Biota Environmental Sciences

Winu Project Migratory Bird Review

Prepared for

Rio Tinto Winu Pty Ltd

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1.0 Introduction

1.1 Project Background

Rio Tinto Winu Pty Ltd (RTW) plans to develop a new copper-gold mine, referred to as the Winu Project, approximately 320 km east of Port Hedland in the Pilbara region of Western Australia, within both the Nyangumarta and Martu People's Native Title Determination Areas.

The development envelope (DE) for the Winu Project ('the project') includes a number of component areas and has been revised since the commencement of work. A summary of key terminology for the project is included below in Table 1.1.

Table 1.1: Key terminology for the Winu Project.

Term	Definition
Project	The Winu project, including development of a new below-water table copper-gold deposit and associated infrastructure and activities required to access, process and transport ore.
Winu Development Envelope ('Winu DE' or 'DE')	Refers to the combined areas of the mine and infrastructure area, road access corridor and regional borefield, Rimfire. All activities will occur within this area (23,649 ha).
Mine and Infrastructure Area ('MIA')	Refers to the area containing the mineralised deposit and related infrastructure (10,182 ha). This is the Winu mine site.
Road Access Corridor ('RAC')	Refers to the Access Road, which encompasses the entire length of the existing Access Road from Great Northern Highway to the MIA (6,647 ha).
Rimfire Borefield ('Rimfire')	Refers to the regional borefield located at Rimfire, which is approximately 31 km from the MIA (6,820 ha).
(Former) Texas Borefield	Refers to the formerly-proposed regional borefield located at Texas, approximately 22 km from the MIA. This area has been removed from the current DE as RTW no longer intends to extract water from this area.
Disturbance Footprint	Refers to the indicative direct disturbance area for the proposed action (EPBC 2025/10208; 4,878 ha).

RTW's proposal was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for assessment (EPBC 2025/10208). DCCEEW requested additional information to inform the referral decision. The additional information requested included additional baseline data for six Migratory-listed bird species that have the potential to occur in the project area, specifically:

- Pacific [Fork-tailed] Swift *Apus pacificus*;
- Oriental Plover *Charadrius veredus*;
- Little Curlew *Numenius minutus*;
- Oriental Pratincole *Glareola maldivarum*;
- Australian [Gull-billed] Tern *Gelochelidon [nilotica] macrotarsa*; and
- Barn Swallow *Hirundo rustica*.

Biota Environmental Sciences (Biota) was commissioned to prepare a report addressing this request for information.

1.2 Study Scope

1.2.1 Study Area

This report focuses only on the results from within the current DE (as referred to the DCCEEW). The DE covers approximately 23,649 ha and includes the combined areas of the Mine and Infrastructure Area (MIA), the Road Access Corridor (RAC), and the regional borefield (Rimfire) and its associated access tracks and pipelines (see Figure 2.1).

While the focus of the current scope is on the Winu DE, sampling effort and species recorded from outside the Winu DE for the AREH project (as shown in Figure 2.1) are also discussed as they provide regional context and reference data for the work completed within the Winu DE, particularly in an under-surveyed region such as the Great Sandy Desert. A data sharing agreement has been reached between Rio Tinto and the nearby Australian Renewable Energy Hub (AREH), enabling the data from AREH surveys to be utilised here.

1.2.2 Report Objectives

The objective of this report is to address the request by the DCCEEW for further information about six migratory-listed bird species occurring or potentially occurring within the DE, specifically:

- Pacific [Fork-tailed] Swift *Apus pacificus*;
- Oriental Plover *Charadrius veredus*;
- Little Curlew *Numenius minutus*;
- Oriental Pratincole *Glareola maldivarum*;
- Australian [Gull-billed] Tern *Gelochelidon [nilotica] macrotarsa*; and
- Barn Swallow *Hirundo rustica*.

In particular, information was requested about:

- the local population size, distribution and habitat for each species;
- survey effort for each species; and
- how the surveys met the content of relevant departmental survey guidelines.

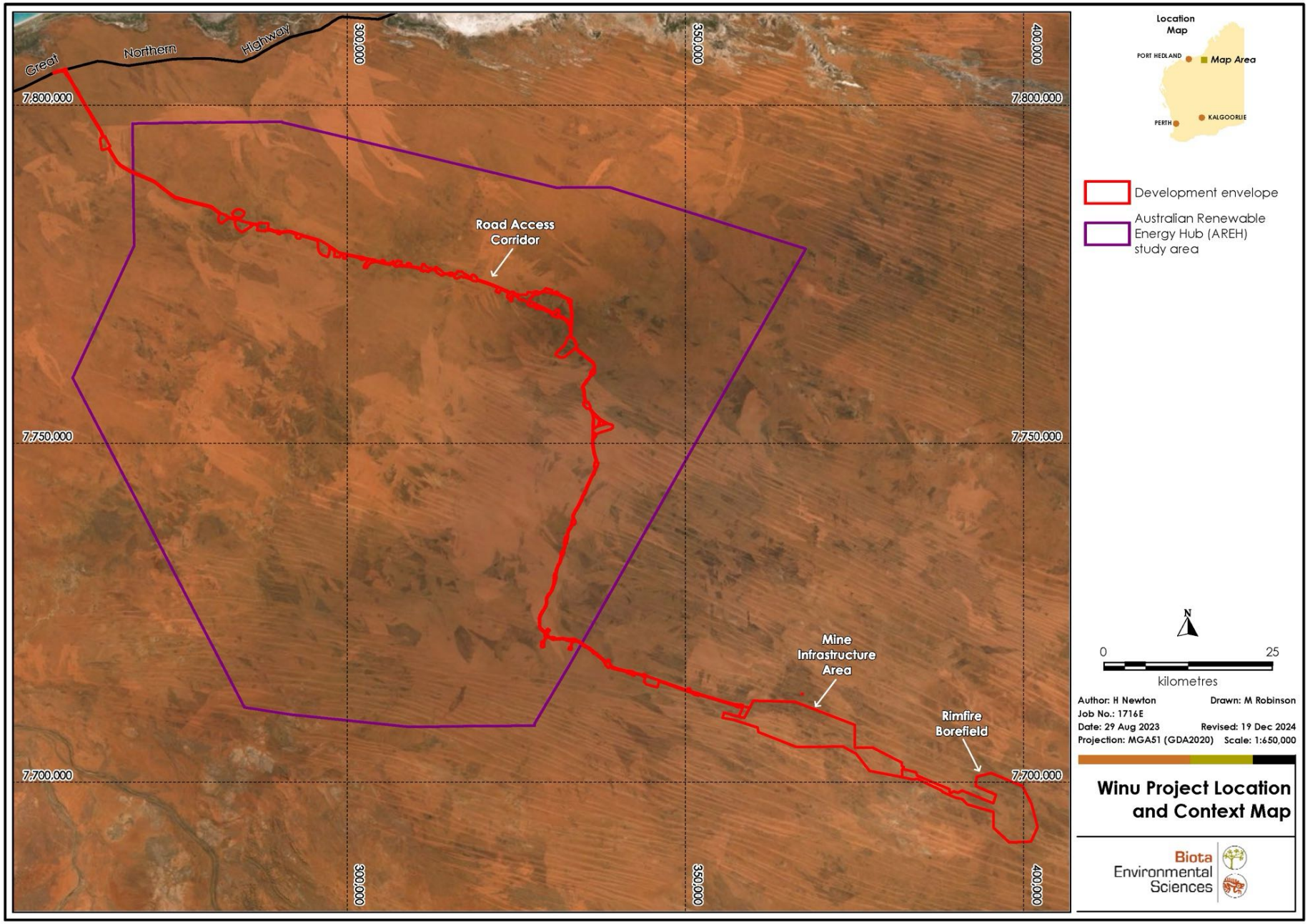

Figure 1.1: Winu Project location map.

2.0 Methodology

2.1 Relevant Guidelines

This assessment of survey effort and techniques, habitat and populations for the six Migratory-listed species is based on the guidelines and information provided in the following documents:

- *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE 2013);
- DRAFT *Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE 2015);
- *EPBC Act Policy Statement 3.21 Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE 2017); and
- *Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species* (van Swinderen et al. 2025).

General survey methodology for all survey work referenced in this report was developed with consideration to the EPA's *Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna* (EPA 2016) and *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020).

2.2 Consolidated Survey Effort

A significant amount of biological survey work has been undertaken by Biota within the Winu DE and in the broader locality between 2017 and 2024 for the purposes of environmental impact assessment (EIA) for both the Winu Project and AREH.

A detailed review of the survey effort undertaken across both the Winu and AREH projects relevant to the detection of the six Migratory-listed bird species considered here is presented in Table 2.2, with a brief discussion of the relevant survey methods with respect to the species of interest included below in Sections 3.0 to 8.0. Further information on each of the survey techniques for specific survey phases is available in the relevant survey reports referenced in Table 2.2. Additional survey data from contextual waterbird and shorebird surveys of the flooded Walyarta system and Eighty Mile Beach from the AREH project (Biota 2025a) are also included for regional context.

2.2.1 Avifauna Surveys

Systematic avifauna surveys included 20-minute and 30-minute unbounded surveys undertaken by a suitably-qualified and experienced observer. Systematic avifauna surveys within the DE were concentrated within the MIA as part of the detailed fauna survey undertaken for the project in 2019 (Biota 2021). These surveys are suitable for detecting all six bird species discussed in this report, providing they are undertaken within the periods when the species are likely to be present in the region. The specific timing for each species is discussed under the individual species accounts that follow.

A total of 1,910 minutes of systematic avifauna survey effort was undertaken across 32 sites within the DE, with a further 1,690 minutes of effort undertaken across 30 sites outside of the DE (Table 2.1).

2.2.2 Automated Recording Units (ARUs)

Automated recording units (ARUs) were deployed to target Night Parrot and overflying migratory birds. ARUs deployed to target Night Parrots were programmed to record from approximately dusk to dawn, while ARUs targeting overflying migratory birds were primarily programmed to record throughout the day and night.

ARUs have proven suitable for detection of Pacific Swift, Oriental Pratincole, Oriental Plover, and Little Curlew, though some of the species are primarily detected during the day so were unlikely to be detected on ARUs deployed targeting Night Parrots which are programmed to record at night only. Australian [Gull-billed] Terns have also been detected on ARUs, but the number of detections is relatively low so the effectiveness of ARUs for detection of that species is less clear.

Data were analysed by John Graff (Principal Zoologist) using Kaleidoscope Pro software (Wildlife Acoustics) targeting frequency ranges and other parameters based on reference calls for the target species. Analysis of data from ARUs targeting Night Parrots used parameters based on Night Parrot calls but appeared to be effective at detecting the Migratory-listed species of interest here and these species were noted where detected in most analyses. Analysis periods for which the Migratory-listed species were not noted (as they were not the species of interest) were excluded from the survey effort calculations.

ARUs were deployed at 28 sites for a total of 2,514 nights within the DE, and a further 39 sites for a total of 5,161 nights outside of the DE (Table 2.1).

2.2.3 General/Targeted/Nocturnal Searches

General and targeted searches were usually undertaken as foot traverses searching for evidence of all vertebrate fauna species (general searches), or specifically for certain significant fauna species (targeted searches). Nocturnal searches involved spotlighting either on foot or from a vehicle to search for fauna species that are more readily detected at night.

Targeted searches discussed here were not specifically targeted at the six migratory-listed birds being considered here. However, all six species have a relatively high detectability if present in an area, so they have a relatively high likelihood of being detected incidentally during these searches.

Nocturnal searches are only likely to have been suitable for detecting plains-foraging shorebirds (i.e. Oriental Plover, Little Curlew and Oriental Pratincole) which are known to forage nocturnally.

A total of 113 general or targeted searches were undertaken within the DE, and a further 181 outside of the DE (Table 2.1). Search effort was at least 6,032 minutes within the DE, and 15,112 minutes outside (Table 2.1) but these figures are underestimates as search duration data were not available for some general and targeted searches.

2.2.4 Opportunistic Sightings

All six species have a relatively high detectability if present in an area, as they are not particularly cryptic in habits. Thus, there is a relatively high probability of detecting the species opportunistically during survey work undertaken within the appropriate season. Additionally, the highly transient habits of several of the species, particularly Pacific Swifts and Oriental Pratincoles, mean that they may be encountered stochastically at almost any time.

Table 2.1: Survey effort suitable for detecting migratory-listed bird species.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	32 sites (1,790 minutes)	30 sites (1,660 minutes)
ARUs	28 sites (2,514 nights)	39 sites (5,161 nights)
General or Targeted Searches	113 searches (6,032 minutes)[1]	181 searches (15,112 minutes)[1]
Nocturnal Searches	9 searches (1,888 minutes)[1]	1 search (928 minutes)[1]

[1] Duration data not available for some searches, so duration given here is an underestimate.

Table 2.2: Overview of survey methods and consolidated effort across AREH and Winu projects.

Survey Description	Survey Dates	Scope	Environmental Conditions	Relevant Methodology and Effort[1]
AREH Detailed Survey (Biota 2022a) Including: RAC	• Phase 1: 24th August – 5th September 2017 • Phase 2: 13th – 21st March 2018 • Phase 3: 8th – 19th March 2021	Three-phase seasonal detailed fauna survey	Conditions during all phases were typical of the region at the time of each survey though significant rainfall events occurred in the months preceding Phase 1 (January and February 2017) and Phase 2 (January and February 2018). A small low-pressure system passed through during Phase 3 (March 2021), which was of importance for detecting Pacific Swifts in particular.	• Avifauna Surveys: 42 • ARUs[2]: 2 • General Searches: 12 • Targeted Searches: 78 • Nocturnal Searches: 4
AREH Migratory Shorebirds and Waterbirds Studies (Biota 2018, 2022b, 2025a) Including: RAC	• Sep 2020-May 2021 • Nov 2022; Jan-Mar 2023 • Oct 2023- April 2024 (outside DE)	Waterbird and shorebird assessments	Walyarta system was fully flooded during 2017-18 season.	• ARUs[2]: 17 overall (6 per season, one lost to fire in 2023-24 season)
AREH Targeted Fauna (Biota 2024) Including: RAC	• 20th – 29th September 2023	Targeted fauna survey	Weather during the survey was typical for the time of the year; however, the area experienced an extended wet season with high rainfall occurring well into April 2023.	• Targeted Searches: 13
Winu Detailed Survey (Biota 2021) Including: MIA	• Phase 1:12th – 20th May 2019 • Phase 2: 18th – 25th September 2019	Two-phase seasonal detailed fauna survey	Phase 1 occurred after an unusually dry wet season (January – March), with much lower rainfall recorded than the long-term medians across each month.	• Avifauna Surveys: 20 • ARUs[2]: 12 • Targeted Searches: 63 • Nocturnal Searches: 6

Survey Description	Survey Dates	Scope	Environmental Conditions	Relevant Methodology and Effort[1]
Winu Reinjection Borefield and Potential Borrow Source Areas (Biota 2021) Including: MIA and RAC	• 11th – 20th July 2020	Basic and targeted survey	Weather during the survey was typical for the region at the time of the survey.	• Targeted searches: 45
Winu Additional Areas Targeted Surveys • Winu Project Area Extension (Biota 2022c) • Winu Water Borefield (Biota 2023a) Including: MIA, Rimfire	• 15th – 22nd July 2022	Basic and targeted survey across multiple areas	Significantly higher than average rainfall was recorded in the preceding months of March and May 2022.	• ARUs[2]: 4 • Targeted Searches: 41
Winu Project Native Vegetation Clearing Permit Fauna Clearance Survey (Biota 2023b) Including: RAC	• 19th – 28th July 2023	Targeted fauna survey conducted prior to planned vegetation clearing	Weather during the survey was typical for the time of the year; however, the area experienced an extended wet season with high rainfall occurring well into April 2023.	• Targeted Searches: 21
Winu Borefields Fauna Survey Including: RAC and Rimfire	• 26th February – 4th March 2024 • 8th – 11th April 2024 • 6th – 16th May 2024	Basic and targeted fauna survey of Winu borefield options	Months preceding initial survey experienced higher than average rainfall. The area was also significantly burnt.	• ARUs[2]: 12 • General Searches: 11
Winu Pipeline Corridors Fauna Survey Including: Rimfire	• 8th – 12th July 2024	Basic and targeted fauna survey of Winu borefield pipeline corridor options	Weather during the survey was typical for the region at the time of the survey.	• ARUs[2]: 2 • General Searches: 10
Winu Targeted Night Parrot Survey (Biota 2025b) Including: Rimfire	• March 2024-ongoing	Targeted Night Parrot survey	Rainfall close to annual mean in 2023-24.	• ARUs[2]: 18

[1] Includes survey effort suitable for detecting any or all of the six species in addition to specific targeted effort.

[2] Automated recording units, includes only audible-range recording units, not ultrasonic ARUs for bat detection which are unsuitable for bird detection.

