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# Consolidated Detailed Flora and Vegetation Assessment of the Winu Project, June 2026

Prepared for: Rio Tinto Winu Pty Limited

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# Contents

|           |                                                                        |           |
|-----------|------------------------------------------------------------------------|-----------|
| <b>1.</b> | <b>Executive Summary .....</b>                                         | <b>1</b>  |
| <b>2.</b> | <b>Introduction .....</b>                                              | <b>7</b>  |
| 2.1.      | Project Background .....                                               | 7         |
| 2.2.      | Land Use .....                                                         | 7         |
| 2.3.      | Physical Environment .....                                             | 13        |
| 2.3.1.    | <i>Climate</i> .....                                                   | 13        |
| 2.3.2.    | <i>Geology</i> .....                                                   | 13        |
| 2.3.3.    | <i>Soil Landscape Systems</i> .....                                    | 17        |
| 2.3.4.    | <i>Hydrology and Hydrogeology</i> .....                                | 20        |
| 2.4.      | Biological Environment .....                                           | 20        |
| 2.4.1.    | <i>Interim Biogeographic Regionalisation of Australia (IBRA)</i> ..... | 20        |
| 2.4.2.    | <i>Pre-European Vegetation</i> .....                                   | 24        |
| 2.4.3.    | <i>Groundwater Dependent Ecosystems (Terrestrial)</i> .....            | 28        |
| 2.4.4.    | <i>Significant Wetlands</i> .....                                      | 28        |
| 2.4.5.    | <i>Environmentally Sensitive Areas</i> .....                           | 28        |
| 2.4.6.    | <i>Conservation Reserves in the Region</i> .....                       | 29        |
| <b>3.</b> | <b>Previous Surveys.....</b>                                           | <b>32</b> |
| 3.1.      | Summary of Previous Surveys .....                                      | 32        |
| 3.2.      | Survey Conditions .....                                                | 44        |
| <b>4.</b> | <b>Methods .....</b>                                                   | <b>46</b> |
| 4.1.      | Desktop Assessment.....                                                | 46        |
| 4.1.1.    | <i>Literature Review</i> .....                                         | 46        |
| 4.1.2.    | <i>Database Searches</i> .....                                         | 46        |
| 4.2.      | Field Assessment.....                                                  | 47        |
| 4.2.1.    | <i>Assessment of Quadrats and Relevés</i> .....                        | 48        |
| 4.2.2.    | <i>Flora Specimen Identification</i> .....                             | 48        |
| 4.2.3.    | <i>Significant Flora</i> .....                                         | 49        |
| 4.2.4.    | <i>Introduced Species</i> .....                                        | 49        |
| 4.2.5.    | <i>Vegetation Mapping</i> .....                                        | 49        |
| 4.2.6.    | <i>Vegetation Condition</i> .....                                      | 49        |
| 4.2.7.    | <i>Floristic Analysis</i> .....                                        | 49        |

|            |                                                                          |            |
|------------|--------------------------------------------------------------------------|------------|
| <b>5.</b>  | <b>Results and Discussion .....</b>                                      | <b>50</b>  |
| 5.1.       | Literature Review.....                                                   | 50         |
| 5.2.       | Database Searches.....                                                   | 56         |
| 5.2.1.     | <i>Significant Flora</i> .....                                           | 56         |
| 5.2.2.     | <i>Threatened and Priority Ecological Communities</i> .....              | 65         |
| 5.2.3.     | <i>Invasive Species</i> .....                                            | 66         |
| 5.3.       | Field Assessment .....                                                   | 67         |
| 5.3.1.     | <i>Flora</i> 67                                                          |            |
| 5.3.2.     | <i>Unresolved Specimens</i> .....                                        | 68         |
| 5.3.3.     | <i>Numbers of Plants of Priority Flora and Species of Interest</i> ..... | 70         |
| 5.3.4.     | <i>Descriptions of Priority Flora of the Winu Project</i> .....          | 80         |
| 5.3.5.     | <i>Range Extensions</i> .....                                            | 131        |
| 5.3.6.     | <i>Species of Taxonomic Interest</i> .....                               | 133        |
| 5.3.7.     | <i>Introduced Species</i> .....                                          | 141        |
| 5.3.8.     | <i>Culturally Significant Species</i> .....                              | 145        |
| 5.3.9.     | <i>Landforms</i> .....                                                   | 146        |
| 5.3.10.    | <i>Vegetation Associations</i> .....                                     | 150        |
| 5.3.11.    | <i>Patch Analysis</i> .....                                              | 156        |
| 5.3.12.    | <i>Vegetation Condition</i> .....                                        | 170        |
| 5.3.13.    | <i>Fire</i> 170                                                          |            |
| 5.3.14.    | <i>Priority Ecological Communities</i> .....                             | 175        |
| 5.3.15.    | <i>Groundwater-Dependant Ecosystems (GDE)</i> .....                      | 175        |
| 5.3.16.    | <i>Statistical Analysis</i> .....                                        | 176        |
| <b>6.</b>  | <b>Assessment Against the 10 Clearing Principles .....</b>               | <b>190</b> |
| <b>7.</b>  | <b>Limitations.....</b>                                                  | <b>194</b> |
| <b>8.</b>  | <b>List of Participants .....</b>                                        | <b>196</b> |
| <b>9.</b>  | <b>Acknowledgements .....</b>                                            | <b>197</b> |
| <b>10.</b> | <b>Bibliography .....</b>                                                | <b>199</b> |

## Figures

|           |                                                                                                                |    |
|-----------|----------------------------------------------------------------------------------------------------------------|----|
| Figure 1. | Location of the Winu Project .....                                                                             | 9  |
| Figure 2. | Winu Project Regional Cadastre .....                                                                           | 11 |
| Figure 3. | Long-term average climate data for Telfer (weather station number 13030)<br>(1974– May 2026) (BoM, 2026a)..... | 13 |

|                                                                                                                                                                                                           |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 4. Surface Geology of the Winu Project.....                                                                                                                                                        | 15  |
| Figure 5. Soil Landscape Systems of the Winu Project.....                                                                                                                                                 | 18  |
| Figure 6. Location of the Winu Project within IBRA.....                                                                                                                                                   | 22  |
| Figure 7. Pre-European Vegetation of the Winu Project.....                                                                                                                                                | 26  |
| Figure 8. Environmentally Sensitive Areas and Conservation Reserves of the Region                                                                                                                         | 30  |
| Figure 9. Monthly (2017-2026) Rainfall (mm), Long-Term Average (1974 - May 2026)<br>Rainfall (mm) and Mean Maximum Temperature (°C) (2003-2022) (Telfer<br>Aero Weather Station – 13030) (BoM 2026c)..... | 45  |
| Figure 10. Regional Flora of Conservation Significance (Database searches).....                                                                                                                           | 63  |
| Figure 11: Species Accumulation Curve Displaying New Species Encountered with the<br>Progression of New Quadrat Sites. ....                                                                               | 67  |
| Figure 12. Priority Flora Locations Across the Winu Project. ....                                                                                                                                         | 78  |
| Figure 13. Current <i>Cynodon anisocarpus</i> distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                              | 82  |
| Figure 14. <i>Cynodon anisocarpus</i> (P1) Distribution Across the Winu Project.....                                                                                                                      | 84  |
| Figure 15. Current <i>Goodenia hartiana</i> (P2) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                           | 87  |
| Figure 16. <i>Goodenia hartiana</i> (P2) Distribution Across the Winu Project. ....                                                                                                                       | 88  |
| Figure 17. Current <i>Bonamia oblongifolia</i> (P3) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                        | 91  |
| Figure 18. <i>Bonamia oblongifolia</i> (P3) Distribution Across the Winu Project.....                                                                                                                     | 92  |
| Figure 19. Current <i>Comesperma sabulosum</i> (P3) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                        | 95  |
| Figure 20. <i>Comesperma sabulosum</i> (P3) Distribution across the Winu Project Area...                                                                                                                  | 96  |
| Figure 21. Current <i>Corynotheca asperata</i> (P3) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                        | 99  |
| Figure 22. <i>Corynotheca asperata</i> (P3) Distribution across the Winu Project Area ....                                                                                                                | 100 |
| Figure 23. Current <i>Dasymalla chorisepala</i> (P3) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                       | 103 |
| Figure 24. <i>Dasymalla chorisepala</i> (P3) Distribution across the Winu Project Area...                                                                                                                 | 104 |
| Figure 25. Current <i>Eragrostis lanicaulis</i> (P3) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                       | 107 |
| Figure 26. Distribution of <i>Eragrostis lanicaulis</i> nearby the Winu Development<br>Envelope .....                                                                                                     | 108 |
| Figure 27. Current <i>Indigofera ammobia</i> (P3) distribution recognised by a) Western<br>Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium<br>(2026).....                          | 111 |

|            |                                                                                                                                                                                         |     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 28  | <i>Indigofera ammobia</i> (P3) Distribution across the Winu Project Area.....                                                                                                           | 112 |
| Figure 29. | Current <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)..... | 116 |
| Figure 30  | <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) Distribution across the Winu Project Area .....                                                                                       | 117 |
| Figure 31. | Current <i>Synostemon arenosus</i> (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (202).....                         | 120 |
| Figure 32  | <i>Synostemon arenosus</i> (P3) Distribution across the Winu Project Area .....                                                                                                         | 121 |
| Figure 33. | Current <i>Terminalia kumpaja</i> (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026).....                         | 123 |
| Figure 34  | <i>Terminalia kumpaja</i> (P3) Distribution across the Winu Project Area .....                                                                                                          | 125 |
| Figure 35. | Current <i>Tribulopsis marliesiae</i> (P3) distribution recognised by a) Western Australian Herbarium (1998-2024) and b) Australasian Virtual Herbarium (2024).....                     | 128 |
| Figure 36  | <i>Tribulopsis marliesiae</i> (P3) Distribution across the Winu Project Area .....                                                                                                      | 129 |
| Figure 37  | <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138) Distribution across the Winu Project Area .....                                                                        | 135 |
| Figure 38. | <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB1179) Distribution across the Winu Project Area .....                                                                | 138 |
| Figure 39. | Introduced Flora Species Occurring across the Winu Project. ....                                                                                                                        | 143 |
| Figure 40. | Conceptualised diagram of landforms and vegetation occurring across the Winu Project .....                                                                                              | 148 |
| Figure 41. | Overview Map of Vegetation Associations Occurring across the Winu Project.....                                                                                                          | 164 |
| Figure 42. | Vegetation Mapping Legend.....                                                                                                                                                          | 166 |
| Figure 43. | Consolidated Quadrat Site Locations of the Winu Project .....                                                                                                                           | 168 |
| Figure 44. | Vegetation Condition of the Winu Project.....                                                                                                                                           | 171 |
| Figure 45. | Regional Fire Frequency (2014-2024).....                                                                                                                                                | 173 |
| Figure 48. | (Iteration 2.2) Dendrogram Illustrating Clustering of Sand Dune Quadrat Sites Across the Winu Project (P/A; 23 sites; 103 species; Stress = 0.1607).....                                | 180 |
| Figure 49. | (Iteration 3.3.2) Dendrogram Illustrating Clustering of Rocky Quadrat Sites Across the Winu Project (PFC; 25 sites; 115 species; Stress = 0.1737) ....                                  | 181 |
| Figure 50. | (Iteration 4.2) Dendrogram Illustrating Clustering of Claypan Quadrat Sites Across the Winu Project (P/A; 25 sites; 100 species; Stress = 0.1604) .....                                 | 182 |
| Figure 51. | (Iteration 6.3.1) Dendrogram Illustrating Clustering of Sandplain Quadrat Sites Across the Winu Project) (PFC; 191 sites; 183 species; Stress = 0.2171).....                            | 184 |

## Tables

|                                                                                                                                                                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Table 1. Surface geology of the Winu Project (Raymond, et al., 2012).....                                                                                                                                                                               | 14  |
| Table 2. Soil landscape systems of the Winu Project (DPIRD, 2024a) .....                                                                                                                                                                                | 17  |
| Table 3. Pre-European vegetation system associations of the Winu Project<br>(WALGA, 2020). .....                                                                                                                                                        | 25  |
| Table 4. Summary of previous botanical surveys conducted across the<br>Winu Project (adapted from Biota, 2023) .....                                                                                                                                    | 34  |
| Table 5. Total annual rainfall as a percentage to the long-term average<br>(1974 – 2026) (Telfer Aero weather station number 13030)<br>(BoM, 2026c). .....                                                                                              | 44  |
| Table 6. Details of database searches conducted. ....                                                                                                                                                                                                   | 46  |
| Table 7. Summary of available reports relevant to the Winu Project.....                                                                                                                                                                                 | 52  |
| Table 8. Summary of conservation significant flora database searches and<br>literature review results for the vicinity of the Winu Project<br>(sorted by conservation rank) and their likelihood of occurrence<br>within the Development Envelope. .... | 57  |
| Table 9. Threatened and Priority Ecological Communities within the<br>Winu Project region (DBCA, 2024f, DBCA, 2023a, DBCA,<br>2023b). ....                                                                                                              | 65  |
| Table 10. Unresolved Flora specimens of the Winu Project .....                                                                                                                                                                                          | 68  |
| Table 11. Priority Flora Numbers Within and Outside the Winu Project<br>Area .....                                                                                                                                                                      | 71  |
| Table 12. Populations Analysis of Priority Flora of the Winu Project.....                                                                                                                                                                               | 75  |
| Table 13. Population Analysis for Priority Flora incorporating Regional<br>Data in Western Australia .....                                                                                                                                              | 77  |
| Table 14. Flora species encountered across the Winu Project, representing<br>Extensions >100 km to Current Known Distributions. ....                                                                                                                    | 131 |
| Table 15. Summary of findings for previous weed surveys across the<br>Winu Project.....                                                                                                                                                                 | 141 |
| Table 16. Culturally Significant Plant Species Occurring Across the Winu<br>Project .....                                                                                                                                                               | 145 |
| Table 17. Vegetation Associations Described across the Winu Project. ....                                                                                                                                                                               | 150 |
| Table 18. Number of Patches and Areas of Vegetation Associations<br>within the Development Envelope .....                                                                                                                                               | 159 |
| Table 19. Number of Patches and Areas of Vegetation Associations<br>within the Development Envelope Sorted In Order of<br>Decreasing Representation Outside the DE .....                                                                                | 161 |
| Table 20. Species Name Conversions for Statistical Analysis .....                                                                                                                                                                                       | 176 |
| Table 21. Parameters of Statistical Analyses and Associated Stress Values.....                                                                                                                                                                          | 179 |
| Table 22. Summary of Floristic Analysis .....                                                                                                                                                                                                           | 186 |

## Plates

|                                                                                                                                                   |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Plate 1. <i>Cynodon anisocarpus</i> (P1) during growth (left) and senescence (right)</b> .....                                                 | 81  |
| Plate 2. <i>Cynodon anisocarpus</i> (P1) habitat as encountered on the Winu Project.....                                                          | 83  |
| Plate 3. <i>Goodenia hartiana</i> (Priority 2) flower .....                                                                                       | 86  |
| Plate 4. <i>Goodenia hartiana</i> (P2) (left) excavation revealing connective rhizomes and (right) example of prolific post-fire recruitment..... | 87  |
| Plate 5. <i>Bonamia oblongifolia</i> (P3) detail of flowers and petiolate leaves .....                                                            | 90  |
| Plate 6 <i>Comesperma sabulosum</i> (P3) shrub and flower .....                                                                                   | 94  |
| Plate 7 <i>Corynotheca asperata</i> (P3) plant and flower .....                                                                                   | 98  |
| Plate 8. <i>Dasymalla chorisepala</i> (P3) flower and plant.....                                                                                  | 102 |
| Plate 9. <i>Eragrostis lanicaulis</i> showing the characteristic knotty woolly nodes, Western Australia Herbarium (WA Herbarium 1998-2026) .....  | 106 |
| Plate 10. <i>Indigofera ammobia</i> (P3) plant, seed pod and flower .....                                                                         | 110 |
| Plate 11. <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759).....                                                                                  | 115 |
| Plate 12. <i>Synostemon arenosus</i> (P3), plant and flower .....                                                                                 | 119 |
| Plate 13. <i>Terminalia kumpaja</i> (Priority 3).....                                                                                             | 124 |
| Plate 14. <i>Tribulopsis marliesiae</i> (Priority 3).....                                                                                         | 127 |
| Plate 15. <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138).....                                                                   | 134 |
| Plate 16. <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB1179), .....                                                         | 137 |

## Vegetation Description – Plates

|                                                                                                                                                                 |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Plate 1. D1 - <i>Corymbia chippendalei</i> Low Open Woodland over <i>Triodia schinzii</i> (Biota 2021) .....                                                    | 264 |
| Plate 2. D2 - <i>Owenia reticulata</i> Scattered Low Trees over <i>Triodia schinzii</i> .....                                                                   | 265 |
| Plate 3. D3 - <i>Grevillea stenobotrya</i> , <i>Grevillea wickhamii</i> & <i>Acacia anaticeps</i> Tall Shrubland over <i>Triodia schinzii</i> (Biota 2021)..... | 266 |
| Plate 4. D4 - <i>Melaleuca lasiandra</i> Open Low Shrubland over <i>Triodia schinzii</i> .....                                                                  | 267 |
| Plate 5. P1 - <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> .....                       | 268 |
| Plate 6. P2 - <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i> .....                                                                     | 269 |
| Plate 7. P3 - <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i> ...                                                | 270 |
| Plate 8. P4 - <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> .....                                                                        | 271 |
| Plate 9. P5 - <i>Acacia</i> spp. Scattered Shrubs over <i>Sorghum plumosum</i> var. <i>plumosum</i> & <i>Triodia schinzii</i> (Biota 2021).....                 | 272 |
| Plate 10. P6 - <i>Owenia reticulata</i> & <i>Erythrophleum chlorostachys</i> Scattered Low Trees over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> ) .....  | 273 |
| Plate 11. P7 - <i>Calytrix carinata</i> Low Shrubland over <i>Triodia schinzii</i> .....                                                                        | 274 |



