. Soils are sandy to gravelly with extremely low fertility and moisture-holding capacity (Day et al. 1985). The	Soft spinifex (*Triodia pungens*) was the primary source of a thermoplastic resin used as a cementing agent across central Australia. The resin was obtained by pounding portions of the plant on a hard surface, winnowing and yandying the dislodged material to remove plant fragments, then heating it until it coagulated and compressing it with a hot stone or saliva-wetted fingers (Latz 1995; Clarke 2007). The resulting black substance hafted stone blades onto adzes, axes and spearthrowers, moulded ornaments, and repaired implements generally (Clarke 2007; O'Connell et al. 1983). Resin of lower bonding strength was also recovered from Triodia-associated anthills (Latz 1995). Whole plants served for shelters and windbreaks, leaf bunches functioned as torches, and the burnt remains provided black pigment for body and artefact decoration (Latz 1995). Among the Warlpiri, resinous antbed was heated, ground to powder, wetted and swallowed to treat diarrhoea, or rubbed onto infants for various ailments (Latz 1995). Conkerberry (Carissa lanceolata) produced sweet black berries eaten fresh or dried and reconstituted in water; its fine-grained wood was used for spear-heads (Latz 1995; O'Connell et al. 1983). Orange inner bark from the roots was soaked in water to produce a medicinal wash for skin and eye conditions, and the thorns were used to cure warts (Latz 1995). Snappy gum (*Eucalyptus leucophloia*) yielded a medicinal wash from a decoction of the bright yellow inner bark, and its dead wood was favoured as firewood

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
		Yelvertoft (also in Gulf Fall and Uplands)	presence of Chrysopogon fallax amongst the Triodia reflects the transitional position between lateritic uplands and clay plains. Narrow bands of lancewood (A. shirleyi) open forest may occur on associated lateritic breakaways (Wilson et al. 1990).	for the ease with which it breaks into convenient portions (Latz 1995). Desert bloodwood (*Eucalyptus terminalis*) produced edible insect galls (bush coconuts): mature galls were broken open to reveal a grub and a white edible flesh lining the inner wall (Latz 1995; O'Connell et al. 1983). The sap tanned kangaroo skin waterbags, and resin mixed with water and fat served as a medicinal ointment (O'Connell et al. 1983). Ribbon grass (*Chrysopogon fallax*) had medicinal applications among the Alyawarra, who crushed the swollen roots with water for use as a body wash (Latz 1995). The lateritic substrate, with its shallow gravelly soils, limits root-vegetable and tuber harvesting but concentrates spinifex resin resources across extensive hummock grasslands, while scattered eucalypt canopy trees provide firewood, medicine and gall-based foods.
Coolibah - Swamp Box	Mitchell Grass Downs	Barkly 1 (also in Gulf Fall and Uplands)	Coolibah (*Eucalyptus microtheca*) and swamp box (*Lophostemon grandiflorus*) form a low open woodland over a mid-height sparse shrubland of whitewood (*Atalaya hemiglauca*) and, in disturbed or edge situations, sickle-leaf wattle (*Acacia holosericea*) and with a tussock grassland of silky browntop (*Eulalia aurea*) and ribbon grass (Chrysopogon fallax). Mitchell grass (*Astrebla spp*.) and supplejack (*Ventilago viminalis*) are also characteristic. The community occupies flat to gently sloping low-lying floodplains and fringing watercourses, on heavy grey or brown cracking clays subject to intermittent flooding. The ground layer includes *Astrebla spp*. and *Chrysopogon fallax*, with Eulalia aurea in moister positions. This community sits in a wetter landscape position than the treeless Mitchell grasslands and represents a transitional zone between the upland downs and drainage-associated woodlands. Lophostemon grandiflorus is associated with the northern, higher-rainfall margins of the bioregion (Perry & Christian 1954; Wilson et al. 1990).	Coolibah (Eucalyptus microtheca) was a versatile resource tree. Its fine seeds, classified as 'soft', were ground with water without prior parching to produce an edible paste (O'Connell et al. 1983). Seed was collected by breaking branches and placing them on a claypan to dry for several days; the liberated seed was then winnowed, soaked overnight, rubbed clean and ground on a millstone (Clarke 2007). Lerp scale on the leaves was eaten without preparation (O'Connell et al. 1983). The hard, tough wood was used for deep bowls employed as shovels (O'Connell et al. 1983), and the bark was burnt to produce ash for pituri preparation (Clarke 2007; O'Connell et al. 1983). Sickle-leaf wattle (Acacia holosericea) produced small seeds in large quantities during good seasons, easily collected over up to a month as they matured progressively (Latz 1995). The seeds were eaten, grubs were obtained from the roots, honeydew from lac scale infections was consumed, and the arils produced a red dye when soaked in water (Latz 1995). Whitewood (Atalaya hemiglauca) harboured edible witchetty grubs in trunk and roots, and a white trunk sap was also eaten (Latz 1995; O'Connell et al. 1983). The soft white wood was favoured for ornamental shavings used in ceremonies (Latz 1995). Supplejack (Ventilago viminalis) yielded a sweet white gum from insect wounds in the trunk during spring; small spears were made from its stems, the bark was burnt for pituri ash, and native bee colonies were sometimes found in trunk hollows (Latz 1995). Ribbon grass (Chrysopogon fallax) had medicinal applications among the Alyawarra, who crushed the swollen roots with water for use as a body wash, possibly with laxative properties; the stems were used as children's play spears (Latz 1995). The floodplain position and proximity to watercourses make this community a convergence point for multiple resource types: tree-based foods (seed, gum, lerp, grubs), material culture items (bowls, spears, pituri ash) and water access.
Silver Box - Bauhinia	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Barkly 1 (also in Gulf Fall and Uplands); Beetaloo (also in Gulf Fall and Uplands); Creswell (also in Gulf Fall and Uplands); Pollyarra/Creswell; Wonorah/Barkly 1; Wonorah/Creswell (also in Gulf Fall and Uplands)	Silver box (*Eucalyptus pruinosa*) and bauhinia (*Lysiphyllum cunninghamii*) form a low open woodland over a mid-height open shrubland of conkerberry (*Carissa lanceolata*) and turpentine wattle (*Acacia lysiphloia*), with a hummock grassland of soft spinifex (*Triodia pungens*) and a tussock component of ribbon grass (*Chrysopogon fallax*). Whitewood (*Atalaya hemiglauca*), desert bloodwood (*Corymbia opaca*) and nine-awn grass (*Enneapogon polyphyllus*) are also characteristic. The community occurs on lateritic red earths or sandy yellow earths, typically on rises and undulating terrain peripheral to the cracking-clay plains. It is widespread on non-clay substrates within and around the margins of the Mitchell Grass Downs, forming mosaics with both cracking-clay grasslands and lateritic snappy gum communities. Corymbia opaca is a common canopy associate and Atalaya hemiglauca a frequent mid-storey element (Fisher 2001).	Soft spinifex (*Triodia pungens*) was the primary source of thermoplastic resin essential to Aboriginal technology, used for hafting tula adzes and other stone tools, repairing implements and bonding composite objects (Latz 1995). The resin was collected by pounding portions of the plant on a hard surface, winnowing and yandying to remove debris, then heating until it coagulated and could be compressed and moulded (Latz 1995). Whole spinifex plants were also used for shelters, windbreaks, wrapping sacred objects, and as torches; the burnt remains served as a black colouring agent (Latz 1995). Conkerberry (*Carissa lanceolata*) provided sweet berries, fine-grained wood for spear-heads, and a root bark medicinal wash for skin and eye conditions (Latz 1995; O'Connell et al. 1983). Whitewood (*Atalaya hemiglauca*) yielded witchetty grubs, edible sap, edible flowers (O'Connell et al. 1983) and soft white wood for ceremonial ornaments (Latz 1995). Turpentine wattle (*Acacia lysiphloia*) seeds were eaten (O'Connell et al. 1983), and its hard wood was comparable to A. monticola, used by the Pintupi for hunting spear barbs (Latz 1995). Eucalypt kino from the canopy species would have been available for medicinal washes and eye treatments (Clarke 2007; Clarke 2008). The mixed hummock-tussock ground layer and open shrub stratum create a mosaic of resource patches, with spinifex resin collection concentrated in the hummock grass zones and fruit and grub procurement focused on the shrub and tree components.
Lancewood Open Forest	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands)	Lancewood (*Acacia shirleyi*) forms a low open forest over a sparse tussock grassland of Eriachne ciliata and Schizachyrium fragile, with ribbon grass (*Chrysopogon fallax*) also present. The community occurs on lateritic breakaways and gravelly lateritic soils of the Sturt Plateau. Lancewood forests are a biogeographically distinctive community restricted to the residual lateritic Sturt Plateau and adjacent areas; the majority of characteristic plant species are associated with these communities (Woinarski & Fisher 1995). A. shirleyi forms dense canopy stands on lateritic substrates where the Tertiary erosion surface is well preserved. Soils are well-drained, gravelly lithosols (Aldrick & Wilson 1990). This open-forest variant lacks the bullwaddy (*Macropteranthes kekwickii*) co-dominant found in other lancewood community types.	Lancewood (Acacia shirleyi) dominates the canopy but has no species-specific ethnobotanical records. By analogy with other hard-wooded acacias, its dense timber would be consistent with selection for weapons and heavy implements such as clubs, fighting staves and digging sticks, as Aboriginal toolmakers favoured dense wattle woods for striking weapons (Clarke 2007; Latz 1995). Many acacia species produce edible gum exudates, often from insect bore-holes, consumed as a carbohydrate source (Latz 1995; Clarke 1986). Ribbon grass (Chrysopogon fallax) roots were recognised by the Alyawarra as medicinal when crushed with water and used as a body wash, and possibly also as a laxative; the stems served as children's play spears (Latz 1995). The open forest structure with a grassy understorey of Eriachne ciliata and Schizachyrium fragile provides ground-layer seed resources broadly consistent with the grass seed harvesting economy documented across inland Australia (Clarke 2007).
Lancewood Kekwick (Low)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Joanundah	Lancewood (*Acacia shirleyi*) and bullwaddy (*Macropteranthes kekwickii*) form a low woodland over a sparse tussock grassland of Eragrostis cumingii, Mnesithea formosa and Paspalidium rarum. The lower stature probably reflects shallower or more skeletal soils on the deeply laterised Tertiary surface of the Sturt Plateau. M. kekwickii is a distinctive small tree largely restricted to the Sturt Plateau region (Fisher 2001). The community represents part of a mosaic on the lateritic surface that includes eucalypt woodlands on deeper soils and lancewood open forest on breakaway edges.	The grass understorey is the primary source of documented botanical resources. Eragrostis eriopoda, a congener of the ground-layer species *E. cumingii*, was one of the most commonly utilised seed grasses in central Australia, ground on stone slabs to produce meal for baking (Latz 1995; Clarke 2007). Paspalidium rarum belongs to a grass group closely related to Panicum, species of which — particularly native millet (*P. decompositum*) — were among the most widely harvested seed grasses across the arid zone (Latz 1995; Clarke 2007). The low woodland structure provides reduced canopy cover, increasing light penetration to the ground layer and potentially enhancing grass seed productivity. The reduced stature of the canopy trees limits the available timber resource relative to taller lancewood–kekwick forms.

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
Lancewood Kekwick (Rocky)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Joanundah	Lancewood (*Acacia shirleyi*) and bullwaddy (*Macropteranthes kekwickii*) form a mid-height open forest with a tall open shrubland of turpentine wattle (*Acacia lysiphloia*) and white currant (*Flueggea virosa*), over a tussock grassland of ribbon grass (*Chrysopogon fallax*) and Enneapogon oblongus. Variable-barked bloodwood (*Corymbia dichromophloia*) is a common canopy associate, and wire grass (*Aristida pruinosa*) occurs in the ground layer. This variant occupies the rockiest positions within the lateritic landscape, typically on breakaway edges and slopes where laterite rubble and outcrop are prominent. Soils are well-drained, gravelly lithosols (Aldrick & Wilson 1990). The rocky substrate provides structural microhabitat diversity not present on smoother lateritic surfaces.	The ethnobotanical uses of the key species match those of the standard lancewood–kekwick type: turpentine wattle (A. lysiphloia) yielded edible seed, root grubs and medicinal smoking and infusion treatments (Latz 1995); variable-barked bloodwood (*C. dichromophloia*) produced edible bush coconut galls (Latz 1995); and ribbon grass (*C. fallax*) provided medicinal root washes (Latz 1995). The rocky substrate introduces additional resource dimensions. Gravelly scree slopes and outcrops are the preferred habitat of *A. lysiphloia* (Latz 1995), so turpentine wattle may be particularly well represented in this variant. Rocky ground also provides natural surfaces for seed grinding; while portable grindstones were carried, flat rock surfaces were used opportunistically for processing grass and acacia seed (Clarke 2007). The hard wood of A. monticola, closely allied to A. lysiphloia and found on rocky ground, was prized by Pintupi people for spear barbs (Latz 1995). Rocky substrates may limit grass understorey and tuber-producing species, but crevices and sheltered overhangs near lancewood–kekwick communities would have provided shelter and storage locations.
Lancewood-Kekwick	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Joanundah	Lancewood (*Acacia shirleyi*) and bullwaddy (*Macropteranthes kekwickii*) form a mid-height open woodland with a tall open shrub layer of turpentine wattle (Acacia lysiphloia) and white currant (*Flueggea virosa*), over a tussock grassland of ribbon grass (*Chrysopogon fallax*) and Enneapogon oblongus. Variable-barked bloodwood (*Corymbia dichromophloia*) and wire grass (*Aristida pruinosa*) are also present. This is the typical form of the lancewood–kekwick community, occurring on deeply laterised Tertiary surfaces of the Sturt Plateau on gravelly lateritic soils. The community is part of a distinctive biogeographic assemblage restricted to the Sturt Plateau, which forms one of three centres of regional endemism in the NT (Fisher 2001). The open woodland structure indicates moderately deep lateritic soils with moisture availability sufficient to support both tree canopy and tussock grass ground layer.	Turpentine wattle (*Acacia lysiphloia*) had documented food and medicinal uses: the seed was eaten, though sticky pods made collection difficult unless seed was gathered after falling, and edible grubs were found in the roots (Latz 1995). The plant was used to smoke mothers and babies after birth or to fumigate sick infants, and an infusion treated itchy skin (Latz 1995). The closely related *A. monticola*, not always distinguished from *A. lysiphloia* by Aboriginal users, had hard wood prized for spear barbs (Latz 1995). Variable-barked bloodwood (Corymbia dichromophloia) produced bush coconut galls eaten throughout central Australia — the mature gall contained an edible grub and a white inner flesh resembling coconut (Latz 1995). Bloodwood sap tanned kangaroo skin waterbags (O'Connell et al. 1983). Ribbon grass (*Chrysopogon fallax*) provided medicinal root material and children's play spear stems (Latz 1995), while wire grass (*Aristida pruinosa*) belongs to the mulga grass group whose seeds were ground into meal for baking (Latz 1995; Clarke 2007). The open woodland structure with a shrub layer and tussock grass understorey concentrates botanical resources across several strata, with canopy species providing timber, gum and insect foods, and ground-layer grasses offering seed and medicinal material.
Lancewood Kekwick (Closed)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands)	Lancewood (*Acacia shirleyi*) and bullwaddy (*Macropteranthes kekwickii*) form a mid-height woodland with a tall open shrubland of turpentine wattle (*Acacia lysiphloia*) and white currant (*Flueggea virosa*), over a tussock grassland of ribbon grass (*Chrysopogon fallax*) and Enneapogon oblongus. Variable-barked bloodwood (*Corymbia dichromophloia*) and wire grass (*Aristida pruinosa*) are also present. This is the closed canopy variant of the lancewood–kekwick community, typically occupying the most favourable positions on the lateritic surface where soil depth and moisture are greatest. Ground-layer cover may be reduced under the denser canopy. Dense lancewood–bullwaddy thickets are a visually distinctive feature of the Sturt Plateau landscape, widespread between Katherine and Larrimah (Wilson et al. 1990).	Turpentine wattle (Acacia lysiphloia) seed was eaten and edible grubs were collected from its roots (Latz 1995). The plant had medicinal applications: it was used to smoke mothers and babies after birth, and an infusion treated itchy skin (Latz 1995). Variable-barked bloodwood (*Corymbia dichromophloia*) yielded bush coconut galls containing edible grubs and white fleshy material (Latz 1995), and its sap tanned kangaroo skin waterbags (O'Connell et al. 1983). Ribbon grass (*Chrysopogon fallax*) roots were used medicinally as a body wash by the Alyawarra (Latz 1995). The denser canopy closure would reduce grass understorey productivity, limiting the availability of ground-layer seed resources from species such as wire grass (*Aristida pruinosa*), whose congeners were ground for food across central Australia (Latz 1995; Clarke 2007). Conversely, the closed canopy would increase shade, potentially favouring gum exudates on acacia trunks and concentrating insect gall formation on bloodwood trees.
Bloodwood Box Open Forest	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands)	Variable-barked bloodwood (*Corymbia dichromophloia*), rusty bloodwood (*Eucalyptus ferruginea*) and snappy gum (*Eucalyptus leucophloia*) form a low open forest with a sparse shrubland of paperbark (Terminalia canescens) and butterfly bush (Petalostigma pubescens), over a tussock grassland of ribbon grass (*Chrysopogon fallax*) and curly spinifex (*Triodia bitextura*). Northern ironwood (*Erythrophleum chlorostachys*) is a common mid-canopy component, and emu-berry (*Grewia retusifolia*) is present in the shrub layer. The community occurs on gently sloping lateritic plateaux of the Sturt Plateau on moderately deep, well-drained red earth soils. It forms part of the eucalypt woodland mosaic occupying positions with deeper soils than the lateritic breakaways supporting lancewood communities. The open-forest structure indicates relatively productive lateritic soils.	Northern ironwood (*Erythrophleum chlorostachys*) provided one of the densest and hardest timbers available in tropical and semi-arid woodland, selected for digging tools and harpoon points (Clarke 2007). Asian seafarers visiting the northern Australian coast also collected ironwood timber for construction and boat repair (Clarke 2007). Bloodwood species (*Corymbia spp*.) yielded kino applied as a wash to sore eyes, lips, wounds, burns and sores, and sometimes diluted and drunk for sore throats (Latz 1995). Bloodwood sap also served as a tanning agent for kangaroo skin waterbags (Latz 1995; O'Connell et al. 1983). Where present, bloodwood trees hosted bush coconut galls containing an edible grub and white inner flesh, and their hollows frequently sheltered native bee colonies whose honey was a prized food (Latz 1995). Curly spinifex (*Triodia bitextura*) belongs to the non-resinous hard spinifex group and was used primarily for shelters and as a fire vector, lacking the resin yield of soft spinifex (Latz 1995). The open forest structure, combining dense canopy timber species, kino-producing bloodwoods and ironwood, concentrated durable tool-making materials and medicinal resources, though ground-layer plant foods are limited compared to communities with soft spinifex or more diverse forb layers.
Bloodwood Box (Tussock)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands)	Variable-barked bloodwood (*Corymbia dichromophloia*), rusty bloodwood (*Eucalyptus ferruginea*) and snappy gum (*Eucalyptus leucophloia*) form a low open woodland with a sparse shrubland of paperbark (*Terminalia canescens*) and butterfly bush (Petalostigma pubescens), over a tussock grassland of ribbon grass (*Chrysopogon fallax*) with curly spinifex (*Triodia bitextura*). Northern ironwood (*Erythrophleum chlorostachys*) and emu-berry (*Grewia retusifolia*) are also present. This tussock grass variant of the bloodwood–box community indicates soils with slightly greater clay content or moisture availability than the hummock grass–dominated form. It occurs on lateritic red earth soils of the Sturt Plateau, with Terminalia canescens and Petalostigma pubescens forming a sparse mid-stratum.	Northern ironwood (*Erythrophleum chlorostachys*) provided dense timber for digging tools and harpoon points (Clarke 2007), while bloodwood species (*Corymbia dichromophloia* and related taxa) yielded medicinal kino applied to wounds, sores and eyes, and sap for tanning skin waterbags (Latz 1995; O'Connell et al. 1983). Bush coconut galls on bloodwoods were eaten for their grub and white inner flesh, and native bee colonies in bloodwood hollows supplied honey (Latz 1995). Emu-berry (*Grewia retusifolia*) produced small edible fruits. The tussock grass ground cover provides less resinous material than spinifex-dominated communities but would have carried fire effectively, and the open ground layer would have facilitated access to tree-based resources including kino, galls and timber.

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
Bloodwood Box (Gravelly)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands)	Variable-barked bloodwood (*Corymbia dichromophloia*), rusty bloodwood (*Eucalyptus ferruginea*) and snappy gum (*Eucalyptus leucophloia*) form a low woodland with a sparse shrubland of paperbark (*Terminalia canescens*) and butterfly bush (*Petalostigma pubescens*), over a tussock grassland of ribbon grass (*Chrysopogon fallax*) and curly spinifex (*Triodia bitextura*). Northern ironwood (*Erythrophleum chlorostachys*) and emu-berry (*Grewia retusifolia*) are also characteristic. This gravelly soil variant occurs on lateritic surfaces with coarser soil texture and better drainage than the tussock or open-forest variants. Gravelly rises within the Sturt Plateau landscape are areas of relatively high plant richness and structural diversity, with bare stony patches, short grasses and annual herbs, scattered shrubs, and dense perennial grasses in gilgai micro-relief (Fisher 2001).	Northern ironwood (*Erythrophleum chlorostachys*) was a source of dense, heavy timber selected for digging tools and harpoon points, and was also collected by Asian visitors for construction (Clarke 2007). Bloodwood species produced kino used medicinally as a wash for wounds, burns and sore eyes, and as a drink for sore throats (Latz 1995). Bloodwood sap served as a tanning agent for kangaroo skin waterbags (O'Connell et al. 1983). Bush coconut galls and native bee colonies in bloodwood hollows were food sources (Latz 1995). Curly spinifex (*Triodia bitextura*) belongs to the non-resinous hard spinifex group, used for shelters and windbreaks but not yielding adhesive resin (Latz 1995). Emu-berry (*Grewia retusifolia*) produced edible fruits. The gravelly substrate may have limited root foods and tubers compared to deeper soil profiles, concentrating the ethnobotanical utility of this community in its canopy and sub-canopy timber, kino and fruit resources.
Eucalypt Woodland (Spinifex)	Gulf Fall and Uplands; Mitchell Grass Downs; Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Pollyarra/Creswell; Wonorah/Creswell (also in Gulf Fall and Uplands); Yelvertoft (also in Gulf Fall and Uplands)	Snappy gum (*Eucalyptus leucophloia*), silver box (Eucalyptus pruinosa) and desert bloodwood (*Eucalyptus terminalis*) form a low woodland over a sparse shrubland of conkerberry (Carissa lanceolata) and quinine bush (Petalostigma quadriloculare), with a low open hummock grassland of curly spinifex (Triodia bitextura) and soft spinifex (Triodia pungens). Ribbon grass (Chrysopogon fallax) occurs as a tussock component. The community occurs on lateritic surfaces with sandy or gravelly soils of extremely low fertility and moisture-holding capacity (Day et al. 1985). The woodland structure indicates slightly deeper soils or more favourable moisture conditions than the open woodland snappy gum community. These hummock grass communities on lateritic substrates support a vertebrate fauna distinct from the cracking-clay grasslands, with higher species richness particularly among reptiles and mammals (Fisher 2001).	A decoction of the bright yellow inner bark of snappy gum (E. leucophloia) was used as a medicinal wash, though reports conflict on whether the solution was also taken internally (Latz 1995). Snappy gum dead wood breaks readily into convenient portions and was favoured as firewood (Latz 1995). Desert bloodwood (*E. terminalis*) provided bush coconut galls, flower honey, native bee colonies in hollow trunks, kino for medicinal application to sores, eyes, burns and wounds, red sap for tanning waterbags, and wood for bowls and implements (Latz 1995). Soft spinifex (Triodia pungens) was the primary source of spinifex resin, an essential thermoplastic adhesive for hafting stone tools, constructing and repairing implements, and bonding composite objects; collection involved pounding, winnowing, yandying and heat-treatment (Latz 1995). Spinifex plants also served for shelters, windbreaks, wrapping sacred objects, and as torches; the burnt remains provided black body-paint pigment (Latz 1995). Among the Warlpiri, resinous antbed was burnt, ground, wetted and swallowed for diarrhoea or rubbed onto babies, and the acrid smoke was also considered healing (Latz 1995). Conkerberry (Carissa lanceolata) contributed sweet berries, spear-head wood and a root-bark medicinal wash for skin and eye conditions (Latz 1995; O'Connell et al. 1983). Ribbon grass (Chrysopogon fallax) was used medicinally among the Alyawarra (O'Connell et al. 1983). The lateritic substrate and gravelly soils would have limited tuber resources, directing foraging toward the tree canopy for grubs, galls, honey, kino and bark medicine, and toward the hummock grass layer for resin procurement.
Coolibah Guttapercha	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Joanundah	Coolibah (*Eucalyptus microtheca*) and guttapercha (*Excoecaria parvifolia*) form a low open woodland, with whitewood (*Atalaya hemiglauca*) as a secondary canopy element, over a mid-height tussock grassland of Flinders grass (*Iseilema vaginiflorum*) and ribbon grass (*Chrysopogon fallax*). Blue grass (*Dichanthium spp*.) and bauhinia (Lysiphyllum cunninghamii) are characteristic associates. The community occupies flat to gently sloping low-lying floodplains with braided drainage lines, on heavy grey or brown clays that are intermittently flooded. Excoecaria may dominate in clumps along watercourses (Wilson et al. 1990). This community sits in the floodplain zone between elevated cracking-clay downs and more permanently waterlogged drainage depressions, forming complex mosaics with Mitchell grassland and Chrysopogon/Dichanthium grassland (Perry & Christian 1954).	Coolibah (*Eucalyptus microtheca*) was of considerable ethnobotanical breadth. The seeds were an important food where the tree was abundant; seed-laden branches were broken off and dried on a hard surface for several days, after which seeds were gathered, cleaned, ground to a paste and eaten raw or cooked (Latz 1995). Because flowering could occur even in dry conditions and different trees seeded at different times, coolibah seeds were available for extended periods and were often obtainable when other seed foods were scarce (Latz 1995). Edible grubs were found in the wood, hollow trunks were favoured sites for native bee colonies, and lerp scale was eaten from the leaves (Latz 1995). The bark was burnt to produce ash for pituri, as it smoulders slowly and completely, leaving clean grey ash (Latz 1995). The wood was used for heavy implements including deep bowls fashioned as shovels (O'Connell et al. 1983), and water could be obtained from the roots (Latz 1995). Coolibah trees along creeks also hosted witchetty grubs in quantity, locatable by a red spot on the bark and extracted by opening the bark with an axe and using a hooked twig (Cane 1987). Whitewood (*Atalaya hemiglauca*) harboured edible witchetty grubs in trunk and roots, and a white trunk sap was also eaten (Latz 1995). Its soft white wood produced ceremonial ornaments with shavings shaped into decorative forms while still attached to the stick; detached shavings were mixed with blood for certain ceremonies (Latz 1995). The flowers were eaten without preparation (O'Connell et al. 1983). Conkerberry, bauhinia and ribbon grass occur in the understorey with uses as described for adjacent communities. The open woodland on periodically flooded clay soils concentrates resources along drainage lines, with coolibah providing a seasonally flexible seed supply and the tree hollows and root systems offering grub and water resources across dry periods.
Coolibah Guttapercha (Floodplain)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Joanundah	A denser variant of the coolibah–guttapercha community, with coolibah (*Eucalyptus microtheca*) and guttapercha (*Excoecaria parvifolia*) forming a low woodland over a tussock grassland of Flinders grass (*Iseilema vaginiflorum*) and ribbon grass (*Chrysopogon fallax*). Whitewood (*Atalaya hemiglauca*), blue grass (Dichanthium spp.) and bauhinia (*Lysiphyllum cunninghamii*) are also present. The greater canopy cover of *E. microtheca* and *Excoecaria* reflects more reliable moisture availability on the more frequently inundated floodplain portions. *Astrebla squarrosa* may occur in moister microhabitats, replacing *A. pectinata* which dominates drier upland grasslands. These floodplain woodlands are ecologically important as riparian corridors within the otherwise treeless Mitchell grassland landscape, providing habitat structure and nutrient inputs from leaf litter (Fisher 2001). On the Joanundah land system, Excoecaria was found evenly distributed across the floodplain (Stewart et al. 1954).	This community shares the same key species as the coolibah–guttapercha type. The ethnobotanical uses are identical: coolibah seeds ground to paste and eaten, grubs and native bee honey from hollows, lerp scales from leaves, bark ash for pituri, wood for heavy implements, and root water (Latz 1995). Whitewood provided witchetty grubs, edible sap and ceremonial wood (Latz 1995; O'Connell et al. 1983). Conkerberry contributed fruit and medicinal bark washes (Latz 1995). The floodplain setting distinguishes this community in landscape position rather than species composition. Periodic inundation would have enhanced ground-layer grass productivity and replenished soil moisture around tree root systems, extending the period over which coolibah seeds, grubs and root water were accessible. Floodplain positions along drainage systems were focal points for resource procurement, and the concentration of coolibah on waterlogged clay soils created predictable foraging patches for seed harvesting and grub collection in the post-wet season.
Bauhinia Bloodwood	Gulf Fall and Uplands; Mitchell Grass	Beetaloo (also in Gulf Fall and Uplands);	Bauhinia (*Lysiphyllum cunninghamii*) and inland bloodwood (*Corymbia opaca*) form a low woodland over a mid-height open shrubland of conkerberry (*Carissa lanceolata*) and turpentine wattle (*Acacia lysiphloia*), with a hummock grassland of	The leaves and bark of bauhinia (*Lysiphyllum cunninghamii*) were chewed by Aboriginal travellers when in need of water, described in the Victoria River area as sufficient to prevent perishing from thirst (Clarke 2007). Soft spinifex (*Triodia pungens*) yielded spinifex resin, the principal adhesive for hafting stone tools, constructing composite spears and repairing implements (Latz 1995; O'Connell

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
	Downs; Sturt Plateau	Pollyarra/Creswell; Wonorah/Creswell (also in Gulf Fall and Uplands)	soft spinifex (Triodia pungens) and ribbon grass (*Chrysopogon fallax*). Silver box (*Eucalyptus pruinosa*), whitewood (*Atalaya hemiglauca*) and nine-awn grass (*Enneapogon polyphyllus*) are also characteristic. The community is distinguished from the silver box–bauhinia community by the dominance of Lysiphyllum and Corymbia rather than Eucalyptus in the canopy. It typically occupies lateritic red earths peripheral to the cracking-clay plains. Lysiphyllum cunninghamii is a semi-deciduous leguminous tree widespread on non-clay substrates in the northern Barkly and Gulf regions (Fisher 2001). Its nitrogen-fixing capacity may contribute to higher soil fertility under canopy patches.	et al. 1983). The resin collection process involved pounding, winnowing, yandying and heat-treatment to form a durable thermoplastic (Latz 1995). Spinifex plants also served for shelter and windbreak construction, torch-making and wrapping cached objects; ant larvae and eggs from resinous anthills were eaten, and burnt anthill material was used medicinally by Warlpiri people for diarrhoea and infant ailments (Latz 1995). Whitewood (*Atalaya hemiglauca*) harboured edible witchetty grubs and yielded an edible white sap; its soft wood was carved into ceremonial ornaments and its bark was burnt for pituri ash (Latz 1995). Conkerberry (*Carissa lanceolata*) berries were a favoured food eaten fresh or dried, and its root bark produced a medicinal wash for skin and eye conditions (Latz 1995). Inland bloodwood (*Corymbia opaca*) produced kino used in wound treatment (Clarke 2007). The combination of bauhinia as a water substitute for travellers, spinifex resin for tool maintenance and conkerberry fruit makes this community a landscape unit where transit-related and manufacturing resources coincided.
Kekwick Lancewood (Chrysopogon)	Gulf Fall and Uplands; Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Pollyarra/Creswell	Bullwaddy (*Macropteranthes kekwickii*) forms the dominant low woodland canopy with lancewood (*Acacia shirleyi*) secondary, over a mid-height open tussock grassland of ribbon grass (*Chrysopogon fallax*) and Paspalidium rarum, with Mnesithea formosa also characteristic. This variant occurs where edaphic conditions favour bullwaddy over lancewood. M. kekwickii is a distinctive semi-deciduous tree largely restricted to the Sturt Plateau region and lateritic surfaces in the Gulf Fall and Uplands. The Chrysopogon-dominated understorey indicates slightly heavier or moister soils within the lateritic surface.	The grass understorey is the primary source of documented botanical resources. Ribbon grass (*Chrysopogon fallax*) roots had medicinal applications among the Alyawarra, used crushed with water as a body wash and possibly as a laxative; the stems served as children's play spears (Latz 1995). Paspalidium rarum is related to the Panicum grasses whose seed was harvested across the arid zone, with native millet (*Panicum decompositum*) being one of the principal seed foods of inland Australia, collected from thick stands, threshed and ground on stone slabs (Latz 1995; Clarke 2007). The dominance of the grass layer with a relatively open woodland canopy suggests that grass seed collection and processing would have been the primary plant-based subsistence activity in these settings, consistent with the seed-grinding economy that characterised Aboriginal subsistence across inland Australia (Cane 1987; Clarke 2007).
Kekwick Lancewood (Panicum)	Mitchell Grass Downs; Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands); Wonorah/Creswell (also in Gulf Fall and Uplands)	Bullwaddy (*Macropteranthes kekwickii*) forms the dominant low woodland canopy with lancewood (Acacia shirleyi), over a low open tussock grassland of Panicum mindanaense and Evolvulus alsinoides. The Panicum-dominated understorey may reflect slightly lighter-textured or more skeletal soils than the Chrysopogon variant. Evolvulus alsinoides is a small perennial herb characteristic of open, well-drained positions on lateritic substrates. These bullwaddy-dominant thickets are part of the biogeographically distinctive Sturt Plateau vegetation assemblage (Woinarski & Fisher 1995).	Panicum mindanaense belongs to the same genus as native millet (*P. decompositum*), the seed of which was among the most widely harvested and processed plant foods across inland Australia (Latz 1995; Clarke 2007). Native millet seed was collected from thick stands, threshed in wooden dishes, winnowed, and ground on stone slabs with water to produce a paste baked in coals (Latz 1995; Clarke 2007). The membership of P. mindanaense in this genus and its occurrence in grassland stands consistent with bulk seed harvesting makes analogous use plausible. The open grass-dominated understorey concentrates potential seed resources at ground level, and the relatively low canopy favours grass seed production. Most use-claims for this community rest on genus-level inference from central Australian documentation (Latz 1995; Clarke 2007; Cane 1987), and the applicability of these analogues to the Barkly Tableland and Gulf Fall and Uplands bioregions should be treated with caution.
Paperbark (Drainage)	Sturt Plateau	Beetaloo (also in Gulf Fall and Uplands)	Paperbark (*Melaleuca citrolens*) and *M. minutifolia* form a low woodland along drainage lines and watercourses, with a mid-height sparse shrubland of conkerberry (*Carissa lanceolata*) and a tussock grassland of silky browntop (*Eulalia aurea*) and ribbon grass (*Chrysopogon fallax*). Teatree (*Melaleuca stenostachya*), Triodia microstachya and silver box (Eucalyptus pruinosa) are also characteristic. The community occupies defined drainage features within the broader lateritic landscape, where moisture concentration supports paperbark species absent from surrounding well-drained surfaces. Melaleuca low woodland along watercourses occurs as narrow bands within the Sturt Plateau eucalypt woodland and lancewood mosaics (Wilson et al. 1990). These drainage-line communities provide linear habitat corridors through the woodland landscape.	Paperbark sheeting from Melaleuca species was used extensively across northern and central Australia as a universal wrapping and construction material (Clarke 2007; Latz 1995). Large slabs were fashioned into sheaths for stone knives, stiffened internally with grass stems and bound with hair string, and wallets for carrying sacred objects and pituri trade items were made similarly (Latz 1995). Bark also served as blankets for babies, splints, bandages, and was used as a brush for dabbing blood onto ground paintings (Latz 1995). Branches retaining dry leaves were used in shelter construction; the Aranda used paperbark branches as a type of fish net, laying a line of branches across one end of a narrow pool and pushing them through to land fish at the opposite end (Latz 1995). In tropical Australia, the aromatic leaves were crushed and soaked in water to produce a medicinal tea for coughs and colds (Clarke 2007; Clarke 2008). Fumes from smouldering paperbark branches were also used medicinally by the Pitjantjatjara (Latz 1995). The nectar of Melaleuca lasiandra was a moderately important sweet food in the Western Desert (Cane 1987; Latz 1995). Paperbark fibre was one of three basic fibre types used in central Australia, alongside vine stems and inner bark, serving in rope-making, sandal production and the wrapping of ceremonial objects and trading items (Latz 1995). Conkerberry in the shrub layer provided berries, spear-head wood and medicinal root-bark wash as described for adjacent communities (Latz 1995). The drainage-line position concentrates water and organic matter, and the paperbark canopy would have offered bark resources year-round, with leaf-flush and nectar production linked to post-wet-season conditions.
Silver Box Bauhinia (Tussock)	Gulf Fall and Uplands; Mitchell Grass Downs	Creswell (also in Gulf Fall and Uplands); Pollyarra/Creswell	Silver box (Eucalyptus pruinosa) and bauhinia (*Lysiphyllum cunninghamii*) form a low open woodland with a sparse shrubland of conkerberry (*Carissa lanceolata*), over a mid-height tussock grassland of ribbon grass (*Chrysopogon fallax*) and Flinders grass (*Iseilema vaginiflorum*). Blue grass (*Dichanthium fecundum*) is a characteristic component, and desert bloodwood (*Eucalyptus terminalis*) is a common canopy associate. This tussock grass variant of the silver box–bauhinia community typically occupies slightly heavier soils or lower landscape positions than the hummock grass form, representing a transition toward the cracking-clay grasslands. The presence of Dichanthium fecundum reflects the higher-rainfall northern margins where Mitchell grasslands grade into Dichanthium-dominated grasslands.	Desert bloodwood (*E. terminalis*) provided bush coconut galls, honey, native bee colonies, kino for medicinal washes, red sap for tanning waterbags, and firewood (Latz 1995). Conkerberry (*Carissa lanceolata*) contributed berries, spear-head wood and root-bark medicine (Latz 1995; O'Connell et al. 1983). Ribbon grass (*Chrysopogon fallax*) was recorded as a medicinal species among the Alyawarra (O'Connell et al. 1983). The tussock grass ground layer on clay substrates provided a foraging context different from the hummock grass variant: spinifex resin was absent, shifting resource emphasis toward the tree and shrub layers. Tussock grasslands on cracking clays were traversed during seasonal movements between water sources, and the scattered eucalypt canopy offered grub habitat, shade for processing activities, and kino and honey resources distributed across the landscape.
Coolibah Bauhinia (Clay)	Gulf Fall and Uplands; Mitchell Grass Downs	Creswell (also in Gulf Fall and Uplands); Pollyarra/Creswell	Coolibah (*Eucalyptus microtheca*) and bauhinia (*Lysiphyllum cunninghamii*) form a low woodland with a sparse shrubland of conkerberry (*Carissa lanceolata*), over a mid-height tussock grassland of ribbon grass (*Chrysopogon fallax*) and Flinders grass (*Iseilema vaginiflorum*). Silver box (*Eucalyptus pruinosa*), desert bloodwood (*Eucalyptus terminalis*) and blue grass (*Dichanthium fecundum*) are also characteristic. The community occupies a transitional landscape position on clay soils between treeless Mitchell grasslands on deep cracking clays and eucalypt woodlands	Desert bloodwood (*E. terminalis*) bore edible insect galls known as bush coconuts, formed by a female coccid (*Apiomorpha pomiformis*), containing both a grub and a white edible flesh that was scraped out and eaten (Latz 1995). The flowers produced honey soaked in water for a sweet drink, and hollow trunks were favoured sites for native bee colonies whose honey was among the most sought-after foods in arid and semi-arid Australia (Latz 1995). Kino from E. terminalis wounds was mixed with water and applied to sore eyes, lips, wounds, burns and sores, and was sometimes drunk diluted for sore throats (Latz 1995). The red sap served as a tanning agent for kangaroo-skin waterbags (Latz 1995). Eucalypt kino was used more broadly across Australia for medicinal washes and eye treatments (Clarke 2007; Clarke 2008). Conkerberry (*Carissa lanceolata*) produced sweet black berries

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
			on non-clay substrates. The presence of both coolibah (indicating periodic inundation) and bauhinia (indicating non-cracking or transitional soils) suggests intermediate soil drainage and clay content. In the Gulf Fall and Uplands and northern Mitchell Grass Downs, this community marks the rainfall-mediated transition from Mitchell grassland to *Dichanthium*/*Chrysopogon* grasslands (Fisher 2001).	eaten fresh or dried and reconstituted; the fine-grained wood was used for spear-heads (Latz 1995). Orange inner bark from conkerberry roots was soaked in water to produce a medicinal wash for skin and eye conditions, and its thorns treated warts (Latz 1995). O'Connell et al. (1983) similarly record conkerberry as a medicinal species among the Alyawarra, used as an eye wash. Ribbon grass (*Chrysopogon fallax*) is listed as a medicinal species by O'Connell et al. (1983) among the Alyawarra. Grass seed harvesting from tussock grasslands on cracking clay was widely practised across semi-arid Australia (Clarke 2003). The clay substrate and woodland canopy concentrate resources around the tree layer, with eucalypt hollows hosting grubs and native bee colonies and the shrub understorey providing fruit and medicinal bark.
Eucalypt Low Open Forest	Gulf Fall and Uplands	Pollyarra/Creswell	Snappy gum (*Eucalyptus leucophloia*), silver box (*Eucalyptus pruinosa*) and desert bloodwood (*Eucalyptus terminalis*) form a low open forest with a sparse shrubland of conkerberry (*Carissa lanceolata*) and quinine bush (*Petalostigma quadriloculare*), over a hummock grassland of curly spinifex (*Triodia bitextura*) and soft spinifex (*Triodia pungens*). Ribbon grass (*Chrysopogon fallax*) is also present. The community occurs on lateritic surfaces in the Gulf Fall and Uplands on well-drained gravelly soils. The open-forest structure indicates relatively productive lateritic soils supporting higher canopy cover than open woodland communities on similar substrates.	Desert bloodwood (*Eucalyptus terminalis*) provided bush coconut galls with edible grub and white flesh, native bee honey from trunk hollows, lerp scales, flower nectar soaked in water, and kino used medicinally for wounds, sore eyes and throats (Latz 1995). Its sap tanned kangaroo skin waterbags (O'Connell et al. 1983), and trunk boles were fashioned into water-carrying bowls (Latz 1995). Conkerberry (*Carissa lanceolata*) produced sweet berries eaten fresh or reconstituted from dried form, fine-grained wood for spear-heads, and a root bark medicinal wash (Latz 1995). Soft spinifex (*Triodia pungens*) yielded resin for adhesive use in tool construction and repair (Latz 1995; O'Connell et al. 1983), while curly spinifex (Triodia bitextura), a non-resinous hard spinifex, served more limited purposes such as shelter construction (Latz 1995). Eucalypt kino was broadly used as medicine across Australia (Clarke 2007; Clarke 2008). The co-occurrence of resinous soft spinifex alongside bloodwood and conkerberry in a low open forest setting concentrates adhesive, food, medicinal and tool-timber resources within a structurally accessible community.
Eucalypt Low Woodland	Gulf Fall and Uplands	Pollyarra/Creswell	White-leaved box (*Eucalyptus chlorophylla*), silver box (*Eucalyptus pruinosa*) and desert bloodwood (*Eucalyptus terminalis*) form a low open woodland with a sparse shrubland of conkerberry (*Carissa lanceolata*) and yellow hakea (Hakea arborescens), over a mid-height tussock grassland of ribbon grass (*Chrysopogon fallax*) and white spear grass (*Sehima nervosum*). Bunch spear grass (*Heteropogon contortus*) and canoe bush (*Terminalia canescens*) are also characteristic. This community is widespread across the Gulf Fall and Uplands on flat to gently undulating plains and lower hill slopes, on deep red or yellow earths and some clayey loam soils (Wilson et al. 1990). The tussock grass understorey, dominated by tall perennials including Sehima nervosum, reflects the higher-rainfall regime of the Gulf Fall and Uplands compared to the Mitchell Grass Downs to the south.	Desert bloodwood (*Eucalyptus terminalis*) was the most ethnobotanically productive species present, yielding bush coconut galls with edible grub and white flesh, lerp scales, flower honey soaked in water, native bee colonies, and kino applied to wounds, sores and eyes or drunk for sore throats (Latz 1995). Its sap tanned kangaroo skin waterbags (O'Connell et al. 1983), and trunk boles were carved into water-carrying bowls (Latz 1995). Conkerberry (*Carissa lanceolata*) berries were eaten fresh or dried and reconstituted; its fine-grained wood was fashioned into spear-heads, and root bark yielded a medicinal wash for skin and eye conditions (Latz 1995). Yellow hakea (*Hakea arborescens*) belongs to a genus whose flowers produced nectar consumed directly or steeped in water (O'Connell et al. 1983; Cane 1987). Bunch spear grass (*Heteropogon contortus*) leaves were boiled to produce a warm tea for treating coughs (Clarke 2007). The low woodland structure provides broadly the same resource suite as the box woodland (plains), with productive bloodwood canopy, conkerberry fruit and medicinal bark, and hakea nectar, though the lower canopy height and more open structure may have facilitated access to tree-based resources including galls and native bee colonies.
Box Woodland (Plains)	Gulf Fall and Uplands	Pollyarra/Creswell	White-leaved box (*Eucalyptus chlorophylla*), silver box (*Eucalyptus pruinosa*) and desert bloodwood (*Eucalyptus terminalis*) form a low woodland with a sparse shrubland of conkerberry (*Carissa lanceolata*) and yellow hakea (*Hakea arborescens*), over a mid-height tussock grassland of ribbon grass (*Chrysopogon fallax*) and white spear grass (*Sehima nervosum*). Bunch spear grass (*Heteropogon contortus*) and canoe bush (*Terminalia canescens*) are also characteristic. The woodland structure indicates slightly deeper or more fertile soils on level to gently undulating plains. This community occurs in the Gulf Fall and Uplands and represents the plains expression of the regional eucalypt woodland, distinct from lateritic rises supporting snappy gum or lancewood communities.	Desert bloodwood (*Eucalyptus terminalis*) was one of the most ethnobotanically productive trees in semi-arid and tropical woodland. Its bush coconut galls, formed by a coccid insect, contained an edible grub and white inner flesh comparable to coconut (Latz 1995). Lerp scales on leaves were consumed, and flowers produced honey soaked in water for a sweet drink; native bee colonies in bloodwood hollows yielded the most prized honey in central Australia (Latz 1995). Bloodwood kino was applied to sore eyes, lips, wounds, burns and sores, diluted and drunk for sore throats, and mixed with kangaroo dung as a cementing substance (Latz 1995). The red sap served as a tanning agent for kangaroo skin waterbags (O'Connell et al. 1983). Bole swellings on bloodwood trunks were cut off and fashioned into rounded wooden bowls for carrying water, and fruit capsules were used as hair decorations, necklaces and children's playthings (Latz 1995). Conkerberry (*Carissa lanceolata*) produced sweet berries eaten fresh or dried and reconstituted; its root bark yielded a medicinal wash for skin and eye complaints, and the fine-grained wood was used for spear-heads (Latz 1995). Yellow hakea (Hakea arborescens) belongs to a genus whose flowers contained nectar sipped directly or soaked in water for a sweet drink (O'Connell et al. 1983; Cane 1987). Bunch spear grass (*Heteropogon contortus*) leaves were boiled to produce a warm tea for treating coughs (Clarke 2007). The open plains setting, with its productive bloodwood canopy and accessible understorey fruits, would have concentrated foraging around the scattered tree layer.
Bloodwood Box (Peneplain)	Mitchell Grass Downs	Wonardo; Wonorah	Inland bloodwood (*Corymbia opaca*), weeping bloodwood (*Corymbia bella*) and silver box (*Eucalyptus pruinosa*) form a low open woodland with a mid-height open shrubland of conkerberry (*Carissa lanceolata*) and whitewood (*Atalaya hemiglauca*), over a hummock grassland of soft spinifex (*Triodia pungens*) and silky browntop (*Eulalia aurea*). Turpentine wattle (*Acacia lysiphloia*) and nine-awn grass (*Enneapogon polyphyllus*) are also present. The community occurs on peneplain surfaces — ancient, low-relief erosional landscapes with lateritic red earths. In the Mitchell Grass Downs context, it occupies remnant elevated surfaces peripheral to the cracking-clay plains. The presence of Corymbia opaca reflects the more arid, inland character of this landscape position.	Inland bloodwood (*Corymbia opaca*) produced kino used medicinally in a manner consistent with other bloodwood species; its kino mixed with ghost gum kino was applied to cuts and flesh wounds for protection from flies (Clarke 2007). Soft spinifex (*Triodia pungens*) was the primary source of spinifex resin, among the most durable bonding materials available in Aboriginal Australia, used in tula adzes, composite spears and for repairing wooden implements (Latz 1995; O'Connell et al. 1983). Collection and preparation was a complex, time-consuming process involving pounding, winnowing, yandying and heat-treating (Latz 1995). Spinifex plants were also used for shelters, windbreaks, wrapping sacred objects and making torches; ant larvae and eggs from resinous anthills were eaten, and the anthills had medicinal applications among Warlpiri people (Latz 1995). Whitewood (*Atalaya hemiglauca*) harboured edible witchetty grubs in trunk and roots and exuded an edible white sap from insect wounds (Latz 1995). Its soft white wood was carved into ornaments for ceremonial use, with shavings shaped into decorative forms while still attached to the stick (Latz 1995). Conkerberry (*Carissa lanceolata*) produced sweet black berries eaten fresh or dried and reconstituted; its fine-grained wood was used for spear-heads, and orange inner bark from the roots was soaked for a medicinal wash for skin and eye conditions (Latz 1995).
Mitchell Grass (Closed)	Mitchell Grass Downs	Wonorah/Creswell (also in Gulf Fall and Uplands)	A closed-canopy variant of Mitchell grass tussock grassland, dominated by barley Mitchell grass (*Astrebla pectinata*) and Flinders grass (*Iseilema membranaceum*, *I. vaginiflorum*), with a patchy tall sparse shrubland of mimosa bush (*Acacia farnesiana*) and bramble wattle (*Acacia victoriae*). It occurs on deep grey cracking-	Bramble wattle (*Acacia victoriae*) was a food source: green pods were lightly roasted before the seeds were eaten, and mature hard-coated seeds were parched, pounded with a hammerstone and ground into a paste (Latz 1995; O'Connell et al. 1983). A white trunk gum was also eaten, edible grubs were found in roots and trunk, and the wood was used for hunting spear blades (Latz 1995). Mimosa bush (*Acacia farnesiana*), restricted to clayey soils near watercourses, was not generally eaten for its seed, but the wood

Community	Bioregions	Land Systems	Ecology	Ethnobotanical Uses
			clay vertosols and is distinguished from the typical community by higher tussock density and ground cover, indicating more favourable moisture conditions or reduced grazing pressure. Floristic composition closely matches the standard Mitchell grass (grey clay) community, but perennial grass cover is notably higher. These denser grassland stands likely correspond to gilgai depressions or areas receiving slightly enhanced run-on moisture, or to paddocks more distant from watering points where grazing pressure is reduced (Fisher 2001).	served for axe handles and music sticks, and the large thorns were used as splinter-removal tools (Latz 1995; O'Connell et al. 1983). The closed tussock structure of this variant concentrates grass biomass, and where A. victoriae occurs in denser patches along subtle edaphic gradients, seed, gum and grub resources would have been locally concentrated.
Mitchell Grass (Open)	Mitchell Grass Downs	Wonorah/Creswell (also in Gulf Fall and Uplands); Yelvertoft (also in Gulf Fall and Uplands)	An open variant of Mitchell grass tussock grassland, dominated by barley Mitchell grass (*Astrebla pectinata*) and Flinders grass (*Iseilema membranaceum*, *I. vaginiflorum*), with a patchy tall sparse shrubland of mimosa bush (*Acacia farnesiana*) and bramble wattle (*Acacia victoriae*). Tussock density and ground cover are lower than in the typical community. Reduced cover may reflect drier microhabitats, elevated positions within the gilgai micro-relief, or proximity to watering points where sustained grazing pressure removes perennial tussocks (Fisher 2001). Floristic composition is otherwise consistent with the standard community.	Bramble wattle (*Acacia victoriae*) was a food source: green pods were lightly roasted before eating, and mature hard-coated seeds were parched, pounded and ground into a paste (Latz 1995; O'Connell et al. 1983). A white trunk gum was eaten, edible grubs occurred in roots and trunk, and the wood was used for hunting spear blades (Latz 1995). Mimosa bush (*Acacia farnesiana*), restricted to clayey watercourse soils, was not generally eaten for seed, but the wood served for axe handles and music sticks, and the large thorns were used as splinter-removal tools (Latz 1995; O'Connell et al. 1983). The open tussock structure and lower grass density further reduce overall resource availability per unit area compared to denser Mitchell grass communities, and ethnobotanical resources are concentrated where patchy acacia shrubs occur along drainage features or edaphic discontinuities within the clay plain.
Mitchell Grass (Sparse)	Mitchell Grass Downs	Wonorah/Creswell (also in Gulf Fall and Uplands); Yelvertoft (also in Gulf Fall and Uplands)	A sparse variant of Mitchell grass tussock grassland, dominated by barley Mitchell grass (*Astrebla pectinata*) and Flinders grass (*Iseilema membranaceum*, *I. vaginiflorum*), with a patchy tall sparse shrubland of mimosa bush (*Acacia farnesiana*) and bramble wattle (*Acacia victoriae*). This represents the lowest cover state of the Astrebla community. Very low tussock density may indicate severe drought impact, long-term heavy grazing pressure, or naturally less productive landscape positions such as convex gilgai surfaces or areas with thinner clay profiles. Annual grasses (*Iseilema spp.*) and ephemeral forbs become proportionally more important when perennial grass cover is very low. These sparse stands are vulnerable to soil surface degradation through loss of the self-mulching structure (Fisher 2001).	Bramble wattle (*Acacia victoriae*) was a food source: green pods were lightly roasted before eating, and mature hard-coated seeds were parched, pounded and ground into a paste (Latz 1995; O'Connell et al. 1983). A white trunk gum was eaten, edible grubs occurred in roots and trunk, and the wood was used for hunting spear blades (Latz 1995). Mimosa bush (*Acacia farnesiana*), restricted to clayey watercourse soils, was not generally eaten for seed, but the wood served for axe handles and music sticks, and the large thorns were used as splinter-removal tools (Latz 1995; O'Connell et al. 1983). Sparse tussock cover and the correspondingly low density of acacia shrubs make this the most resource-limited of the Mitchell grass variants, with ethnobotanical use likely concentrated around water points and subtle drainage lines where A. victoriae persists.

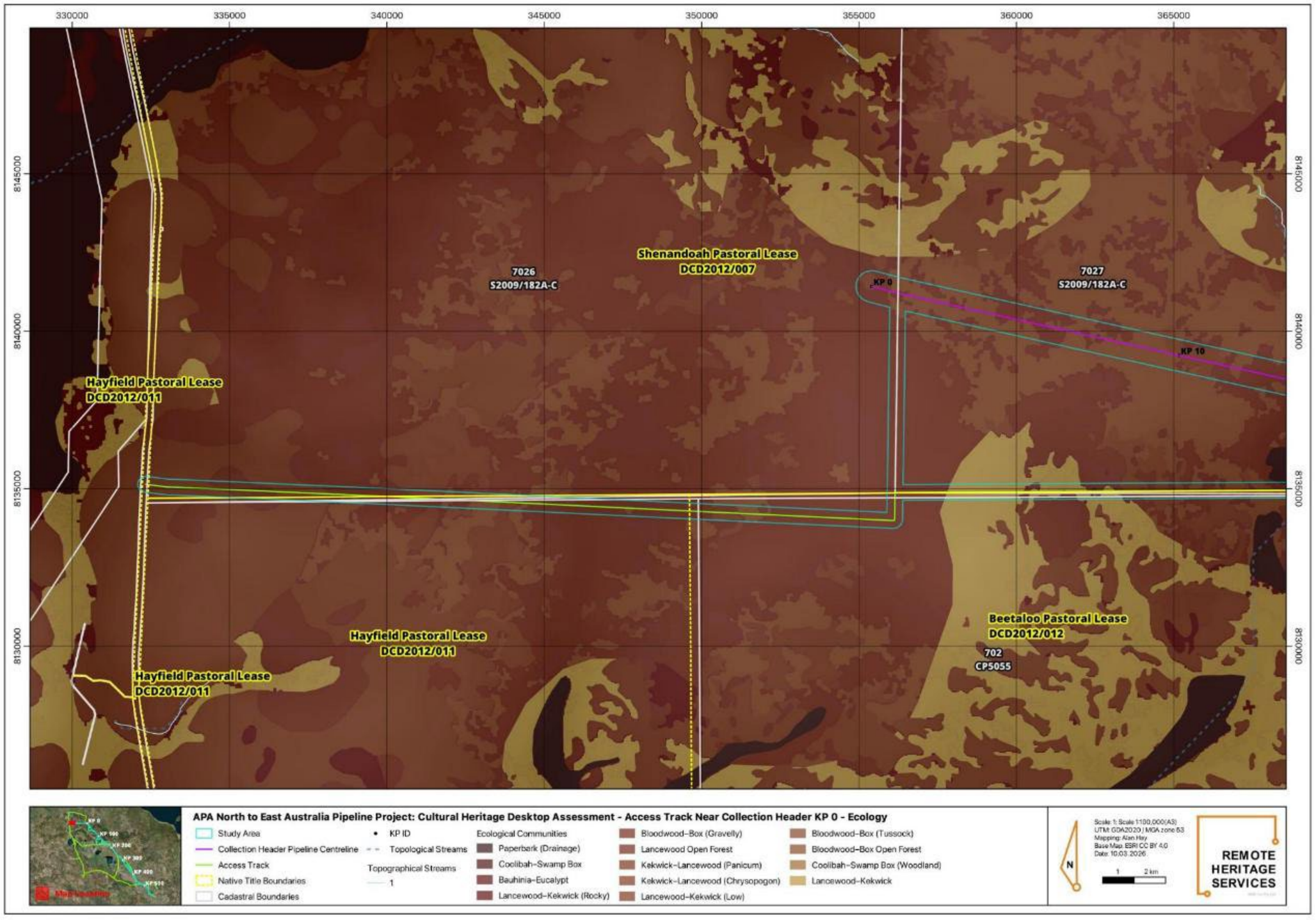

Figure 12: Access Track Near Collection Header KP 0 - Ecological Context.

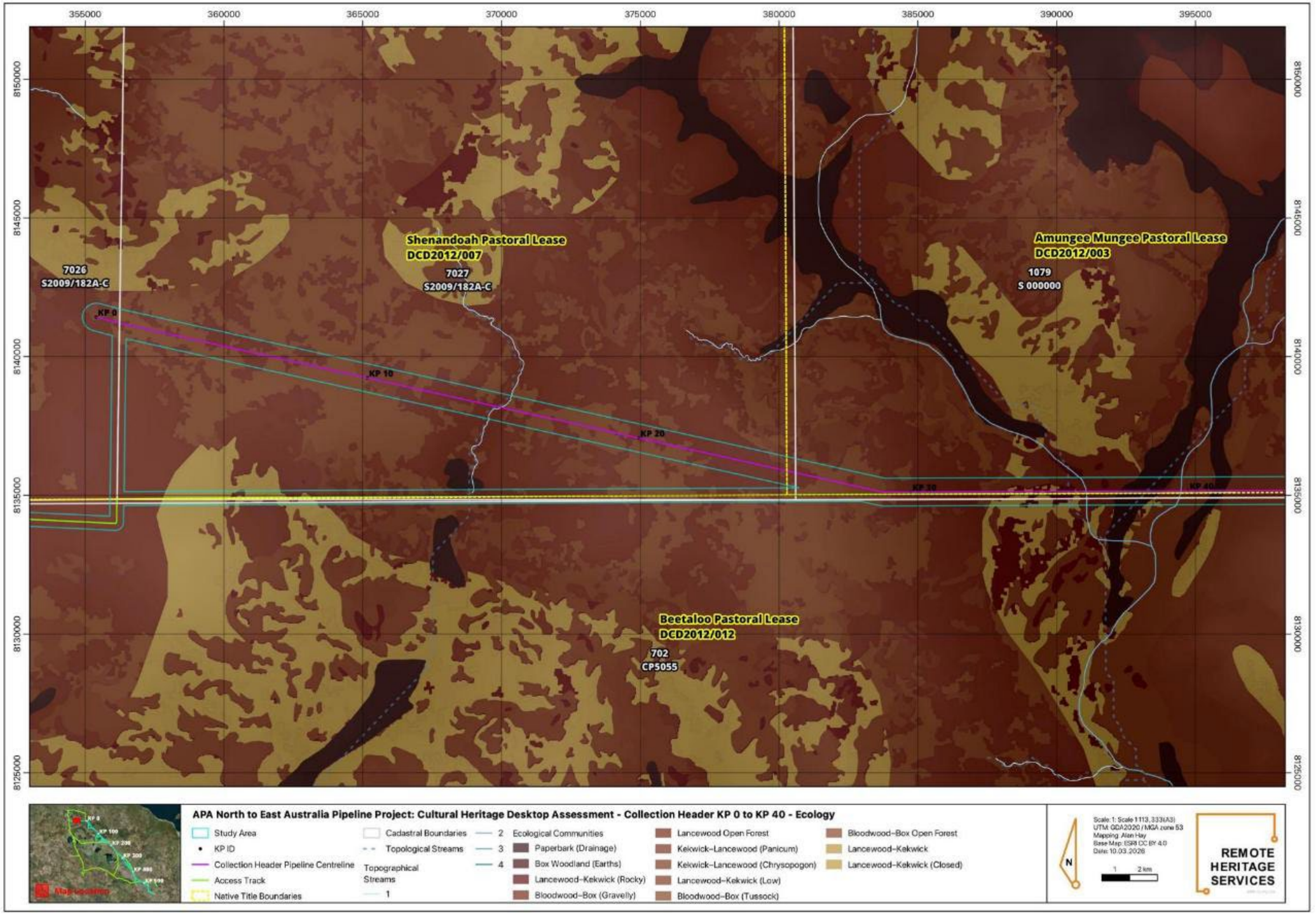

Figure 13: Collection Header KP 0 to KP 40 - Ecological Context.