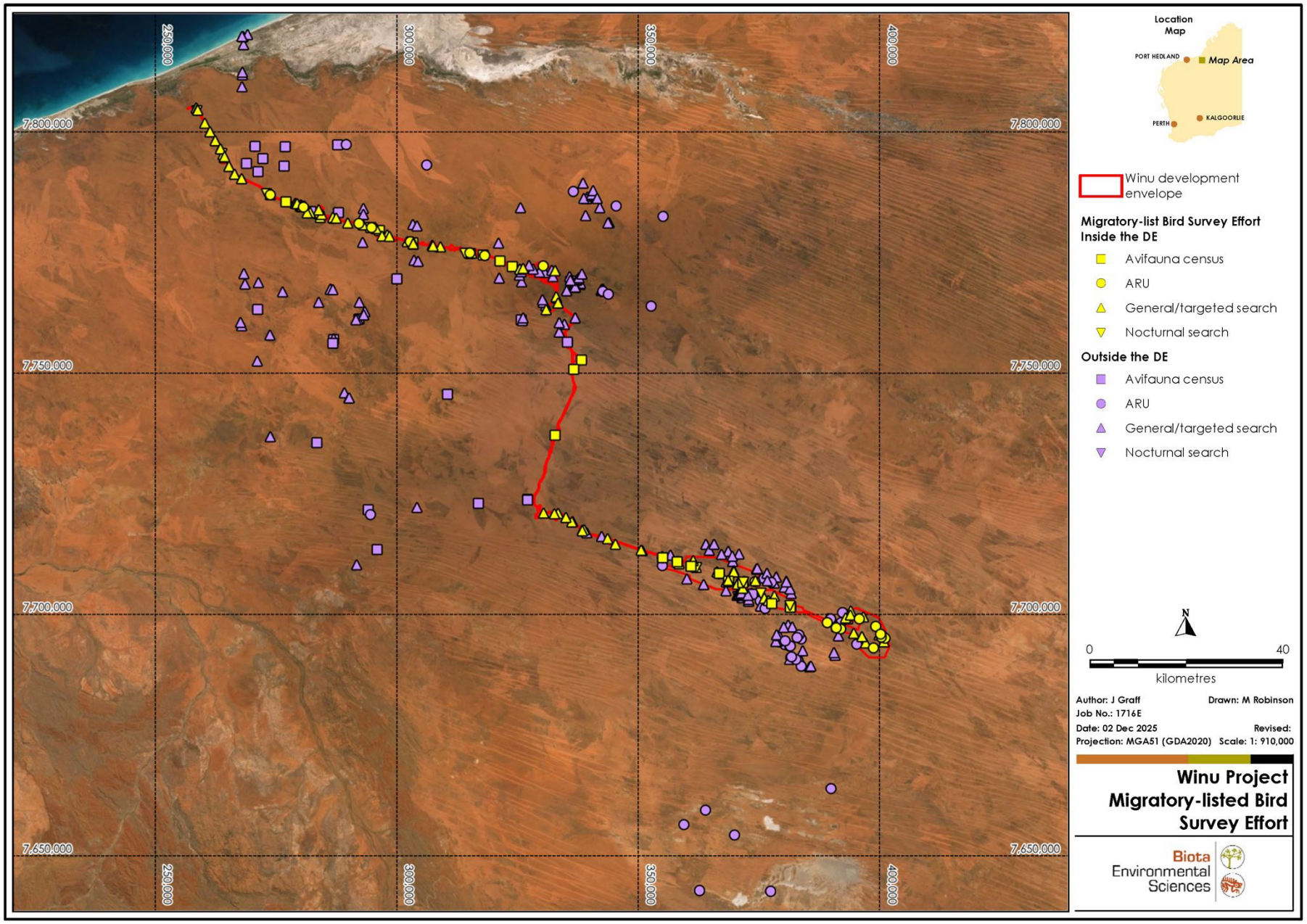

Figure 2.1: **Survey effort suitable for detecting Migratory-listed birds.**

2.3 Habitat and Population Significance

Significant impact criteria for Migratory-listed species under federal MNES significant impact guidelines are based primarily on the concepts of 'important habitat' and an 'ecologically significant proportion' of populations (DoE 2013). As such, in this report we have focused on assessing whether the population of each species in the Winu DE is likely to represent an ecologically significant proportion of the total population or flyway population of the species, and whether habitat for each species within the DE is likely to constitute important habitat.

These assessments were made based on the relevant guidelines (DoE 2013, 2015, DoEE 2017), outlined below in Sections 2.3.1 and 2.3.2.

2.3.1 Important Habitat

Under the MNES guidelines (DoE 2013), important habitat for Migratory-listed species is defined as habitat that is:

- utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species [see Section 2.3.2]; and/or
- of critical importance to the species at particular life-cycle stages; and/or
- utilised by a migratory species which is at the limit of the species range, and/or
- within an area where the species is declining.

The DE is unlikely to contain habitat of critical importance for any of the six species at particular life-cycles, although five of them are non-breeding migrants that may utilise the DE for foraging. For these species, similar suitable foraging habitat occurs widely through the Great Sandy Desert and the sandplains extending north towards Eighty Mile Beach, while higher quality foraging habitat also exists in the region at Lake Waukarlycarly (approximately 50 km to the south of the MIA) and the Walyarta (Mandora Marsh) system to the north on the near-coastal plains adjacent to Eighty Mile Beach. There is a remote chance that Australian [Gull-billed] Terns could use the ephemeral claypans in the DE for breeding when inundated, but the likelihood is very low given the very limited extent of that habitat (all within the Rimfire borefield). Similarly, the DE is unlikely to represent the limit of range for any of the six species, as suitable habitats (and records of each) extend further south along the coast and/or inland (e.g. Cornell Lab of Ornithology 2025). As such, our focus for assessing the likelihood that the DE constitutes suitable habitat in the individual species accounts below is the likelihood that the DE is used by an ecologically significant proportion of the population of the species, and whether the species is known to be declining in Australia.

2.3.2 Ecologically Significant Population Proportion

The definition of an ecologically significant proportion of the population for a Migratory-listed species varies depending on the species (DoE 2013), but for most of the species addressed in this report is generally considered to constitute >0.1% (nationally significant) or >1% (internationally significant) of the species' estimated flyway population. These estimates have been published, at least in draft form, in DCCEEW guidelines and documentation for five of the six species addressed in this report (DoE 2015, van Swinderen et al. 2025). The 1% threshold for Australian [Gull-billed] Tern was taken from the Waterbirds Population Portal (Wetlands International 2025). The thresholds for national and internationally significant population proportions from these sources are summarised below in Table 2.3.

Table 2.3: Ecologically significant populations for six migratory-listed bird species.

Species	Common name	Nationally Significant (0.1%)	Internationally Significant (1%)
Pacific Swift	*Apus pacificus*	100	1,000
Oriental Plover	*Charadrius veredus*	230	2,300
Little Curlew	*Numenius minutus*	110	1,100
Oriental Pratincole	*Glareola maldivarum*	2,880	28,800
Australian [Gull-billed] Tern	*Gelochelidon [nilotica] macrotarsa*	100[1]	1,000[1]
Barn Swallow	*Hirundo rustica*	1,000	10,000

Sources: DoE (2015), van Swinderen *et al*. (2025), and Wetlands International (2025).

[1] Inferred from published 1% threshold.

2.4 Fauna Habitats

Five rationalised fauna habitats (plus disturbed/cleared areas) were defined for within the Winu DE through consolidation of the supporting studies reported on in Biota (2025c). One additional habitat, 'rocky outcropping', also occurs outside of the DE in the Winu RAC locality. The rationalised habitats and their representation within the Winu DE and disturbance footprint are presented in Table 2.4.

Table 2.4: Fauna habitats of the Winu DE and disturbance footprint.

Habitat	DE	Disturbance Footprint
Shrub and spinifex on sandplain	17,039 ha (72%)	3,683 ha (75%)
Inland sand dune	3,105 ha (13%)	815 ha (17%)
Gravelly lateritic rises	3,116 ha (13%)	238 ha (5%)
Clayey sandplain with termitaria	125 ha (<1%)	39 ha (1%)
Ephemeral claypan	49 ha (<1%)	Nil
Disturbed/cleared areas	214 ha (<1%)	102 ha (2%)

The suitability of each of these habitats for individual species is discussed within the individual species accounts in Sections 3.0 to 8.0, and summarised in Section 9.1.

3.0 Pacific [Fork-tailed] Swift

3.1 Species Background

The Pacific Swift (*Apus pacificus*), sometimes treated as conspecific with Fork-tailed Swift, is listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act), as well as under the *Biodiversity Conservation Act 2016* (WA) (BC Act). The species is a non-breeding summer migrant to Australia, primarily from September to April (Menkhorst et al. 2017). The Pacific Swift is generally more common in the northern half of Western Australia, and in coastal and near-coastal areas, but can occur anywhere in the state (Menkhorst et al. 2017, Cornell Lab of Ornithology 2025).

The Pacific Swift is not listed as threatened under the EPBC Act or the BC Act and is currently listed as 'Least Concern' by the IUCN. The population of the species is also considered stable (BirdLife International 2025).

3.2 Habitat

Pacific Swifts are thought to be entirely aerial in habit while in Australia, foraging for flying insects and even sleeping on the wing, and occurring over all terrestrial habitats. They are highly mobile, often occurring in association with unsettled weather and low pressure systems (Johnstone and Storr 1998), though their occurrence in an area is not limited to such conditions. The draft referral guideline for this species states that important habitat for the species includes a variety of habitats ranging from inland plains to wooded areas (DoE 2015).

3.3 Survey Adequacy

There are no formal guidelines or standard survey techniques for Pacific Swifts (DoE 2015). Their transient habits mean that short duration surveys are often ineffective for detecting the presence of the species, so assessment of occurrence based on a combination of any records obtained during the survey, existing records in databases, and input from local observers (DoE 2015) is likely to be most effective.

Survey effort undertaken that was suitable for detecting Pacific Swifts included systematic avifauna surveys and deployment of ARUs, along with the possibility of observations during general and targeted searches or opportunistically (Table 3.1; Figure 3.1). There are few existing records for the Winu locality due to its remote location and limited access. However, passive acoustic recorders (ARUs) have proven effective for detecting the presence of this species over long deployments in the AREH survey area (Biota, unpublished data), including the RAC portion of the Winu DE.

Pacific Swifts are primarily present in Australia from September to April (Section 3.1), so survey effort within the September to April period is considered suitable for detecting the species. Survey effort outside of this period is not likely to be suitable for detecting the species and has not been included in Table 3.1 or Figure 3.1. Similarly, ARU data from the AREH project indicate that Pacific Swifts are detected on ARUs largely during the day (Biota, unpublished data). Thus, units that are set to record only at night are of limited suitability for detecting Pacific Swifts and have also not been included in Table 3.1 or Figure 3.1, though there is the possibility of occasional opportunistic detections.

Table 3.1: Survey effort suitable for detecting Pacific Swifts in the Winu locality.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	17 sites (790 minutes)	26 sites (1,240 minutes)
ARUs	9 sites (1,757 nights)	8 sites (1,399 nights)
General or Targeted Searches	47 searches (1,932 minutes)[1]	83 searches (4,503 minutes)[1]

[1] Duration data not available for some searches, so duration given here is an underestimate.

Assessment of the occurrence of Pacific Swift in the DE is based primarily on regional data, which is in accordance with draft survey recommendations from the DCCEEW (DoE 2015), and extensive ARU data available from the RAC, which has proven effective at detecting the species (Biota, unpublished data). The survey effort within the MIA and Rimfire has been limited, but we consider that extrapolation of the extensive data available from the RAC (over 180 detections over three seasons; see Table 3.2) is sufficient for making an informed assessment of likely occurrence across the full Winu DE.

3.4 Survey Findings

3.4.1 Occurrence in the Winu DE and locality

Pacific [Fork-tailed] Swifts were recorded from five locations within the Winu DE, all within the RAC, and on a further six ARUs located within 200 m of the DE (Table 3.2; Figure 3.2). Whilst all records within or potentially within the DE were obtained from the RAC, it should be noted that the survey effort suitable for detecting this species was significantly higher, with long-term monitoring ARUs recording during daylight hours only deployed in this section of the DE.

Regional records involve counts ranging from single individuals to flocks of 2,000 and were primarily concentrated relatively close to the coast (Cornell Lab of Ornithology 2025). However, this is likely primarily driven by relative survey effort, as observations from the AREH project demonstrated that the species also occurs widely further inland (Figure 3.3).

Pacific Swifts were recorded from the DE from October to April, but the majority of records fall between December and March. This may be due to the increased prevalence of tropical low-pressure systems and associated unsettled weather during this period.

Table 3.2: Pacific Swift records from the Winu DE and immediate surrounds.

Site	Location		Record type	Notes
	Latitude	Longitude		
Within DE				
Opportunistic	-20.0352	120.9249	Observation	Flock of 110 observed overhead in March 2021.
Opportunistic	-20.1104	121.2213	Observation	Flock of five individuals observed overhead in February 2021.
AREH05A	-20.1170	121.2612	Sound recording	Birds detected on 17 days between November 2020 and March 2021, all detections during the day.

Site	Location		Record type	Notes
	Latitude	Longitude		
AREH08A	-20.0628	121.0379	Sound recording	Birds detected on 24 days between January and early April 2023, all detections during the day or at dawn or dusk.
AREH09A	-20.1120	121.2320	Sound recording	Birds detected on 48 days between January and March 2023, all detections during the day or at dawn or dusk.
ARU within 200 m of DE				
AREH01A	-19.9990	120.8379	Sound recording	Birds detected on 7 days between October 2020 and March 2021, all detections during the day.
AREH02A	-20.0230	120.9035	Sound recording	Birds detected on 12 days between December 2020 and March 2021, all detections during the day.
AREH03A	-20.0545	121.0130	Sound recording	Birds detected on 5 days between January and February 2021, all detections during the day or at dusk.
AREH04A	-20.0903	121.1140	Sound recording	Birds detected on 5 days between February and March 2021, all detections during the day or at dusk.
AREH07A	-20.0367	120.9351	Sound recording	Birds detected on 13 days between January and March 2023, all detections during the day.
AREH10A	-20.1380	121.3771	Sound recording	Birds detected on 47 days between January and early April 2023, all detections during the day or at dawn or dusk.

3.4.2 Population in the Winu DE

As the species is highly transient, the population of Pacific Swifts using the Winu DE will be highly variable and therefore difficult to adequately estimate. The majority of records obtained from the DE are based on call recordings detected on ARUs which do not allow accurate counts of individuals, though the continuous chorus of calling in some detections indicates that large flocks do occur at times. Regional records involve counts ranging from single individuals to flocks of 2,000 (Cornell Lab of Ornithology 2025).

The draft referral guidelines estimate that 100 individuals constitute a nationally significant proportion of the species' population, and 1,000 individuals constitute an internationally significant proportion of the species' population (DoE 2015). A flock of 110 birds was observed over the RAC in March 2021, constituting a nationally significant proportion of the species' population, and it is likely that over 100 individuals utilise airspace over the DE regularly. No counts of over 1,000 individuals were obtained from the DE, but such counts are known from the locality (e.g. Cornell Lab of Ornithology 2025) and it is possible that some of the ARU detections involved such numbers based on the volume of calling. Thus, it is considered likely that airspace over the DE occasionally supports in excess of 1,000 individual Pacific Swifts.

3.4.3 Habitat in Winu Locality

Pacific Swifts are likely to use airspace over all habitats within the Winu DE for foraging and potentially roosting on the wing. The species does not breed in Australia, so will not use the DE for breeding.

As discussed above in Section 3.4.2, the Winu DE constitutes important habitat for Pacific Swifts according to draft DCCEEW guidelines (DoE 2015) as it is known to support an ecologically significant proportion of the species' population on occasions. However, similar suitable foraging habitat extends very widely throughout much of the Great Sandy Desert, and the sandplains extending north to Eighty Mile Beach, so the DE represents only a small proportion of important habitat for Pacific Swift in the region.