|                                                                                                                                                                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Plate 12. P8 - <i>Acacia eriopoda</i> & <i>Acacia sericophylla</i> Open Shrubland over<br><i>Triodia schinzii</i> ( <i>Triodia epactia</i> ) .....                                                                                                      | 275 |
| Plate 13. P9 - <i>Acacia ancistrocarpa</i> & <i>Acacia monticola</i> Open Shrubland over<br><i>Triodia schinzii</i> ( <i>Triodia epactia</i> ) (Biota 2021) .....                                                                                       | 276 |
| Plate 14. P10a - <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia epactia</i> .....                                                                                                                                                    | 277 |
| Plate 15. P10b - <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia schinzii</i><br>and <i>Triodia epactia</i> ( <i>Acacia stellaticeps</i> ) (Biota 2021) .....                                                                         | 278 |
| Plate 16. P10c - <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia schinzii</i> .....                                                                                                                                                   | 279 |
| Plate 17. P10d - <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia brizoides</i> .....                                                                                                                                                  | 280 |
| Plate 18. P11 - <i>Grevillea refracta</i> ( <i>Acacia ancistrocarpa</i> & <i>Acacia monticola</i> )<br>Scattered Tall Shrubs over <i>Triodia epactia</i> (Biota 2021) .....                                                                             | 281 |
| Plate 19. P12 - <i>Grevillea refracta</i> , <i>Acacia monticola</i> & <i>Acacia colei</i> var. <i>colei</i><br>Open Shrubland over <i>Acacia adoxa</i> var. <i>adoxo</i> & <i>Triodia epactia</i> (Biota 2021)....                                      | 282 |
| Plate 20. P13 - <i>Gardenia pyriformis</i> subsp. <i>keartlandii</i> Scattered Low Trees over<br><i>Triodia schinzii</i> (Biota 2021) .....                                                                                                             | 283 |
| Plate 21. P14 - <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia</i><br><i>ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i> .....                                                             | 284 |
| Plate 22. P15a - <i>Corymbia candida</i> Open Low Woodland over <i>Triodia schinzii</i> .....                                                                                                                                                           | 285 |
| Plate 23. P15b - <i>Corymbia candida</i> Open Low Woodland over <i>Acacia monticola</i><br>shrubland over <i>Triodia epactia</i> .....                                                                                                                  | 286 |
| Plate 24. P15c - <i>Corymbia candida</i> Open Low Woodland over <i>Triodia brizoides</i> .....                                                                                                                                                          | 287 |
| Plate 25. P16 - <i>Eucalyptus odontocarpa</i> Very Open Shrub Mallee over <i>Triodia schinzii</i> ....                                                                                                                                                  | 288 |
| Plate 26. P18 - <i>Corymbia opaca</i> Open Woodland over <i>Triodia schinzii</i> .....                                                                                                                                                                  | 289 |
| Plate 27. P19 - <i>Melaleuca lasiandra</i> Low Open Shrubland over <i>Triodia schinzii</i> .....                                                                                                                                                        | 290 |
| Plate 28. P20 - <i>Acacia ancistrocarpa</i> & <i>Acacia orthocarpa</i> Open Shrubland over<br><i>Triodia schinzii</i> & <i>Triodia epactia</i> .....                                                                                                    | 291 |
| Plate 29. P21 - <i>Acacia sericophylla</i> Open Shrubland over <i>Triodia schinzii</i> .....                                                                                                                                                            | 292 |
| Plate 30. P22 - <i>Acacia stipuligera</i> Open Shrubland over <i>Triodia schinzii</i> .....                                                                                                                                                             | 293 |
| Plate 31. R1 - <i>Acacia bivenosa</i> ( <i>Acacia ancistrocarpa</i> ) Scattered Shrubs over<br><i>Triodia brizoides</i> ( <i>Triodia schinzii</i> ) .....                                                                                               | 294 |
| Plate 32. R2 - <i>Grevillea wickhamii</i> Scattered Tall Shrubs over <i>Mirbelia viminalis</i><br>( <i>Acacia hilliana</i> ) & <i>Triodia brizoides</i> ( <i>Triodia epactia</i> ) .....                                                                | 295 |
| Plate 33. R3 - <i>Acacia hilliana</i> ( <i>Acacia adoxa</i> var. <i>adoxo</i> ) Low Open Shrubland<br>over <i>Triodia epactia</i> (Biota 2021) .....                                                                                                    | 296 |
| Plate 34. R4 - <i>Ficus brachypoda</i> Scattered Low Trees over <i>Acacia monticola</i> ,<br><i>Grevillea pyramidalis</i> & <i>Triodia epactia</i> .....                                                                                                | 297 |
| Plate 35. R5 - <i>Senna artemisioides</i> subsp. <i>oligophylla</i> , <i>Senna sericea</i> ( <i>Acacia bivenosa</i> )<br>Scattered Low Shrubs over <i>Triodia epactia</i> ( <i>Aristida contorta</i> , <i>Dactyloctenium</i><br><i>radulans</i> ) ..... | 298 |
| Plate 36. R6 - <i>Grevillea wickhamii</i> , <i>Acacia monticola</i> & <i>Acacia ancistrocarpa</i> Open<br>Shrubland over <i>Triodia epactia</i> .....                                                                                                   | 299 |
| Plate 37. C1 - <i>Eucalyptus victrix</i> Open Woodland over <i>Triodia epactia</i> .....                                                                                                                                                                | 300 |
| Plate 38. C2 - <i>Acacia bivenosa</i> Scattered Low Shrubs over <i>Triodia brizoides</i> &<br><i>Triodia epactia</i> ( <i>Triodia schinzii</i> ) .....                                                                                                  | 301 |
| Plate 39. C3 - <i>Acacia bivenosa</i> ( <i>Acacia stellaticeps</i> ) Low Shrubland over <i>Triodia epactia</i> .                                                                                                                                        | 302 |

|                                                                                                                                                |     |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Plate 40. C4 - <i>Acacia ancistrocarpa</i> Open Low Shrubland over <i>Eulalia aurea</i> & <i>Triodia epactia</i> .....                         | 303 |
| Plate 41. C5 – Claypan Playa ( <i>Diplachne fusca</i> subsp. <i>muelleri</i> , <i>Eragrostis falcata</i> ) with Scattered Herbs .....          | 304 |
| Plate 42. C6 – Claypan ( <i>Cullen pustulatum</i> , <i>Gossypium australe</i> ) over <i>Eulalia aurea</i> ( <i>Eragrostis xerophila</i> )..... | 305 |

## Appendices

|                                                                                                                           |     |
|---------------------------------------------------------------------------------------------------------------------------|-----|
| Appendix 1. Previous Survey Areas Representing Project Option<br>Domain (including adjacent AREH) .....                   | 210 |
| Appendix 2. Framework for Conservation Significant Flora: WA (DBCA).....                                                  | 213 |
| Appendix 3. DBCA Definitions of Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) ..... | 220 |
| Appendix 4. Vegetation Condition Scale.....                                                                               | 227 |
| Appendix 5. Protected Matters Search Tool Results .....                                                                   | 230 |
| Appendix 6. NatureMap Search Results .....                                                                                | 233 |
| Appendix 7. Declared Pests -s22(2) of the Broome and East Pilbara Local Government Areas (Shires) .....                   | 239 |
| Appendix 8. Consolidated Systematic Species List.....                                                                     | 245 |
| Appendix 9. 1:25,000 Scale Vegetation Mapping of the Winu Project.....                                                    | 260 |
| Appendix 10. Consolidated Vegetation Associations of the Winu Project .....                                               | 263 |
| Appendix 11. Raw Quadrat Data .....                                                                                       | 314 |
| Appendix 12. Consolidated GPS Tracklogs at 1:25K.....                                                                     | 611 |

## Key Proposal Terminology

| Component                          | Description                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The Proposal                       | Includes the development of a new below-water table (BWT) copper-silver-gold deposit and associated infrastructure and activities required to access, process and transport ore.                                                                                                                                                                                                                           |
| Development Envelope (DE)          | Refers to the combined areas of the mine and infrastructure area, access road and Rimfire Bore Field. All activities will occur within this area.                                                                                                                                                                                                                                                          |
| Conceptual Footprint               | Refers to the indicative direct disturbance of the Proposal. To provide project flexibility, this footprint is indicative only and includes key elements such as mine pit, waste rock landforms and infrastructure. The final location of key elements and infrastructure may occur outside the Conceptual Footprint but will be contained within the Development Envelope and within any approval limits. |
| Mine and Infrastructure Area (MIA) | Refers to the area containing the mineralised deposit and related infrastructure. This is the Winu mine site.                                                                                                                                                                                                                                                                                              |
| Rimfire Bore Field (Rimfire)       | Refers to the regional bore field located at Rimfire, which is approximately 31 km from the MIA. This includes the pipelines, infrastructure and access tracks back to the MIA.                                                                                                                                                                                                                            |
| 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 Winu Project Area.                                                                                                                                                                                                                                                           |



## 1. Executive Summary

Rio Tinto Winu Pty Limited (Rio Tinto Winu) plan to develop a new copper-gold mine, referred to as the Winu Project. The Winu Project is located approximately 320 km east of Port Hedland and 300 km south of Broome within the south-western portion of the Great Sandy Desert region of Western Australia, extending across both the Nyangumarta and Martu People's Native Title Determination Areas.

The Project's Development Envelope (DE) spans 23,649.07 ha, consisting of three components:

- Mine Infrastructure Area (MIA): area containing the mineralised deposit and related infrastructure; includes monitoring bores north of mine area (10,181.48 ha);
- Road Access Corridor (RAC): existing access road linking Great Northern Highway to the Winu Project Area (6,647.25 ha);
- Rimfire Bore Field (Rimfire): regional bore field located 31 km east of the MIA. Includes a linkage corridor to the MIA (6,820.34 ha);

A number of botanical surveys have been conducted across the Winu Project area since 2017, including Detailed Flora and Vegetation Surveys within and outside the DE. Survey areas addressing previous project option domains and terminology include the Winu Project Area (WPA), Winu Re-injection Bore Field (WRIB), the Winu Road Access Corridor (WRAC), the Winu Project Area Extensions (WPAE), Texas Bore Field (Texas) and Wallal Bore Field (Wallal) (Appendix 1). Additional detailed survey work on adjoining tenements, as part of the Asian (now Australian) Renewable Energy Hub (AREH) Project is ongoing, with some information included in this report.

Rio Tinto Winu commissioned Western Botanical to consolidate all previous botanical survey data and address any gaps in survey extent and detail, with the objective of bringing all components of the Winu Project to a 'Detailed' survey level.

The surveys and report have been prepared to meet requirements for Impact Assessment in accordance with the Environmental Protection Authority (2016b), Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. This report describes the flora and vegetation across the Winu Project based on all field data to June 2026.

The report addresses: i) results of a desktop review of the likelihood of encountering Conservation significant flora; ii) vegetation mapping at NVIS Level 5 'Association' level, supported by 159 permanent quadrat sites (and a further 28 sites from the AREH Project); iii) a flora species inventory including both opportunistic and targeted recording of known Priority flora species; iv) descriptions of Conservation significant flora species, including species of taxonomic interest; v)

descriptions of Conservation significant ecological communities, including groundwater dependant ecosystems; vi) a vegetation condition assessment; and vii) an impact assessment against the 10 clearing principles. Discussion of limitations and future work is also included.

The Winu Project is located across two IBRA bioregions (Dampierland and Great Sandy Desert), and three subregions (Mackay, McLarty and Pindanland). Five vegetation systems are described across the Project, all of which feature *Acacia*-dominated steppe over *Triodia* hummock grasslands.

Significant Wetlands, Environmentally Sensitive Areas and Conservation Reserves, are all noted as occurring in the region, though none have been recorded within the Winu Project area. A potential Groundwater Dependant Ecosystem (GDE) occurs in the area south of the Rimfire Borefield.

Several desktop assessments have been conducted as part of Project studies. The most recent assessment identified 33 Conservation Significant flora species occurring within 100 km of the MIA. Of these, ten were considered as likely occurring within the Study Area while a further eight were considered as possibly occurring.

No PEC's or TEC's were found to occur in the Study Area. Within the broader region of the Winu Project, one TEC and five PECs are associated with the Walyarta (Mandora Marsh) and coastal area of Eighty Mile Beach. The closest listed TEC or PEC is the Eighty Mile Beach Land System. This Priority 3 PEC is situated along the coastline, approximately 7 km from the northern end of the Development Envelope (RAC intersection with Great Northern Highway). This section of the RAC is also located within 10km of a Ramsar wetland site.

Since 2017, numerous botanical surveys have been conducted across the Winu Project. Survey work conducted by other consultancies includes:

- Reconnaissance surveys of the MIA and the RAC conducted by Astron between 2017-2019;
- 2-phase Detailed surveys of the RAC (including diversion and borrow source areas), MIA and the Proposed Re-Injection Bore Field conducted by Biota between 2018-2020;
- Intensive targeted searches for Priority flora undertaken by Pheonix Environmental Sciences and Biota in 2026 on transects at 50m intervals, across areas of the MIA previously surveyed at low intensity, in consultation with Western Botanical.

Survey work conducted by Western Botanical includes:

- Detailed surveys of the MIA Extensions and Rimfire and Texas Bore Fields by Western Botanical in 2021-2024;
- A Reconnaissance survey of the Wallal Bore Field by Western Botanical in 2023;
- Detailed surveys of the Revised Rimfire and Texas Bore Field in 2024;
- Targeted Priority flora and weed surveys of the MIA, RAC, and Rimfire and Texas Bore Fields between 2022-2025;
- A single-phase Detailed survey of Winu South in 2024;
- Detailed survey of additional quadrats established to ensure a minimum of three quadrats in relevant vegetation associations in early 2026; and
- Intensive targeted searches for Priority flora across the MIA in early 2026.

Survey conditions throughout the project have varied, with above average rainfall recorded in 2017, 2022, and 2024; average rainfall recorded during 2018 and 2023; and below average rainfall recorded between 2019 and 2021. Rainfall in 2024 was around average with the highest falls in January (121.2 mm) and March (272mm). Rainfall in 2025 was well above average (701mm total) with high rainfall noted in February (289.2 mm). Prior to the most recent surveys being conducted in April – June 2026, rainfall was average to above average (43.8mm in January and 146.8 mm in February), however, March rainfall (12.6 mm) was well below average with near average conditions noted in April (14 mm) and May (25.4 mm). These conditions appear to correlate with the Indian Ocean Dipole (IOD) phases and follow normal seasonal conditions for the region.

Following the consolidation of survey data across all years, 342 flora species from 147 genera and 52 families have been recorded across the Winu Project. Of these 252 (74.5%) were recorded within quadrat sites, while 86 (25.4%) were recorded opportunistically, during relevé assessments or traverses. Sixty-four flora specimens recorded over the cumulative years of survey inclusive of Biota and Western Botanical surveys 2018 – 2026 were not able to be identified to species level. The majority of these specimens represent duplicate collections of plants where the sampled material was insufficient to enable definitive identification. Half the specimens were collected prior to Western Botanical's involvement in the program. One species initially recorded as *Polymeria?* sp. Broome (K.F. Kenneally 9759) (P3) was subsequently confirmed as that species and has been assessed. The remainder of unresolved specimens are considered to represent poor material with insufficient features to definitively identify and are not similar to any known Priority flora of the region. Intensive Priority flora surveys conducted across the MIA in early 2026 did not encounter any additional Priority flora species, indicating the assessment has been conclusive.

Thirteen Priority flora species have been encountered within the Winu Project area. Two of these Priority flora; *Eragrostis lanicaulis* (P3) and *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1), have been recorded exclusively outside the DE. Consolidated abundance figures of species within and outside the Development Envelope to June 2026 are tabulated below.

| Taxon                                                               | Consolidated Abundances to June 2026 |       |                           |        |         |
|---------------------------------------------------------------------|--------------------------------------|-------|---------------------------|--------|---------|
|                                                                     | Inside DE (number and %)             |       | Outside DE (number and %) |        | Total   |
| <i>Cynodon anisocarpus</i> (P1)                                     | 63,587                               | 14.7% | 367,973                   | 85.3%  | 431,560 |
| <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) (P1)    | 0                                    | 0%    | 1                         | 100%   | 1       |
| <i>Goodenia hartiana</i> (P2)                                       | 552,280                              | 62.2% | 335,702                   | 37.8%  | 887,982 |
| <i>Bonamia oblongifolia</i> (P3)                                    | 3                                    | 0.2%  | 1,263                     | 99.8%  | 1,266   |
| <i>Comesperma sabulosum</i> (P3)                                    | 51                                   | 18.8% | 220                       | 81.2%  | 271     |
| <i>Corynotheca asperata</i> (P3)                                    | 2,554                                | 30.0% | 5,962                     | 70%    | 8,516   |
| <i>Dasymalla chorisepala</i> (P3)                                   | 118                                  | 31.3% | 259                       | 68.7%  | 377     |
| <i>Eragrostis lanicaulis</i> (P3)                                   | 0                                    | 0%    | 1                         | 100%   | 1       |
| <i>Indigofera ammobia</i> (P3)                                      | 18,658                               | 49.3% | 19,217                    | 50.8%  | 37,875  |
| <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3) <sup>1</sup> | 0                                    | 0.0%  | 73                        | 100.0% | 73      |
| <i>Synostemon arenosus</i> (P3)                                     | 2,467                                | 49.6% | 2,508                     | 50.4%  | 4,975   |
| <i>Terminalia kumpaja</i> (P3)                                      | 110                                  | 49.3% | 113                       | 50.7%  | 223     |
| <i>Tribulopsis marliesiae</i> (P3)                                  | 787                                  | 47.5% | 870                       | 52.5%  | 1,657   |

Two undescribed taxa have been recorded during the botanical assessments: *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) and *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179). These are labelled as Species of Interest (SOI).

*Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138), a robust perennial grass, is abundant and widespread on sand plains within the DE and has also been observed by the authors outside the DE and near the Nifty Copper Mine. It is considered highly likely to be similarly abundant within the Little Sandy Land System outside the DE. Only recently recognised, its distribution regionally is yet to be assessed.

*Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179), a small annual to 20cm on the margins of small claypans, has been recorded outside the DE, 1.22 km NE of the proposed Winu airfield. Attempts to assess this species since it was recognised have been hampered by unfavourable (i.e. dry) seasonal conditions.

Both grass species are subject to on-going taxonomic review by Dr. Terry MacFarlane at the WA Herbarium. Consolidated abundance figures of species within and outside the Development Envelope to June 2026, where known, are tabulated below.

| Taxon (Species of Interest) | Consolidated Abundances to June 2026 |
|-----------------------------|--------------------------------------|
|-----------------------------|--------------------------------------|

<sup>1</sup> *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3), has no numbers of plants occurring within the DE, however, a population was recorded within the DE in August 2019, prior to confirmation of this as a Priority species, but no numbers were attributed to this at that time.



|                                                                          | Inside DE<br>(number and %) |        | Outside DE (number<br>and %) |       | Total   |
|--------------------------------------------------------------------------|-----------------------------|--------|------------------------------|-------|---------|
| <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138)         | 111,003                     | 99.97% | 33                           | 0.03% | 111,036 |
| <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB1179) | 0                           | 0%     | 500                          | 100%  | 500     |

A further potential undescribed species, *Portulaca* sp. Nyangumarta (B. Eckermann Opp01) was recorded on the margin of a proposed borrow pit on the RAC in early June 2026. While not discussed in detail here, specimens will be reviewed by Dr. Matt Barrett (James Cook University) via WA Herbarium to confirm its taxonomic status, (Western Botanical 2026).

| Taxon (Species of Interest)                           | Consolidated Abundances to June 2026 |       |                              |       |       |
|-------------------------------------------------------|--------------------------------------|-------|------------------------------|-------|-------|
|                                                       | Inside DE<br>(number and %)          |       | Outside DE (number<br>and %) |       | Total |
| <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01) | 77                                   | 56.6% | 59                           | 43.4% | 136   |

Of the 342 flora species encountered across the Winu Project, 68 represent extensions to current known distributions of between 100-400 km. Botanical survey work within the Great Sandy Desert (GSD) has been limited and the Winu Project has enabled substantial insight into the distributions of a number of taxa through this region of the GSD. The number and scale of range extensions reflects the paucity of survey and botanical data in this region.

Ten weed species have been recorded across the Winu Project to date: *Alternanthera pungens*, *Cenchrus ciliaris* (Buffel Grass), *Citrullus amarus* (a Melon), *Dactyloctenium aegyptium* (Coast Button Grass), *Euphorbia prostrata*, *Stylosanthes hamata* (Verano Stylo); *Trianthema portulacastrum* (Giant Pigweed), *Tribulus terrestris* (Caltrop), *Tridax procumbens* (Tridax), *Solanum lycopersicum* (Tomato). Of these, the *Cenchrus ciliaris*, *Citrullus amarus* and *Solanum lycopersicum* were encountered at the Winu Camp and removed immediately. *Citrullus amarus* and *Dactyloctenium aegyptium* were predominantly encountered at the Wallal Tanks area, within the pastoral lease area on the Nyangumarta Highway. *Alternanthera pungens* and *Tridax procumbens* were recorded at the Magnum Camp in April 2025. No other weed species were encountered within or nearby the Winu DE, reflecting vegetation being in relatively good condition and only relatively recent activity in the area.

Forty-one flora species considered to have ethno-botanical significance occur across the Winu Project. All flora taxa of ethno-botanical significance recorded within the Project Area are considered to be common and widespread across the Winu Project area and all are more broadly distributed across Great Sandy Desert bioregion and north-western Australia.

The Development Envelope falls on six soil landscape systems. Approximately 50% of the Development Envelope is located across sandplain with linear dunes that support shrubby spinifex grasslands (Little Sandy System). The AB40 system constitutes approximately 31% of the Development Envelope and is characterised by longitudinal dunes on undulating plain with ironstone gravels commonly occurring. The Buckshot System is the most restricted of the soil landscape systems and is characterised by gravelly sandplains. This system constitutes < 1% of the Development Envelope, within the vicinity of the previously proposed Wallal Bore Field and adjacent sections of the RAC.