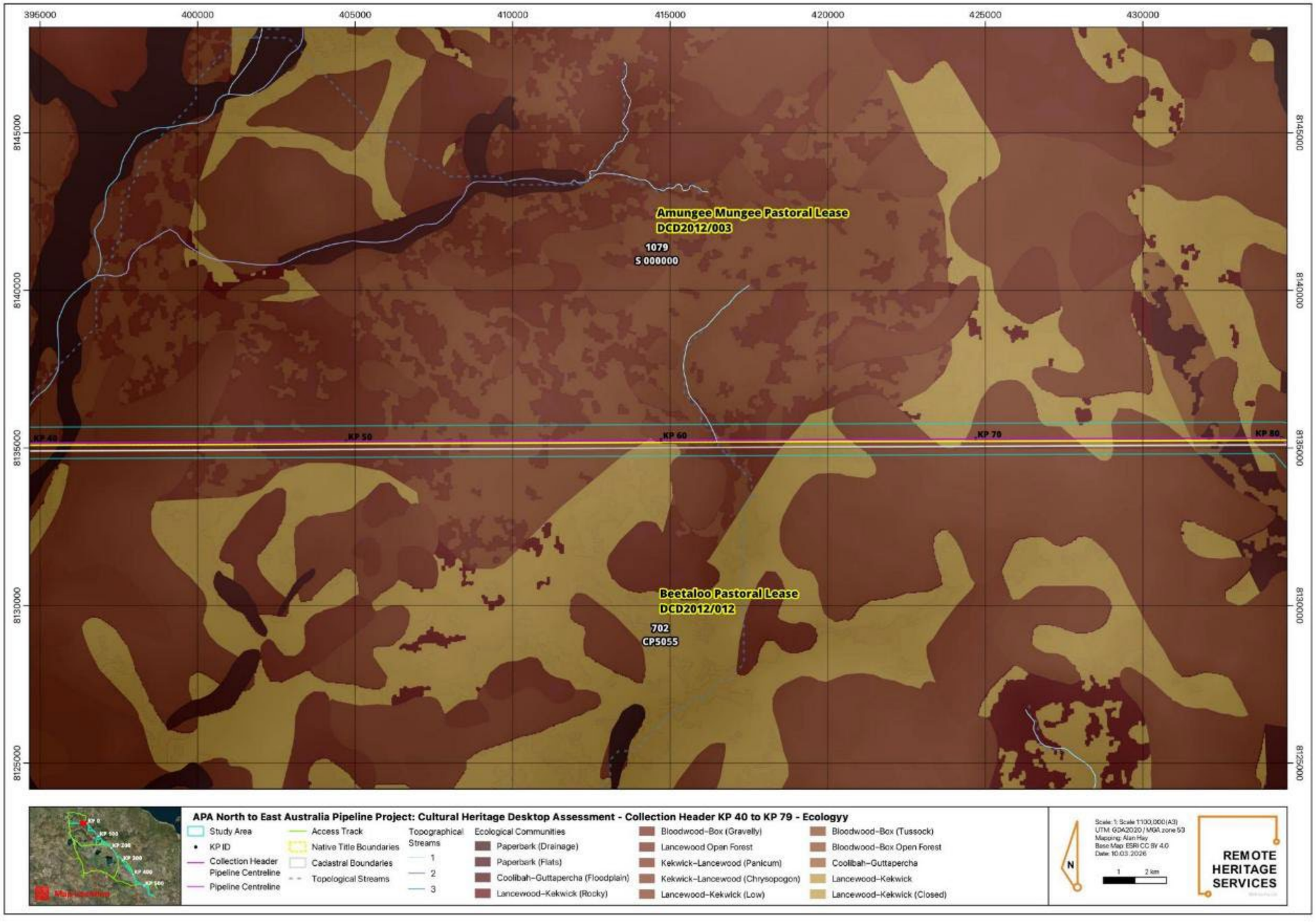

Figure 14: Access Track Near Collection Header KP 0 - Ecological Context.

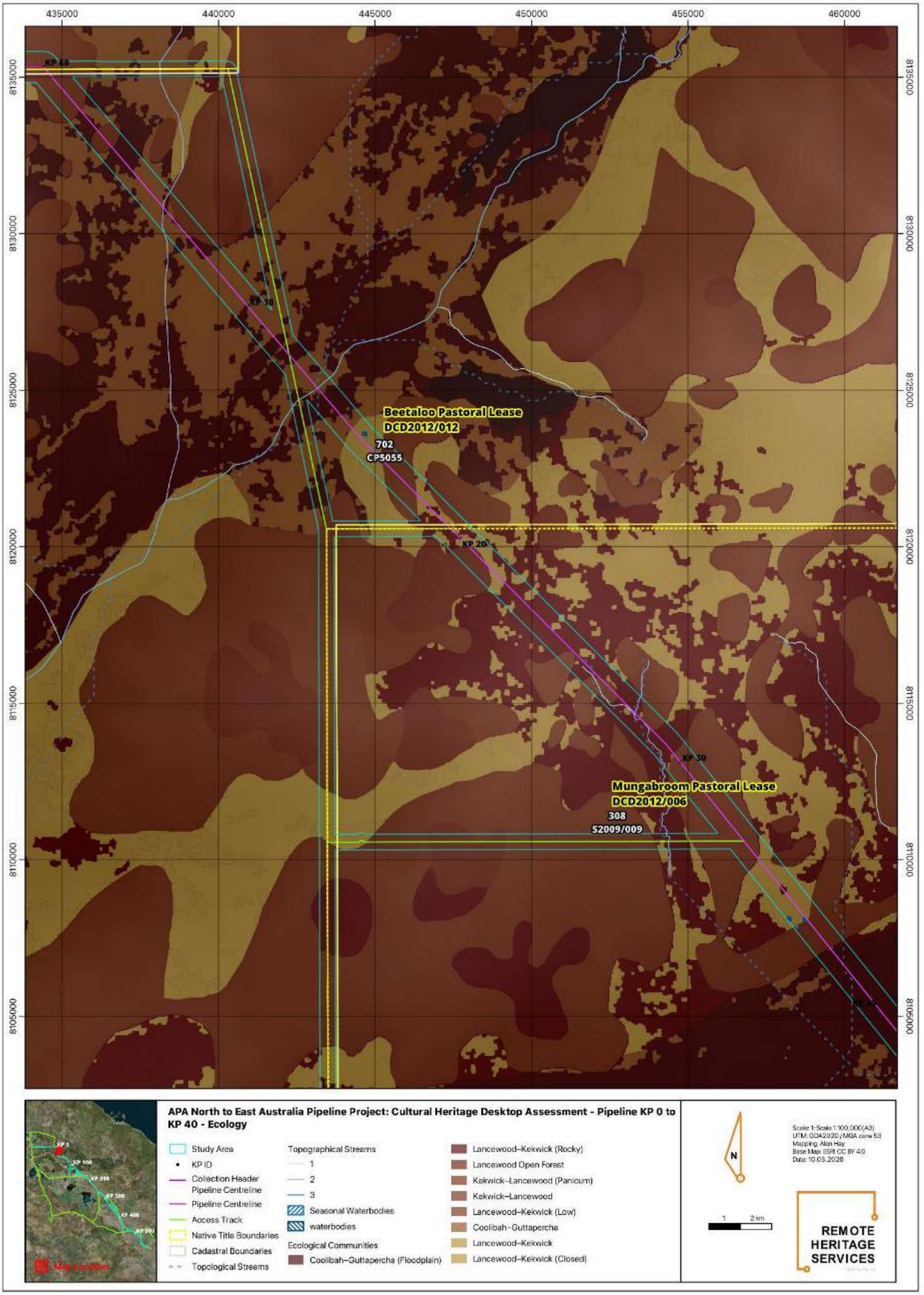

Figure 15: Pipeline KP 0 to KP 40 - Ecological Context.

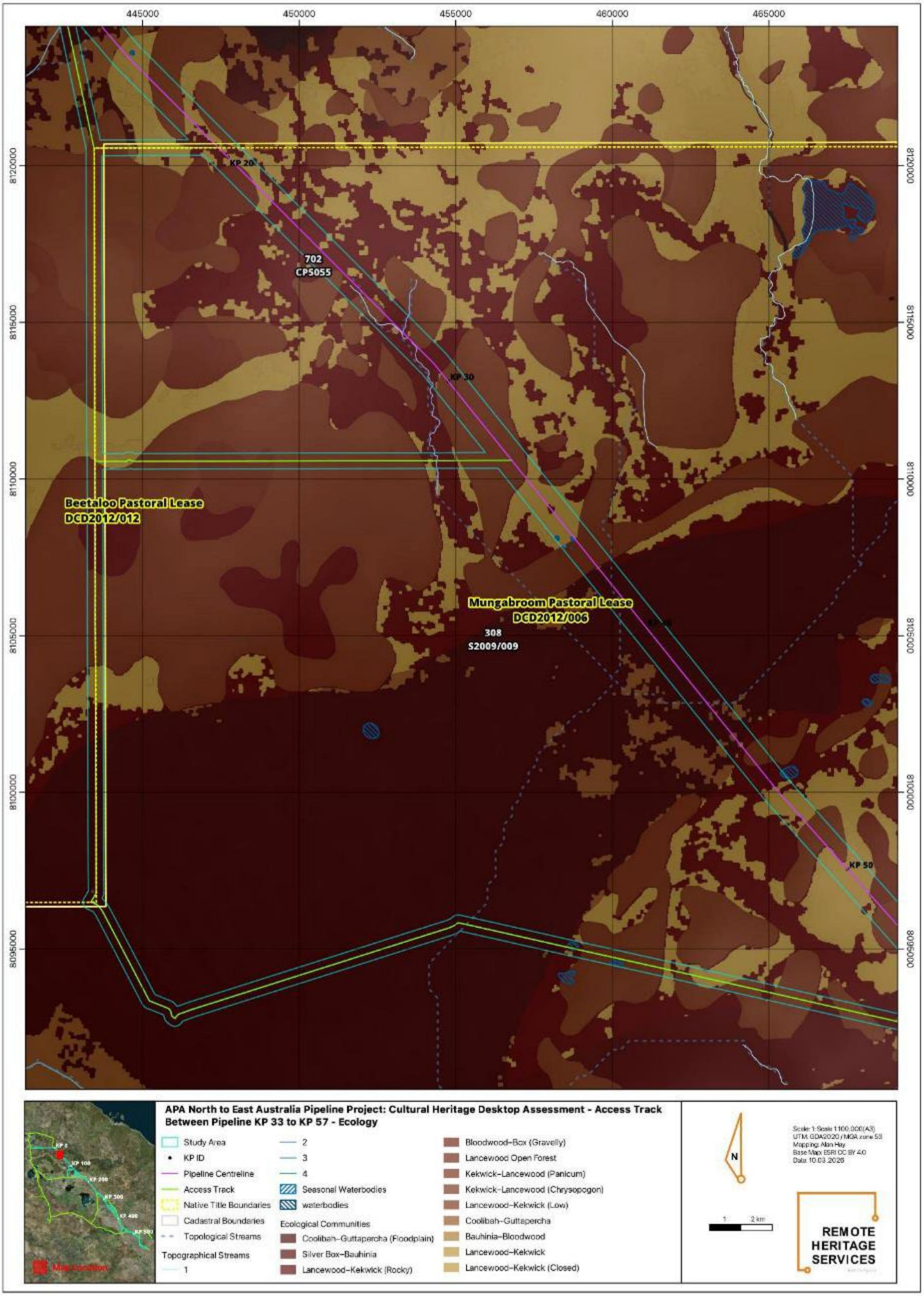

Figure 16: Access Track Between Pipeline KP 33 to KP 57 - Ecological Context.

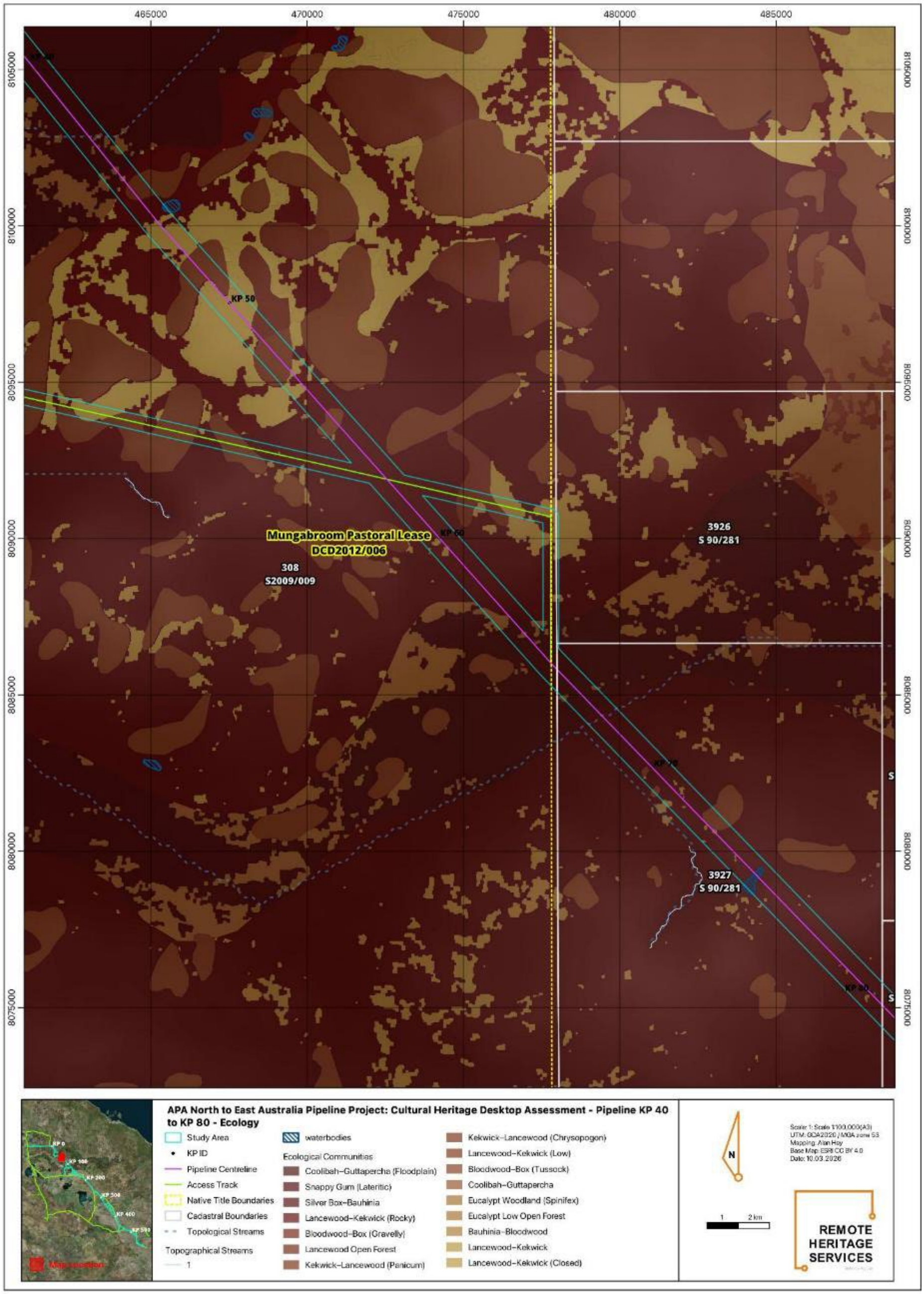

Figure 17: Pipeline KP 40 to KP 80 - Ecological Context.

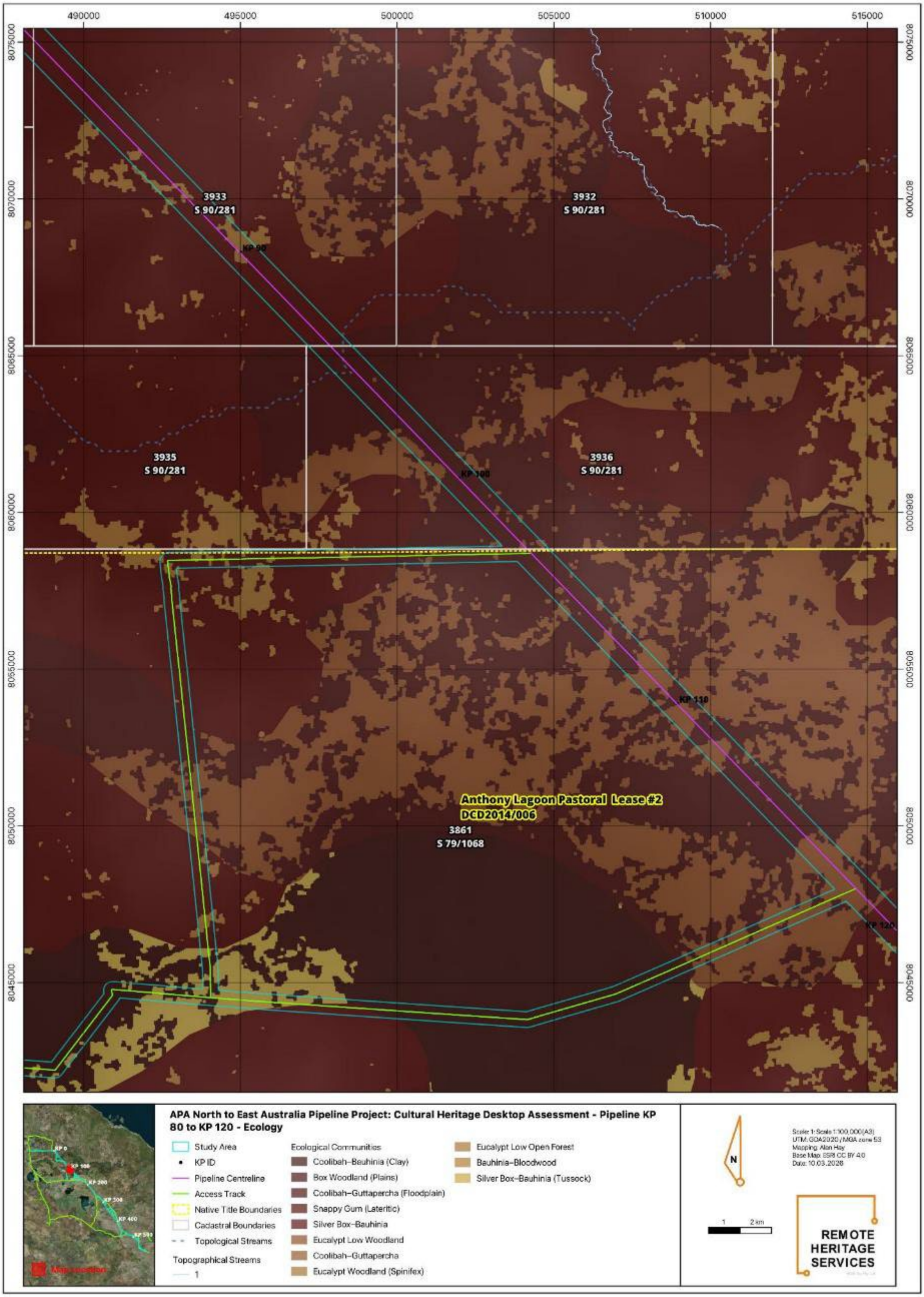

Figure 18: Pipeline KP 80 to KP 120 - Ecological Context.

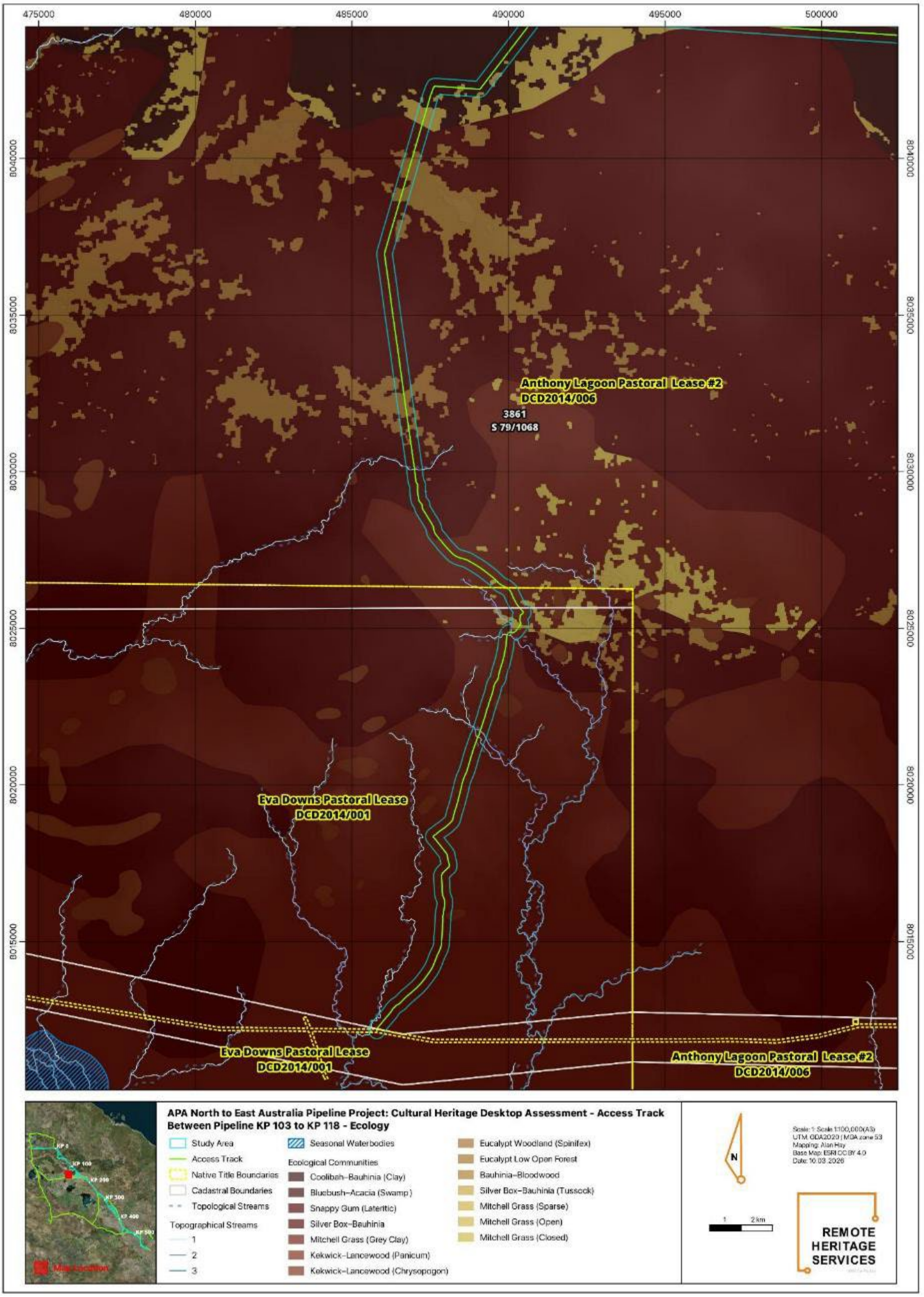

Figure 19: Access Track Between Pipeline KP 103 to KP 118 - Ecological Context.

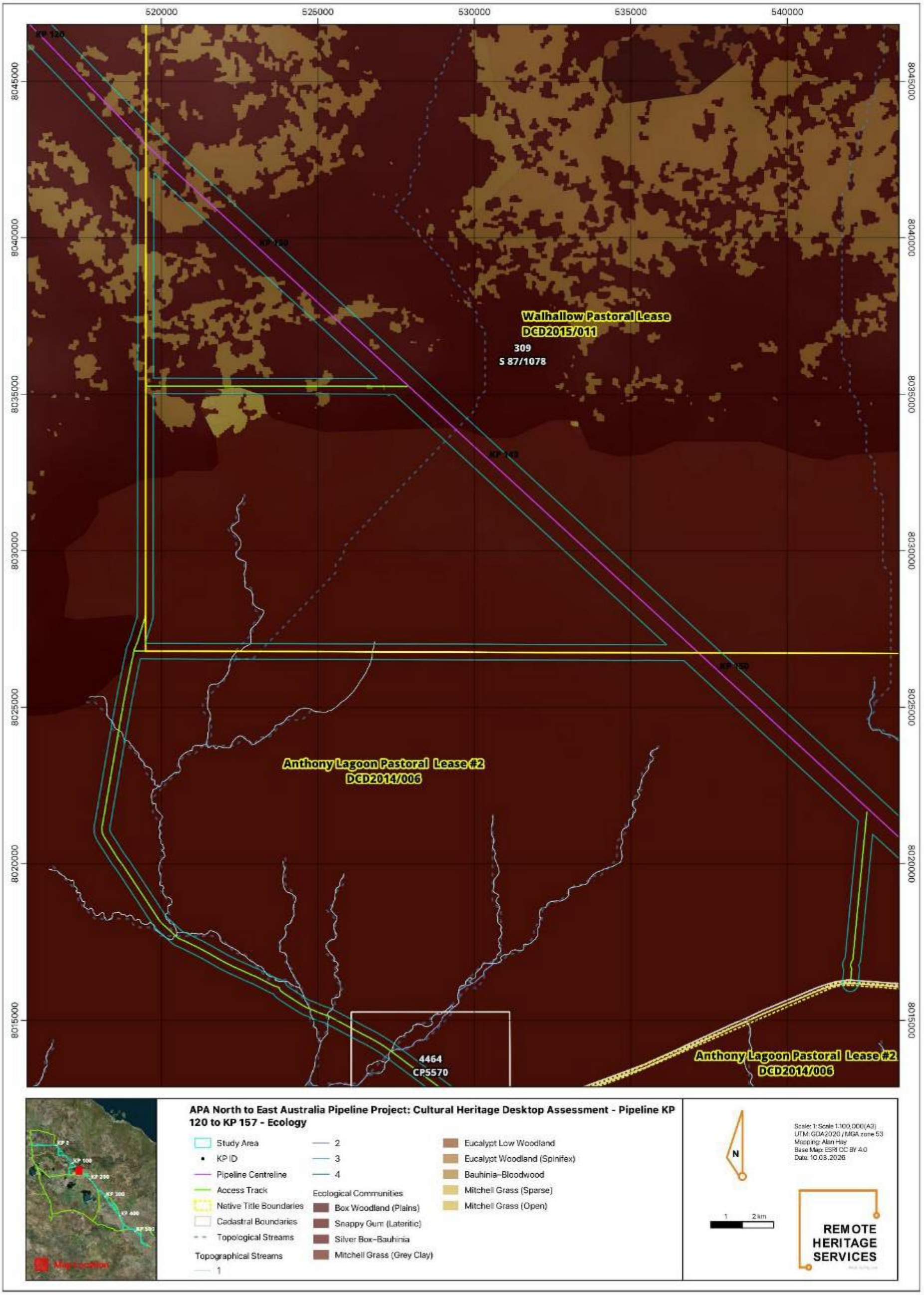

Figure 20: Pipeline KP 120 to KP 157 - Ecological Context.

Figure 21: Pipeline KP 120 to KP 157 - Ecological Context.

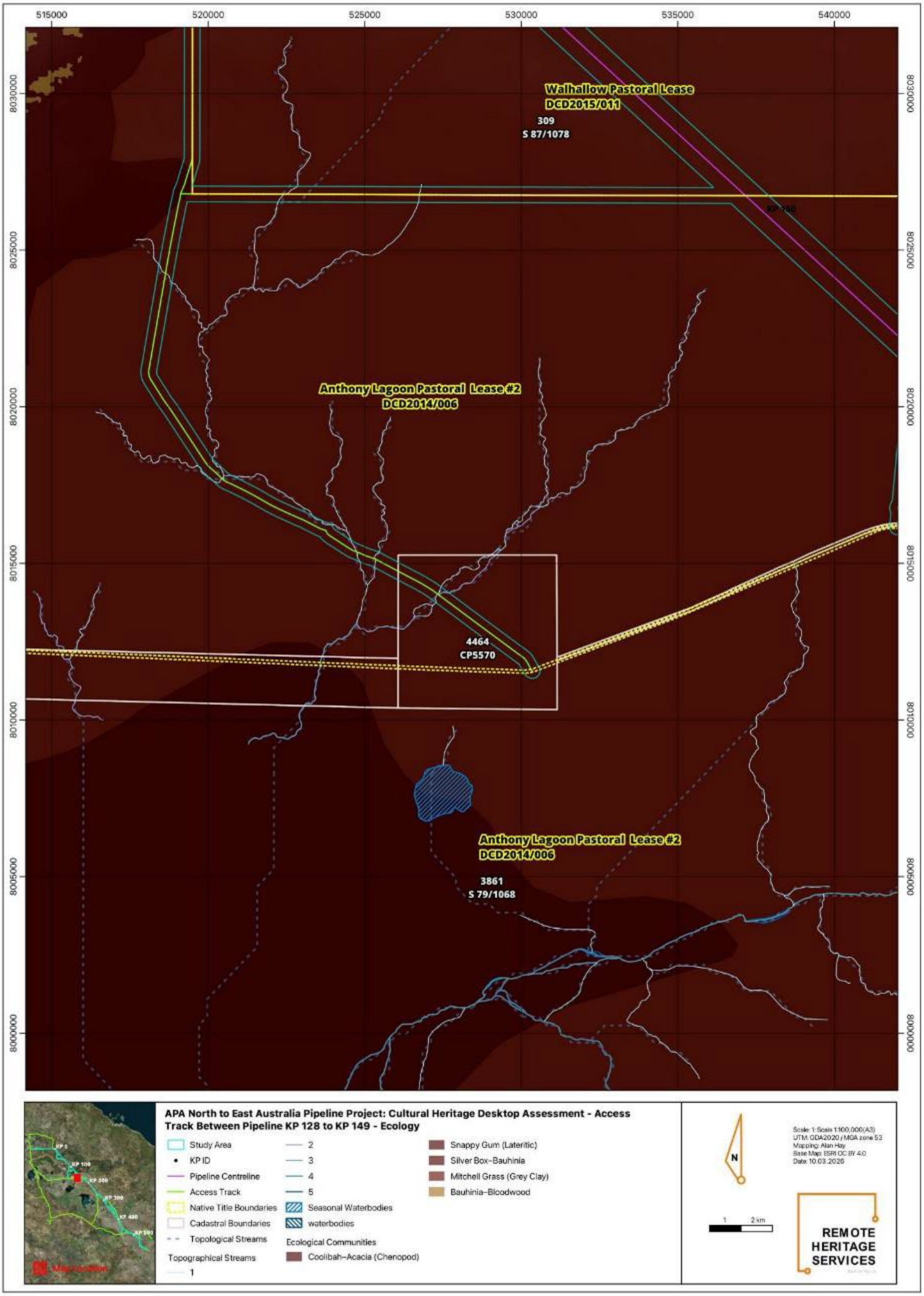

Figure 22: Access Track Between Pipeline KP 128 to KP 149 - Ecological Context.

Figure 23: Pipeline KP 157 to KP 193 - Ecological Context.

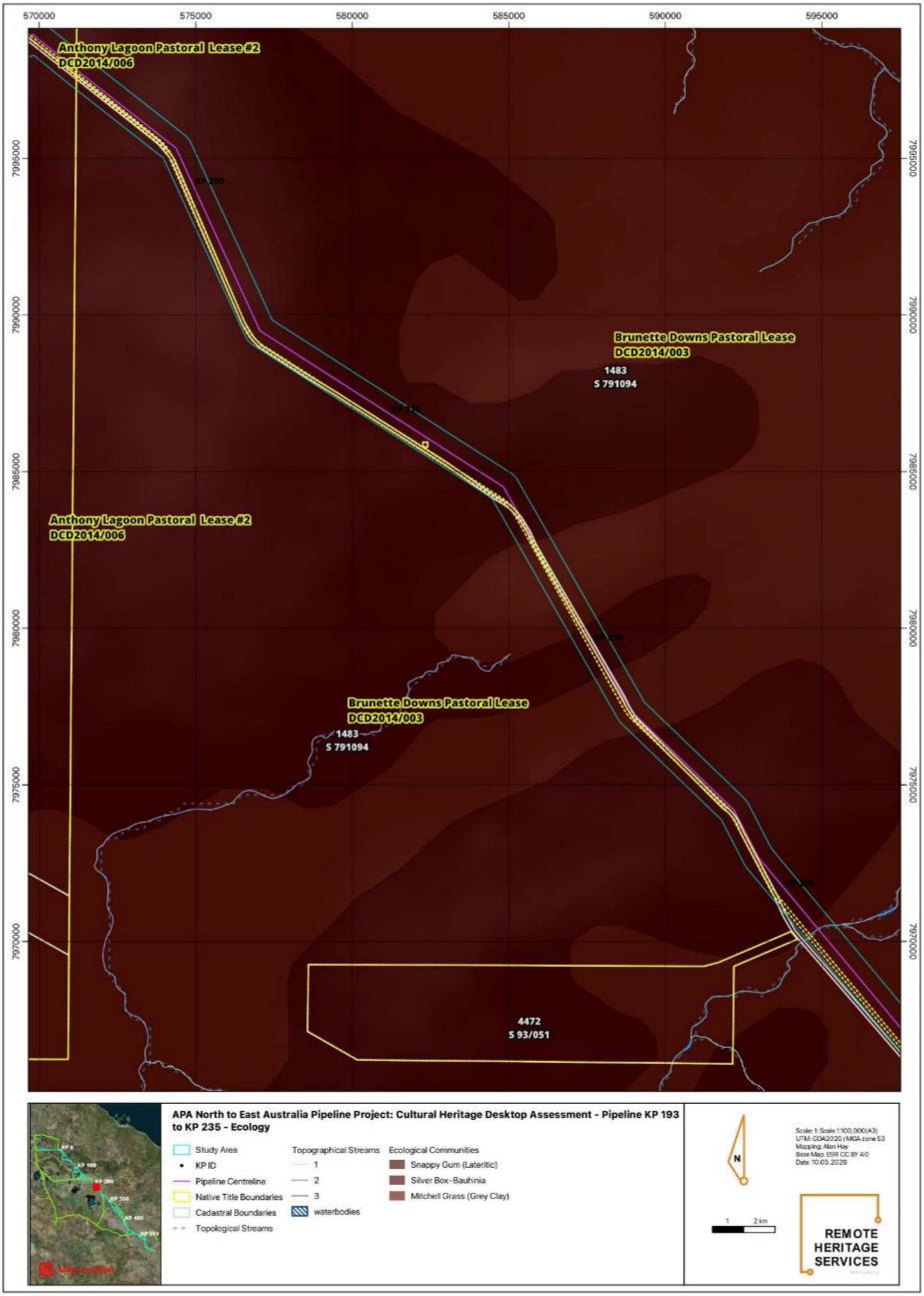

Figure 24: Pipeline KP 193 to KP 235 - Ecological Context.

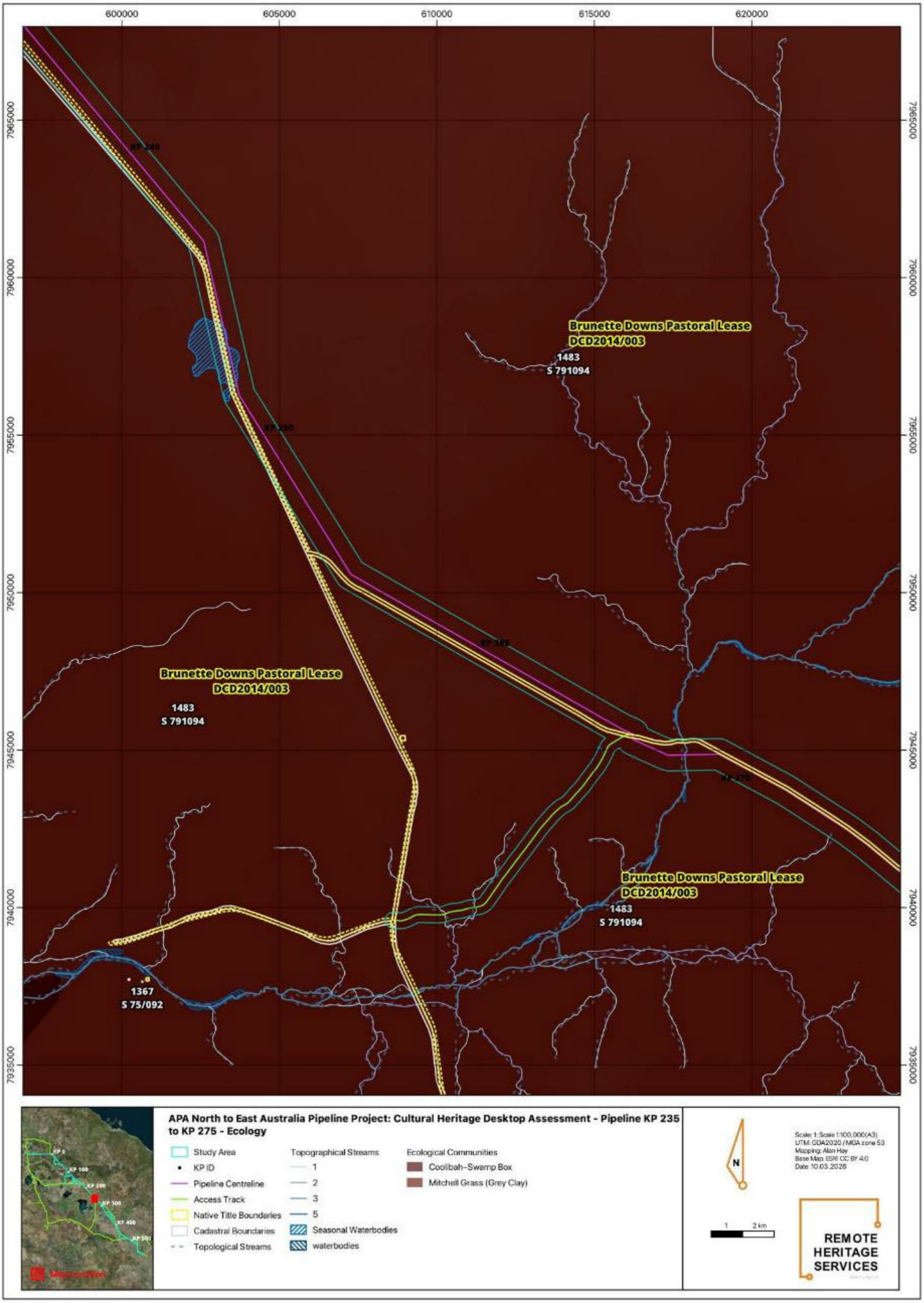

Figure 25: Pipeline KP 235 to KP 275 - Ecological Context.

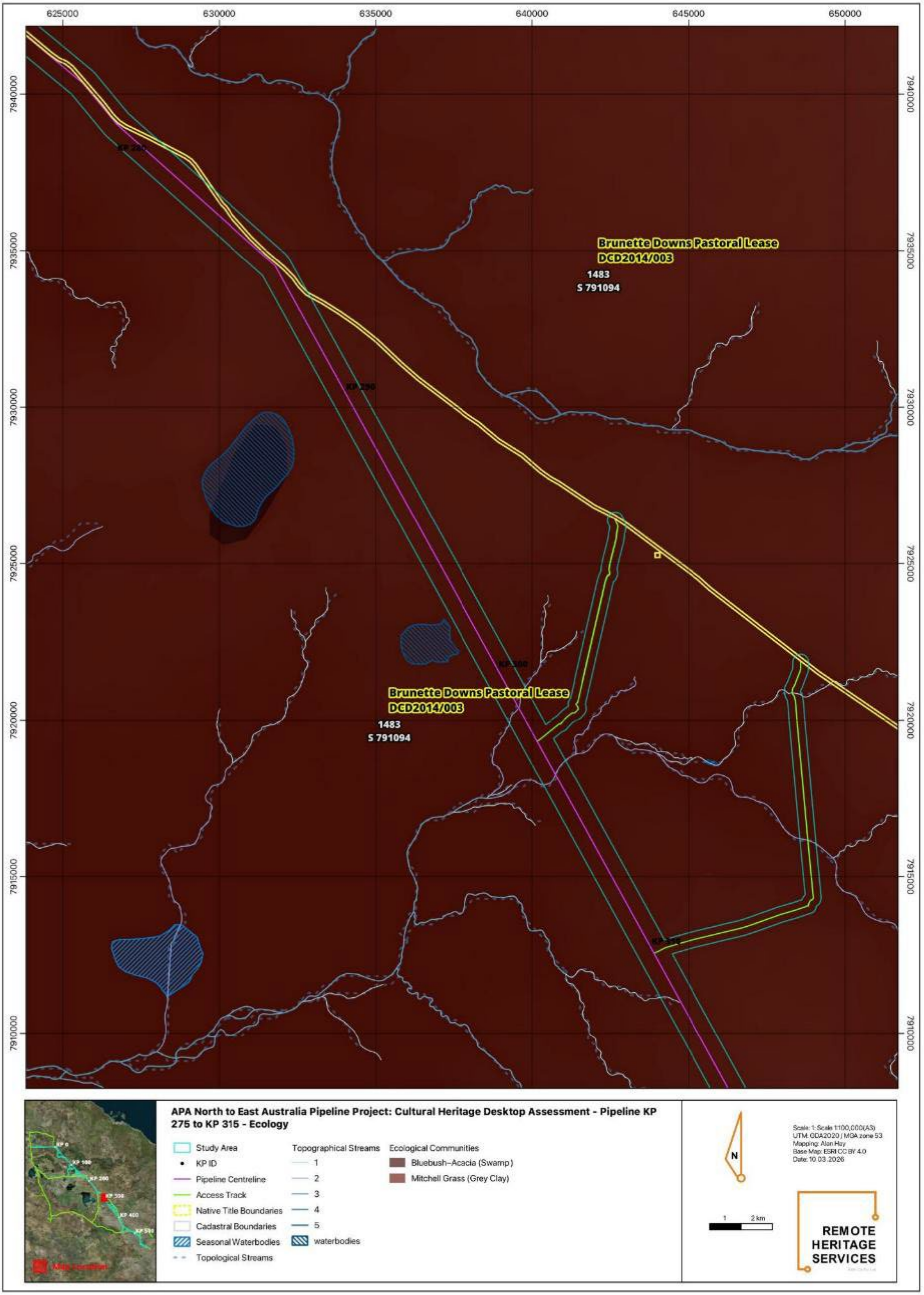

Figure 26: Pipeline KP 275 to KP 315 - Ecological Context.

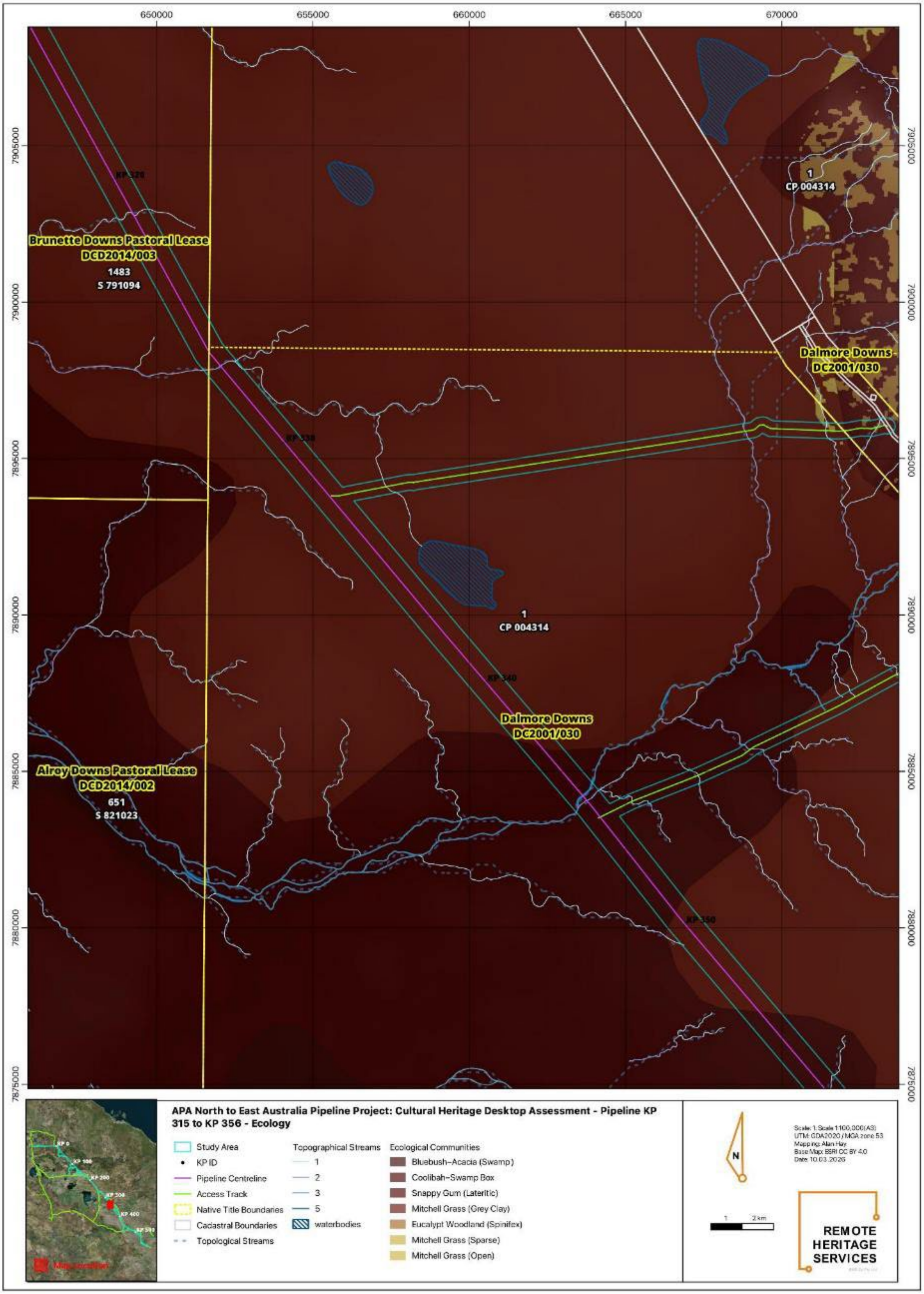

Figure 27: Pipeline KP 315 to KP 356 - Ecological Context.

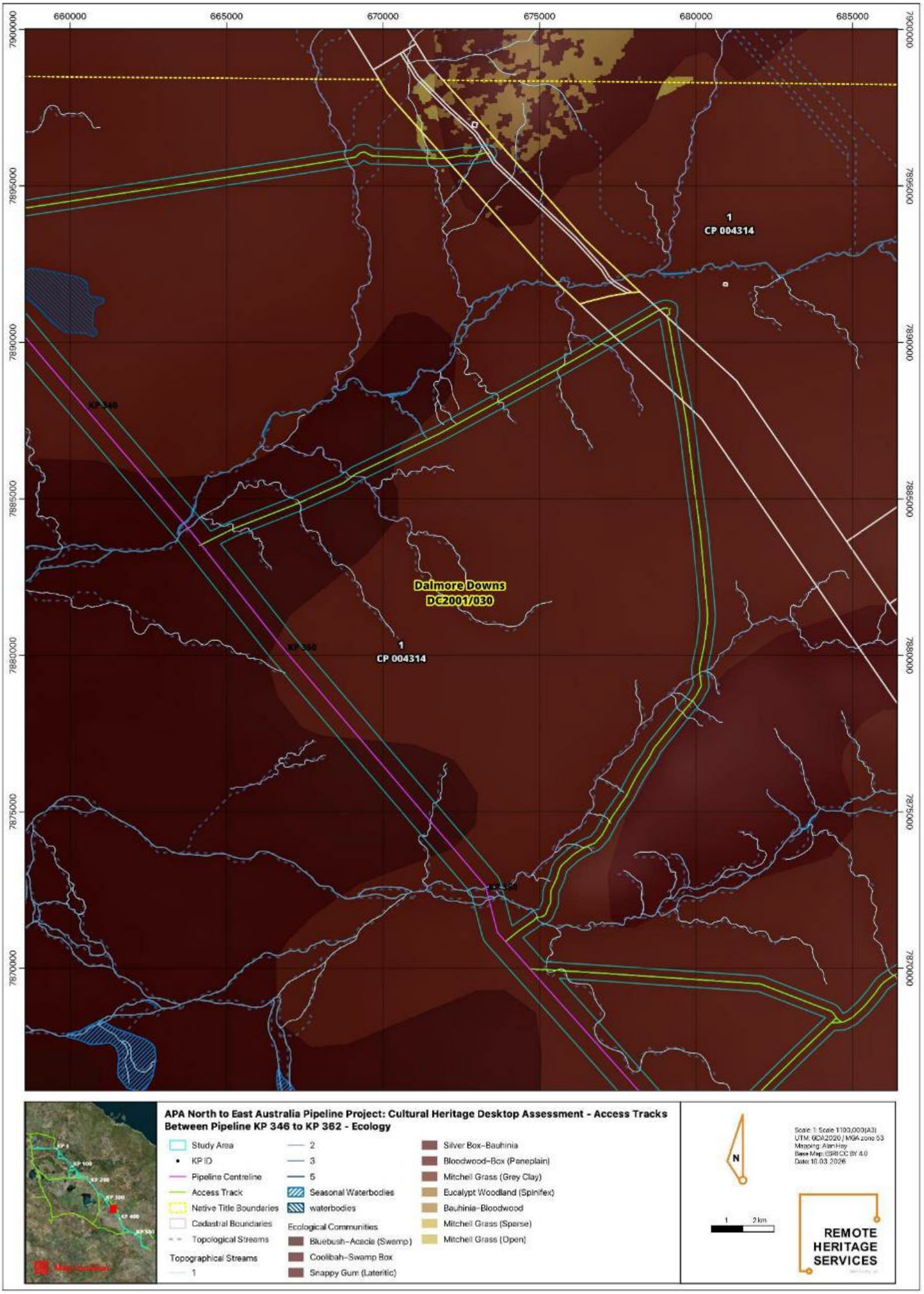

Figure 28: Access Tracks Between Pipeline KP 356 to KP 362 - Ecological Context.

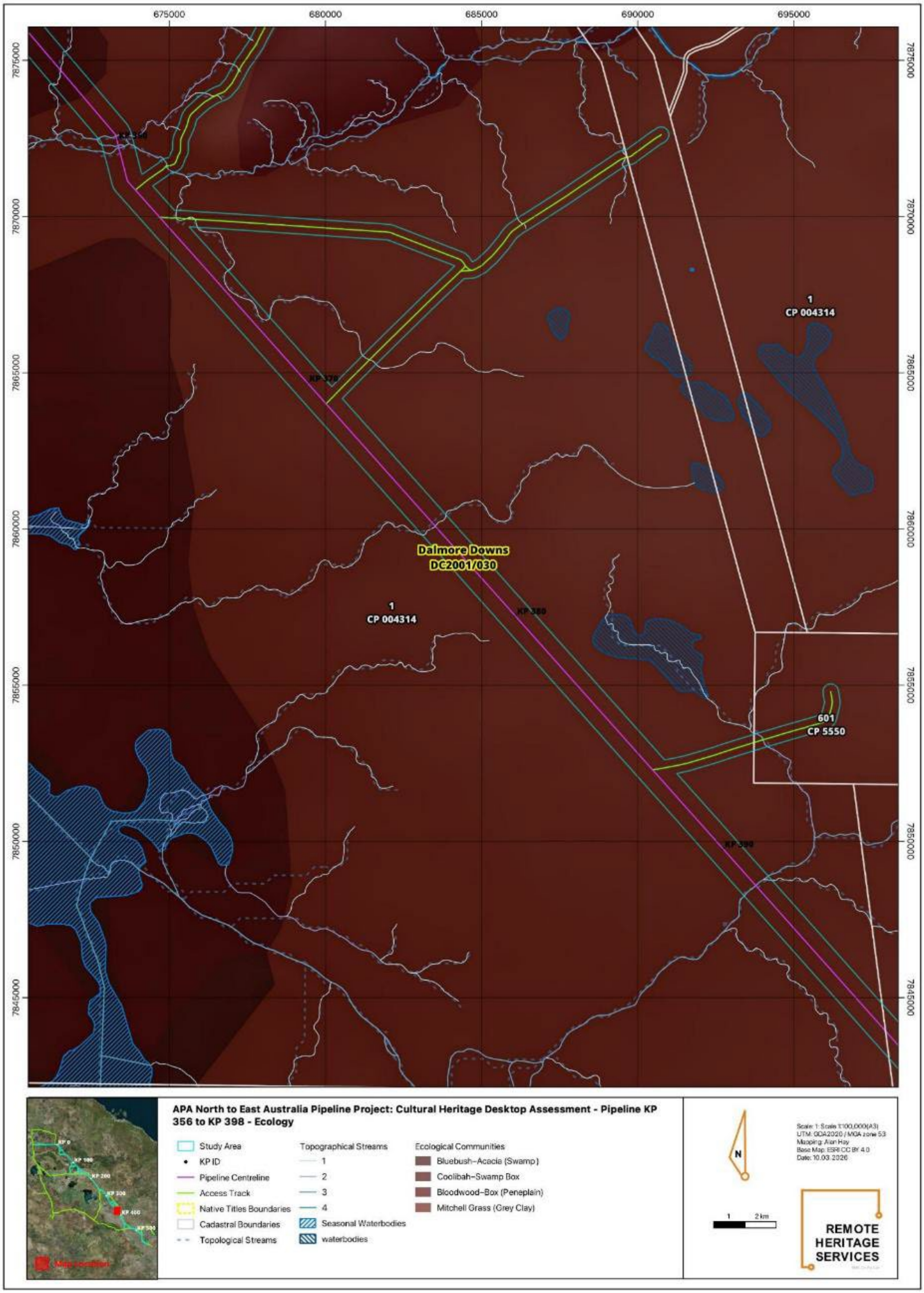

Figure 29: Pipeline KP 356 to KP 398 - Ecological Context.

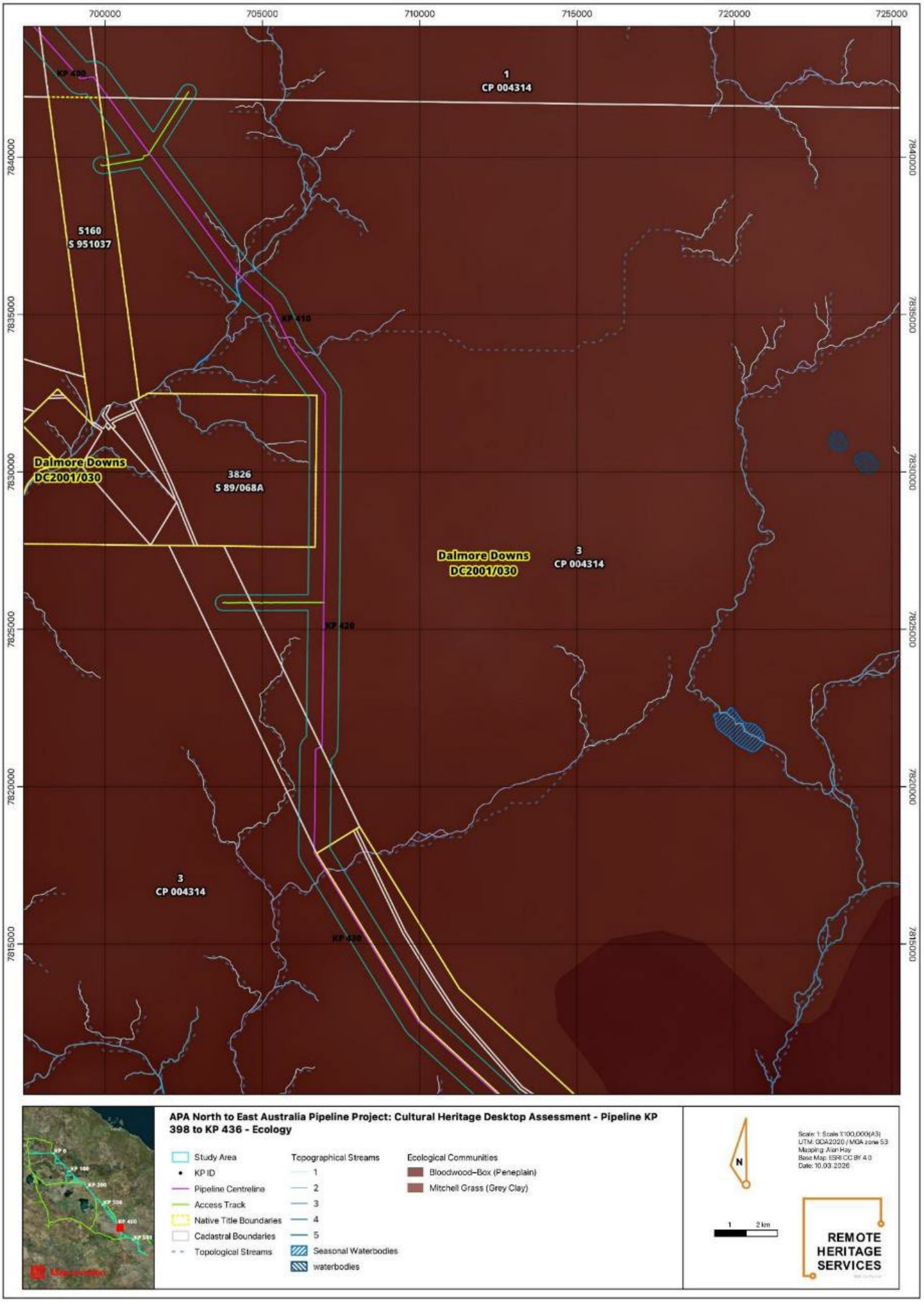

Figure 30: Pipeline KP 398 to KP 436 - Ecological Context.