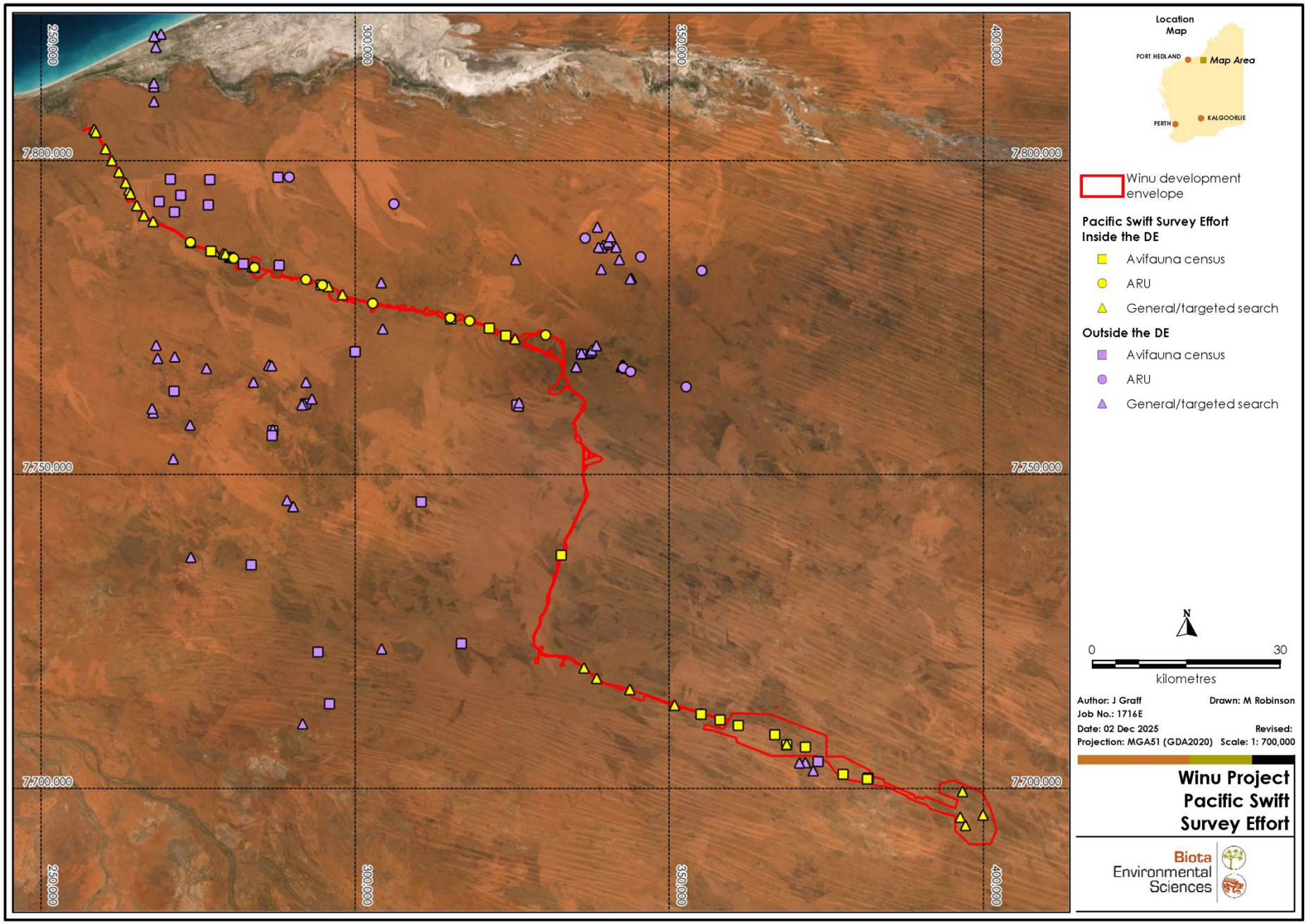

Figure 3.1: **Survey effort suitable for detecting Pacific Swifts.**

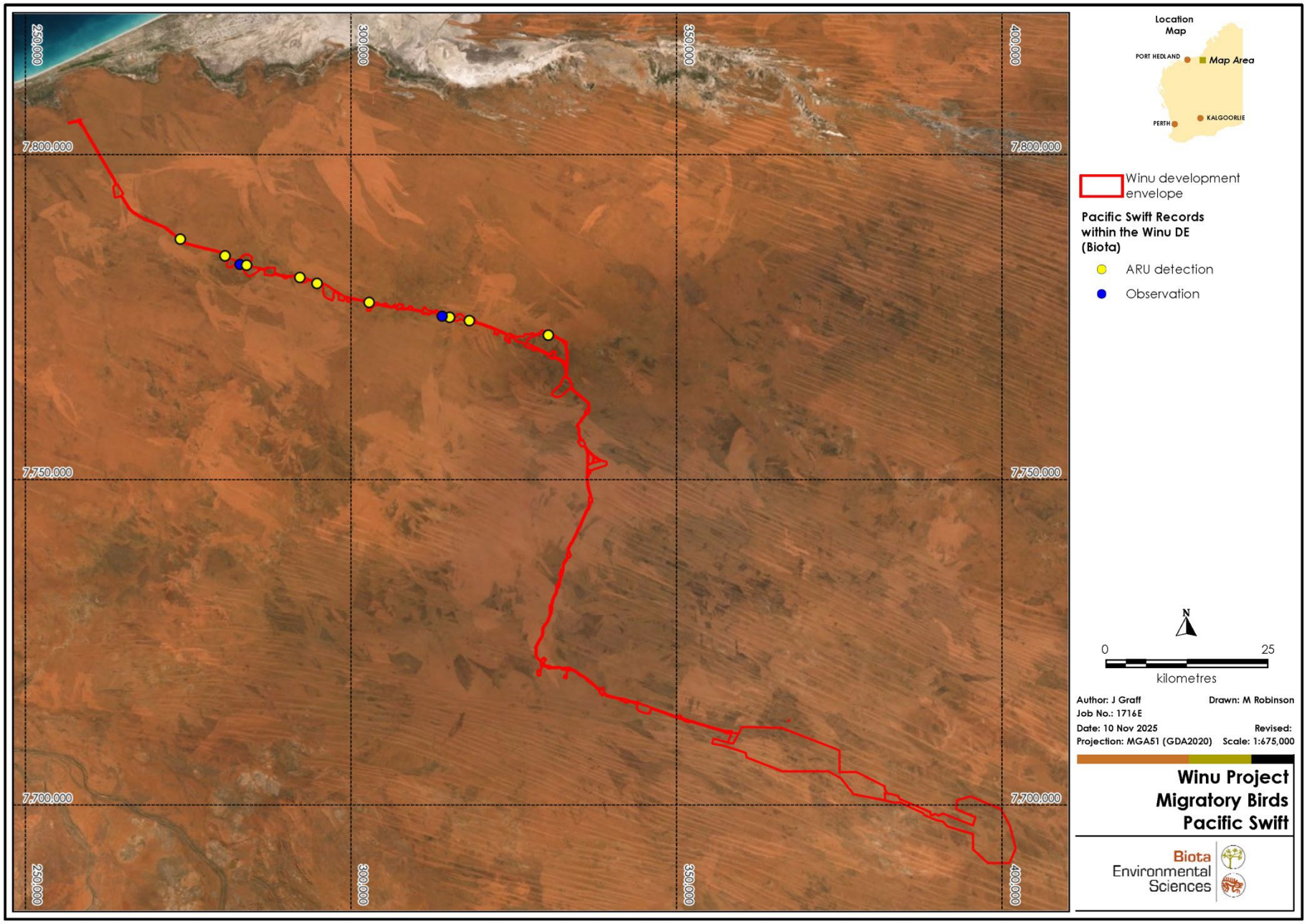

Figure 3.2: **Pacific [Fork-tailed] Swift records within the Winu DE.**

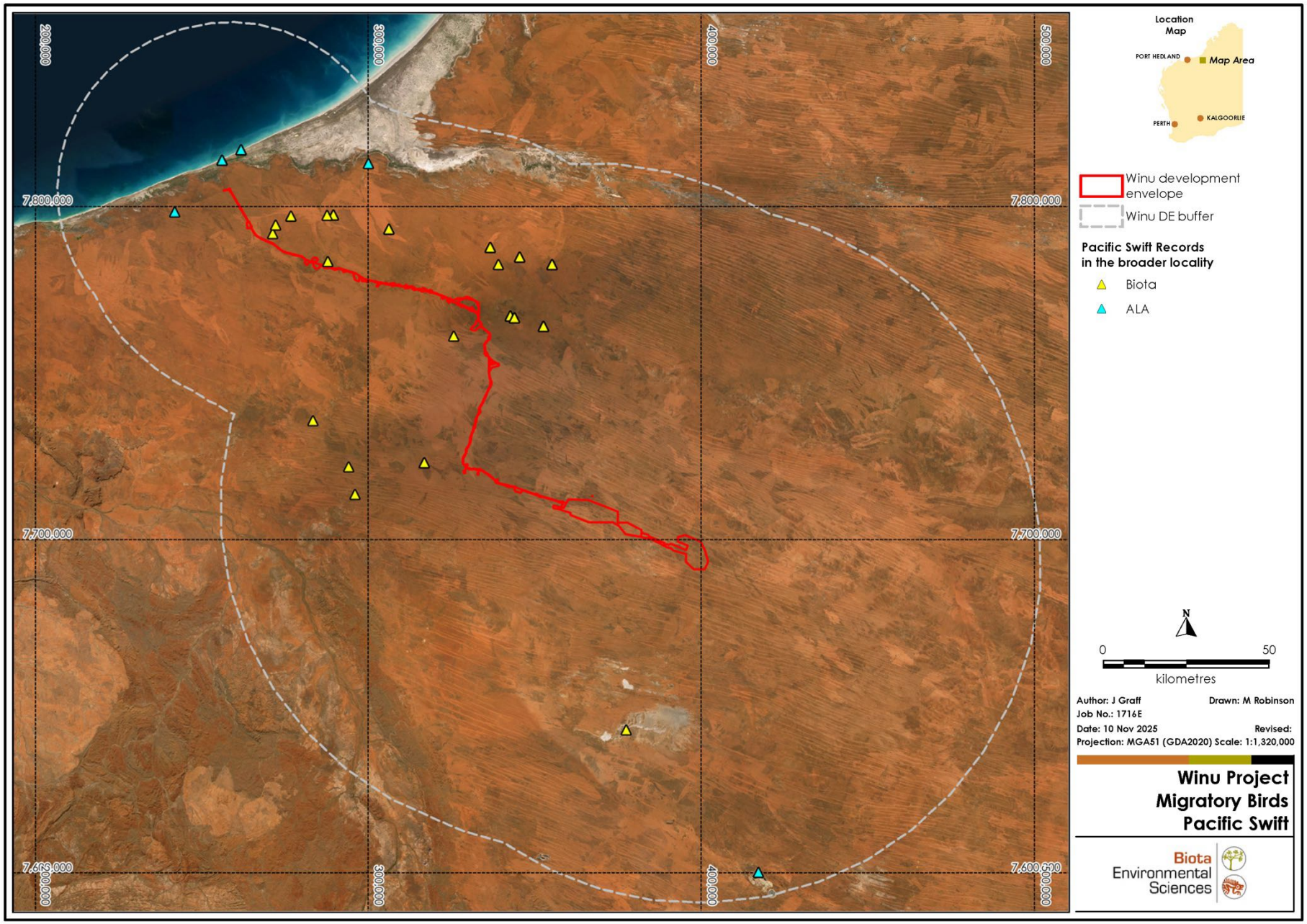

Figure 3.3: Pacific [Fork-tailed] Swift records from the Winu locality.

4.0 Oriental Plover

4.1 Species Background

The Oriental Plover (*Charadrius veredus*) is listed as Migratory under the EPBC Act and the BC Act. The species is a non-breeding summer migrant to Australia, occurring primarily from September to April (Johnstone and Storr 1998). They are mobile in response to conditions, and disperse away from the coast across inland northern Australia during the wet season (Minton et al. 2013).

The Oriental Plover is not listed as threatened under state or federal legislation and is currently listed as 'Least Concern' by the IUCN. The population of the species is also thought to be stable globally (BirdLife International 2025), and showed no evidence of a declining trend in Australia in the short term (Clemens et al. 2019). Insufficient data was available to assess the long-term trend in Australia (Clemens et al. 2019).

4.2 Habitat

Preferred foraging habitats for the Oriental Plover include a variety of sparsely vegetated open areas, including short-grassed or bare plains, bare wetland margins, and recently burnt areas (Johnstone and Storr 1998). This also includes man-made habitats such as sports fields and airfields. The species will also use tidal mudflats, beaches, sewage ponds and freshwater wetland areas, either while on migration or for roosting during the heat of the day (Johnstone and Storr 1998, Menkhorst et al. 2017).

4.3 Survey Adequacy

There is limited published guidance on survey effort and methodology for Oriental Plover. The species is one of 37 shorebird species considered under EPBC Act Policy Statement 3.21, but the survey guidance within focuses on wetland habitats and discrete shorebird areas more applicable to shorebird species reliant on wetlands. This is of limited suitability for much of the DE, which encompasses sand dune and sand plain habitats that extend largely contiguously for over 100 km north, east and southeast, making the definition of discrete shorebird areas in such habitat problematic. Nevertheless, recommended survey effort guidelines are still applicable, with a recommended five survey phases for a shorebird site including four phases from when the largest numbers of shorebirds are present (approximately October to April in northern Australia) and one phase during the austral winter (DoEE 2017).

Survey effort undertaken that was suitable for detecting Oriental Plovers included systematic avifauna surveys and deployment of ARUs, along with the possibility of observations during general and targeted searches or opportunistically (Table 4.1; Figure 4.1). There are numerous regional records from Eighty Mile Beach and adjacent plains but few existing records for the Winu locality due to its remote location and limited access. Passive acoustic recorders have proven effective for detecting the presence of this species over long deployments in the AREH survey area (Biota 2025a).

Oriental Plovers are present in Australia primarily from September to April (Section 4.1), so survey effort outside of these months is unlikely to detect the species and has not been

included in Table 4.1 or Figure 4.1. ARU data from the AREH project indicate that Oriental Plovers are detected on ARUs during the day and night (Biota 2025a) so units deployed to target Night Parrots that are set to record only at night are suitable for detecting Oriental Plovers.

Table 4.1: Survey effort suitable for detecting Oriental Plover in the Winu locality.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	17 sites (790 minutes)	26 sites (1,240 minutes)
ARUs	19 sites (1,947 nights)	30 sites (3,478 nights)
General or Targeted Searches	47 searches (1,932 minutes)[1]	83 searches (4,503 minutes)[1]
Nocturnal Searches	5 searches (704 minutes)[1]	1 search (928 minutes)[1]

[1] Duration data not available for some searches, so duration given here is an underestimate.

Assessment of the occurrence of Oriental Plover in the DE is based primarily on records obtained from the Winu and AREH field surveys, supplemented by existing records from the region. Survey effort does not meet the five phases of survey for all areas of the DE. However, the combination of ARU deployments and on-ground surveys across the DE cover four seasons each, which we consider to be sufficient to provide an adequate assessment of the species' occurrence within the DE.

4.4 Survey Findings

4.4.1 Occurrence in the Winu DE and locality

Oriental Plovers have been recorded at five locations within the DE, and on a further six ARUs located within 200 m of the DE (Table 4.2; Figure 4.2). Birds observed in the DE were observed foraging or loafing in open areas within the clayey sandplain with termitaria habitat, and adjacent areas mapped as shrub and spinifex on sandplain, or in one case overflying. The pattern of calling in ARU detections usually indicates birds in flight moving past the recorder, though Oriental Plovers are more likely to call in flight than while on the ground foraging so it is possible that birds foraged in these areas on occasion without being detected.

Previous regional records have been concentrated along the coast at Eighty Mile Beach and on adjacent coastal plains (Cornell Lab of Ornithology 2025). However, ARU data collected regionally during Winu and AREH fauna surveys indicate that the species occurs widely in inland areas of the locality (Figure 4.3).

Regionally, Oriental Plovers congregate along Eighty Mile Beach and the adjacent plains on arrival in Australia, reportedly remaining in these areas until the wet season begins before spreading out across inland areas of northern Australia (Minton et al. 2013). Although this pattern is evident in the occurrence of Oriental Plovers along Eighty Mile Beach, birds have been observed inland around the Winu locality from their arrival in September, so some individuals clearly move inland upon arrival. It is possible that these birds move between these inland areas and the coast to seek thermal refuges for roosting until the wet season rains make wetland areas available inland for this purpose.

Table 4.2: Oriental Plover records from the Winu DE and immediate surrounds.

Site	Location		Record type	Notes
	Latitude	Longitude		
Within DE				
WIN05P	-20.7303	121.7395	Observation	Single bird observed overflying in September 2019.
Opportunistic	-20.7751	121.8599	Observation	Two birds observed foraging on open ground near the airport in September 2019.
Opportunistic	-20.7770	121.8633	Observation	Six birds observed on open ground near the airport in September 2019.
Opportunistic	-20.7318	121.7682	Observation	Two birds observed overflying in November 2019.
AREH09A	-20.1120	121.2320	Sound recording	Birds detected passing on two days in January 2021, both during the day.
ARU within 200 m of DE				
RIM03A	-20.8097	121.9351	Sound recording	Birds detected passing on 5 days between February and March 2025, all at night[1].
AREH01	-19.9990	120.8379	Sound recording	Birds detected passing on 8 days between September 2020 and March 2021; 5 during day and 3 at night
AREH02	-20.0230	120.9035	Sound recording	Birds detected passing on 7 days between September 2020 and January 2021; 5 during day and 2 at night
AREH03	-20.0545	121.0130	Sound recording	Birds detected passing on 5 days from October to December 2020, all during the morning.
AREH04	-20.0903	121.1140	Sound recording	Birds detected passing on one afternoon in September 2020.
AREH10	-20.1380	121.3771	Sound recording	Birds detected passing on one day in November 2022 during the early morning, and on two days in January 2023 in the morning and late afternoon.

[1] Unit recording only at night.

4.4.2 Population in the Winu DE

Observations of Oriental Plovers within the DE have all involved <10 individuals, so it is likely that the overall population using the development envelope is relatively small (likely <100 individuals). This is supported by ARU recordings which primarily involve relatively small numbers of calls; though the call data do not demonstrate this with certainty, it does suggest relatively small flocks are involved in most ARU records. The broader region does support large numbers of Oriental Plovers, with counts of up to 144,300 recorded along Eighty Mile Beach (Piersma and Hassell 2010) and frequent counts over the 1% criterion of 2,300 (Driessen et al. 2025). These records are all from Eighty Mile Beach and the adjacent coastal plains, but none from further inland. Nevertheless, it is possible that larger numbers of Oriental Plovers may occur in the DE on rare occasions.