The landforms present across the Winu Project are characterised into four major groups, i) Sand dunes and associated swales, associated with deep red sand; ii) Interdunal sandplains, associated with deep to shallow red to pale orange sands; iii), Stony rises and gentle outcroppings, associated with gravelly clay soils; and iv) Claypans and low-lying clay flats, associated with deeper clays and subject to seasonal inundation.

Forty-one Vegetation Associations (with an accompanying 9 sub-associations for a total of 50) have been recorded across the Winu Project. These include four occurring on Sand dunes and associated swales (D1-4); 22 occurring on Interdunal sandplains (P1-23, inclusive of P10, P15& P23); seven occurring on Stony rises and gentle outcroppings (R1-7); and eight occurring on Claypans and low-lying clay flats (C1-8). In multiple circumstances a number of these units were observed to mosaic within one another and have been mapped as such.

The condition of vegetation across the Winu Project is considered mostly Excellent (i.e., Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement). The minor exceptions are cleared access tracks, drill pads and existing infrastructure areas which are classified as Disturbed. Weeds are largely absent across the Project, with small populations noted in the Pastoral Lease at the western section of Nyangumarta Highway. Fire is a key driver of change in vegetation structure, with vegetation associations representing many successional stages of recovery following fire.

The majority of the Winu Project Study Area lies within two extensive Land Systems: (i) The Little Sandy System (50% of the DE) is characterised by sandplain and subparallel linear WNW-ESE dunes that support shrubby spinifex grasslands; and (ii) the AB40 system (31% of the DE) is characterised by longitudinal dunes on undulating plain with ironstone gravels supporting Spinifex plains. Both these Land Systems are very extensive in area outside the DE. Given the relatively high-level uniformity of the landforms, soils and vegetation of the region encompassing the Winu Study Area (i.e. Land Systems), it is considered highly likely that the flora and vegetation encountered across the Winu Project is typical of the Land Systems within Great Sandy Desert bioregion. The statistical analysis largely supported the field designations of Vegetation Associations across the Project DE.

Publicly available detailed information of the flora and vegetation of the region is limited. The reports of the vegetation associations, Priority flora and Species of Interest presented in this

assessment is biased to the Development Envelope as limited systematic surveys have been conducted by Winu outside the DE to date.

## 2. Introduction

### 2.1. Project Background

Rio Tinto Winu Pty Limited (Rio Tinto Winu) plan to develop a new copper-gold mine, referred to as the Winu Project. The Winu Project is located approximately 320 km east of Port Hedland and 300 km south of Broome within the northern Pilbara region of Western Australia (Figure 1).

The Winu copper and gold deposit was discovered in 2017 by Rio Tinto Exploration with further exploration and resource development activities undertaken between 2018 and 2026. The proposed Project Development Envelope (DE) is 23,649.07 ha, consisting of three components:

- Mine Infrastructure Area (MIA): area containing the mineralised deposit and related infrastructure; includes monitoring bores north of mine area (10,181.48 ha);
- Road Access Corridor (RAC): existing access road linking Great Northern Highway to the Winu Project Area (6,647.25 ha);
- Rimfire Bore Field (Rimfire): regional bore field located 31 km east of the MIA. Includes a linkage corridor to the MIA (6,820.34 ha);

Since 2017, botanical surveys have been conducted across the Winu Project area (for various iterations of the Development Envelope) by a number of consultancies (as discussed in Section 3, Previous Surveys). In 2023 Western Botanical was commissioned by Rio Tinto Copper to undertake a consolidation of all previous survey data with the objective of bringing all components of the current Winu Project to a Detailed survey level by addressing gaps in previous survey work and adjustments in project design.

The Winu Project has been referred to the Environmental Protection Authority (EPA) for assessment under section 38 of the *Environmental Protection Act 1986* (EP Act). This report presents the consolidation of all botanical survey work conducted within, and outside, the Development Envelope (as currently defined) to June 2026. It has been prepared to meet requirements for Impact Assessment in accordance with Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b) and Environmental Factor Guideline – Flora and Vegetation (EPA 2016a).

### 2.2. Land Use

The Winu Project falls within the Martu (WAD6110/1998) and Nyangumarta (WAD6281/1998) Native Title Determination Areas. The RAC and majority of the MIA are on the Nyangumarta (WAD6281/1998) Native Title Determination Area. Within the boundary of the Martu Native

Title Determination Area lie part of the MIA, the Rimfire Borefield, an existing airstrip (proposed for upgrade) and previous borefield prospect (Texas bore field).

The Nyangumarta Native Title Determination Area is also recognised as the Nyangumarta Warrarn Indigenous Protected Area (IPA). This IPA covers 2.8 million hectares and overlaps with several conservation reserves which are jointly vested or managed with the Western Australian Conservation and Parks Commission (as discussed in Section 2.3.6) (NIAA, 2024).

The Winu Project spans areas of two local governments, the Shire of Broome and the Shire of East Pilbara. Approximately 5 km of the RAC (northern section of Nyangumarta Highway) is located within the Shire of Broome with the remainder within the Shire of East Pilbara. The Winu Project intersects one pastoral lease. A section of the RAC (approximately 20 km near the Great Northern Highway) is located within the Wallal Downs Station (Figure 2) (the Mandora Station is approximately 5 km north east of this same section of the RAC). The pastoral lease located nearest the proposed area of active mining is Warrawagine Station, approximately 100 km west of the MIA (Rio Tinto Winu Pty Ltd, 2023).

The Great Northern Highway is the only sealed road in the area with all other roads unsealed, four-wheel drive only tracks. Included within the RAC is 97 km of the western end of the road known as the Nyangumarta Highway, 54 km of track known as Wirrkirr, Wirrkirr Road and 32 km of a track named Copperhead Road (Rio Tinto Winu Pty Ltd, 2023). The Nyangumarta Highway (previously known as the Kidson Track or Wapet Road) was created in the late 1960s by West Australian Petroleum Pty Ltd for exploration purposes on Unallocated Crown Land. As the road was never gazetted by the WA Government, it became a private road owned by the Nyangumarta People (within their traditional lands).

The Australian Renewable Energy Hub (AREH) Project is located on a 6,500-square kilometre site adjacent the Winu Project. Part of the RAC and the previous Wallal bore field (an alternative bore field prospect) fall within the boundary of the AREH. The MIA is approximately 33 km east of the proposed AREH (Rio Tinto Winu Pty Ltd, 2023).

**Figure 1. Location of the Winu Project**



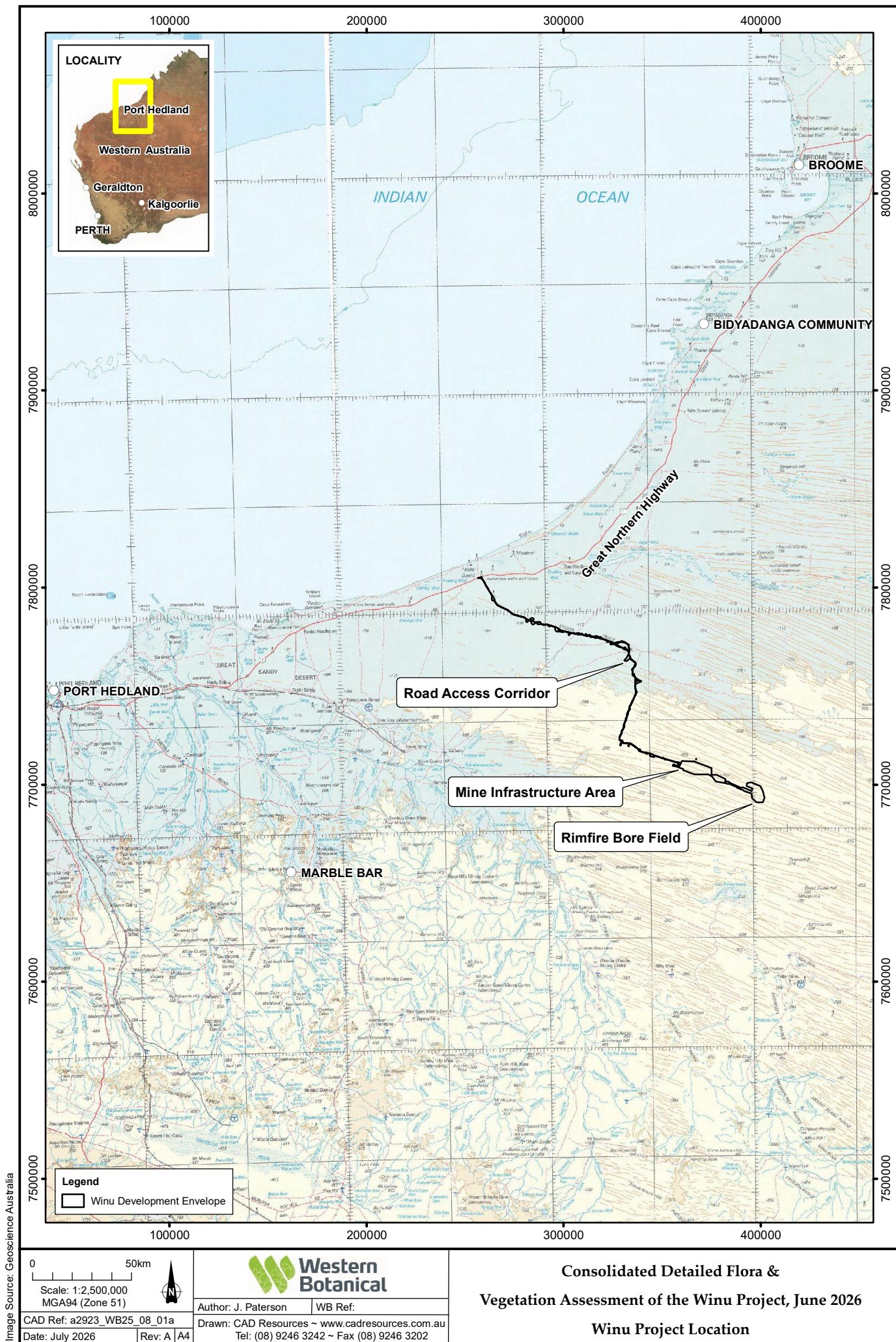
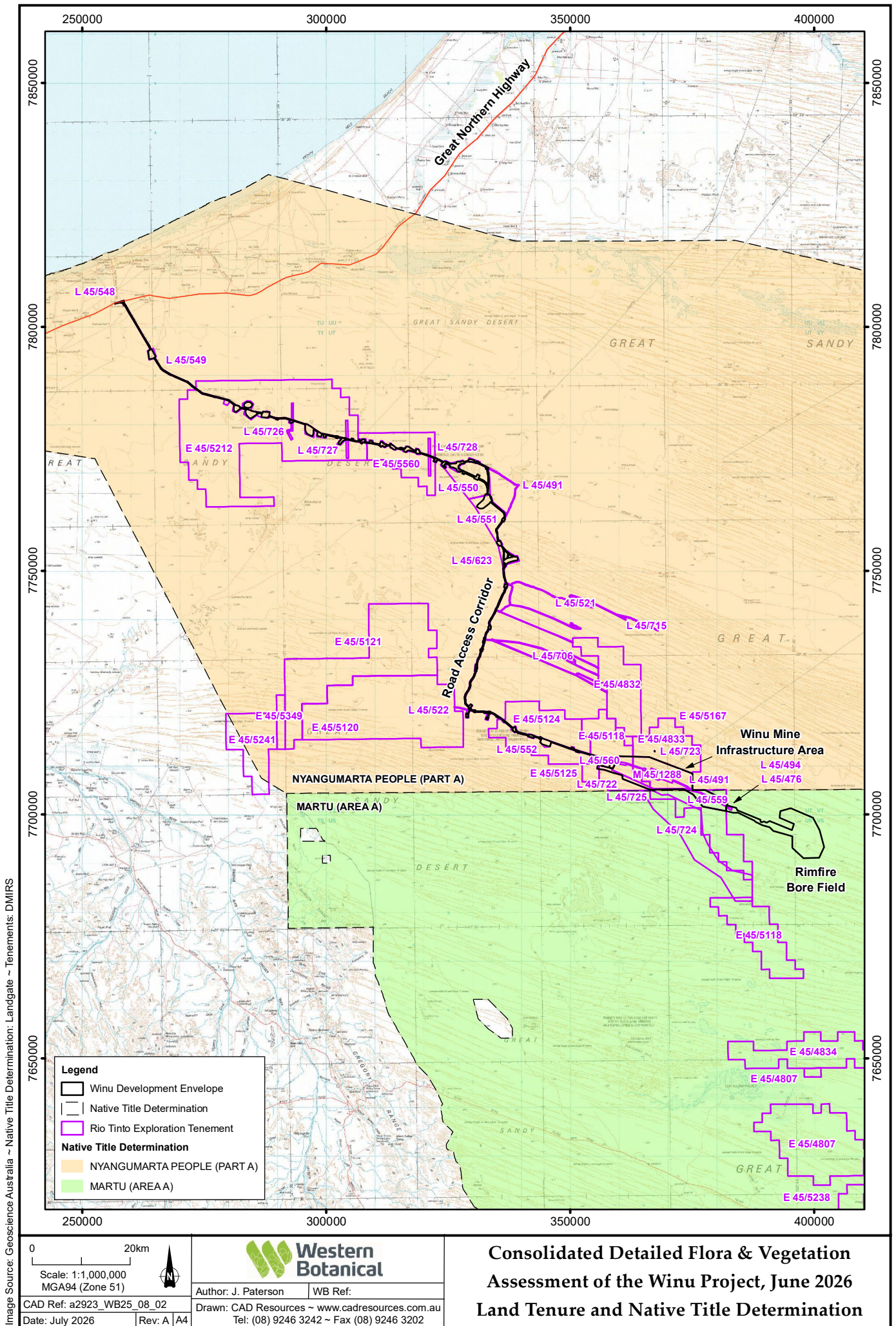


Image Source: Geoscience Australia

**Figure 2. Winu Project Regional Cadastre**



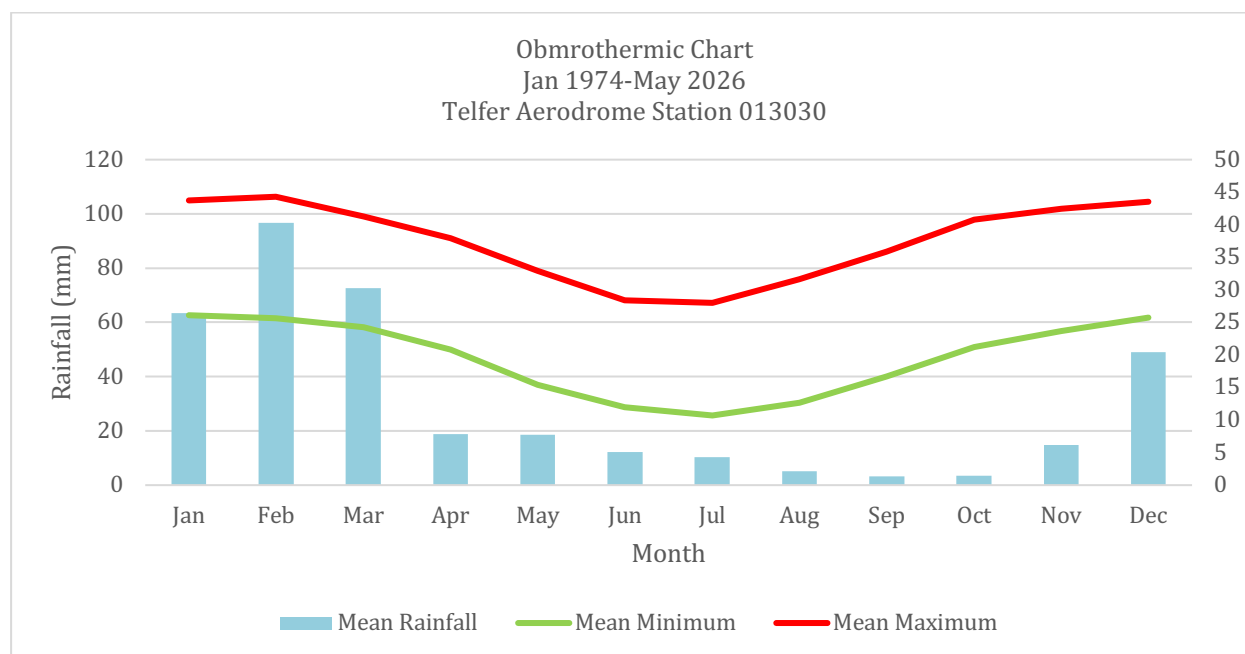




## 2.3. Physical Environment

### 2.3.1. Climate

The Winu Project area experiences a hot desert arid climate (Köppen BWh), characterised by extremely hot summers and very warm winters. The nearest Bureau of Meteorology (BoM) weather station is located at Telfer (Telfer Aero weather station number 13030), approximately 100 km south-east of the Winu Project. The average annual rainfall for Telfer to May 2026 is 371.8 mm. Average monthly rainfall peaks from late spring to mid-autumn, with the highest mean monthly average rainfall occurring in February (96.8 mm) (Figure 3). Rainfall during these months is associated with the southward movement of tropical lows and cyclones. Mean maximum daily temperatures range from 25.4 °C in June to 40.5 °C in December with mean minimum temperatures ranging from 10.7 °C in July to 26.1 °C in January (BoM, 2026a).



**Figure 3. Long-term average climate data for Telfer (weather station number 13030) (1974– May 2026) (BoM, 2026a).**

### 2.3.2. Geology

The Winu Project is located in the Paterson Province, a 30,000 km<sup>2</sup> area consisting of Early to Middle Proterozoic high grade metamorphic rocks, acid and basic intrusive rocks, shelf sediments and minor younger granite intrusive rocks. The Paterson region is considered highly prospective for gold-copper and base metal mineral systems (Geoscience Australia, 2022). The Winu Project is hosted in metamorphosed massive sandstones, siltstones, and lesser mafic rocks that are possible distal and deep-water correlatives of the Malu Formation of the Yeneena basin, which also hosts the large Telfer Au-Cu deposit. Mineralization at Winu is hosted by numerous thin, brittle veins and breccias with at least four distinct vein sets associated with Cu-Au recognised. Within the

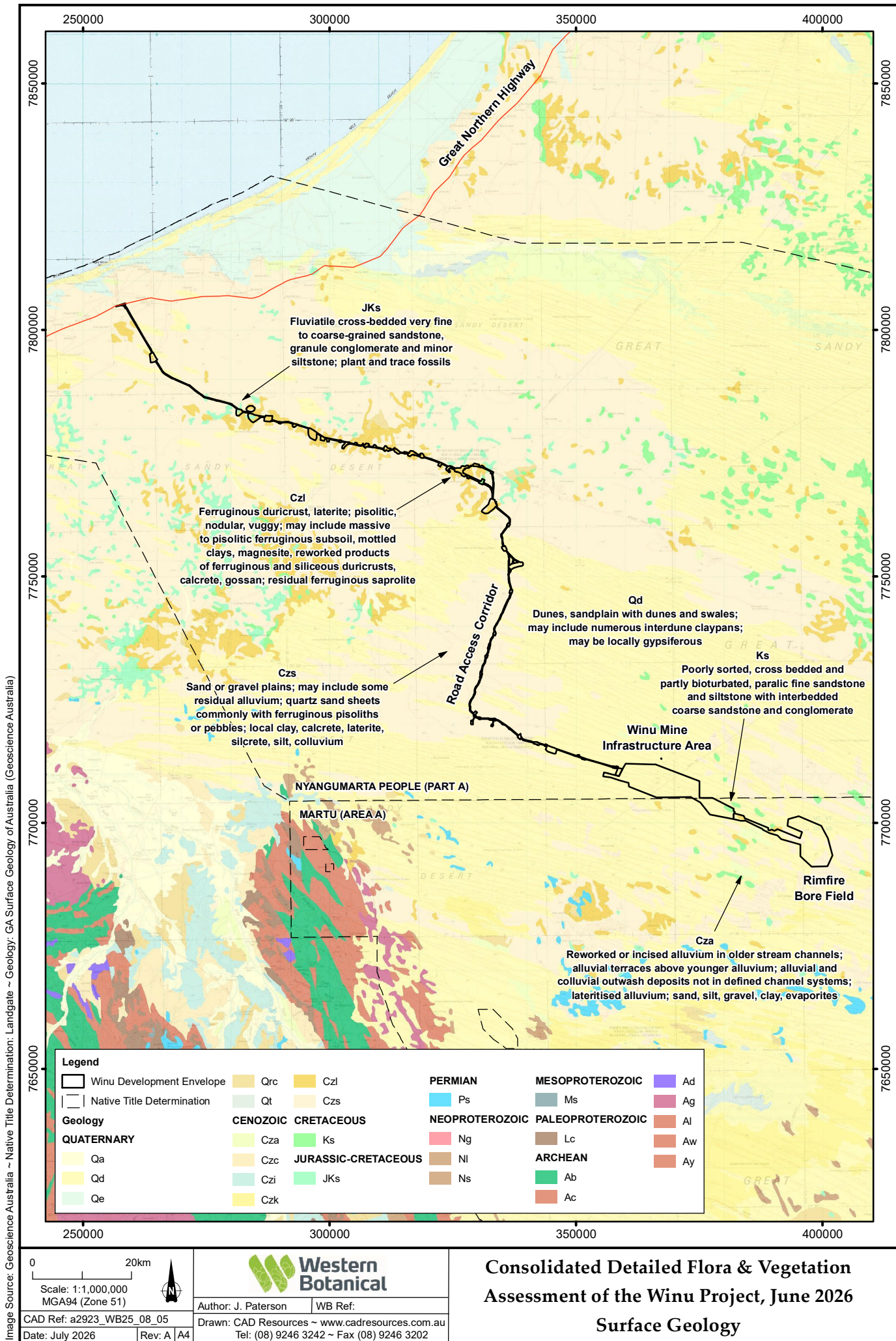
region, the Winu deposit is unique in that it preserves evidence for an early, reduced intrusion-related gold system overprinted by a more oxidized intrusion-related copper system (Dalstra et al., 2023).