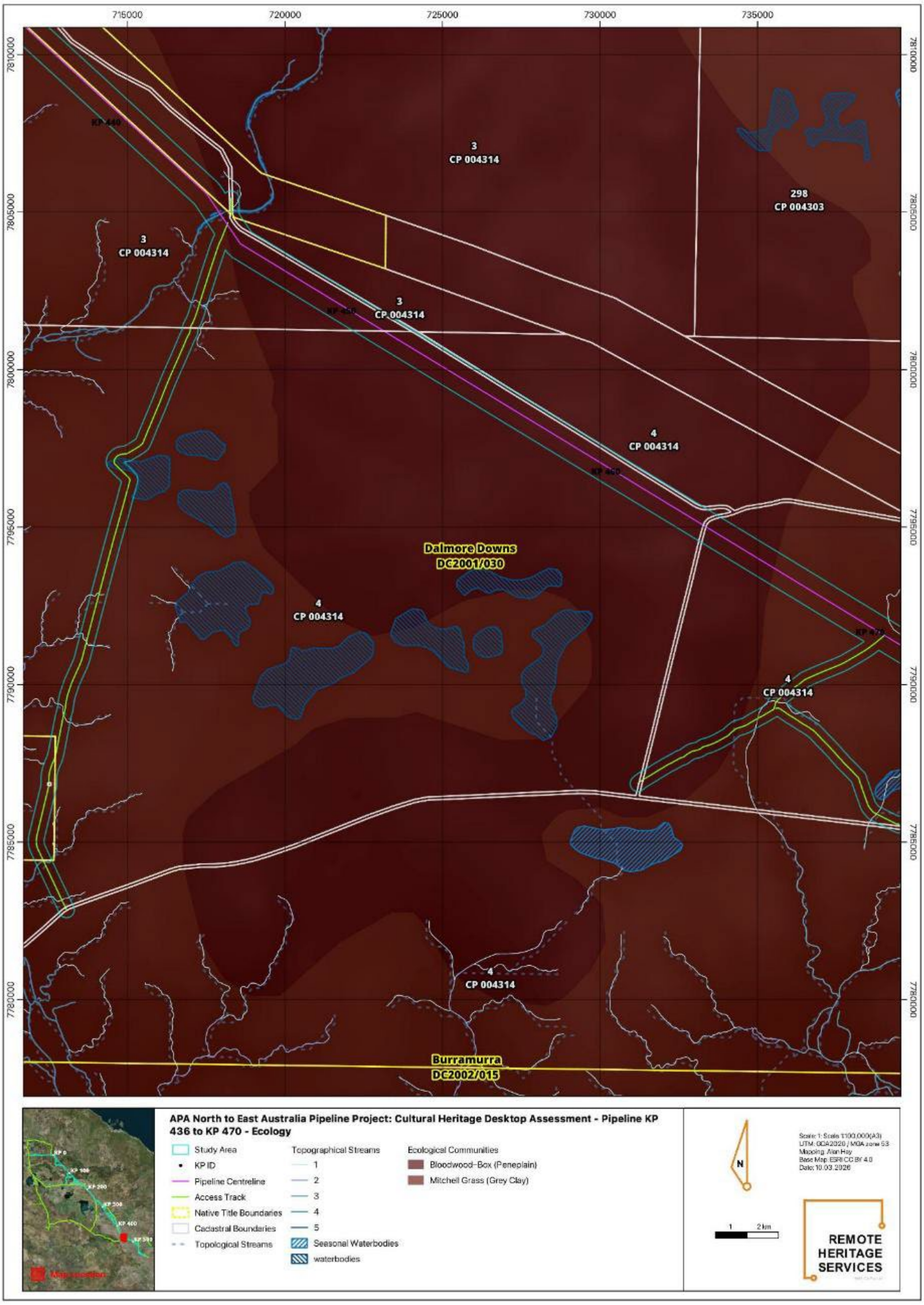

Figure 31: Pipeline KP 436 to KP 470 - Ecological Context.

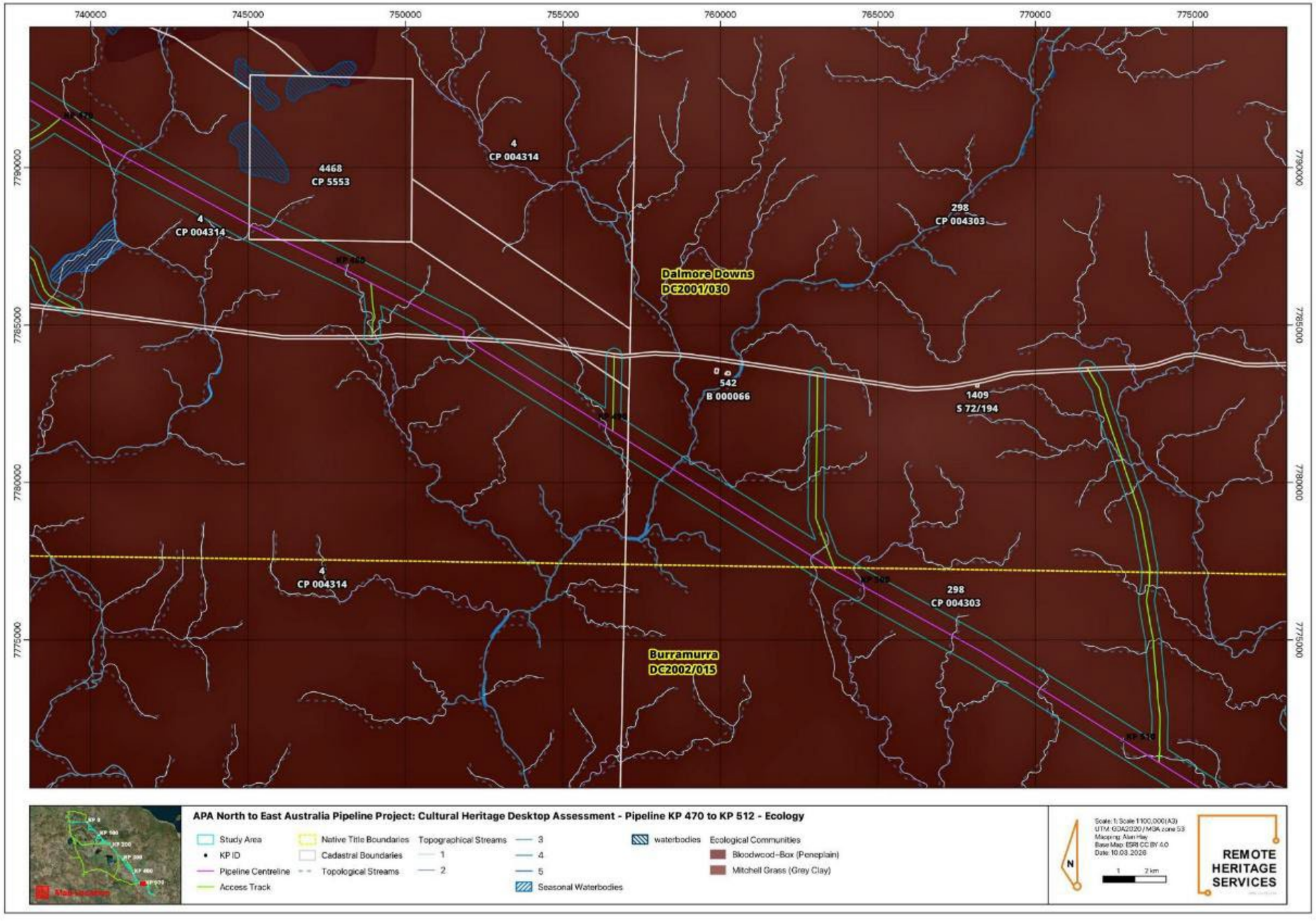

Figure 32: Pipeline KP 470 to KP 512 - Ecological Context.

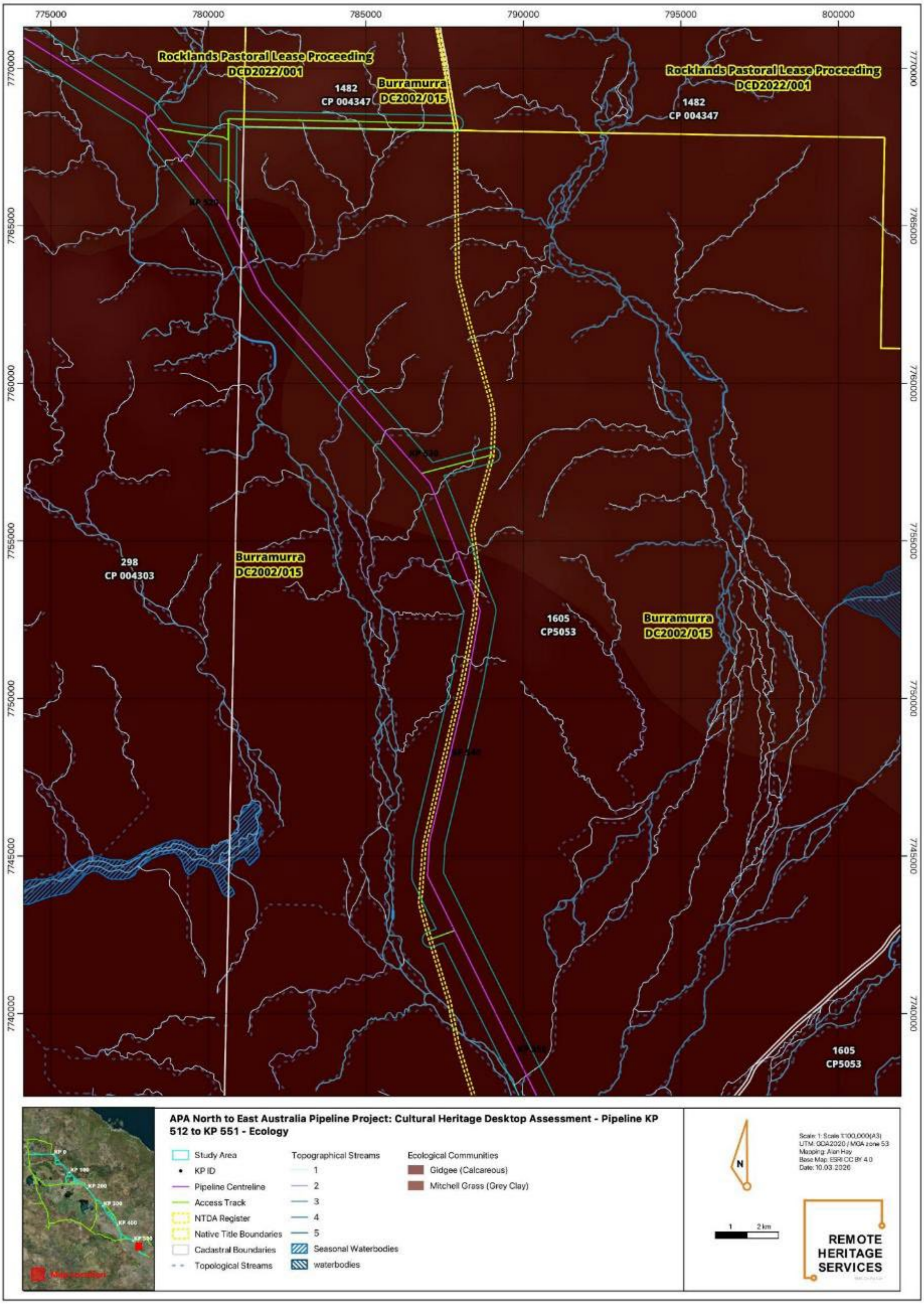

Figure 33: Pipeline KP 512 to KP 551 - Ecological Context.

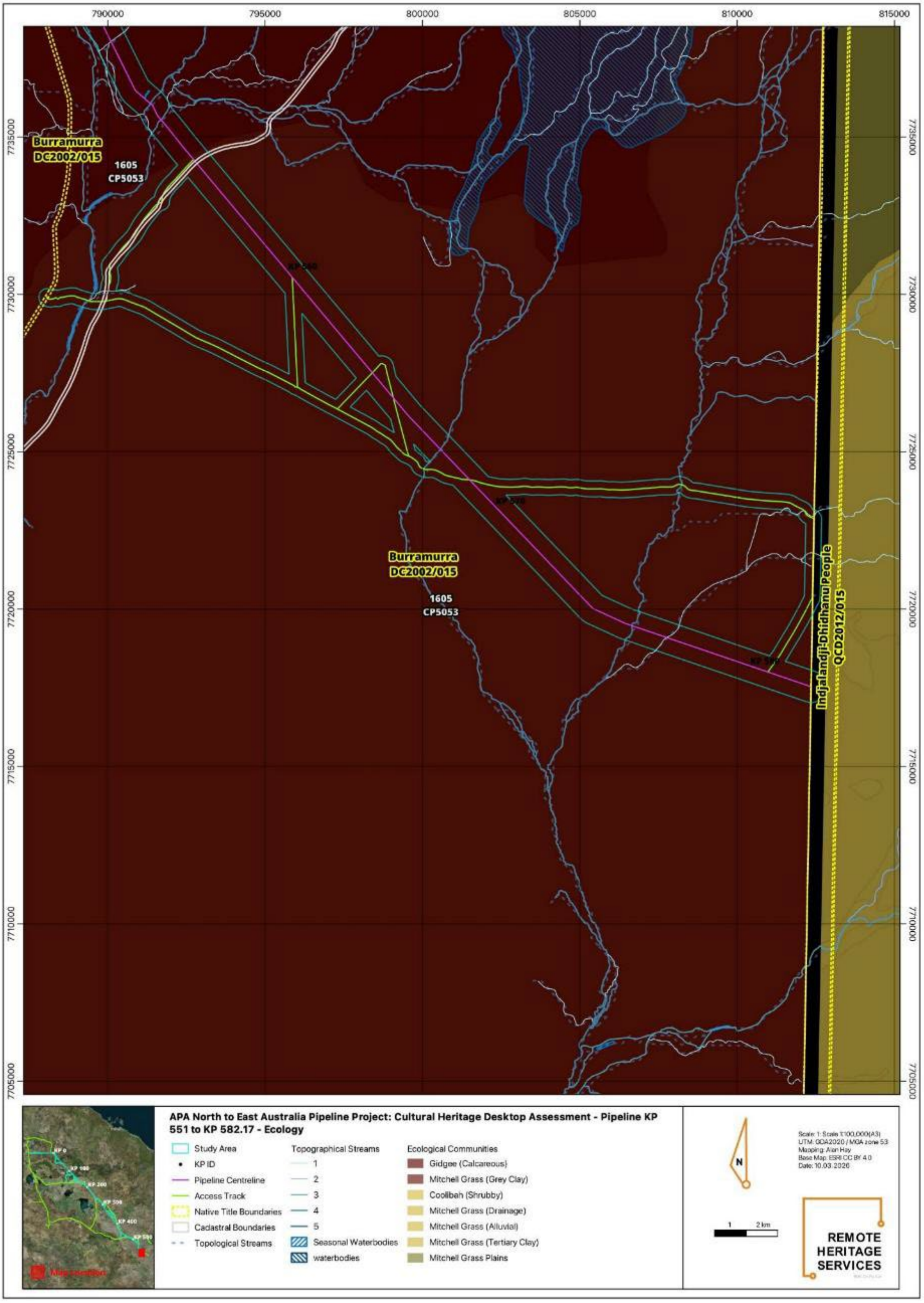

Figure 34: Pipeline KP 551 to KP 582.17 - Ecological Context..

4.4 POST-DEPOSITIONAL LAND DISTURBANCE FACTORS

The visibility, preservation, and integrity of cultural heritage across the NEA Assessment Areas are influenced by a range of post-depositional land disturbance factors. These factors must be considered when interpreting the results of archaeological survey and assessing the significance of identified cultural heritage places. The following discussion outlines the principal agents of disturbance relevant to the NEA Assessment Area.

4.4.1 Pastoral Activities

The Barkly Tableland has been subject to pastoral land use since the 1880s, when cattle stations including Avon Downs, Austral Downs Alexandria Station, Brunette Downs, Creswell Downs, and Anthony Lagoon were established on the Mitchell grasslands (Baker et al. 2002). The sustainability of these early pastoral enterprises was largely dependent upon the direct exploitation of the surrounding natural environment. Stations required extensive clearing of native vegetation for stockyards, homestead precincts, and access corridors, while natural water sources were appropriated and modified to sustain livestock. The landscape was fundamentally reshaped to serve the operational demands of the pastoral industry, with cumulative consequences for both the natural environment and the cultural heritage resource it contained.

A particularly significant aspect of early pastoral development was the establishment of water bores to access sub-artesian and artesian groundwater across the stations. Bore construction in the late nineteenth and early twentieth centuries required the deployment of steam-driven drilling machinery, such as the Davey Paxman steam engine, which powered bore-sinking operations across the region. Historic imagery shows this engine in use at Bore 16 on Alexandria Station, 1.1 km west of NEA Chainage 362 (see **Error! Reference source not found.**). This same engine now rests at Bore No. 8 at Anthony Lagoon, where it is protected on the Northern Territory Heritage Register as a significant example of early pastoral-industrial technology.

Figure 35: Davey Paxman steam engine at Bore 16 Alexandria Station, 1917

The operation of these steam-driven bore engines required timber as a fuel source, and this demand introduced a further layer of environmental disturbance to the surrounding landscape. Historical photographs from Alexandria Station depict large wagons heavily laden with timber being carted across the station to supply fuel for the bore-sinking machinery (see Figure 36). The scale of timber harvesting necessary to sustain bore-drilling operations was considerable; each bore required a continuous supply of firewood to keep the steam engine progressing, and timber was sourced from the surrounding woodlands, resulting in progressive denudation of vegetation across wide areas radiating outward from bore sites. This selective removal of timber likely altered the structure and composition of native vegetation communities which may have held culturally modified trees or other artefacts and structures.

Figure 36: Horse team hauling timber on Alexandria Station Approx 1920.

Pastoral activities over more than 140 years have introduced a broader range of ongoing disturbance processes to the landscape. Cattle grazing has resulted in the progressive degradation of ground surface conditions in the vicinity of waterholes, drainage lines, and other water sources, where stock congregate and trample the substrate. This trampling compacts surface soils, disturbs shallow archaeological deposits, and displaces surface artefacts from their original contexts. Stock routes and mustering tracks have created linear corridors of compacted and eroded ground across the NEA Assessment Areas, with some of these tracks subsequently formalised as station access roads. The establishment of pastoral infrastructure, including yards, bores, tanks, fencing, and homestead complexes, has introduced localised areas of intensive ground disturbance, particularly around permanent water sources that would also have been focal points for Aboriginal occupation. On the Sturt Plateau and Gulf Fall and Uplands sections, pastoral impacts are generally less intensive due to lower stocking rates on the lateritic soils, though localised disturbance around bores, yards, and access tracks is still evident.

4.4.2 Road and Infrastructure Construction

The NEA Assessment Areas are intersected by the Barkly Highway, the Tablelands Highway, Rankin Road, Austral Downs Road and Barkley Stock Route, coupled with a network of unsealed station access tracks and stock routes. Construction of these roads and their associated infrastructure, including borrow pits, gravel extraction areas, culverts, and drainage works, has introduced corridors of significant ground disturbance through the landscape. These roads have also been subject to multiple upgrades and realignments over the past century. Borrow pits excavated for road construction materials are a common feature along road corridors and represent areas of complete ground surface removal, often extending well beyond the immediate road formation. The progressive upgrading and sealing of regional highways have involved substantial earthworks, including land clearing, topsoil stripping, cut-and-fill operations, and the installation of drainage infrastructure, all of which have impacted the archaeological resource within road corridors and their immediate surrounds.

4.4.3 Gas, Oil, and Mineral Exploration

More recently, the NEA Assessment Areas have been subject to increasing levels of disturbance associated with gas, oil, and mineral exploration activities, particularly in connection with the Beetaloo Sub-basin. These activities have introduced well pads, drilling sites, seismic survey lines, and associated infrastructure into the Sturt Plateau and Gulf Fall and Uplands sections of the NEA Assessment Areas. Exploration drilling requires the construction of level, compacted well pads, typically involving vegetation clearing, topsoil removal, and the importation of fill material over areas of several hectares per site. Each drill site is serviced by access tracks, which involve further clearing, grading, and compaction of the ground surface, often extending for considerable distances through otherwise undisturbed terrain. Seismic survey programs have introduced extensive grids of cleared and graded lines across the landscape, with associated receiver lines, source lines, and vehicle access corridors contributing to widespread, albeit generally shallow, ground surface disturbance.

The cumulative effect of exploration activities is the progressive fragmentation of the land surface by networks of cleared pads, tracks, and linear corridors, with consequent impacts to the integrity and spatial context of surface and near-surface archaeological materials. Water extraction for drilling operations, the construction of temporary camp sites and laydown areas, and the movement of heavy vehicles and machinery across station tracks further compound the disturbance footprint of exploration programs. As exploration transitions to development and production phases, these impacts are intensified through the construction of permanent access roads, production well pads, gathering pipelines, and processing facilities. Exploration and development activities in the Northern Territory are generally subject to cultural heritage assessment requirements prior to commencement, with proponents obligated to identify and implement measures to avoid or minimise impacts to cultural heritage values.

4.4.4 Cattle and Feral Animal Impacts

Cattle impacts on the archaeological resource are most pronounced in the vicinity of water sources, where stock congregation results in intensive hoof traffic, surface compaction, pugging of wet soils, and disturbance of shallow deposits. Along watercourses, cattle access to channels and banks accelerates bank erosion and the reworking of alluvial deposits that may contain archaeological material. On the cracking clay plains, cattle trails create networks of compacted linear paths that

modify surface drainage patterns and concentrate erosion. These soils present poor contexts for site preservation independent of cattle activity, as the shrink-swell processes may mechanically displace artefacts vertically through the soil profile, compromising stratigraphic integrity in the process. As a result, archaeological material within cracking clay plains may already be buried below the depth accessible to surface cattle disturbance. Feral animals, including horses, donkeys, and pigs, contribute additional disturbance. Feral pigs in particular are known to root extensively in soft ground around wetlands and drainage features, disturbing shallow deposits and displacing surface materials. Feral animal impacts are concentrated around the same water sources that are of highest archaeological sensitivity.

4.4.5 Altered Fire Regimes

The introduction of pastoral land management has fundamentally altered the fire regimes that shaped the NEA Assessment Areas for tens of thousands of years prior to European settlement. Aboriginal peoples across northern Australia maintained the landscape through a system of fine-scale, mosaic burning conducted progressively throughout the year. These low-intensity, patchy burns served multiple purposes: regenerating food plants, maintaining open hunting grounds, managing fuel loads, encouraging new growth to attract game, and fulfilling ceremonial and custodial obligations to country. The resulting mosaic of recently burnt, regenerating, and mature vegetation across the landscape created a patchwork of differing fuel ages and structural conditions that functioned as a natural system of firebreaks, limiting the spread and intensity of any single fire event.

With the establishment of the pastoral industry from the 1880s, traditional burning practices were progressively disrupted and, in many areas, ceased entirely. Pastoralists actively suppressed fire across their leasehold lands in order to preserve grass cover for cattle grazing, particularly on the Mitchell grass plains and improved pasture areas where standing feed represented the primary economic asset of the station. The deliberate exclusion of fire from the landscape allowed grass fuel loads to accumulate unchecked over successive seasons, producing dense, continuous fuel beds that had not existed under traditional Aboriginal management. When fires do eventually ignite, whether from lightning strike, accidental ignition, or prescribed burning that escaped containment, the accumulated fuel loads result in fires of far greater intensity, extent, and duration than those that had occurred under the traditional mosaic burning regime.

These large-scale, high-intensity wildfires have had significant consequences for the cultural heritage resource. Fire-susceptible archaeological site types, including scarred trees, carved or ring-barked trees marking ceremonial or territorial boundaries, and wooden structures such as platform burials, and shelters, are particularly vulnerable to destruction by intense fire. The progressive attrition of fire-susceptible heritage sites through altered fire regimes represents an ongoing and cumulative threat to the cultural heritage values of the NEA Assessment Areas.

4.4.6 Natural Erosion and Soil Processes

In addition to anthropogenic disturbance, natural geomorphic processes influence the condition of the archaeological resource. On the cracking clay plains of the Mitchell Grass Downs, vertic soil processes, including seasonal shrink-swell cycling, self-mulching, and gilgai microrelief development, mechanically displace artefacts through the soil profile, destroying stratigraphic integrity and spatial patterning (Baker et al. 2002). Sheet erosion during high-intensity wet season rainfall events can strip

surface soils and expose or redistribute artefacts across deflated surfaces. Wind erosion during the dry season contributes to the deflation of sandy substrates on the Sturt Plateau and on sand sheets within the Mitchell Grass Downs, creating lag concentrations of heavier materials including stone artefacts. Along watercourses, episodic flood events scour channel beds and banks, transporting artefacts into secondary contexts within channel gravels. On lateritic surfaces, the stable, hardened substrate limits vertical displacement but artefacts remain exposed to weathering, animal burrowing, and surface wash.

The combination of pastoral, infrastructure, resource exploration, faunal, and natural disturbance factors means that archaeological material across the NEA Assessment Areas is rarely found in primary depositional context on open surfaces, and interpretations of site integrity must account for these post-depositional disturbance processes.

5 ETHNOHISTORICAL, ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

5.1 PRE-CONTACT LAND USE AND SUBSISTENCE ECONOMY

Prior to European contact, the semi-arid environment of the Barkly Tableland and broader NEA Assessment Areas supported mobile, seasonally adaptive groups whose land use was governed by a sophisticated and detailed ecological knowledge of the landscape. Perennial waterholes, soaks, and river systems functioned as the primary organisational anchors for Aboriginal occupation; movement patterns traditionally linked these permanent water sources during arid periods before expanding into broader foraging ranges during the wetter seasons Gould 1980; Smith 2013). This strategic relationship with water was a defining characteristic of long-term occupation, with the cultural significance of key water sources, some of which lie within or adjacent to the NEA Assessment Areas, reflecting their centrality to both practical survival and ceremonial life over millennia.

Documented land use strategies involved a complex suite of adaptive practices, including scheduled movement between resources, the management of vegetation through fire, and the exploitation of a wide diversity of plant and animal foods. The inherent flexibility of these subsistence strategies allowed Aboriginal groups to successfully mitigate environmental risk and maintain continuous occupation of this semi-arid region. Ultimately, the archaeological record across the Project region serves as partial material record of this sustained and adaptive use of the landscape.

5.1.1 Regional Patterns of Seed Processing and Exchange

A well-documented component of Aboriginal subsistence in arid and semi-arid Australia is the use of grinding technology for the processing of grass seeds, hard-cased seeds, tubers, corms, and other starchy plant foods. Grinding stones (consisting of lower grinding slabs and upper hand-held mullers) are a common stone artefact type recorded in the archaeological record across the arid and semi-arid zones of Australia (Smith 1986; Gorecki et al. 1997; Mulvaney 1997).

For the Holocene period, there is broad consensus that intensive seed-based economies were a component of Aboriginal subsistence. The formalisation of grinding technology, particularly the development of specialised wet-milling equipment, is widely associated with the intensified use of seeds in the late Holocene (Smith 1986, 2013). Smith's (1986) study documented the development of a distinctive millstone technology in Central Australia from approximately 5,000 years ago, associated with the intensive exploitation of grass seeds. However, some researchers argue that seed-based economies were important considerably earlier, suggesting that the late Holocene pattern reflects an intensification of pre-existing practices rather than an entirely new economic strategy (Fullagar and Field 1997; Gorecki et al. 1997).

Regardless of the precise antiquity of seed-based economies, the broader social and economic significance of seed processing is well attested in the archaeological record. The importance of seed processing extended beyond subsistence, as it was implicated in trade networks, social aggregation, and the provisioning of large ceremonial gatherings (Smith 2013; Cane 1989). The storage of processed seed foods enabled groups to support large populations at key water sources for extended periods. Archaeological research at the Kurutiti sandstone quarry on Helen Creek, approximately 100 km

south-west of the Collection Header Assessment Area, provides data on the scale of grindstone production in the region. The quarry encompasses approximately 5.5 hectares of quarried sandstone rubble within a 75-hectare site area, where controlled splitting and hammer-dressing were used to manufacture milling implements for the broader Barkly Tablelands (Mulvaney 1997). Associated with the Milywaru (two quiet snakes) Dreaming tradition, the site's mythological association is likely to have contributed to the value ascribed to its products within regional exchange systems (Mulvaney 1997). Investigations confirm the transfer of these implements over distances exceeding 300 km, providing material evidence of networks linking the Ashburton Range to the broader region (Mulvaney 1997; Mulvaney and Pickering 1991).

These archaeological patterns are corroborated by the ethnographic record, which documents both the technologies of seed processing and the exchange networks through which grinding implements circulated. Roth (1897:102) documented that grinding was done by means of two stones, a large irregular slab and a smaller rounded one, with seed worked until reduced to a fine powder. His accounts detail the systematic nature of the harvest, describing how various grasses were processed before being baked in the ashes into a form of damper (Roth 1901:11). Roth (1897:104) also documented the long-distance transport and barter of grindstones from the Toko Ranges, 280 km south of the NEA Northern Territory/Queensland border crossing, to exchange locations at Carandotta and Roxburgh, from which they entered wider distribution networks along the Georgina River. These observations are consistent with the archaeological evidence for the selective procurement of sandstone from sources such as Kurutiti (Mulvaney 1997), confirming the functional requirements of seed processing technology in the region. Ethnographic accounts from Newcastle Waters, approximately 60 km south of the Project Area, further attest to the importance of grass seed procurement at the time of European contact. Ashwin (1932:64) described large quantities of grass seed stored in wooden dishes at a camp near Newcastle Waters:

> *There was a large mia-mia [hut], about seven feet high, in the middle and about 16 feet diameter… There were large bundles of spears stored there, and large wooden dishes four and five feet long filled with grass seed as large as rice with the husk or skin still on the seed… There must have been about a ton of seed stored there in 17 large dishes, full and all covered with paper-bark.*

Within the Project Area and broader corridor, grinding stones remain a common surface and subsurface artefact class. Their presence, particularly around watercourses and lake margins, and on the margins of the black soil plains is consistent with the broader pattern of seed processing documented both archaeologically and ethnographically.

5.1.2 Trade and Exchange Networks

McCarthy (1939) documented a network of trunk trade routes traversing the Australian continent, along which goods, materials, ceremonial items, and knowledge were exchanged between Aboriginal groups over distances of thousands of kilometres. This research, published as a series of articles in the journal Oceania, remains a principal reference for the understanding of pre-contact Aboriginal exchange systems.

McCarthy identified several principal trunk trade routes operating at the continental scale (see Figure 37 below). The attached map, adapted from McCarthy (1939), illustrates these routes and their

geographic relationships to the approximate NEA Project Area. A major north–south trunk route ran along the Georgina River system through the eastern portion of the NEA Assessment Area, connecting the Flinders Range and Lake Eyre basin areas to the south with the southern Gulf coastal areas to the north (McCarthy 1939). Roth (1897:132), whose observations were drawn upon by McCarthy, described the operational character of these routes in the western Queensland districts adjacent to the Project Area:

> *"…this walk-about is but part and parcel of the great trading or bartering system which is more or less continually going on throughout the various districts. Certain trade-routes laid down from time immemorial along their own or messmates' country are followed by the members of a tribe or tribes, along which each knows that he is free to travel unmolested: these routes, of greater or less extent, are rigidly adhered to. The opening of the local market, so to speak, may take place at the instance of one of the elders or 'bosses' at one of the larger camps" (Roth 1897: 132, cited in McCarthy 1939).*

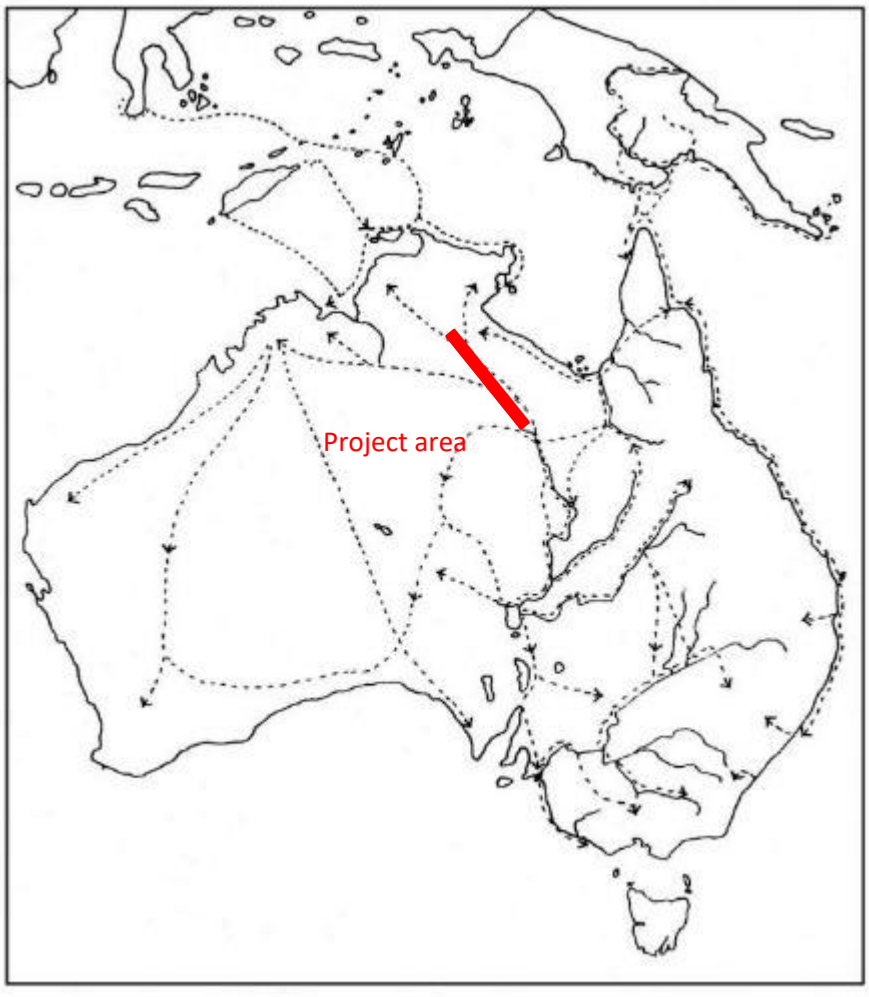

Figure 37: The Aboriginal trunk trading routes that operated throughout the Australian mainland and beyond, at the time of first European settlement, as analysed by F.D. McCarthy (adapted from McCarthy 1939: Map 16).

McCarthy's analysis demonstrated that the trunk trade system functioned in sections, with goods moving between neighbouring groups and horde territories in a relay-like fashion. Individual groups

generally knew the direction from which traded items arrived, but not necessarily their ultimate origin, a pattern consistent with the relay exchange model. The constant demand for items including pearl shell, baler shell, ochre, pituri (*Duboisia hopwoodii*), stone axes, and ceremonially significant materials ensured a continuous flow along the routes. This demand-driven system maintained ongoing inter-group contact and the social obligations that structured travel and exchange (McCarthy 1939; Mulvaney 2002).

McCarthy argued that the trade routes had maintained essentially stable pathways over long periods of time, citing the recovery of discarded bone, shell, and broken tools along established route corridors as evidence of their longevity and consistent use across generations (McCarthy 1939). The routes were generally well-known to participating groups, with knowledge of their existence and direction passing through oral tradition as song lines. In arid and semi-arid regions such as the NEA Assessment Areas, routes reliably followed watercourses and connected water sources, making the availability of water a key determinant of route geography.

5.1.3 Exchange Goods and Their Significance

The goods exchanged along the continental trade networks were diverse in both material type and cultural significance. Items documented in the ethnographic and ethnohistoric literature include: stone axes manufactured from particular quarry sources; red and yellow ochres sourced from specific geologically distinct deposits; pearl shell and baler shell moving inland from coastal regions; pituri (*Duboisia hopwoodi*i), a psychoactive plant traded across vast distances from its source areas in far western/central Queensland, principally west of the Georgina and Mulligan Rivers; wooden artefacts including spearthrowers, shields, and clubs; hair string and other woven items; and ceremonially significant objects including objects with specific Dreaming associations (McCarthy 1939; McBryde 1987; Roth 1897).

The significance of traded goods was frequently as much ceremonial and social as economic. As Stanner observed, it was typically the gift rather than what was given that mattered in Aboriginal exchange, and the act of exchange was fundamentally a social one that created and renewed obligations between groups and individuals (Stanner 1933, cited in Mulvaney 2002). The long-distance movement of items between groups involved in trade also implied a network of social relationships (kinship ties, ceremonial obligations, and forms of formal friendship) that structured who could travel where and on whose country (McCarthy 1939; McBryde 1987).

Oral histories recorded from Indjalandji-Dhidhanu People whose country intersects the eastern portion of the NEA Assessment Area confirm the operation of these trade networks at the local and regional scale (Keys and Memmott 2016). Accounts describe the exchange of green stone axes from specific source locations, green and black stone axes from river and upland Mitakoodi and Kalkadoon areas to the east, red ochre from Waanyi country, pituri from Birdsville, and ceremonially significant substances from specific named Dreaming locations across a broad geographic area (Memmott 2010). These accounts indicate detailed knowledge of the landscape extending beyond the boundaries of any single group's Country, and the maintenance of reciprocal obligations structured by kinship and ceremony.

Sandstone grinding implements constituted another class of exchange good within the Barkly Tablelands region, with their production and long-distance barter documented both ethnographically

and archaeologically (see Section 5.1.1). Non-local stone materials recovered at Kurutiti within the Ashburton Range (100 km southwest of the Collection Header), including banded chert from the Barkly Tablelands and dolerite axes likely originating from the Mount Isa area, provide evidence for bidirectional exchange, with grindstones moving outward from the Ashburton Range while other valued stone types moved inward (Mulvaney 1997; Mulvaney and Pickering 1991). The leilira (stone knife) blades produced at the nearby Renner Springs silcrete quarries also circulated within this regional exchange system, wrapped in paperbark sheaths and bundled together specifically for exchange purposes (Paton 1994; Murgatroyd 1991). These multiple overlapping exchange networks, involving grindstones, leilira blades, stone axes, and other goods, together constituted a complex regional economic and social system linking the groups from across the Project Area to a broader continental exchange framework.

5.1.4 Inter-Group Ceremonial Connections and the Law Bloc

Trade along the continental routes was inseparable from inter-group ceremony, Law obligations, and social exchange. Meetings at key locations facilitated initiation ceremonies, regional Law business, and inter-marriage arrangements, all of which reinforced the network of kinship and custodial relationships binding together the Traditional Owner groups of the region. These relationships were formalised through an Inter-tribal Law Bloc maintained across the Georgina River basin, which connected groups across the NEA Assessment Areas in a shared framework of ceremonial obligation extending over hundreds of kilometres (Memmott 2010).

Research at Kurutiti provides additional data on the ceremonial dimension of exchange, where the Milywaru Dreaming tradition is associated with the Kankarlu ceremony, a high ceremony involving initiation rites, body painting, and restricted men's business (Mulvaney 1997). Custodians reported that ceremonies associated with Milywaru sites, including Kurutiti, were performed during the early wet season around November and December, when congregations of people would gather at the location for extended periods. Historical sources indicate that such ceremonial gatherings in the Barkly region could attract several hundred people (Favenc 1879, 1888; Ashwin 1932). It is within these ceremonial contexts that the exchange of grindstones, stone knives, ochres, and other goods principally took place, with the act of exchange embedded within kinship obligations and ritual performance rather than functioning as a purely economic transaction (Mulvaney 1997; Stanner 1933).

These relationships are not restricted to the historical period. Many are formally recognised in contemporary native title determinations, which acknowledge reciprocal ceremonial rights and obligations between groups as part of the ongoing expression of traditional law and custom. The persistence of these obligations into the present is indicative of the continuing cultural heritage values associated with the Project Area and is a material consideration for cultural heritage management across the corridor.

5.1.5 Early European Contact and the Pastoral Period

The first recorded European crossing of the Barkly Tableland occurred from November to December 1861, when explorer William Landsborough traversed the region during his search for Burke and Wills, naming it after Sir Henry Barkly, then Governor of Victoria (Landsborough 1862; Queensland Heritage

Register, Camp 67 and Camp 69 entries). Landsborough's traverse opened the region to subsequent pastoral interest, though sustained non-Indigenous settlement did not immediately follow.

Landsborough's journal provides an early documented account of contact-period exchange in the Project corridor. On 29 December 1861, at Camp 25 on the Herbert River (now the Georgina River), Landsborough recorded that his troopers, with his consent, presented glass bottles to Aboriginal people encountered near the camp. The Aboriginal group subsequently returned with the bottles alongside hawk feathers, displaying them as tokens of peaceful intent to the expedition party (Landsborough 1862). This episode documents the incorporation of European material objects into Aboriginal systems of social signalling and exchange. The approximately one hundred Aboriginal people reported in the vicinity of this camp, described by Landsborough as heavily armed warriors, is consistent with the Herbert River waterway functioning as a focus of Aboriginal occupation and aggregation at the time of first European contact. The use of glass bottles as exchange items is consistent with the archaeological identification of knapped glass artefacts at contact-period sites in the broader region.

The arrival and settlement of Europeans more broadly from the 1860s and 1870s, through the establishment of the Overland Telegraph Line, pastoral expansion, and droving infrastructure, was accompanied by disruption to Aboriginal populations and traditional lifeways (Bottoms 2013; Evans et al. 1988; Loos 1982; Reynolds 1978). Frontier conflict and displacement affected the distribution of Aboriginal groups across the region and, in some cases, contributed to the misidentification of traditional territories in early ethnographic records, with groups recorded in locations that reflected their displacement rather than their traditional Country (Memmott et al. 1988; Memmott 2010).

By the early twentieth century, transient reconnaissance had given way to permanent pastoral settlement. Large station leases transformed the land use patterns of the region and drew Aboriginal groups into the station economy as workers, often under conditions that further disrupted connections to Country. The early ethnographic record for the specific NEA Assessment Areas is sparse, and much of the current understanding of traditional occupation and land use derives from oral histories held by Traditional Owners and from anthropological research conducted in direct consultation with Aboriginal communities, largely in the context of native title claims.

It should be noted that errors characterise portions of the early ethnographic literature. Subsequent field research, primarily associated with land claims and native title processes, has substantially revised and corrected these earlier accounts. The definitive authority on matters of cultural affiliation, estate group identity, and Country rests with Traditional Owners themselves. The anthropological work currently being undertaken by the Northern Land Council, in consultation with the relevant Traditional Owners will provide the authoritative basis for understanding the specific cultural heritage interests at stake across the Project Area.

5.2 Archaeological Background

Comparatively little is known about the archaeology of the Mitchell Grass Downs bioregion and the Barkly Tableland. As Wallis and Collins (2013:45) observe, whilst archaeological sites in inland north-west Queensland were first described in the early 1900s, limited systematic research has been undertaken in the region. The NEA Assessment Areas themselves have been subject to minimal archaeological investigation. Understanding of Aboriginal occupation in the immediate vicinity must

therefore be extrapolated from broader patterns documented across Central Australia, from archaeological research specific to the Mitchell Grass Downs, and from comparable lineal survey projects.

5.2.1 Regional Archaeological Patterns in Central Australia

Aboriginal occupation of Central Australia is dated to at least 35,000 years Before Present (BP), through age determinations at Puritjarra Rock Shelter in the Cleland Hills (Smith et al. 2017) and Kulpi Mara Rockshelter (Thorley et al. 2011). Evidence from Central Australian sites suggests Aboriginal groups in the Pleistocene were generally small and highly mobile, using wider territories than those occupied in the Holocene (O'Connor et al. 1998; Smith 1989; Smith et al. 1998; Thorley 1998). This phase of colonisation most likely coincided with a period of higher rainfall. Horton (1981) proposed that paleo-drainage systems, comparable to those feeding into the Newcastle Waters, Tarrabool Lake and Lake Sylvester and the Georgina Basin may have acted as critical corridors allowing people to move into the drying interior of Australia in the pre-Last Glacial Maximum (LGM) period. No Pleistocene occupational areas have been recorded in the surrounding region, though potential has been noted at Lake Woods 100 km to the southwest (Bowler et al. 1998; Shipton et al. 2021; Smith 1986).

Increased aridity during the LGM (20,000 to 18,000 years BP) led to changes in residential mobility, territory, and regional networks (Smith 1989; Veth 1989, 1993, 2005b). Suggestions by Veth (1993) and others that better-watered parts of Australia functioned as refugia during this period have found support in excavations at sites such as Gledswood 1 Rockshelter, on the eastern margins of the Mitchell Grass Downs, which shows occupation spanning more than 28,000 years in a comparable watered setting to the Georgina River system (Keys 2009; Wallis et al. 2009, 2014; Lowe et al. 2016). Similarly, Pleistocene sites have been recorded at Lawn Hill, 200 km to the east of the NEA Assessment Areas. Post-LGM occupation across the continent shows a strong increase in activity between 9, 000 and 6,000 years BP, followed by an apparent decline around 3,000 years BP that may represent a major population contraction linked to the onset of El Niño–Southern Oscillation conditions (Smith et al. 2008; Williams et al. 2015). Recovery may not have occurred in Central Australia until 1,500 years BP. The last 1,000 years appears to have been a period of significant change, with evidence of more intensive occupation and substantial increases in site use, particularly in lower catchments and on sand plain and valley floors (Smith 2006; Thorley 1998).

During the mid-to-late Holocene (5,000 to 3,000 years BP), hafted tools such as tula adzes and backed blades, along with a seed grinding economy, appeared in Central Australia (Smith 1986). More than 70 of the 140 known plant food species in Central Australia were exploited for seeds (Flood 1990).

5.2.2 Comparable Lineal Pipeline Surveys

Several lineal pipeline surveys in comparable arid to semi-arid zone landscapes provide directly applicable data for predictive modelling. Earthsea Pty Ltd conducted extended surveys for two pipelines: one extending 400 km across parts of the Tanami Desert north of Alice Springs, and another extending 670 km from Tennant Creek to Mt Isa. Consistent patterns observed across both surveys included: a complete absence of artefactual material in arid land units without water; increasing density and diversity of artefact types in areas with permanent water access; and larger, more diverse sites in areas with greater resource availability and higher annual rainfall.

Wolfe and Keys (2021) assessed the Sun Cable Australia-Asia PowerLink Solar Precinct near Lake Woods, approximately 115 km southwest of the Project Area, documenting 13 archaeological sites and 26 isolated artefacts. Site types comprised minor lithic scatters, minor stone quarries, and drainage depressions/soaks, with artefact assemblages predominantly composed of flaked stone in chalcedony, quartzite, silcrete, and chert. Distribution showed clear correlation with water sources and raw material outcrops. Some claypans showed signs of potential enhancement by Aboriginal people through deepening to exploit subsurface water. Evidence of knapped glass and ceramics at one survey location indicated that stone tool manufacture continued into the twentieth century.

The most directly comparable survey to the current Project Area was the Jemena Northern Gas Pipeline (NGP) cultural heritage assessment (Keys and Memmott 2016). The NGP spans 622km in total from near Tennant Creek (NT) to Mount Isa (Qld). The Keys and Memmott (2016) assessment encompassed a 146 km corridor extending east from the Queensland/Northern Territory border through the Indjalandji-Dhidhanu Native Title Determination Area. The survey of a 50 m wide corridor, conducted between May and July 2016 with full Traditional Owner participation coordinated by Dugalunji Aboriginal Corporation, recorded 101 archaeological sites and 1,076 isolated finds. Site types comprised artefact scatters (73), quarry sources (20), isolated knapping areas (4), culturally modified trees (3), and a single contact site. Overall site density averaged one site per 1.4 km, with a background scatter of approximately seven isolated artefacts per kilometre.

The distribution of archaeological material along the NGP corridor showed strong correlations with proximity to watercourses and outcropping raw materials. Larger stone artefact scatters, containing high diversity in raw material and tool types including formal tools, retouched artefacts, and grindstones, were principally located on sandy margins of the black soil plains adjacent to watercourses. Artefact frequency decreased across the Mt Isa Inlier where water sources were scarce. Quarry sites were located in virtually all locations where suitable raw material was present. While more than 60% of site complexes comprised fewer than 50 artefacts, several large sites exceeded 2,000 artefacts each, and 41 sites had boundaries extending beyond the surveyed corridor.

5.2.3 Archaeological Patterns in the Mitchell Grass Downs

Archaeological research specific to the Mitchell Grass Downs remains limited. The most common site types recorded are open, low-density concentrations of predominantly silcrete and chert unretouched flakes and cores located on slightly elevated ridges or terraces in close proximity to watercourses (Wallis and Collins 2013). These assemblages represent palimpsests, with multiple occupation events compressed into single non-stratified surface deposits. The evidence suggests use by highly mobile, transient populations on an occasional seasonal basis when environmental conditions were amenable to travel.

The cracking clay vertosols that dominate the Mitchell Grass Downs present particular challenges for archaeological preservation. Vertic soil processes, including seasonal shrink-swell cycling, self-mulching of the surface horizon, and gilgai microrelief development, mechanically displace artefacts through the soil profile, destroying stratigraphic integrity and spatial patterning. Archaeological material on these surfaces, where present, occurs as low-density, deflated surface scatters that cannot be considered in situ.

5.2.4 Contact Archaeology

Contact period sites are relevant to understanding Aboriginal responses to colonisation and the transformation of Aboriginal societies during the early colonial period. Archaeological evidence from comparable regions demonstrates that Aboriginal people maintained stone tool manufacture into the twentieth century while incorporating European materials into their technological repertoires (Wolfe and Keys 2021).

No systematic studies of contact period features have been undertaken in the immediate NEA Assessment Areas. Sites associated with Aboriginal people involved in the pastoral industry are probable, as are sites relating to the construction of the Overland Telegraph Line. The distribution, density, and characteristics of contact period sites in the region remain poorly understood due to the lack of systematic investigation.

5.3 HISTORICAL HERITAGE OF THE NEA ASSESSMENT AREAS

The NEA Assessment Area traverses one of the longest-settled pastoral landscapes in northern Australia, extending from Daly Waters eastward across the Barkly Tableland to Camooweal in western Queensland. The NEA Assessment Area overlays more than 160 years of cumulative European land use along. Successive phases of exploration, telegraph construction, pastoral occupation, droving, and road development have produced a complex pattern of historical heritage places and landscape modification along this alignment.

This section provides a brief outline of the principal historical themes relevant to the NEA Assessment Areas, drawing on primary and secondary sources to establish the sequence of European exploration, pastoral development, and associated infrastructure within the NEA Assessment Area. It also addresses the relationship between European movement corridors and pre-existing Aboriginal pathways, and the implications of historical land use for archaeological preservation and visibility within the NEA Assessment Area.

5.3.1 European Exploration

- **John McDouall Stuart and the Route North**

European knowledge of the country traversed by the NEA Assessment Area derives initially from the explorations of John McDouall Stuart, whose route established the alignment subsequently followed by the Overland Telegraph Line, the north–south stock routes, and ultimately the Stuart Highway. It is unknown whether Stuart traversed any parts of the NEA Assessment Area during his fifth and sixth expeditions (1861–1862), however it is noted the Stuart Highway closely follows his route. On his fifth expedition he reached the extensive chain of ponds to which he applied the European name Newcastle Waters in late May 1861 (Hardman 1865). He established a base camp near the present station site but was unable to find a practicable route northward through the waterless scrub and turned back in July 1861. On his sixth and successful transcontinental crossing, the party returned to Newcastle Waters on 5 April 1862 and rested the horses for a week before pushing north. Stuart reached and applied the European name Daly Waters on 28 May 1862, after Sir Dominick Daly, Governor of South Australia, and camped there for two weeks while scouting the route ahead (Morris 1976; Bailey 2006).

His journals record the country's waterholes, timber, and grass cover in terms that directly informed both the telegraph alignment and subsequent pastoral development.

5.3.2 William Landsborough and the Search for Burke and Wills

At the eastern end of the NEA Assessment Area, European presence on the upper Georgina River commenced with the explorer William Landsborough's passage through the area in 1861–1862. Landsborough had been appointed by the Victorian and Queensland governments to lead one of four official relief expeditions dispatched to search for the missing Burke and Wills party, which had set out from Melbourne in August 1860 to cross the continent from south to north and was reported missing in June 1861 (QHR listing 602716).

Landsborough's party sailed from Brisbane aboard the brig Firefly and established a depot on the Albert River at the site of present-day Burketown. From mid-November 1861 he explored south-westward toward Central Mount Stuart, following the Gregory River and ascending the main range. On 21 December 1861, Landsborough encountered and applied a European name to an inland river flowing south, which he called the Herbert, after the first Premier of Queensland. The Queensland authorities subsequently renamed this river the Georgina, after the daughter of Sir Arthur Kennedy, Governor of Queensland from 1877 to 1883. Northern Territory maps continued to show the upper reaches as the Herbert River into the twentieth century, and the name Herbert River remains in use in the Northern Territory for the headwaters of this watercourse (NT Place Names Register).

Landsborough encountered three large waterholes on the upper Georgina River, already long known to and held as sacred sites by the Indjalandji people, and applied the European names Lakes Mary, Francis, and Canellan (also recorded in his journal as 'Kenellan'). These waterholes and their resources supported the trading and ceremonial camps of the Indjalandji and their neighbours (Memmott 2010; 2012). Landsborough recorded large groups of Aboriginal people, noting approximately one hundred people in the neighbourhood of his camp. On 30 December 1861 he reached the furthest extent of his search and, realising that rain could flood the country and isolate his party, struggled back to the Albert River depot without finding any trace of Burke and Wills (QHR listing 602716). Landsborough subsequently led his party south, eventually reaching Melbourne in October 1862, becoming the first European to cross the continent from north to south.

Landsborough's favourable reports of the surrounding grasslands, which he described as some of the finest pastoral country he had seen, triggered successive waves of pastoral occupation on the upper Georgina River between 1864 and 1884 (Memmott 2012). His exploration also contributed directly to the extension of Queensland's western boundary from 141° East to 138° East in April 1862, placing the Albert, Gregory, and Herbert (Georgina) rivers and much of the Barkly Tableland within Queensland (QHR listing 602716). Landsborough also applied the European name Barkly Tableland to the region, after Sir Henry Barkly, then Governor of Victoria.

5.3.3 David Lindsay and the Pastoral Boundary Surveys

In 1885–1886, the surveyor David Lindsay led a private expedition from Adelaide to Port Darwin, the principal purpose of which was to survey and fix the boundaries of pastoral leases on the Barkly Tableland. Lindsay's party, consisting of seven men and twelve camels, departed Hergott Springs (now Marree) in November 1885 and travelled north through the sandy desert to the Queensland boundary

area before commencing the pastoral surveys (South Australian Register, 30 November 1886; Lindsay 1889).

Lindsay proceeded to the Herbert trigonometrical pile (also known as the Austral Pillar) (19 km Southwest of NEA KP 555), a survey monument established by Charles Winnecke at the junction of the Herbert (Georgina) and James Rivers, south of the present Austral Downs homestead. This pile had been built to enable pastoral leases to be granted in 1882, prior to the completion of the Northern Territory–Queensland border survey in 1884. From the pile, Lindsay commenced his survey to fix the boundaries of the pastoral leases and resolve disputes over the ownership of important water sources across the Barkly Tableland (South Australian Register, 30 November 1886; NT Place Names Register).

Lindsay's survey occupied approximately six months. He examined some 250 miles of country and connected the Queensland boundary with the Overland Telegraph Line, setting out the principal boundaries for many of the great stations including Alexandria and Brunette Downs (NT Place Names Register). Lindsay reported the country as first-class grazing land with sufficient timber and good permanent waters, and noted the ease with which wells could be sunk in the tableland. His survey work was instrumental in resolving boundary disputes and formalising the tenure arrangements that underpinned the pastoral industry across the region. Lindsay was subsequently elected a Fellow of the Royal Geographical Society, London, and published an account of his expedition in the Proceedings of the Royal Geographical Society in 1889.

5.3.4 **Ernest Favenc and the Queenslander Transcontinental Expedition**

In July 1878, Ernest Favenc was selected by the proprietors of The Queenslander newspaper to lead an expedition from Blackall in western Queensland to Darwin, to evaluate the practicability of a transcontinental railway connecting the Queensland rail network with Port Darwin. Favenc's party, comprising O'Malley, Hedley, Briggs, and an Aboriginal member, departed Blackall and traversed country along the western border of Queensland, crossing the northern portion of the present survey area and reaching Powell's Creek on the Overland Telegraph Line before continuing to Darwin, arriving in February 1879 (Gibbney 1972; Favenc 1888).

Favenc's route across the Barkly Tableland took him through the northern part of the NEA Assessment Area. During the course of this expedition, Favenc located the permanent lagoon on Cresswell Creek that subsequently gave Anthony Lagoon its name, and recorded the Corella Lagoon, Cresswell Creek, Sylvester Creek, and De Burgh Creek, among other features (Favenc 1888). The identification of permanent and semi-permanent water sources along this route was of direct consequence for subsequent pastoral occupation; Favenc himself returned to the region in 1881 and, in partnership with the De Salis brothers, established Cresswell Downs Station on the creek he had recorded three years earlier (Gibbney 1972).

A notable aspect of Favenc's expedition reports, published in The Queenslander, was his practice of recording Aboriginal names for water bodies alongside the European names he applied. This was not universal among explorers of the period; Winnecke, surveying comparable country on the southern Barkly Tableland in 1878, was unable to record Aboriginal names for the waterholes and native wells he encountered until he began employing Aboriginal guides on his return in 1883 (Koch 2009). Favenc's inclusion of Aboriginal toponyms provided a degree of consistency between European mapping and Aboriginal geographical knowledge, and these records contribute to the identification of places of cultural significance within the NEA Assessment Area.

5.3.5 The Overland Telegraph Line

The completion of the Australian Overland Telegraph Line in August 1872 was the single most transformative European intervention in the landscape traversed by the NEA Assessment Area. The 3,200 km line from Adelaide to Darwin followed Stuart's route and was constructed under the direction of Charles Todd, South Australia's Superintendent of Telegraphs (Taylor 1980; Donovan 1981). The Powell Creek Telegraph Station, located approximately 60 km south of the present town of Elliott, is listed on the Northern Territory Heritage Register. Tennant Creek Telegraph Station, built initially in timber in 1872 and reconstructed in locally quarried stone by 1875, is situated on Warumungu country near the significant sacred site of Jurnkurakurr (NT Heritage Register).

The telegraph stations functioned as government rations depots and, critically, as points of contact between Aboriginal and non-Aboriginal people. At Tennant Creek, Warumungu people were employed at the station and by the 1890s more than 100 Aboriginal people were living in its vicinity; the site was subsequently declared an Aboriginal Reserve (NT Heritage Register; Powell 1982). Contact period archaeological sites associated with Aboriginal engagement with the telegraph infrastructure have been recorded in the NEA Assessment Area, including knapped glass and ceramics at the Powell Creek Telegraph Station site and a flaked telegraph insulator at Dunmarra Site 1 just to the west of the NEA Assessment Area (Wolfe and Keys 2021).

5.3.6 Pastoral Development

The Overland Telegraph Line served as the primary corridor for European pastoral expansion across the Barkly region. In 1877, Nathaniel Buchanan and Sam Croker crossed the Barkly Tableland from east to west, traversing country subsequently taken up for pastoral settlement (Powell 1982). Within a decade of the telegraph line's completion, pastoralists had taken up leases across the western and central portions of the NEA Assessment Area, and by the late 1880s pastoral occupation had extended east to the Georgina River. The NEA Assessment Area traverses many of these early established pastoral leases, several of which rank among the largest and longest-established cattle properties in Australia. The following subsections summarise the history of the principal stations traversed by or adjacent to the NEA Assessment Area, sources from historic mapping and public records.

A review of historic mapping notes that the NEA Assessment Areas avoids the primary built infrastructure from this period, however its likely that fencelines, tracks and watering infrastructure may fall within or be transected by the corridors.

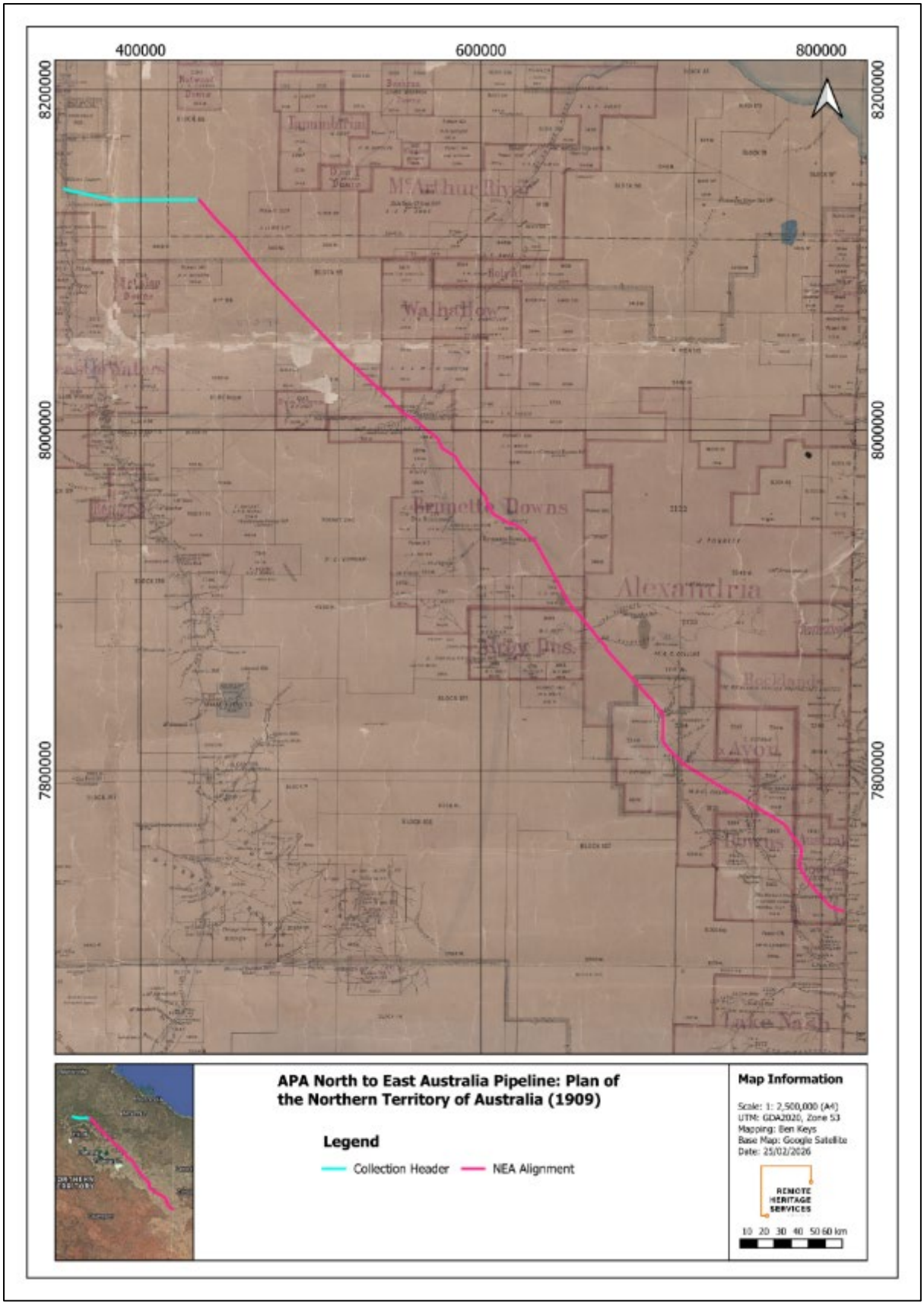

Figure 38: Map of Pastoral Runs on the Barkly Tableland, c. 1909. This map illustrates the extent of formalised pastoral occupation across the Tableland by the first decade of the twentieth century, showing the distribution of leases relative to the principal watercourses, stock routes, and telegraph line.