The flyway population estimate for Oriental Plover is 230,000, meaning that 230 individuals constitute a nationally significant proportion of the species' population, and 2,300 individuals constitute an internationally significant proportion (van Swinderen et al. 2025). As discussed

above, it is likely that the population using the DE numbers <100 individuals, but it is possible that over 230 individuals may use the DE occasionally. It is unlikely that the DE supports 2,300 or more Oriental Plovers.

4.4.3 Habitat in Winu Locality

Oriental Plovers observed within the DE were using clayey sandplain with termitaria habitat, and adjacent areas mapped as shrub and spinifex on sandplain. Suitable foraging habitat for the species exists in the DE in the clayey sandplain with termitaria, ephemeral claypan habitats, and disturbed and cleared areas (see Table 9.2). Potentially suitable foraging habitat also exists in open parts of shrub and spinifex sandplain, and gravelly lateritic rise habitat types, such as recently-burnt areas. The ephemeral claypan habitats also represent potential roosting habitat, particularly when inundated.

As discussed above in Section 4.4.2, it is possible that the DE occasionally supports 230 or more Oriental Plovers and thus may support an ecologically significant population of Oriental Plover and thus constitute important habitat for the species according to DCCEEW guidelines (DoEE 2017). However, similar suitable foraging habitat to that available in the DE also occurs widely through the Great Sandy Desert and the sandplains extending north towards Eighty Mile Beach. Higher quality foraging habitat also exists in the region at Lake Waukarlycarly and the former Texas borefield (now removed from the DE), and further afield on the near-coastal plains adjacent to Eighty Mile Beach and the Walyarta (Mandora Marsh) system.

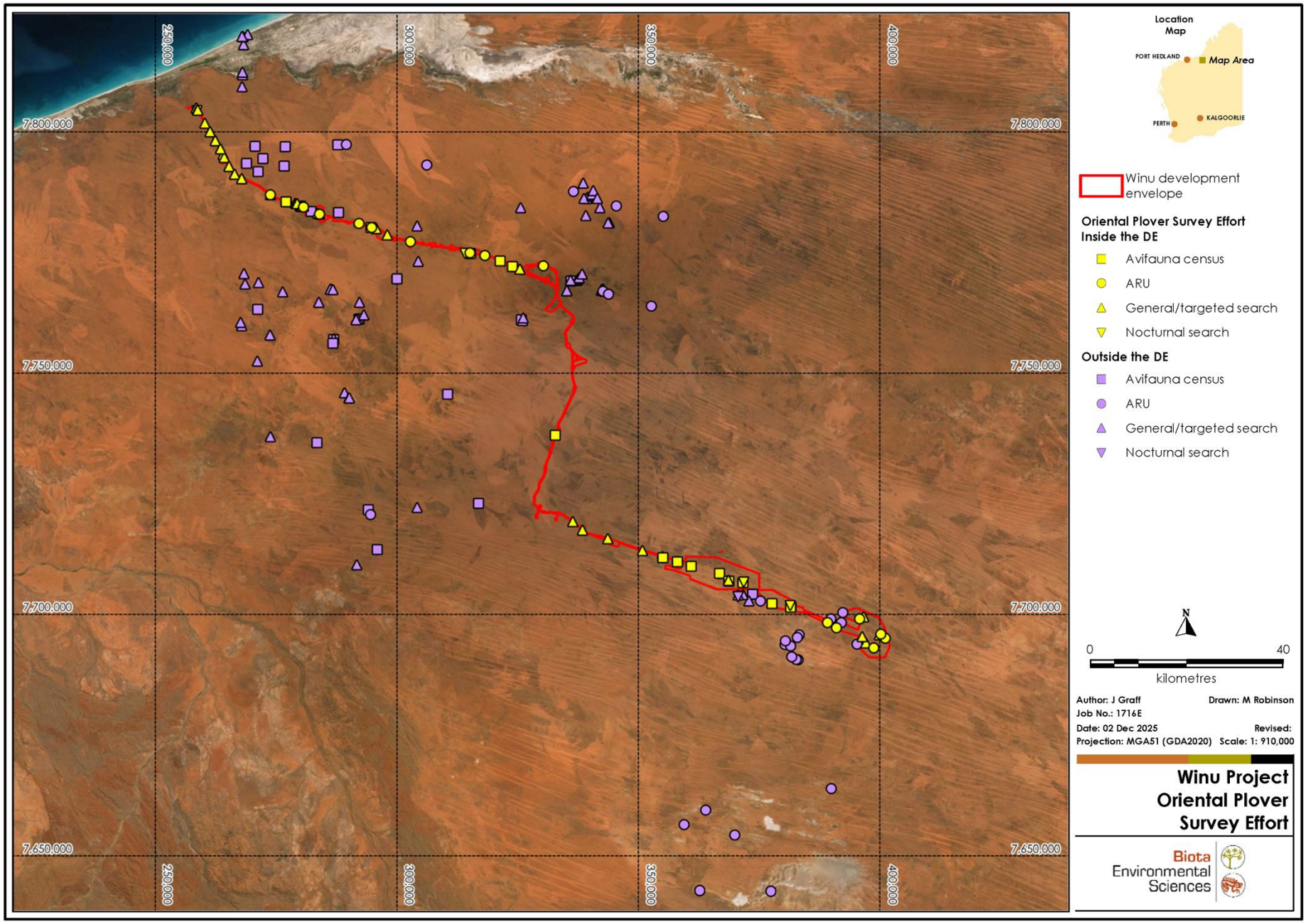

Figure 4.1: **Survey effort suitable for detecting Oriental Plovers.**

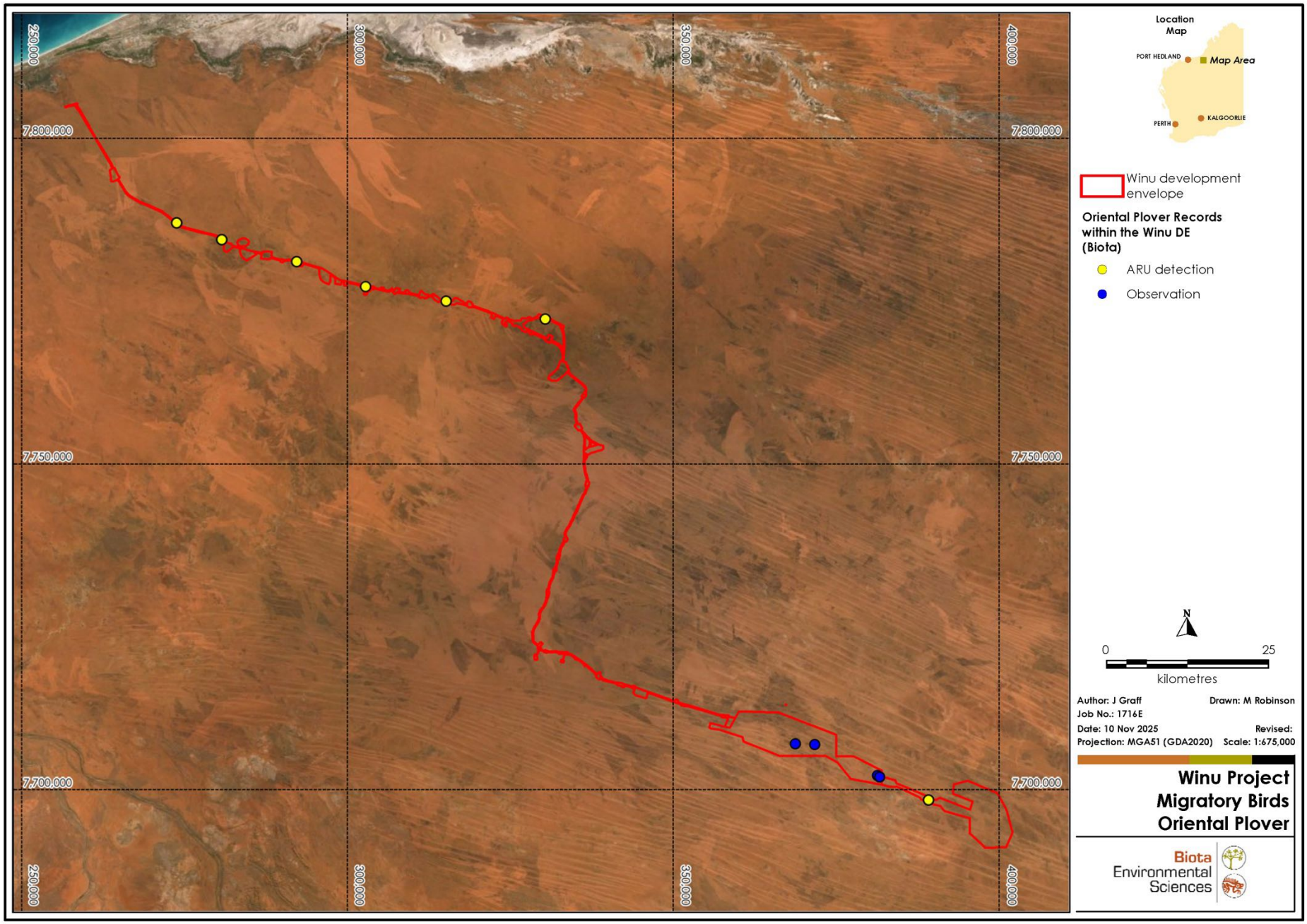

Figure 4.2: **Oriental Plover records within the Winu DE.**

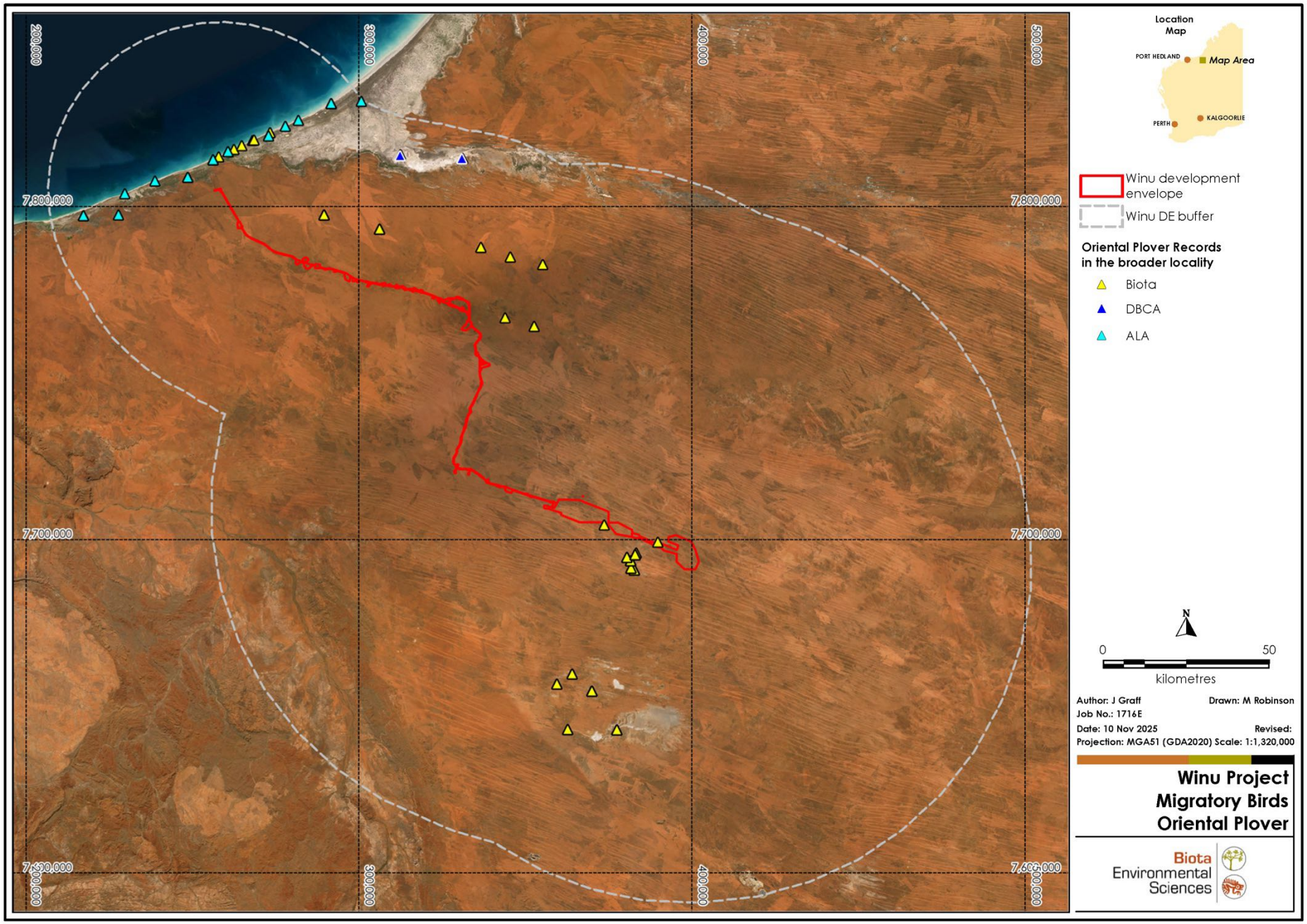

Figure 4.3: **Oriental Plover records from the Winu locality.**

5.0 Little Curlew

5.1 Species Background

The Little Curlew (*Numenius minutus*) is listed as Migratory under the EPBC Act and the BC Act. It is a common non-breeding summer migrant to northern Australia, primarily between mid-September and April, with very few overwintering (Menkhorst et al. 2017).

The Little Curlew is not listed as threatened under state or federal legislation and is currently listed as 'Least Concern' by the IUCN. However, the population is thought to be declining globally (BirdLife International 2025). There is some evidence of a short-term decline in Australia, though insufficient data were available to assess the longer-term population trend (Clemens et al. 2019).

5.2 Habitat

The Little Curlew favours short grassland habitats for foraging, including natural short grasslands or recently burnt grasslands, airfields and sports grounds, and less commonly other open habitats such as drying river beds and tidal flats (Johnstone and Storr 1998). During the heat of the day, they often move to freshwater wetlands, beaches or tidal flats to loaf or roost on cool, moist substrates (Menkhorst et al. 2017).

5.3 Survey Adequacy

There is limited published guidance on specific survey effort and methodology for Little Curlew. As with Oriental Plover, the Little Curlew is one of 37 shorebird species considered under EPBC Act Policy Statement 3.21, but the survey guidance within focuses on wetland habitats and discrete shorebird areas. This is of limited suitability for much of the DE which encompasses sand dune and sand plain habitats that extend largely contiguously for over 100 km north, east and south-east, making the definition of discrete shorebird areas in such habitat problematic. Nevertheless, recommended survey effort guidelines are still applicable, with a recommended five survey phases for a shorebird site including four phases from when the largest numbers of shorebirds are present (approximately October to April in northern Australia) and one phase during the austral winter (DoEE 2017).

Survey effort undertaken that was suitable for detecting Little Curlews included systematic avifauna surveys and deployment of ARUs, along with the possibility of observations during general and targeted searches or opportunistically (Table 5.1; Figure 5.1). Passive acoustic recorders have proven effective for detecting the presence of this species over long deployments in the AREH survey area (Biota 2025a).

Little Curlews are present in Australia primarily from September to April (Section 5.1), so survey effort outside of these months is unlikely to detect the species and has not been included in Table 5.1 or Figure 5.1. ARU data from the AREH project indicate that Little Curlew are primarily detected on ARUs at night (Biota 2025a), so units deployed to record only at night are suitable for detecting Little Curlews, and are included in the survey effort outlined below.

Table 5.1: Survey effort suitable for detecting Little Curlew in the Winu locality.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	17 sites (790 minutes)	26 sites (1,240 minutes)
ARUs	19 sites (1,947 nights)	30 sites (3,478 nights)
General or Targeted Searches	47 searches (1,932 minutes)[1]	83 searches (4,503 minutes)[1]
Nocturnal Searches	5 searches (704 minutes)[1]	1 search (928 minutes)[1]

[1] Duration data not available for some searches, so duration given here is an underestimate.

Assessment of the occurrence of Little Curlew in the DE is based primarily on ARU data collected from the Winu and AREH projects, supplemented by existing records from the region. Survey effort does not meet the five phases of survey for all areas of the DE outlined within EPBC Act Policy Statement 3.21. The combination of ARU deployments and on-ground surveys across the DE cover four seasons each, which represents significant survey effort suitable for detecting this species. However, as all Little Curlew records obtained thus far are from ARU recordings, there are limitations to estimating population size and the extent to which birds use the DE for foraging (as ARU recordings may represent birds overflying the DE, not using it). To address this, we have adopted a more precautionary approach to population assessment and habitat usage in Sections 5.4.2 and 5.4.3 below.

5.4 Survey Findings

5.4.1 Occurrence in the Winu DE and locality

Little Curlews have been recorded at three locations within the DE, and on a further five ARUs located within 200 m of the DE (Table 5.2; Figure 5.2). All records involve calls detected on ARUs, and primarily involved birds in flight, as the species primarily calls in flight and the patterns of calling typically indicated individuals moving past recording equipment.

Previous regional records have been concentrated along the coast at Eighty Mile Beach and on adjacent coastal plains (Cornell Lab of Ornithology 2025). However, ARU data collected regionally during Winu and AREH fauna surveys indicate that the species occurs widely in inland areas of the locality (Figure 5.3).