The Winu Project spans six surface geological units (Table 1; Figure 4). Dominant units include Qd (dunes, sandplains with dunes) which comprise ~ 67 % of the Development Envelope, Czs (sand or gravel plains) ~ 19 % and Czl (Ferruginous duricrust, laterite) ~ 11 %.

**Table 1. Surface geology of the Winu Project (Raymond, et al., 2012).**

| Geology Unit | Description                                                                                                                                                                                                                                             | Area (ha) within Development Envelope | % of Development Envelope |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------|
| Cza          | Reworked or incised alluvium in older stream channels; alluvial terraces above younger alluvium; alluvial and colluvial outwash deposits not in defined channel systems; lateritised alluvium; sand, silt, gravel, clay, evaporites                     | 147.23                                | 0.62                      |
| Czl          | Ferruginous duricrust, laterite; pisolitic nodular, vuggy; may include massive to pisolitic ferruginous subsoil, mottled clays, magnesite, reworked products of ferruginous and siliceous duricrusts, calcrete, gossan; residual ferruginous saprolite. | 2,692.74                              | 11.39                     |
| Czs          | Sand or gravel plains; may include some residual alluvium; quartz sand plains commonly with ferruginous pisoliths or pebbles; local clay, calcrete, laterite, silcrete, silt, colluvium                                                                 | 4,425.87                              | 18.72                     |
| JKs          | Fluvatile cross-bedded very fine to coarse-grained sandstone, granule conglomerate and minor siltstone; plant and trace fossils                                                                                                                         | 189.64                                | 0.80                      |
| Ks           | Poorly sorted, cross bedded and partly bioturbated, paralic fine sandstone and siltstone with interbedded coarse sandstone and conglomerate                                                                                                             | 259.21                                | 1.10                      |
| Qd           | Dunes, sandplain with dunes and swales; may include numerous interdune claypans; may be locally gypsiferous                                                                                                                                             | 15,934.39                             | 67.38                     |
|              | Total                                                                                                                                                                                                                                                   | 23,649.07                             |                           |

**Figure 4. Surface Geology of the Winu Project**





### 2.3.3. Soil Landscape Systems

Soil landscape mapping of Western Australia has been completed by the Department of Primary Industries and Regional Development (DPIRD) through the compilation of various surveys at differing scales (varying from 1:20,000 to 1:3,000,000). The mapping conforms to a nested hierarchy which was established to manage the varying scales and subsequent levels of information evident across the surveys (DPIRD, 2024a).

During the early 1990s, extensive land system mapping and condition assessments of pastoral land within the Pilbara was completed by the then Department of Agriculture and Food, Western Australia (DAFWA) (currently DPIRD) (van Vreeswyk et al., 2004). The existence and condition of soils, landforms, vegetation, habitat, ecosystems and declared plants and animals were catalogued, with the goal of improving overall understanding of the area's natural resources, and to assist with planning and implementation of resource management practices.

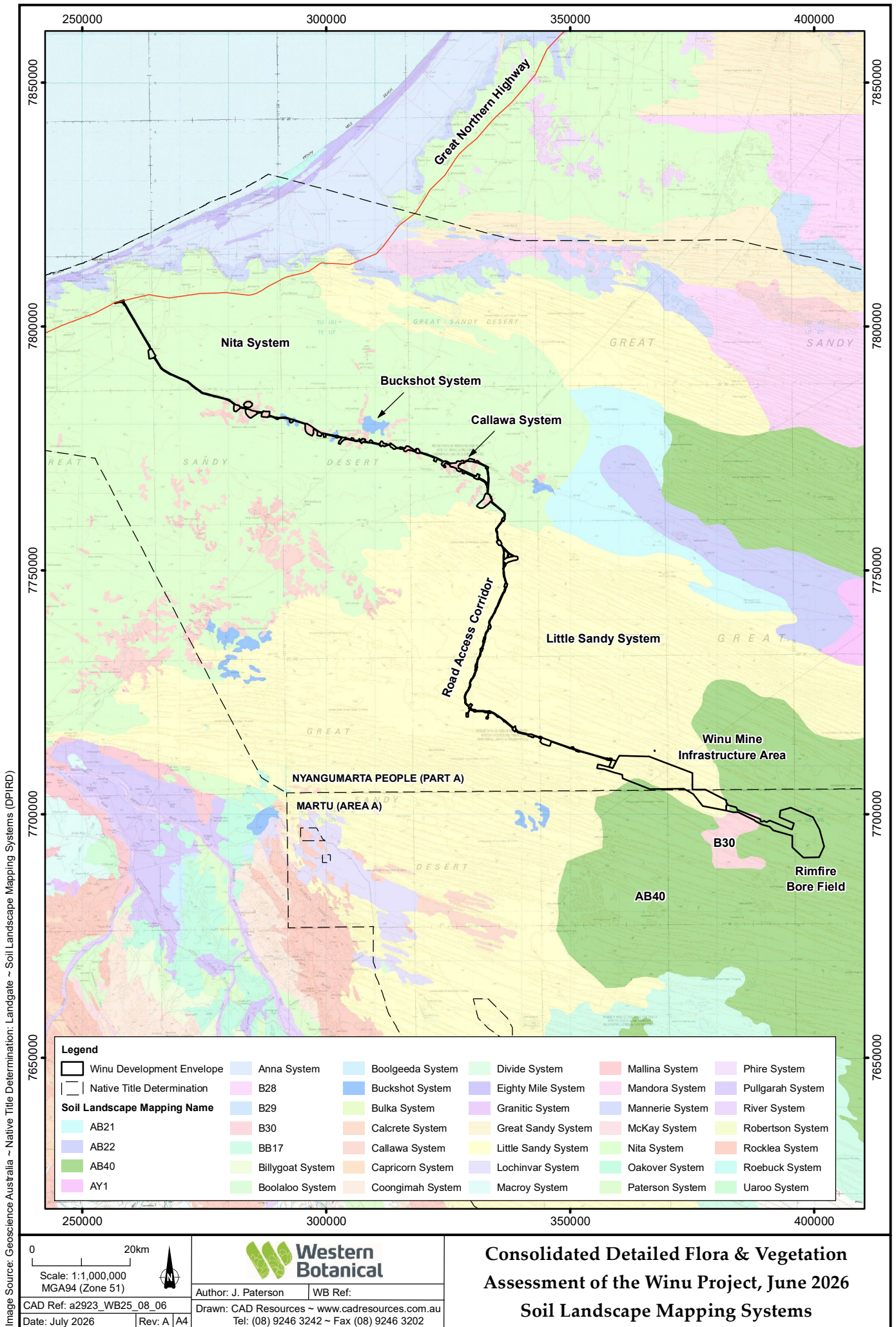
The Development Envelope falls on six soil landscape systems. Approximately 50% of the Development Envelope is located across sandplain with linear dunes that support shrubby spinifex grasslands (Little Sandy System). The AB40 system constitutes approximately 31% of the Development Envelope and is characterised by longitudinal dunes on undulating plain with ironstone gravels commonly occurring. The Buckshot System is the most restricted of the soil landscape systems and is characterised by gravelly sandplains. This system constitutes < 1% of the Development Envelope, within the vicinity of the previous Wallal Bore Field and adjacent sections of the RAC (Table 2, Figure 5).

**Table 2. Soil landscape systems of the Winu Project (DPIRD, 2024a)**

| Soil landscape system | Description                                                                                                                                                                                                                                    | Area (ha) within Development Envelope | % of Development Envelope |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------|
| AB40                  | Gently undulating plain (slightly more elevated than unit AB39) dominated by longitudinal dunes, many exposures of ironstone gravels and some breakaways capped by ironstone (laterite) duricrust.                                             | 7,241.11                              | 30.62                     |
| B30                   | Dune fields--largely stable linear dune fields with swales opening locally into sand plains dune lineation is generally E.-W. but in the area west of 123 deg E. Longitude the trend is NW.-SE.; considerable areas of claypans and salt pans. | 191.77                                | 0.81                      |
| Buckshot System       | Gravelly sandplains and occasional sand dunes supporting shrubby hard spinifex grasslands.                                                                                                                                                     | 95.97                                 | 0.41                      |
| Callawa System        | Highly dissected low hills, mesas and gravelly plains on sandstone and conglomerate supporting soft and hard spinifex grasslands.                                                                                                              | 2,060.32                              | 8.71                      |
| Little Sandy System   | Sandplains with linear and reticulate dunes supporting shrubby hard and soft spinifex grasslands.                                                                                                                                              | 11,838.42                             | 50.06                     |
| Nita System           | Sandplains supporting shrubby spinifex grasslands with occasional trees.                                                                                                                                                                       | 2,221.49                              | 9.39                      |
|                       | <b>Total</b>                                                                                                                                                                                                                                   | <b>23,649.07</b>                      |                           |



**Figure 5. Soil Landscape Systems of the Winu Project**



### 2.3.4. Hydrology and Hydrogeology

The Winu Project is located within the Sandy Desert Basin hydrographic catchment and the Sandy Desert – Lake Dora subcatchment (DPIRD, 2024b). The Great Sandy Desert region experiences little to no surface water runoff to water courses, and surface water features tend to be ephemeral and sparse (V&C Semeniuk Research Group, 2000; as cited in Rio Tinto Winu Pty Ltd, 2023). Surface water features within the vicinity of the Winu Project are limited and consist predominantly of soaks. The closest to the MIA include Winu Soak (22 km north), Toramah Soak (54 km west) and Djimakarra Soak (45 km north). The Oakover River lies approximately 100 km south-west of the MIA (Rio Tinto Winu Pty Ltd, 2023).

The hydrogeology of the Winu Project area consists of Quaternary (Cenozoic) surficial deposits that may form shallow aquifers, deeper metasediment of the Yeneena Basin, which host groundwater, and sandstones of the Canning Basin that form a major regional aquifer known as the Wallal Aquifer. This aquifer is unconfined near the MIA and becomes confined towards the coast (Golder, 2022; as cited in Rio Tinto Winu Pty Ltd, 2023). Groundwater resources in the area have been broadly mapped at a total dissolved solids (TDS) content of 500 - 1,000 milligrams per litre (mg/L) (DWER, 2024a) which is considered marginal in Western Australia. Depth to groundwater surrounding the MIA is typically more than 50 m below ground level (mbgl) (Golder 2022, as cited in Rio Tinto Winu Pty Ltd, 2023).

## 2.4. Biological Environment

### 2.4.1. Interim Biogeographic Regionalisation of Australia (IBRA)

The Winu Project is located across two IBRA bioregions (Dampierland and Great Sandy Desert) and three subregions (Mackay, McLarty and Pindanland) (Figure 6). The majority of the Winu Project is located within the Great Sandy Desert bioregion, an area dominated by sand-dune systems, sandstone mesas and rocky plains (van Etten, 2020). This bioregion comprises two subregions, the McLarty (GSD01) and the Mackay (GSD02). A section of the RAC is located within the McLarty subregion while the MIA, a section of the RAC, and Rimfire bore fields lie within the Mackay subregion (Figure 6). The McLarty and Mackay subregions can be described as:

**McLarty subregion (GSD01)** is 13,173,266 ha in size with an arid tropical climate that is influenced by monsoonal activity. Vegetation is mainly tree steppe grading to shrub steppe in the south and can be broadly described as;

- open hummock grassland of *Triodia pungens* and *T. schinzii* with scattered trees of *Owenia reticulata* and Bloodwoods, and shrubs of *Acacia* spp, *Grevillea wickhamii* and *G. refracta*, on Quaternary red longitudinal sand dune fields overlying Jurassic and Cretaceous sandstones of the Canning and Armadeus Basins;
- *Casuarina decaisneana* (Desert Oak) in the far east of the sub region;



- shrub steppe such as *Acacia pachycarpa* shrublands over *Triodia pungens* hummock grass on gently undulating lateritised uplands;
- samphire low shrublands and *Melaleuca glomerata* - *M. lasiandra* shrubland associated with extensive salt-lake chains on occluded paleo-drainage systems.

Land use within the McLarty subregion is comprised of Unallocated Crown Land (UCL) and Crown Reserves (Graham, 2001a). The pre-European vegetation of this subregion remains intact (see Section 2.3.2). Less than 1% is protected (reserved) for conservation (DBCA, 2018).

**Mackay subregion (GSD02)** extends across Western Australia and into the Northern Territory. Within Western Australia it occupies 18,636,695 ha and has an arid tropical climate that receives predominantly summer rainfall. Monsoonal influences are apparent in the north-western sector. The subregion is described as a tropical inland ‘red centre’ desert and includes the ‘Percival’ and ‘Auld’ palaeoriver systems. Vegetation can be broadly described as that listed for the McLarty subregion, with the exception that *Casuarina decaisneana* (Desert Oak) is present in the south and east of the subregion. Land use within the Mackay subregion is primarily UCL, Aboriginal Lands and Reserves, mining leases and small areas of urban development (Kendrick, 2001). The pre-European vegetation of this subregion remains intact (see Section 2.3.2), with approximately 4.5 % protected (reserved) for conservation (DBCA, 2018).

The northern-most section of the Development Envelope extends into the Dampierland bioregion which is an area characterised by extensive plains, ranges and gorges. The Development Envelope is situated within one subregion (Pindanland, DAL02) of this bioregion:

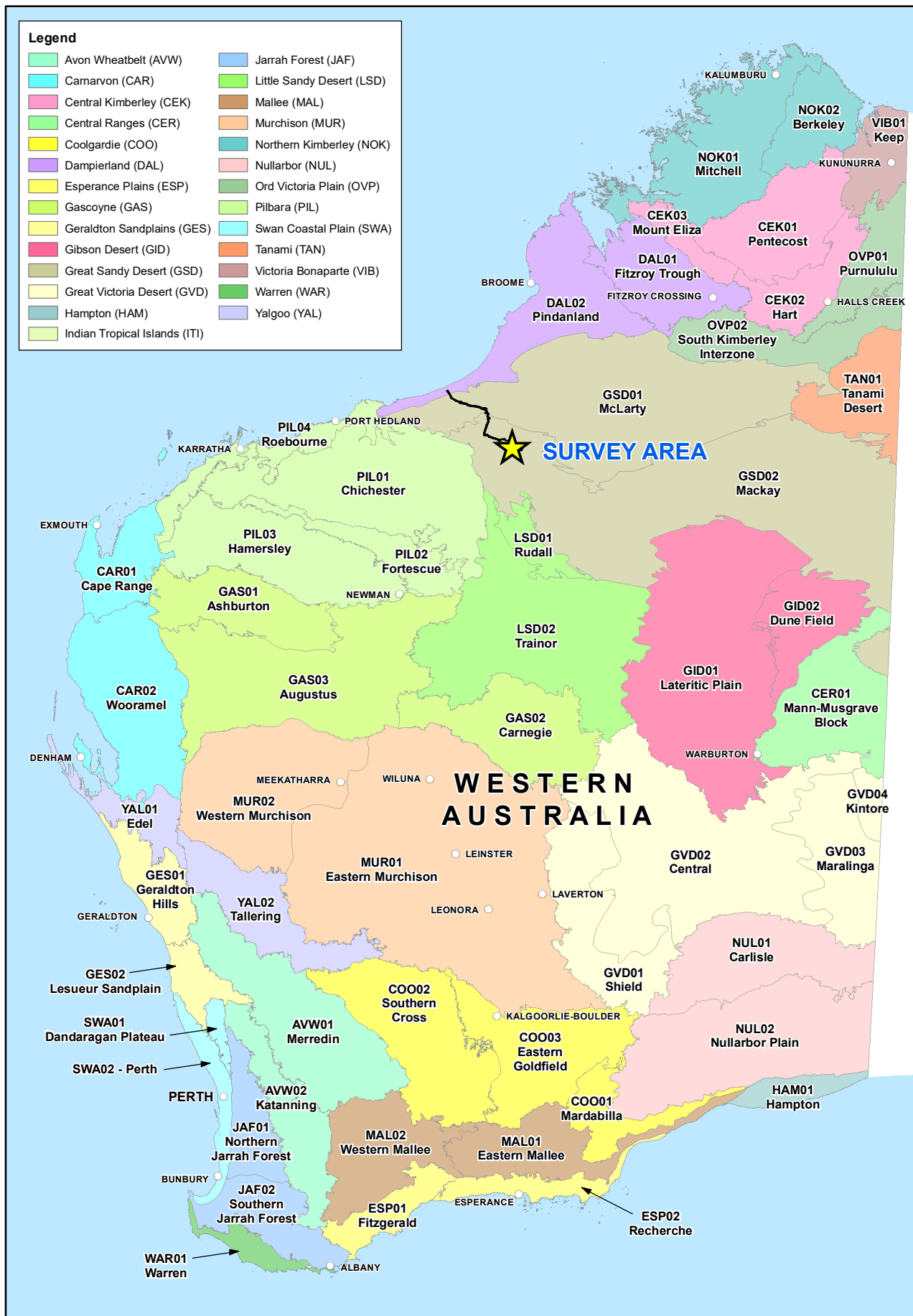
**Pindanland subregion (DAL02)** is 5,198,904 ha in size with a dry hot tropical and semi-arid climate that receives summer rainfall. Vegetation is broadly described as pindan and can be further classified as:

- hummock grasslands on hills on Quaternary sandplain overlying Jurassic and Mesozoic sandstones with Pindan;
- mangal, samphire – *Sporobolus* spp. grasslands, *Melaleuca alsophila* low forests, and *Spinifex* spp. – *Crotalaria* spp. strand communities on Quaternary marine deposits on coastal plains;
- tree savannahs of ribbon grass (*Chrysopogon* spp.) – bluegrass (*Dichanthium* spp.) grasses with scattered coolibah (*Eucalyptus microtheca*) - *Bauhinia cunninghamii*;
- riparian forests of river red gum (*Eucalyptus camaldulensis*) and Cadjeput (*Melaleuca* spp.) fringing drainage areas.

Land use within the Pindanland subregion is comprised of UCL and Crown Reserves and grazing (Graham, 2001b). The pre-European vegetation of this subregion remains intact (see Section 2.3.2), however less than 1% is protected (reserved) for conservation (DBCA, 2018).

**Figure 6. Location of the Winu Project within IBRA**





### 2.4.2. Pre-European Vegetation

The pre-European vegetation mapping of Western Australia dataset maps the original native vegetation presumed to have existed prior to European settlement. It is based predominantly on the published and unpublished mapping of J.S. Beard. The first broad-scale vegetation mapping of Western Australia was conducted by Beard in 1979 with several revisions and updates resulting in the most recent and comprehensive iteration, detailed in Beard *et al.* (2013).