- **Shenandoah (Collection Header Chainage KP 0 to KP 25) and Sturt Plains (Access Tracks)**

Shenandoah Station is a pastoral lease covering approximately 1,200 km² located between Daly Waters and Elliott in the central Northern Territory and transected by the western end of the Collection Header. The Dyer family has operated Shenandoah and the adjacent Hayfield Station (approximately 1,000 km²) since 1974. Val Dyer became a founding member of the Northern Territory Cattlemen's Association and was recognised as the Northern Territory Rural Woman of the Year. The properties are now operated as a second-generation family enterprise (Territory Q 2022; Katherine Times 2025).

The properties are operated as an integrated pastoral enterprise running approximately 17,000 head of Brahman cattle.

- **Amungee Mungee (Collection Header Chainage KP 25 to KP 79.7)**

Amungee Mungee Station is a pastoral lease covering 3,285 km². The property surrounds the Bullwaddy Conservation Reserve to the north, south, and west, and is traversed by the Carpentaria Highway. The area is characterised by thin infertile soils on a lateritic land surface, with large fragmented stands of bullwaddy interspersed with areas of lancewood.

In 1968, the block of land was put up for ballot and was won by Jeff and Cooee Hills. The station was renamed Cooee Hills and was occupied by the Hills family from 1971. The family fenced the property and stocked it with 1,250 head of cattle before departing in 1977 following their son's death. Reg and Mollie Hartig acquired the property shortly afterwards and remained there until 1981, when Reg died and was buried on the property. The Zlotkowski family, who also owned Wollogorang Station, subsequently held the lease until 2014, when the destocked property was sold for $6.5 million to a partnership involving Brett Blundy's BB Retail Capital (BBRC) and the Bilba Group's Adrian and Emma Brown (Beef Central 2015). The new owners increased watering points from 20 to 160 within three years, and cattle numbers rose from 2,600 to over 40,000 head (AgriWebb 2025). In 2022, Amungee Mungee was sold by BBRC to the Bilba Group. Subsequently in 2025, the property name returned to Cooee Hills (NT Place Names Register).

- **Beetaloo (NEA Chainage KP 0 to KP 20) and Mungabroom (NEA Chainage KP 25 to KP 64)**

Beetaloo Station was established in the 1890s by Harry M. Bathern, also known as 'Bullwaddy', who had overlanded cattle to numerous other Territory properties including Brunette Downs and Eva Downs. When Bathern died in 1928, the property occupied approximately 3,000 square miles (7,770 km²). The lease was managed for most of the twentieth century in the traditional Top End manner, with limited infrastructure improvements and a reliance on seasonal watering points and whatever grassland was accessible within cattle walking distance to water (Soils for Life 2024; The Land 2016).

The Dunnicliff family acquired the lease in 2002, encompassing the perpetual pastoral leases of Beetaloo, OT Downs, and Mungabroom. The combined total area is 1,054,700 hectares (10,547 km²), with Beetaloo and OT Downs covering 707,800 hectares and Mungabroom covering 346,900 hectares. John Dunnicliff embarked on a transformative infrastructure development programme, installing over 600 water points connected by 3,000 km of polyethylene pipe and constructing 3,000 km of fencing. This development increased watering points from 40 to over 600, enabling cattle to walk no further than 2.5 km to water. Retail billionaire Brett Blundy partnered with the Dunnicliff family in 2014 through BB Retail Capital. Following John Dunnicliff's death in 2016, he received a posthumous Order

of Australia for services to the livestock industry, particularly recognising his water development innovations (The Land 2016; Soils for Life 2024). The Beetaloo aggregation was subsequently sold to the Consolidated Pastoral Company in 2025, including approximately 72,000 head of cattle (Stock & Land 2025).

- **Walhallow (NEA Chainage KP 125 to KP 149)**

Walhallow Station, also known as Walhallow Downs, occupies approximately 9,970 km² of open plains, Mitchell grass downs, coolabah woodland, and spinifex desert. The country was first traversed by Europeans during the expeditions of Ernest Favenc and Nathaniel Buchanan across the Barkly Tableland in 1878 (Gibbney 1972; Powell 1982).

The station was settled in 1881 by John Bassett and William Thomas Millett Christian, who established it as a cattle property during the broader wave of pastoral expansion across the Northern Territory in the early 1880s. The name 'Walhallow' derives from the Christian family's earlier property near Quirindi in New South Wales, established around 1828. Christian retained ownership into at least 1907 (Beef Central 2015; QCL 2023). In 1918, Walhallow was put up for auction alongside Brunette Downs and Eva Downs, reflecting the financial pressures facing remote pastoral enterprises in the post-war period.

The post-contact history of the station includes documented violence against Aboriginal people. In 1929, an Aboriginal employee named Paddy was beaten to death by two European employees, William John Everitt and William John Faulk, following a dispute over sweet potatoes taken from the homestead garden. Both men were charged with murder and taken to Darwin for trial. This incident is representative of the broader pattern of violence and coercion that characterised labour relations on remote pastoral stations across the Barkly region during the early twentieth century.

Through the later twentieth century, Walhallow passed through a succession of corporate owners. CSR held the property before Peter Sherwin purchased it in 1982. Walhallow served as the headquarters of Sherwin's pastoral empire, which at its peak in the 1980s ran between 280,000 and 340,000 head of cattle across multiple Territory properties (Beef Central 2022). Sherwin sold to Janet Holmes a Court's Heytesbury Pastoral for $16.6 million in 1987. Colonial Pastoral took on the operation with 30,000 head in 1997, before Paraway Pastoral Company purchased the station in 2009 as part of a $169 million three-property transaction (QCL 2023). Brett Blundy acquired the property from Paraway around 2015. The Walhallow aggregation, comprising Walhallow and the adjoining 6,454 km² Cresswell Downs, was offered for sale in 2022 with over 61,000 head of cattle (QCL 2023). The station currently has a carrying capacity of approximately 50,000 head of Brahman cattle.

- **Anthony Lagoon (NEA Chainage KP 149 to KP 195)**

Anthony Lagoon Station is named after the permanent lagoon on Cresswell Creek recorded by Ernest Favenc during his 1878 Queenslander expedition (Gibbney 1972). The lagoon became an important watering point on the cattle route from Western Australia to Queensland. A store was erected at Anthony Lagoon in 1889 and a police station was established in 1895, reflecting the growing settlement and need for law enforcement in the remote pastoral district. The Anthony Lagoon Pastoral Company was formed in 1929 with a capital of £100,000 (Barkly Regional Council 2021).

The station initially operated as an outstation of Brunette Downs before being taken on as a single lease. It is currently operated by the Australian Agricultural Company in conjunction with Eva Downs, covering a combined area of approximately 9,349 km² and supporting approximately 60,000 head of

Brahman cattle. Heritage places on the property include a 1906 cattle dip, a 1945 cattle dip, a Davey Paxman steam engine, and the Police Tracker's Quarters and Gaol, all representing significant material heritage of the pastoral and law enforcement history of the region.

- **Eva Downs (NEA access track south of KP 112)**

Eva Downs is a pastoral lease situated on the Barkly Tableland north-east of Tennant Creek, along the Barkly Stock Route. The lease was established during the same period of pastoral expansion in the 1880s that saw the occupation of the surrounding Brunette Downs and Anthony Lagoon country. Eva Downs and Anthony Lagoon are considered the Australian Agricultural Company's most isolated properties among its current land holdings.

- **Brunette Downs (NEA Chainage KP 195 to KP 325)**

The pastoral lease at Brunette Downs was established in 1881 on the central Barkly Tableland. In 1883, Harry Readford, the drover upon whose exploits the literary character Captain Starlight in Rolf Boldrewood's Robbery Under Arms was loosely based, drove 3,000 head of cattle to the Barkly, establishing the property for Macdonald, Smith and Co. at Corella Creek, subsequently renamed Brunette Downs (Powell 1982; Barkly & Co 2021). Outstations were established at Anthony Lagoon and Cresswell Creek. Additional cattle drives brought 2,500 head in 1884 and a further 1,200 head in 1885 from Burketown. The first sub-artesian bore in the region was sunk on the property in 1903, marking a significant advancement in water infrastructure.

The property passed through several ownership changes: the White family operated the station from 1904 to 1958; King Ranch Pastoral Company acquired it in 1958; and the Australian Agricultural Company (AACo) has owned and operated the station since 1979 (ANU Archives 2022). Brunette Downs occupies approximately 12,212 km² of the central Barkly Tableland, comprising mostly open downs country, and is involved in the breeding and backgrounding of AACo's Australian Composite cattle.

The A.B.C. Amateur Race Club, established around 1910 by station workers from Alexandria, Brunette Downs, and Cresswell Downs, hosts the annual Brunette Races, a four-day outback racing carnival held each June that includes amateur horse racing, campdrafting, rodeo, and gymkhana events. From 1914 to 1949 the races were held beside the Ranken River on Alexandria Station before shifting to the present Brunette Downs grounds. The racecourse and associated event grounds are located on the western margins of the NEA Assessment Area at approximately KP 267. The Brunette Races represent one of the most significant social and cultural heritage events on the Barkly Tableland, attracting participants from pastoral stations across the region and visitors from around Australia (ABC Amateur Race Club 2025).

- **Alexandria Station (NEA Chainage KP 325 to KP 491)**

Alexandria Station, originally established as Alexandria Downs, was taken up in 1877 by the founders of the North Australian Pastoral Company (NAPCo): Queenslanders William Collins, William Forrest, and Sir Thomas McIlwraith, together with Englishmen John Warner and Sir William Ingram (NAPCo 2021). The lease encompassed a vast expanse of the Barkly Tableland and Alexandria became NAPCo's flagship and oldest property, a status it retains to this day. The station occupies approximately 1,641,416 hectares (16,414 km²) of open plains, floodplain, and wooded sandhills, making it the Northern Territory's largest pastoral property and one of Australia's largest cattle stations. The main homestead is situated on the Playford River, with two outstations: Soudan on the Ranken River and

Gallipoli on the eastern side of the lease. The South Barkly Stock Route crosses the property at the south-west corner.

NAPCo survived the financial and drought-induced crisis of the 1890s principally through its Burdekin properties in Queensland. In 1937, Francis Foster invested heavily in the company, bringing pastoral skills and long-term vision that shaped its development through the twentieth century. The station initially ran Shorthorn cattle but in 1982 transitioned to a composite breeding programme, developing the Alexandria Composite, a stabilised crossbreed suited to the harsh tropical environment. Alexandria currently supports approximately 55,000 head of cattle and produces hay for use across NAPCo's properties.

- **Avon Downs (NEA Chainage KP 491 to KP 521)**

The country between the Georgina (Herbert) River and the Ranken River was among the earliest pastoral land occupied on the eastern Barkly Tableland. In 1866, John and James Ranken, two cousins from pastoral families in New South Wales, herded 4,000 sheep to the area from Queensland's Mackay district, escaping severe drought (Wagstaff 1989). They settled in the area now known as Avon Downs, and three watercourses, the Ranken River, the James River, and Lorne Creek, were named after the family. Poor wool prices subsequently forced the Rankens and other early pastoralists to abandon the area.

In 1882, Thomas Guthrie of Victoria purchased 1,920 km² of the Barkly and established Avon Downs Station, named after his merino stud 'Rich Avon' in Victoria. Guthrie was the first pastoralist to run large numbers of sheep in the Northern Territory, and in what became Australia's longest sheep droving journey, he departed Victoria with 11,000 sheep and arrived at Avon Downs approximately sixteen months later with around 4,000 head (NT Heritage Register 2005). The original Avon Downs homestead was situated between the branches of the Georgina and Ranken rivers, a location selected for its proximity to permanent water and its position at the junction of the two major drainage lines. Historic tracks crossed from this original homestead location north to Camooweal, following the sequence of waterholes along the Georgina.

In 1885, 300 Shorthorn cattle were introduced from South Australia, diversifying the station's operations. Sheep operations ceased in 1919, with the property transitioning fully to cattle production. The Peel River Land and Mineral Company purchased Avon Downs in 1921 for £205,000, demonstrating the significant capital value of established Barkly pastoral properties (Wagstaff 1989). The property was later expanded to 5,957 km², with the original homestead area listed on the Northern Territory Heritage Register in 2005 as a place of high significance. Avon Downs is currently operated by the Australian Agricultural Company.

- **Austral Downs (NEA Chainage KP 521 to KP 582)**

Adjacent to Avon Downs, Austral Downs Station appears to have been established in 1882, east of Avon Downs and founded by Thomas Guthrie. Its starting point was fixed by the Herbert Pile (later the Austral Pillar) at the junction of the James and Herbert (Georgina) rivers, south of the station across the Georgina. When the Herbert River in Queensland was renamed the Georgina River (believed to be around 1877), the pile was renamed the Austral Pillar. This survey monument (its condition currently unknown), at which a latitude and longitude value was observed to enable leases to be granted prior to the completion of the Northern Territory–Queensland border survey in 1884, was the same point from which David Lindsay commenced his pastoral boundary surveys in 1886 (NT Place Names

Register). Austral Downs is currently operated by the Australian Agricultural Company in conjunction with Avon Downs. The Eldo Rocket Shelters at Austral Downs homestead are listed on the Northern Territory Heritage Register.

- **Rocklands (NEA Access Track East of KP 517)**

Rocklands Station is situated along the border of the Northern Territory and Queensland, approximately 10 km north of Camooweal. John Sutherland, with John Frazer and William Hanson of Sydney, successfully applied for the Rocklands lease on the upper Georgina in 1865, arriving with 8,000 sheep (QHR listing 600738; QHR listing 600741). The property was established on the traditional lands of the Indjalandji-Dhidhanu people, and the Georgina River that flows through the middle of the property is also known as a Dreaming Track, along which can be found sacred sites and places where ancestors camped, met, and traded (SLQ 2023).

The establishment of Rocklands was marked by violent dispossession. George Sutherland's own account records that on arrival at Mary Lake in 1865, the sheep were rushed through an occupied Aboriginal camp in the middle of the night, causing panic among the inhabitants (Sutherland 1913). The Aboriginal inhabitants resisted their displacement, and in the days that followed there were multiple confrontations in which firearms were used against Aboriginal people defending their country. When drought caused the lakes to dry up, Sutherland shifted his stock to nearby waterholes where Aboriginal people had taken refuge, and again used armed force to displace them. Sutherland recorded that the objective was to make the Aboriginal people 'understand we were their masters' (Sutherland 1913). Stock losses to dingoes, combined with isolation, scarcity of labour, and transport difficulties, forced Sutherland to abandon the lease by 1869.

Conflict continued under subsequent management. In the early 1880s, the Rocklands Pastoral Company was formed and W. H. Crawford was employed as property manager. In 1883, Crawford was killed by Aboriginal men after he had been pursuing and firing shots at Aboriginal people on the station. A detachment of Native Police under Sub-inspector James Lamond conducted a punitive expedition in response, killing the implicated men and, by contemporary accounts, carrying out wider reprisals against the local population (The Age, 25 June 1883; The Queenslander, 16 June 1883). The subsequent manager, Augustus Henry Glissan, brought a kidnapped Aboriginal boy named Oscar to the property from Cooktown in 1887. Oscar worked as a station hand and recorded his experiences in a series of sketches, now held at the National Museum of Australia, which depict Aboriginal people working on the property, conducting traditional ceremony, and being chained and shot by Native Police troopers (NMA, Oscar's Sketchbook). These records constitute significant primary evidence of the violence and coercion that accompanied pastoral occupation on the upper Georgina.

Benjamin Crosthwaite purchased Rocklands at auction in September 1875 and, with William Tetley, re-established the property in 1876 (QHR listing 600738). The 6,679 km² property is currently operated by the Paraway Pastoral Company. The Indjalandji-Dhidhanu people hold determined native title over 20,000 km² of their traditional country around Camooweal. Through the Indjalandji-Dhidhanu Aboriginal Corporation, the traditional owners self-manage their native title rights and interests, including all negotiated native title agreements and future act processes (SLQ 2023).

5.3.7 Stock Routes, Droving, and Aboriginal Pathways

The pastoral economy of the Barkly Tableland depended on a network of stock routes that converged at Newcastle Waters and radiated east to Queensland, west to the Kimberley, and south toward the railheads. The route of principal relevance to the NEA Assessment Area is the Barkly Stock Route, which ran east from the Overland Telegraph Line across the Barkly Tableland to western Queensland, allowing the movement of cattle between the Barkly stations and the eastern markets via Camooweal and onward to Cloncurry. The NEA Assessment Area transects the Barkly Stock Route at NEA Chainage KP 165.

It is significant that the stock routes and pastoral tracks across the Barkly Tableland, including the Barkly Stock Route where it crosses the NEA Assessment Area, often followed the same sequence of Aboriginal pathways, connecting waterholes, wells, and other important resource areas that had been used by Aboriginal people for thousands of years. The alignment of European movement corridors along pre-existing Aboriginal travel routes reflects the fundamental importance of water sources in this semi-arid landscape. Aboriginal people possessed detailed knowledge of the location and reliability of waterholes, soaks, and wells, and this knowledge directly informed the routes taken by early European explorers, surveyors, and drovers.

The tracks from the original Avon Downs homestead north to Camooweal illustrate also this pattern, following a chain of waterholes and drainage features along the upper Georgina that had served as Aboriginal movement corridors and resource procurement areas long before European arrival. Similarly, the Barkly Stock Route across the central Tableland connected water sources that were focal points of Aboriginal occupation, and Dreaming tracks traverse the NEA Assessment Area connecting places of ceremonial and spiritual significance across the region (Strehlow 1947; Myers 1986; Memmott 2010).

5.3.8 Road Infrastructure

- **The Barkly Highway (NEA Chainage KP 485)**

The Barkly Highway was constructed as a military link road during World War II to connect the Mount Isa railhead in Queensland with the north–south Stuart Highway near Tennant Creek. A supply link between Mount Isa and the Northern Territory was first proposed by the Queensland Main Roads Commission in October 1940. In March 1941, the Army approved the construction of a road by the most direct route from Camooweal to Tennant Creek. Clearing and forming commenced from Camooweal in April 1941, and the initial cut of 455 km was completed by late July. Bores were sunk at intervals to overcome the lack of surface water over the final 320 km to Tennant Creek (ANZAC Square Memorial 2021).

Following the bombing of Darwin on 19 February 1942, the War Cabinet approved the construction of the entire Mount Isa–Tennant Creek road as an all-weather road. During 1942, at the height of the war in the South West Pacific, the road carried over 1,000 heavy military vehicles daily with material and supplies to support operations in the Northern Territory. The difficulties of dry, sandy country and heavy wear on machinery were compounded by almost continuous military traffic. Bitumen surfacing commenced in January 1943, and the road was formally named the Barkly Highway in 1944 (ANZAC Square Memorial 2021). The highway traverses the eastern portion of the NEA Assessment Area at NEA Chainage KP 485.

The Tablelands Highway (NEA Chainage KP 191 to KP 249)

The Tablelands Highway was constructed during the 1960s as a 'Beef Road' under the Commonwealth's Northern Territory beef roads programme. The highway was designed to facilitate the movement of cattle by road train across the Barkly Tableland, replacing the slower and more labour-intensive droving that had characterised the pastoral industry for nearly a century. The road was officially opened on 12 December 1970 (Ozroads 2021).

The 378 km highway bisects the Barkly Tableland from north to south, connecting the Barkly Highway at the Barkly Homestead roadhouse with the Carpentaria Highway near Cape Crawford. Engineering challenges were significant owing to the flat terrain and seasonal monsoonal flooding, requiring culverts, low-level bridges, and floodways at creek crossings including Cresswell Creek. There are no towns or services along its length. Sealing of the highway commenced in the 1970s, and substantial portions had been bitumen-sealed by 1980. The route historically aligned with established stock routes used for driving cattle across the Tableland, which in turn followed pre-existing Aboriginal movement corridors between water sources. Upgrades to selected sections to a two-lane sealed standard were completed in 2020 under the Northern Australia Beef Roads Program.

6 ARCHAEOLOGICAL PREDICTIVE MODEL AND SENSITIVITY MAPPING

6.1 ARCHAEOLOGICAL PREDICTIVE MODEL

The environmental, cultural, and archaeological background research conducted for this report has identified consistent patterns in the distribution of archaeological sites across comparable landscapes. While biases in archaeological investigation may influence the available record, significant correlations between bioregions/land systems, hydrology, surface geology, ecology and site distribution have been observed. General site distribution patterns from broader regional research and comparable lineal pipeline surveys provide a basis for the following predictive statements about the probable distribution of archaeological material within the NEA Assessment Areas:

1. The riparian zones of all water features are predicted to be the primary locations for archaeological sites and artefacts, including major watercourses, permanent and semi-permanent waterholes, swamps, closed drainage depressions, and claypans. Archaeological materials are likely to be concentrated on adjacent elevated landforms rather than within these features. More broadly, the presence of a significant water source elevates the archaeological sensitivity of all surrounding landforms, while areas with abundant permanent water may also reduce the relative importance of smaller, less reliable water features nearby.

2. Not all water sources are archaeologically equivalent. In the cracking clay soils of the Mitchell Grass Downs, where infiltration rarely exceeds 300 mm depth, surface water persistence is the critical variable distinguishing ephemeral from seasonally reliable water sources. Larger water features collect runoff from proportionally larger catchments and retain water for longer periods, creating a predictable hierarchy of resource value. The size of a water feature therefore serves as a proxy for the likely intensity and duration of past occupation in its vicinity.

3. There may be an absence of artefactual material in land units without water, consistent with the pattern documented across comparable arid zone pipeline surveys. However, on the Sturt Plateau where knappable stone is scarce across the lateritised surface, Aboriginal people may have relied more heavily on organic tool materials such as timber and bone, which rarely survive in the archaeological record without specific preservation conditions such as burial in sheltered or waterlogged deposits. An apparent absence of stone artefacts in this bioregion should therefore not be taken as evidence of low occupation intensity, as the archaeological record is likely to under-represent the full range of tools and materials that were in use.

4. A distinction is predicted between occupation locations and resource locations. Sandy rises, sand plains [Czs], stream terraces, and lateritic rises [Czl] adjacent to water represent favourable occupation locations where the highest density and diversity of archaeological materials are expected. Water features such as closed depressions and claypans represent resource locations.

5. The diverse geology of the NEA Assessment Areas offers varying potential for past resource procurement. Within the Mitchell Grass Downs, chalcedonic silicification of the Austral Downs Limestone [Czia] and chert nodules within the Brunette Limestone [Czib], Ranken Limestone

[Elbr], and Camooweal Dolostone [Elbc] have produced siliceous raw materials suitable for stone tool manufacture; low rises where these formations outcrop represent potential quarry and reduction sites. Within the Sturt Plateau, the lateritised surface is dominated by hard ironstone crust (laterite) [Czl] which lacks suitable fine-grained toolmaking materials but provides elevated occupation positions during the wet season. Stone raw materials in this bioregion would have been imported from adjacent areas or sourced from small, localised deposits within discrete sediment sequences. Cretaceous sandstone sediments [Ks] and Mullaman Beds sandstone [Klm] outcropping within the Sturt Plateau and Gulf Fall and Uplands provide a potential source of raw material suitable for the manufacture of grindstones. The Gulf Fall and Uplands transition zone contains mixed geological exposures where transported chert gravels and siliceous materials may occur in colluvial and alluvial deposits. Alluvium [Qa] and colluvium [Qrc] zones have high potential for containing transported raw materials and for preserving archaeological deposits through burial. Residual black soil plains [Czrb] generally have lower potential, except where flooding has deposited raw materials.

6. Raw material availability operates as an independent determinant of site location. Areas where lithic raw material sources coincide with water access represent zones of compounded archaeological potential. The most common raw materials are likely to be chert, chalcedony, silcrete, quartz, and quartzite, with sandstone sourced for grinding implements.

7. The importance of the seed grinding economy across the arid zone is well attested. Areas suitable for grass growth, particularly in the Mitchell Grass Downs, have potential for archaeological evidence of seed processing on their margins, such as grindstones. The Cretaceous sandstone formations identified in Statement 5 represent potential source materials for grinding implements, and areas where these formations outcrop in proximity to grass-bearing land units have compounded potential for seed processing evidence. Mitchell grass islands, lateritic or sandy rises within the black soil plains, may represent foci for processing activity.

8. Karst features occur in two distinct settings within the NEA Assessment Areas: sinkholes (dolines) formed through dissolution and collapse within the siliceous Mullaman Beds on the Sturt Plateau (Twidale 1987; Grimes 2009), and dissolution features in the Camooweal Dolostone [Elbc] in the eastern portions of the Mitchell Grass Downs. Both settings may act as natural water catchments and provide localised shelter, representing strong attractors for occupation.

9. The cracking clay soils [Czrb] dominating the Mitchell Grass Downs destroy stratigraphic integrity through seasonal shrink-swell cycling, self-mulching, and gilgai development. Archaeological material on these surfaces cannot be considered in situ. Interpretable archaeological evidence is concentrated on the non-cracking clay landform types identified in Statement 4, which provide more stable depositional contexts.

10. The margins of topographic highs within the black soil plains are typically characterised by sandier soils where regolith deposits have shed downslope, carrying stone raw materials with them. These sandy margins provide both favourable occupation surfaces and ready access to displaced stone resources, making them archaeologically sensitive locations. In some sections

of the clay plains, the density of suitable stone raw materials at the surface, particularly chert gravels derived from the underlying carbonate formations, is sufficient to suggest that these areas were actively used for stone procurement and tool manufacture despite the challenging soil conditions (RHS, field observations).

11. There is potential for buried archaeological deposits in land units subject to sediment accumulation, particularly in flood-out zones, lake margins [Qt], and areas of aeolian sand accumulation.

12. Given the general absence of outcropping rock shelves within the NEA Assessment Areas, rock art sites are unlikely. Large quarry complexes are also unlikely, with the exception of areas of outcropping chert on the Mitchell Grass Downs. Smaller, localised reduction sites associated with outcrops of siliceous raw material sources cannot be excluded.

13. Contact period archaeological sites may be present, particularly in areas associated with the early pastoral stations, and track networks. Stone tool manufacture continued into the twentieth century in this area, and both Aboriginal and European contact period materials may be present throughout the corridor.

14. Areas of concentrated historical disturbance, including road corridors and modern constructions such as wells, have lower potential for intact archaeological deposits. Diffuse disturbance from introduced animals and invasive species may have altered erosion patterns, particularly in riparian zones.

15. The most common site types are likely to be isolated stone artefacts, stone artefact scatters, quarry sites (in areas with suitable lithic materials), and grinding sites (particularly on margins or elevated areas of the Mitchell Grass Downs). Sites away from permanent water sources are likely to be small with limited diversity in raw materials and artefact types. Larger, more diverse assemblages are predicted in proximity to reliable water where repeated or extended occupation occurred.

These predictive statements provide the empirical basis for the sensitivity mapping methodology in Section 6.2, where the relationships between water feature size, landform character, geological context, and landscape setting are operationalised through systematic sensitivity ratings, size-scaled buffer assignments, and contextual adjustments.

6.2 ARCHAEOLOGICAL DESKTOP SENSITIVITY MAPPING

A 1 km buffer (500 m either side of the centreline) was applied to the proposed Collection Header and NEA Pipeline alignment, and a 0.5 km buffer (250 m either side) was applied to adjacent access tracks identified for use by the Project. Landforms and landform elements within these buffers were identified through analysis of aerial imagery, APA's initial drive-through observations, and available spatial datasets.

The following Sensitivity Mapping considers the potential that Aboriginal archaeological sites are located within specific land units of the NEA Assessment Areas. The assessment draws upon the background archaeological studies, hydrology, land systems and surface geology, topography, and ecology as presented in the predictive model above.

6.2.1 Terminology and Classification

Landform features were described and documented following the *Australian Soil and Land Survey Handbook*. Where an area contains all components of a landform feature, it is referred to by the landform element (e.g. rise). Where it comprises part of a feature, the specific element is used (e.g. rise slope, rise crest). Where the type of landform helps define its character, this is stated (e.g. lateritic rise, sandy rise, gilgai-dominated closed depression).

6.2.2 Conceptual Framework: Occupation and Resource Locations

A fundamental distinction was drawn between occupation locations and resource locations. Occupation locations are areas likely to have been the focus of habitation or sustained activity, such as sandy rises providing well-drained camping surfaces. Resource locations are areas that provided water, food, or raw materials but may not themselves contain extensive cultural material, such as closed depressions that held seasonal water.

This distinction is reflected in the sensitivity mapping through the application of buffers around resource locations to capture the likely distribution of associated occupation evidence on adjacent landforms. Occupation locations themselves do not require buffers, as archaeological materials are predicted to occur within the feature. Mitchell grass islands represent an intermediate case where small buffers capture the potential for materials distributed around these activity foci.

6.2.3 Feature Size Classification

Water-related features were classified by area, with size serving as a proxy for catchment area, water retention capacity, and consequently the duration and reliability of ponded water following rainfall. Table 12 presents the area-based classification applied.

Table 12: Feature Size Classification

Size Class	Area Threshold	Archaeological Implications
Very Small	<0.1 ha	Opportunistic resources encountered during foraging; minimal buffer warranted.
Small	0.1–0.5 ha	Short-duration water retention; limited occupation potential.
Medium	0.5–6 ha	Water retention for weeks following significant rainfall; viable short-term camping locations.
Large	6–50 ha	Seasonal or near-permanent water; focal points for repeated occupation.
Very Large	>50 ha	Permanent or semi-permanent water sources; primary local anchors for sustained occupation.

6.2.4 Sensitivity Rating Framework

Each identified feature was assigned a sensitivity rating using a four-tier classification reflecting the predicted likelihood of archaeological materials being present, based on landform characteristics, proximity to water, and landscape context. Table 13 defines the rating tiers.

Table 13: Sensitivity Rating Definitions

Rating	Probability Descriptor	Potential Site Types
Almost Certain	Expected to occur in most circumstances.	Stone artefact scatters Isolated artefacts Hearth features Quarries Other occupation-related features
Probable	Probably occur in most circumstances.	Stone artefact scatters Isolated artefacts Hearth features
Possible	Could occur sometime.	Isolated artefacts Low density artefact scatters
Unlikely	Not expected to occur.	No archaeological feature likely.

Table 14 presents the sensitivity ratings applied to key landform types identified within the NEA Assessment Areas.

Table 14: Sensitivity Ratings for Landform Features

Landform Feature	Feature Rating	Buffer Rating	Rationale
Swamps	Almost Certain	Almost Certain	Capacity to retain water for longer periods; boundaries become focal points during drier periods; artefacts less visible within swamp due to soil movement.
Closed drainage depressions	Probable	Possible	Important resource locations for water and associated flora/fauna; archaeological materials more likely on margins than within depression.
Sandy rises (adjacent to water)	Almost Certain	—	Favourable occupation locations; elevated sensitivity where adjacent to substantial streams or swamps.
Sandy rises (distant from water)	Possible–Probable	—	Base level sensitivity retained; occupation potential lower without proximate water source.
Stream terraces	Possible–Probable	—	Individually assessed for suitable occupation zones; rating dependent on stream order and terrace characteristics.
Mitchell grass islands	Probable	Possible	Small foci of activity; buffer represents potential for materials distributed around feature.
Shallow closed depressions	Possible	Possible	Unlikely to retain water for extended periods; lower sensitivity than closed drainage depressions.

Landform Feature	Feature Rating	Buffer Rating	Rationale
Featureless floodplains	Unlikely–Possible	—	Generally low potential; elevated where proximate to large lakes or swamps.

6.2.5 Buffer Assignments

Buffers were assigned to resource locations based on the feature size classes defined in Table 12, reflecting the likely scale of activity around each location. Larger features are more likely to have been used by larger groups undertaking a broader range of activities, producing a wider distribution of archaeological material. The buffer distances applied are provided in Appendix 2.

Table 15: Buffer Distances by Feature Size

Feature Size Class	Buffer Distance	Rationale
Very Small / Small	50 m	Limited activity zone around minor features.
Medium	100 m	Moderate activity zone reflecting increased utilisation.
Large / Very Large	125 m	Extended activity zone for significant resource locations.

Streams and drainage channels were not buffered algorithmically. Instead, adjacent terraces or rises were individually inspected to identify suitable occupation zones, recognising that the relationship between watercourses and occupation areas varies according to local topography and stream characteristics. In some cases, detailed hand-drawn buffers were applied where the relationship between a feature and its surrounding landforms required individual consideration.

6.2.6 Contextual Sensitivity Adjustments

Baseline sensitivity ratings were adjusted according to the broader landscape setting in which each feature occurs. Two types of adjustment were applied:

Upward adjustments. Where the surrounding landscape carried a higher sensitivity rating, buffers around smaller features were elevated to match. The most common instance was Possible-rated buffers around small, closed depressions being raised to Probable to match the surrounding landscape. Featureless floodplains, normally rated as Unlikely, were elevated where proximate to large lakes or swamps.

Downward adjustments. Features were adjusted downward where they were unlikely to retain water for extended periods, particularly shallow depressions on the Mitchell Grass Downs in proximity to permanent rivers where larger, more reliable water sources would have dominated land use patterns and reduced the relative attractiveness of smaller, less reliable alternatives.

6.2.7 Sensitivity Mapping Results

Application of the predictive model and sensitivity rating methodology to the full extent of the NEA Assessment Areas identified 133 Cultural Heritage Sensitivity Areas (CHSAs), each representing a coherent landscape unit within which individual landform features were assessed against the

sensitivity framework. Sensitivity ratings assigned across the 133 CHSAs are presented in full in Appendix 2. Regarding the CHSA naming convention used in Appendix 2, the descriptor within each identifier denotes the infrastructure type to which the CHSA relates: CH (Collection Header), PL (Pipeline), and RD (Road/Access Track).

Across these 133 CHSAs, a total of 3,014 individual landform features were identified, classified, and assigned sensitivity ratings. The sensitivity mapping outputs are presented in Appendix 3, which depict every identified feature and its assigned rating within its landscape context.

- **Almost Certain:** 1,134 features across 117 CHSAs, predominantly Mitchell grass islands, swamps, drainage depressions, stream channels, and sandy rises situated in proximity to permanent or semi-permanent water sources.
- **Probable:** 904 features across 103 CHSAs, dominated by closed depressions, drainage depressions, tree clumps, and lateritic plain margins where the convergence of moisture-concentrating landforms and favourable substrate conditions indicates a strong likelihood of past occupation or resource procurement.
- **Possible:** 556 features across 84 CHSAs, comprising principally closed depressions, drainage depressions, and extensive lateritic plains where environmental indicators suggest some potential but where greater distance from reliable water or cracking clay terrain moderates the predicted likelihood.
- **Unlikely:** 420 features across 82 CHSAs, consisting largely of extensive lateritic plains, broad lateritic rise margins, and areas of modern disturbance. These areas are not without all potential, but the combination of distance from water, unfavourable substrate conditions, and absence of landform characteristics associated with occupation places them at the lowest tier.

Feature totals include transition zones between landform types, assessed as discrete features reflecting their role as interfaces between occupation and resource locations. Algorithmically generated buffers around sensitive features are not included in these counts, as they represent precautionary zones rather than independently assessed landforms.

The distribution of sensitivity ratings reflects the environmental and geomorphic patterns established in the background research. Almost Certain and Probable features concentrate along drainage corridors, around permanent and semi-permanent water sources, and on elevated terrain adjacent to collecting landforms. The extensive Mitchell Grass Downs plains that dominate the central and eastern portions of the NEA Assessment Areas are characterised by a predominance of Possible and Unlikely ratings, reflecting cracking clay substrate conditions and generally greater distances from reliable water. The sensitivity mapping provides a spatially explicit expression of the predicted archaeological patterns and establishes the basis for the targeted survey design and route refinement recommendations presented in Section 6.

7 PROJECT RECOMMENDATIONS

Based on the sensitivity mapping, predictive model, and risk assessment presented in this report, the following recommendations are made for the identification and management of Aboriginal cultural heritage, including sacred sites, within the NEA Pipeline Project Area.

7.1 SACRED SITE AUTHORITY CERTIFICATE

1. It is recommended that APA obtain an Authority Certificate under the *Northern Territory Aboriginal Sacred Sites Act 1989* prior to construction activities. It is noted that APA has applied to AAPA for an Authority Certificate. The Authority Certificate process may identify additional sacred sites not currently on the Register of Sacred Sites, and Restricted Work Areas may therefore change the scope of avoidance requirements beyond what is currently known from this desktop assessment. The location of all Restricted Work Areas and their conditions should be made available to all authorised personnel to ensure compliance with the Certificate.

2. In the interim, all recorded and registered sacred sites should be avoided, including those that encompass pastoral access tracks proposed for use by the Project.

7.2 HERITAGE FIELD ASSESSMENTS

7.2.1 Archaeological Field Assessment

3. An archaeological field assessment of the NEA Pipeline Project Area, including access tracks, should be undertaken prior to final pipeline route design and construction activities. It is noted that these assessments have been scheduled by APA, with the outcomes informing the pipeline's final route. APA has committed to site avoidance as a priority where possible.

4. The archaeological field assessment should be undertaken as pedestrian survey with Traditional Owner participation, in accordance with an agreed survey strategy negotiated through the NLC. The survey strategy should aim to achieve the following minimum coverage, based on the sensitivity ratings assigned in Section 6.2.7 above:

    a. Areas rated 'Almost Certain' should be surveyed at 100% coverage.

    b. Areas rated 'Probable' should be surveyed at a minimum of 75% coverage, targeting key risk areas as identified in the field.

    c. Areas rated 'Possible' should be surveyed at a minimum of 50% coverage, targeting key risk areas as identified in the field.

    d. Areas rated 'Unlikely' should be surveyed at a minimum of 10–20% coverage.

7.2.2 Traditional Owner Engagement

5. APA should ensure Traditional Owners and Site Custodians are engaged in heritage management decision-making throughout the Project. This should include:

a. Participation in archaeological field surveys.

b. Involvement in site significance assessments for identified heritage places.

c. Consultation on avoidance and management options where heritage places cannot be avoided.

d. Ongoing engagement during construction through heritage monitoring where required.

The NLC's role as the representative body for Aboriginal interests in the Project Area should be recognised, and any required agreements should be negotiated through the NLC prior to commencement of field assessment activities.

7.2.3 Post-Assessment Reporting

6. Following the field assessment, a report/s[4] and associated constraints mapping should be prepared presenting the outcomes of the survey. The constraints mapping should feed directly into final alignment design to ensure that the field results inform the construction footprint. The report should include recommendations for the management of Aboriginal cultural heritage in accordance with best practice and Traditional Owner consultation and should be prepared in a form suitable for submission to the Heritage Branch and, if required, to the NT EPA.

7.3 HERITAGE MANAGEMENT

7. Following the completion of field assessments and Traditional Owner consultation, a Cultural Heritage Management Plan (CHMP) (or Plans, where separate documents are required for individual Aboriginal parties) should be developed for the Project. The CHMP should address the protection and management of all Aboriginal cultural heritage identified during the desktop assessment and field surveys and should include provisions for previously unrecorded heritage that may be identified during construction. As a minimum, the CHMP should address site avoidance measures, management protocols for heritage places that cannot be avoided, monitoring requirements during construction, and the Unexpected Finds Protocol outlined in Recommendation 9. The CHMP should be developed in consultation with relevant Traditional Owner groups and the NLC and should be finalised prior to the commencement of construction activities.

8. Until such time as a formal CHMP is in place for the Project, APA should avoid impacts to Aboriginal archaeological places and objects protected under the *Heritage Act 2011* (NT). Where avoidance is not practicable following the field assessment and alignment refinement process, APA should obtain a work approval under Part 3.2 (sections 72–77) of the *Heritage*

[4] It is noted that separate reporting may be required to present culturally sensitive or confidential heritage information to individual Aboriginal parties whose interests are affected by the Project. This approach ensures that cultural information is disclosed only to the appropriate Traditional Owner group, in accordance with cultural protocols.

Act 2011 prior to any disturbance of identified archaeological places or objects. No disturbance should occur without the appropriate work approval being in place.

7.3.1 Unexpected Finds Protocol

9. APA should adopt the Unexpected Finds Protocols presented in Appendix 4 of this report. The protocols should be approved and in place prior to the commencement of construction activities, and referenced in all contractor environmental management plans. The protocols cover:

    a. Discovery of Aboriginal archaeological places and objects: immediate cessation of work in the vicinity of the find, notification of the Site Supervisor, Project Manager, and NT Heritage Branch. Work is not to recommence until direction is provided by the Heritage Branch. Where works are to continue within the area of an identified place or object, a work approval must be obtained under Part 3.2 of the Heritage Act 2011 (NT).

    b. Discovery of potential human remains: immediate cessation of all work within a 50 m radius, notification of the NT Police who will assume control of the site, and subsequent notification of the Heritage Branch and AAPA. Work is not to recommence until direction is provided by the relevant authorities.

    In both cases, a written report must be submitted to the CEO of the Heritage Branch as soon as practicable, in accordance with the reporting obligations under the *Heritage Act 2011* (NT).

7.3.2 Workforce Training

10. APA should implement workforce cultural heritage training and inductions for all staff and contractors working on the NEA Pipeline Project, covering:

    a. Cultural awareness and the significance of Aboriginal cultural heritage in the Project Area.

    b. Aboriginal cultural heritage protection obligations under the *Heritage Act 2011* (NT) and the *Northern Territory Aboriginal Sacred Sites Act 1989*.

    c. The Unexpected Finds Protocol outlined in Appendix 4, including stop-work procedures and reporting requirements.

    d. Identification of common Aboriginal archaeological site types in the field, with reference to the site types identified in the predictive model and sensitivity mapping.

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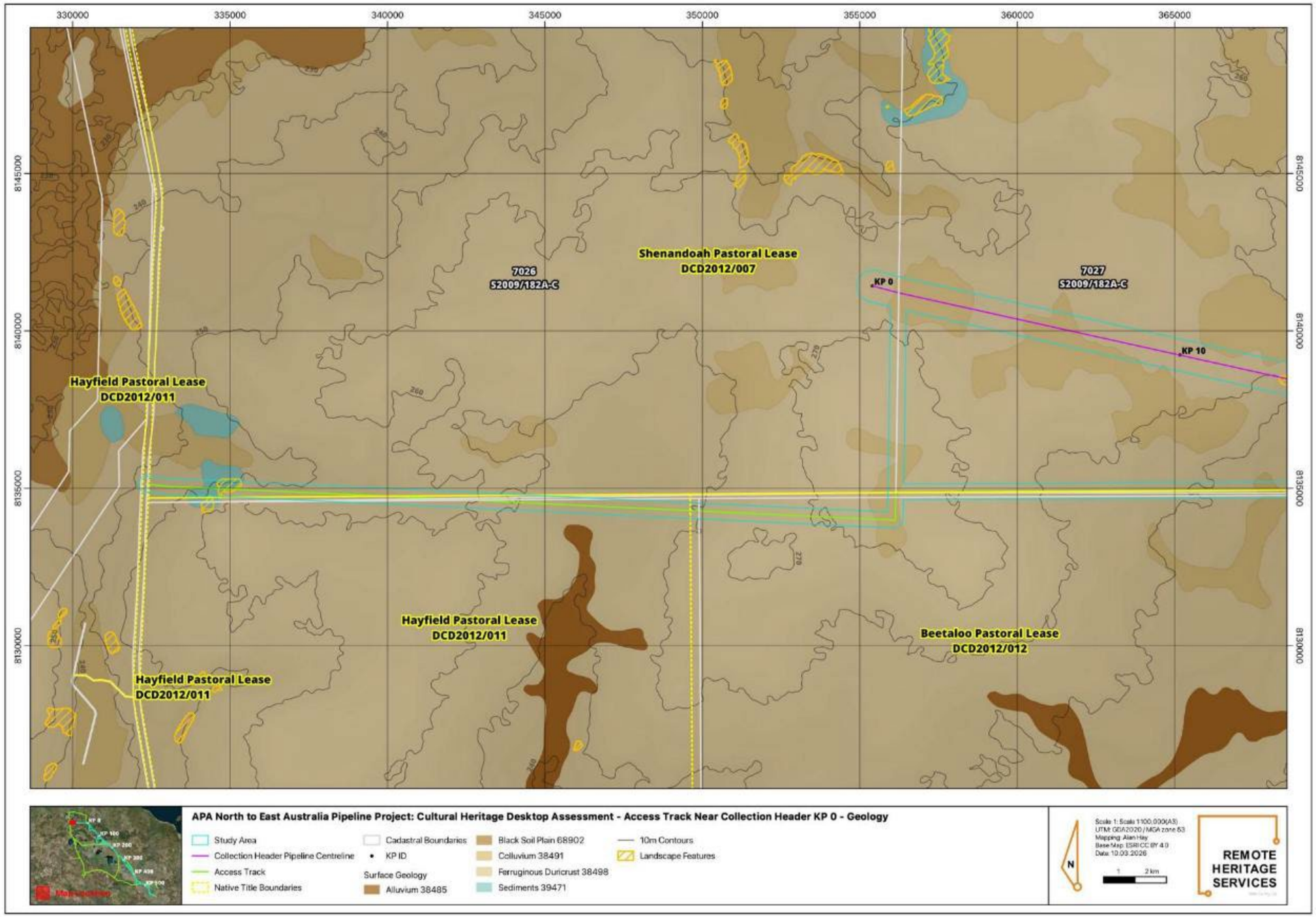
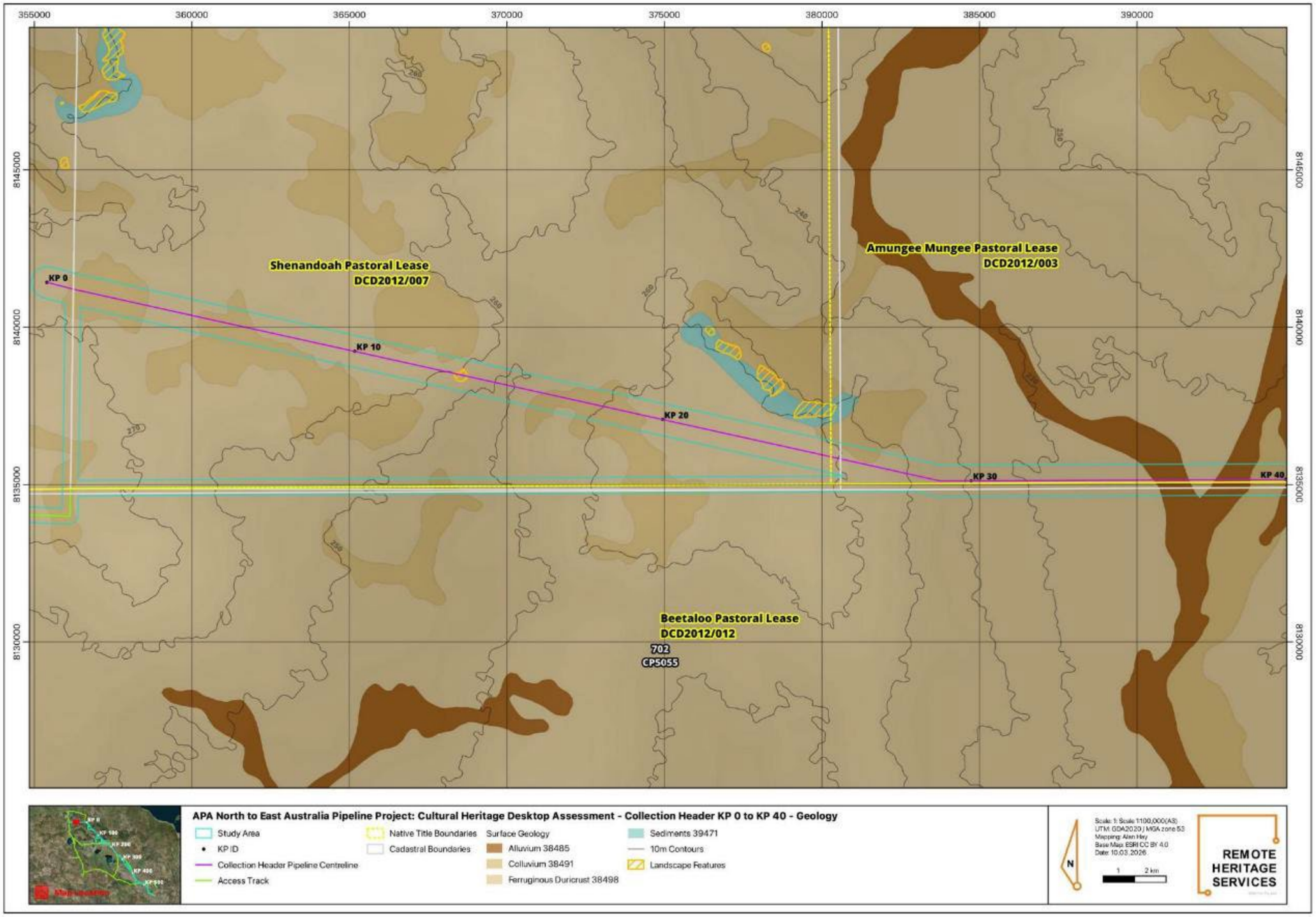
APPENDIX 1: MAPPING OF THE GEOLOGICAL UNITS OF THE NEA ASSESSMENT AREAS