As with Oriental Plovers, Little Curlews in this region congregate along Eighty Mile Beach and the adjacent plains on arrival in Australia, reportedly remaining in these areas until the wet season begins before spreading out across inland areas of northern Australia (Minton et al. 2013). In contrast to detections of Oriental Plovers, the detections of Little Curlew within the DE and surrounds also show this pattern, with detections recorded only from December onwards once the wet season is likely to have commenced.

Table 5.2: Little Curlew records from the Winu DE and immediate surrounds.

Site	Location		Record type	Notes
	Latitude	Longitude		
Within DE				
WIF05A	-20.8581	122.0266	Sound recording	Birds detected on five days in March and April 2024, all detections at night[1].
AREH05A	-20.1170	121.2612	Sound recording	Birds detected on two days in February 2021, both detections at night.
AREH08A	-20.0628	121.0379	Sound recording	Calls from at least one bird detected on one day in January 2023, detection at night.
ARU within 200m of DE				
AREH01A	-19.9990	120.8379	Sound recording	Birds detected on three days from February to March 2021, all between midnight and sunrise.
AREH02A	-20.0230	120.9035	Sound recording	At least one bird passes in the early morning on one day in December 2020.
AREH03A	-20.0545	121.0130	Sound recording	Birds detected passing in the evening on one day in February 2021.
AREH07A	-20.0367	120.9351	Sound recording	Calls from at least one bird detected on one day in February 2023, detection at night.
AREH10A	-20.1380	121.3771	Sound recording	Birds detected passing on one day in February 2023 and one day in March 2023, both detections at night.

[1] Unit recording only at night

5.4.2 Population in the Winu DE

No visual observations of Little Curlew were obtained from the DE or the broader locality, which limits our ability to assess population size as counts are not reliably obtainable from ARU data alone. However, ARU recordings generally only involved a few calls, and most inland records involve fewer than 100 individuals (Cornell Lab of Ornithology 2025). Thus, it is likely that the number of Little Curlews using the DE is fewer than 100 individuals, if indeed the species does regularly use the DE. However, larger numbers do occur along the coast at Eighty Mile Beach and on adjacent coastal plains, with occasional higher counts further from the coast.

The flyway population estimate for Little Curlew is 110,000, meaning that 110 individuals constitute a nationally significant proportion of the species' population, and 1,100 individuals constitute an internationally significant proportion. Based on the available information, and adopting a conservative approach, it is possible that the DE supports 110 Little Curlews on occasion, though we consider that the likelihood of this is still low.

5.4.3 Habitat in Winu Locality

Suitable foraging habitat for Little Curlews in the DE occurs largely in the clayey sandplain with termitaria, ephemeral claypan habitats, and some disturbed and cleared areas (see Table 9.2). Potentially suitable foraging habitat also exists in open parts of shrub and spinifex sandplain, and gravelly lateritic rises habitat types, such as recently-burnt areas. The ephemeral claypan habitats also represent potential roosting habitat, particularly when inundated.

As discussed above in Section 5.4.2, it is unlikely that the DE regularly supports 110 or more Little Curlew and thus is unlikely to support an ecologically significant proportion of the Little Curlew population. However, because the species may be declining in Australia (Clemens et al. 2019), habitat in the DE could be considered to constitute important habitat for the species according to DCCEEW guidelines (DoEE 2017). As with most other species discussed here, similar suitable foraging habitat to that available in the DE occurs widely through the Great Sandy Desert and the sandplains extending north towards Eighty Mile Beach. Higher quality foraging habitat also exists in the region at Lake Waukarlycarly and the former Texas borefield (now removed from the DE), and further afield on the near-coastal plains adjacent to Eighty Mile Beach and the Walyarta (Mandora Marsh) system.

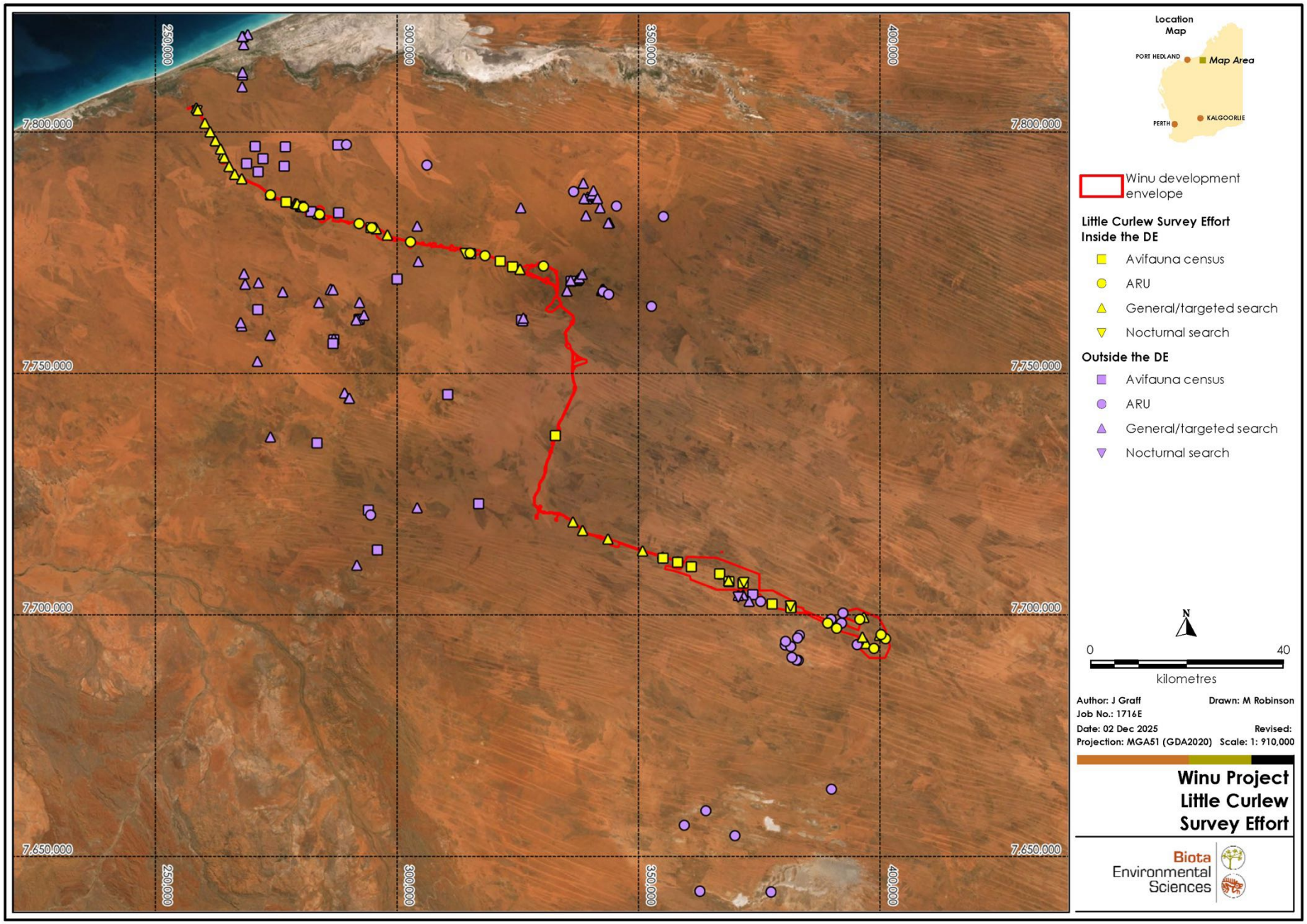

Figure 5.1: **Survey effort suitable for detecting Little Curlews.**

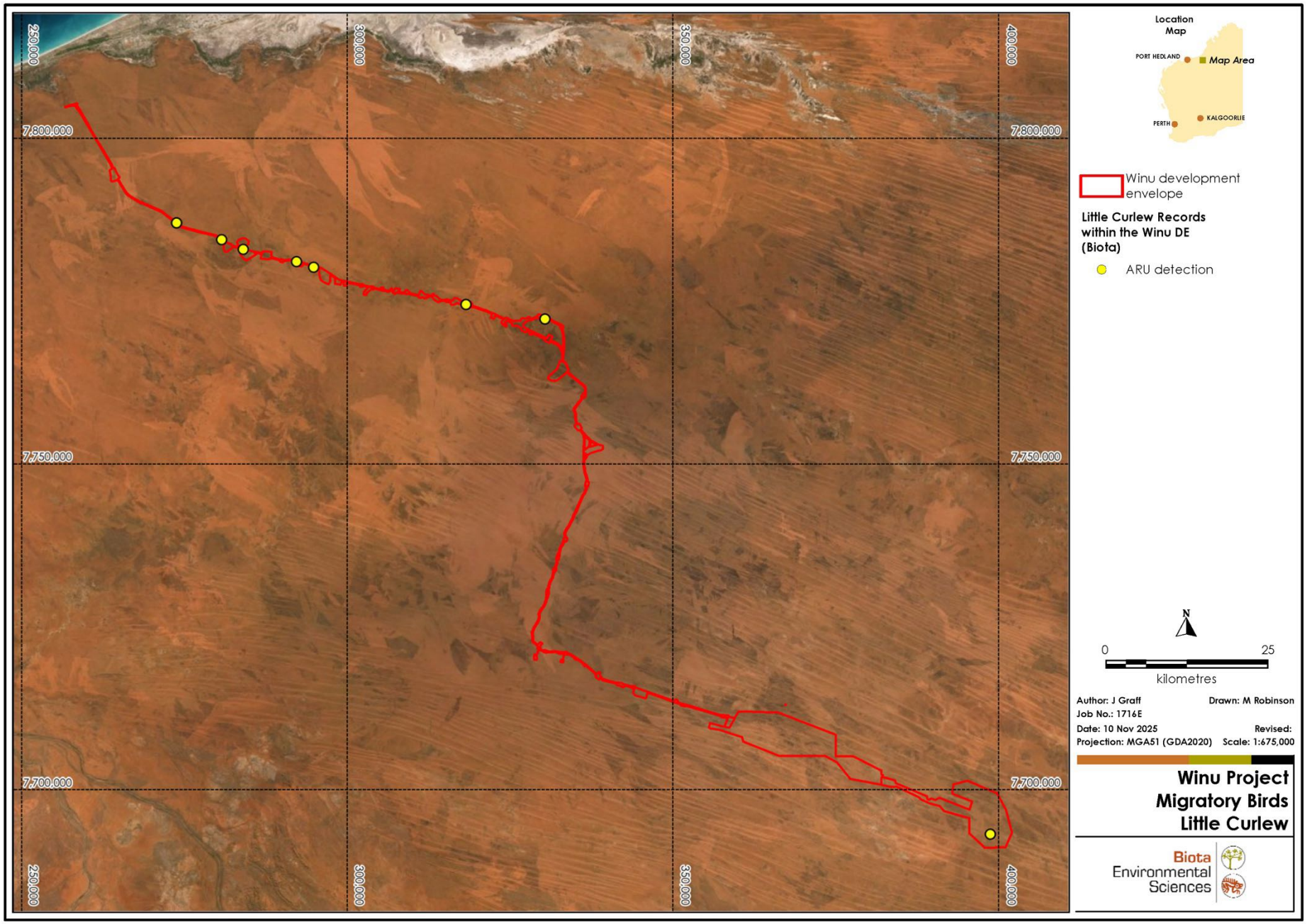

Figure 5.2: **Little Curlew records within the Winu DE.**

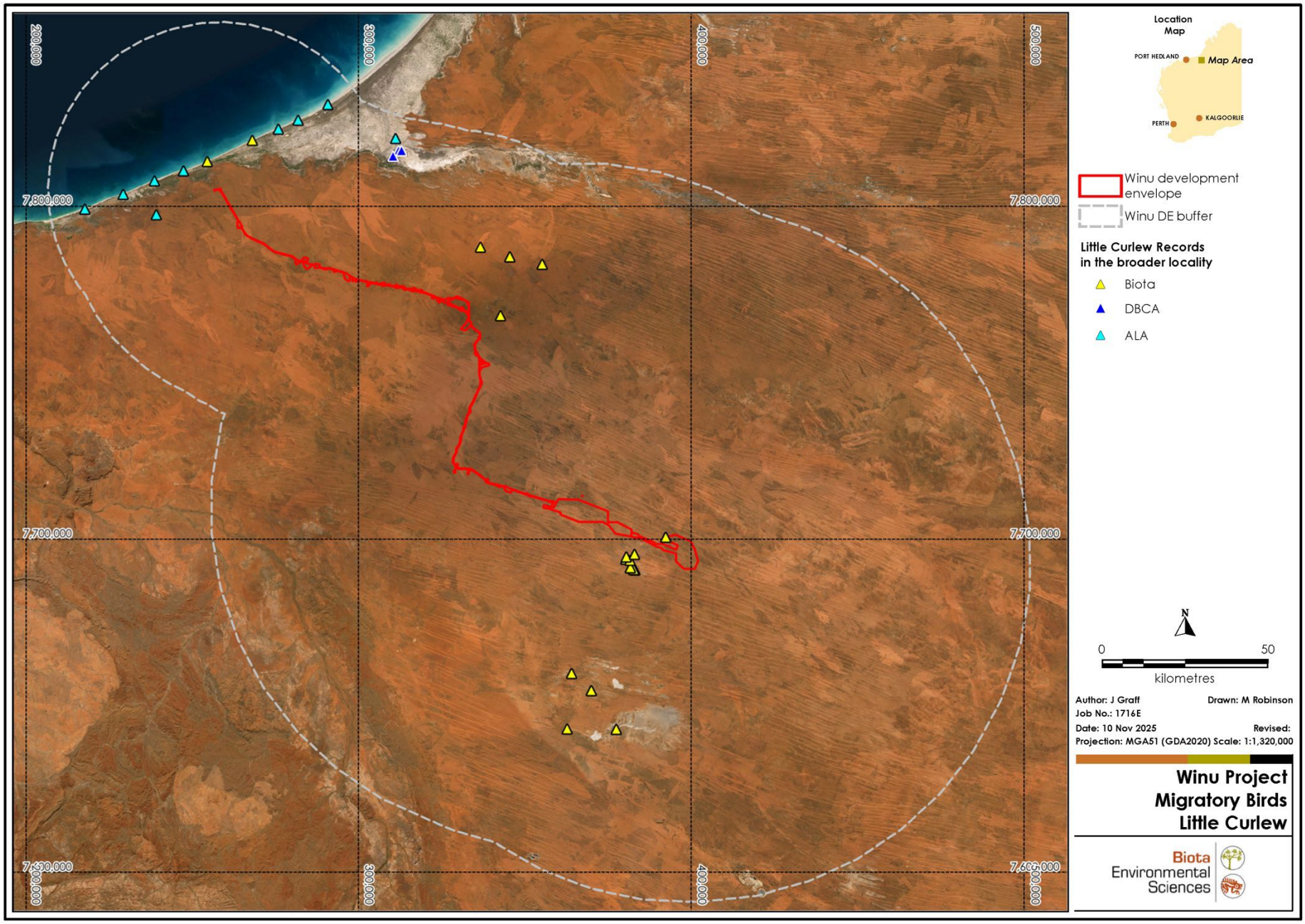

Figure 5.3: **Little Curlew records from the Winu locality.**

6.0 Oriental Pratincole

6.1 Species Background

The Oriental Pratincole (*Glareola maldivarum*) is listed as Migratory under the EPBC Act and the BC Act. The species is a non-breeding migrant to Australia and is typically present from October to May, with the largest numbers present from December to March (Johnstone and Storr 1998, Sitters et al. 2004)

The Oriental Pratincole is not listed as threatened under state or federal legislation and is currently listed as 'Least Concern' by the IUCN. The population of the species is also thought to be stable globally and in the East-Asian Australasian Flyway, including Australia (BirdLife International 2025), though its highly nomadic habits make identifying population trends in Australia challenging (see e.g. Clemens et al. 2019).

6.2 Habitat

The Oriental Pratincole often uses broadly similar foraging habitats to the Oriental Plover, including grassland plains, bare wetland margins, and agricultural land. However, Oriental Pratincoles take most of their insect prey aerially (Johnstone and Storr 1998), and will forage over a wider range of open habitat types, including spinifex grasslands, shrublands, and occasionally over more wooded areas. The species will also use tidal mudflats, beaches, sewage ponds and freshwater wetland areas, primarily for roosting during the heat of the day. They are mobile in response to conditions, and disperse across inland northern Australia during the wet season, occasionally gathering in exceptionally high numbers (Sitters et al. 2004).

6.3 Survey Adequacy

There is little formal guidance or standard survey methodology for Oriental Pratincoles. The species is one of 37 shorebird species considered under EPBC Act Policy Statement 3.21, but the survey guidance outlined within focuses on wetland habitats and is of limited suitability for much of the DE. Oriental Pratincoles forage aerially over a range of open habitats and occurrence at a location can be highly variable, both in terms of presence/absence and overall numbers. Thus, as for Pacific Swifts, short duration surveys can be ineffective for detecting the presence of the species, so consideration existing records in databases, and input from local observers is likely to be important for assessment of occurrence in an area.

Survey effort undertaken that was suitable for detecting Oriental Pratincoles included systematic avifauna surveys and deployment of ARUs, along with the possibility of observations during general and targeted searches or opportunistically (Table 6.1; Figure 6.1). Passive acoustic recorders have proven effective for detecting the presence of this species over long deployments in the AREH survey area (Biota 2025a).