Statistics on the pre-European and current extent of the Beard vegetation associations of Western Australia are used in the assessment of development applications and both conservation and land use planning. A summary of the bioregional extent of the pre-European vegetation associations present in the Development Envelope is presented in Table 3. Information has been sourced from the latest (2020) dataset (WALGA, 2020).

Beard describes five vegetation system associations across the Winu Project (Table 3, Figure 7), all of which feature hummock grasslands. Approximately 81% of the Development Envelope is located within the Great Sandy Desert\_134 vegetation system association which is described as a mosaic of hummock grassland and open low tree steppe on sandhills and hummock grassland and shrub steppe between dunes (Table 3). The MIA, Rimfire bore field, and a portion of the RAC all lie within this mapped vegetation system association (Figure 7). The most restricted vegetation system association is Mandora East\_80 which comprised < 0.01% of the Development Envelope (Table 3). The RAC intersects this vegetation at the northern end of the Development Envelope (Figure 7).

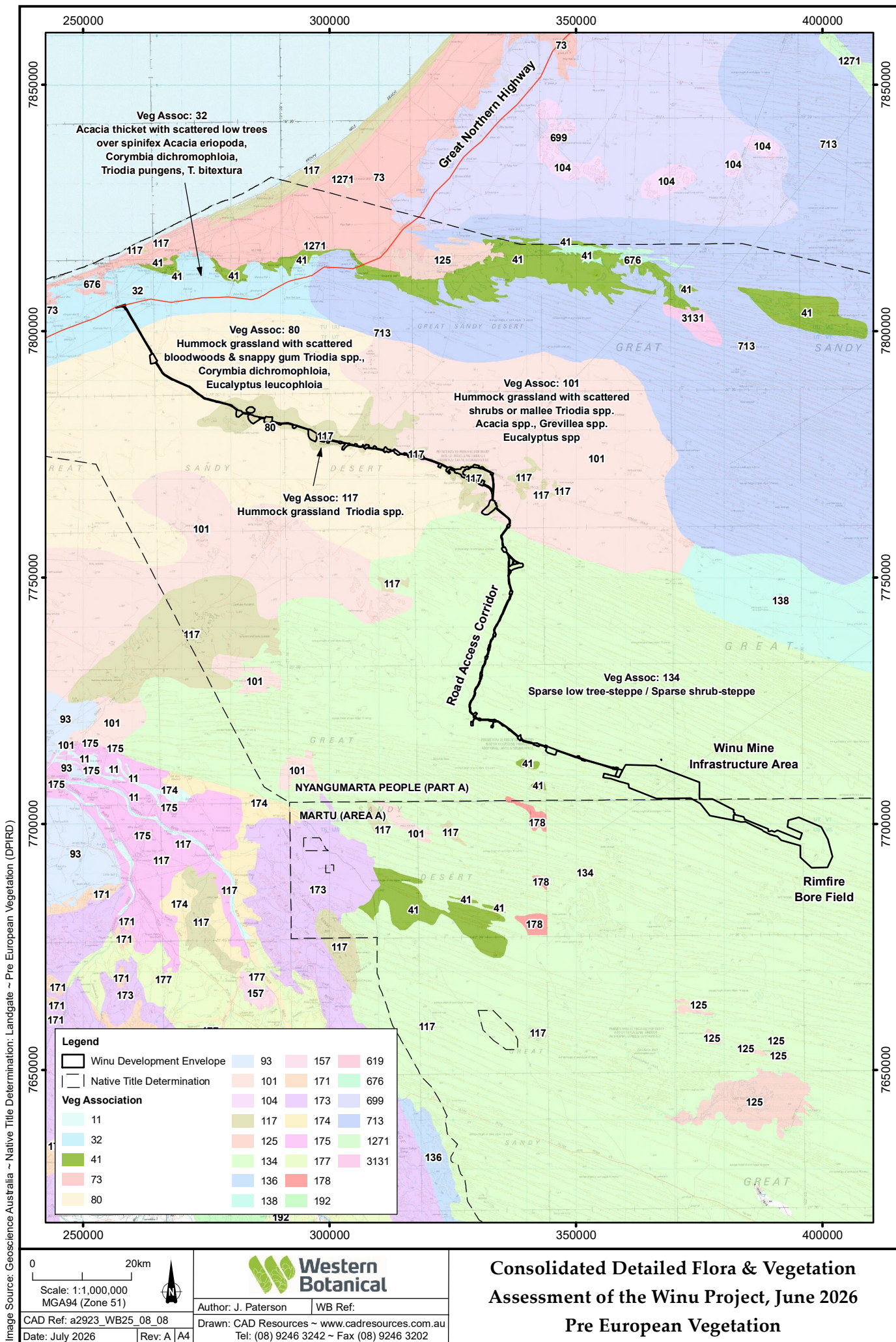
All vegetation system associations mapped across the Development Envelope remain intact at a bioregional level with greater than 99% of pre-European extent remaining of each (Table 3). The Development Envelope is located within the Shire of East Pilbara and the Shire of Broome, both of which currently have 99% of their pre-European vegetation extent remaining (GoWA, 2023).

**Table 3. Pre-European vegetation system associations of the Winu Project (WALGA, 2020).**

| Veg. System        | Veg. Assoc. | SA Code | Description                                                                                                                                                                                                          | Scale                        | Pre-European Extent (ha) | Current Extent (ha) (% remaining) | Area in DE (ha) | % of DE | % of Current Extent in DE |
|--------------------|-------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------|-----------------------------------|-----------------|---------|---------------------------|
| Great Sandy Desert | 134         | 134.1   | Mosaic: Hummock grasslands, open low tree steppe; Desert Bloodwood and Feathertop Spinifex ( <i>Triodia schinzii</i> ) on sandhills / Hummock grasslands, shrub steppe; mixed shrubs over spinifex between sandhills | Great Sandy Desert Bioregion | 13,596,636.86            | 13,594,698.52 (100%)              | 19,245.86       | 81.38   | 7.88%                     |
| Mandora East       | 80          | 80.1    | Hummock grasslands and low tree steppe with Desert Walnut over soft spinifex between sand ridges.                                                                                                                    | Great Sandy Desert Bioregion | 1,108.25                 | 1,108.25 (100%)                   | 630.17          | 2.67    | 0.26%                     |
|                    |             |         |                                                                                                                                                                                                                      | Dampierland Bioregion        | 293,426.20               | 293,426.20 (100%)                 | 2.18            | 0.01    | <0.01%                    |
| Mandora East       | 101         | 101.1   | Hummock grasslands and shrub steppe with <i>Acacia pachycarpa</i> over soft spinifex.                                                                                                                                | Great Sandy Desert Bioregion | 961,169.65               | 961,123.89 (100%)                 | 663.92          | 2.81    | 0.27%                     |
| Mandora East       | 117         | 117.1   | Hummock grasslands and grass steppe with soft spinifex.                                                                                                                                                              | Great Sandy Desert Bioregion | 467,578.76               | 467,121.70 (99.9%)                | 2,976.28        | 12.59   | 1.22%                     |
| Pindan             | 32          | 32.1    | Pindan sandplain with <i>Acacia</i> shrubland with scattered low trees over <i>Triodia</i> spp.                                                                                                                      | Dampierland Bioregion        | 244,296.83               | 244,265.18 (100%)                 | 130.66          | 0.55%   | 0.05%                     |
| Total              |             |         |                                                                                                                                                                                                                      |                              |                          |                                   | 23,649.07       |         |                           |

**Figure 7. Pre-European Vegetation of the Winu Project**







### 2.4.3. Groundwater Dependent Ecosystems (Terrestrial)

A Groundwater Dependent Ecosystem (GDE) is defined as an ecosystem that relies on groundwater for some or all its water requirements. The GDE Atlas is a national dataset of Australian GDEs to inform groundwater planning and management. The Atlas contains information about three types of ecosystems (aquatic, terrestrial and subterranean). Terrestrial GDEs refer to ecosystems that rely on the subsurface presence of groundwater, this includes all vegetation ecosystems (BoM, 2024b).

A small section of the Development Envelope is classified as having low potential to support a terrestrial GDE, namely where the RAC (along Nyangumarta Highway) intersects a mosaic of small areas mapped as such (BoM, 2024b). No other areas of the Development Envelope have been identified as having potential to support a terrestrial GDE (by the GDE Atlas). Due to the depth to groundwater in the area (> 40 m within the unconfined aquifer and > 50 m within the confined aquifer), it is considered unlikely that vegetation within the vicinity of the Development Envelope is dependent on groundwater (Golder 2022, as cited in Rio Tinto Winu Pty Ltd, 2023).

### 2.4.4. Significant Wetlands

The nearest significant wetland to the Development Envelope is the Eighty Mile Beach wetland system. This system comprises the white sand beaches and intertidal mudflats of Eighty Mile Beach and Walyarta (Mandora Marsh). The latter is comprised predominantly of two large lakes that are inundated following cyclonic rains. Walyarta's western lake is a claypan approximately 30 km in length while the eastern lake is a broad, braided drainage line with vegetated islands and small salt or claypans (Graham, 1999 as cited in DCLM, 2003). The system is the most important wetland for waders in north-western Australia and has international significance as it provides land fall for waders migrating south for the Australian summer (RSIS, 2024). The Eighty Mile Beach wetland system is Ramsar listed and recognised by the Directory of Important Wetlands in Australia (DIWA) (DBCA; 2024a, 2024b). It is located approximately 135 km north-west of the MIA (Rio Tinto Winu Pty Ltd, 2023). At its nearest point, the northern end of the RAC (at Great Eastern Highway) is located approximately 9 km south east of the Eighty Mile Beach Ramsar site (DBCA, 2024b).

### 2.4.5. Environmentally Sensitive Areas

Environmentally sensitive areas (ESAs) are classes or areas of native vegetation where the exemptions for clearing vegetation under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Clearing Regulations) do not apply. They include the following:

- a declared World Heritage property as defined in section 13 of the *Environment Protection and Biodiversity Conservation Act 1999* of the Commonwealth;
- an area that is included on the Register of the National Estate, because of its natural heritage value, under the *Australian Heritage Council Act 2003* of the Commonwealth;
- a defined wetland and the area within 50 m of the wetland;

- the area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located;
- the area covered by a threatened ecological community;
- a Bush Forever site listed in “Bush Forever” Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission, as described in subclause (3);
- the areas covered by the following policies —
  - (i) the Environmental Protection (Gnangara Mound Crown Land) Policy 1992;
  - (ii) the Environmental Protection (Western Swamp Tortoise) Policy 2002;
- the areas covered by the lakes to which the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 applies;
  - (i) protected wetlands as defined in the Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998;
  - (j) areas of fringing native vegetation in the policy area as defined in the Environmental Protection (Swan and Canning Rivers) Policy 1998.

The Development Envelope is not located within an ESA. The nearest ESA is the Eighty Mile Beach wetland system (as discussed in Section 2.3.4) and the area within 50 m of the wetland (DWER, 2024b) (Figure 8).

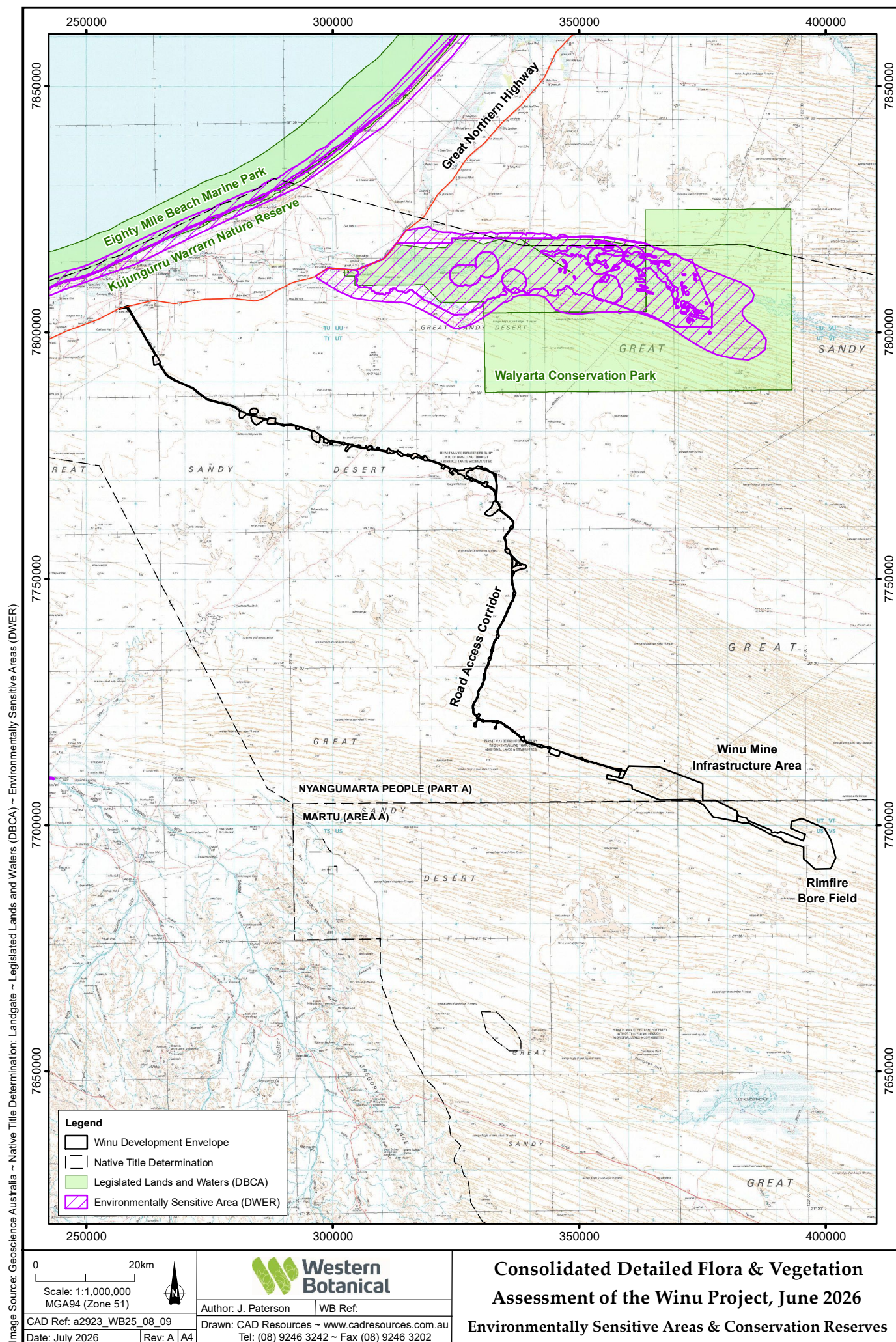
#### **2.4.6. Conservation Reserves in the Region**

The largest conservation reserve nearest the Development Envelope is Walyarta Conservation Park which encompasses the Walyarta (Mandora Marsh) and is located (at its nearest point) approximately 40 km north of the RAC (DBCA, 2024c) (Figure 8). Comprised of three reserves (Reserve No. 52383; 53017 and 52387) the park has a total area of 231,814 ha and is jointly vested with the Conservation and Parks Commission, the Nyangumarta Warrarn Aboriginal Corporation (Reserve No. 53017), Karajarri Traditional Lands Association (52383) and Nyangumarta-Karajarri Aboriginal Corporation (53017) (DBCA, 2019).

A series of narrow conservation reserves are located along the coast of 80 Mile Beach and lie adjacent to the Eighty Mile Beach Marine Park. The closest of these include the Kujungurru Warrarn Nature Reserve (Reserve No. 52363; 2,555 ha) which is located approximately 8.5 km from the Development Envelope (at the intersection of Great Eastern Highway) and the Kujungurru Warrarn Conservation Park (Reserve No. 52362; 1,139 ha), approximately 23 km distance from said intersection.

**Figure 8. Environmentally Sensitive Areas and Conservation Reserves of the Region**







### 3. Previous Surveys

#### 3.1. Summary of Previous Surveys

Numerous botanical surveys have been conducted across the Winu Project area, beginning with a survey of the RAC in August 2017 (referred to as the WRAC at the time and conducted by Biota) and culminating with the most recent surveys conducted by Pheonix Environmental Sciences, Biota and Western Botanical in 2026.

A map of previous survey areas representing Project option domains is presented in Appendix 1. A summary of all botanical surveys conducted prior to 2024 is detailed in Table 4. The list of surveys includes:

- Two Reconnaissance surveys of the Winu Project Area (WPA) (now referred to as the MIA) (Astron, 2018; 2019) as well as a two-phase Detailed flora and vegetation survey of the WPA (Biota, May 2019; September 2019);
- A single-phase flora and vegetation survey of the Winu Re-Injection Borefield (WRIB) (now referred to as the proposed Re-Injection Bore Field) (Biota, May 2019);
- A Detailed (two-phase) flora and vegetation survey of the RAC Sections 1 and 2 (Biota, August 2019; Western Botanical, April 2023);
- A Detailed (two-phase) flora and vegetation survey of the RAC Section 2 as part of AREH scope (Biota, September 2017; March 2018; April 2023);
- Reconnaissance surveys of the proposed RAC diversion to the existing Nyangumarta Hwy (Biota, August 2019; July 2020);
- A Reconnaissance survey of potential RAC borrow source areas (Biota, July 2020);
- Follow-up assessment of seasonal limitation of survey work across the MIA (Western Botanical, June 2022);
- A Detailed (two-phase) flora and vegetation assessment of the proposed MIA extensions including Targeted Priority flora searches (Western Botanical, June 2022; October 2022);
- Four Targeted weed surveys of the MIA and RAC (Western Botanical, June 2022; March 2023; April 2024, April 2025).
- A Detailed (two-phase) flora and vegetation survey of the Rimfire and Texas bore fields: Phase one - proposed production bore pads only (Western Botanical, October 2022); Phase two – full survey area (Western Botanical, June 2023; October 2023; March 2024);



- Follow-up Targeted Priority flora survey of the MIA and proposed MIA Extension (Western Botanical, April 2023) and the RAC (Western Botanical, June 2023);
- A Reconnaissance survey of the Wallal bore field (Western Botanical, April 2023).
- A regional Targeted Priority flora search of areas north of the MIA (Western Botanical, April 2024).
- A Detailed (two-phase) flora and vegetation survey of the Revised Development Envelope (i.e., the Texas and Rimfire bore field extensions) (Western Botanical, June 2024, July 2024, November 2024).
- A Targeted survey of the Rimfire bore field pipeline corridor alignment (Western Botanical November 2024).
- A single-phase flora and vegetation survey of the Winu South survey Area (Western Botanical November 2024, December 2024).
- Detailed survey of an additional four quadrats established to ensure a minimum of three quadrats in relevant vegetation associations within the MIA in March 2026;
- Intensive targeted searches for Priority flora across the MIA undertaken by Pheonix Environmental Services and Biota Environmental Sciences in consultation with Western Botanical in April 2026.
- Further intensive targeted surveys for relevant Priority flora within the proposed Development Envelope by Western Botanical in May and May/June 2026.