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APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Collection Header KP 0 to KP 40 - Geology
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Ferruginous Duricrust 38498
Sediments 39471
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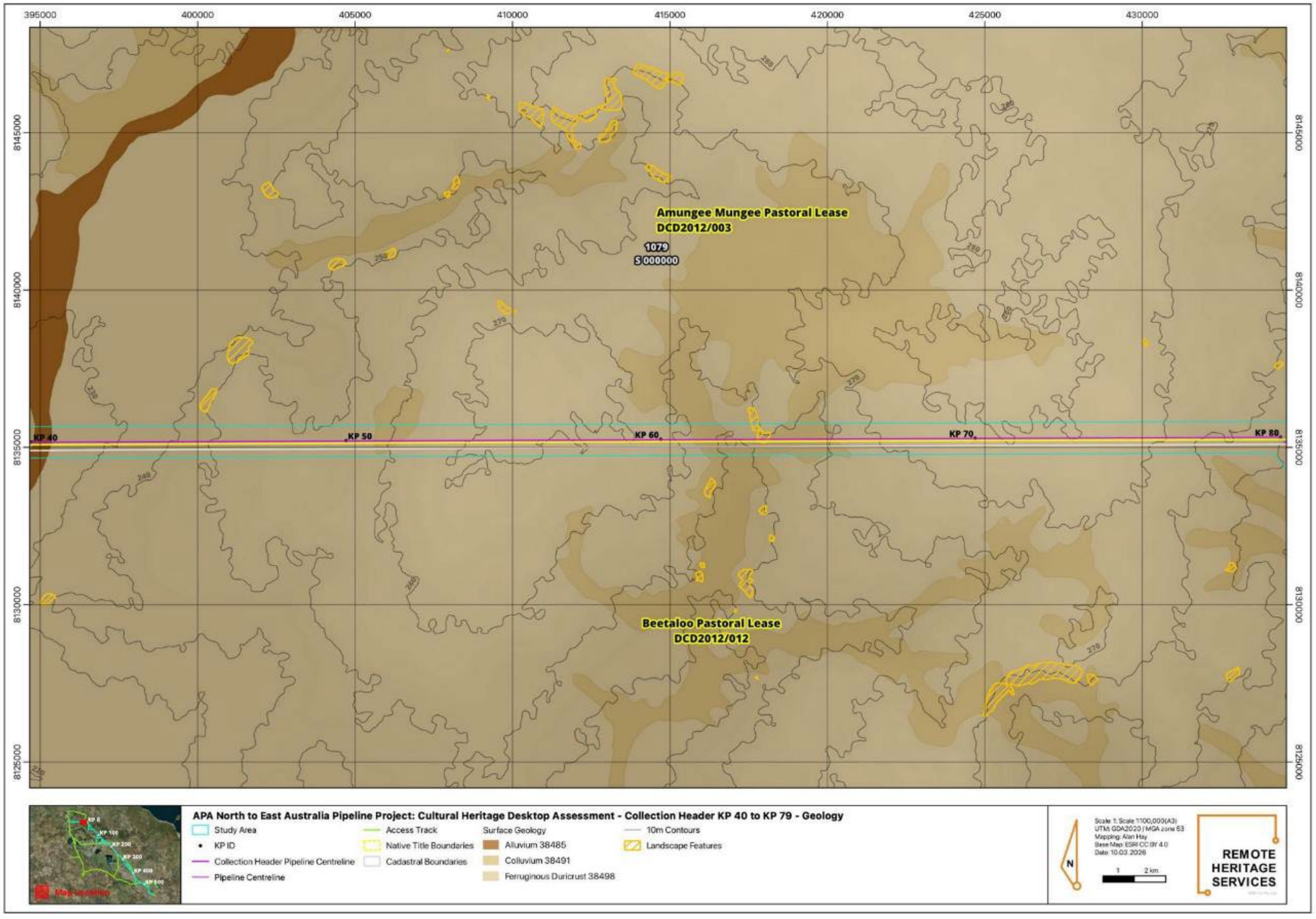
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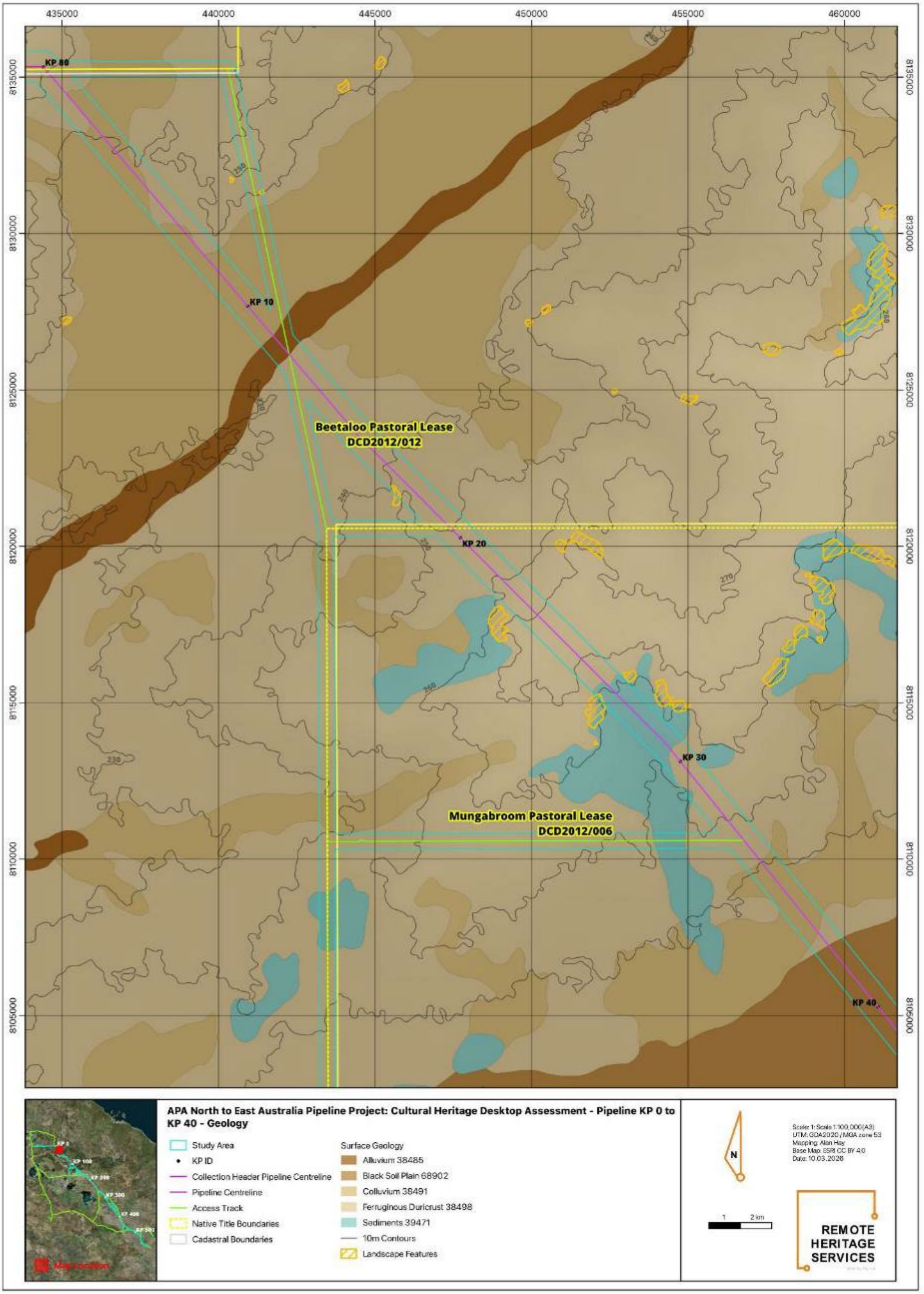
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APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Pipeline KP 0 to KP 40 - Geology
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Surface Geology
Alluvium 38485
Black Soil Plain 68902
Colluvium 38491
Ferruginous Duricrust 38498
Sediments 39471
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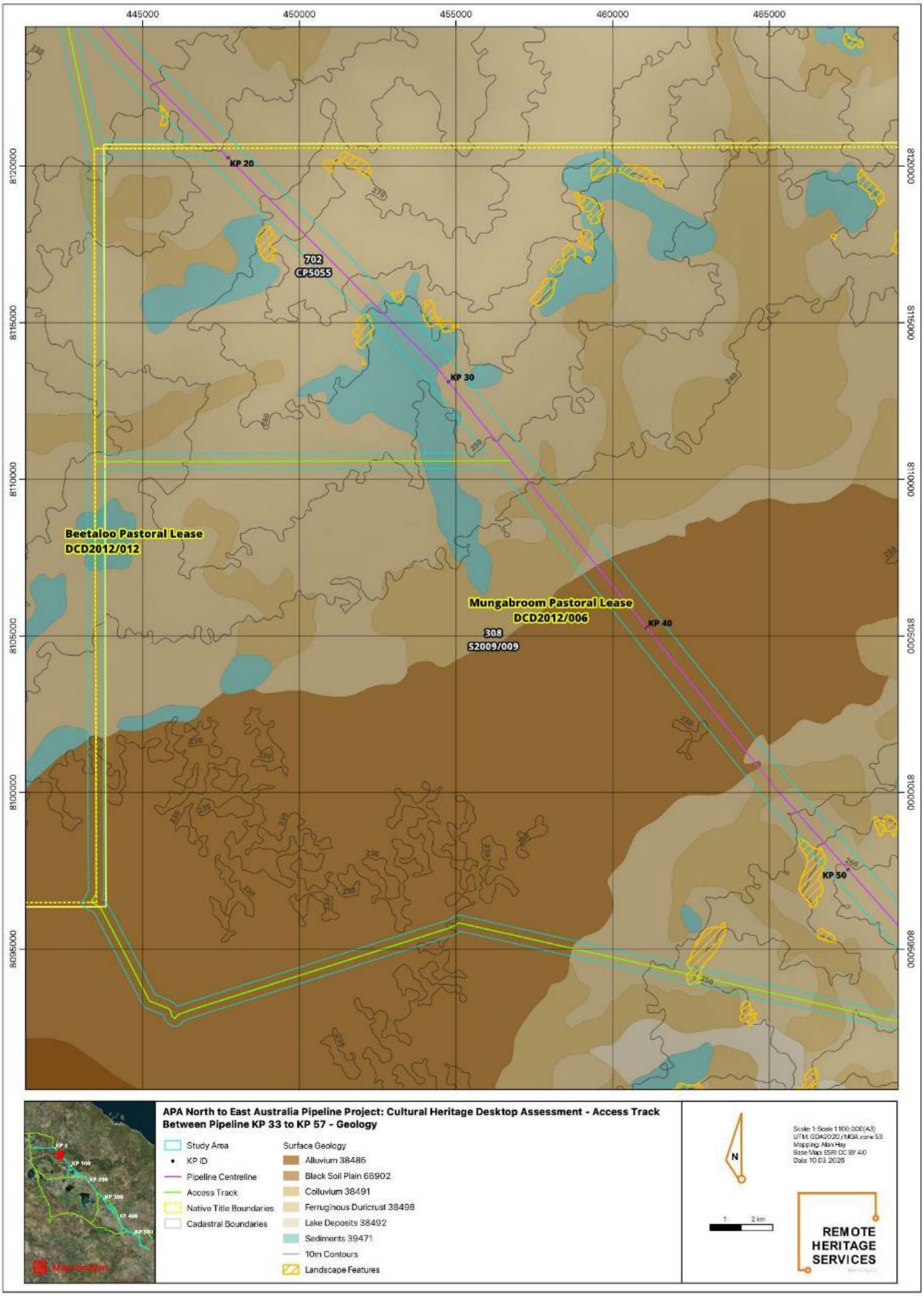
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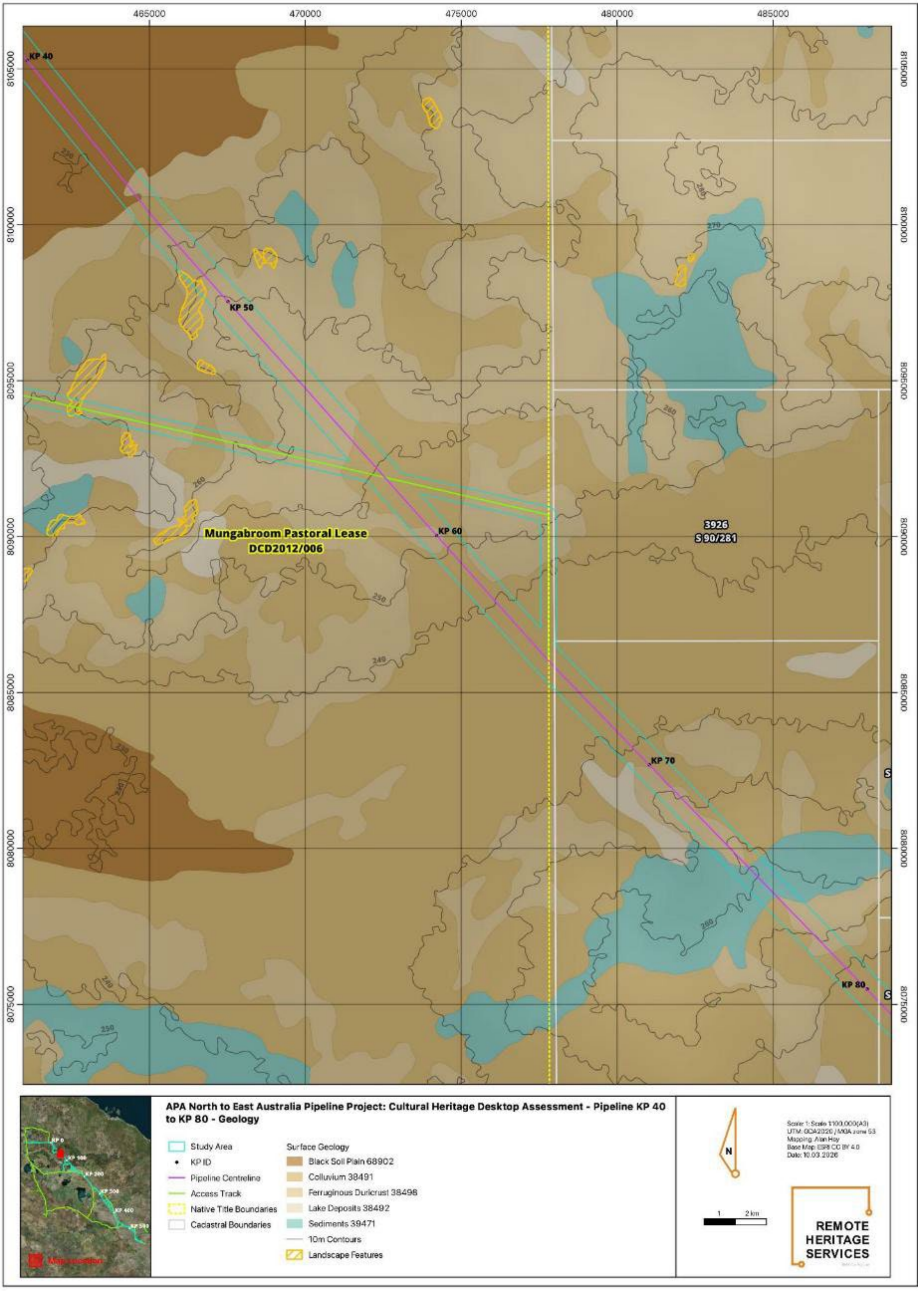
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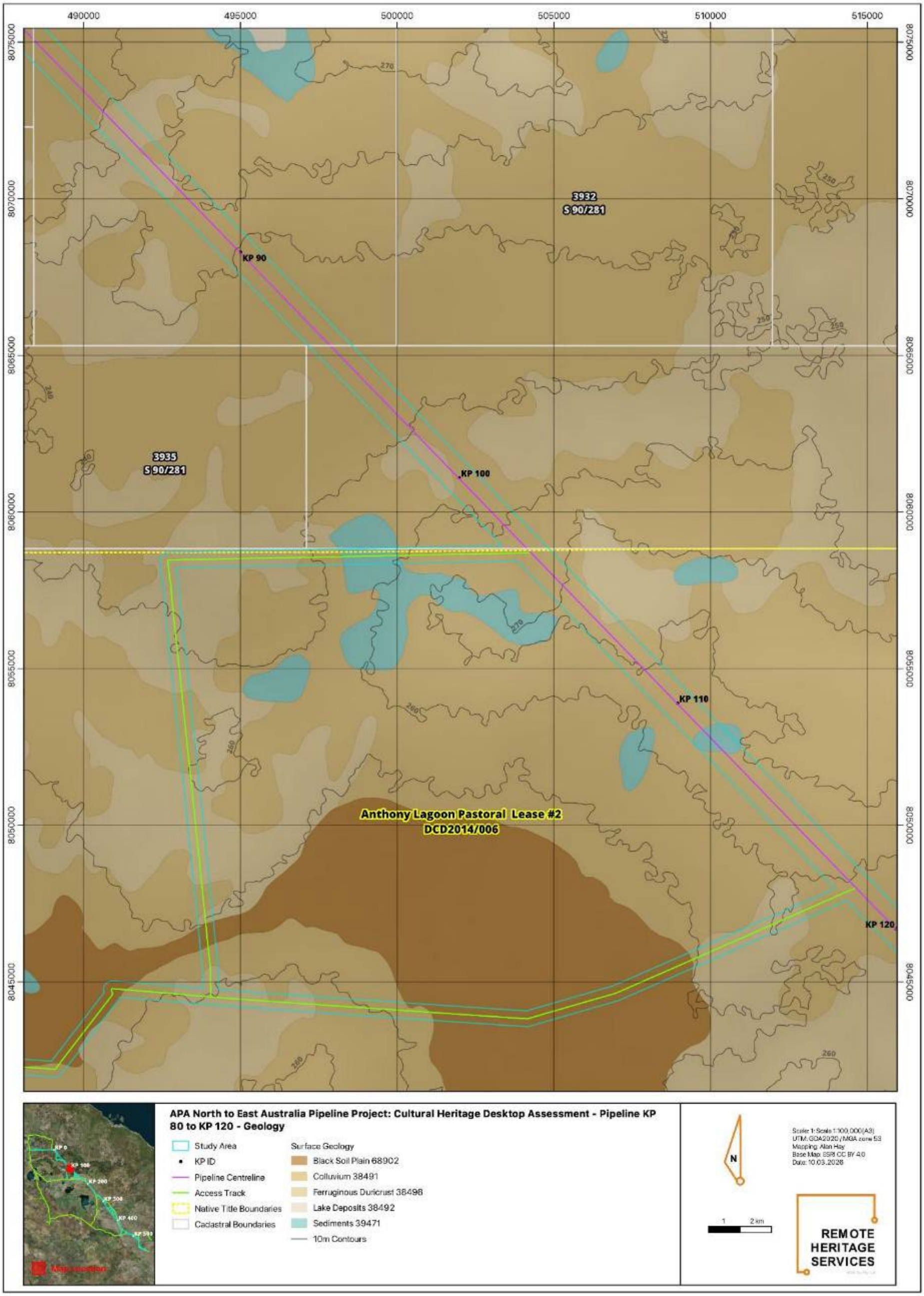
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KP 110
KP 120
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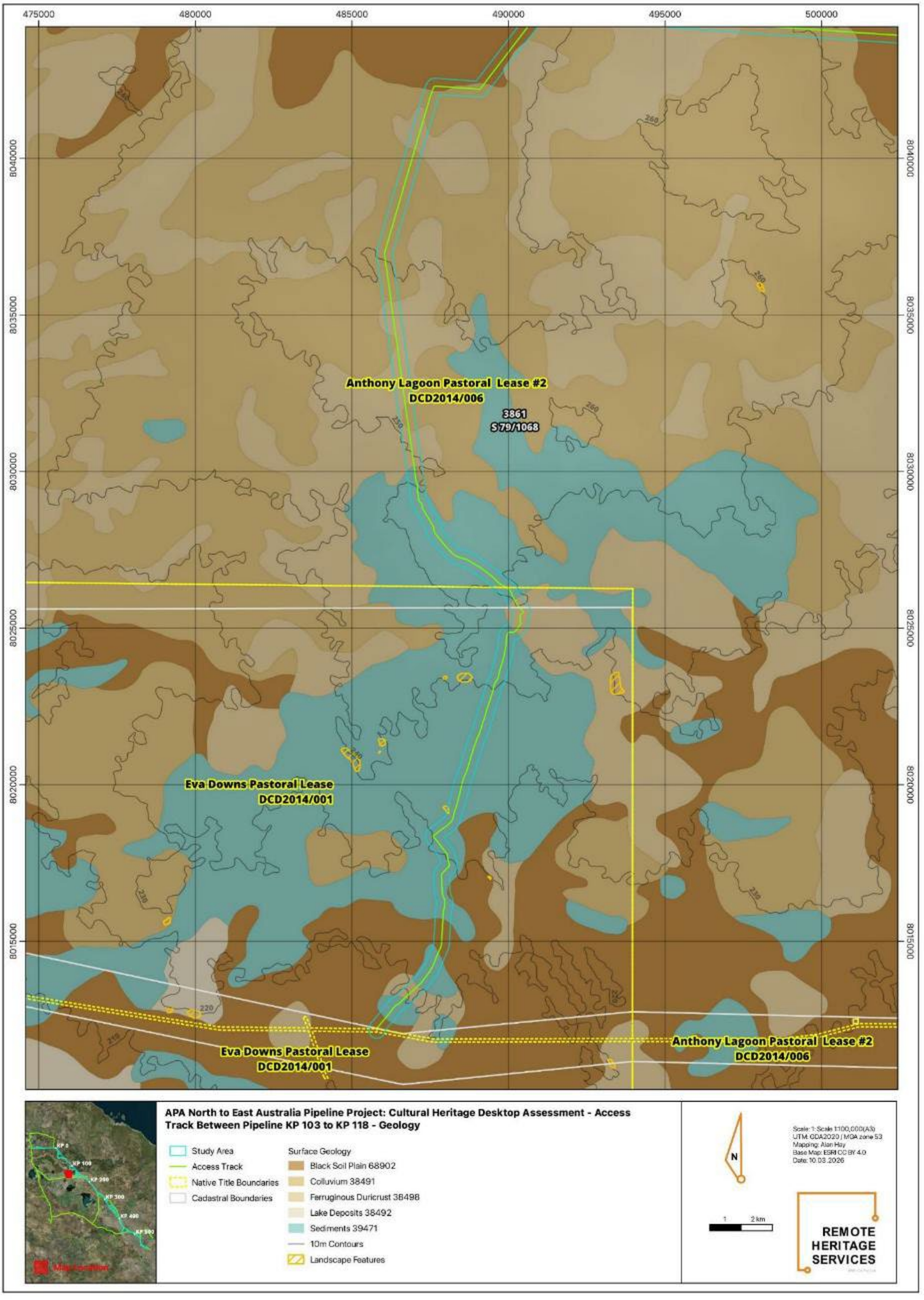
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DCD2014/006
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Access Track
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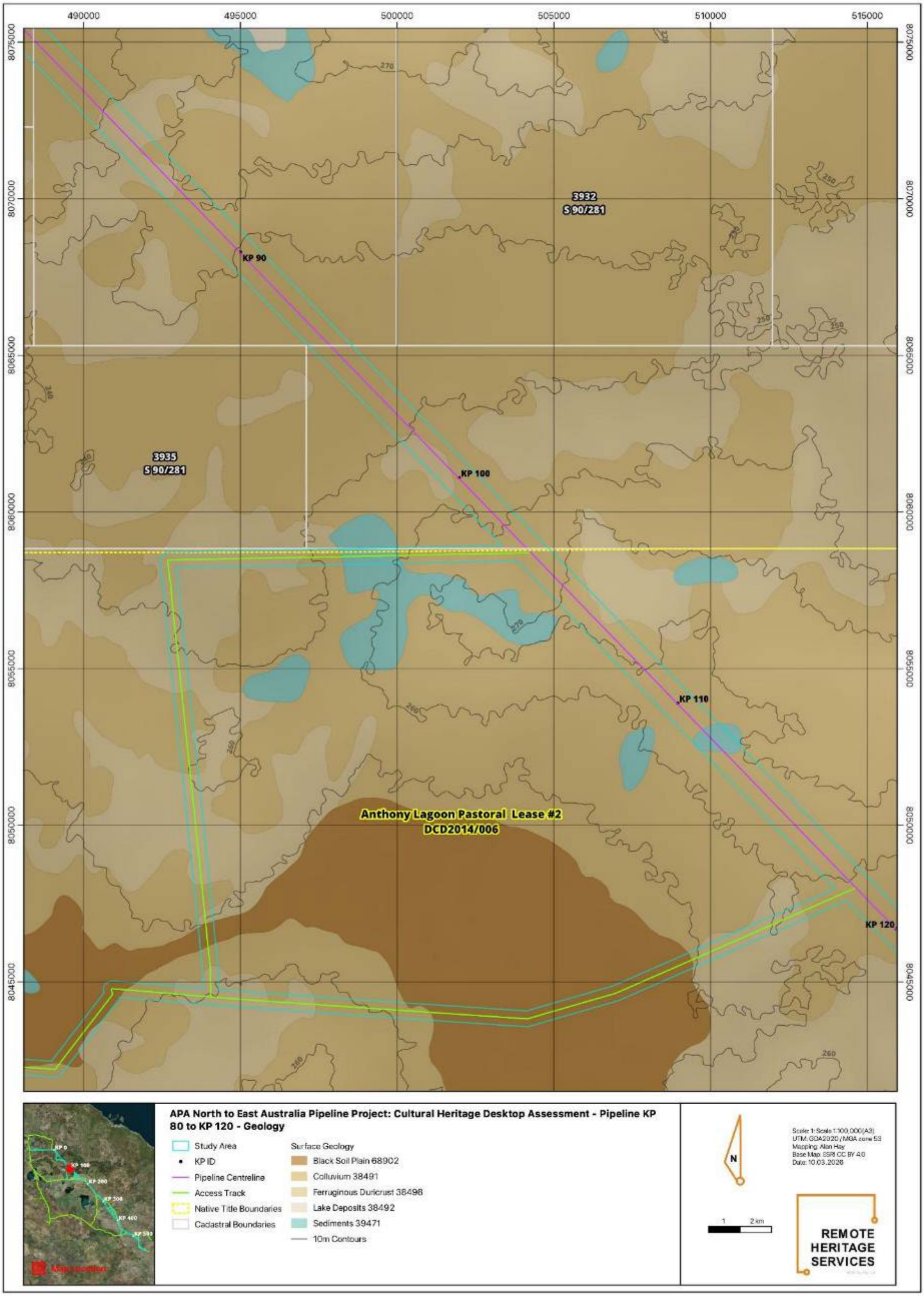
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Pipeline Centreline
Access Track
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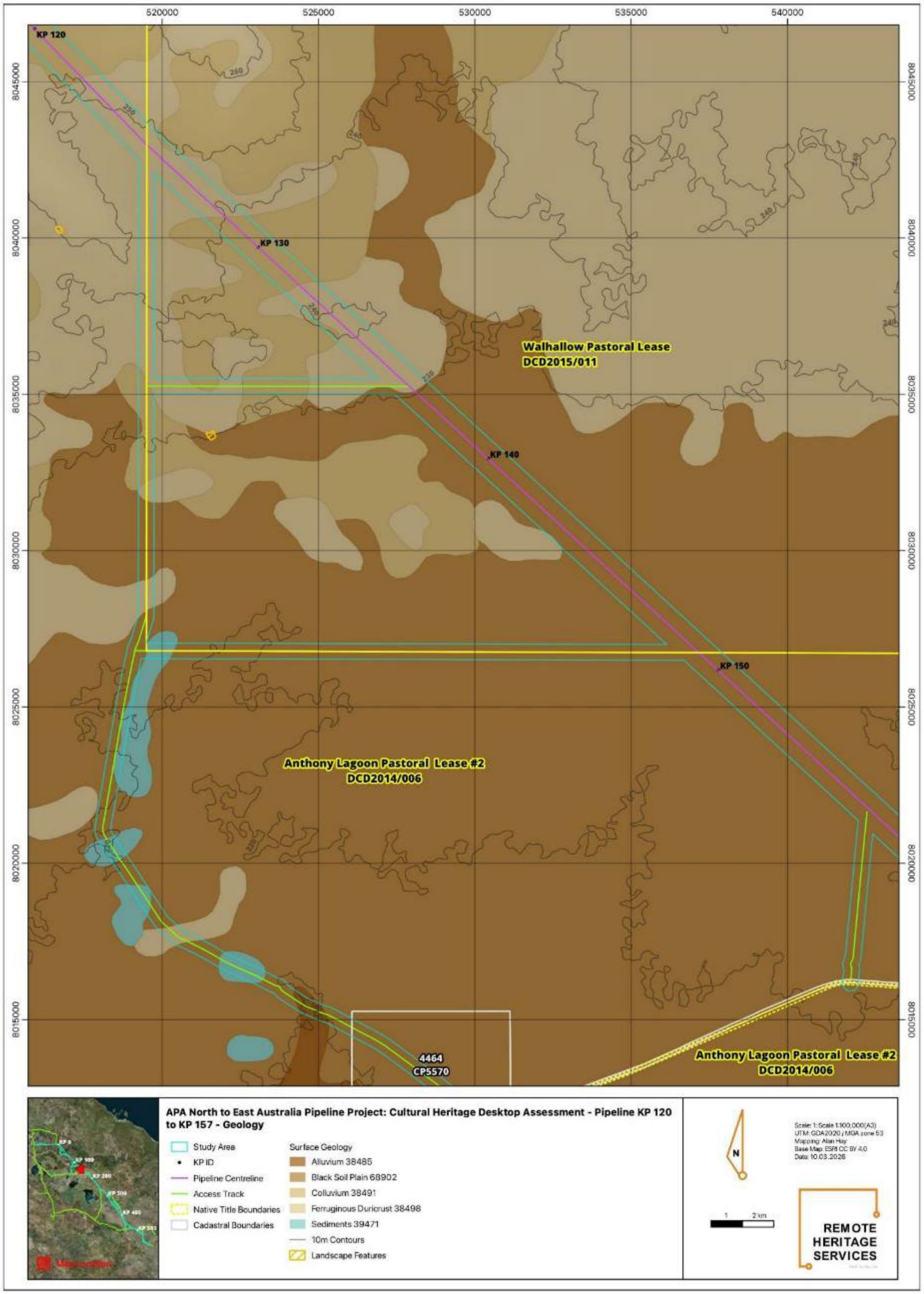
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4464
CP5570
Anthony Lagoon Pastoral Lease #2
DCD2014/006
APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Pipeline KP 120 to KP 157 - Geology
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Surface Geology
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Black Soil Plain 68902
Colluvium 38491
Ferruginous Duricrust 38498
Sediments 39471
10m Contours
Landscape Features
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2 km
REMOTE HERITAGE SERVICES


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KP 150
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CP5570
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DCD2014/006
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Access Track
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Cadastral Boundaries
Surface Geology
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Anthony Lagoon Formation
Black Soil Plain 68902
Brunette Limestone
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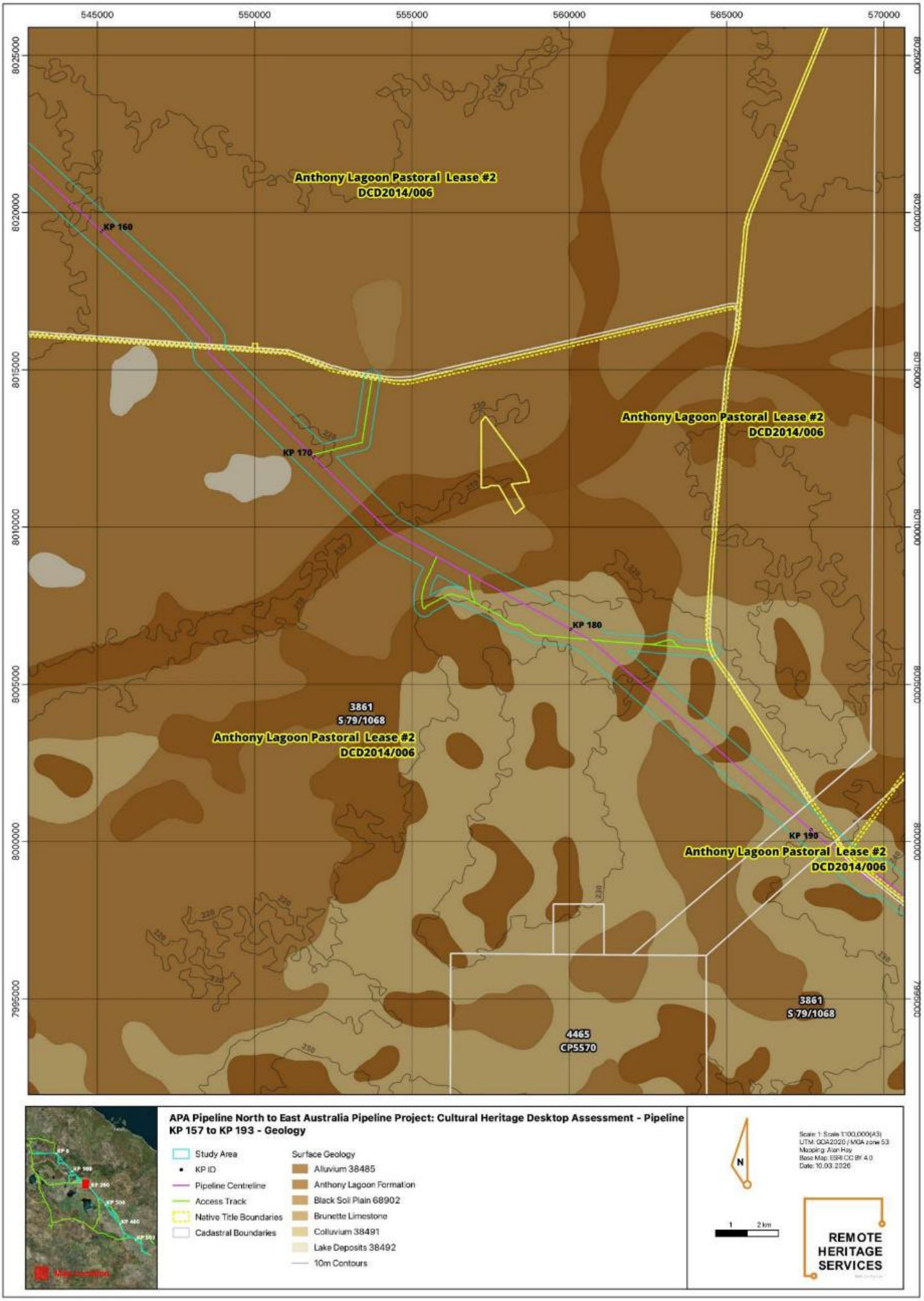
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KP 190
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S 79/1068
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Cadastral Boundaries
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Lake Deposits 38492
10m Contours
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REMOTE HERITAGE SERVICES


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S 93/051
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Study Area
KP ID
Pipeline Centreline
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Cadastral Boundaries
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Anthony Lagoon Formation
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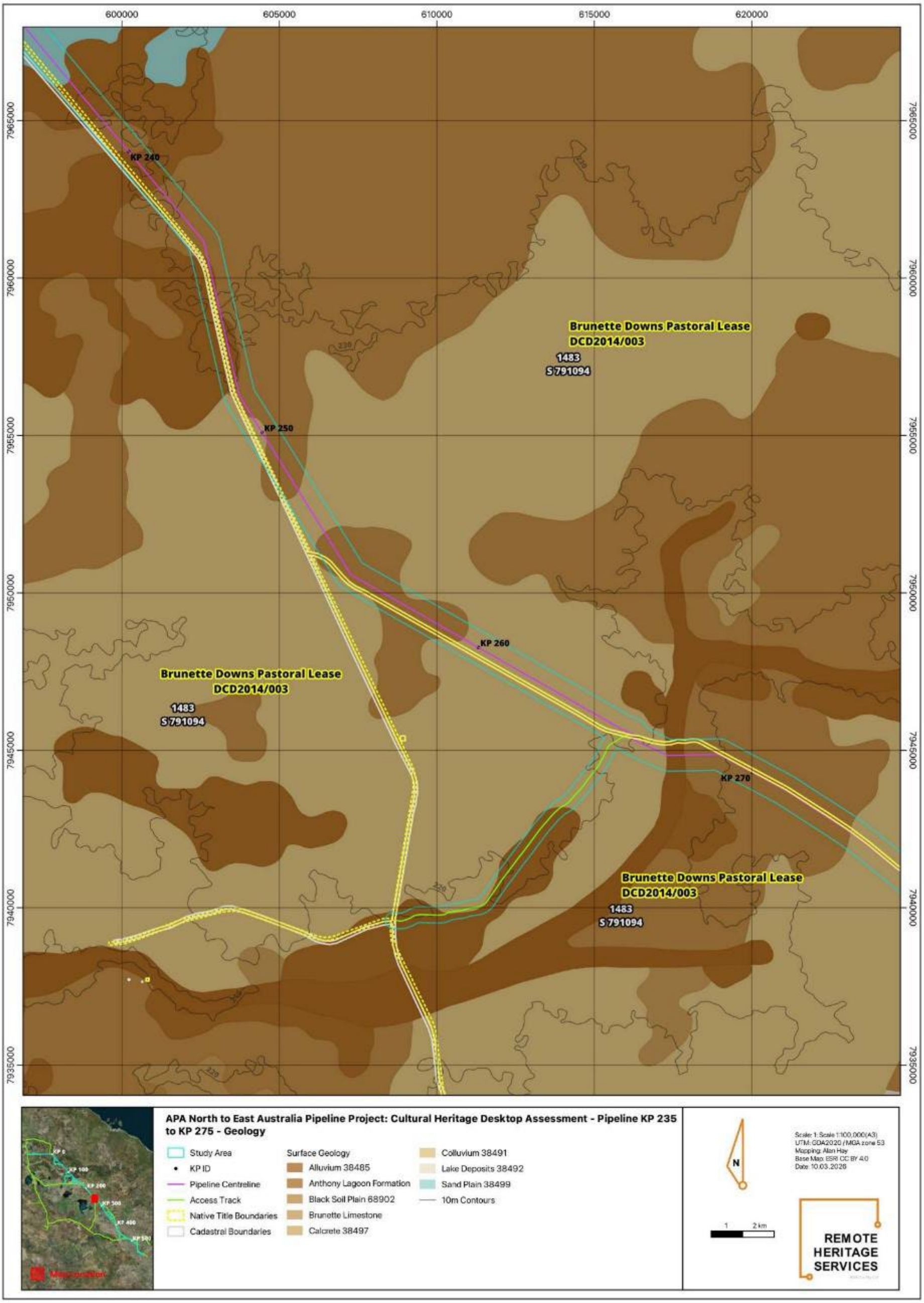
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Study Area
KP ID
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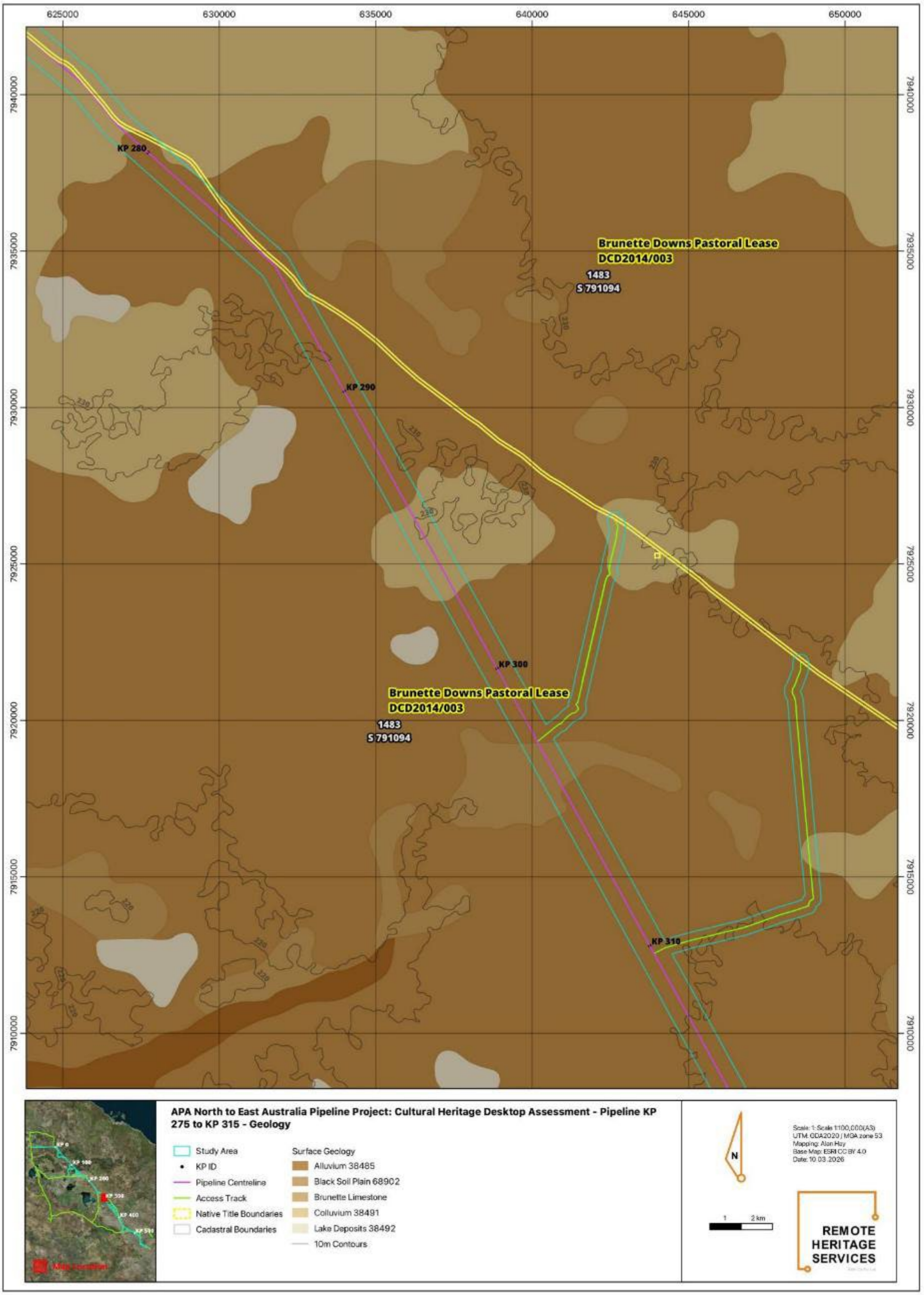
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Study Area
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Access Track
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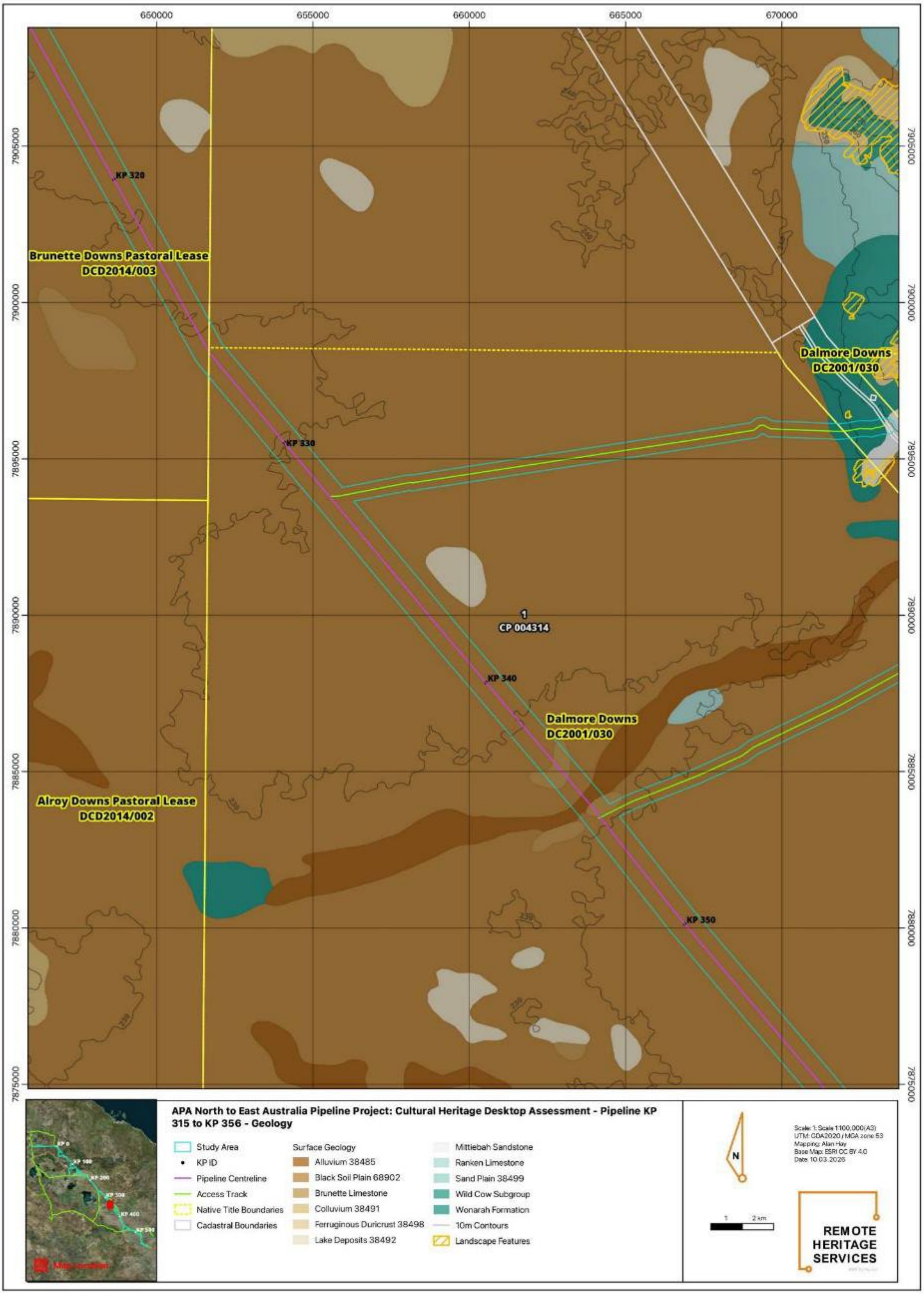
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Lake Deposits 38492
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KP 350

KP 360

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APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Access Tracks Between Pipeline KP 346 to KP 362 - Geology

Study Area
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Access Track
Native Title Boundaries
Cadastral Boundaries

Surface Geology
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Ferruginous Duricrust 38498
Lake Deposits 38492
Mittiebah Sandstone
Ranken Limestone
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REMOTE HERITAGE SERVICES


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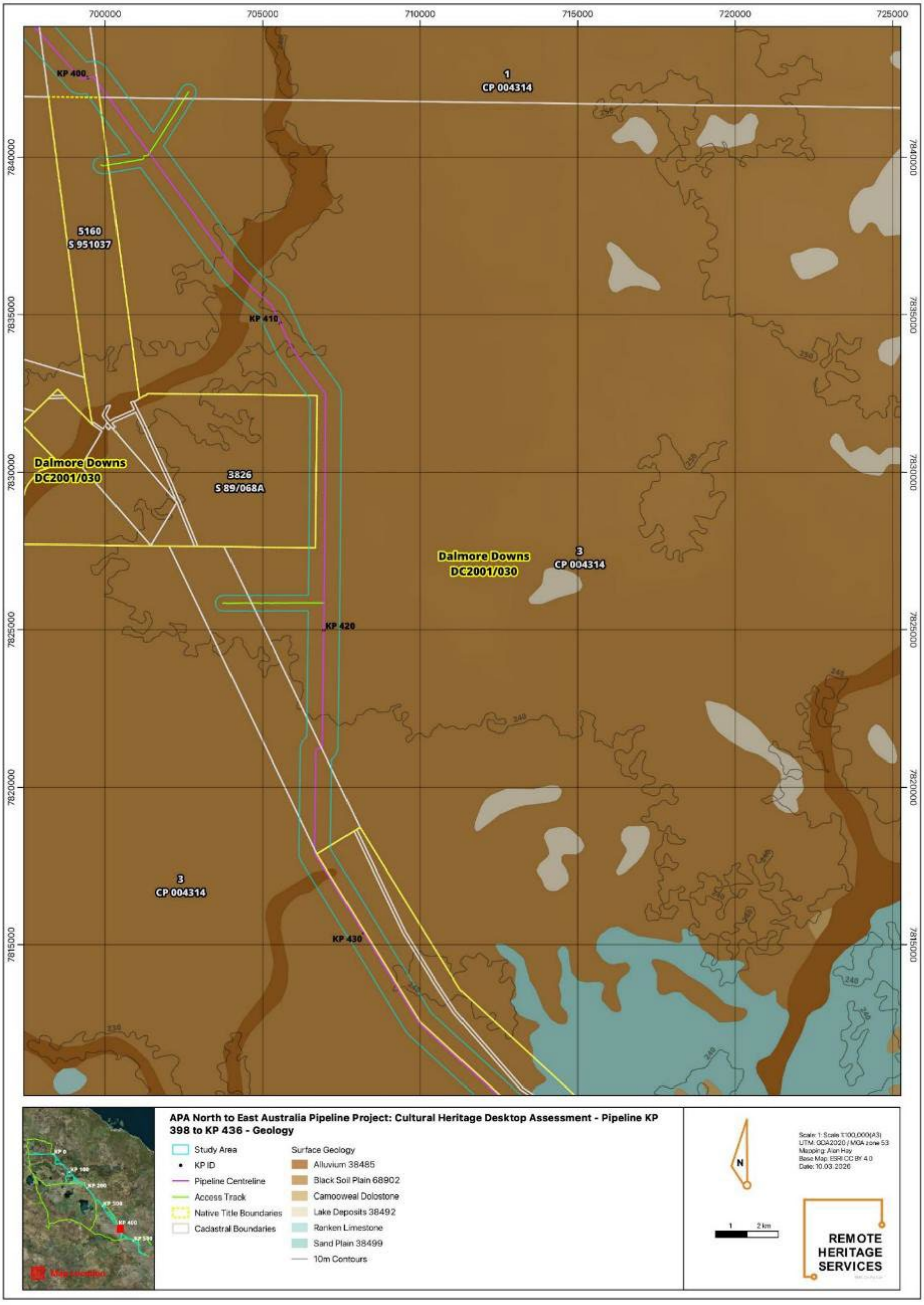
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Ranken Limestone
Sand Plain 38499
10m Contours
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REMOTE HERITAGE SERVICES


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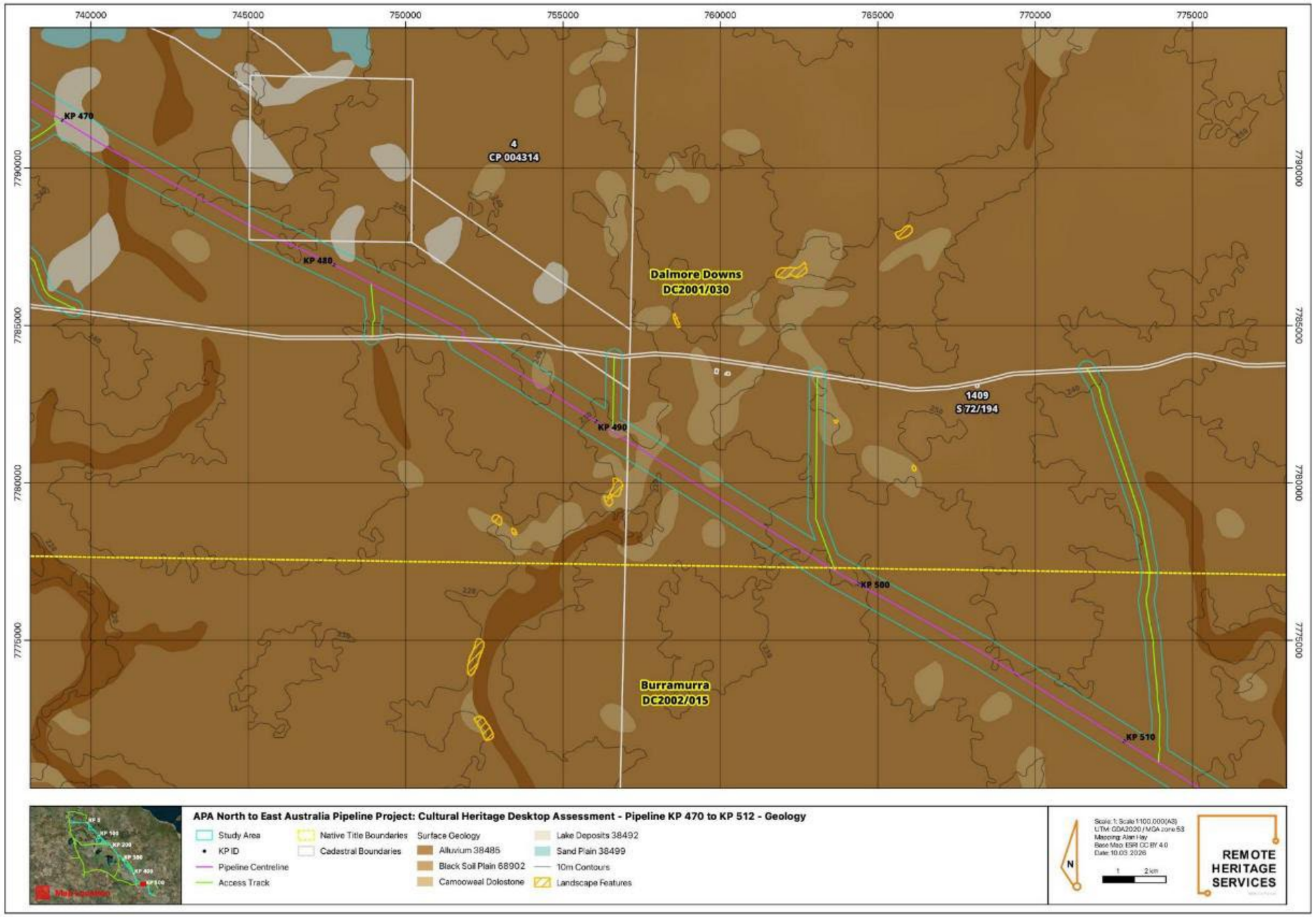
REMOTE HERITAGE SERVICES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Surface Geology
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Landscape Features
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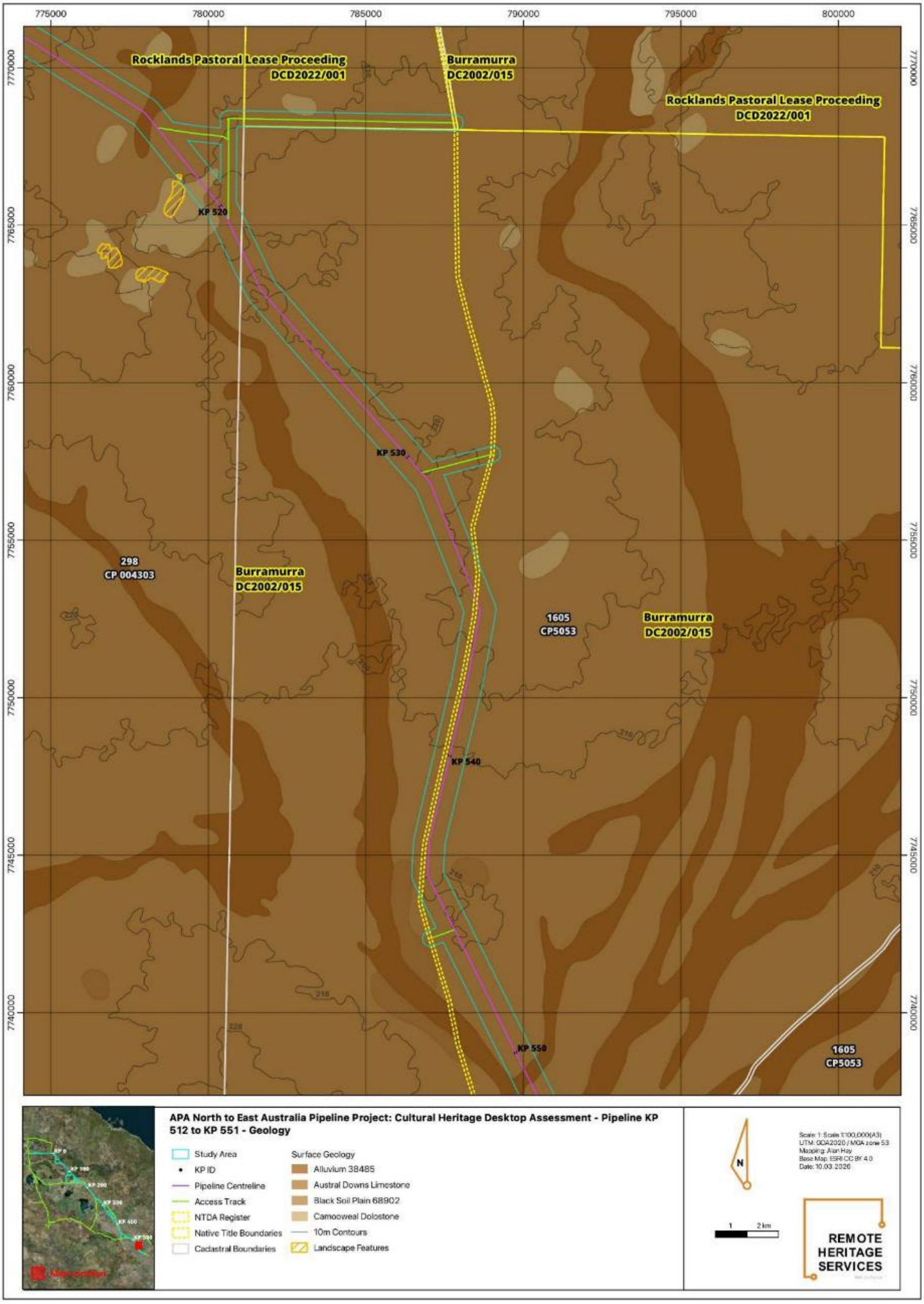
REMOTE HERITAGE SERVICES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DC2002/015
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Landscape Features
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REMOTE
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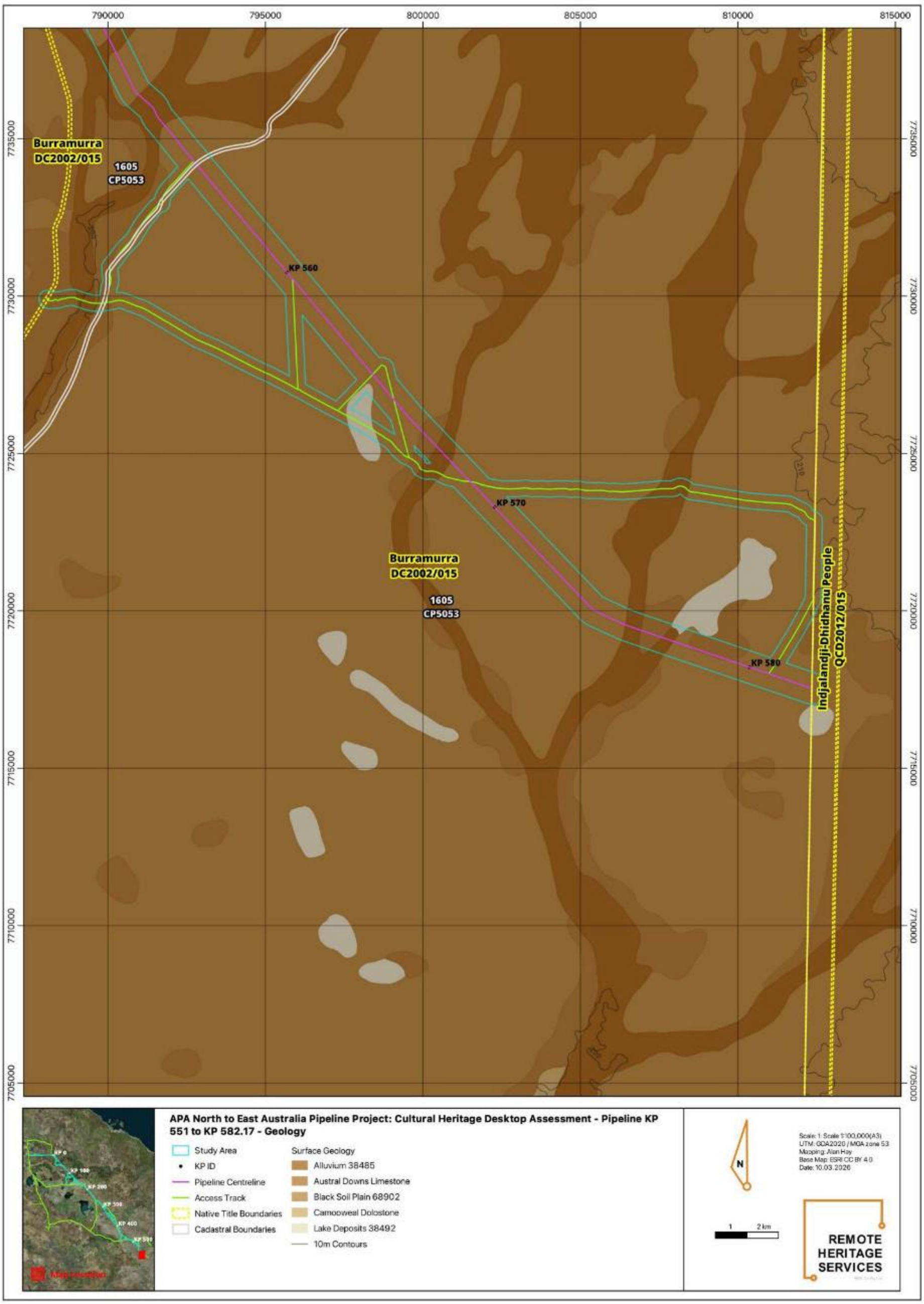
SERVICES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Indjalandji-Dhidhanu People
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APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Pipeline KP 551 to KP 582.17 - Geology
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Access Track
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Surface Geology
Alluvium 38485
Austral Downs Limestone
Black Soil Plain 68902
Camooweal Dolostone
Lake Deposits 38492
10m Contours
N
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2 km
REMOTE HERITAGE SERVICES

APPENDIX 2: CULTURAL HERITAGE SENSITIVITY AREAS

Table 16: Sensitivity Areas across the NEA Assessment Area

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_CH_001	A subdued lateritic terrain forming part of a broad drainage basin characterised by sparse eucalypt woodland grading to open woodland across an almost flat surface. Throughout, the landscape lacks prominent watercourses or rises and instead presents as a gently undulating plain with scattered drainage depressions and channels. The dominant surface is a grassy plain with isolated trees underlain by colluvium derived from weathered laterite with patches of ferruginous duricrust. Here, this colluvial mantle has created deeper stone-free profiles suited to grassland development through the redistribution of weathered material from the original Tertiary lateritic surface. Eucalypt Open Woodlands dominate the grassy plains on colluvial substrates with widely spaced Corymbia and Eucalyptus over a grassy understorey, while denser Eucalypt Woodlands form on the backplain surfaces; ferruginous duricrust supports shallow red earth soils with surface lateritic gravels. Closed depressions scattered across the terrain support woodland communities. Notably, moisture accumulates in enclosed basins probably produced by dissolution within the laterite or by argilliturbation. Transition zones between the grassy plains and drainage features show gradational vegetation changes responding to subtle substrate and moisture differences across this low-relief landscape.	KP 0	7027, S2009/182A-C, 7026, S2009/182A-C	DCD2012/007	-	1 Closed Depression; 1 Transition Zone; 1 Woodland	2 Backplain; 1 Closed Depression; 2 Woodland	1 Modern Construction
CHSA_CH_002	A broad level landscape occupying the centre of a wide drainage basin with a prominent drainage depression flanked by crescent-shaped scrubby woodland. the terrain presents a mosaic of grassy basin floors interspersed with slightly elevated scrubby areas on residual rises and irregular closed depressions. The grassy plain with isolated trees forms the dominant surface developed on a mix of ferruginous duricrust and colluvium, supporting Eucalypt Open Woodlands and Woodlands with variable density responding to substrate differences. In this setting, the duricrust provides shallow red earth soils with lateritic gravels while colluvium creates deeper stone-free profiles. Closed depressions on ferruginous duricrust carry Eucalypt Open Woodlands, such that moisture concentrates in depressions that may owe their form to dissolution or shrink-swell dynamics in the parent material. Crescent-shaped scrubby woodland on residual rises indicating elevated terrain preserving remnant laterite above the surrounding basin floor. The mosaic vegetation pattern reflects the interplay between substrate depth, drainage position and moisture availability across this low-relief terrain, with denser woodland on better-drained elevated positions and sparser vegetation on the seasonally moist basin floors.	KP 1,KP 2,KP 3,KP 4,KP 5,KP 6,KP 7,KP 8,KP 9,KP 10,KP 11,KP 12,KP 13,KP 14,KP 15	7027, S2009/182A-C, 7026, S2009/182A-C	DCD2012/007	2 First Order Stream Channel; 1 Seasonal First Order Channel; 1 Transition Zone; 1 Valley Flat Slope	18 Closed Depression; 1 Closed Depression with Margins; 1 Rise; 1 Tree Clump; 1 Valley Flat; 1 Wooded Plain with Drainage Channel; 1 Woodland within Closed Depression	10 Closed Depression; 1 Closed Depression with Margins; 1 Valley Flat	1 Grassy Plain with Isolated Trees
CHSA_CH_003	A landscape positioned at the junction of two drainage basins with a central sandy rise marking a subtle topographic high. Throughout, the terrain divides clearly between reddish tree-populated lateritic ground to the north and a greener drainage basin to the south reflecting fundamental substrate and vegetation differences. The broad drainage basin with closed depressions occupies much of the area developed on colluvium with subordinate ferruginous duricrust, producing a landscape where Eucalypt Open Woodlands dominate with the greener appearance reflecting eucalypt woodland over seasonally moist basin soils receiving run-on from surrounding elevated terrain. The contrast between reddish laterite and greener basin reflects the difference between remnant Tertiary land surface preserving shallow gravelly soils and the colluvially-mantled basin floors. deeper profiles support more vigorous growth during favourable moisture conditions. Closed depressions scattered through the terrain concentrate moisture in hollows potentially shaped by karst processes or argilliturbation within the laterite, while the central sandy rise represents a preserved fragment of the original lateritic surface standing above the surrounding drainage system.	KP 16,KP 17,KP 18,KP 19,KP 20,KP 21,KP 22	7027, S2009/182A-C	DCD2012/007	1 Closed Depression; 2 Seasonal Wetland; 1 Valley Flat Slope	7 Closed Depression; 1 Reticulated Stream Channel; 1 Tree Clump	5 Closed Depression; 2 Drainage Basin with Closed Depressions; 1 Plain with Drainage Depressions	2 Valley Flat

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_CH_004	A landscape straddling two drainage basins with a central sandy rise showing strong contrast between elevated reddish lateritic terrain and lower drainage basin floors. Throughout, significant topographic relief separates the residual rises from a substantial seasonal wetland occupying the lowest ground. The extensive backplain forms the dominant surface carrying Eucalypt Woodlands and Open Woodlands on ferruginous duricrust representing the reddish lateritic terrain visible from the air, with shallow red earth soils preserving the character of the Tertiary laterised surface. Closed depressions on duricrust support woodland communities, such that moisture accumulates, while the seasonal wetland in the lowest position receives convergent drainage from the surrounding catchment and would have provided relatively reliable water access during wetter periods. The strong vegetation and colour contrast between elevated laterite and lower drainage positions reflects the fundamental difference between preserved Tertiary surfaces with their shallow gravelly soils and the moisture-receiving basin floors,deeper profiles and seasonal waterlogging create different growing conditions.	KP 23,KP 24,KP 25,KP 26,KP 27,KP 28,KP 29,KP 30,KP 31,KP 32	1079, S 000000, 7027, S2009/182A-C, 702, CP5055	DCD2012/003, DCD2012/007, DCD2012/012	1 Residual Rise; 1 Transition Zone	10 Closed Depression; 1 Drainage Basin; 1 Drainage Channel; 2 Sandy Woodland; 5 Tree Clump; 2 Woodland Flat	1 Closed Depression; 1 Drainage Channel; 1 Woodland Flat	2 Backplain; 2 Valley Flat
CHSA_CH_005	A gentle rise above the edge of a very broad drainage channel to the east and upland drainage basins to the west, presenting as a single coherent feature. The central area shows sparse woodland with fringing closed woodlands around the edges where it meets the nearby basins in a pattern reflecting the transition from elevated laterite remnant to surrounding drainage surfaces. The backplain on ferruginous duricrust forms the dominant surface supporting Acacia Open Woodlands and Other Forests and Woodlands on the shallow red earth soils with lateritic gravels characteristic of these preserved Tertiary land surface remnants. Acacia dominance indicating better-drained rocky skeletal conditions distinct from the cracking clay plains. Transition zones mark the contacts between the rise and adjacent terrain carrying mixed woodland communities, while drainage features on duricrust support Eucalypt communities. Notably, seasonal moisture concentration occurs.	KP 33,KP 34,KP 35,KP 36	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	2 Transition Zone	2 Closed Depression; 1 Rise; 1 Seasonal Wetland	-	1 Backplain
CHSA_CH_006	A valley flat and drainage channel at the junction of two very broad drainage channels meeting from the north with two scrubby woodland lateritic rises in the centre,substantial vegetation differences exist between the rises and the surrounding flats with the rises carrying closed woodland contrasting with more open vegetation on lower ground. Residual rises on colluvium grading to alluvium support Acacia Forests and Woodlands in dense stands forming the scrubby woodland rises. Valley flats on alluvium carry Melaleuca and Eucalypt communities characteristic of the seasonally inundated grey-brown clays receiving water and sediment from the surrounding catchment. The convergent drainage position creates a landscape receiving sediment and water from multiple upstream sources, with the alluvial substrate producing different soil conditions than the surrounding lateritic terrain. The rises represent preserved fragments of older terrain standing above the alluvial valley floor, with the vegetation contrast reflecting the fundamental substrate difference between the better-drained rise positions and the seasonally waterlogged valley flats.	-	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	1 Residual Rise	1 Closed Depression	1 Residual Rise	-
CHSA_CH_007	A comparatively upland area of drainage depressions, lateritic rises and numerous small closed depressions spaced fairly evenly around the centre of a large drainage depression,the landscape covers an upland drainage headwater zone with a large central clay depression or rise that is significantly more vegetated than surroundings reflecting the moisture concentration characteristic of these collecting features. Valley flats form the highest surfaces in this upland context supporting Eucalypt and Acacia communities on ferruginous duricrust, with closed depressions on duricrust carrying woodland communities. moisture accumulates in hollows attributable to subsurface dissolution or argilliturbation in the duricrust. The upland headwater position means this terrain collects and redistributes water from surrounding surfaces in run-off/run-on systems that enhance the effectiveness of limited rainfall.	KP 42,KP 43,KP 44,KP 45,KP 46,KP 47,KP 48,KP 49,KP 50,KP 51	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	1 Sandy Rise; 3 Transition Zone	8 Closed Depression; 2 Drainage Basin; 1 Tree Clump; 3 Woodland within Closed Depression; 1 Woodland within Drainage Depression	2 Closed Depression; 1 Drainage Basin; 2 Drainage Channel; 5 Drainage Channel and Backplain	-
CHSA_CH_008	Valley flats form the dominant surface on ferruginous duricrust supporting Eucalypt Woodlands and Open Woodlands across the broad drainage floor, while rises on duricrust carry Acacia Forests and Woodlands in dense stands on the elevated terrain representing pisolithic ironstone rubble remnants of the eroded Tertiary land surface. A broad plain or floodplain with scattered sandy and lateritic rises carrying closed woodland including several pronounced rises adjacent to incipient first and second order streams with strong archaeological potential,numerous small closed depressions scatter throughout particularly in the broad western area. The rises adjacent to incipient streams occupy positions. What stands out is that elevated terrain meets the developing drainage network, creating interfaces between well-drained laterite surfaces and moisture-receiving drainage positions. Closed depressions scattered across the terrain concentrate moisture in depressions that may owe their form to dissolution or shrink-swell dynamics in the parent material, with transition zones on duricrust showing gradational vegetation changes between the major landform elements.	KP 52,KP 53,KP 54,KP 55,KP 56,KP 57,KP 58,KP 59,KP 60,KP 61,KP 62,KP 63,KP 64,KP 65	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	2 Channel Pool; 2 Residual Rise; 1 Rise; 2 Seasonal First Order Channel; 1 Transition Zone; 1 Woodland on Rise	16 Closed Depression; 7 Tree Clump; 1 Vegetated Rise; 3 Woodland within Closed Depression	5 Closed Depression; 3 Valley Flat; 1 Woodland within Closed Depression; 1 Woodland within Drainage Depression	3 Valley Flat