Oriental Pratincole are present in Australia in the largest numbers from November to May (Section 6.1), so survey effort outside of these months is unlikely to detect the species and has not been included in Table 6.1. These data also indicate that Oriental Pratincole are primarily detected on ARUs during the day (Biota 2025a). Thus units deployed that are set to record only at night are of limited suitability for detecting Oriental Pratincoles and have also

not been included in Table 6.1, though there is the possibility of occasional opportunistic detections.

Table 6.1: Survey effort suitable for detecting Oriental Pratincole in the Winu locality.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	3 sites (80 minutes)	19 sites (1,020 minutes)
ARUs	9 sites (1,218 nights)	8 sites (1,074 nights)
General or Targeted Searches	9 searches (1,032 minutes)[1]	40 searches (1,055 minutes)[1]
Nocturnal Searches	2 searches (duration unknown)[1]	-

[1] Duration data not available for some searches, so duration given here is an underestimate.

Assessment of the occurrence of Oriental Pratincole within the DE is based primarily on ARU data collected from the AREH project, supplemented by several visual observations and existing records from the region. Survey effort does not meet the five phases of survey for all areas of the DE outlined in the migratory shorebird guidelines, but the extensive ARU survey effort is across multiple seasons in the RAC is likely to be more effective for understanding their occurrence due to the erratic occurrence of the species in most areas. There is limited appropriate ARU survey effort within the main DE, but is unlikely that such effort would significantly alter our conclusions about the species' occurrence in the DE.

6.4 Survey Findings

6.4.1 Occurrence in the Winu DE and locality

Oriental Pratincoles were recorded from six locations within the DE, all within the RAC, and on a further seven ARUs located within 200 m of the DE along the RAC (Table 6.2; Figure 6.2). Oriental Pratincoles were recorded frequently on ARUs deployed within the RAC as part of migratory bird surveys for the AREH project (Biota 2025a).

Regional records involve counts ranging from single individuals to flocks of 50,000 and were primarily concentrated relatively close to the coast (Cornell Lab of Ornithology 2025). However, this is likely primarily an artefact of relative survey effort, as observations from the AREH project demonstrated that the species also occurs widely further inland (Figure 6.3).

The largest numbers of Oriental Pratincoles typically occur in the region between December and March, largely coinciding with the main months of the wet season. This pattern is also evident in the records from the DE (Table 6.2) which were all obtained between December and March.

Table 6.2: Oriental Pratincole records from the Winu DE and immediate surrounds.

Site	Location		Record type	Notes
	Latitude	Longitude		
Within DE				
Opportunistic	-19.9035	120.7338	Observation	Two flocks, totalling c. 1,000 individuals, foraging over burnt spinifex and acacia shrubland in February 2018.

Site	Location		Record type	Notes
	Latitude	Longitude		
Opportunistic	-19.9645	120.7724	Observation	Flock of c. 250 individuals foraging over open shrubland and spinifex in February 2018.
Opportunistic	-20.1140	121.2536	Observation	Flock of 35 individuals flying overhead in February 2018.
AREH05	-20.1170	121.2612	Sound recording	Birds detected on 25 days from December 2020 to March 2021, majority of detections during the day or at dawn.
AREH08	-20.0628	121.0379	Sound recording	Birds detected on 26 days in January and February 2023, majority of detections during day or at dusk or dawn.
AREH09	-20.1120	121.2320	Sound recording	Flocks detected on 30 days in January and February, majority of detections during day or at dusk or dawn.
ARU within 200 m of DE				
AREH01	-19.9990	120.8379	Sound recording	Birds detected on 22 days from December 2020 to March 2021, all detections during day or at dawn/dusk.
AREH02	-20.0230	120.9035	Sound recording	Birds detected on 29 days from December 2020 to March 2021, majority of detections during the day or at dawn.
AREH03	-20.0545	121.0130	Sound recording	Birds detected on 22 days from December 2020 to March 2021, majority of detections during the day or at dawn.
AREH04	-20.0903	121.1140	Sound recording	Birds detected on one morning in February 2021 and on one morning in March 2021.
AREH07	-20.0367	120.9351	Sound recording	Birds detected on 18 days in January and February 2023, majority of detections during day or at dusk or dawn.
AREH10	-20.1380	121.3771	Sound recording	Birds detected on 33 days in January and February 2023, majority of detections during day or at dusk or dawn.

6.4.2 Population in the Winu DE

The three Oriental Pratincole observations within the Winu DE have involved between 35 and c. 1,000 individuals. The vast majority of records were obtained from sound recordings, so accurate counts are not possible. However, the volume of calls present in some audio detections indicates large numbers of individuals were present at times. Regional records in recent years include flocks of up to 50,000 (Cornell Lab of Ornithology 2025), primarily from Eighty Mile Beach and immediately adjacent near-coastal plains. The Eighty Mile Beach area often hosts huge numbers of Oriental Pratincoles, most notably in 2004 when an aerial count estimated 2.88 million individuals loafing along Eighty Mile Beach during the heat of the day (Sitters et al. 2004). These exceptional counts are primarily observed along Eighty Mile Beach during the heat of the day, or foraging over adjacent coastal and near-coastal plains, but large numbers have been reported further inland.

The flyway population estimate for Oriental Plover is 2.88 million, meaning that 2,880 individuals constitute a nationally significant proportion of the species' population, and 28,800 individuals constitute an internationally significant proportion (van Swinderen et al. 2025).

6.4.3 Habitat in Winu Locality

Oriental Pratincoles are likely to use airspace over all habitats within the Winu DE for foraging. The species does not breed in Australia, so will not use the DE for breeding.

As discussed above in Section 6.4.2, it is likely that the DE supports more that 2,880 Oriental Pratincoles on occasion and thus may support an ecologically significant proportion of the population and constitute important habitat for the species according to DCCEEW guidelines (DoEE 2017). However, similar suitable foraging habitat to that available in the DE also occurs widely through the Great Sandy Desert and the sandplains extending north towards Eighty Mile Beach, while Eighty Mile Beach itself, and the Walyarta (Mandora Marsh) system and nearby coastal plains are listed as an important sites for the species (BirdLife International 2025).

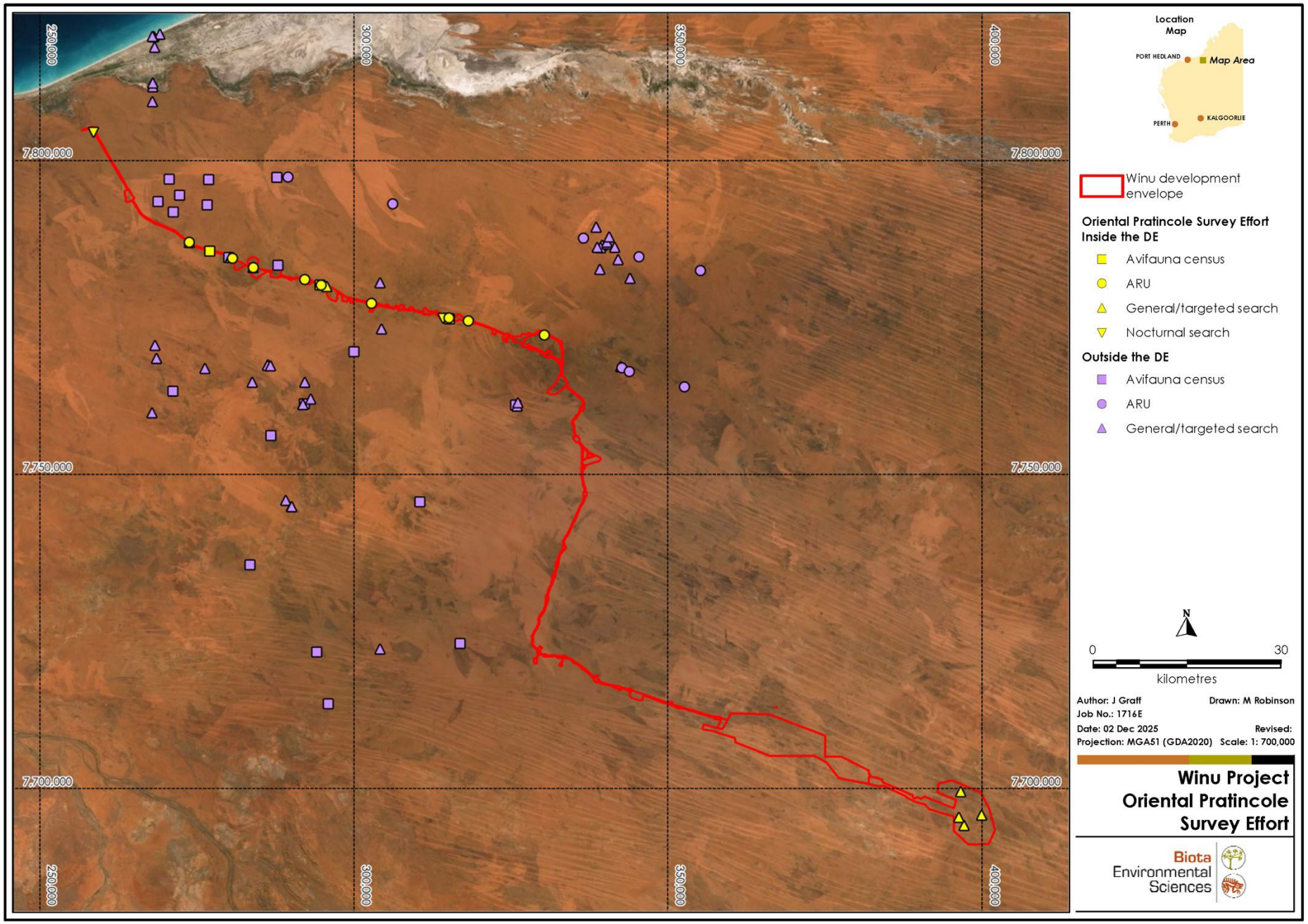

Figure 6.1: **Survey effort suitable for detecting Oriental Pratincoles.**

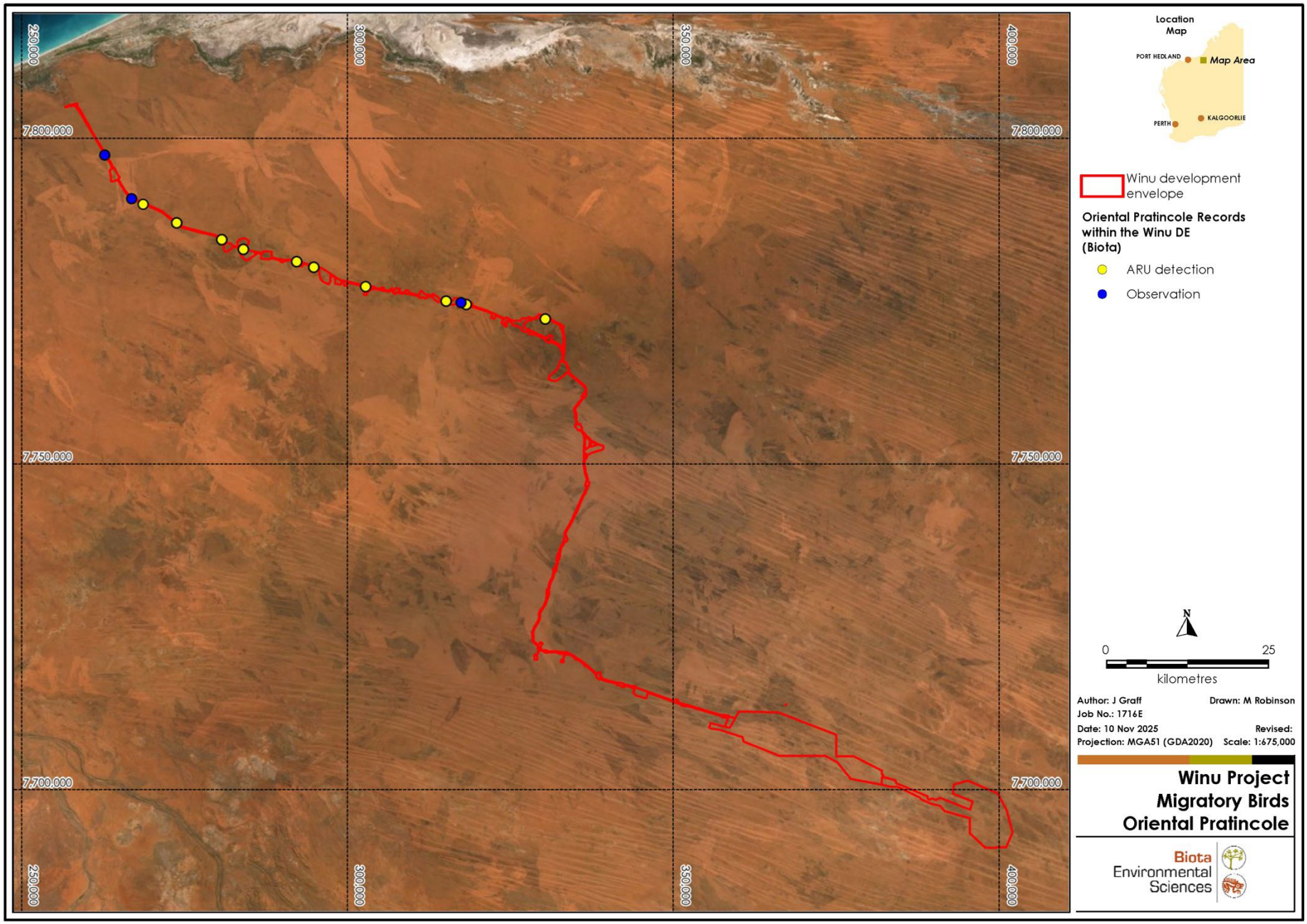

Figure 6.2: **Oriental Pratincole records within the Winu DE.**

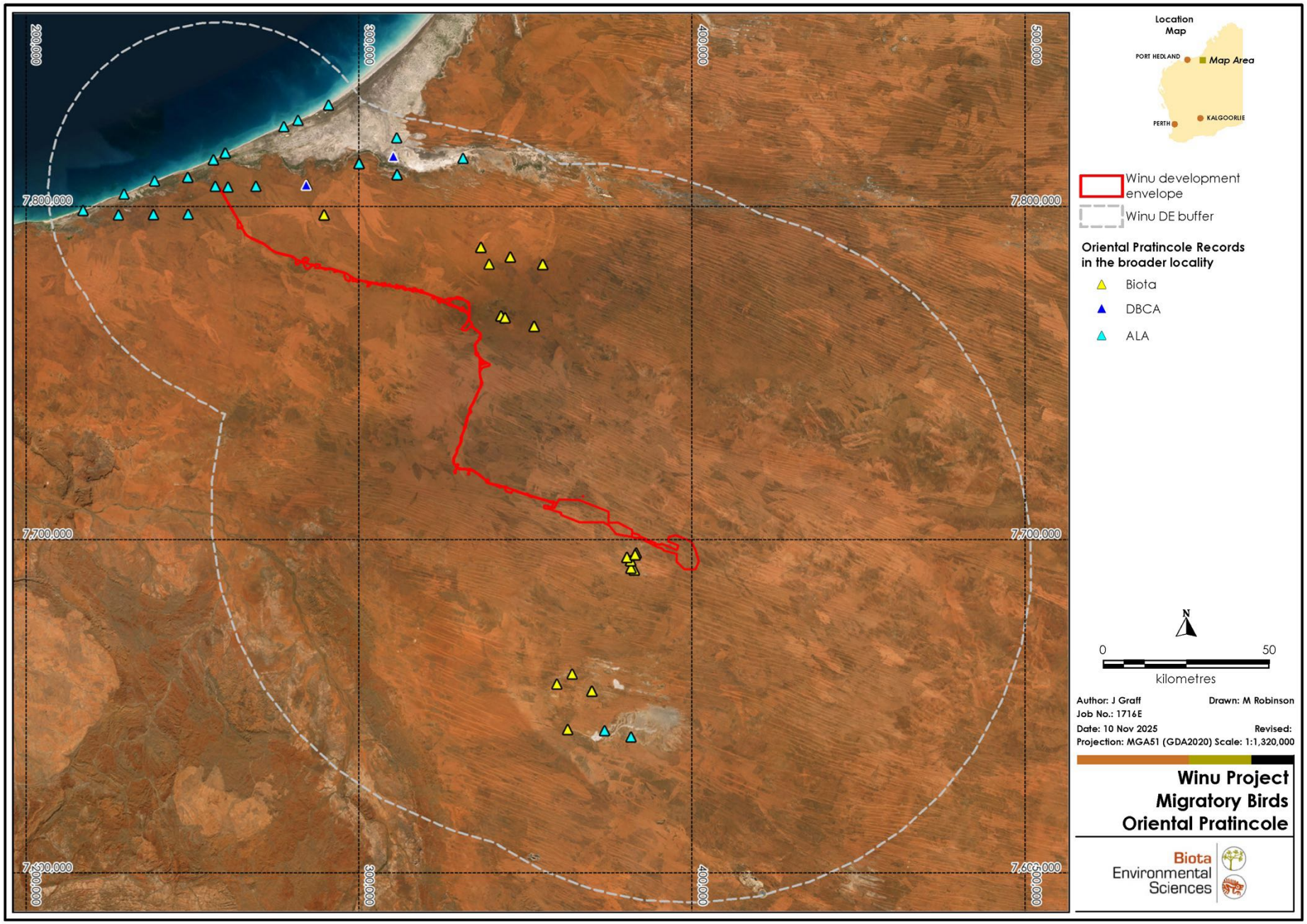

Figure 6.3: **Oriental Pratincole records from the Winu locality.**

7.0 Australian [Gull-billed] Tern

7.1 Species Background

There are two populations of Gull-billed Tern in Australia; a resident population, *G.* [*nilotica*] *macrotarsa* and a migratory population *G. nilotica affinis*. Most authorities now recognise the resident Australian population as a distinct species, the Australian [Gull-billed] Tern, based on differences in plumage, structure, ecology and genetics (Rogers et al. 2005). However, the Australian [Gull-billed] Tern is still listed as Migratory under the EPBC Act due to a lag in updating the taxonomy of the species. Australian [Gull-billed] Terns are nomadic and occur widely across Australia, including both coastal and inland areas, particularly in northern Australia (Menkhorst et al. 2017).