**Table 4. Summary of previous botanical surveys conducted across the Winu Project (adapted from Biota, 2023)**

| Consultant     | Project Component | Location                                                                                                                       | Area (ha)    | Survey Description and Report Reference                                                                                                                                                                                                          | Survey Dates                                                                                                                                                                                                           | Season                                                                                              | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Limitations                                                                                                                                                                                                                                                                        |
|----------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biota & Astron | MIA               | 320 km east of Port Hedland.                                                                                                   | 13,401.90 ha | Two-phase Detailed flora and vegetation survey (completed over the entire Mine Survey Area).<br><br>Two Reconnaissance level flora and vegetation surveys completed by Astron.<br><br>33 quadrats, 2 relevés.<br><br><b>Astron (2018, 2019a)</b> | <ul style="list-style-type: none"> <li>• October 2018</li> <li>• March 2019</li> <li>• Phase 1: 12<sup>th</sup>–17<sup>th</sup> May 2019</li> <li>• Phase 2: 18<sup>th</sup>–24<sup>th</sup> September 2019</li> </ul> | <ul style="list-style-type: none"> <li>• Sampling conducted in both wet and dry seasons.</li> </ul> | <ul style="list-style-type: none"> <li>• No TECs/PECs.</li> <li>• No weeds.</li> <li>• Excellent condition.</li> <li>• Seven significant species:               <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Corynotheca asperata</i> (P3)</li> <li>- <i>Dasymalla chorisepala</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Synostemon arenosus</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>• 11 vegetation types.</li> <li>• 195 species from 95 genera and 37 recorded.</li> <li>• Number of species recorded represents high diversity for development envelope of this size in this locality.</li> </ul> | <ul style="list-style-type: none"> <li>• Contextual information was limited at time of surveys.</li> <li>• Low rainfall during Biota surveys; suboptimal conditions for collection of annual flora.</li> <li>• Disturbance (fire).</li> <li>• Minor access limitations.</li> </ul> |
|                | RAC               | 18.6 km section of the existing Nyangumarta Highway, from the Great Northern Highway to the western edge of the AREH boundary. | 290.7 ha     | Single phase Reconnaissance flora and vegetation survey.<br><br>8 quadrats, 5 relevés. 7 additional sites.                                                                                                                                       | <ul style="list-style-type: none"> <li>• Section 1: 22<sup>nd</sup>–27<sup>th</sup> August 2019</li> </ul>                                                                                                             | <ul style="list-style-type: none"> <li>• Dry season.</li> </ul>                                     | <ul style="list-style-type: none"> <li>• No TECs/PECs.</li> <li>• No weeds.</li> <li>• Excellent condition.</li> <li>• Seven significant species:               <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Bonamia oblongifolia</i> (P3)</li> <li>- <i>Dasymalla chorisepala</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Polymeria</i> sp. Broome (K.F. Kenneally)</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Contextual information was limited at time of surveys.</li> <li>• Poor seasonal conditions in some portions of development envelope.</li> <li>• Disturbance (fire) a minor limitation.</li> </ul>                                         |

| Consultant | Project Component | Location                                                                                                                  | Area (ha)   | Survey Description and Report Reference                                                                                                                                                                       | Survey Dates                                                                                                                                                                                                         | Season                                                                                            | Key Findings                                                                                                                                                                                                                     | Limitations |
|------------|-------------------|---------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|            |                   | ~137 km along the existing Nyangumarta Highway and Old Dump Road, within the AREH boundary; ~220 km east of Port Hedland. | 1,893.10 ha | Two-phase Detailed flora and vegetation survey previously completed for the AREH Project<br><b>Biota (2018)</b><br><br>Single phase Reconnaissance level flora and vegetation survey<br><b>Astron (2019b)</b> | <ul style="list-style-type: none"> <li>Section 2: Phase 1: 24<sup>th</sup> August – 5<sup>th</sup> September 2017</li> <li>Phase 2: 13<sup>th</sup>–21<sup>st</sup> March 2018</li> <li>May 2019 (Astron)</li> </ul> | <ul style="list-style-type: none"> <li>Sampling conducted in both wet and dry seasons.</li> </ul> | 9759) (P3) – 1 individual outside development envelope boundary<br>- <i>Terminalia kumpaja</i> (P3)<br>- <i>Tribulopsis marliesiae</i> (P3)<br>• 13 vegetation types.<br>• 218 species from 101 genera and 41 families recorded. |             |
|            |                   | 22.6 km section of the existing Old Dump Road, from the eastern edge of the AREH boundary to the MIA.                     | 361.00 ha   | Single phase Reconnaissance flora and vegetation survey.<br><b>(Biota, 2021)</b>                                                                                                                              | <ul style="list-style-type: none"> <li>Section 3: 22<sup>nd</sup>–27<sup>th</sup> August 2019</li> </ul>                                                                                                             | <ul style="list-style-type: none"> <li>Dry season.</li> </ul>                                     |                                                                                                                                                                                                                                  |             |
|            |                   | ~22 km and 1.5 km of proposed diversion to the existing Nyangumarta Highway, within Section 2.                            | 2,554.00 ha | Single phase Reconnaissance flora and vegetation survey.<br><b>(Biota, 2021)</b>                                                                                                                              | <ul style="list-style-type: none"> <li>Diversion: 22<sup>nd</sup>–27<sup>th</sup> August 2019</li> <li>Diversion option: 12<sup>th</sup>–20<sup>th</sup> July 2020</li> </ul>                                        | <ul style="list-style-type: none"> <li>Dry season.</li> </ul>                                     |                                                                                                                                                                                                                                  |             |
|            |                   | Potential borrow source areas (PBSAs) along the RAC.                                                                      | 8,978.60 ha | Single phase Reconnaissance flora and vegetation survey.<br><b>(Biota, 2021)</b>                                                                                                                              | <ul style="list-style-type: none"> <li>12<sup>th</sup>–20<sup>th</sup> July 2020</li> </ul>                                                                                                                          | <ul style="list-style-type: none"> <li>Dry conditions.</li> </ul>                                 |                                                                                                                                                                                                                                  |             |

| Consultant | Project Component                       | Location                                                                                                               | Area (ha)     | Survey Description and Report Reference                                                        | Survey Dates                                                                                                                                                                                                                                                                      | Season                                            | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Limitations                                                                                                                                                                                |
|------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <b>Proposed Re-Injection Bore Field</b> | Directly north of the MIA                                                                                              | 2679.50 ha    | Single-phase survey, inc. veg mapping and limited Priority flora searches<br><br>(Biota, 2021) | • Single Phase 15 <sup>th</sup> - 16 <sup>th</sup> July 2020                                                                                                                                                                                                                      | Dry conditions                                    | <ul style="list-style-type: none"> <li>• No TECs/PECs.</li> <li>• No weeds.</li> <li>• Excellent condition</li> <li>• 3 significant species: <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Corynotheca asperata</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> </ul> </li> <li>• Five vegetation types.</li> <li>• 78 native vascular flora species from 54 genera and 21 families</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Only single phase conducted in dry conditions.</li> <li>• Targeted Priority searches lacking</li> <li>• On-foot survey effort lacking.</li> </ul> |
|            | <b>AREH (BP)</b>                        | 220 km east of Port Hedland. Encompassing almost the entire Winu project area except a portion of the RAC (Section 1). | 660,306.00 ha | Four-phase Detailed flora and vegetation survey.<br><br><b>Biota (2018; 2021)</b>              | <ul style="list-style-type: none"> <li>• Phase 1: 24<sup>th</sup> August – 4<sup>th</sup> September 2017</li> <li>• Phase 2: 13<sup>th</sup>–22<sup>nd</sup> March 2018</li> <li>• Phase 3: 10<sup>th</sup> -20<sup>th</sup> March 2021</li> <li>• Phase 4: April 2023</li> </ul> | • Sampling conducted in both wet and dry seasons. | <ul style="list-style-type: none"> <li>• No TECs/PECs occur in current development envelope.</li> <li>• Three weed species.</li> <li>• Excellent to Very Good condition.</li> <li>• 10 significant species: <ul style="list-style-type: none"> <li>- <i>Seringia exastia</i> (T [C'wealth only])</li> <li>- <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) (P1)</li> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Bonamia oblongifolia</i> (P3)</li> <li>- <i>Croton aridus</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Phyllanthus</i> sp. aff. <i>hebecarpus</i> (Priority 3)</li> <li>- <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)</li> <li>- <i>Terminalia kumpaja</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>• Five vegetation types.</li> <li>• 325 species from 138 genera and 47 families recorded.</li> <li>• Number of species recorded considered high for development envelope of this size in this locality.</li> </ul> | <ul style="list-style-type: none"> <li>• Contextual information was limited at time of surveys.</li> </ul>                                                                                 |

| Consultant        | Project Component | Location                     | Area (ha)    | Survey Description and Report Reference                                                                                                                                                                                                                                                           | Survey Dates                                                                                             | Season                                            | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Limitations                                                                                                                                                                                                                                          |
|-------------------|-------------------|------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Western Botanical | MIA               | 320 km east of Port Hedland. | 13,401.90 ha | <p>Assessment of seasonal limitations of previous botanical survey work across the MIA</p> <p><b>Western Botanical (2023a)</b></p> <p>Targeted Priority flora surveys across the MIA</p> <p><b>Western Botanical</b></p> <p>Annual weed survey</p> <p><b>Western Botanical (2022b, 2023b)</b></p> | <p>• 15<sup>th</sup>-17<sup>th</sup> June 2022</p> <p>• 24<sup>th</sup> – 28<sup>th</sup> March 2023</p> | <p>• Prolonged wet season</p> <p>• Wet season</p> | <p>• Flora present during good seasonal conditions (wet season) were similar to those recorded during poor conditions (prolonged dry season)</p> <p>• Three weed species</p> <ul style="list-style-type: none"> <li>- *<i>Citrullus amarus</i></li> <li>- *<i>Cenchrus ciliaris</i></li> <li>- *<i>Solanum lycopersicum</i></li> </ul> <p>• Seven significant species:</p> <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Corynotheca asperata</i> (P3)</li> <li>- <i>Dasymalla chorisepala</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Synostemon arenosus</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> | <p>• Access issues - not all previous quadrat sites were revisited</p> <p>• Access - Survey not conducted in Martu Native Title Area.</p> <p>• Timeframe/survey effort - targeted survey work comprehensive on sand dunes and interdunal plains.</p> |



| Consultant | Project Component              | Location                                                                                  | Area (ha)   | Survey Description and Report Reference                                                                                                                         | Survey Dates                                                                                                                                                       | Season                                                                                            | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Limitations                                                                                                                                                                        |
|------------|--------------------------------|-------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <b>Proposed MIA Extensions</b> | 320 km east of Port Hedland.                                                              | 3,533.00 ha | Two-phase Detailed flora and vegetation survey<br><br><b>Western Botanical (2022a)</b>                                                                          | <ul style="list-style-type: none"> <li>Phase 1: 19<sup>th</sup>-23<sup>rd</sup> June 2022</li> <li>Phase 2: 8<sup>th</sup>-11<sup>th</sup> October 2022</li> </ul> | <ul style="list-style-type: none"> <li>Sampling conducted in both wet and dry seasons.</li> </ul> | <ul style="list-style-type: none"> <li>No TECs/PECs.</li> <li>No weeds.</li> <li>Excellent condition</li> <li>6 significant species:               <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Corynotheca asperata</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Synostemon arenosus</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>Seven vegetation types</li> <li>103 species from 65 genera and 28 families</li> </ul>                                                                                                                                               | <ul style="list-style-type: none"> <li>Timeframe/survey effort - targeted survey work comprehensive on sand dunes only, while potentially lacking on interdunal plains.</li> </ul> |
|            | <b>RAC</b>                     | Sections 1, 2 and 3, proposed diversion & potential borrow source areas (described above) | 6,477.3 ha  | Second phase detailed flora and vegetation survey (rescore RAC quadrats >5 yrs)<br><br>Targeted Priority flora searches<br><br><b>Western Botanical (2023c)</b> | <ul style="list-style-type: none"> <li>29<sup>th</sup> March – 5<sup>th</sup> April 2023</li> <li>16<sup>th</sup> -22<sup>nd</sup> June 2023</li> </ul>            | <ul style="list-style-type: none"> <li>Wet season</li> </ul>                                      | <ul style="list-style-type: none"> <li>No TECs/PECs.</li> <li>Two weed species               <ul style="list-style-type: none"> <li>- <i>Citrullus amarus</i></li> <li>- <i>Dactyloctenium aegyptium</i></li> </ul> </li> <li>Eight significant species:               <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Bonamia oblongifolia</i> (P3)</li> <li>- <i>Dasymalla chorisepala</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- ?<i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)</li> <li>- <i>Synostemon arenosus</i> (P3)</li> <li>- <i>Terminalia kumpaja</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>No limitations</li> </ul>                                                                                                                   |

| Consultant | Project Component        | Location                                                        | Area (ha)  | Survey Description and Report Reference                                                                                                                                                                   | Survey Dates                                                                                                                                                                                                                                                                                     | Season                                                                                             | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Limitations                                                                                                                                                                                                                                                                                      |
|------------|--------------------------|-----------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | <b>Rimfire BoreField</b> | 20km east of Winu Camp (10km east of MIA eastern boundary)      | 8,006.8 ha | Two-phase detailed flora and vegetation survey (Phase 1: only proposed drill pads and access tracks, Phase 2: broader survey area)<br><br>13 quadrats, 15 relevés<br><br><b>Western Botanical (2023c)</b> | <ul style="list-style-type: none"> <li>Phase 1: 12<sup>th</sup>-16<sup>th</sup> October 2023</li> <li>Phase 2: 24<sup>th</sup>-29<sup>th</sup> June 2023</li> <li>Phase 3: 24<sup>th</sup>-29<sup>th</sup> October 2024</li> <li>Phase 4: 19<sup>th</sup>-24<sup>th</sup> March 2024.</li> </ul> | <ul style="list-style-type: none"> <li>Sampling conducted in both wet and dry seasons.</li> </ul>  | <ul style="list-style-type: none"> <li>No TECs/PECs.</li> <li>No weeds.</li> <li>Excellent condition.</li> <li>Five significant species: <ul style="list-style-type: none"> <li>- <i>Cynodon anisocarpa</i> (P1)</li> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>11 vegetation types (4 new to Winu Project)</li> <li>138 species from 81 genera and 34 families recorded shared between Rimfire and Texas</li> </ul> | <ul style="list-style-type: none"> <li>Access issues - Sand dunes remain unsurveyed.</li> <li>Timeframe/survey effort - change to scope drastically increased survey areas and additional effort required to effectively survey (i.e., additional quadrating, mapping, targeted work)</li> </ul> |
|            | <b>Texas Bore Field</b>  | 15km southeast of Winu Camp (5km south of MIA eastern boundary) | 3,293.5 ha | Two-phase detailed flora and vegetation survey (Phase 1: only proposed drill pads and access tracks, Phase 2: broader survey area)<br><br>8 quadrats, 12 relevés<br><br><b>Western Botanical (2023c)</b>  | <ul style="list-style-type: none"> <li>Phase 1: 12<sup>th</sup>-16<sup>th</sup> October 2023</li> <li>Phase 2: 24<sup>th</sup>-29<sup>th</sup> June 2023</li> <li>Phase 3: 24<sup>th</sup>-29<sup>th</sup> October 2024</li> <li>Phase 4: 19<sup>th</sup>-24<sup>th</sup> March 2024.</li> </ul> | <ul style="list-style-type: none"> <li>Sampling conducted in both wet and dry seasons..</li> </ul> | <ul style="list-style-type: none"> <li>No TECs/PECs.</li> <li>No weeds.</li> <li>Excellent condition.</li> <li>Four significant species: <ul style="list-style-type: none"> <li>- <i>Cynodon anisocarpa</i> (P1)</li> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>11 vegetation types (6 new to Winu Project)</li> <li>138 species from 81 genera and 34 families recorded shared between Rimfire and Texas</li> </ul>                                             | <ul style="list-style-type: none"> <li>Timeframe/survey effort - change to scope drastically increased survey areas and additional effort required to effectively survey (i.e., additional quadrating, mapping, targeted work)</li> </ul>                                                        |

| Consultant | Project Component            | Location                                                                        | Area (ha) | Survey Description and Report Reference                                         | Survey Dates                                          | Season       | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Limitations                                                                                                                              |
|------------|------------------------------|---------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------|-------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
|            | <b>Wallal Bore Field</b>     | 3 proposed locations on Nyangumarta Highway 40-70km from Great Northern Highway | 471 ha    | Reconnaissance survey<br><br>5 quadrats<br><br><b>Western Botanical (2023c)</b> | • 29 <sup>th</sup> March – 5 <sup>th</sup> April 2023 | • Wet season | <ul style="list-style-type: none"> <li>• No TECs/PECs.</li> <li>• No weeds.</li> <li>• Excellent condition.</li> <li>• Four significant species: <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Terminalia kumpaja</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>• Vegetation mapping has not been completed in this area</li> <li>• 93 species from 63 genera and 3 families recorded.</li> </ul> | <ul style="list-style-type: none"> <li>• Timeframe/survey effort - additional effort required to effectively survey all area.</li> </ul> |
|            | <b>Regional (outside DE)</b> | Areas north of the Development Envelope, within Nyangumarta Native Title Area   | N/A       | Targeted Priority flora search<br><br><b>Western Botanical (2024)</b>           | • 15 <sup>th</sup> -28 <sup>th</sup> April 2024       | • Wet season | <ul style="list-style-type: none"> <li>• Eight significant species: <ul style="list-style-type: none"> <li>- <i>Cynodon anisocarpa</i> (P1)</li> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Corynotheca asperata</i> (P3)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Dasymalla chorisepala</i> (P3)</li> <li>- <i>Synostemon arenosus</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> </ul>                              | <ul style="list-style-type: none"> <li>• No limitations</li> </ul>                                                                       |

| Consultant | Project Component                                                             | Location                                     | Area (ha) | Survey Description and Report Reference                                                                                                                                      | Survey Dates                                                                                                                                                                      | Season     | Key Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Limitations                                                                                                                 |
|------------|-------------------------------------------------------------------------------|----------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|            | <b>Revised Development Envelope (Rimfire and Texas bore field extensions)</b> | Between six and 25 km southeast of Winu Camp |           | Two-phase flora and vegetation survey<br><br>30 quadrats, 10 relevés<br><br>Aerial targeted Priority flora searches across sand dunes<br><br><b>Western Botanical (2024)</b> | <ul style="list-style-type: none"> <li>Phase 1: 10<sup>th</sup>-17<sup>th</sup> June 2024</li> <li>1<sup>st</sup>- 7<sup>th</sup> June 2024</li> <li>Phase 2 (snipped)</li> </ul> | Wet season | <ul style="list-style-type: none"> <li>No TECs/PECs.</li> <li>No weeds.</li> <li>Excellent condition.</li> <li>Eight significant species: <ul style="list-style-type: none"> <li>- <i>Cynodon anisocarpa</i> (P1)</li> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>29 vegetation types (8 new to Winu Project)</li> <li>204 species from 111 genera and 45 families recorded shared between Rimfire and Texas</li> </ul> | <ul style="list-style-type: none"> <li>Sand dunes not traversed on foot</li> <li>Only 13 of 31 quadrats rescored</li> </ul> |
|            | <b>Winu South</b>                                                             | 5 km south of Winu Camp                      | 1,577 ha  | Single-phase flora and vegetation survey<br><br>3 quadrats<br><br>Targeted Priority flora searches across sand dunes                                                         | <ul style="list-style-type: none"> <li>Phase 1: 28<sup>th</sup> October- 3<sup>rd</sup> November 2024</li> <li>6<sup>th</sup>-8<sup>th</sup> December 2024</li> </ul>             | Dry season | <ul style="list-style-type: none"> <li>No TECs/PECs.</li> <li>No weeds.</li> <li>Excellent condition.</li> <li>Eight significant species: <ul style="list-style-type: none"> <li>- <i>Goodenia hartiana</i> (P2)</li> <li>- <i>Indigofera ammobia</i> (P3)</li> <li>- <i>Comesperma sabulosum</i> (P3)</li> <li>- <i>Corynotheca asperata</i> (P3)</li> <li>- <i>Tribulopsis marliesiae</i> (P3)</li> </ul> </li> <li>14 vegetation types (1 new to Winu Project)</li> <li>113 species from 76 genera and 31 families</li> </ul>                                          | <ul style="list-style-type: none"> <li>Only one phase conducted, during dry season</li> </ul>                               |
|            | <b>RAC and MIA</b>                                                            | 320 km east of Port Hedland.                 |           | Detailed survey of additional quadrats established to ensure a minimum of three quadrats in relevant                                                                         | March 2026                                                                                                                                                                        | Wet Season | Established 4 quadrats, (3 within the RAC, one enroute to Rimfire Borefield), ensuring minimum 3 replicates in each vegetation association across the Winu project                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                             |

| Consultant                            | Project Component | Location                     | Area (ha)  | Survey Description and Report Reference                                          | Survey Dates                                 | Season     | Key Findings                                                                                                                                                                                                                                                                                                                                                       | Limitations |
|---------------------------------------|-------------------|------------------------------|------------|----------------------------------------------------------------------------------|----------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|                                       |                   |                              |            | vegetation associations                                                          |                                              |            |                                                                                                                                                                                                                                                                                                                                                                    |             |
| <b>Pheonix Environmental Sciences</b> | <b>MIA</b>        | 320 km east of Port Hedland. | 2,477.5 ha | Intensive targeted searches for Priority flora across remaining unsurveyed areas | 15 – 21 April 2026<br>30 April – 6 May 2026  | Wet season | <i>Goodenia hartiana</i> (P2)<br><i>Corynotheca asperata</i> (P3)<br><i>Synostemon arenosus</i> (P3)<br><i>Tribulopsis marliesiae</i> (P3)<br><i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138), (SOI)                                                                                                                                              |             |
| <b>Biota Environmental Services</b>   | <b>MIA</b>        | 320 km east of Port Hedland. | 1,148.6 ha | Intensive targeted searches for Priority flora across remaining unsurveyed areas | 30 April – 6 May 2026                        | Wet season | <i>Goodenia hartiana</i> (P2)<br><i>Comesperma sabulosum</i> (P3)<br><i>Corynotheca asperata</i> (P3)<br><i>Indigofera ammobia</i> (P3)<br><i>Synostemon arenosus</i> (P3)<br><i>Tribulopsis marliesiae</i> (P3)<br><i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138), (SOI)                                                                        |             |
| <b>Western Botanical</b>              | <b>MIA</b>        | 320 km east of Port Hedland. | 3025.2 ha  | Intensive targeted searches for Priority flora across remaining unsurveyed areas | 17 May – 28 May 2026<br>25 May – 5 June 2026 | Wet season | <i>Goodenia hartiana</i> (P2)<br><i>Bonamia oblongifolia</i> (P3)<br><i>Corynotheca asperata</i> (P3)<br><i>Dasymalla chorisepala</i> (P3)<br><i>Indigofera ammobia</i> (P3)<br><i>Synostemon arenosis</i> (P3)<br><i>Terminalia kumpaja</i> (P3)<br><i>Tribulopsis marliesiae</i> (P3)<br><i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138), (SOI) |             |



| Consultant        | Project Component | Location | Area (ha) | Survey Description and Report Reference                                                                   | Survey Dates | Season     | Key Findings                                                | Limitations |
|-------------------|-------------------|----------|-----------|-----------------------------------------------------------------------------------------------------------|--------------|------------|-------------------------------------------------------------|-------------|
| Western Botanical | RAC               |          | 23.7 ha   | Targeted survey for <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01)<br><br>Western Botanical (2026) | 1 July 2026  | Wet Season | <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01) (SOI) |             |