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_CH_009	A large lateritic rise within the centre of a very broad plain irregularly shaped with numerous small drainage depressions and shallow closed depressions among the elevated ground, and here the rises carry substantially denser tree cover than surrounding lower terrain owing to the divergence between remnant laterite and cracking clay. The backplain on ferruginous duricrust forms the rise crest supporting Acacia Forests and Woodlands in dense stands on shallow red earth soils with lateritic gravels, representing pisolithic ironstone rubble remnants of the eroded Tertiary lateritic plain, producing a landscape where the better-drained rocky skeletal conditions support tree establishment. A distinctive woodland with closed understorey occupies mid-slope positions on duricrust carrying Acacia Woodlands, while valley flats and closed depressions support Acacia communities,and moisture accumulates. The rise represents an erosional remnant of an older lateritic surface now standing above the surrounding plain, with the differential weathering creating the complex pattern of rises, depressions and drainage lines visible across this terrain.	KP 66,KP 67,KP 68,KP 69	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	1 Remnant Oxbow; 2 Residual Rise; 3 Transition Zone; 2 Vegetated Rise; 2 Woodland within Drainage Depression	3 Closed Depression; 1 Rise Slope; 1 Tree Clump; 1 Woodland with Closed Understorey	4 Small Clay Plain	-
CHSA_CH_010	Broad lateritic rises forming uplands above a surrounding very broad plain with an irregular shape and numerous small drainage depressions and shallow closed depressions among the elevated ground. The rises carry substantially more tree cover than lower areas with deeper depressions around the borders of larger basins and woodland concentrated on footslopes. The backplain on ferruginous duricrust supports Acacia Forests and Woodlands representing the elevated lateritic surface with characteristic shallow red earth soils and pisolithic gravels, with the Acacia dominance indicating the better-drained rocky skeletal conditions on these preserved Tertiary land surface remnants; trees establish on microsites that escape the cracking clay regime of surrounding plains. Closed depressions scattered across the rises concentrate moisture in features whose genesis likely involves karst dissolution, argilliturbation, or both, while the woodland concentration on footslopes reflects enhanced moisture availability, such that run-on from surrounding elevated terrain accumulates at the terrain contacts.	KP 70,KP 71,KP 72,KP 73,KP 74,KP 75,KP 76	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	1 Series of Low Rises and Small Depressions Adjoining Large Drainage Basin; 3 Swamp; 3 Transition Zone	6 Closed Depression; 3 Closed Depression in Drainage Basin; 1 Drainage Channel; 1 Tree Clump	2 Backplain; 1 Closed Depression; 3 Woodland within Drainage Depression	1 Valley Flat
CHSA_CH_011	A landscape comprising a broad drainage depression in the west and an area of elevated drainage depressions punctuated by closed depressions and woodland-covered residual rises in the east, representing the easternmost extent of a series of rises in the middle of the broad drainage basin with the entire area notably scrubby. Closed depressions dominate the terrain on ferruginous duricrust supporting Acacia Forests and Woodlands in characteristically dense stands contributing to the scrubby appearance, with these depressions concentrating moisture in hollows attributable to subsurface dissolution or argilliturbation in the duricrust. The complex pattern of rises, depressions and drainage lines reflects differential weathering of the laterite profile creating terrain variation across what was originally a more uniform Tertiary land surface, with Eucalypt Woodlands occurring as a minor component on specific terrain positions. The scrubby woodland character indicates the better-drained rocky skeletal conditions on these laterite remnants,Acacia establishes on shallow gravelly soils unsuited to the cracking clay regime.	KP 0,KP 77,KP 78,KP 79,KP 79.7	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	1 Transition Zone	5 Closed Depression; 1 Scrubby Rise; 3 Tree Clump; 2 Wooded Plain with Drainage Channel; 1 Woodland within Drainage Depression	2 Closed Depression; 1 Drainage Channel	1 Valley Flat
CHSA_PL_001	A large floodplain with terrace surfaces flanking a substantial watercourse with channel pools likely providing permanent or near-permanent water that would have been a landscape focus for people requiring reliable water access. What stands out is that the persistence of channel pools through dry periods creates refugia within an otherwise ephemeral drainage system. Extensive lateritic plains on ferruginous duricrust grading to colluvium dominate the terrain supporting Eucalypt Open Woodlands and Woodlands across the stable terrace surfaces. the deeper colluvial profiles created by sediment redistribution from the original lateritic surface provide conditions suited to woodland development. Valley flats on alluvium carry Melaleuca and Eucalypt communities characteristic of the periodically waterlogged heavy clays fed by run-on from the surrounding landscape.	KP 1,KP 2,KP 3,KP 4,KP 5,KP 6,KP 7,KP 8,KP 9,KP 10,KP 11,KP 12,KP 13,KP 14,KP 15	308, S2009/009, 702, CP5055	DCD2012/006, DCD2012/012	1 Area Around Channel Pool; 3 Closed Depression; 1 Drainage Depression; 1 Rise Slope; 2 Swamp; 1 Transition Zone Between Valley Flat and Rise; 3 Woodland within Closed Depression; 1 Woodland within Drainage Depression	1 Backplain; 9 Closed Depression; 1 Drainage Basin; 1 Drainage Depression; 1 Open Woodland on Rise; 1 Rise Slope; 4 Sandy Rise; 4 Tree Clump; 5 Woodland within Closed Depression	2 Closed Depression; 1 Extensive Stream-Adjacent Rise-Margin Lateritic Plain; 1 Extensive Stream-adjacent Rise-margin Lateritic Plain; 1 Floodplain; 1 Rise Slope; 1 Transition Zone Between Drainage Depression and Rise; 2 Woodland within Closed Depression	4 Extensive Stream-Adjacent Rise-Margin Lateritic Plain; 3 Extensive Stream-adjacent Rise-margin Lateritic Plain

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_002	A large rise in the centre of a floodplain with extensive drainage channels on either side, carrying woodland on the rises contrasting with sparse woodland in the broad upland drainage depression, producing a landscape where reddish soils extend into the drainage depressions reflecting the lateritic parent material. The broad lateritic plain on ferruginous duricrust forms the dominant surface supporting Acacia Open Woodlands with Acacia Forests and Woodlands representing the better-drained conditions on shallow red earth soils with scattered pisoliths and ironstone gravels. The reddish soil character extending into drainage positions indicates colluvial redistribution of weathered laterite into lower terrain. The rise represents a preserved remnant of the Tertiary lateritic plain now standing above the surrounding alluvial surfaces.	KP 16,KP 17,KP 18,KP 19,KP 20,KP 21,KP 22	308, S2009/009, 702, CP5055	DCD2012/006, DCD2012/012	1 Closed Depression; 1 Rise Slope Complex; 1 Seasonal Drainage Channel; 1 Seasonal First Order Channel with Transition Zone Around Drainage Depression and Vegetated Rises; 1 Transition Zone Around Drainage Depression and Vegetated Rises; 1 Transition Zone Between Drainage Depression and Rise	2 Closed Depression; 5 Tree Clump; 2 Tree Clump in Drainage Depression; 2 Woodland within Closed Depression	1 Closed Depression; 1 Closed Depression and Sandy Rises; 1 Seasonal Drainage Channel; 4 Tree Clump; 2 Tree Clump in Drainage Depression; 1 Vegetation Boundary at Transition Zone Between Drainage Depression and Rise; 2 Woodland within Closed Depression	7 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_PL_003	A large drainage depression including rise slopes on the northern margin but not on the southern side, with sparse areas intermixed with open woodlands within the drainage basin. The area likely drains eastward representing headwaters leading to lower terrain to the south and east. The broad lateritic plain on ferruginous duricrust forms the dominant surface supporting Acacia Forests and Woodlands on shallow lateritic soils, with rise slopes on duricrust carrying denser Acacia communities. The result is the elevated position provides better drainage than surrounding basin floors. The asymmetric rise slope distribution reflects differential erosion of the original lateritic surface.	KP 23,KP 24,KP 25,KP 26	308, S2009/009	DCD2012/006	1 Closed Depression; 3 Rise or Drainage Depression	4 Closed Depression; 1 Rise Slope Adjacent to Floodplain; 2 Rise Slope and Seasonal Drainage Channel; 2 Tree Clump	1 Broad Stream-adjacent Rise-margin Lateritic Plain; 3 Closed Depression; 2 Linear Drainage Depression; 2 Tree Clump	-
CHSA_PL_004	A landscape functioning as a strainer for the surrounding floodplains with numerous drainage channels and rills leading down into a swamp, representing a concentration point for the surrounding landscape with drainage depressions heavily aggraded at the bottom. What stands out is that the area functions as a water-collecting feature. The lateritic plain on Cretaceous sediments supports Eucalypt and Acacia communities across the upper terrain,the flat-lying Cretaceous parent material reflects the marine transgression that covered much of Central Australia and underwent little subsequent deformation to produce extensive plains. The landscape geometry creates natural water concentration that would have provided relatively reliable moisture access.	KP 27,KP 28,KP 29	308, S2009/009	DCD2012/006	1 Drainage Depression and Vegetated Sandy Rise; 2 Linear Drainage Depression; 1 Linear Reticulating Drainage Channel; 1 Rise; 1 Rise Slope Above Drainage Channel; 1 Rise Slope and Seasonal Drainage Channel; 1 Seasonal Drainage Channel; 1 Seasonal First Order Channel; 1 Seasonal First or Second Order Channel; 1 Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Swamp; 1 Tree Clump; 1 Woodland on RIse; 9 Woodland on Sandy Rise; 2 Woodland within Closed Depression	1 Linear Drainage Depression	-	6 Stream-adjacent Swamp-adjacent Lateritic Plain
CHSA_PL_005	Rises falling away very gently to the south with minor drainage channels and substantial areas of intermixed closed and sparse woodland, producing a landscape where the closed vegetation areas likely reflect subsurface differences such as slopes or drainage depressions creating the transitional rise midslope character. The broad lateritic plain on ferruginous duricrust forms the dominant surface supporting Other Forests and Woodlands and Acacia communities on shallow red earth soils with lateritic gravels, with the vegetation density variation reflecting subtle topographic and substrate differences across the midslope position.	KP 30,KP 31,KP 32,KP 33,KP 34	308, S2009/009	DCD2012/006	1 Rise Slope Above Valley Flat; 1 Transition Zone Between Drainage Depression and Rise	1 Closed Depression; 1 Drainage Depression with Tree Island; 1 Small Rises and Drainage Channel; 2 Transition Zone Between Drainage Depression and Rise	1 Closed Depression	1 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_PL_006	A valley flat lower slope thickly grassed with small depressions and possibly some swamps, presenting a very gentle terrain that represents the transition from elevated lateritic terrain to an adjacent floodplain. What stands out is that run-on from upslope positions enhances soil moisture availability. The broad lateritic plain on colluvium forms the dominant surface supporting Acacia Open Woodlands across this swamp-adjacent depression-rich terrain; the colluvial substrate indicates redistribution of weathered laterite from higher terrain into this lower-slope position creating deeper stone-free profiles.	KP 35,KP 36,KP 37	308, S2009/009	DCD2012/006	1 Rise Slope Above Floodplain; 3 Swamp; 1 Transition Zone Between Drainage Depression and Rise; 1 Transition Zone Between Rise and Floodplain	-	1 Broad Swamp-adjacent Depression-rich Lateritic Plain	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_007	A flat grassed floodplain that is not treed with rise slopes and stream channels at either side. the rise slopes are distinct and covered with closed woodland or closed forest contrasting sharply with the open treeless plain that likely becomes properly flooded during heavy rain events functioning as a seasonal wetland or lake. The extensive depression-rich lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands characteristic of the Vertosol cracking clay conditions. In this setting, gilgai microrelief creates the surface microtopography, with the treeless character reflecting the mechanical root shearing that excludes woody vegetation from these widely cracking soils. Rise slopes on colluvium carry Acacia Forests and Woodlands representing pisolithic ironstone rubble remnants of the eroded Tertiary lateritic plain.	KP 38,KP 39,KP 40,KP 41,KP 42,KP 43,KP 44,KP 45,KP 46	308, S2009/009	DCD2012/006	1 Drainage Depression at Floodplain Edge	1 Drainage Depression at Floodplain Edge	-	1 Extensive Depression-rich Rise-margin Lateritic Plain
CHSA_PL_008	A landscape continuing the floodplain and rise slope pattern with lateritic surfaces transitioning to black soil plains and associated drainage features, producing a landscape where the interplay between remnant laterite and cracking clay creates distinctive vegetation contrasts. Broad lateritic ground on black soil grading to ferruginous duricrust supports Eucalypt Woodlands across the broad surface, while rise slopes on colluvium carry Acacia Forests and Woodlands on the better-drained elevated terrain representing preserved Tertiary land surface remnants. The black soil component produces Vertosol conditions with gilgai microrelief, and here self-mulching surfaces and deep cracking characterise the treeless areas.	KP 47,KP 48,KP 49	308, S2009/009	DCD2012/006	1 Rise Slope Adjacent to Floodplain	1 Closed Forest; 1 Closed Forest or Thick Scrub; 2 Drainage Depression	1 Broad Depression-rich Rise-margin Lateritic Plain; 2 Drainage Depression	-
CHSA_PL_009	Drainage uplands embracing a large floodplain with drainage channels and depressions creating a mosaic of grassy depressions, reddish slopes with sparse trees and bands of closed woodland. Here, the V-shaped area embraces and is crossed by a substantial drainage basin to the south in a configuration that concentrates flow from multiple catchment areas. The extensive swamp-adjacent lateritic plain on colluvium and ferruginous duricrust forms the dominant surface, supporting Eucalypt and Acacia communities across terrain, such that the colluvial redistribution of weathered laterite has created deeper stone-free profiles in lower positions while shallow gravelly soils persist on rises.	KP 50,KP 51,KP 52,KP 53,KP 54,KP 55,KP 56,KP 57,KP 58	308, S2009/009	DCD2012/006	1 Backplain and Rise Slopes; 1 Closed Depression; 2 Drainage Depression; 2 Drainage Depression and Swamp; 1 Rise Footslope; 2 Rise Slope; 4 Sandy Rise or Vegetated Drainage Depression; 10 Swamp; 1 Transition Zone Around Drainage Depression and Sandy Rise; 1 Transition Zone Around Drainage Depression and Vegetated Rises; 1 Transition Zone Around Swamps, Drainage Depressions and Vegetated Rises; 2 Transition Zone Between Floodplain and Woodland Rise; 1 Transition between large valley flat and sandy rise; 3 Tree Clump; 1 Woodland on Sandy Rise; 1 Woodland within Closed Depression	8 Closed Depression; 3 Drainage Basin; 8 Drainage Depression; 1 Drainage Depression Adjacent to Backplain; 4 Extensive Swamp-adjacent Depression-rich Lateritic Plain; 1 Lightly Vegetated Sandy Rise Slope and Risecrest; 3 Tree Clump; 4 Woodland on Sandy Rise; 1 Woodland within Closed Depression	3 Closed Depression; 2 Drainage Basin; 2 Drainage Depression; 3 Extensive Swamp-adjacent Depression-rich Lateritic Plain	18 Extensive Swamp-adjacent Depression-rich Lateritic Plain
CHSA_PL_010	A southerly-aspect gentle rise slope of broken terrain with a stream channel towards its base. the land levels off, fairly sparsely but consistently wooded throughout in a pattern reflecting the enhanced moisture retention of south-facing slopes. The broad lateritic plain on colluvium forms the dominant surface supporting Eucalypt Open Woodlands across the gentle terrain,and the colluvial substrate indicates redistribution of weathered laterite from higher positions into this slope setting creating deeper profiles than the original lateritic surface.	KP 59,KP 60,KP 61,KP 62,KP 63	308, S2009/009	DCD2012/006	-	-	-	1 Broad Stream-adjacent Lateritic Plain

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_011	A very large area of broken ground with numerous drainage basins narrowing to drainage channels towards the southwest. sparsely wooded drainage basins and channels are interspersed with closed woodland or open forest on shallow rises and tree clumps in a mosaic reflecting substrate variation across the dissected terrain. Reddish soils characterise the slopes with greener areas marking drainage positions,the interplay between remnant laterite surfaces and colluvially-mantled drainage floors creates the vegetation contrast, with closed depressions on ferruginous duricrust supporting woodland communities where moisture accumulates.	KP 64,KP 65,KP 66,KP 67,KP 68,KP 69,KP 70,KP 71,KP 72,KP 73,KP 74,KP 75,KP 76,KP 77,KP 78,KP 79,KP 80,KP 81,KP 82,KP 83,KP 84,KP 85,KP 86,KP 87,KP 88,KP 89,KP 90,KP 91,KP 92,KP 93,KP 94,KP 95,KP 96,KP 97,KP 98,KP 99,KP 100,KP 101,KP 102	3861, S 79/1068, 3927, S 90/281, 3933, S 90/281, 3926, S 90/281, 3936, S 90/281, 308, S2009/009	DCD2012/006	3 Closed Depression; 2 Drainage Basin; 1 Drainage Depression with Trees; 1 Open Woodland within Closed Depression; 2 Reticulated Drainage Channel; 3 Rise; 4 Rise Slope; 2 Sandy Rise; 1 Scattered Tree Clumps; 2 Sinkhole; 1 Transition Zone Between Drainage Depression and Rise; 5 Tree Clump; 1 Woodland Within Closed Depression and Sandy Rise Along Stream	6 Closed Depression; 1 Drainage Basin; 1 Drainage Depression Above Backplain; 1 Drainage Depression Margin; 1 Drainage Depression and Tree Island; 1 Drainage Depression with Trees; 3 Extensive Stream-adjacent Rise-margin Lateritic Plain; 1 Open Woodland within Closed Depression; 4 Reticulated Drainage Channel; 1 Transition Zone Between Drainage Depression and Rise; 1 Transition Zone from Drainage Depression to Backplain; 1 Transition between large valley flat and lateritic rise; 5 Tree Clump; 1 Tree Clump in Drainage Depression	7 Closed Depression; 5 Drainage Basin; 9 Extensive Stream-adjacent Rise-margin Lateritic Plain; 1 Transition Zone Between Drainage Depression and Rise; 1 Tree Clump in Drainage Depression	9 Extensive Stream-adjacent Rise-margin Lateritic Plain
CHSA_PL_012	Large area of broken ground above a closed seasonal wetland or lake draining directly into it,the southernmost margin connecting to another area holds extremely high archaeological potential due to the convergence of drainage and proximity to persistent water that would have concentrated resources and human activity. Sparsely wooded drainage basins and channels are interspersed with closed woodland or open forest on shallow rises, with the reddish soils and green drainage areas reflecting the contrast between remnant laterite and moisture-receiving drainage positions.	KP 103,KP 104,KP 105,KP 106,KP 107,KP 108,KP 109	3861, S 79/1068, 3936, S 90/281	DCD2014/006	1 Sandy Rise; 3 Sinkhole; 1 Transition Zone Around Drainage Depression and Vegetated Rises; 1 Transition Zone Between Lateritic Rise and Swamp	20 Closed Depression; 1 Drainage Basin; 1 Drainage Depression Margin; 3 Drainage Depression Margin and Rise Slope; 1 Meandering Drainage Channel; 1 Reticulated Drainage Channel; 1 Risecrest and Rise Slope; 1 Transition between large valley flat and lateritic rise	18 Closed Depression; 3 Drainage Depression; 1 Drainage Depression Margin; 17 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Transition Zone Between Upper and Lower Rise Slope; 1 Transition between large valley flat and lateritic rise	12 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain
CHSA_PL_013	A sparsely wooded drainage channel draining a large drainage basin to the north into the seasonal lake floodplain to the south, with no obvious stream development present as the channel likely only flows or becomes waterlogged rarely under conditions of high catchment saturation. The broad lateritic plain on colluvium forms the dominant surface supporting Eucalypt communities across terrain, producing a landscape where the colluvial redistribution of weathered laterite into this drainage position has created deeper profiles suited to woodland development.	KP 110,KP 111	3861, S 79/1068	DCD2014/006	1 Transition between large valley flat and lateritic rise	-	-	1 Broad Stream-adjacent Lateritic Plain
CHSA_PL_014	Upland drainage basin above a large seasonal lake or wetland characterised by sparse trees and large amounts of tussock grass. Vague drainage depressions lead toward the seasonal wetland to the southwest in a configuration that collects and directs catchment runoff toward the terminal water body. The broad lateritic plain on colluvium forms the dominant surface supporting Eucalypt Woodlands across terrain. In this setting, the colluvial substrate indicates weathered laterite redistributed into this basin position.	KP 112,KP 113,KP 114,KP 115,KP 116,KP 117,KP 118	3861, S 79/1068	DCD2014/006	1 Sandy Rise Slope and Risecrest; 1 Seasonal First Order Channel; 1 Transitional Zone Between Wooded Sandy Rise Crest and Rise Slopes	2 Broad Stream-adjacent Rise-margin Lateritic Plain; 2 Transition Zone Between Drainage Depression and Rise	2 Broad Stream-adjacent Rise-margin Lateritic Plain	1 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_PL_015	Very gentle rises interspersed with drainage depressions and drainage basins. Throughout, the rises tend to be wooded with open woodland shading to closed forest, while drainage depressions within the reddish-soil rise areas are thickly wooded and the flats appear grassier where laterite has eroded away or been mantled by cracking clay soils. The widespread lateritic surface on colluvium and ferruginous duricrust forms the dominant surface, supporting mixed eucalypt and Acacia communities across terrain; the interplay between remnant laterite and redistributed colluvium creates the vegetation pattern.	KP 119,KP 120,KP 121,KP 122,KP 123,KP 124,KP 125,KP 126,KP 127,KP 128,KP 129,KP 130,KP 131,KP 132,KP 133,KP 134,KP 135,KP 136	3861, S 79/1068, 309, S 87/1078	DCD2014/006, DCD2015/011	1 Closed Depression; 2 Drainage Basin; 1 Drainage Depression; 1 First Order Stream Channel; 2 Reticulated Stream Channel; 2 Rise Slope; 1 Rise Slope and Transition Zone; 1 Sandy Rise; 1 Seasonal First Order Stream; Seasonal Second Order Stream; 1 Transition Zone Around Drainage Depression and Vegetated Rises	2 Closed Depression; 2 Drainage Basin; 1 Drainage Depression; 1 Rise Slope; 1 Rise Slope and Risecrest; 1 Risecrest and Rise Slope; 1 Transition between large valley flat and lateritic rise	1 Closed Depression; 1 Drainage Basin; 1 Drainage Depression; 6 Extensive Stream-adjacent Rise-margin Lateritic Plain; 1 Valley Flat	13 Extensive Stream-adjacent Rise-margin Lateritic Plain

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_016	A very large floodplain with major watercourses joining to form a seasonal river with permanent channel pools in the south. In this setting, anything in proximity to the channel pools holds the highest potential and the rises in the plain including crests, slopes and margins are similarly high potential representing quite likely a major landscape focus for past human activity. The broad lateritic plain on black soil grading to colluvium and alluvium forms the dominant surface, supporting Eucalypt and Melaleuca communities responding to the substrate gradient from cracking clay plain to drainage corridor. Permanent channel pools representing refugia persisting through dry periods.	KP 137,KP 138,KP 139,KP 140,KP 141,KP 142,KP 143,KP 144,KP 145,KP 146,KP 147,KP 148,KP 149,KP 150,KP 151,KP 152,KP 153,KP 154,KP 155,KP 156,KP 157,KP 158,KP 159,KP 160,KP 161,KP 162,KP 163,KP 164,KP 165,KP 166,KP 167,KP 168,KP 169,KP 170,KP 171,KP 172	4464, CP5570, 3861, S 79/1068, 309, S 87/1078	DCD2014/006, DCD2015/011	3 Backplain; 6 Closed Depression; 2 Closed Depression with Gilgai Microrelief; 2 Drainage Basin; 1 Drainage Depression and Sandy Rise; 1 Drainage Depression, Rise Slope and Risecrest; 3 Indistinct Feature; 2 Lunette; 1 Open Woodland within Floodplain; 1 Residual Rise; 1 Reticulated Drainage Channel; 5 Reticulated Stream Channel; 1 Rise Adjacent to Stream Channel; 1 Rise and Risecrest; 8 Sandy Rise; 1 Sandy Risecrest; 1 Sandy Risecrest and Rise Slope; 1 Seasonal First Order Stream; 1 Seasonal First Order Stream Corridor; 1 Seasonal First Order Stream Corridor and Well; 1 Seasonal First and Third Order Channel; 1 Stream Channel; 5 Swamp; 6 Terrace Flat; 1 Terrace Plain; 1 Transition Zone Between Drainage Depression and Rise	1 Backplain; 34 Closed Depression; 8 Closed Depression with Gilgai Microrelief; 1 Drainage Basin; 2 Drainage Depression; 2 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 2 Gilgai Microrelief; 3 Indistinct Feature; 1 Open Woodland On Floodplain; 1 Seasonal First Order Channel; 1 Sparsely Wooded Drainage Corridor; 2 Tree Clump	1 Backplain; 29 Closed Depression; 9 Closed Depression with Gilgai Microrelief; 1 Drainage Basin; 3 Drainage Depression; 1 Drainage Depression and Sandy Rise; 8 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Open Woodland on Floodplain; 2 Tree Clump	1 Broad Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Closed Depression; 56 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Highly Disturbed Land; 1 Well
CHSA_PL_017	River valley and terrace flat of the highest archaeological potential with permanent water present year-round at large channel pools. The result is the river valley is heavily vegetated while the terrace plain is much less so and little rises and terraces around the channel create potentially very complex site development situations. The valley flat on alluvium supports Melaleuca and Eucalypt communities characteristic of the intermittently flooded heavy clay soils receiving run-on water, sediment and nutrients from the catchment, while terrace surfaces on colluvium grading to duricrust carry sparser woodland communities.	KP 173,KP 174,KP 175,KP 176,KP 177	3861, S 79/1068	DCD2014/006	4 Broad Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Permanent Stream Channel; 1 Rise Adjacent to Seasonal Stream Channel; 1 Rise Slope Adjacent to Floodplain; 1 Rise Slope and Risecrest with Drainage Depression; 1 Seasonal First Order Channel	1 Backplain; 1 Broad Stream-adjacent Swamp-adjacent Lateritic Plain	-	3 Broad Stream-adjacent Swamp-adjacent Lateritic Plain

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_018	Very gentle rises interspersed with drainage depressions and drainage basins with wooded rises shading to closed forest. The result is drainage depressions within the reddish-soil rise areas are thickly wooded while flats appear grassier where laterite has eroded or been mantled by clay soils shaped by the difference between remnant Tertiary surfaces and younger depositional materials. The widespread lateritic surface on ferruginous duricrust grading to colluvium and black soil forms the dominant surface, supporting mixed communities responding to the substrate gradient from shallow gravelly laterite on rises to Vertosol cracking clays on the grassier flats.	KP 178,KP 179,KP 180,KP 181,KP 182,KP 183,KP 184,KP 185,KP 186,KP 187,KP 188,KP 189,KP 190,KP 191,KP 192,KP 193,KP 194,KP 195,KP 196,KP 197,KP 198,KP 199,KP 200,KP 201,KP 202,KP 203,KP 204,KP 205,KP 206,KP 207,KP 208,KP 209,KP 210,KP 211,KP 212,KP 213	3861, S 79/1068, 5153, CP5570, 3151, S 86/079, 1483, S 791094	DCD2014/003, DCD2014/006	2 Drainage Basin; 1 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Seasonal First Order Stream Corridor; 1 Second Order Stream Channel; 2 Transition Zone Between Backplain and Swamp	6 Closed Depression; 1 Drainage Basin	3 Closed Depression; 1 Drainage Basin; 5 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 3 Pronounced Drainage Depression	2 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 2 Modern Construction
CHSA_PL_019	Small floodplain forming a drainage depression between rises with trees around the footslopes of the rises and grass elsewhere, representing the typical interplay between elevated laterite remnants supporting woodland and lower cracking clay surfaces supporting grassland. The depression-rich lateritic plain on black soil forms the dominant surface supporting Eucalypt Open Woodlands across the broad terrain. Here, the black soil component produces Vertosol conditions with gilgai microrelief and self-mulching surfaces while the lateritic rises above preserve shallow gravelly soils suited to tree growth.	KP 214,KP 215	1483, S 791094	DCD2014/003	1 Drainage Depression; 1 Rise Slope	-	-	1 Depression-rich Rise-margin Lateritic Plain
CHSA_PL_020	A small rise representing a smaller version of the gentle rises interspersed with drainage depressions and drainage basins typical of this terrain. What stands out is that the rises tend to be wooded grading from open woodland to closed forest with thickly wooded drainage depressions in the reddish-soil rise areas and grassier flats where laterite has eroded. The broad lateritic plain on silcrete grading to ferruginous duricrust forms the dominant surface, supporting Eucalypt and Acacia communities across terrain,and the silcrete substrate indicates an alternative duricrust mineralogy to the more common ferruginous variety.	KP 216,KP 217,KP 218	1483, S 791094	DCD2014/003	1 Closed Depression	1 Broad Depression-rich Rise-margin Lateritic Plain; 1 Drainage Depression	1 Broad Depression-rich Rise-margin Lateritic Plain	-
CHSA_PL_021	Small floodplain forming a drainage depression between rises with trees around the footslopes of the rises and grass elsewhere in the typical pattern reflecting the contrast between remnant laterite supporting woodland and cracking clay producing grassland. The broad lateritic plain on black soil grading to other substrates forms the dominant surface supporting Eucalypt Open Woodlands, while closed depressions on silcrete grading to black soil carry Eucalypt Woodlands,moisture accumulates in these collecting features.	KP 219,KP 220,KP 221,KP 222	1483, S 791094	DCD2014/003	1 Transition Zone Between Floodplain and Lateritic Rise	6 Closed Depression; 1 Drainage Depression and Levees	4 Broad Depression-rich Rise-margin Lateritic Plain; 6 Closed Depression; 1 Drainage Depression and Levees	1 Broad Depression-rich Rise-margin Lateritic Plain; 1 Well
CHSA_PL_022	Rise crest and lower slope terrain with scrubby open woodland on the elevated areas grading to sparse grassy woodland on the lower slopes and nearly treeless conditions on the plain. The result is the soil appears reddish throughout reflecting the lateritic parent material across the slope sequence. The broad lateritic plain on silcrete grading to other substrates forms the dominant surface supporting Eucalypt communities that decrease in density downslope as the terrain transitions from shallow gravelly duricrust soils to deeper cracking clay conditions.	KP 223,KP 224	1483, S 791094	DCD2014/003	1 Rise Slope and Footslope	-	2 Broad Depression-rich Rise-margin Lateritic Plain	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_023	Gentle rises alternate with drainage depressions and basins across this terrain. The rises are wooded grading from open woodland to closed forest, with thickly wooded drainage depressions in the reddish-soil rise areas and grassier flats where laterite has eroded reflecting the interplay between preserved Tertiary surfaces and younger depositional materials. The broad lateritic plain on silcrete grading to ferruginous duricrust and black soil forms the dominant surface, supporting mixed communities responding to the substrate gradient.	KP 225,KP 226,KP 227,KP 228,KP 229,KP 230	1483, S 791094	DCD2014/003	1 Rise Midslope	2 Closed Depression; 2 Drainage Depression; 1 Drainage Depression, Rise Slope, Risecrest and Footslope; 1 Transition Zone Between Gilgai and Drainage Basin	5 Broad Depression-rich Rise-margin Lateritic Plain; 2 Closed Depression; 2 Drainage Depression	-
CHSA_PL_024	Transitional zone between the final group of rises and the large open floodplains with small closed woodland rises, watercourses with obvious channel pools to the west and a river running through, representing a corridor that would have been used for movement between landscape zones. Bright orange-red margins on the small rises mark the laterite footslopes, producing a landscape where weathered ferruginous material has concentrated, creating visually distinctive terrain contacts. The broad lateritic plain on silcrete grading to black soil and alluvium forms the dominant surface.	KP 231,KP 232,KP 233,KP 234,KP 235,KP 236,KP 237,KP 238,KP 239,KP 240	1483, S 791094	DCD2014/003	1 Drainage Depression and Shallow Rises; 1 Floodplain; 1 Reticulated Stream Channel; 1 Rise Slope; 1 Swamp	1 Area of Complex Microrelief; 1 Backplain; 2 Closed Depression; 1 Drainage Depression	1 Closed Depression; 1 Drainage Depression; 1 Rise Slope	1 Backplain; 2 Broad Swamp-adjacent Rise-margin Lateritic Plain
CHSA_PL_025	The hallmark gilgai texture of Vertosol country marks this stretch of the corridor. The plain is open grassland broken only by occasional trees fringing depressions or perched on rises.	KP 241,KP 242,KP 243,KP 244	1483, S 791094	DCD2014/003	-	-	1 Drainage Basin	1 Broad Swamp-adjacent Depression-rich Lateritic Plain
CHSA_PL_026	Two large swamps of extremely high archaeological potential within an anastomosing plain with shallow drainage depressions. the typical treeless character persists with occasional trees around depressions or on residual rises and gilgai development throughout indicating the Mitchell grass cracking clay country. Swamps on other substrates grading to black soil support Tussock Grasslands and wetland communities, representing persistent or semi-persistent water features within the otherwise seasonally dry plain that would have concentrated resources and human activity.	KP 245,KP 246,KP 247	1483, S 791094	DCD2014/003	1 Swamp; 1 Swamp and Well	-	-	-
CHSA_PL_027	Adjacent to two large swamps conferring very high archaeological potential, the terrain is an anastomosing plain with shallow drainage depressions typically treeless except for occasional trees around depressions or on residual rises, with gilgai microrelief present throughout and less distinct drainage depressions and subtle mould-pattern changes in the grass indicating cracking clay behaviour. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands characteristic of the Vertosol conditions.	KP 248,KP 249,KP 250,KP 251,KP 252	1483, S 791094	DCD2014/003	6 Mitchell Grass Island	6 Mitchell Grass Island	-	1 Broad Swamp-adjacent Mitchell Grass Lateritic Plain
CHSA_PL_028	Pronounced the uneven gilgai surface formed by repeated shrink-swell cycles defines this country. The plain is stripped of trees by the cracking clay regime, except where depressions or rises permit root survival.	KP 253,KP 254	1483, S 791094	DCD2014/003	-	-	1 Backplain	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_029	Drainage lines weave and reconnect across the surface, dominated by grass with only sporadic trees surviving where depressions or rises interrupt the clay. gilgai microrelief is present throughout this Mitchell grass country indicating the Vertosol cracking clay conditions derived from weathering of calcareous Tertiary sediments or erosion of the adjacent Tertiary lateritic plain. Lateritic plains underlain by black soil forms the dominant surface supporting Tussock Grasslands characteristic of these widely cracking soils, and here the gilgai depressions function as local moisture stores with rainfall penetrating deep cracks that subsequently close on swelling to shield moisture from evaporation.	KP 255,KP 256,KP 257,KP 258,KP 259,KP 260,KP 261,KP 262,KP 263,KP 264,KP 265,KP 266,KP 267,KP 268,KP 269,KP 270,KP 271,KP 272,KP 273,KP 274,KP 275,KP 276,KP 277,KP 278,KP 279,KP 280,KP 281,KP 282,KP 283,KP 284,KP 285	1483, S 791094	DCD2014/003	2 Channel Pool; 1 Closed Depression; 4 Drainage Depression; 3 First Order Stream Channel; 56 Mitchell Grass Island; 1 Seasonal Stream Channel and Valley Flat; 1 Second Order Stream Channel; 1 Swamp; 1 Terrace Flat	1 Closed Depression; 15 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 31 Mitchell Grass Island; 1 Shallow First Order Drainage Channel; 2 Tree Clump	2 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	12 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 2 Mitchell Grass Island; 1 Modern Well
CHSA_PL_030	Adjacent to a permanent lake or wetland conferring very high archaeological potential representing a scene of considerable past activity, the terrain is an anastomosing plain with shallow drainage depressions typically treeless with gilgai microrelief throughout indicating the Mitchell grass cracking clay country. The proximity to permanent water creates a landscape context of enhanced resource reliability within the otherwise seasonal plain, with the lake or wetland functioning as a refugium. aquatic productivity persists through dry periods and resources concentrate.	KP 286,KP 287,KP 288,KP 289,KP 290,KP 291,KP 292,KP 293,KP 294,KP 295,KP 296,KP 297	1483, S 791094	DCD2014/003	2 Closed Depression with Gilgai Microrelief; 3 Extensive Mitchell Grass Lateritic Plain; 26 Mitchell Grass Island	-	-	-
CHSA_PL_031	Open Mitchell grass stretches unbroken here, characteristically treeless apart from isolated woody individuals rooted at depression margins. gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country reflecting the cracking clay behaviour of the underlying Vertosol soils. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands. Throughout, the mould-pattern changes in the grass indicate subtle variations in gilgai development and soil moisture distribution across the plain.	KP 298,KP 299,KP 300	1483, S 791094	DCD2014/003	4 Mitchell Grass Island	1 Broad Mitchell Grass Lateritic Plain	-	-
CHSA_PL_032	A stream channel within an anastomosing plain with shallow drainage depressions essentially woodless save for occasional trees clinging to depression rims and low rises. Notably, gilgai microrelief is present throughout indicating the Mitchell grass Vertosol conditions. The broad Mitchell grass lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, while the stream channel concentrates seasonal flow across the otherwise flat terrain creating a linear feature of enhanced moisture availability.	KP 301	1483, S 791094	DCD2014/003	1 Broad Mitchell Grass Lateritic Plain; 3 Mitchell Grass Island	-	-	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_033	Shrink-swell clay soils control the character of this landscape. The plain is treeless black soil country punctuated only by the odd eucalypt at depression margins, dissected by shallow braided drainage. with classic gilgai patterning produced by the mechanical action of swelling clays derived from the Vertosol cracking clay soils formed on weathered calcareous Tertiary sediments. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with the gilgai creating surface microtopography,slight depressions accumulate moisture that penetrates deep cracks and becomes shielded from evaporation as the clay swells and the fissures close.	KP 302,KP 303	1483, S 791094	DCD2014/003	14 Mitchell Grass Island	2 Mitchell Grass Island	1 Broad Stream-adjacent Mitchell Grass Lateritic Plain	1 Broad Stream-adjacent Mitchell Grass Lateritic Plain; 1 Modern Construction; 2 Modern Well
CHSA_PL_034	Seasonal stream channels on black soil concentrate flow across the flat terrain, while the possible dune features suggest aeolian reworking of sandy materials during drier climatic phases when vegetation cover was reduced. The surrounding plain is treeless black soil country punctuated only by the odd eucalypt at depression margins, with shallow braided drainage throughout. and possible incipient or remnant dunes characteristically treeless apart from isolated woody individuals rooted at depression margins. Notably, gilgai microrelief is present throughout indicating the Mitchell grass cracking clay conditions.	KP 304	1483, S 791094	DCD2014/003	1 Channel Pool; 1 Seasonal Stream Channel	1 Possible Incipient or Remnant Dunes	-	-
CHSA_PL_035	Against the dominant grassland, scattered rises and depression margins support the only woody vegetation. The broader surface is essentially woodless save for occasional trees clinging to depression rims and low rises. with pronounced gilgai microrelief across the Mitchell grass plain. Extensive lateritic surfaces on black soil forms the dominant surface supporting Tussock Grasslands, with the treeless character reflecting the mechanical root shearing that excludes woody vegetation from widely cracking soils. Here, the soil swells and shrinks with wetting and drying cycles.	-	1483, S 791094	DCD2014/003	1 First Order Stream Channel; 5 Mitchell Grass Island	1 Mitchell Grass Island	1 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	2 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Well
CHSA_PL_036	Open black soil country stretches across this section of the corridor. Shallow braided drainage dissects the surface, which is a grassland surface from which seasonal cracking effectively bars all but the hardiest woody plants near depressions. gilgai microrelief is present throughout this Mitchell grass country indicating the Vertosol cracking clay conditions. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands characteristic of these widely cracking soils derived from weathering of calcareous Tertiary sediments or erosion of the adjacent Tertiary lateritic plain.	KP 305,KP 306,KP 307,KP 308,KP 309,KP 310,KP 311,KP 312,KP 313,KP 314,KP 315,KP 316	1483, S 791094	DCD2014/003	1 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 First Order Stream Channel; 3 Mitchell Grass Island; 1 Open Drainage Depression; 1 Rill; 1 Swamp	5 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 2 Swamp	-	1 Well
CHSA_PL_037	Near to a permanent lake or wetland conferring very high archaeological potential, the terrain is an anastomosing plain with shallow drainage depressions largely bare of trees save for scattered individuals around depressions and on surviving rises,with the uneven gilgai surface formed by repeated shrink-swell cycles. The proximity to permanent water creates enhanced resource reliability within the otherwise seasonal plain, with the lake or wetland representing a refugium; aquatic productivity persists through dry periods.	KP 317,KP 318,KP 319,KP 320,KP 321	1483, S 791094	DCD2014/003	1 Broad Stream-adjacent Lateritic Plain; 1 Seasonal First Order Channel	1 Drainage Depression	-	-
CHSA_PL_038	Seasonal cracking and swelling of the clay matrix excludes woody vegetation from this plain. The surface is grassland where trees gain a foothold only at depression edges or on elevated rises, dissected by shallow interlocking drainage. gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country reflecting the cracking clay behaviour of the Vertosol soils. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with the mould-pattern changes indicating variations in gilgai development and moisture distribution that create visual texture across the otherwise uniform terrain.	KP 322,KP 323,KP 324,KP 325,KP 326,KP 327,KP 328,KP 329,KP 330,KP 331	1483, S 791094, 1, CP 004314	DCD2014/003	1 Drainage Depression; 1 Second Order Confluence Channel	1 Closed Depression; 2 Extensive Stream-adjacent Lateritic Plain	1 Closed Depression	1 Extensive Stream-adjacent Lateritic Plain
CHSA_PL_039	Adjacent to a substantial swamp described as big and beautiful conferring very high archaeological potential, the terrain is an anastomosing plain with shallow drainage depressions dominated by grass with only sporadic trees surviving where depressions or rises interrupt the clay. With gilgai hummock-and-hollow patterning across the Mitchell grass surface. The substantial swamp represents a significant water feature. aquatic productivity concentrates and persists longer than ephemeral features, creating a refugium within the seasonally dry plain that would have drawn sustained human attention.	KP 332,KP 333,KP 334,KP 335,KP 336,KP 337,KP 338,KP 339,KP 340	1, CP 004314	-	1 Drainage Depression; 7 Extensive Depression-rich Lateritic Plain; 1 Open Woodland Plain	-	-	1 Well

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_040	From ground level, grass stretches to the horizon broken only by scattered trees at depression edges. The plain is devoid of woodland apart from sparse trees anchored around depressions or on residual rises. gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country derived from Vertosol cracking clay soils. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with the gilgai depressions functioning as local moisture stores. In this setting, rainfall penetrates deep cracks that close on swelling to shield moisture from evaporation.	KP 341,KP 342	1, CP 004314	-	-	-	1 Broad Stream-adjacent Lateritic Plain	-
CHSA_PL_041	Braided drainage channels with multiple meandering streams, and here most would flow when sufficient water is present or the whole area may flood, with channel pools present and trees along the watercourses representing very high archaeological potential for permanent and semi-permanent water access. The braided channel system concentrates flow from the surrounding catchment into multiple parallel and interconnecting streams, creating a zone of enhanced moisture availability and aquatic habitat within the otherwise seasonally dry plain.	KP 343,KP 344,KP 345,KP 346	1, CP 004314	-	2 Channel Pool; 1 Seasonal Fifth Order Channel	-	-	-
CHSA_PL_042	Satellite imagery shows this as a pale grassland surface dissected by faint braided drainage. On the ground, the plain is devoid of woodland apart from sparse trees anchored around depressions or on residual rises. gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country formed on Vertosol cracking clay soils. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with the gilgai creating surface microtopography, producing a landscape, such that slight depressions accumulate moisture.	KP 347,KP 348,KP 349,KP 350,KP 351,KP 352,KP 353,KP 354,KP 355,KP 356,KP 357	1, CP 004314	-	1 Seasonal First Order Channel	5 Closed Depression; 1 Drainage Basin; 9 Drainage Depression; 11 Shallow Residual Rise	1 Closed Depression; 3 Drainage Depression; 7 Extensive Stream-adjacent Lateritic Plain; 15 Shallow Closed Depression; 23 Shallow Drainage Depression; 1 Shallow Residual Rise	-
CHSA_PL_043	Plains and stream channel terrain with extremely high archaeological potential. In this setting, large permanent watercourses are present with few trees except along the watercourses, with the valley floor presumably shallow and meandering rivers likely to have channel pools to the west. The permanent watercourse represents a persistent linear feature of concentrated aquatic resources within the surrounding seasonal plain, with the trees along watercourses indicating elevated terrain margins that escape cracking clay conditions.	KP 358,KP 359,KP 360,KP 361,KP 362,KP 363,KP 364,KP 365	1, CP 004314	-	1 Drainage Depression; 1 Extensive Stream-adjacent Lateritic Plain; 1 Permanent Third Order Channel; 2 Seasonal First Order Channel; 2 Transition Zone Between Seasonal Stream Channel and Terrace Plain	3 Extensive Stream-adjacent Lateritic Plain	-	1 Extensive Stream-adjacent Lateritic Plain
CHSA_PL_044	Shallow interlocking drainage depressions cross this grassland, grassland where trees gain a foothold only at depression edges or on elevated rises, producing a landscape where gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country derived from Vertosol cracking clay soils. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with the gilgai depressions functioning as local moisture stores,and rainfall penetrates deep cracks that subsequently close on swelling.	KP 366,KP 367,KP 368,KP 369,KP 370,KP 371,KP 372,KP 373,KP 374,KP 375,KP 376,KP 377,KP 378,KP 379	1, CP 004314	-	1 First Order Stream; 2 First Order Stream Channel; 1 First Order Stream Corridor; 1 Seasonal First Order Channel	12 Drainage Depression; 1 Extensive Stream-adjacent Lateritic Plain; 1 Transition Zone Between Seasonal Stream Channel and Terrace Plain	1 Drainage Depression; 1 Extensive Stream-adjacent Lateritic Plain	2 Extensive Stream-adjacent Lateritic Plain; 1 Small Lateritic Plain; 1 Well
CHSA_PL_045	Bordering a large lake or permanent wetland conferring very high archaeological potential, the terrain is an anastomosing plain with shallow drainage depressions treeless black soil country punctuated only by the odd eucalypt at depression margins. Throughout, with the hallmark gilgai texture of Vertosol country. The permanent wetland represents a significant refugium,aquatic productivity persists through dry periods and diverse resources concentrate, creating a natural focus for sustained human activity.	KP 380,KP 381,KP 382,KP 383,KP 384,KP 385,KP 386	601, CP 5550, 1, CP 004314	-	1 Channel Pool; 1 DUNE SWAMP; 2 Drainage Channel; 3 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Seasonal Stream Channel; 1 Swamp Dune	1 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	-	1 Modern Construction
CHSA_PL_046	Seasonal stream channels on black soil form the dominant drainage features concentrating flow across the flat terrain, while the broad lateritic plain supports Tussock Grasslands with the characteristic gilgai microrelief creating local moisture storage. The surrounding plain is essentially woodless save for occasional trees clinging to depression rims and low rises, with shallow braided drainage throughout. with the hallmark gilgai texture of Vertosol country.	KP 387,KP 388,KP 389,KP 390,KP 391	1, CP 004314	-	1 Seasonal Stream Channel	1 Broad Stream-adjacent Lateritic Plain	-	-
CHSA_PL_047	A floodplain or backplain extending southeast from a river situated between two second order streams and terminating at a fourth or fifth order stream draining wetlands to the northwest, with very featureless terrain showing scattered small drainage depressions indicating the low relief character of this Mitchell grass country. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands on Vertosol cracking clay conditions, with the position between multiple stream orders indicating enhanced drainage connectivity.	KP 392,KP 393,KP 394,KP 395,KP 396,KP 397	5160, S 951037, 1, CP 004314	-	-	1 Claypan; 3 Drainage Depression; 1 Swamp Dune	4 Broad Stream-adjacent Swamp-adjacent Lateritic Plain	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_048	A floodplain or backplain extending northwest from a river with very featureless terrain showing no Mitchell grass islands except a few present but not within this area, and only very tiny drainage depressions indicating the extremely low relief of this cracking clay landscape. A permanent third order channel on black soil forms a significant drainage feature with associated channel pools, while the broad lateritic plain supports Tussock Grasslands on Vertosol conditions.	KP 398,KP 399,KP 400,KP 401,KP 402,KP 403,KP 404,KP 405,KP 406,KP 407	5160, S 951037, 1, CP 004314, 3, CP 004314	-	5 Drainage Depression; 1 FIrst Order Stream Channel; 1 Mitchell Grass Island	1 Drainage Depression; 1 Drainage Depressions; 1 Seasonal First Order Channel	1 Drainage Depressions; 2 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	3 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Well
CHSA_PL_049	An area including a large permanent river in the west with numerous trees along the river within a 50-metre band of the water itself, and here the river is quite wide and substantial with multiple channel pools and a large Mitchell grass island to the east preserving remnant Tertiary lateritic terrain. The permanent river represents the most reliable water feature in this landscape, with channel pools providing refugia. aquatic productivity persists through dry periods and resources concentrate along the tree-lined corridor. The large Mitchell grass island represents a pisolithic ironstone rubble remnant of the eroded Tertiary land surface.	KP 408,KP 409,KP 410,KP 411,KP 412	3826, S 89/068A, 3, CP 004314	-	4 Mitchell Grass Island; 1 Permanent Third Order Channel; 1 Stream Channel	-	3 Broad Stream-adjacent Mitchell Grass Lateritic Plain	-
CHSA_PL_050	A river gently incised into the surrounding landscape with substantially more trees around the river. Notably, valley flats and terraces occur around the river with terrace plains and rises around them creating complex landforms and high archaeological potential from the multiple terrain positions at varying elevations. The incision creates elevated terraces above the active floodplain, with alluvial deposits on the valley floor and colluvial mantling on terrace surfaces supporting varied vegetation communities.	KP 413,KP 414,KP 415,KP 416,KP 417,KP 418,KP 419,KP 420,KP 421,KP 422,KP 423,KP 424,KP 425,KP 426,KP 427,KP 428,KP 429,KP 430,KP 431,KP 432,KP 433,KP 434,KP 435,KP 436,KP 437,KP 438,KP 439,KP 440,KP 441,KP 442,KP 443,KP 444	5159, CP 5551, 3826, S 89/068A, , 3, CP 004314	-	1 Drainage Depression; 1 Drainage Depression and Seasonal Stream Channels; 1 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 65 Mitchell Grass Island; 1 Seasonal Stream Channel; 1 Stream Channel Confluence; 5 Swamp; 1 Valley Flat Slope	6 Drainage Depression; 11 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 3 Small Mitchell Grass Lateritic Plain	4 Drainage Depression; 6 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Modern Well; 1 Valley Flat; 1 Well	8 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Well

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_051	A large residual lateritic rise with reddish soils not grassed like the surrounding landscape, with lots of microrelief present but not gilgai microrelief rather small scale undulations and depressions creating a textured surface with little sandy rises and small closed depressions. The rise represents a pisolithic ironstone rubble remnant of the eroded Tertiary lateritic plain, standing above the surrounding cracking clay as preserved older terrain with fundamentally different soil character supporting woodland rather than grassland vegetation.	KP 445,KP 446,KP 447,KP 448,KP 449,KP 450,KP 451,KP 452,KP 453,KP 454,KP 455,KP 456,KP 457,KP 458,KP 459,KP 460,KP 461,KP 462,KP 463	, 3, CP 004314, 4, CP 004314	-	4 Drainage Depression; 2 Extensive Depression-rich Rise-margin Lateritic Plain; 1 Open Woodland Within Closed Depression; 1 Rise Slope; 1 Seasonal First Order Channel	4 Drainage Depression; 3 Extensive Depression-rich Rise-margin Lateritic Plain	1 Extensive Depression-rich Rise-margin Lateritic Plain	2 Extensive Depression-rich Rise-margin Lateritic Plain
CHSA_PL_052	An open woodland drainage depression representing an unusual configuration of elements in the broader landscape. Throughout, drainage depressions on silcrete support Eucalypt Open Woodlands in linear collecting features creating wooded terrain contrasting with surrounding grassland. The silcrete substrate indicates an alternative duricrust mineralogy to the more common ferruginous variety, both representing resistant weathering products that preserve elevated terrain though here occurring in a drainage position suggesting complex geological history.	KP 464,KP 465	4, CP 004314	-	5 Drainage Depression; 3 Flat with Gilgai; 1 Seasonal Wetland; 1 Terrace Flat	-	-	-
CHSA_PL_053	Interlocking drainage depressions cross this grassland, dominated by grass with only sporadic trees surviving where depressions or rises interrupt the clay,and gilgai microrelief is present throughout indicating the Mitchell grass Vertosol conditions. Flats with gilgai on silcrete support Tussock Grasslands on surfaces. The result is the silcrete substrate indicates alternative duricrust mineralogy occurring within the broader cracking clay landscape, while the gilgai development reflects the shrink-swell behaviour characteristic of these heavy clay soils.	KP 466,KP 467,KP 468,KP 469	4, CP 004314	-	1 Closed Depression; 1 Flat with Gilgai; 2 Terrace Flat with Gilgai; 1 Wooded Drainage Depression	1 Closed Depression; 2 Open Drainage Depression; 1 Swamp-adjacent Gilgai Lateritic Plain	-	5 Broad Mitchell Grass Gilgai Lateritic Plain
CHSA_PL_054	The convergent drainage geometry concentrates flow from multiple source areas into a single collecting feature, creating enhanced moisture availability and nutrient concentration. The result is multiple streams join. A broad drainage depression feeding a nearby large stream forming the southeastern border,and the depression is fed by multiple streams and depressions becoming a significant reticulating feature before reaching the stream, with trees present around the edges of the depression.	KP 470,KP 471,KP 472	4, CP 004314	-	2 Mitchell Grass Island; 1 Open Drainage Depression; 2 Seasonal Third Order Channel; 2 Stream-adjacent Mitchell Grass Lateritic Plain	-	1 Stream-adjacent Mitchell Grass Lateritic Plain	-
CHSA_PL_055	A very high potential area consisting of a series of large channel pools in the course of a seasonal river. In this setting, although seasonal water likely moves continuously beneath the surface and in this area the water is likely to surface and form pools for much of the year representing semi-permanent refugia. The channel pools concentrate aquatic resources within the otherwise dry riverbed, with subsurface flow maintaining moisture availability and supporting the persistence of pools between surface flow events.	KP 473	4, CP 004314	-	1 Stream-adjacent Lateritic Plain	-	-	-
CHSA_PL_056	Braided drainage depressions thread across this grassland, bare of trees across the clay flats, with woody growth limited to depression edges and rise crests, and here gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country derived from Vertosol cracking clay soils. Mitchell grass islands on black soil represent pisolithic ironstone rubble remnants of the eroded Tertiary lateritic plain, standing above the surrounding cracking clay as elevated features supporting woodland vegetation on shallow gravelly soils.	KP 474,KP 475,KP 476,KP 477,KP 478,KP 479,KP 480	4468, CP 5553, 4, CP 004314	-	2 Closed Depression; 3 Closed Woodland on Residual Rise; 2 Drainage Depression; 3 Extensive Stream-adjacent Mitchell Grass Lateritic Plain; 1 Mitchell Grass Island; 1 Reticulating Stream; First Order Stream Channel	-	-	-
CHSA_PL_057	A stream channel in an anastomosing plain with shallow drainage depressions bare of trees across the clay flats, with woody growth limited to depression edges and rise crests. Notably, gilgai microrelief is present throughout indicating the Mitchell grass Vertosol conditions. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, while the stream channel concentrates seasonal flow across the flat terrain creating a linear feature of enhanced moisture availability.	KP 481	4, CP 004314	-	1 Broad Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Wooded Stream Channel from Large Lake or Swamp 6 sensitivity	-	-	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_058	Stream channel cutting through an anastomosing plain with shallow drainage depressions almost entirely treeless, with woody vegetation confined to depression margins and isolated rises; with the mounded gilgai surface distinctive of cracking clay grassland. Terrace flats on black soil form elevated surfaces adjacent to the channel, supporting vegetation communities responding to the enhanced drainage position, while the broader plain supports Tussock Grasslands with characteristic gilgai microrelief.	KP 482,KP 483,KP 484,KP 485	4, CP 004314	-	1 Broad Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Second Order Reticulated Stream; 1 Terrace Flat; 1 Wooded Drainage Depression; 1 Wooded Stream Channel from Large Lake or Swamp 6 sensitivity	2 Broad Stream-adjacent Swamp-adjacent Lateritic Plain	-	-
CHSA_PL_059	An area with several small watercourses throughout terminating at a meandering and somewhat incised stream on the eastern border. What stands out is that everything has very high potential including the rises and drainage depressions due to the concentration of water features and terrain diversity. The multiple watercourses create a network of seasonal drainage features crossing the terrain, with the incised stream at the border indicating active erosion into the surrounding plain and the potential for exposed substrate and archaeological deposits.	KP 486,KP 487,KP 488,KP 489,KP 490,KP 491,KP 492	, 4, CP 004314, 298, CP 004303	-	1 Drainage Depression; 1 Seasonal Fifth Order Channel; 1 Seasonal First Order Channel	1 Drainage Depression; 2 Extensive Stream-adjacent Lateritic Plain	1 Extensive Stream-adjacent Lateritic Plain	3 Extensive Stream-adjacent Lateritic Plain
CHSA_PL_060	This stretch of the corridor crosses wide-open grassland, characteristically treeless apart from isolated woody individuals rooted at depression margins with shallow interlocking drainage throughout. gilgai microrelief and subtle mould-pattern changes in the grass characterise this Mitchell grass country reflecting the cracking clay behaviour of the underlying Vertosol soils. The broad lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with residual rises representing pisolithic ironstone rubble remnants of the Tertiary lateritic surface.	KP 493,KP 494,KP 495,KP 496,KP 497,KP 498,KP 499,KP 500	298, CP 004303	-	2 Channel Pool; 3 Drainage Depression; 2 First Order Stream Channel; 34 Mitchell Grass Island; 1 Seasonal First and First Order Channel; 1 Second Order Stream Channel; 1 Terrace Flat; 1 Wide Valley Flat with Seasonal Second Order Channel	1 First Order Steam; 8 Mitchell Grass Island	10 Broad Stream-adjacent Mitchell Grass Lateritic Plain	8 Broad Stream-adjacent Mitchell Grass Lateritic Plain
CHSA_PL_061	A network of shallow drainage depressions dissects this grassland, devoid of woodland apart from sparse trees anchored around depressions or on residual rises; with pronounced gilgai microrelief across the Mitchell grass plain. Channel pools on black soil form significant water features within the drainage network, representing refugia. Here, water persists through dry periods and aquatic resources concentrate.	KP 501	298, CP 004303	-	1 Channel Pool; 1 First Order Stream Channel; 1 Possible Channel Pool Possible Modern Construction; 1 Third Order Stream Channel with Rills; 1 Wide Valley Flat with Seasonal Second Order Channel	-	-	-
CHSA_PL_062	Water moves diffusely across this surface through a network of shallow interlocking channels. The surrounding grassland is almost entirely given over to grass,trees restricted to depression fringes and remnant rises. with gilgai hummock-and-hollow patterning across the Mitchell grass surface. The broad Mitchell grass lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands, with the treeless character reflecting mechanical root shearing that excludes woody vegetation from widely cracking soils.	-	298, CP 004303	-	1 Backplain with Gilgai around Seasonal Third Order Channel; 1 Channel Pool; 1 First Order Stream Channel with all the usuals; 1 First Order Stream Intersection; 1 First Order Stream and Levees; 7 Mitchell Grass Island; 1 Seasonal First Order Anastomosing Channel; 1 Seasonal First Order Channel; 1 Seasonal First to Third Order Channel	4 Backplain Between Two Streams; 1 Drainage Basin	1 Drainage Depression	15 Broad Stream-adjacent Mitchell Grass Lateritic Plain; 1 Well
CHSA_PL_063	Seasonal wetting and drying drives this landscape, with cracking clays alternately swelling shut and splitting open. The plain is open grassland from which trees are largely excluded, persisting only around depressions and on rises. gilgai microrelief is present throughout indicating the Mitchell grass Vertosol conditions. The broad Mitchell grass lateritic plain on black soil forms the dominant surface supporting Tussock Grasslands characteristic of these cracking clay conditions, with gilgai depressions functioning as local moisture stores.	KP 502,KP 503,KP 504,KP 505,KP 506,KP 507	298, CP 004303	-	7 Mitchell Grass Island; 1 Seasonal First Order Channels and Backplain; 1 Seasonal First to Second Order Channel	1 Drainage Depression	1 Lateral Drainage Channels and Levees	5 Broad Stream-adjacent Mitchell Grass Lateritic Plain
CHSA_PL_064	Braided drainage lines collect and redistribute seasonal rainfall across the plain. The surrounding grassland is almost entirely treeless, with woody vegetation confined to depression margins and isolated rises. gilgai microrelief is present throughout indicating the Mitchell grass Vertosol conditions. Buffers around Mitchell grass islands mark the transitional zones between pisolithic ironstone rubble remnants of the Tertiary lateritic surface and the surrounding cracking clay plain, representing interfaces between fundamentally different substrate types.	KP 508,KP 509,KP 510,KP 511,KP 512,KP 513,KP 514,KP 515,KP 516	298, CP 004303	-	1 Backplain with Gilgai around Seasonal Third Order Channel; 2 First Order Stream Channel; 29 Mitchell Grass Island; 1 Seasonal Fourth Order Channel	1 Backplain; 1 Mitchell Grass Island	-	6 Broad Stream-adjacent Mitchell Grass Lateritic Plain