The Australian [Gull-billed] Tern is not listed as threatened under state or federal legislation and is currently listed as 'Least Concern' by the IUCN. The population trend of the species appears to be increasing over both the short and medium term (Clemens et al. 2019).

7.2 Habitat

Australian Terns breed colonially on flooded inland wetlands (Johnstone and Storr 1998). When not breeding, the species is most common in coastal and estuarine areas with tidal flats, but also occurs on freshwater and saline wetlands (Menkhorst et al. 2017). Australian [Gull-billed] Terns will also forage over dry grassland areas, sometimes far from water (Menkhorst et al. 2017).

7.3 Survey Adequacy

There are no specific survey guidelines for Australian [Gull-billed] Terns, though the guidelines for migratory shorebird surveys (DoEE 2017) have some applicability to the species. However, as the species is nomadic within Australia and does not typically migrate overseas, survey timing outlined in those guidelines is unlikely to be applicable in most areas.

Survey effort undertaken that was suitable for detecting Australian Tern included systematic avifauna surveys, deployment of ARUs, and the possibility of observations during general and targeted searches or opportunistically (Table 7.1). The species has been recorded on ARUs (Biota 2025a), but only infrequently, so it is unclear how effective ARUs are for detecting this species.

The Australian [Gull-billed] Tern is present in Australia throughout the year, so surveys in all months are suitable for detecting the species. However, the species may be present in larger numbers regionally in periods following significant rainfall when ephemeral wetlands in the region hold water.

Table 7.1: Survey effort suitable for detecting Australian [Gull-billed] Tern in the Winu locality.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	32 sites (1,790 minutes)	30 sites (1,660 minutes)
ARUs	28 sites (2,514 nights)	39 sites (5,161 nights)
General or Targeted Searches	113 searches (6,032 minutes)[1]	181 searches (15,112 minutes)[1]

[1] Duration data not available for some searches, so duration given here is an underestimate.

Assessment of the occurrence of Australian [Gull-billed] Terns in the DE is based primarily on records (or lack thereof) from the Winu and AREH project, supplemented by existing records from the region. Extensive survey effort has been undertaken across both projects that would have been suitable for detecting the presence of Australian [Gull-billed] Terns and we consider that this is sufficient for drawing reasonable conclusions about the occurrence of the species within the DE.

7.4 Survey Findings

7.4.1 Occurrence in the Winu DE and locality

A single Australian [Gull-billed] Tern was observed within the MIA during field surveys, while calls were detected on an ARU within 200 m of the DE along the RAC (Table 7.2; Figure 7.2).

Australian [Gull-billed] Terns have regularly been recorded in the region, with most records along Eighty Mile Beach and in the Walyarta (Mandora Marsh) system (Figure 7.3). Breeding is also known from Walyarta when the system is in flood (Biota 2025a).

Table 7.2: Australian [Gull-billed] Tern records from the Winu DE and immediate surrounds.

Site	Location		Record type	Notes
	Latitude	Longitude		
Within DE				
Opportunistic	-20.7330	121.7600	Observation	Single bird observed flying over Winu camp and surroundings passing through the area.
ARU within 200 m of DE				
AREH01A	-19.9990	120.8379	Sound recording	Calls from at least one bird detected on one day in May 2021, detected in the afternoon.

7.4.2 Population in the Winu DE

The sole field observation of Australian [Gull-billed] Tern within the Winu DE involved a single individual. It is not possible to determine the number of individuals involved in the ARU detection with certainty, though only a small number of calls were detected.

The population estimate for Australian [Gull-billed] Terns in 100,000 (Wetlands International 2025), meaning that 100 individuals constitute a nationally significant proportion of the species' population, and 1,000 individuals constitute an internationally significant proportion. Based on the very limited numbers of observations and the nature of available habitat within the DE, it is unlikely that the DE regularly supports 100 or more Australian [Gull-billed] Terns.

7.4.3 Habitat in Winu Locality

The Australian [Gull-billed] Tern observed within the Winu DE was observed in flight over shrub and spinifex on sandplain habitat surrounding Winu camp. Potentially suitable foraging habitat also exists within the remaining non-disturbed habitats within the DE, while the ephemeral claypan habitat (when inundated) represents suitable roosting habitat and

potentially suitable breeding habitat, though the limited extent means it is unlikely that the DE would support breeding.

As discussed above in Section 7.4.2, it is unlikely that the DE regularly supports an ecologically significant proportion of the population of Australian [Gull-billed] Terns. Similarly, the population trend of the species appears to be increasing over both the short and medium term (Clemens et al. 2019). Hence, it is unlikely that the DE constitutes important habitat for Australian [Gull-billed] Terns under MNES guidelines.

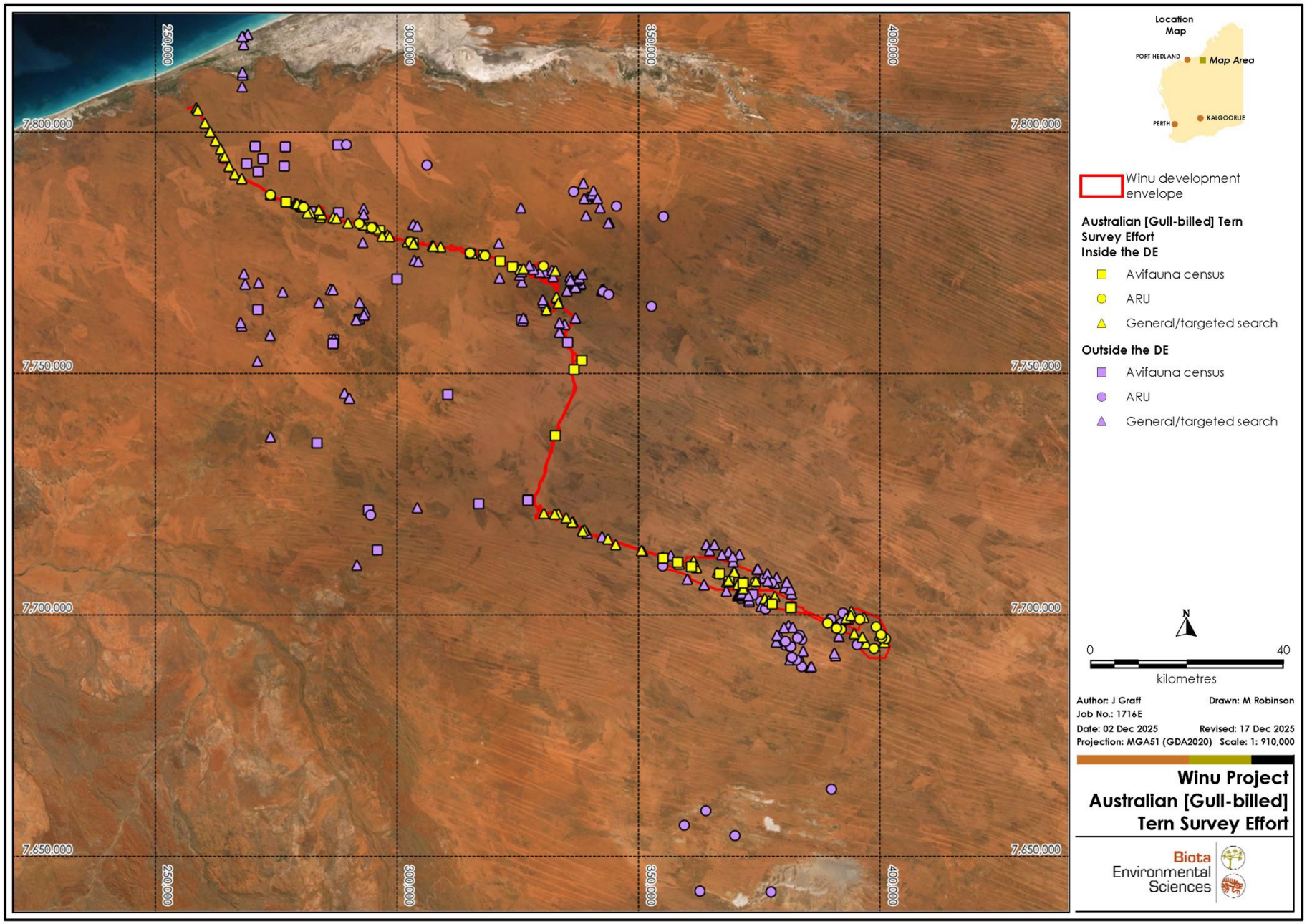

Figure 7.1: **Survey effort suitable for detecting Australian [Gull-billed] Terns.**

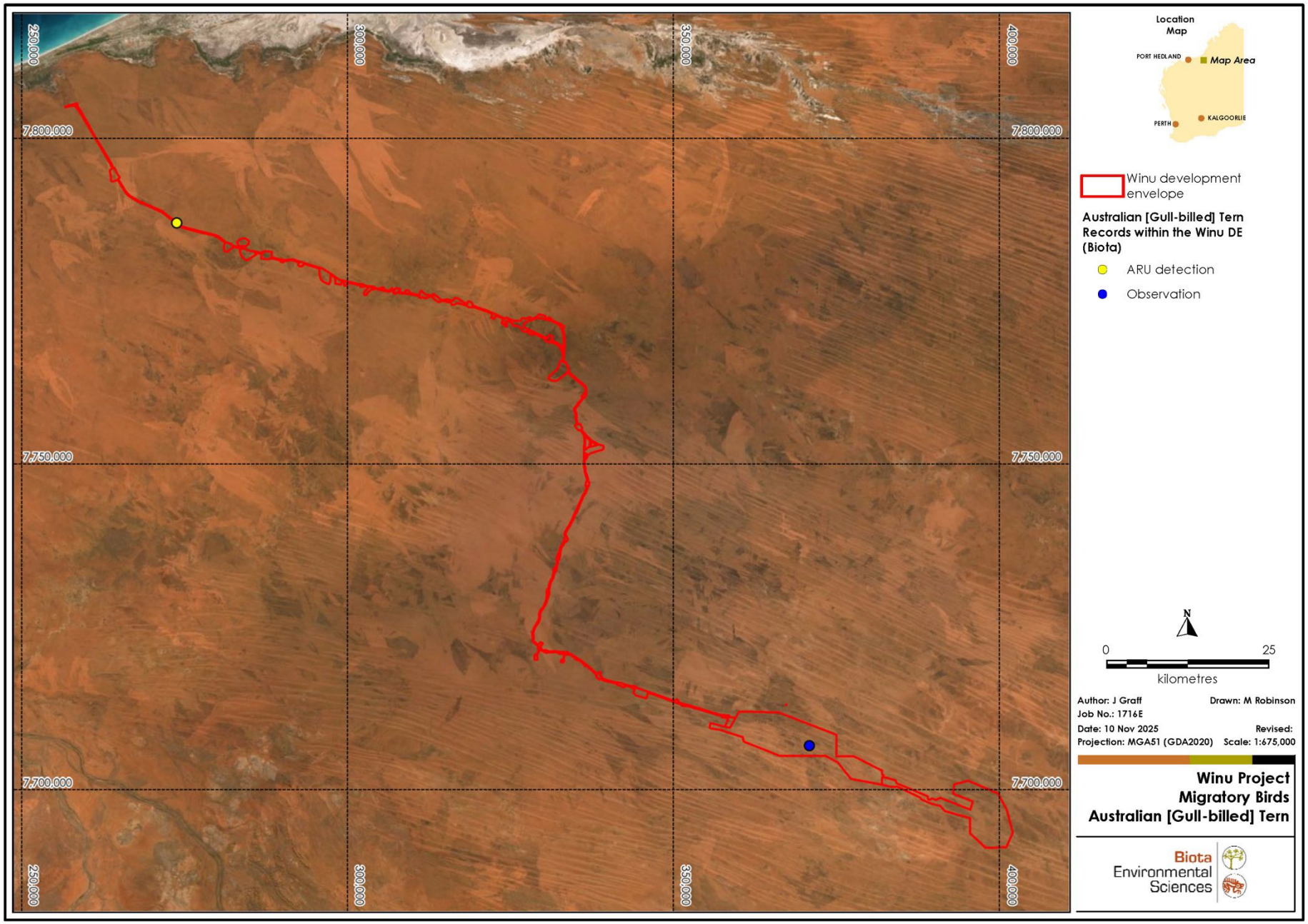

Figure 7.2: **Australian [Gull-billed] Tern records within the Winu DE.**

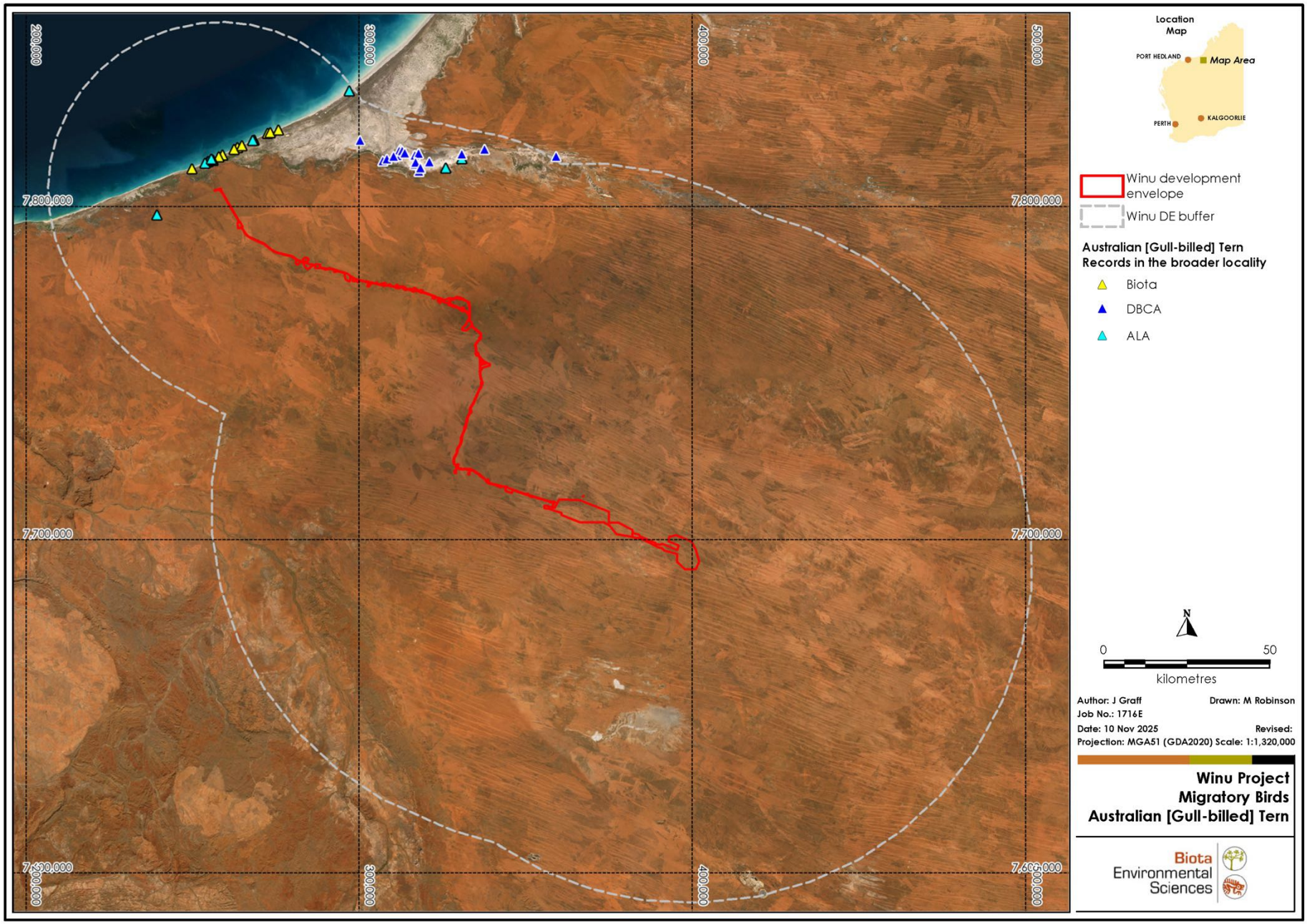

Figure 7.3: **Australian [Gull-billed] Tern records from the Winu locality.**

8.0 Barn Swallow

8.1 Species Background

The Barn Swallow (*Hirundo rustica*) is listed as Migratory under the EPBC Act and the BC Act. The species is a non-breeding migrant to Australia, where it occurs primarily in coastal and near-coastal areas of northern Australia between the Pilbara in Western Australia and northern Queensland (Menkhorst et al. 2017). The species is primarily present in Western Australia between September and April (Johnstone and Storr 2004).