### 3.2. Survey Conditions

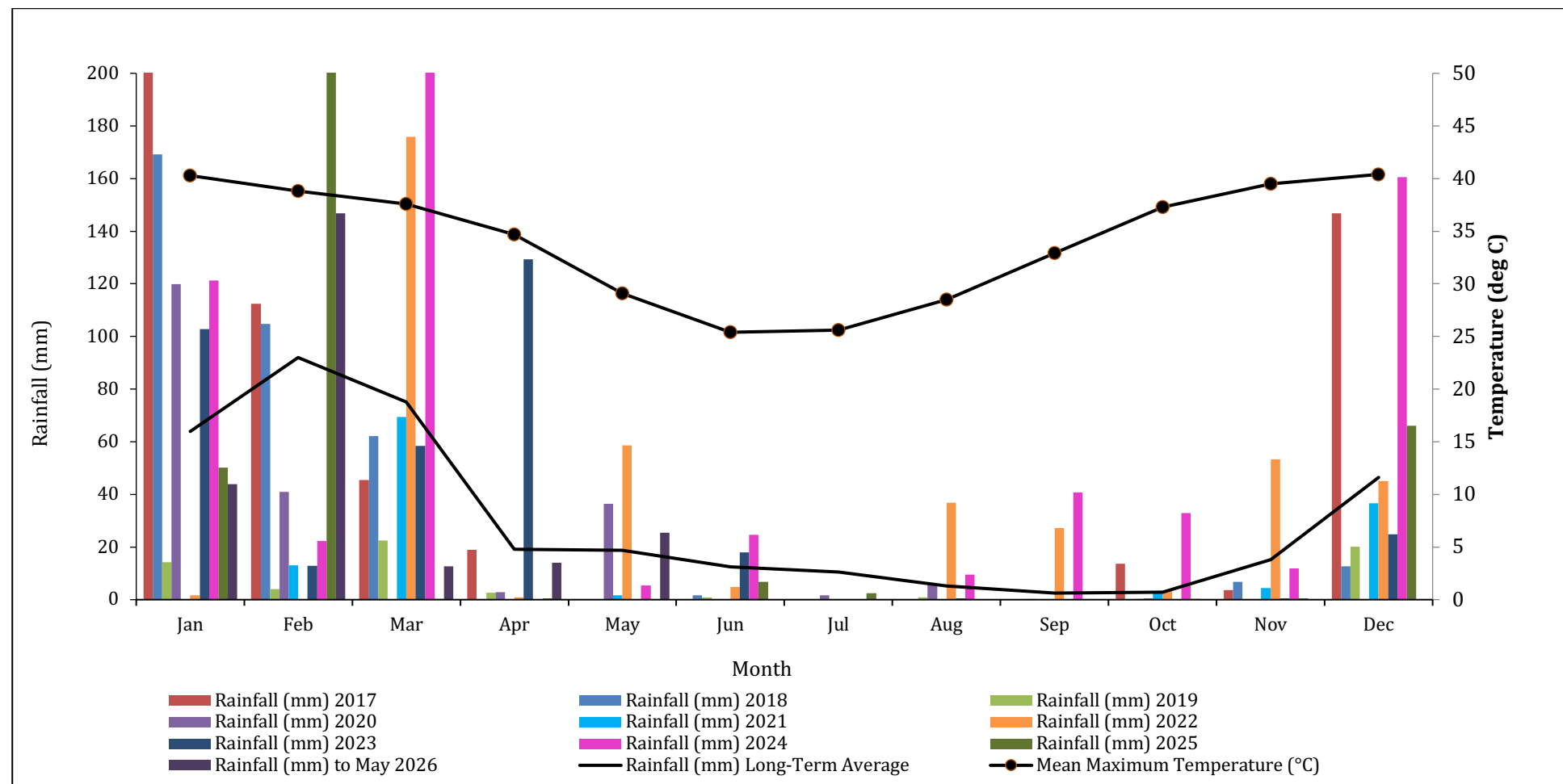
Historic (1974-2021) and recent (2017- 2026) monthly rainfall, and mean maximum temperatures (2003-2026) (Telfer Aero weather station – 13030) are presented in Figure 9.

Total annual rainfall amounts (mm) and percentages of the long-term average between 2017 and May 2026 (as recorded at the Telfer Aero weather station number 13030) are presented in Table 5. While the Winu Project is located some 100km north of this weather station, these results demonstrate above-average rainfall likely occurring across the Winu Project area in the years 2017 and 2022 and average rainfall during 2018 and 2023, with above average again in late 2024 and early 2025. Optimal survey conditions can therefore be inferred for these years. Below-average rainfall from 2019 to 2021 indicates sub-optimal survey conditions.

These trends appear to correspond with observed Indian Ocean Dipole (IOD) phases. Negative IOD phases observed in 2016 and 2022 are associated with higher rainfall in the region, whilst the 2019 Positive IOD phase is associated with reduced rain in the region (BoM, 2026c).

**Table 5. Total annual rainfall as a percentage to the long-term average (1974 – 2026) (Telfer Aero weather station number 13030) (BoM, 2026c).**

| Year                  | Total Rainfall (mm) | % of long-term average | Annual rainfall status |
|-----------------------|---------------------|------------------------|------------------------|
| 2017                  | 723.2               | 198.7                  | Above average rainfall |
| 2018                  | 357.2               | 98.2                   | Average rainfall       |
| 2019                  | 65.4                | 17.9                   | Below average rainfall |
| 2020                  | 207.8               | 57.1                   | Below average rainfall |
| 2021                  | 128                 | 35.2                   | Below average rainfall |
| 2022                  | 407.4               | 111.9                  | Above average rainfall |
| 2023                  | 347.0               | 95.4                   | Average rainfall       |
| 2024 (January – June) | 445.4               | 192.4                  | Above average rainfall |
| 2025                  | 701                 | 188.5                  | Above average rainfall |
| 2026 (Jan – May)      | 242.6               | n/a                    | Below average rainfall |
| Long- term average    | <b>364.4</b>        |                        |                        |



**Figure 9. Monthly (2017-2026) Rainfall (mm), Long-Term Average (1974 – May 2026) Rainfall (mm) and Mean Maximum Temperature (°C) (2003-2022) (Telfer Aero Weather Station – 13030) (BoM 2026c).**

4. Methods

4.1. Desktop Assessment

4.1.1. Literature Review

A review of available literature relevant to the Winu Project area was undertaken, utilising (but not limited to) the Index of Biodiversity Surveys for Assessment search portal. All surveys previously conducted over the Winu Project area were excluded from the review, as these are discussed separately in Section 3.1. Emphasis was placed on surveys conducted within the Great Sandy Desert bioregion in which the Winu Project lies.

4.1.2. Database Searches

Database searches were conducted to identify potential Threatened and Priority Flora species, Threatened Ecological Communities (TECs), Priority Ecological Communities (PECs), or other areas of conservation significance that may be encountered during field surveys (Table 6). The DBCA Framework for Conservation Significant Flora; and the Definitions of TECs and PECs are presented in Appendix 2 and Appendix 3 respectively.

Subsequent to the database searches, a desktop assessment of the likelihood of each Threatened and Priority flora species occurring within the Development Envelope was undertaken by considering (a) the proximity of known Conservation Significant flora and communities to the Development Envelope; and (b) the similarities between supporting habitats for each species and those of the Development Envelope.

A search of DPIRD’s Western Australian Organism List (WAOL) for the Shire of Broome and the Shire of East Pilbara was completed to identify plant species declared under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) that are known to occur in Western Australia, for the local government areas.

A number of database searches have been completed in prior years associated with earlier desktop assessments of the Winu Project. The results of the latest, and therefore most current searches undertaken in June 2024 are presented in Table 6.

Table 6. Details of database searches conducted.

| Provider                                                        | Reference                         | Database                                       | Search parameters                                                |
|-----------------------------------------------------------------|-----------------------------------|------------------------------------------------|------------------------------------------------------------------|
| Western Australia                                               |                                   |                                                |                                                                  |
| Department of Biodiversity, Conservation and Attractions (DBCA) | DBCA, (2024d)<br>(Ref: 22-0624FL) | Threatened and Priority Flora database         | 100 km radius of 20°43’30.43”S, 121°48’41.37”E and 20°0’46.92”S, |
|                                                                 | DBCA (2024e)<br>(Ref: 22-0624FL)  | Western Australian Herbarium Specimen database |                                                                  |

| Provider                                                                 | Reference                        | Database                                                | Search parameters                                                                                     |
|--------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|                                                                          |                                  |                                                         | 121° 0'43.26"E                                                                                        |
|                                                                          | DBCA (2024f)<br>(Ref: 07-0624EC) | Threatened and Priority Ecological Communities database | 100 km radius of 20°43'30.43"S, 121°48'41.37"E and 20°0'46.92"S, 121° 0'43.26"E                       |
|                                                                          | DBCA (2024g)<br>(Ref:04-0624NM)  | NatureMap                                               | 100 km radius of 20°43'30.43"S, 121°48'41.37"E for all flora records and 20°0'46.92"S, 121° 0'43.26"E |
| Department of Climate Change, Energy, the Environment and Water (DCCEEW) | DCCEEW (2024)                    | Protected Matters Search Tool (PMST)                    | 50 km radius of Development Envelope polygon                                                          |
| Department of Primary Industries and Regional Development (DPIRD)        | DPIRD (2024c)                    | Western Australian Organism List                        | Shires of Broome and East Pilbara                                                                     |

## 4.2. Field Assessment

Over the duration of the Winu Project a combination of Detailed and Targeted-style assessments have been conducted.

Detailed assessments involve comprehensive survey work to catalogue species and map the vegetation and its condition across a study area via quadrat sampling and opportunistic collections (EPA 2016b). In contrast, Targeted assessments involve searching for Conservation significant flora species, both within and outside of the Development Envelope, with focus on specific habitats that likely support those species.

A summary of previous botanical surveys conducted across the Winu Project, including the style, survey location and date conducted, is presented in Table 4. Detailed descriptions of sampling techniques are included in Section 4.2.1.



#### 4.2.1. Assessment of Quadrats and Relevés

##### Quadrats

A series of 50 m x 50 m quadrats were established within each recognised vegetation association, using steel fence droppers and measuring tapes to demarcate corners and boundaries. Where possible, a minimum of three representative quadrat sites per described vegetation association were installed, taking care to avoid disturbed or interzonal areas. Photographs were taken from the two permanent corners (north-west and south-east), while data pertaining to the following parameters was recorded into notebooks at each quadrat site.

**General:** vegetation association, date, persons recording, quadrat size;

**Location:** unique site number, project name, coordinates recorded on handheld GPS, datum GDA94 (accuracy +/- 5 m), digital photograph;

**Vegetation:** species present, height and projected foliar cover (PFC) for each species, species outside of the quadrat (but not noted within), structural description (Based on NVIS level 5 'Association' descriptions);

**Disturbance:** vegetation condition, fire age;

**Physical Conditions:** rock type, soil, landform description, runoff.

New or unknown taxa recorded during quadrat assessments were collected, and given unique collection numbers. To avoid unnecessary duplication, taxa occurring within the quadrats were compared against previous collections. If the PFC for a taxon was lower than 0.5%, it was recorded as a presence (+) only.

##### Relevés

Relevé sampling was conducted opportunistically during preliminary mapping efforts. Data collected during relevé sampling was similar to quadrating, however, less intensive and without a specific boundary. Key parameters recorded during relevés may include;

**General:** Vegetation Association, Date,

**Location:** Unique site number, Project name, Coordinates recorded on handheld GPS, Datum GDA94 (accuracy +/- 5 m), Digital photograph;

**Vegetation:** Species present, Height and Projected Foliar Cover (PFC) for each species, Brief structural description (Based on NVIS level 5 'Association' descriptions);

**Disturbance:** Vegetation Condition, Fire age;

**Physical Conditions:** Rock type, Soil, Landform Description, Runoff.

#### 4.2.2. Flora Specimen Identification

Flora not readily recognised in the field were collected and pressed for later identification, together with information pertaining to the date, location, and field description. The identification of

samples referenced the resources of Western Botanical's herbarium and the Western Australian Reference Herbarium (WAH).

#### **4.2.3. Significant Flora**

The locations of all significant flora recognised during the field survey were recorded using Garmin GPS devices. Specimens of significant flora, represented by Threatened or Priority flora, flora considered novel or undescribed or flora records representing an extension to the current known range for that species, were retained and a voucher specimen submitted to the Western Australian Herbarium. Specialist taxonomists at the WA Herbarium and James Cook University, Cairns, were consulted for commentary on potential novel taxa.

#### **4.2.4. Introduced Species**

Occurrences of introduced flora species were assessed during all survey work. Dedicated targeted weed surveys have been conducted annually since 2022, with focus on infrastructure areas and areas of high vehicular traffic, where weeds are most likely to occur.

#### **4.2.5. Vegetation Mapping**

The vegetation of the Study Area was mapped at NVIS level 5 '*Association*' level, using high-resolution aerial photography at a scale of 1:10,000 and Google Earth imagery. The boundaries of Vegetation Associations were defined on the ground and confirmed through extensive traverses across the Study Area, both on-foot and in-vehicle. All Vegetation Association boundaries were marked on A3 laminated colour maps in the field, and supplied to CAD Resources for digitization.

#### **4.2.6. Vegetation Condition**

Vegetation condition was assessed according to the vegetation condition scale adapted from Trudgen (1988), as presented in EPA (2016a) (Appendix 4).

#### **4.2.7. Floristic Analysis**

All data was entered into a proprietary Microsoft Access database (Griffin, 2012). Statistical analyses were conducted to investigate floristic similarity amongst sites, groupings of sites, and to assess relationships amongst groupings.

Presence-absence (PA) data was assessed, in conjunction with percent foliar coverage (PFC), in order to incorporate dominance of key species within vegetation groupings. To optimise interpretive output, PFC's were standardised to cover values (CV) scaled from 0-5. The effects of including annual flora species, and excluding singleton and outlier sample sites were examined during initial runs – the results guiding later iterations of the analysis.

Analysis of flora data was conducted using PATN v3.12 statistical package software (Belbin, 2010). Association (Bray and Curtis), Classification (Flexible UPGMA Agglomerative

Hierarchical Fusion), and Ordination (Semi-Strong Hybrid) components of PATN were utilised in the analysis; primarily producing a dendrogram of site similarity/dissimilarity with suggested Vegetation Association groupings provided by PATN.

## 5. Results and Discussion

### 5.1. Literature Review

Prior to the botanical surveys associated with the AREH and Winu Projects (conducted from 2017 until present), there had been limited sampling of the broader area within the Great Sandy Desert (Biota, 2023). The study completed by Biota (2018a) for the AREH Project included a review of surveys conducted in the region, highlighting those containing habitat similar to the AREH (and therefore the adjacent Winu Project). Three reports identified by Biota (2018a) have been included in this review. In addition, six reports summarising botanical surveys conducted over the Nifty Copper Mine and the Telfer Gold Mine were also reviewed (Table 7). The surveys reviewed were limited in size compared to the broadscale assessments completed for the AREH and Winu Projects.

The three reports highlighted by Biota (2018a) all pertain to targeted flora surveys conducted on pastoral leases to north of the Winu Project, the closest being located approximately 9km from the northern end of the RAC (on the Mandora Pastoral Lease). Four Priority flora species were located during this survey, all of which have since been recorded within the Winu Project Development Envelope:

- *Bonamia oblongifolia* (P3)
- *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3)
- *Terminalia kumpaja* (P3)
- *Tribulopsis marliesiae* (P3)

Surveys conducted on the Anna Plains (EnviroWorks, 2017) and Nita Downs (Biota, 2017) Pastoral Leases (located 105 km and 125 km north of the RAC respectively), located three Priority flora species, only one of which remains a Priority listed species at the date of this report (*Bonamia oblongifolia*, P3).

The Nifty Copper Mine and the Telfer Gold Mine are approximately 100 km south and south-east respectively of the Winu Project MIA. Approximately 45 km apart, surveys across these projects between 2002 – 2021 identified ten Priority flora species:

- *Comesperma sabulosum* (P3)
- *Corynotheca asperata* (P3)
- *Dampiera atriplicina* (P2)
- *Dasymalla chorisepala* (P3)
- *Euphorbia clementii* (P2)

- *Fuirena incrassata* (P2)
- *Goodenia hartiana* (P2)
- *Indigofera ammobia* (P3)
- *Synostemon arenosus* (P3)
- *Thysanotus* sp. Desert East of Newman (R.P. Hart 964) (P2)

Western Botanical has previously observed *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) near the Nifty Copper Mine, however, the species was not recognised as being of taxonomic interest at that time. Its abundance and distribution in that area has not been assessed.

Due to the paucity of botanical survey within the broader region, a number of range extensions for various taxa were identified during botanical surveys for these projects.

No vegetation synonymous with a TEC or PEC was identified at any of the survey localities.