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_065	An area occupying land between two substantial streams with part edging onto a remnant lateritic rise. What stands out is that there is some variation in vegetation with trees around drainage depressions and sparser vegetation on the open plain reflecting the substrate differences between remnant laterite and cracking clay. The position between two streams creates a landscape context of enhanced drainage connectivity, with the lateritic rise representing preserved Tertiary terrain standing above the surrounding plain.	KP 517,KP 518,KP 519,KP 520,KP 521,KP 522	298, CP 004303, 1605, CP5053	-	1 Broad Stream-adjacent Mitchell Grass Lateritic Plain; 1 Closed Depression; 1 First Order Stream; 3 Fourth Order Confluence with Smaller Streams; 4 Mitchell Grass Island; 1 Rise Crest with Gilgai; 1 Rise Slope; 2 Second Order Stream Channel; 1 Shallow Rise Above Stream Channel	4 Broad Stream-adjacent Mitchell Grass Lateritic Plain	1 Strongly Gilgai Backplain	-
CHSA_PL_066	Mitchell grass dominates a plain that is grassland where trees gain a foothold only at depression edges or on elevated rises. Shallow braided drainage dissects the plain. gilgai microrelief is present throughout indicating the Mitchell grass Vertosol conditions. Buffers around fourth order stream channels mark the transitional zones between the drainage corridor and surrounding plain, representing interfaces of enhanced moisture availability and potential archaeological interest.	KP 523,KP 524,KP 525,KP 526,KP 527,KP 528,KP 529,KP 530,KP 531,KP 532,KP 533,KP 534,KP 535,KP 536,KP 537,KP 538,KP 539,KP 540,KP 541,KP 542,KP 543,KP 544,KP 545,KP 546,KP 547,KP 548,KP 549	298, CP 004303, 1605, CP5053	-	1 Backplain and Stream Margin; 1 First Order Stream; 33 Mitchell Grass Island; 1 Open Drainage Depression; 6 Seasonal First Order Channel; 1 Seasonal First Order Confluence; 1 Seasonal First and First Order Drainage System; 1 Seasonal Second Order Channel; 1 Seasonal Second and Third Order Confluence; 1 Valley Flat and Seasonal Stream Network	1 Mitchell Grass Island; 2 Open Drainage Depression	1 Backplain; 4 Drainage Depression; 10 Extensive Stream-adjacent Mitchell Grass Lateritic Plain	4 Extensive Stream-adjacent Mitchell Grass Lateritic Plain
CHSA_PL_067	A significant area encompassing the fall onto the lowest part of land within the project area and possibly the regional low point. What stands out is that very high archaeological potential characterises this terrain with its water-concentrating geometry that would have drawn sustained human attention. The convergent drainage and low-point position creates a natural water-collecting feature. What stands out is that flow from surrounding catchment accumulates, with the terminal position representing the most reliable moisture zone within the broader landscape.	KP 550,KP 551,KP 552,KP 553,KP 554,KP 555,KP 556,KP 557,KP 558,KP 559,KP 560,KP 561,KP 562,KP 563,KP 564,KP 565,KP 566,KP 567,KP 568	1605, CP5053	-	1 Drainage Depression; 3 Drainage Depression and Margins; 2 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Fifth Order Stream Channel; 1 Fifth Order Stream Channel with Permanent Channel Pools; 5 Seasonal Fifth Order Anastomotic Channel; 1 Second Order Stream Channel and Margins; 1 Stream Valley; 20 Swamp; 1 Valley Slope with Rills	2 Closed Depression; 2 Drainage Channel; 2 Drainage Depression; 4 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	1 Closed Depression; 1 Drainage Depression; 3 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_PL_068	Cracking clay soils derived from the underlying black soil formation dominate. The surface is devoid of woodland apart from sparse trees anchored around depressions or on residual rises, dissected by shallow interlocking drainage. with rhythmic hummock-and-depression topography characteristic of these black soil plains. Buffers around fifth order stream channels mark the transitional zones between major drainage corridors and surrounding plain, representing interfaces of sustained moisture availability and significant archaeological potential.	KP 569,KP 570,KP 571,KP 572,KP 573,KP 574,KP 575,KP 576,KP 577,KP 578,KP 579,KP 580,KP 581,KP 582,KP 582.17	1605, CP5053	QCD2012/015	1 Closed Depression; 4 Drainage Depression; 1 First Order Stream Channel; 1 Fourth Order Stream; 2 Meander Channel; 3 Permanent Fifth Order Channel; 1 Reticulating Stream; 1 Reticulating Stream Channel; 1 Rise Slope and Risecrest; 2 Seasonal First Order Channel; 7 Swamp	1 Closed Depression; 1 Drainage Basin; 1 Drainage Depression; 14 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Mitchell Grass Island; 1 Reticulating Stream Channel	5 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain	1 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 5 Modern Well
CHSA_PL_069	Large area of broken ground above a closed seasonal wetland or lake draining directly into it,the southernmost margin connecting to another area holds extremely high archaeological potential due to the convergence of drainage and proximity to persistent water that would have concentrated resources and human activity. Sparsely wooded drainage basins and channels are interspersed with closed woodland or open forest on shallow rises, with the reddish soils and green drainage areas reflecting the contrast between remnant laterite and moisture-receiving drainage positions.	KP 103,KP 104,KP 105,KP 106,KP 107,KP 108,KP 109	3861, S 79/1068, 3936, S 90/281	DCD2014/006	1 Sandy Rise; 3 Sinkhole; 1 Transition Zone Around Drainage Depression and Vegetated Rises; 1 Transition Zone Between Lateritic Rise and Swamp	20 Closed Depression; 1 Drainage Basin; 1 Drainage Depression Margin; 3 Drainage Depression Margin and Rise Slope; 1 Meandering Drainage Channel; 1 Reticulated Drainage Channel; 1 Risecrest and Rise Slope; 1 Transition between large valley flat and lateritic rise	18 Closed Depression; 3 Drainage Depression; 1 Drainage Depression Margin; 17 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Transition Zone Between Upper and Lower Rise Slope; 1 Transition between large valley flat and lateritic rise	12 Extensive Stream-adjacent Swamp-adjacent Lateritic Plain
CHSA_RD_001	A complex area of closed forest or thick scrub on rises interspersed with open woodland within drainage depressions, reflecting the substrate contrast between remnant laterite supporting dense vegetation on better-drained rocky skeletal soils and drainage positions. Throughout, seasonal moisture concentration supports more open communities. Closed depressions on ferruginous duricrust support Acacia Forests and Woodlands in basins with dense vegetation.	-	7026, S2009/182A-C,	DCD2012/007, DCD2012/011	1 Closed Forest; 2 Transition Zone between Sparse Riselope Vegetation and Thicker Risecrest Vegetation; 1 Transition Zone between Sparse and Thick Vegetation around Vegetated Drainage Depression; 1 Transition between Valley Flat and Sandy Rise; 4 Vegetated Area above Drainage Depression; 2 Vegetated Sandy Rise	6 Closed Depression; 2 Drainage Depression Margin; 1 Lateritic Rise; 1 Rise Slope Adjacent to a Drainage Basin; 1 Seasonal Wetland; 1 Transition Zone between Sparse and Thick Vegetation around Vegetated Drainage Depression; 3 Vegetated Rise	1 Drainage Basin; 1 Plain with Drainage Depressions; 3 Woodland within Drainage Depression	1 Modern Construction; 2 Road; 2 Valley Flat
CHSA_RD_002	A very broad drainage depression draining a large drainage basin to the south and then to the southeast, with overall sparse vegetation and sandy rises scattered throughout preserved islands of the Tertiary lateritic platform within the broader collecting feature. Drainage depressions on ferruginous duricrust support woodland communities. The result is moisture accumulates, with the sparse vegetation across the broad depression reflecting the seasonal moisture regime.	-	7026, S2009/182A-C,	DCD2012/007, DCD2012/011	-	2 Drainage Depression; 3 Sandy Rise; 1 Transition Zone at Large Drainage Depression Edge; 1 Transition Zone between Lateritic Rise and Drainage Depression	1 Woodland within Drainage Depression	4 Depression-Rich Rise-Margin Lateritic Plain
CHSA_RD_003	A series of drainage depressions of varying depth with woodland varying in density according to topographic position, producing a landscape where the terrain connects multiple depression systems. Drainage depressions on ferruginous duricrust support woodland communities. In this setting, moisture accumulates, with the variation in woodland density reflecting differences in depression depth and moisture availability across this interconnected drainage network.	-	7026, S2009/182A-C,	DCD2012/007, DCD2012/011	1 Transition Zone	-	3 Drainage Depression	-
CHSA_RD_004	An extensive area comprising a drainage basin or floodplain with a few first order streams, tree clumps and woodland within closed depressions. Here, the soil appears reddish with drainage depressions and channels scattered throughout reflecting the lateritic parent material. The tree clumps and woodland within closed depressions indicate positions, producing a landscape where moisture accumulates in enclosed basins probably produced by dissolution within the laterite or by argilliturbation. Reddish soils indicating colluvial redistribution of weathered laterite across the basin floor.	-	7027, S2009/182A-C, 702, CP5055, 7026, S2009/182A-C,	DCD2012/007, DCD2012/011, DCD2012/012	1 Drainage Depression with Tree Clump; 1 First Order Stream Channel; 1 Swamp	2 Closed Depression; 4 Drainage Depression; 1 Extensive Stream-Adjacent Swamp-Adjacent Lateritic Plain; 25 Tree Clump; 3 Woodland within Closed Depression	2 Closed Depression; 6 Drainage Depression; 4 Extensive Stream-Adjacent Swamp-Adjacent Lateritic Plain; 1 Woodland within Closed Depression	9 Extensive Stream-Adjacent Swamp-Adjacent Lateritic Plain; 1 Modern Construction

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_RD_005	A very shallow rise probably no more than a few metres at the top as the land rises away from the nearby drainage channel, producing a landscape where the rise carries consistent acacia woodland vegetation. Woodland within closed depressions on ferruginous duricrust supports Acacia communities,moisture accumulates, with the shallow rise representing a preserved fragment of Tertiary lateritic terrain standing above the adjacent drainage corridor.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	1 Major Transition Zone; 2 Woodland within Closed Depression	1 Drainage Basin	-	1 Depression-Rich Rise-Margin Lateritic Plain
CHSA_RD_006	A complex area of closed forest or thick scrub on rises interspersed with open woodland within drainage depressions, producing a landscape where substantial variation exists in vegetation density with dense acacia characterising the elevated terrain. The vegetation pattern reflects the substrate contrast between remnant laterite on rises supporting dense Acacia on rocky skeletal soils and drainage positions. Notably, open woodland responds to seasonal moisture concentration.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	1 Major Transition Zone; 1 Rise; 1 Sandy Rise; 1 Transition Zone between Drainage Basin and Closed Forest; 1 Vegetated Rise; 2 Woodland on Rise; 1 Woodland within Closed Depression	3 Closed Depression; 1 Drainage Basin; 2 Transition Zone at Large Drainage Depression Edge	3 Depression-Rich Rise-Margin Lateritic Plain; 3 Drainage Depression	1 Modern Construction
CHSA_RD_007	Broken terrain comprising a complex area of closed forest or thick scrub on small rises oriented north-south interspersed with open woodland within drainage depressions, producing a landscape where reddish lateritic soils are visible. Buffers around closed depressions on ferruginous duricrust mark transitional zones, such that moisture concentrates in features potentially reflecting localised karst dissolution or argilliturbation, with the north-south oriented rises suggesting structural control on landform development.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	1 Rise Adjacent to Large Seasonal Wetland; 1 Rise Slope; 1 Swamp	1 Closed Depression; 1 Residual Rise	-	3 Rise-Margin Lateritic Plain
CHSA_RD_008	Part of a large drainage basin feeding a drainage channel draining north at some distance, with multiple closed woodland patches on rises and small closed depressions present. Buffers around woodland within drainage depressions on ferruginous duricrust mark transitional zones, such that moisture concentrates, with the closed woodland patches on rises indicating preserved Tertiary lateritic terrain supporting different vegetation than surrounding basin floors.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	2 Drainage Depression with Tree Clump; 1 Residual Rise Adjacent to Large Drainage Basin; 1 Reticulated Stream Channel; 2 Rise Adjacent to Large Swamp; 3 Transition Zone on Rise Slope near Swamp; 1 Woodland within Closed Depression; 1 Woodland within Drainage Depression	4 Tree Clump; 1 Woodland within Drainage Depression	4 Drainage Depression; 1 Valley Flat	1 Swamp-Adjacent Depression-Rich Lateritic Plain
CHSA_RD_009	Likely the lowest part of a very large drainage depression or its mid-section. In this setting, the ground looks sandier with little rises, some visible drainage channels and extensive tree cover giving the appearance of a sea of trees. The sandy substrate with little rises indicates preserved fragments of older terrain within the broader depression, with the extensive tree cover reflecting enhanced moisture availability in this low-relief collecting position.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	1 Depression-Rich Rise-Margin Lateritic Plain; 1 Residual Rise	2 Drainage Depression; 1 Transition Zone between Valley Flat and Rise; 1 Vegetated Lateritic Rise	1 Depression-Rich Rise-Margin Lateritic Plain; 1 Drainage Channel	1 Backplain; 1 Depression-Rich Rise-Margin Lateritic Plain
CHSA_RD_010	A lower rise slope between a broad drainage basin with vague drainage depressions and areas of trees. In this setting, some visible red soils indicate exposed laterite with a gradation from dense vegetation to sparse. Drainage depressions on ferruginous duricrust support woodland communities; moisture accumulates, with the rise slope position creating transitional terrain between elevated laterite remnants and lower basin floors.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	-	1 Depression-Rich Lateritic Plain; 1 Drainage Depression	-	-
CHSA_RD_011	At the extreme edges of two drainage basins with a sandy rise in the centre and clear substrate-vegetation contrasts between elevated and lower terrain reflecting the difference between remnant laterite and cracking clay. Buffers around closed depressions on ferruginous duricrust mark transitional zones. In this setting, moisture accumulates in features potentially reflecting localised karst dissolution or argilliturbation, with the sandy rise preserving Tertiary terrain above surrounding plains.	-	7027, S2009/182A-C, 702, CP5055	DCD2012/007, DCD2012/012	1 Drainage Depression; 2 Swamp	1 Closed Depression; 1 Depression-Rich Rise-Margin Lateritic Plain	-	2 Drainage Depression with Small Rise
CHSA_RD_012	The sandy rises represent preserved fragments of the Tertiary lateritic surface standing above the surrounding drainage floor, with the scrub density on rises indicating better-drained rocky skeletal conditions while the more open woodland in depressions reflects seasonal moisture concentration. A broad drainage channel or floodplain with small sandy rises and depressions spread throughout. The result is a gradient is visible from thick scrub on the rises to more open woodland in the depressions and reddish soils indicate lateritic parent material.	-	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	1 Lateritic Rise; 1 Residual Rise; 1 Swamp	4 Closed Depression	1 Drainage Channel; 1 Drainage Depression; 1 Valley Flat	1 Drainage Depression; 1 Modern Construction; 1 Valley Flat
CHSA_RD_013	A transitional zone consisting of rise slopes with closed forest on the rise crest. Here, the soil looks reddish in the south with slightly varying vegetation across this area compared to nearby zones. Closed depressions on ferruginous duricrust support dense woodland communities. Throughout, moisture concentrates in features potentially reflecting localised karst dissolution or argilliturbation, with the reddish soils indicating the lateritic parent material.	-	1079, S 000000, 702, CP5055	DCD2012/003, DCD2012/012	2 Closed Depression; 1 Transition Zone between Drainage Basin and Thick Scrub; 1 Transition Zone between Drainage Depression and Rise	5 Closed Depression	-	3 Depression-Rich Rise-Margin Lateritic Plain

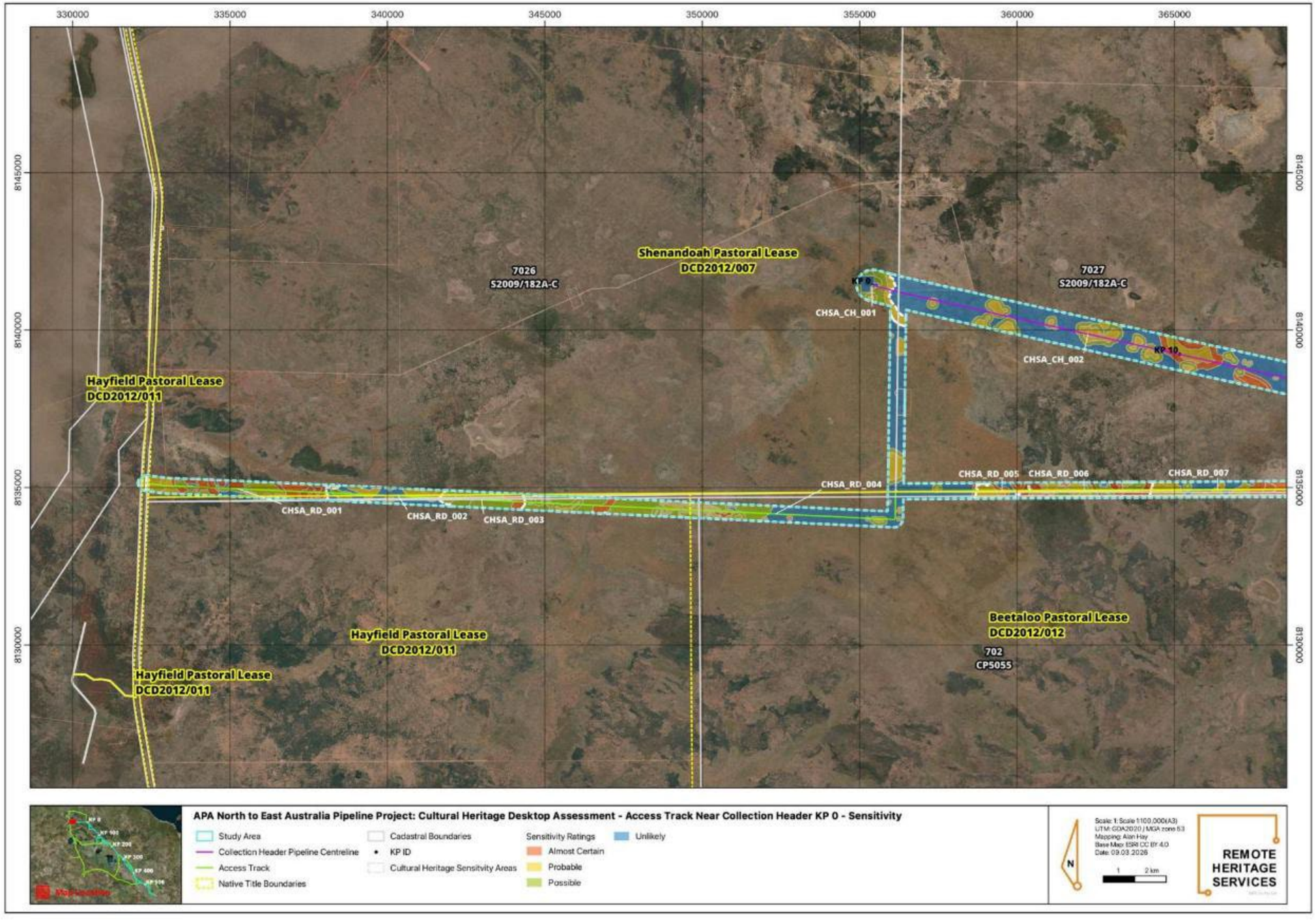
Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_RD_014	A single rise or large area of multiple rises slightly above the surrounding drainage systems, fairly thickly vegetated overall with sandy rises and closed depressions in the thickest areas. The depression-rich rise-margin terrain on ferruginous duricrust supports dense vegetation, and here moisture concentrates in the numerous collecting features, with the sandy rises relict fragments of the original Tertiary surface.	-	702, CP5055	DCD2012/012	1 Transition Zone between Drainage Basin and Rise; 1 Woodland within Drainage Depression	4 Closed Depression; 1 Rise; 1 Rise Slope and Drainage Depression; 3 Tree Clump; 1 Vegetated Flat; 2 Vegetated Rise; 1 Woodland within Closed Depression; 1 Woodland within Drainage Depression	4 Depression-Rich Rise-Margin Lateritic Plain	-
CHSA_RD_015	Broken ground with rises and drainage depressions, stream channels and generally closed woodland or open forest in a scrubby landscape reflecting the complex interplay between remnant laterite surfaces and drainage features. Closed depressions on ferruginous duricrust support Other Forests and Woodlands in basins, and here moisture accumulates, with the scrubby character indicating better-drained rocky skeletal conditions on elevated terrain.	-	702, CP5055	DCD2012/006, DCD2012/012	1 Broad Area Around Tree Clump and Permanent Water; 1 Drainage Depression Transition Zone to Vegetated Rise; 1 Transition Zone Around Swamps, Drainage Depressions and Vegetated Rises; 1 Transition Zone Between Sparse and Thick Vegetation	7 Closed Depression; 2 Drainage Depression; 1 Transition Zone Between Drainage Depression and Rise	2 Broad Swamp-adjacent Depression-rich Lateritic Plain; 7 Closed Depression; 1 Drainage Basin; 3 Drainage Depression; 1 Woodland on Rise	9 Broad Swamp-adjacent Depression-rich Lateritic Plain
CHSA_RD_016	Valley flat slope or drainage depression slope and drainage depression with the entire area thickly wooded showing closed woodland character throughout reflecting enhanced moisture availability in this collecting terrain. Closed depressions on ferruginous duricrust support Acacia Open Woodlands. In this setting, moisture accumulates, with the thick woodland cover indicating sustained moisture concentration in this drainage position.	-	308, S2009/009, 702, CP5055	DCD2012/006, DCD2012/012	2 Closed Depression; 1 Seasonal First Order Channel; 2 Transition Zone Between Drainage Depression and Rise	1 Depression-rich Rise-margin Lateritic Plain	-	-
CHSA_RD_017	A woodland rise slope with closed woodland and open woodland varying across the terrain, reflecting differences in substrate depth and drainage position across the slope. Closed woodland within closed depressions on ferruginous duricrust supports Acacia Forests and Woodlands in basins with dense vegetation. What stands out is that moisture accumulates in features potentially reflecting localised karst dissolution or argilliturbation.	-	308, S2009/009	DCD2012/006	1 Transition Zone Between Drainage Depression and Rise	-	-	1 Depression-rich Rise-margin Lateritic Plain
CHSA_RD_018	A large rise in the centre of a floodplain with extensive drainage channels on either side, carrying woodland on the rises contrasting with sparse woodland in the broad upland drainage depression, producing a landscape where reddish soils extend into the drainage depressions indicating colluvial redistribution of weathered laterite. The rise represents a preserved remnant of the Tertiary lateritic plain, with the woodland on rises reflecting better-drained rocky skeletal conditions.	-	308, S2009/009, 702, CP5055	DCD2012/006, DCD2012/012	8 Broad Area Adjacent to Swamp or Water Body and Well; 4 Closed Depression; 1 Rise Slope Adjacent to Permanent Ponds, Karst or Swamps with Permanent Water; 2 Swamp; 2 Transition Zone Around Swamps, Drainage Depressions and Vegetated Rises	1 Broad Swamp-adjacent Depression-rich Lateritic Plain; 2 Closed Depression; 2 Closed Woodland Closed Depression; 1 Drainage Depression with Small Tree Island; 2 Transition Zone Between Drainage Depression and Rise	1 Broad Swamp-adjacent Depression-rich Lateritic Plain; 1 Closed Depression; 3 Drainage Basin	8 Broad Swamp-adjacent Depression-rich Lateritic Plain
CHSA_RD_019	Elevated lateritic ground forming a substantial rise in the centre of a floodplain with extensive drainage channels on either side, carrying woodland on the rises contrasting with sparse woodland in the broad upland drainage depression. The result is reddish soils extend into the drainage depressions reflecting the lateritic parent material. The rise represents a preserved remnant of the Tertiary lateritic plain standing above surrounding alluvial surfaces, with the reddish soil character indicating colluvial redistribution of weathered laterite.	-	308, S2009/009	DCD2012/006	1 Closed Woodland Within Closed Depression; 1 Rise Slope Above Valley Flat; 2 Transition Zone Around Drainage Depression and Vegetated Rises; 3 Transition Zone Between Drainage Depression and Vegetated Rises	1 Broad Depression-rich Rise-margin Lateritic Plain; 3 Closed Depression; 2 Drainage Depression; 1 Transition Zone Between Drainage Depression and Vegetated Rises; 3 Woodland on Sandy Rise	1 Closed Depression; 3 Drainage Depression; 1 Woodland on Sandy Rise	8 Broad Depression-rich Rise-margin Lateritic Plain
CHSA_RD_020	A drainage channel or valley flat more open in the centre with streams likely at the bottom. Throughout, very thick vegetation around the margins indicates rises with the whole area thickly wooded. Rise slopes above valley flats on ferruginous duricrust support dense Acacia communities on the elevated terrain, with the vegetation contrast between open centre and thickly wooded margins reflecting the difference between seasonally wet valley floor and better-drained rise positions.	-	308, S2009/009	DCD2012/006	-	-	2 Rise-margin Lateritic Plain	-
CHSA_RD_021	Drainage depressions and residual rises with closed depressions scattered throughout. The result is the vegetation pattern reflects the interplay between remnant laterite surfaces and moisture-receiving drainage positions. Drainage depressions on ferruginous duricrust support woodland communities. Notably, seasonal moisture concentrates, with residual rises preserving Tertiary terrain above surrounding drainage floors.	-	308, S2009/009, 702, CP5055	DCD2012/006, DCD2012/012	2 Closed Depression; 1 Rise Footslope Above Floodplain	3 Closed Depression; 1 Transition Zone Between Floodplain and Rises	1 Drainage Depression in Floodplain	2 Extensive Swamp-adjacent Depression-rich Lateritic Plain; 1 Modern Construction

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_RD_022	Closed depressions on ferruginous duricrust concentrate moisture in features potentially reflecting localised karst dissolution or argilliturbation, with rises preserving shallow gravelly soils suited to woodland development. A broad drainage basin with scattered rises and closed depressions. The result is the terrain reflects the typical pattern of elevated laterite remnants interspersed with lower moisture-receiving positions.	-	308, S2009/009	DCD2012/006	-	1 Transition Zone Between Drainage Depression and Rise	1 Depression-rich Rise-margin Lateritic Plain; 1 Drainage Basin	-
CHSA_RD_023	Transition between lateritic rises and drainage depressions, with vegetation varying according to topographic position and substrate depth. Transition zones on ferruginous duricrust mark gradational contacts between elevated terrain and depression floors, with the vegetation gradient reflecting the change from better-drained rocky skeletal soils on rises to seasonally moist conditions in collecting positions.	-	3926, S 90/281, 308, S2009/009	DCD2012/006	-	1 Drainage Depression; 1 Reticulated Drainage Channel; 1 Rise; 1 Transition Zone Between Drainage Depression and Rise; 2 Tree Clump in Drainage Depression	3 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Drainage Depression	5 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_RD_024	Closed depressions on ferruginous duricrust concentrate moisture in depressions that may owe their form to dissolution or shrink-swell dynamics in the parent material, with rises supporting woodland on shallow gravelly soils. A drainage basin with closed depressions and residual rises,vegetation patterns reflect the substrate contrast between preserved laterite surfaces and moisture-receiving positions.	-	3861, S 79/1068	DCD2014/006	1 Rise Slope; 1 Transition Zone Between Drainage Depression and Rise	2 Broad Depression-rich Rise-margin Lateritic Plain; 1 Closed Depression; 2 Drainage Depression	1 Closed Depression; 2 Drainage Depression	2 Modern Well
CHSA_RD_025	Complex topography with rises, drainage depressions and closed depressions creating a mosaic of vegetation types responding to substrate and moisture differences. The pattern reflects the interplay between preserved Tertiary lateritic surfaces on rises and moisture-receiving drainage positions, with closed depressions functioning as local collecting features.	-	3861, S 79/1068	DCD2014/006	-	1 Transition Zone Between Drainage Depression and Rise	-	1 Depression-rich Rise-margin Lateritic Plain
CHSA_RD_026	Rises on ferruginous duricrust preserve shallow gravelly soils supporting woodland, while drainage positions show seasonal moisture concentration. A broad plain with scattered rises and drainage depressions. Throughout, the typical contrast between wooded rises and sparser drainage areas reflects the fundamental substrate difference between remnant laterite and cracking clay.	-	3861, S 79/1068	DCD2014/006	1 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Seasonal First Order Stream; Transition Zone between Floodplain; 1 Transition Zone Between Drainage Depression and Rise	1 Drainage Basin; 1 Lightly Vegetated Rise Surrounded by Drainage Channel; 1 Open Woodland on Sandy Risecrest; 1 Rise Slope; 2 Sandy Rise; 1 Terrace Flat	1 Drainage Depression	8 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_RD_027	Lateritic rises interspersed with drainage depressions and closed depressions. In this setting, the terrain reflects the typical pattern of Tertiary remnants standing above surrounding moisture-receiving positions. The rises preserve shallow red earth soils with lateritic gravels supporting woodland, while depressions concentrate seasonal moisture in collecting features.	-	3861, S 79/1068	DCD2014/006	3 Closed Depression; 1 Reticulated Drainage Channel; 3 Rise Slope	4 Broad Stream-adjacent Rise-margin Lateritic Plain; 9 Closed Depression; 1 Reticulated Drainage Channel; 8 Risecrest and Rise Slope	9 Closed Depression	15 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_RD_028	Drainage depressions and valley flats with rises at the margins. Notably, the terrain configuration creates transitions between elevated laterite remnants and lower collecting positions. Valley flats on alluvium support communities responding to seasonal moisture availability, while rises preserve Tertiary terrain above surrounding drainage floors.	-	3861, S 79/1068	DCD2014/006	1 Second Order Stream Channel; 2 Swamp	2 Closed Depression with Gilgai Microrelief; 1 Transition Zone Between Sandy Rise and Floodplain	2 Closed Depression with Gilgai Microrelief	1 Broad Stream-adjacent Swamp-adjacent Lateritic Plain
CHSA_RD_029	On ferruginous duricrust support dense woodland. Here, moisture accumulates in features potentially reflecting localised karst dissolution or argilliturbation processes in the lateritic substrate. A drainage depression system with multiple closed depressions and connecting channels,woodland varies in density according to moisture availability across this collecting terrain.	-	3861, S 79/1068	DCD2014/006	1 Risecrest and Rise Slope	1 Closed Depression; 1 Sandy Rise Slope	1 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Closed Depression	2 Broad Stream-adjacent Rise-margin Lateritic Plain
CHSA_RD_030	Drainage depressions on ferruginous duricrust support woodland communities. seasonal moisture concentrates, with the depression geometry creating linear features of enhanced moisture availability. A drainage depression system connecting multiple collecting features,woodland varies according to substrate and moisture availability across the terrain.	-	3861, S 79/1068,	DCD2014/001, DCD2014/006	2 Closed Depression with Gilgai Microrelief; 10 Large Seasonal Wetland, Swamp, Seasonal Streams and Sandy Rises; 2 Sand Islands Bordering Swamp and Waterbody; 1 Sandy Rises and Floodplain Margin; 1 Second Order Stream Channel; 44 Swamp	1 Backplain and Sand Islands	2 Closed Depression with Gilgai Microrelief	1 Modern Well; 9 Stream-adjacent Swamp-adjacent Lateritic Plain

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_RD_031	Transition between elevated lateritic terrain and lower drainage positions, with vegetation gradients reflecting substrate changes across this contact zone. Transition zones on ferruginous duricrust mark the gradational contacts between rises preserving Tertiary terrain and depression floors receiving seasonal run-on from surrounding elevated surfaces.	-	-	DCD2014/001	1 Anamolous Feature; 3 Channel Pools; 2 Drainage Depression; 2 Drainage Depression, Risecrest and Rise Slope; 2 Drainage Depressions and Margins; 1 First Order Stream Channel; 1 Lateritic Rise; 2 Permanent Third Stream Order Channel; 3 Remnant Oxbow Lake; 1 Sandy Rise; 1 Seasonal First Order Stream; 1 Seasonal Second Order Stream Channel; 17 Swamp; 2 Swamps and Pools	2 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Closed Depression; 1 Drainage Depression; 1 Drainage Depression, Risecrest and Rise Slope; 4 Drainage Depression, Seasonal Stream Channel, Risecrest and Rise Slope; 3 Drainage Depressions and Margins	1 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Closed Depression; 1 Shallow Drainage Depression; 1 Transition Zone Between Backplain and Sandy Rise	6 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Modern Well
CHSA_RD_032	Closed depressions concentrate moisture in features potentially reflecting localised karst dissolution or argilliturbation processes. A broad drainage basin with scattered closed depressions and rises, such that the terrain pattern reflects differential erosion of the original Tertiary lateritic surface creating elevated remnants above moisture-receiving basin floors.	-	1483, S 791094	DCD2014/003	1 Mitchell Grass Lateritic Plain	-	-	-
CHSA_RD_033	A rise complex with multiple elevated areas separated by drainage depressions and closed depressions, producing a landscape where the terrain reflects preserved fragments of Tertiary lateritic surface standing above surrounding moisture-receiving positions. Rises preserve shallow gravelly soils supporting woodland distinct from the vegetation on lower terrain.	-	1, CP 004314	-	1 Remnant Swamp; 1 Second Order Stream Channel	31 Drainage Depression	1 Broad Stream-adjacent Swamp-adjacent Lateritic Plain; 4 Drainage Depression	5 Broad Stream-adjacent Swamp-adjacent Lateritic Plain; 1 Well
CHSA_RD_034	Multiple drainage depressions converging toward a central collecting feature. What stands out is that the convergent geometry concentrates flow from surrounding terrain creating enhanced moisture availability. Drainage depressions on ferruginous duricrust support woodland communities responding to seasonal moisture concentration.	-	3825, S 89/069A, 1, CP 004314	-	1 Seasonal First Order Channel; 1 Seasonal First Order Channel and Terrace Flat; 2 Stream-adjacent Lateritic Plain	-	-	-
CHSA_RD_035	Drainage channels wind between adjacent rises here. Notably, the terrain creates transitions between elevated laterite remnants and lower moisture-receiving positions. Drainage channels on ferruginous duricrust concentrate seasonal flow, while rises preserve Tertiary terrain above surrounding drainage floors.	-	1, CP 004314	-	-	1 Stream-adjacent Lateritic Plain	-	1 Stream-adjacent Lateritic Plain
CHSA_RD_036	Rises preserve shallow red earth soils supporting woodland vegetation. A broad plain with scattered lateritic rises and intervening drainage depressions; the typical contrast between wooded rises and sparser lower areas reflects the substrate difference between remnant Tertiary terrain and cracking clay surfaces.	-	1, CP 004314	-	1 Seasonal First Order Channel	1 Stream-adjacent Lateritic Plain	-	-
CHSA_RD_037	A drainage depression and valley flat system with rises at the margins. The result is the terrain configuration creates interfaces between elevated laterite remnants and lower collecting positions. Valley flats receive seasonal run-on from surrounding elevated terrain, supporting communities responding to enhanced moisture availability.	-	1, CP 004314	-	1 First Order Stream Channel; 1 Seasonal Second Order Channel; 1 Transition Zone Between Broad Drainage Depression and Residual Rise	2 Broad Stream-adjacent Lateritic Plain; 4 Closed Depression; 3 Drainage Depression; 1 Shallow Closed Depression	1 Shallow Residual Rise	3 Broad Stream-adjacent Lateritic Plain
CHSA_RD_038	Complex topography with rises, slopes and drainage depressions creating terrain diversity, and here vegetation varies according to substrate and position reflecting the interplay between preserved Tertiary surfaces and moisture-receiving drainage features. Closed depressions function as local moisture stores.	-	5160, S 951037, 1, CP 004314	-	3 Channel Pool; 1 Extensive Stream-adjacent Lateritic Plain; 1 Seasonal First and First Order Confluence; 1 Seasonal Second Order Channel; 1 Seasonal Second Order Stream Corridor; 1 Transition Zone	1 Closed Depression; 2 Extensive Stream-adjacent Lateritic Plain	1 Closed Depression; 1 Residual Rise	5 Extensive Stream-adjacent Lateritic Plain; 2 Modern Construction
CHSA_RD_039	Moisture concentrates in closed depressions moisture in hollows attributable to subsurface dissolution or argilliturbation in the duricrust. A drainage basin with closed depressions scattered throughout and residual rises at the margins. What stands out is that the terrain reflects the typical pattern of Tertiary remnants standing above moisture-receiving basin floors.	-	1, CP 004314	-	1 Broad Stream-adjacent Lateritic Plain	-	-	1 Extensive Stream-adjacent Lateritic Plain; 1 Modern Dam

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_RD_040	Lateritic rises and drainage depressions with closed depressions scattered throughout. The result is vegetation patterns reflect the substrate contrast between preserved Tertiary surfaces and moisture-receiving positions. Rises preserve shallow gravelly soils supporting woodland distinct from vegetation on lower terrain.	-	1, CP 004314	-	1 Permanent Third Order Channel	-	-	-
CHSA_RD_041	Rises and intervening drainage depressions,and the terrain reflects differential erosion of the original Tertiary lateritic surface creating elevated remnants above surrounding moisture-receiving positions. The rises preserve shallow red earth soils with lateritic gravels.	-	1, CP 004314	-	2 Drainage Depression; 2 Mitchell Grass Island; 1 Swamp	7 Drainage Depression; 1 Mitchell Grass Island	4 Broad Swamp-adjacent Mitchell Grass Lateritic Plain	-
CHSA_RD_042	Woodland communities occupy drainage depressions developed on ironstone capping. seasonal moisture concentrates in linear and basin-shaped features. A drainage depression system with multiple collecting features connected by channels, and here woodland varies according to moisture availability across this terrain.	-	5160, S 951037, 1, CP 004314	-	9 Mitchell Grass Island; 1 Seasonal First Order Channel	-	2 Broad Stream-adjacent Mitchell Grass Lateritic Plain	4 Broad Stream-adjacent Mitchell Grass Lateritic Plain; 1 Well
CHSA_RD_043	Closed depressions function as local moisture-collecting features. A broad drainage basin with scattered rises and closed depressions, such that the typical contrast between wooded rises and sparser drainage areas reflects the fundamental difference between remnant laterite and cracking clay substrates.	-	3, CP 004314, 4, CP 004314	-	1 Broad Stream-adjacent Rise-margin Lateritic Plain; 2 First Order Stream; First Order Stream Channel; 1 Seasonal Second Order Channel; 1 Transition Zone Between Backplain And Rise	2 Broad Stream-adjacent Rise-margin Lateritic Plain; 1 Drainage Depression	-	-
CHSA_RD_044	Transition between elevated lateritic terrain and lower drainage positions, with vegetation gradients reflecting substrate changes across the contact zone. Transition zones mark gradational contacts between rises preserving Tertiary terrain and depression floors receiving seasonal run-on.	-	4, CP 004314	-	1 Broad Stream-adjacent Lateritic Plain; 6 Closed Depression	-	-	1 Modern Well
CHSA_RD_045	Drainage depressions on ferruginous duricrust support woodland communities, producing a landscape where seasonal moisture concentrates. A drainage depression system connecting multiple collecting features; woodland varies according to substrate and moisture across terrain.	-	, 4, CP 004314	-	1 Fifth Order Stream Channel; 1 First Order Stream; 1 First Order Stream Channel; 2 Seasonal First Order Channel	5 Broad Stream-adjacent Lateritic Plain	1 Broad Stream-adjacent Lateritic Plain	-
CHSA_RD_046	Lateritic rises interspersed with drainage depressions; terrain reflects typical pattern of Tertiary remnants standing above moisture-receiving positions. Rises preserve shallow red earth soils with lateritic gravels supporting woodland vegetation.	-	4, CP 004314	-	1 Open Drainage Depression	1 Broad Swamp-adjacent Depression-rich Lateritic Plain	-	1 Broad Swamp-adjacent Depression-rich Lateritic Plain; 2 Modern Construction
CHSA_RD_047	Drainage channels and adjacent rises creating transitions between elevated laterite remnants and moisture-receiving positions. drainage channels concentrate seasonal flow while rises preserve Tertiary terrain above surrounding floors.	-	4, CP 004314	-	2 Swamp	1 Drainage Depression Margin; 1 Small Swamp-adjacent Lateritic Plain	1 Drainage Depression Margin	-
CHSA_RD_048	Rises preserve shallow gravelly soils suited to woodland development. A broad plain with lateritic rises and intervening drainage depressions,vegetation contrast between wooded rises and sparser areas reflects substrate difference between remnant Tertiary terrain and cracking clay.	-	4, CP 004314	-	-	1 Swamp-adjacent Lateritic Plain	1 Drainage Depression Margin	-
CHSA_RD_049	Valley flats receive seasonal run-on supporting communities responding to enhanced moisture availability. A drainage depression and valley flat complex with rises at margins, and here terrain configuration creates interfaces between elevated laterite remnants and lower collecting positions.	-	4, CP 004314	-	-	-	1 Stream-adjacent Lateritic Plain	-
CHSA_RD_050	Varied terrain featuring rises, drainage depressions and closed depressions. Notably, the pattern reflects interplay between preserved Tertiary surfaces and moisture-receiving positions. Closed depressions concentrate moisture in enclosed basins probably produced by dissolution within the laterite or by argilliturbation.	-	4, CP 004314	-	-	2 Small Stream-adjacent Lateritic Plain	-	-
CHSA_RD_051	Seasonal moisture collects within closed depressions moisture in features indicative of subsurface karst processes or argilliturbation. A drainage basin with closed depressions and residual rises, and here terrain reflects the pattern of Tertiary remnants standing above moisture-receiving basin floors.	-	4, CP 004314	-	1 Closed Depression; 2 Drainage Depression; 1 Drainage Depression and Seasonal Stream Channel; 1 Drainage Depression with Tree Islands; 1 First Order Reticulating Stream	1 Closed Depression; 1 Drainage Depression; 1 Drainage Depression with Tree Islands; 1 Lightly Wooded Rise Slope; 3 Stream-adjacent Rise-margin Lateritic Plain	-	-