The Barn Swallow is not listed as threatened under state or federal legislation and is currently listed as 'Least Concern' by the IUCN. The global population is thought to be declining based on declines in Europe and North America (BirdLife International 2025), but there is no current evidence of decline in Australia.

8.2 Habitat

Barn Swallows inhabit a range of open habitats, particularly near towns and wetlands, where there are high densities of flying insect prey (Johnstone and Storr 2004, Menkhorst et al. 2017). The draft referral guideline indicates that this species forages in airspace over open vegetation, including both native and agricultural vegetation, and over wetlands (DoE 2015).

8.3 Survey Adequacy

The draft referral guideline does not recommend specific surveys for this species because:

> "*the small numbers of these birds visiting Australia, their non-threatened status, their large populations globally and the improbability of a significant proportion of their population being present at a site for changes to that site to have any significance to the conservation status of the species either in Australia or globally*" (DoE 2015 pp. 18-19)

Nevertheless, survey effort suitable for detecting Barn Swallows was expended within the DE and surrounding areas, including systematic avifauna surveys and the possibility of observations during general and targeted searches or opportunistically (Table 8.1). Passive acoustic recorders may be able to detect Barn Swallows, but have not yet been demonstrated to do so effectively in Australia to our knowledge, and ARU data was not scanned for Barn Swallow calls.

Barn Swallows are present in Australia primarily from September to April (Section 8.1), so survey effort outside of these months is unlikely to detect the species and has not been included in Table 8.1.

Table 8.1: Survey effort suitable for detecting Barn Swallow in the Winu locality.

Survey Methodology	Effort Inside DE	Effort Outside DE
Avifauna Surveys	17 sites (790 minutes)	26 sites (1,240 minutes)
General or Targeted Searches	47 searches (1,932 minutes)[1]	83 searches (4,503 minutes)[1]

[1] Duration data not available for some searches, so duration given here is an underestimate.

The survey effort outlined here exceeds DCCEEW guidance as the only published guidelines available, albeit in draft form, do not recommend survey effort be expended on Barn Swallow at all (DoE 2015). It is likely that if Barn Swallows do occur within the DE and surrounds, their occurrence is very sporadic and in low numbers, so the survey effort expended is unlikely to have been sufficient to determine whether the species occurs with confidence, though it is sufficient to indicate that the species does not occur frequently. However, we consider that the combination of the survey effort undertaken in combination with consideration of existing records and understanding of the species' broader occurrence is sufficient for drawing reasonable conclusions about the occurrence of Barn Swallows within the DE.

8.4 Survey Findings

8.4.1 Occurrence in the Winu DE and locality

No Barn Swallows were recorded during the surveys for the Winu or AREH projects. There are only a few records within the Winu locality, with a few records near the coast along Eighty Mile Beach and in the Walyarta (Mandora Marsh) system, and a single record inland around Telfer (Figure 8.2).

8.4.2 Population at Winu

Barn Swallows have not been confirmed to occur at Winu, and the species in not known to occur regularly or in large numbers away from the coast in Australia. Indeed, the species typically occurs in small numbers (typically <100), even at favoured sites in Western Australia (Menkhorst et al. 2017, Cornell Lab of Ornithology 2025), though larger numbers do occur occasionally, including 2,500 near Broome in 2000 (Cornell Lab of Ornithology 2025). Thus, if Barn Swallows do occur at Winu, their occurrence is likely to be occasional, and number of individuals would likely be small (likely <10).

The draft referral guidelines estimate that 1,000 individuals constitute a nationally significant proportion of the species' population. There are few counts of this magnitude anywhere in Australia, and if the species does occur within the Winu DE on occasion it is extremely unlikely that 1,000 or more individuals would occur.

8.4.3 Habitat in Winu Locality

All habitats within the Winu DE are potentially suitable as foraging and dispersal habitat for Barn Swallows, though the absence of surface water in most areas for the majority of the time means it is only likely to constitute supporting habitat. Cleared areas with infrastructure are the most suitable habitat within the DE for roosting and likely constitute the most suitable foraging habitat when surface water is not available elsewhere in the DE. The species does not breed in Australia, so would not use the DE for breeding.

As discussed above in Sections 8.1 and 8.4.2, there is negligible likelihood that the Winu DE would support an ecologically significant proportion of the Barn Swallow population and the species is not known to be declining in Australia. Hence, it is extremely unlikely that the DE constitutes important habitat for Barn Swallows under MNES guidelines.

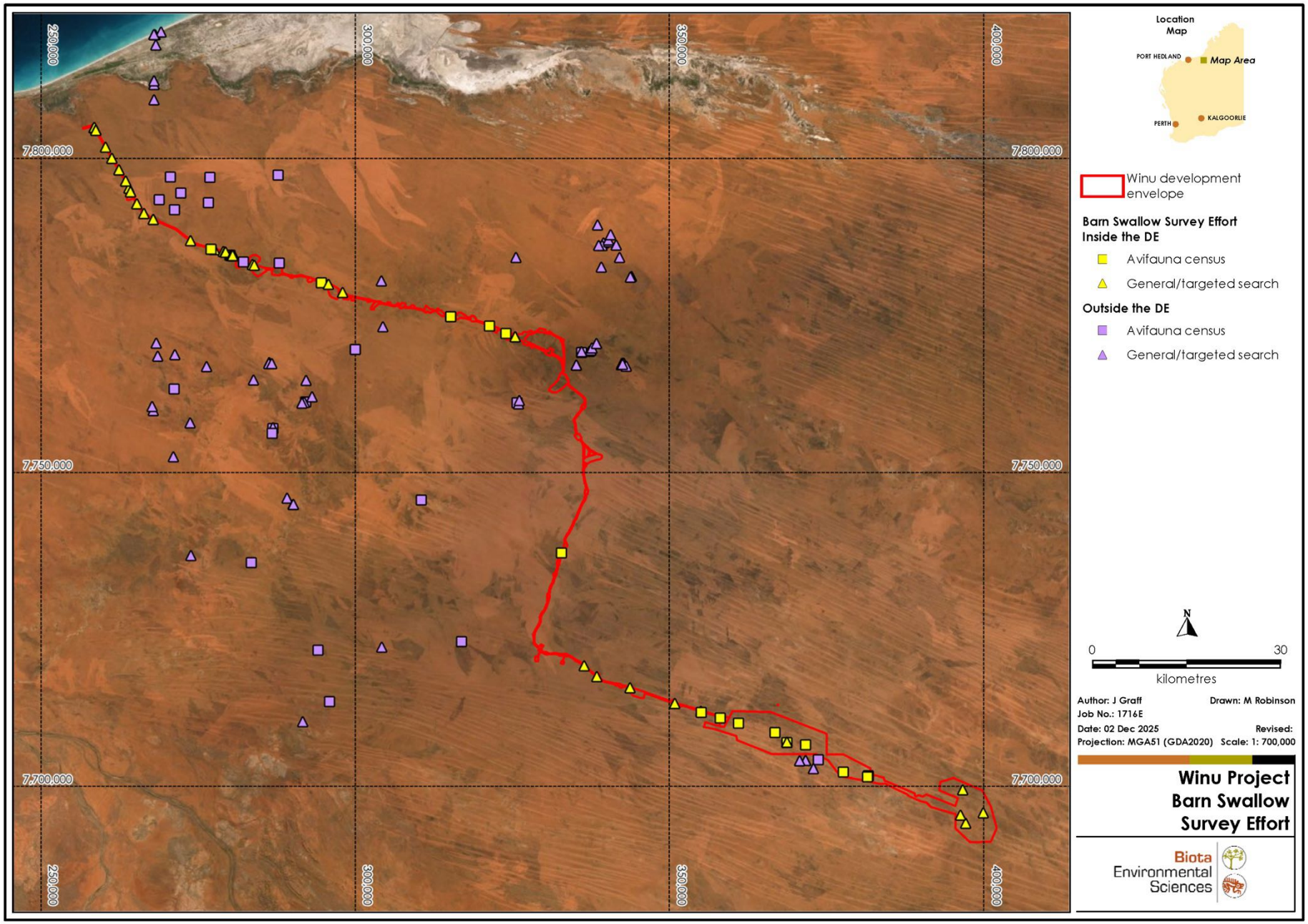

Figure 8.1: Survey effort suitable for detecting Barn Swallows.

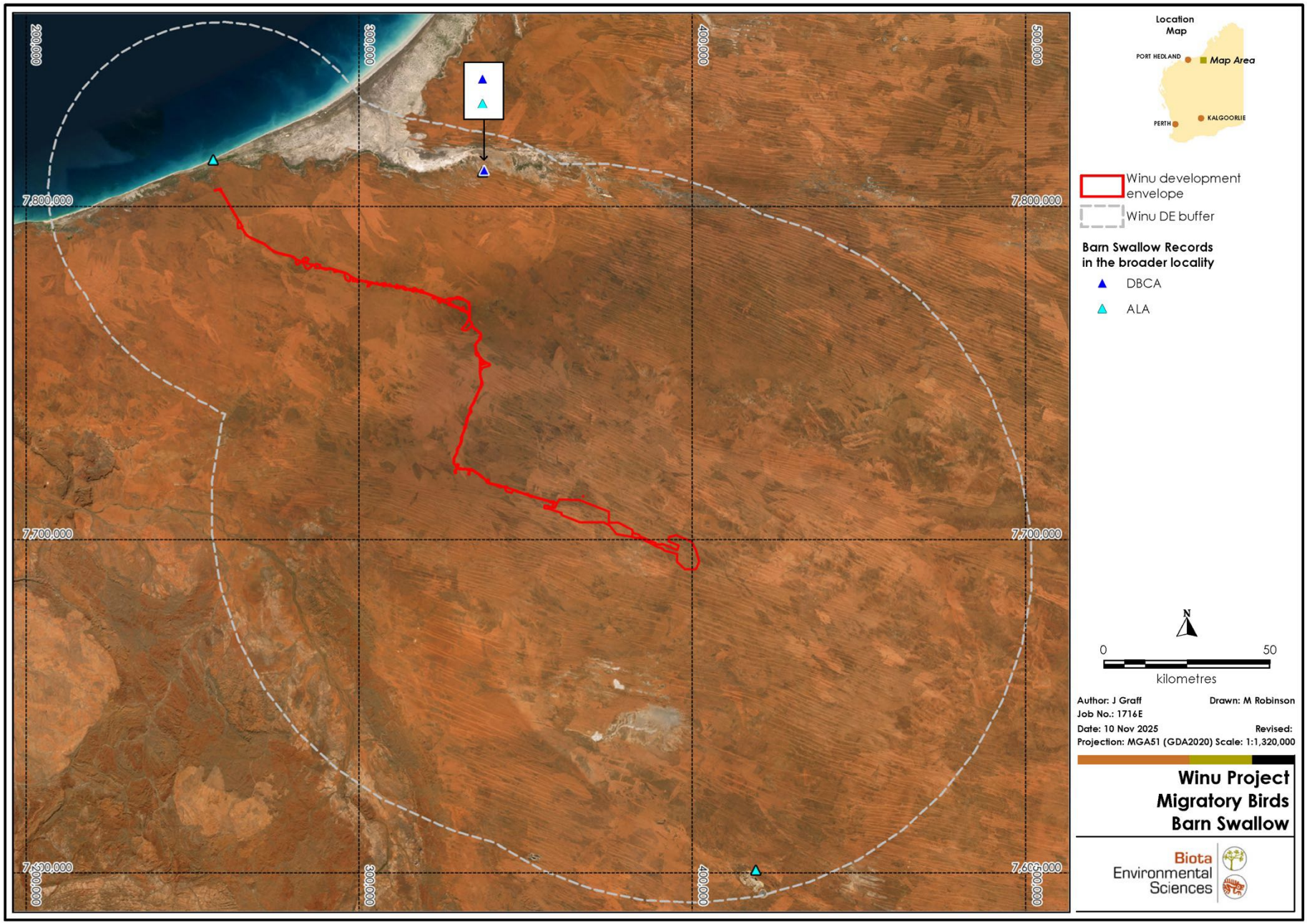

Figure 8.2: **Barn Swallow records from the Winu locality.**

9.0 Habitat Significance Summary

9.1 Population Significance

The Winu DE is known to support nationally significant numbers of Pacific Swift *Apus pacificus*, and has a high likelihood of supporting internationally significant numbers of this species on occasion. There is also a high likelihood that the DE occasionally supports nationally significant numbers of Oriental Pratincole, and a moderate likelihood that the DE supports nationally significant numbers of Oriental Plover and internationally significant numbers of Oriental Pratincole.

The likelihood of the DE supporting nationally and internationally significant numbers of each of the six species is summarised below in Table 9.1, along with an indication of the likely frequency with which the DE is likely to support such numbers.

Table 9.1: Summary of likely significance of population of each species using the Winu DE
(bold text indicates likelihood of a significant population; plain text below indicates frequency of occurrence).

Species	Common name	Nationally Significant (0.1%)	Internationally Significant (1%)
Pacific Swift	*Apus pacificus*	**Confirmed** Frequent	**High likelihood** Occasional
Oriental Pratincole	*Glareola maldivarum*	**High likelihood** Occasional	**Moderate likelihood** Rare
Oriental Plover	*Charadrius veredus*	**Moderate likelihood** Occasional	**Low likelihood** Rare
Little Curlew	*Numenius minutus*	**Low likelihood** Occasional	**Low likelihood** Rare
Australian [Gull-billed] Tern	*Gelochelidon [nilotica] macrotarsa*	**Low likelihood** Rare	**Negligible likelihood** Extremely rare
Barn Swallow	*Hirundo rustica*	**Negligible likelihood** Extremely rare	**Negligible likelihood** Extremely rare

9.2 Habitat Significance

All fauna habitats identified within the DE may be used by the Migratory-listed species addressed here, particularly as several species (particularly Oriental Pratincole and Pacific Swift) forage aerially over most habitat types (Table 9.2).

The habitats of greatest importance for migratory-listed birds within the DE are likely to be the ephemeral claypan and clayey sandplain with termitaria habitat types, which are likely to provide the most suitable foraging habitat for ground-foraging species such as Oriental Plover and Little Curlew, as well as open areas suitable for loafing and possibly roosting (especially if inundated following rain).

Table 9.2: Habitat usage for Migratory-listed bird species in the Winu DE.

Habitat	Pacific Swift	Oriental Plover	Little Curlew	Oriental Pratincole	Australian [Gull-billed] Tern	Barn Swallow
Shrub and spinifex on sandplain	Foraging (airspace above)	Foraging (recently-burnt or other open areas)	Foraging (recently-burnt or other open areas)	Foraging (airspace above)	Foraging	Foraging (airspace above)
Inland sand dune	Foraging (airspace above)	-	-	Foraging (airspace above)	Foraging	Foraging (airspace above)
Gravelly lateritic rises	Foraging (airspace above)	Foraging (recently-burnt or other open areas)	Foraging (recently-burnt or other open areas)	Foraging (airspace above)	Foraging	Foraging (airspace above)
Clayey sandplain with termitaria	Foraging (airspace above)	Foraging	Foraging	Foraging (airspace above) Loafing	Foraging	Foraging (airspace above)
Ephemeral claypan	Foraging (airspace above)	Foraging Roosting	Foraging Roosting	Foraging (airspace above) Roosting/loafing	Foraging Roosting Possible breeding (if inundated)	Foraging (airspace above)
Disturbed/cleared areas	Foraging (airspace above)	Foraging	Foraging	Foraging (airspace above)	-	Foraging (airspace above) Possible roosting (where infrastructure provides potentially suitable roosting sites)

9.3 Summary

The likelihood that the Winu DE constitutes important habitat for each species under MNES guidelines for Migratory-listed species is summarised below in Table 9.3.

Table 9.3: Summary likelihood that Winu DE constitutes important habitat.

Species	Common name	Likelihood
Pacific Swift	*Apus pacificus*	Confirmed
Oriental Pratincole	*Glareola maldivarum*	High
Oriental Plover	*Charadrius veredus*	Moderate
Little Curlew	*Numenius minutus*	Moderate[1]
Australian [Gull-billed] Tern	*Gelochelidon [nilotica] macrotarsa*	Low
Barn Swallow	*Hirundo rustica*	Negligible

[1] Based on Australian population potentially declining rather than ecologically significant population proportion.

As discussed previously, similar habitat to that available in the DE occurs very widely through the Great Sandy Desert and the sandplains extending north towards Eighty Mile Beach. The Great Sandy Desert IBRA region covers 29,694,388 ha in Western Australia, most of which provides similar quality habitat to the DE. Thus, the DE accounts for less than 0.08% of the potentially suitable habitat for most of these species within the Great Sandy Desert IBRA region.

Higher quality habitat for most species occurs in areas associated with salt lake systems. Regionally, this includes Lake Waukarlycarly, and further afield on the near-coastal plains adjacent to Eighty Mile Beach and the Walyarta (Mandora Marsh) system.

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