Cultural Heritage Sensitivity Areas	Description	Kilometre Points	Lot and Parcel	Tribunal ID	Almost Certain	Probable	Possible	Unlikely
CHSA_RD_052	Rises and drainage depressions with closed depressions throughout. Here, vegetation reflects substrate contrast between preserved Tertiary surfaces and moisture-receiving positions. The terrain shows typical laterite-drainage relationships.	-	4, CP 004314	-	1 First Order Stream	2 Stream-adjacent Lateritic Plain	-	-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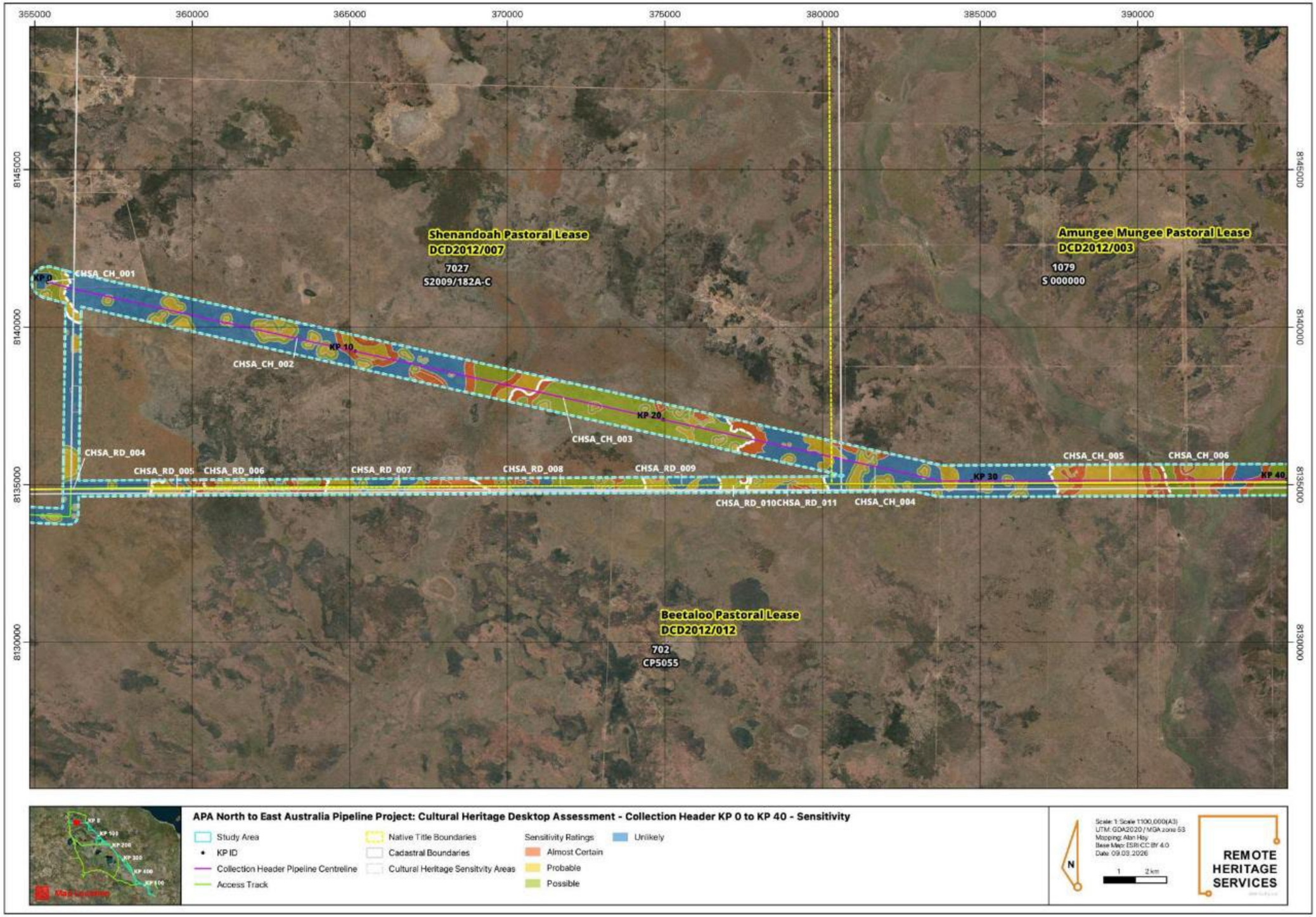
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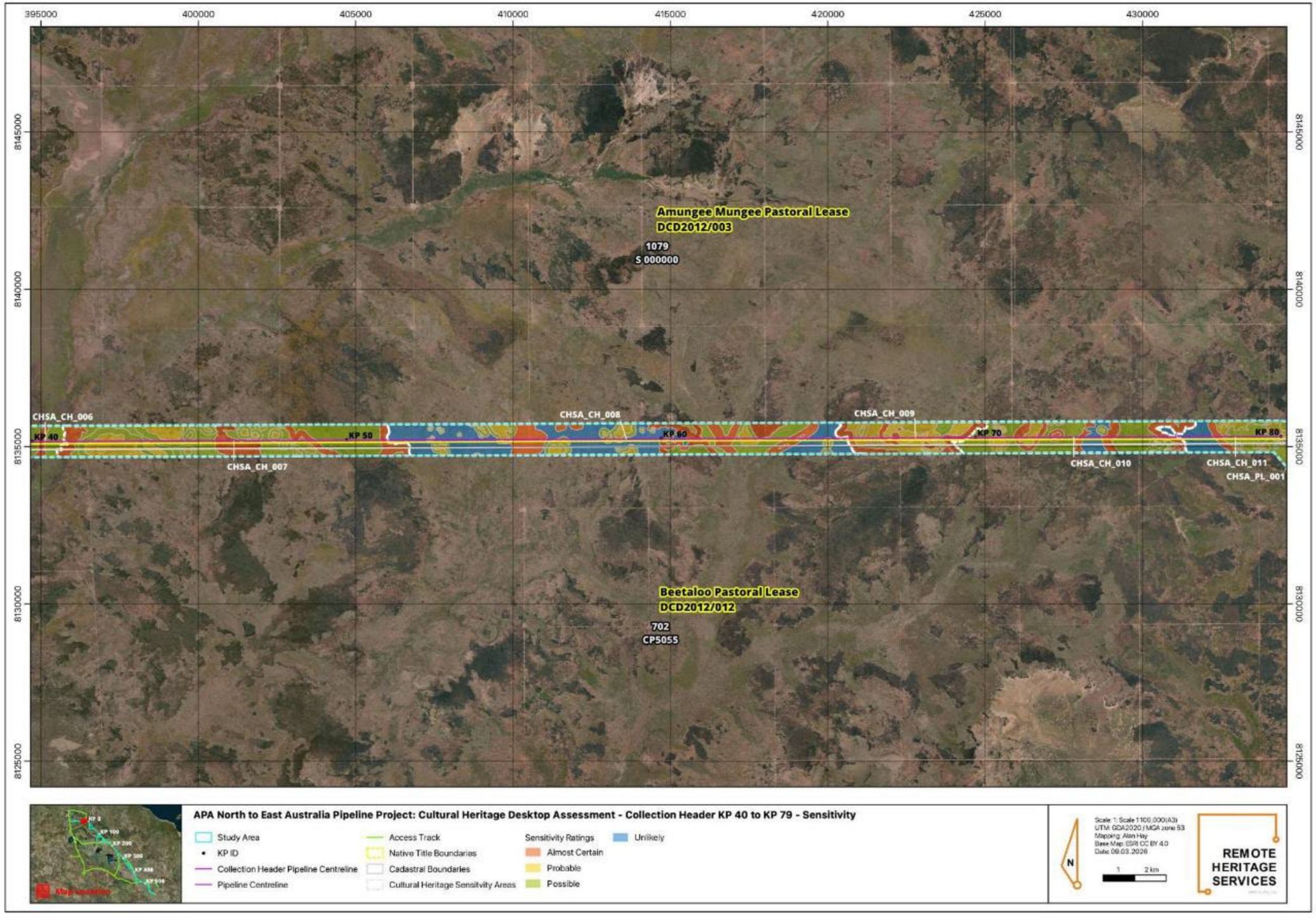
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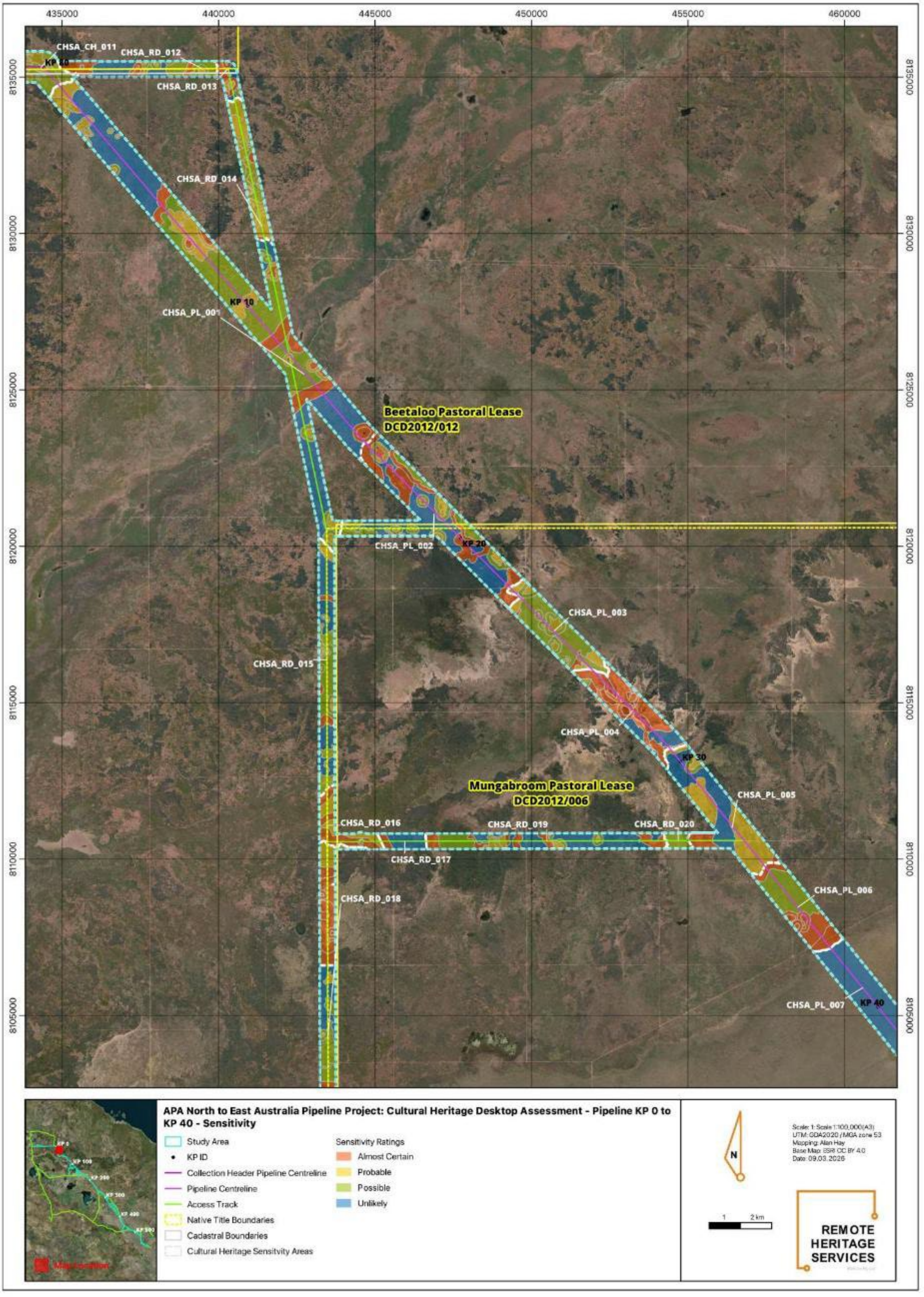
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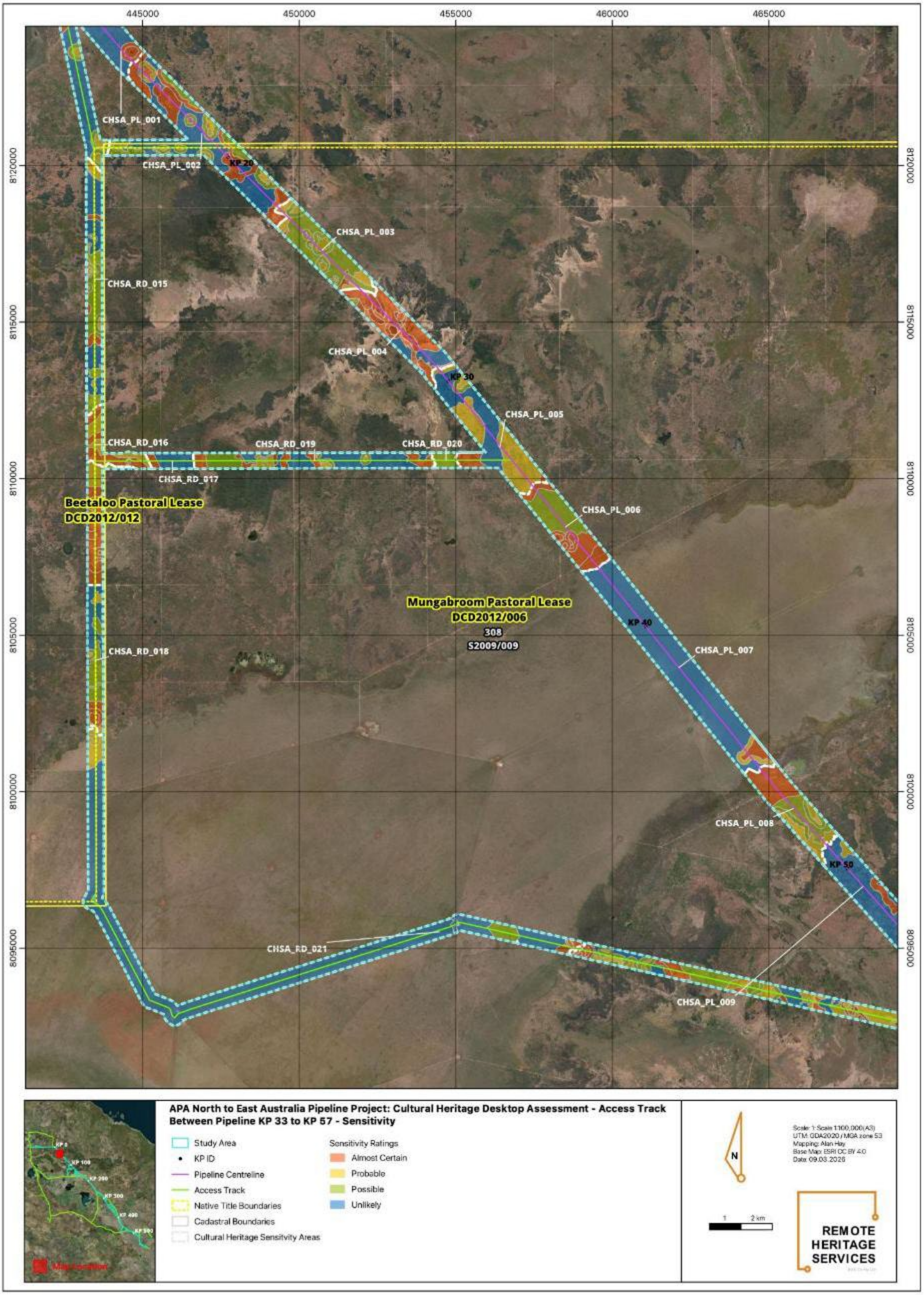
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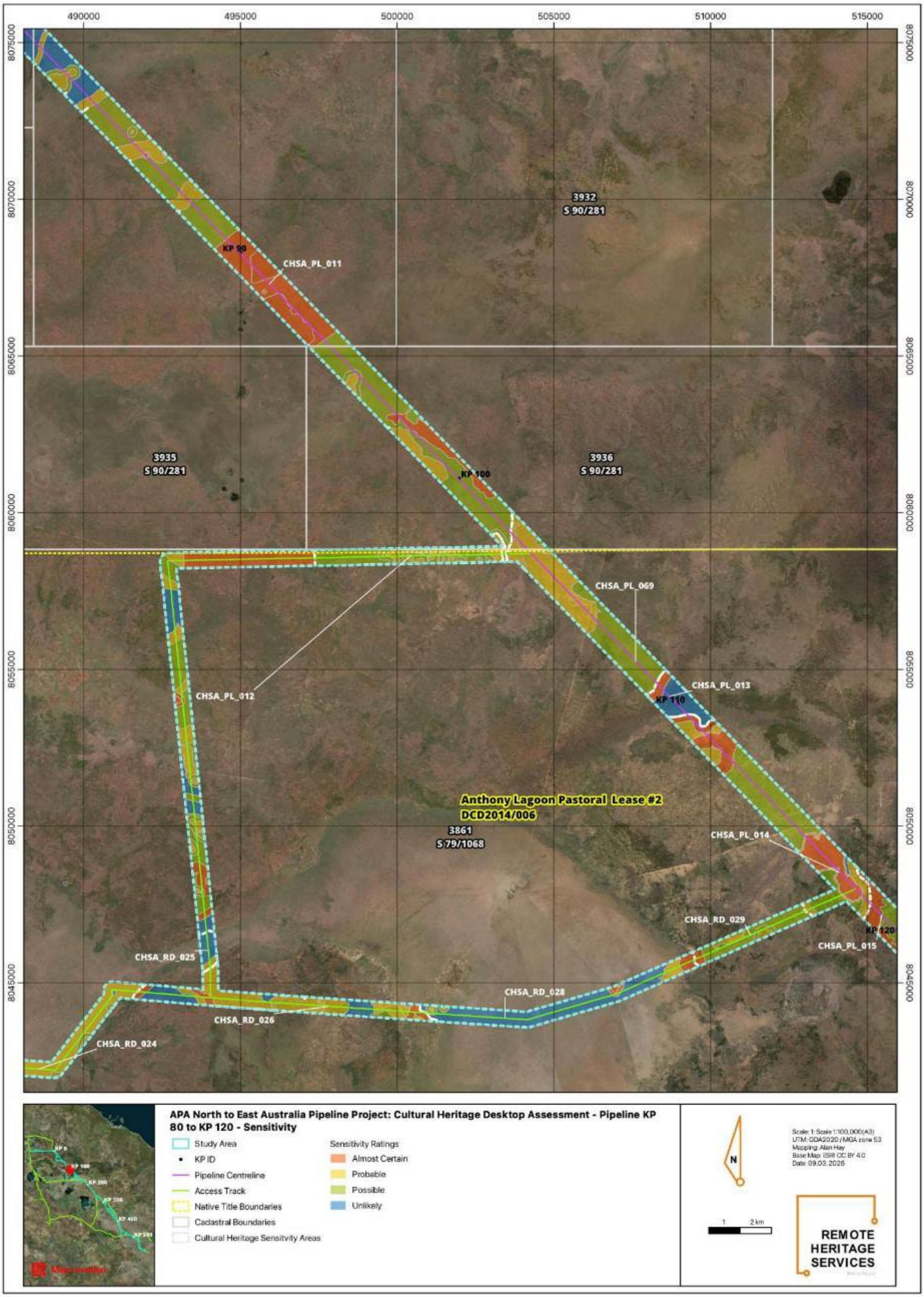
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Access Track
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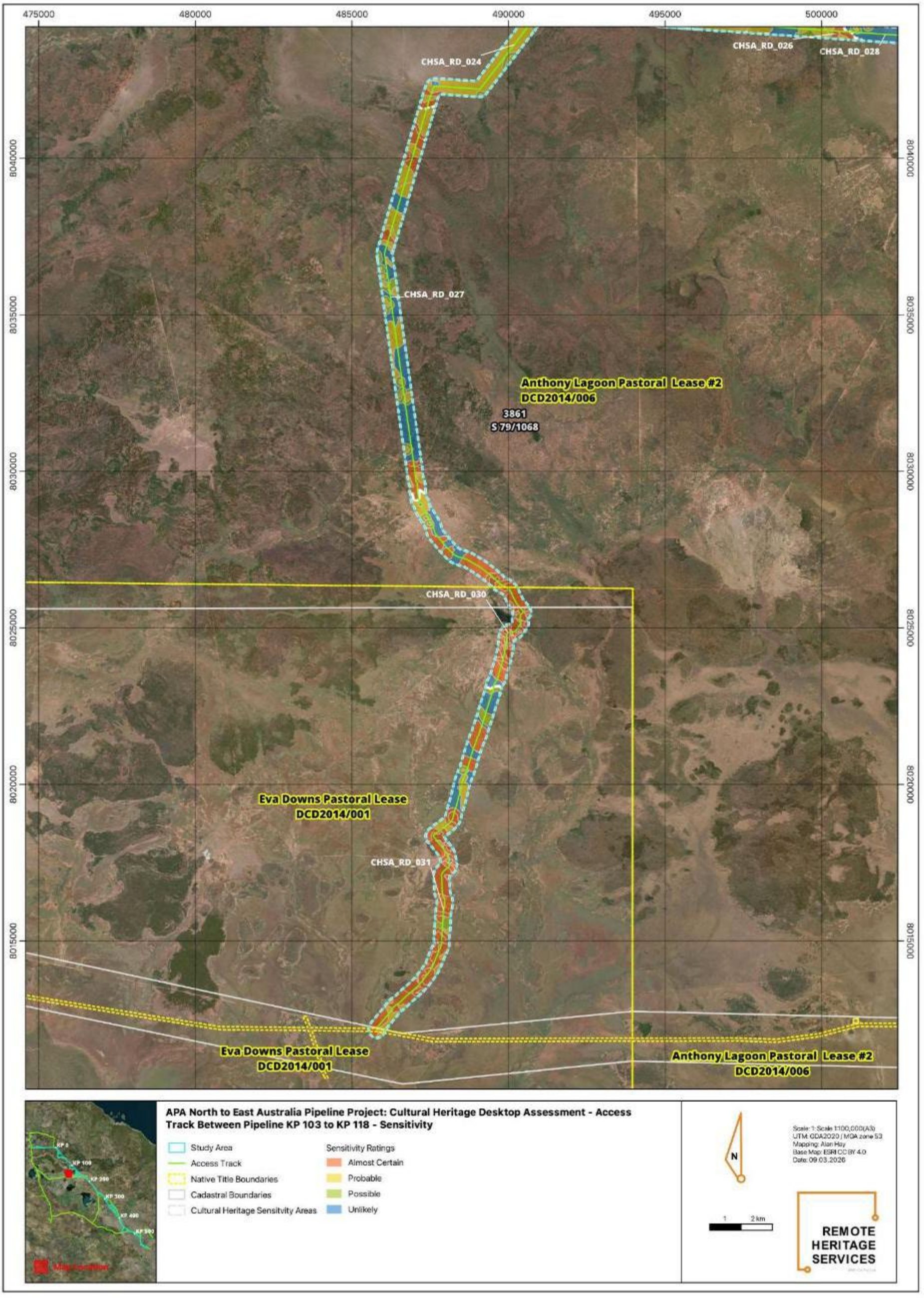
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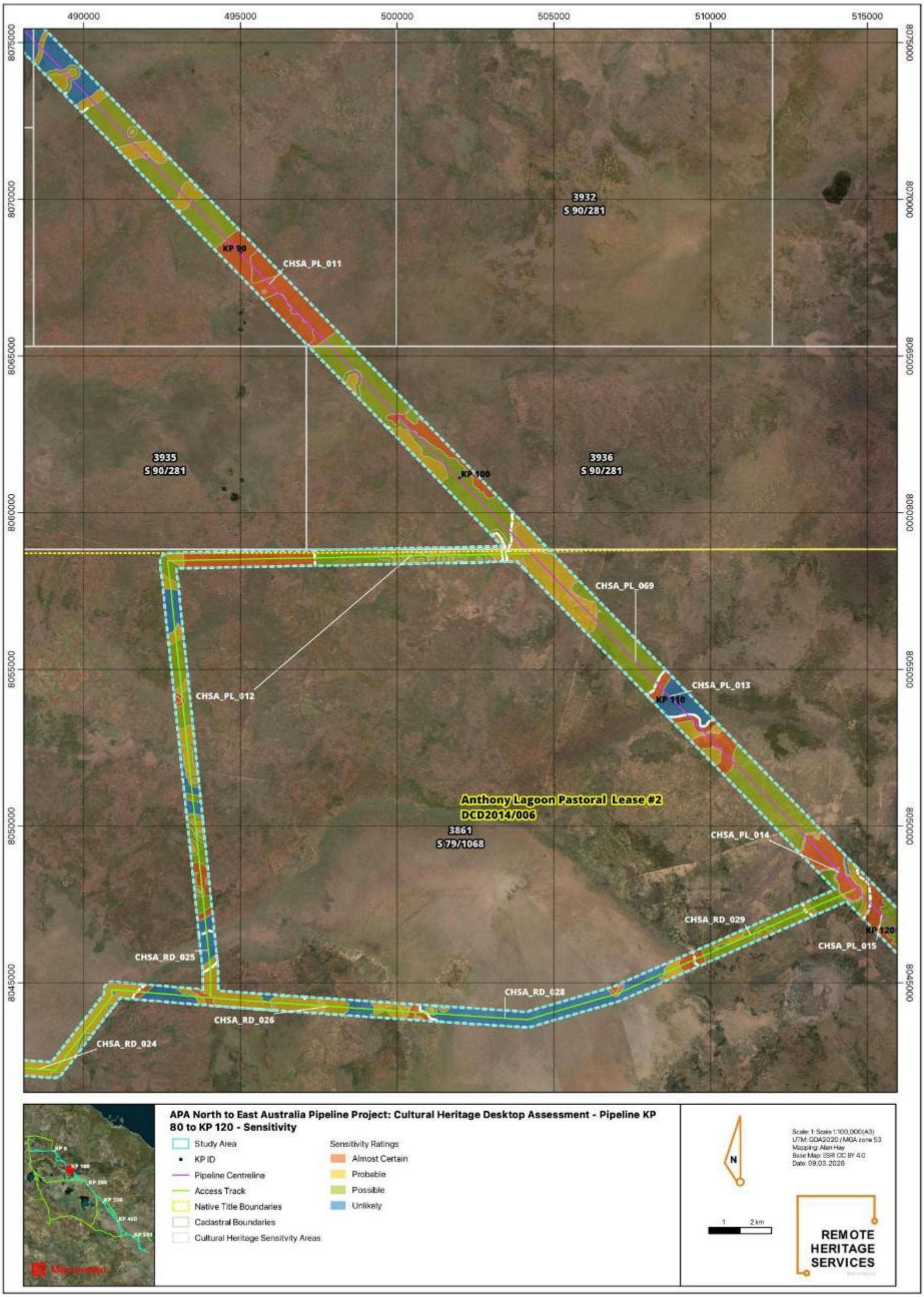
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S 79/1068
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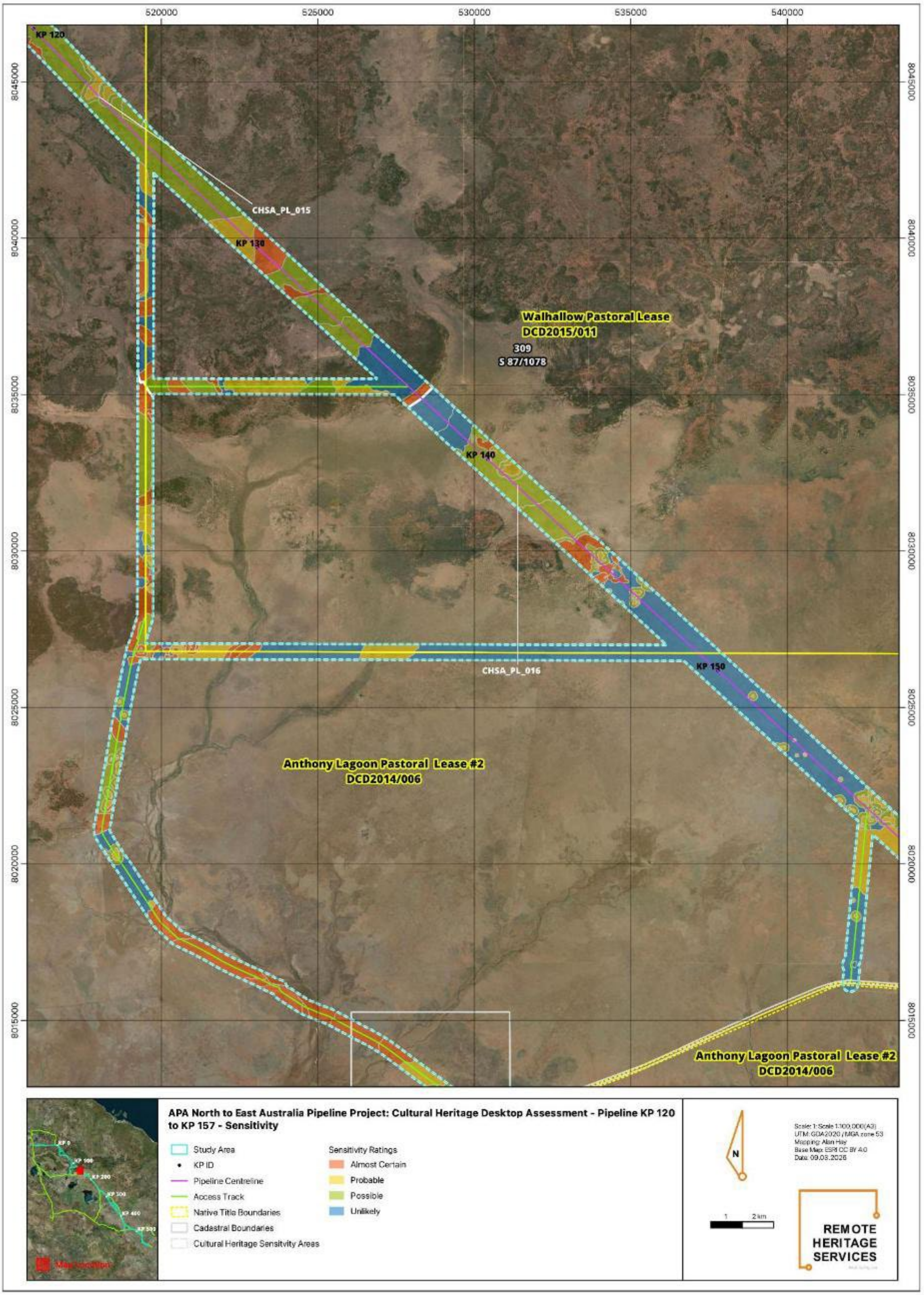
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S 87/1078
KP 140
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Access Track
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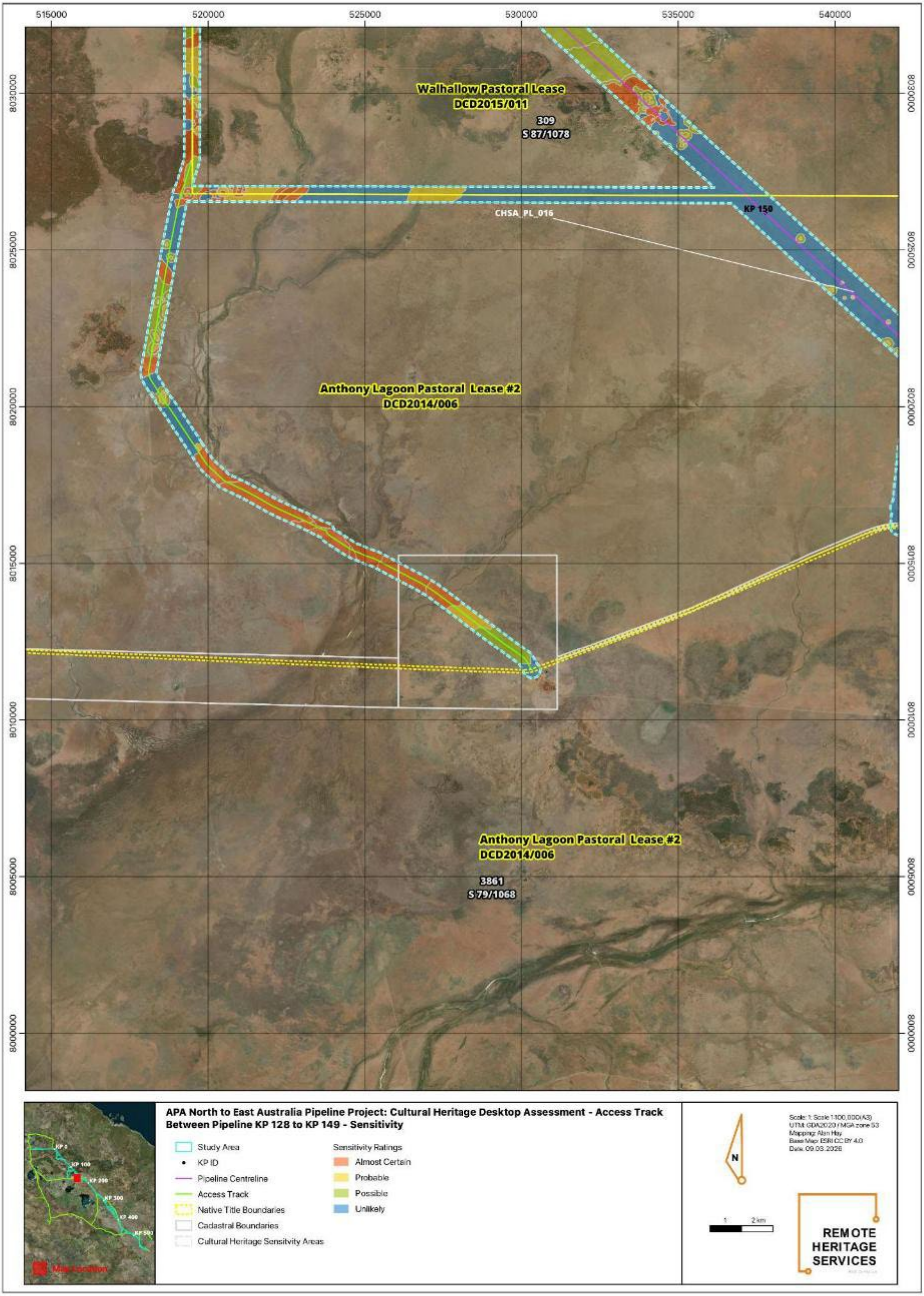
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S 87/1078
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KP 150
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S 79/1068
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Study Area
KP ID
Pipeline Centreline
Access Track
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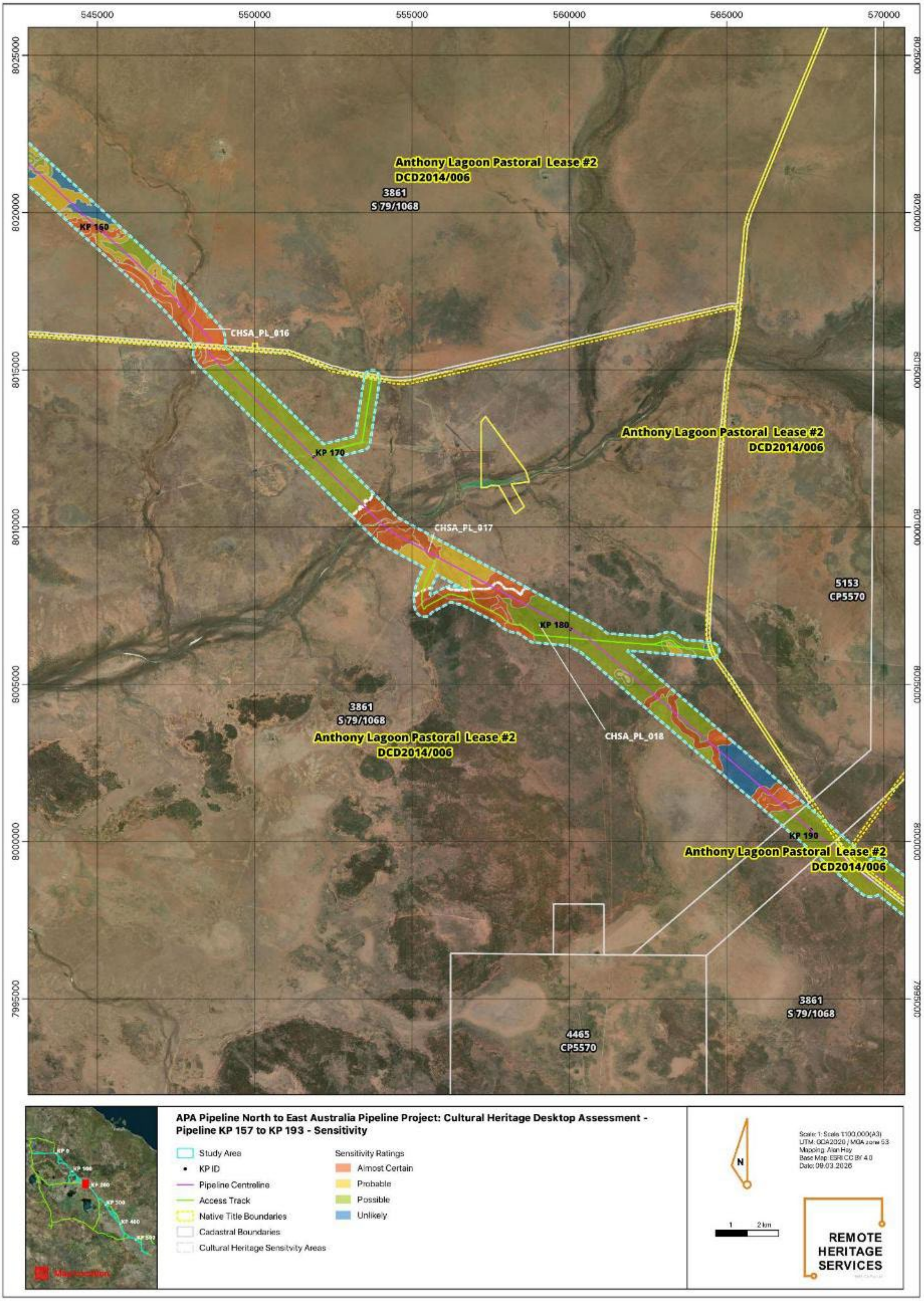
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KP 190
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Study Area
KP ID
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Access Track
Native Title Boundaries
Cadastral Boundaries
Cultural Heritage Sensitivity Areas
Sensitivity Ratings
Almost Certain
Probable
Possible
Unlikely
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REMOTE HERITAGE SERVICES


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S 791094
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CHSA_PL_020
KP 220
CHSA_PL_021
CHSA_PL_022
CHSA_PL_023
KP 230
CHSA_PL_024
4472
S 93/051
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KP ID
Pipeline Centreline
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Cadastral Boundaries
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Possible
Unlikely
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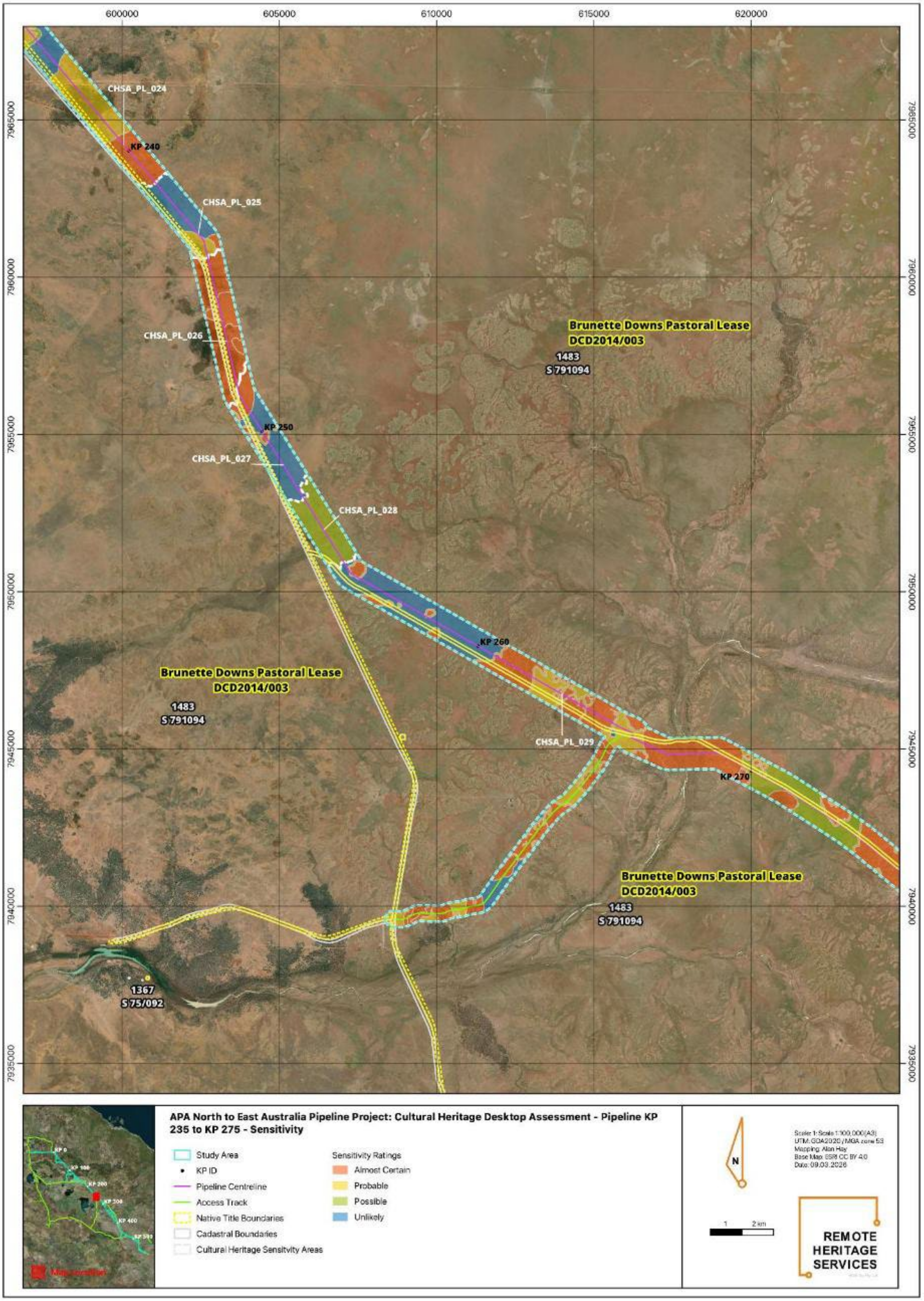
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KP 270
Brunette Downs Pastoral Lease
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S 75/092
APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Pipeline KP 235 to KP 275 - Sensitivity
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KP ID
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Access Track
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Possible
Unlikely
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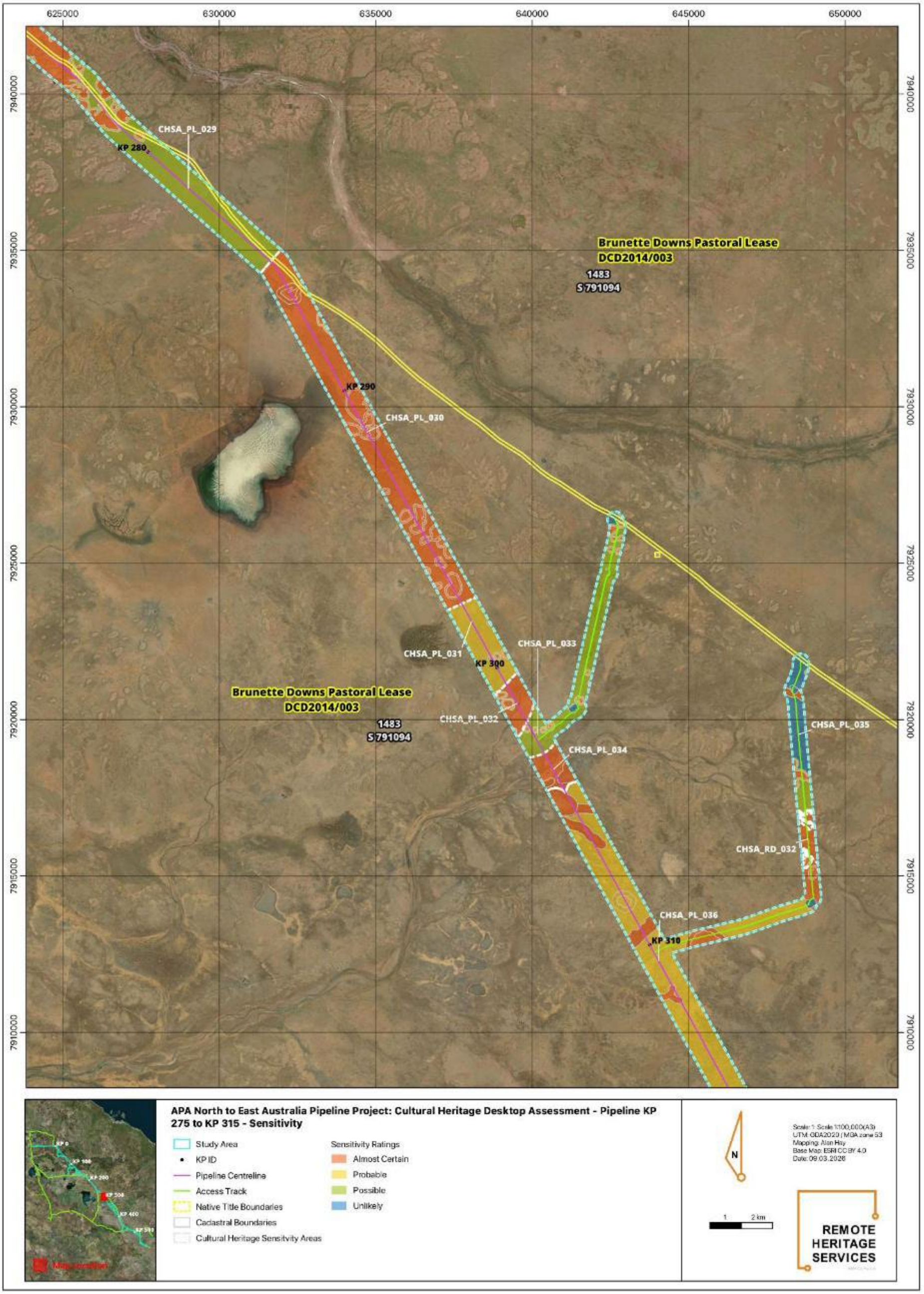
REMOTE HERITAGE SERVICES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KP 290
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KP 310
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Study Area
KP ID
Pipeline Centreline
Access Track
Native Title Boundaries
Cadastral Boundaries
Cultural Heritage Sensitvity Areas
Sensitivity Ratings
Almost Certain
Probable
Possible
Unlikely
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REMOTE HERITAGE SERVICES

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KP 330
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CP 004314
KP 340
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DC2001/030
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DCD2014/002
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KP 350
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APA North to East Australia Pipeline Project: Cultural Heritage Desktop Assessment - Pipeline KP 315 to KP 356 - Sensitivity

- Study Area
- KP ID
- Pipeline Centreline
- Access Track
- Native Title Boundaries
- Cadastral Boundaries
- Cultural Heritage Sensitvity Areas

Sensitivity Ratings
- Almost Certain
- Probable
- Possible
- Unlikely

N

Scale: 1:Scale 1:100,000 (A3)
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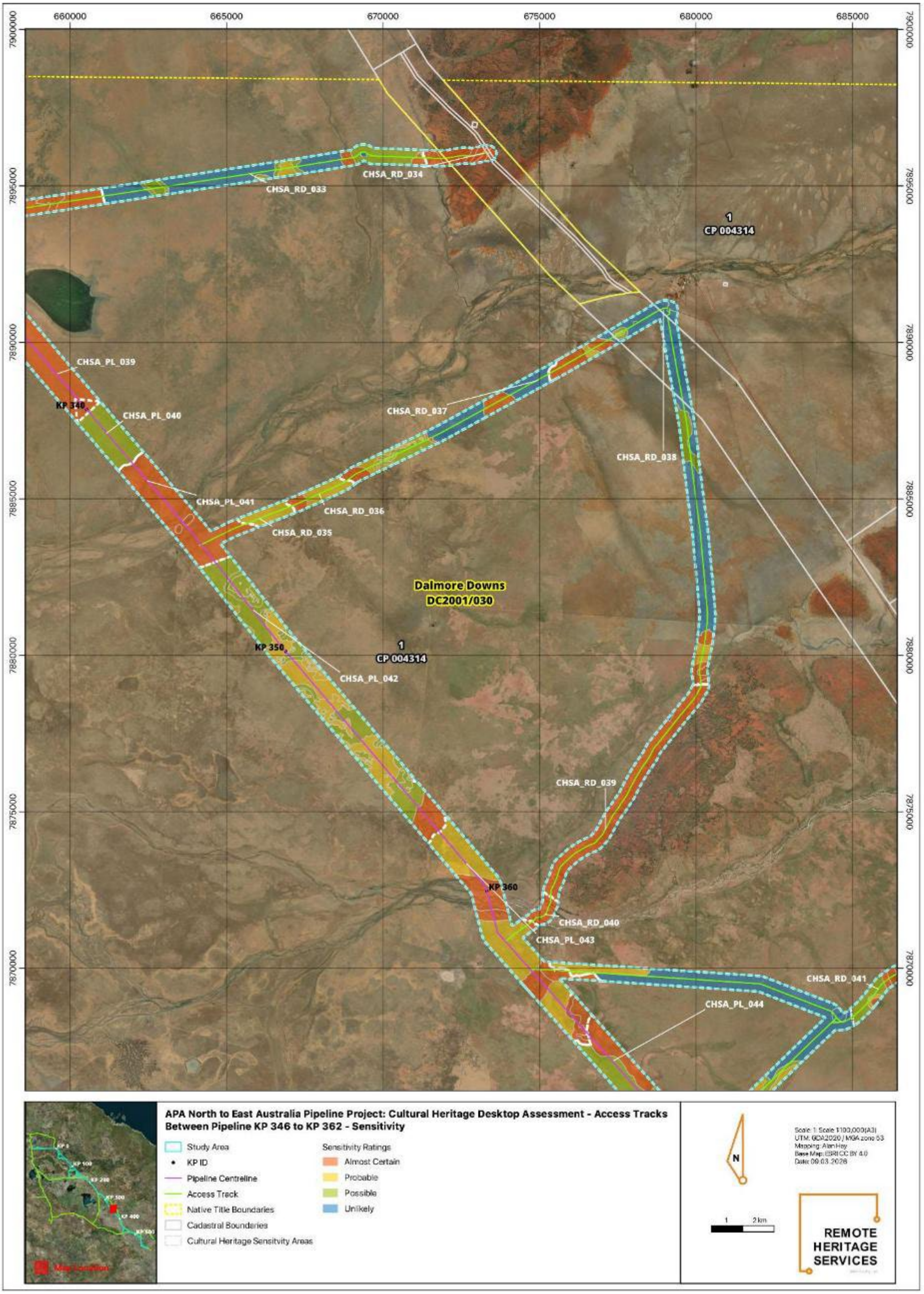
Mapping: Alan Hay
Base Map: ESRI CC BY 4.0
Date: 09.03.2026

1 2 km

REMOTE HERITAGE SERVICES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KP 350
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KP 360
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KP ID
Pipeline Centreline
Access Track
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Cadastral Boundaries
Cultural Heritage Sensitvity Areas
Sensitivity Ratings
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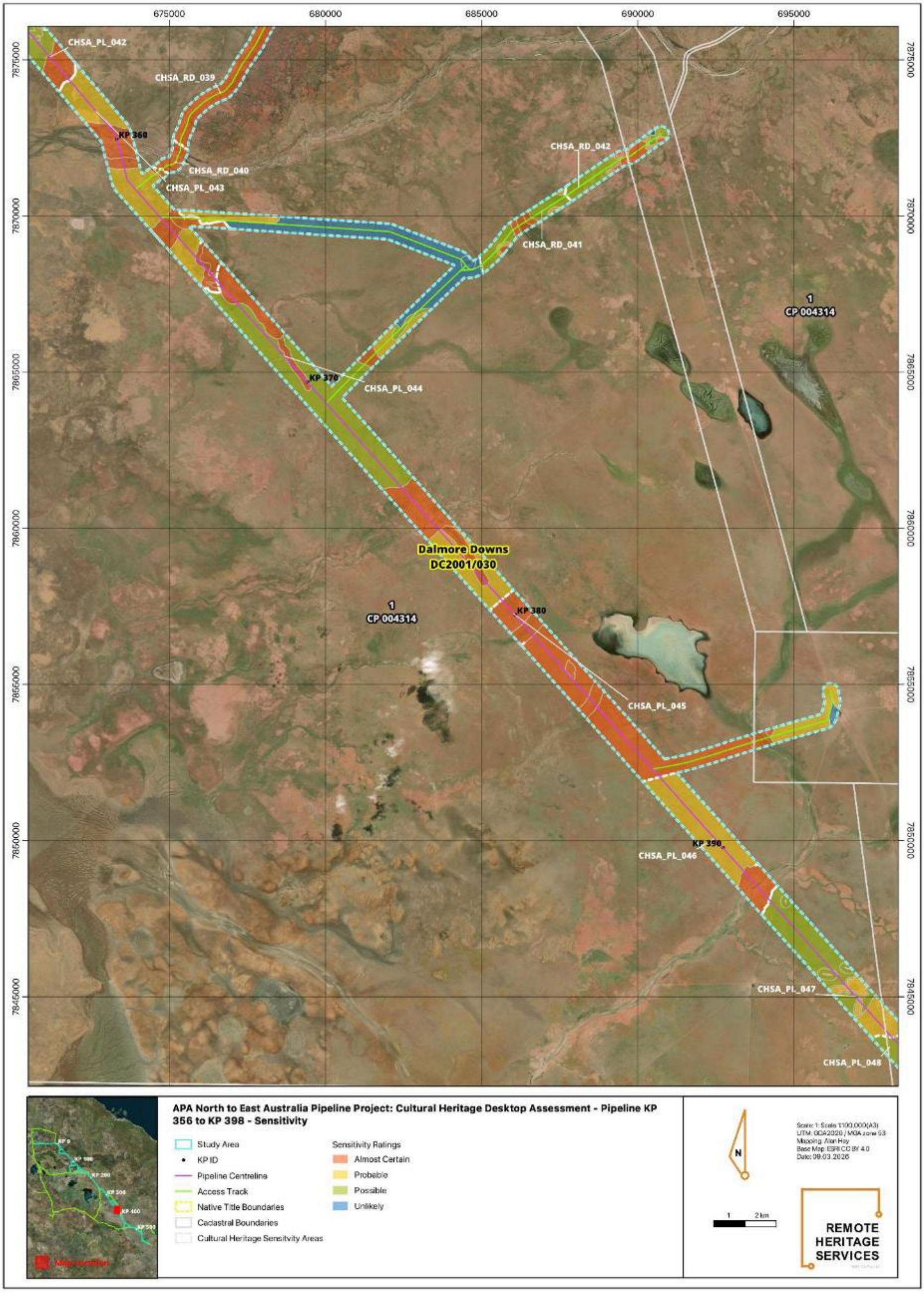
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Study Area
KP ID
Pipeline Centreline
Access Track
Native Title Boundaries
Cadastral Boundaries
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Sensitivity Ratings
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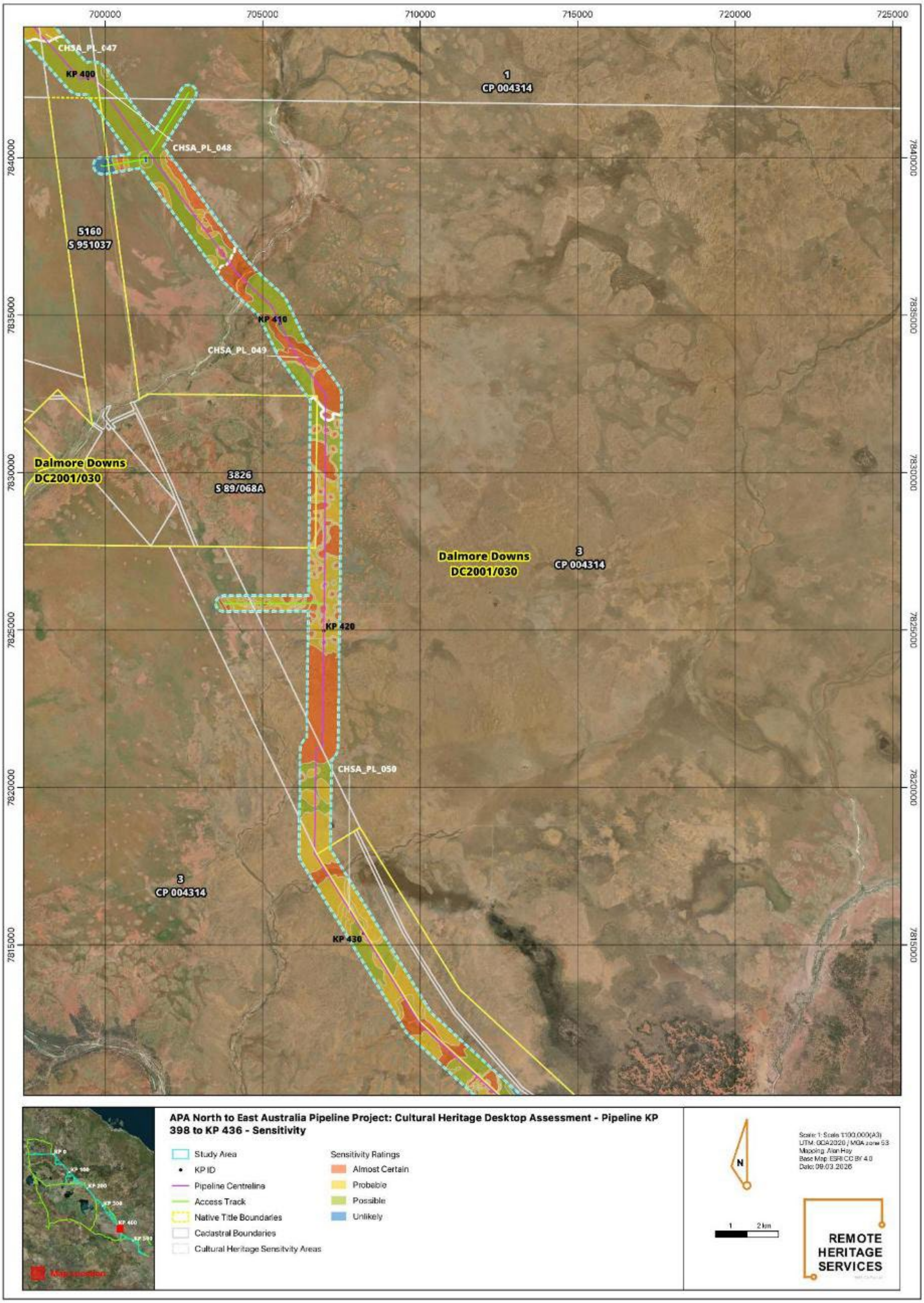
REMOTE HERITAGE SERVICES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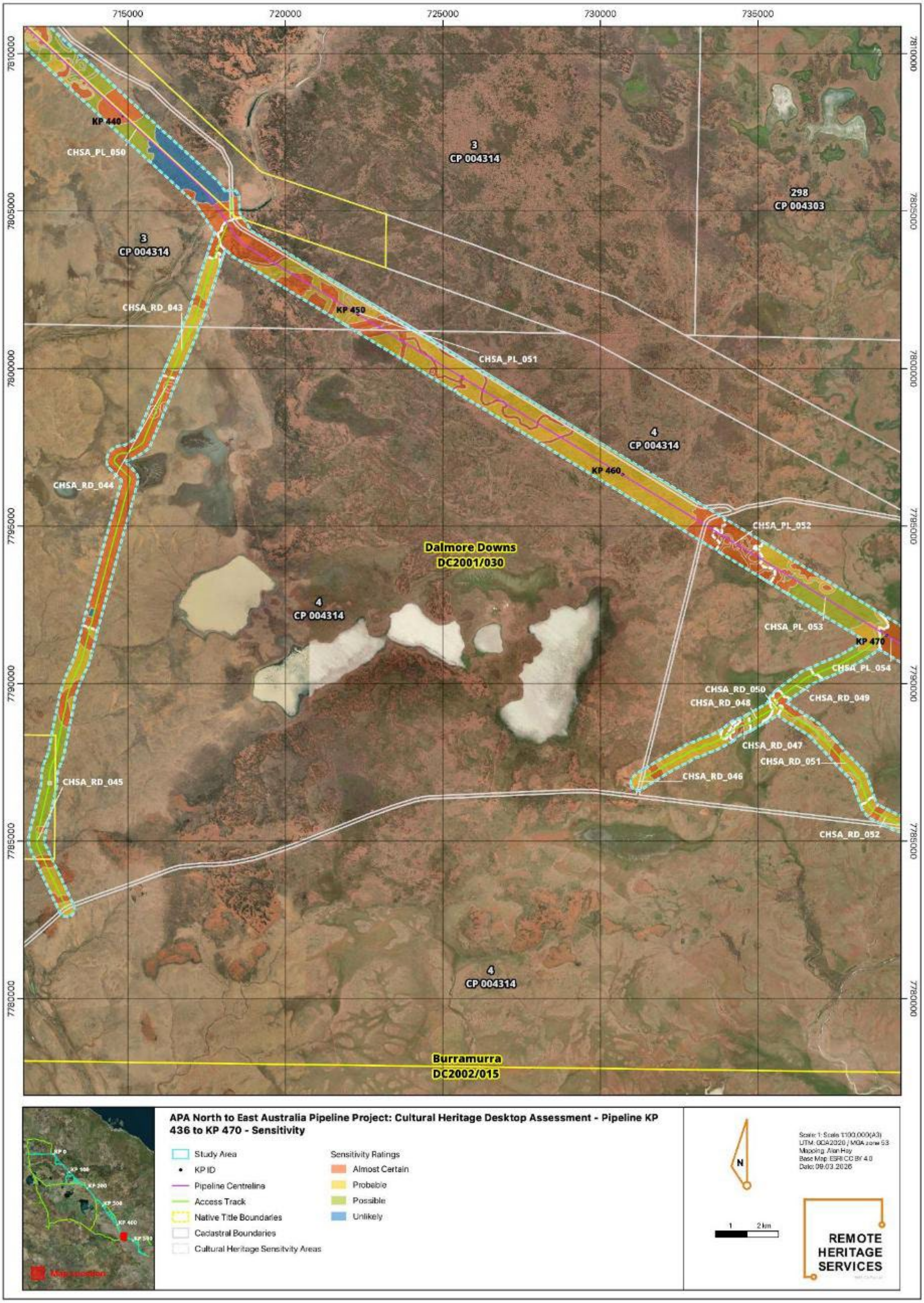
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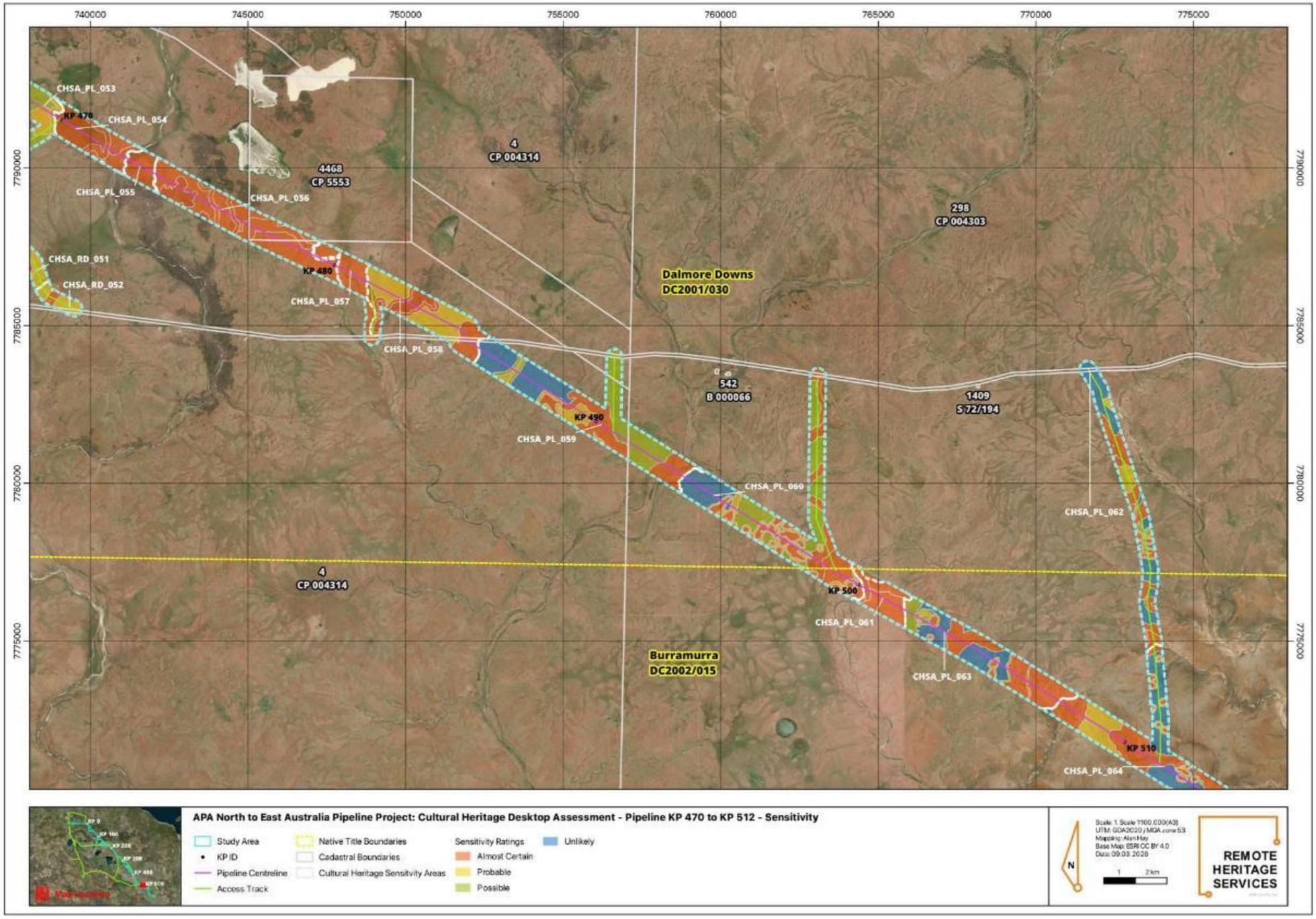
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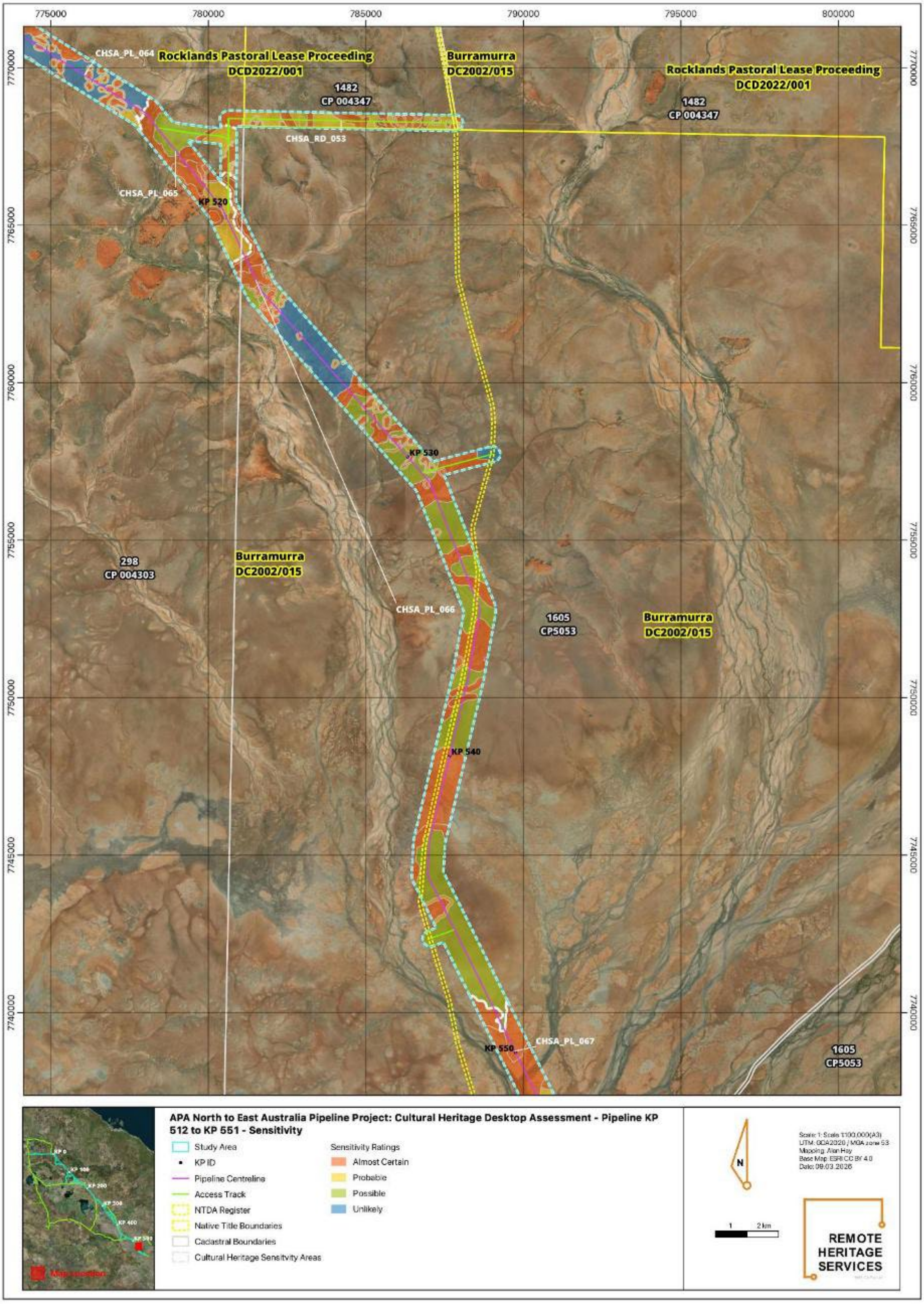
REMOTE HERITAGE SERVICES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1605
CP5053
KP 540
KP 550
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KP ID
Pipeline Centreline
Access Track
NTDA Register
Native Title Boundaries
Cadastral Boundaries
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Sensitivity Ratings
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Probable
Possible
Unlikely
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REMOTE
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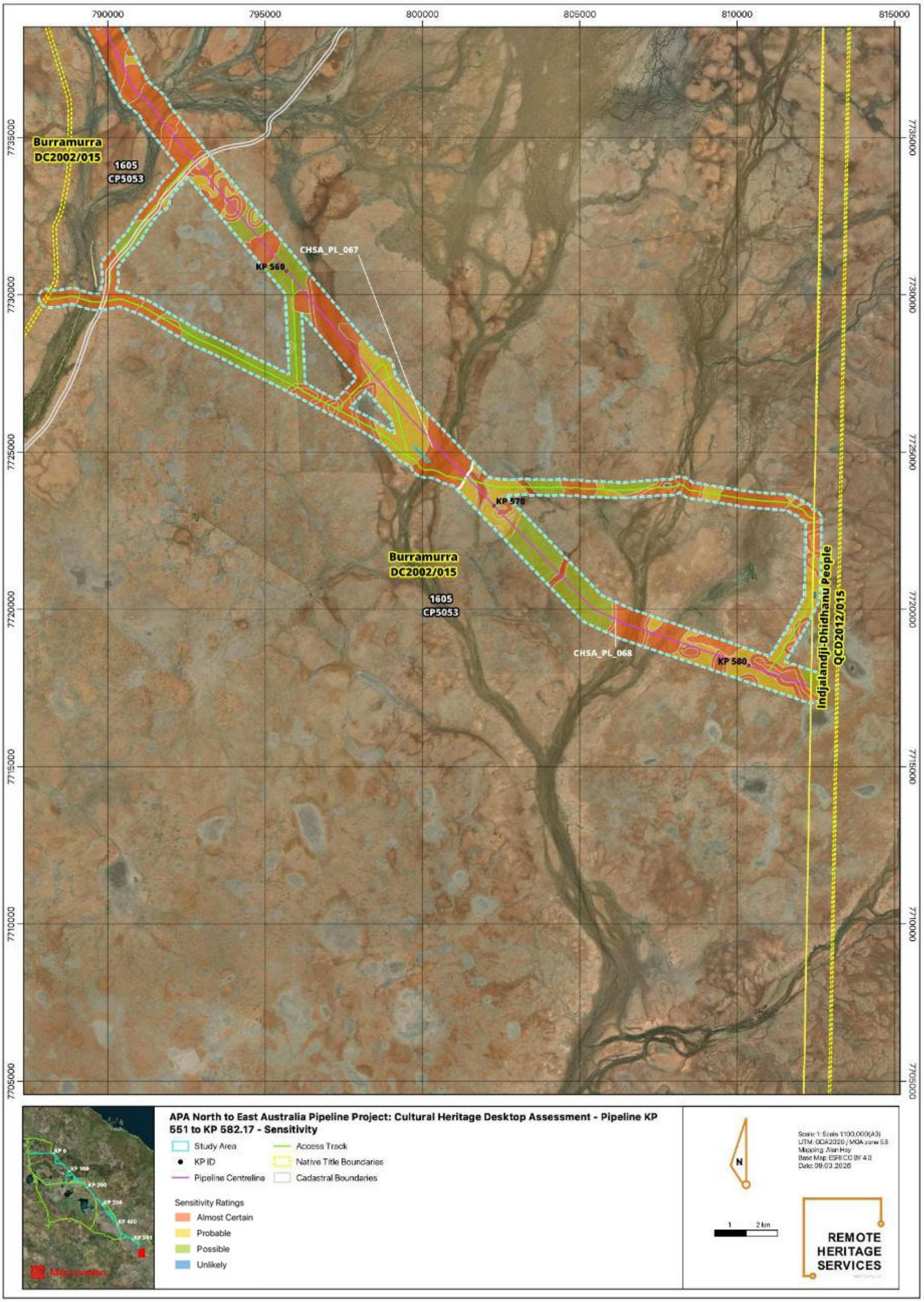
SERVICES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QCD2012/015
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Study Area
KP ID
Pipeline Centreline
Access Track
Native Title Boundaries
Cadastral Boundaries
Sensitivity Ratings
Almost Certain
Probable
Possible
Unlikely
N
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2 km
REMOTE HERITAGE SERVICES

APPENDIX 4: UNEXPECTED FINDS PROTOCOLS

Unexpected Finds Protocol: Archaeological Places and Objects

Archaeological features may be discovered even in areas that have been assessed as being free of cultural heritage places and objects.

If a suspected cultural heritage place or object is discovered:

1. Refer to **Discovery of Potential Human Remains** procedure below if the discovery is suspected of being human remains.
2. All work within the vicinity of suspected archaeological materials must cease immediately and the area flagged/fenced appropriately to ensure that no further work can be undertaken within it.
3. The discovery must be reported immediately to the Site Supervisor, who immediately communicates with the Project Manager.
4. The Project Manager must notify the NT Heritage Branch on (08) 8999 5039 or at Heritage.Branch@nt.gov.au.
5. A report in writing on the discovery must be made as soon as practical to the CEO of the Heritage Branch. The report must include:
    a. a description of the place or object (or photographs with a scale);
    b. its location (including spatial data);
    c. the person's name and address; and
    d. if known by the person – the name and address of the owner or occupier of the place or place where the object is located.
6. Work is not to recommence in the vicinity of the find until direction is provided by the Heritage Branch of the Northern Territory Government.

If works are to continue within the area of an identified archaeological place or object, an Application to Carry out Works must be submitted on the approved form to the Northern Territory Heritage Council for consideration.

The Aboriginal Traditional Owners or Native Title Holders of the subject land should be consulted as part of the Application to Carry Out Work process.

For major works, the Minister will determine whether the object or place can be impacted. Works cannot recommence within the area until a determination is made.

Unexpected Finds Protocol: Skeletal Remains

If potential human material is identified:

1. All work within a 50 m radius of potentially human material must stop immediately.
2. The discovery must be immediately reported to the Site Supervisor who must immediately notify the Project Manager of the discovery. No temporary fencing should be erected unless directed by the police.
3. The Project Manager must immediately notify the Northern Territory Police.
4. The Police will take control of the site as a potential crime scene.
5. If there are reasonable grounds to believe that the remains are:
    a. A crime scene – the Police will provide direction on the management of the discovery.
    b. If remains are Aboriginal ancestral or historical remains rather than a crime scene, the Project Manager should immediately notify:
        i. A Heritage Officer at NT Heritage Branch on (08) 8999 5039 or Heritage.Branch@nt.gov.au, and;
        ii. As soon as practicable after the discovery, write a report to the CEO of the Heritage Branch. The report must include a description of the place or object; its location; the person's name and address; and if known by the person – the name and address of the owner or occupier of the place or place where the object is located.
        iii. The Aboriginal Areas Protection Authority at (08) 8999 4365.
6. Work is not to recommence in the vicinity of the find until direction is provided by the relevant authorities (Police and Heritage Branch of the Northern Territory Government).