**Table 7. Summary of available reports relevant to the Winu Project.**

| Study details and reference                                                                                                                                                                            | Survey type                                                                                                                                                                                                                                                                           | Summary of results                                                                                | Significant findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ~Distance from Project Area |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Nifty Copper Mine</b>                                                                                                                                                                               |                                                                                                                                                                                                                                                                                       |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |
| Western Botanical (2021) Detailed Flora and Vegetation Assessment of the Nifty Copper Mine.<br><br>Report prepared for Cyprium Metals Limited.                                                         | Detailed flora and vegetation assessment. Targeted survey for conservation significant flora. Field survey conducted in May and July 2021.<br><br>Survey area comprised three survey polygons, each ~ 1 km wide and 3.5 km long, adjacent the existing Nifty Copper Mine development. | 174 flora species from 94 genera and 41 families.<br>12 vegetation associations<br>No TEC or PECs | Six Priority flora species recorded: <ul style="list-style-type: none"> <li>• <i>Goodenia hartiana</i> (P2)</li> <li>• <i>Thysanotus</i> sp. Desert East of Newman (R.P. Hart 964) (P2)</li> <li>• <i>Dasymalla chorisepala</i> (P3)</li> <li>• <i>Corynotheca asperata</i> (P3)</li> <li>• <i>Indigofera ammobia</i> (P3)</li> <li>• <i>Sauropus arenosus</i> (P3) (now known as <i>Synostemon arenosus</i> P3)</li> </ul>                                                                                                                                                                                                                                                                                 | 100 km S of MIA             |
| <b>Telfer/Havieron Gold Mine</b>                                                                                                                                                                       |                                                                                                                                                                                                                                                                                       |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |
| Spectrum Ecology & Spatial (2022). Havieron – Telfer Project Desktop Assessment.<br><br>Report prepared for Newcrest Mining Ltd.<br><br>Havieron Project is located 45km east of the Telfer Gold Mine. | Desktop assessment which included the review of all botanical surveys (ten) conducted across the Havieron – Telfer Project area. This included the three reports listed below but also reports dating back to 2002. A summary of the combined reports is presented here.              |                                                                                                   | Eight conservation significant flora species recorded: <ul style="list-style-type: none"> <li>• <i>Seringia exastia</i> (T)</li> <li>• <i>Goodenia hartiana</i> (P2)</li> <li>• <i>Dampiera atriplicina</i> (P2)</li> <li>• <i>Fuirena incrassata</i> (P2)</li> <li>• <i>Euphorbia clementii</i> (P2)</li> <li>• <i>Abutilon trudgenii</i> (P3)<sup>2</sup></li> <li>• <i>Acacia glaucocaesia</i> (P3)<sup>3</sup></li> <li>• <i>Comesperma pallidum</i> (P3)<sup>4</sup></li> </ul> Range Extensions: <ul style="list-style-type: none"> <li>• <i>Fimbristylis neilsonii</i></li> <li>• <i>Fimbristylis leucocolea</i></li> <li>• <i>Maireana triptera</i></li> <li>• <i>Peripleura virgata</i></li> </ul> | 110km SE of MIA             |

<sup>2</sup> *Abutilon trudgenii* is more recently known as *Abutilon* sp. Pilbara (W.R. Barker 2025) which is not threatened.<sup>3</sup> *Acacia glaucocaesia* has been delisted and no longer retains priority status<sup>4</sup> *Comesperma pallidum* has been misapplied against the current name *Comesperma sabulosum* (P3).



| Study details and reference                                                                                                                              | Survey type                                                                                                                                                     | Summary of results                                                                                                                                 | Significant findings                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ~Distance from Project Area |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                                                                                                                                          |                                                                                                                                                                 |                                                                                                                                                    | <ul style="list-style-type: none"> <li>• <i>Sclerolaena crenata</i></li> <li>• <i>Sclerolaena eriacantha</i></li> <li>• <i>Sclerolaena minuta</i></li> <li>• <i>Synaptantha tillaeacea</i> var. <i>tillaeacea</i></li> </ul>                                                                                                                                                                                                                                             |                             |
| Strategen JBS & G. (2021).<br>Detailed Flora and Vegetation Survey Havieron Infrastructure Corridor.<br><br>Report prepared for Newcrest Operations Ltd. | Detailed flora and vegetation survey.<br>45 quadrats located in corridor connecting Havieron Project to Telfer Gold Mine.<br>Field survey conducted April 2021. | 174 flora species from 87 genera and 37 families<br>No weeds<br>Seven vegetation associations<br>Excellent vegetation condition<br>No TECs or PECS | Four significant flora species recorded: <ul style="list-style-type: none"> <li>• <i>Seringia exastia</i> (Threatened – BC Act, Critically Endangered – EPBC Act; Fringed Fire-bush)<sup>5</sup></li> <li>• <i>Cyperus squarrosus</i> (Range extension)</li> <li>• <i>Heliotropium chrysocarpum</i> (Range extension)</li> <li>• <i>Panicum effusum</i> (Range extension)</li> <li>• Myrtaceae (Tribe Chamelauciae) (Potential novel taxa or range extension)</li> </ul> | 110km SE of MIA             |
| Strategen JBS & G. (2020a).<br>Detailed Flora and Vegetation Survey Havieron Project Area.<br><br>Report prepared for Newcrest Operations Ltd.           | Detailed flora and vegetation survey.<br>41 quadrats, 4 relevés<br>Field survey conducted in March and July 2020.                                               | 62 flora species from 44 genera and 23 families<br>No weeds<br>5 vegetation associations<br>No TECs or PECs<br>Excellent vegetation condition      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 110km SE of MIA             |
| Strategen JBS & G. (2020b).<br>Reconnaissance Flora and Vegetation Survey Havieron Access Corridor.                                                      | Reconnaissance flora and vegetation survey.<br>19 relevés                                                                                                       | 40 flora species from 11 families were recorded<br>12 vegetation associations<br>No TECs or PECs                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 110km SE of MIA             |

<sup>5</sup> *Seringia exastia* was previously listed as Threatened (*BC Act* and *EPBC Act*). A taxonomic study that assessed genomic and morphological characters in several *Seringia* taxa has concluded that *Seringia exastia* and *S. elliptica* are the same species. The taxonomy of the genus has been revised to synonymise *S. exastia* and *S. elliptica* under the oldest valid name of *S. exastia* (Binks *et al.*, 2020). As *S. elliptica* is common and widespread throughout the Pilbara, central WA and the NT and extends into SA, following the taxonomic revision, *S. exastia* is now considered common and widespread. Consequently, this species has been reclassified under the BC Act as non-threatened. While currently listed as Critically Endangered under the EPBC Act, it is expected that this classification will be updated in line with the State status.

| Study details and reference                                                                                                                                                                                                                                  | Survey type                                                                                                                     | Summary of results                                                            | Significant findings                                                                                                                                                                                                                                                                                                                                                                                                      | ~Distance from Project Area |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Report prepared for Newcrest Operations Ltd.                                                                                                                                                                                                                 | Field survey conducted April 2020.                                                                                              |                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |
| Syrinx Environmental (2013). Level 2 Flora & Fauna Survey O'Callaghans<br><br>Telfer Optimisation Study Area (~10km SE of Telfer mine)<br><br>Report unable to be sighted for literature review. Summary extracted from Spectrum Ecology and Spatial (2022). | Detailed flora and vegetation survey.<br>36 quadrats<br>Field survey conducted June and October 2011.                           | 176 flora species                                                             | Five significant flora species recorded: <ul style="list-style-type: none"> <li>• <i>Goodenia hartiana</i> (P2)</li> <li>• <i>Fimbristylis neilsonii</i> (Range extension)</li> <li>• <i>Fimbristylis leucocolea</i> (Range extension)</li> <li>• <i>Maireana triptera</i> (Range extension)</li> <li>• <i>Sclerolaena eriacantha</i> (Range extension)</li> <li>• <i>Sclerolaena minuta</i> (Range extension)</li> </ul> | 120km SE                    |
| <b>Pastoral Stations</b>                                                                                                                                                                                                                                     |                                                                                                                                 |                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |
| Biota (2018b). Mandora Station Cattle Fodder Pivots Rare Flora Survey.<br><br>Report prepared for Mandora Cattle Company Pty Ltd.<br><br>Report unable to be sighted for literature review. Summary extracted from DWER (2018).                              | Targeted flora survey of Lot 1502 on Deposited Plan 66802 (160.5ha)<br>Survey conducted after substantial rainfall, March 2018. | One vegetation community<br>Excellent vegetation condition<br>No TECs or PECs | Five Priority flora species recorded: <ul style="list-style-type: none"> <li>• <i>Bonamia oblongifolia</i> (P3)</li> <li>• <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)</li> <li>• <i>Seringia katatona</i> (P3)<sup>6</sup></li> <li>• <i>Tribulopsis marliesiae</i> (P3)</li> <li>• <i>Terminalia kumpaja</i> (P3)</li> </ul>                                                                                 | 9km N of RAC (northern end) |
| EnviroWorks (2017b). Targeted Conservation Flora Survey at Anna Plains.                                                                                                                                                                                      | Targeted flora survey<br>Field survey conducted August 2017                                                                     | No TECs or PECS                                                               | Two Priority flora species recorded: <ul style="list-style-type: none"> <li>• <i>Bonamia oblongifolia</i> (P1)</li> <li>• <i>Phyllanthus eremicus</i> (P3)<sup>7</sup></li> </ul>                                                                                                                                                                                                                                         | 105km N of RAC              |

<sup>6</sup> *Seringia katatona* has been delisted and no longer retains priority status.

<sup>7</sup> *Phyllanthus eremicus* is more recently known as *Lysiandra eremica* which is not threatened.

| Study details and reference                                                                                                                                                                                             | Survey type                                                                                                                              | Summary of results                                                                         | Significant findings                                                                                                                                                      | ~Distance from Project Area |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Report prepared for Anna Plains Cattle Co Pty Ltd                                                                                                                                                                       |                                                                                                                                          |                                                                                            |                                                                                                                                                                           |                             |
| <p>Biota (2017). Nita Downs Irrigation Pivots Rare Flora Survey.</p> <p>Report prepared for Forshaw Pastoral Company.</p> <p>Report unable to be sighted for literature review. Summary extracted from DWER (2017).</p> | <p>Targeted flora survey Lot 41 on Deposited Plan 238418 and Lot 39 on Deposited Plan 238417</p> <p>Field survey conducted June 2017</p> | <p>Three weed species</p> <p>Predominantly Very Good to Excellent vegetation condition</p> | <p>Two Priority flora species recorded:</p> <ul style="list-style-type: none"> <li>• <i>Phyllanthus eremicus</i> (P3)</li> <li>• <i>Seringia katatona</i> (P3)</li> </ul> | 125km NE of RAC             |

## 5.2. Database Searches

### 5.2.1. Significant Flora

Thirty-three taxa of conservation significance were identified from database searches and previous surveys. A summary of the descriptions/habitats, known distribution and nearest recorded location to the Winu Project of these taxa is presented in Table 8. In total, 11 Priority 1, two Priority 2, 18 Priority 3 and two Priority 4 taxa were identified. No flora taxa listed as Threatened under the *BC Act* or *EPBC Act* were identified as occurring within the search radius (DBCA, 2024d, 2024e; DCCEEW, 2024). The results of the DBCA database search (DBCA, 2024d, 2024e), conducted with a 100km radius buffer around the Study Area, are presented in Figure 10. Results generated from the PMST (DCCEEW, 2024) and NatureMap (DBCA, 2024g) database searches, with similar buffers, are presented in Appendix 5 and Appendix 6, respectively.

Included in Table 8 is an assessment of likelihood of the 33 Priority flora species occurring within the Winu Project area. Of these, ten have been recorded within the Development Envelope (*i.e.* confirmed presence) with a further eight assessed as having the potential (possible) based on the recorded presence of associated habitats. Fifteen taxa were assessed as unlikely to occur within the Development Envelope (Table 8).

Priority flora taxa and their recorded location within the Development Envelope identified from database enquiries include:

- *Goodenia hartiana* (P2): MIA, RAC
- *Bonamia oblongifolia* (P3): RAC
- *Comesperma sabulosum* (P3): MIA
- *Corynotheca asperata* (P3): MIA
- *Dasymalla chorisepala* (P3): MIA, RAC
- *Indigofera ammobia* (P3): MIA, RAC
- *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3): RAC
- *Synostemon arenosus* (P3): MIA
- *Terminalia kumpaja* (P3): RAC
- *Tribulopsis marliesiae* (P3): MIA, RAC

**Table 8. Summary of conservation significant flora database searches and literature review results for the vicinity of the Winu Project (sorted by conservation rank) and their likelihood of occurrence within the Development Envelope.**

| Taxon                       | Conservation rank |        |          | Data Source |            |                       |                          | Description, habitat and current known distribution (local government areas) (WAH, 1998)                                                                                                                                                    | Nearest recorded location to Development Envelope | Likelihood within Development Envelope |
|-----------------------------|-------------------|--------|----------|-------------|------------|-----------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------|
|                             | DBCA              | BC Act | EPBC Act | TPFL/ WAH   | Nature Map | Previous Winu Surveys | Literature Review        |                                                                                                                                                                                                                                             |                                                   |                                        |
| Priority 1                  |                   |        |          |             |            |                       |                          |                                                                                                                                                                                                                                             |                                                   |                                        |
| <i>Acacia aphanoclada</i>   | P1                |        |          |             |            |                       | Western Botanical (2021) | Slender, wispy shrub, 1.7-5 m high. Flowers yellow, Aug to Oct. Skeletal stony soils. Rocky hills, ridges and rises. East Pilbara LGA.                                                                                                      | 160km SW                                          | Unlikely                               |
| <i>Acacia fecunda</i>       | P1                |        |          |             |            |                       | Western Botanical (2021) | Erect, obconic shrub, to 3 m high. Flowers yellow, May or Aug. Quartzite gibbers over grey-red skeletal soil. Along shallow creeks and drainage lines, hills, road verges. Ashburton, East Pilbara LGAs.                                    | 160km SW                                          | Unlikely                               |
| <i>Atriplex spinulosa</i>   | P1                |        |          |             |            |                       | Western Botanical (2021) | Monoecious, erect, rounded annual, herb, ca 0.2 m high Brown to grey silty clay loam. Carnarvon, East Pilbara, Greater Geraldton LGAs.                                                                                                      | 160km SW                                          | Unlikely                               |
| <i>Eremophila tenella</i>   | P1                |        |          |             |            |                       | Western Botanical (2021) | Spindly, weeping shrub, 1.8-2.5 m high. Flowers blue, May or Aug to Sep. Stony hillsides. East Pilbara LGA.                                                                                                                                 | 120km S                                           | Unlikely                               |
| <i>Goodenia pedicellata</i> | P1                |        |          |             |            |                       | Western Botanical (2021) | Single-stemmed perennial, herb (with dense, cottony and strigose hairs), to 0.25 m high. Rocky clayey soils. Rocky slopes and crests of small hills. East Pilbara LGA.                                                                      | 120km S                                           | Unlikely                               |
| <i>Lepidium amelum</i>      | P1                |        |          | *           | *          |                       |                          | Erect, spreading shrub, 0.3-1 m high, plants glabrous; leaves sessile, stem-clasping. Flowers white, May to Aug. Sandy loams and stony, calcareous, alkaline soils. Hummock grassland, low open woodland, disturbed sites. East Pilbara LGA | 75km SSW of RAC (southern end)                    | Possible                               |
| <i>Ptilotus wilsonii</i>    | P1                |        |          |             |            |                       | Western Botanical (2021) | Shrub, ca 0.5 m high. Flowers green-white, Oct. Stony gravelly soils. Rocky hills. East Pilbara LGA.                                                                                                                                        | 160km S                                           | Unlikely                               |



| Taxon                                                          | Conservation rank |        |          | Data Source |            |                                                                                    |                                                                                          | Description, habitat and current known distribution (local government areas) (WAH, 1998)                                                                                                                                           | Nearest recorded location to Development Envelope                                                  | Likelihood within Development Envelope |
|----------------------------------------------------------------|-------------------|--------|----------|-------------|------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------|
|                                                                | DBCA              | BC Act | EPBC Act | TPFL/ WAH   | Nature Map | Previous Winu Surveys                                                              | Literature Review                                                                        |                                                                                                                                                                                                                                    |                                                                                                    |                                        |
| <i>Scaevola</i> sp. Isabella Range (R.D. Royce 1918)           | P1                |        |          | *           | *          |                                                                                    |                                                                                          | Stems unribbed. Leaves flat, 10-27 mm long, 2-3 mm wide. Pedicel absent (flowers sessile). Calyx lobes present, calyx length 10 mm long, corolla blue. Pebbly red sand. East Pilbara LGA                                           | 52 km S of RAC (southern end)                                                                      | Possible                               |
| <i>Solanum</i> sp. Mosquito Creek (A.A. Mitchell I. AAM 10795) | P1                |        |          |             |            |                                                                                    | Western Botanical (2021)                                                                 | Level plain. Brown light clay. East Pilbara LGA.                                                                                                                                                                                   | 180km SW                                                                                           | Unlikely                               |
| <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114)    | P1                |        |          | *           |            | Biota (2018a)                                                                      |                                                                                          | Erect spindly shrub. Flowers pink (when uniformly coloured), Jul, Aug or Sep. Undulating crest of a sand dune, including an elevated depression. Reddish brown sand. East Pilbara, Karratha, Port Hedland LGAs.                    | Recorded in AREH study area, 48 km E of RAC                                                        | Possible                               |
| <i>Tribulus minutus</i>                                        | P1                |        |          |             |            |                                                                                    | Western Botanical (2021)                                                                 | Prostrate herb, plants villous; leaflet pairs 5-7; petals 2.5-7 mm long; spines on fruit not well-developed. Stony rise; growing on old track clear of Triodia. Calcrete/silcrete limestone; red sand. East Pilbara LGA.           | 100km W                                                                                            | Unlikely                               |
| <b>Priority 2</b>                                              |                   |        |          |             |            |                                                                                    |                                                                                          |                                                                                                                                                                                                                                    |                                                                                                    |                                        |
| <i>Goodenia hartiana</i>                                       | P2                |        |          | *           | *          | Astron (2018, 2019a, 2019b); Biota (2018a); Western Botanical (2022, 2023b, 2023c) | Western Botanical (2021); Syrinx Environmental (2013); Spectrum Ecology & Spatial (2022) | Erect to spreading, multi-stemmed perennial, herb or shrub (sub-shrub). Sand. Sand dune swales, sandhills. Broome, East Pilbara LGAs.                                                                                              | Recorded in Development Envelope (MIA, RAC, Wallal bore field, Texas Borefield, Rimfire Borefield) | Confirmed                              |
| <i>Thysanotus</i> sp. Desert East of Newman (R.P. Hart 964)    | P2                |        |          | *           | *          |                                                                                    | Western Botanical (2021)                                                                 | Self-supporting perennial, herb (with tuberous roots), distinguished by the long, equal anthers and pseudo-cymose branching. Flowers. Aug to Oct. Red-brown loamy sand or red sand, sometimes silty. Sand plain, I buckshot plain. | 100km S                                                                                            | Possible                               |

| Taxon                        | Conservation rank |        |          | Data Source |            |                                                                |                                                | Description, habitat and current known distribution (local government areas) (WAH, 1998)                                                                                                                                                                                                         | Nearest recorded location to Development Envelope          | Likelihood within Development Envelope |
|------------------------------|-------------------|--------|----------|-------------|------------|----------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------------------|
|                              | DBCA              | BC Act | EPBC Act | TPFL/ WAH   | Nature Map | Previous Winu Surveys                                          | Literature Review                              |                                                                                                                                                                                                                                                                                                  |                                                            |                                        |
|                              |                   |        |          |             |            |                                                                |                                                | East Pilbara, Meekatharra, Ngaanyatjaraku LGAs.                                                                                                                                                                                                                                                  |                                                            |                                        |
| <b>Priority 3</b>            |                   |        |          |             |            |                                                                |                                                |                                                                                                                                                                                                                                                                                                  |                                                            |                                        |
| <i>Bonamia oblongifolia</i>  | P3                |        |          |             |            | Astron (2019b); Biota (2018a, 2021); Western Botanical (2023c) | Biota (2018b); EnviroWorks (2017b)             | Perennial, herb or shrub. Flowers blue, Feb. Sandy or gravelly soils. Broome LGA.                                                                                                                                                                                                                | Recorded in Development Envelope (RAC)                     | Confirmed                              |
| <i>Comesperma sabulosum</i>  | P3                |        |          | *           | *          | Biota (2021); Western Botanical (2022, 2023b, 2023c)           | Spectrum Ecology & Spatial (2022) <sup>8</sup> | Dune. Red sand. Broome, Derby-West Kimberley, East Pilbara, Halls Creek, Meekatharra, Wiluna LGAs.                                                                                                                                                                                               | Recorded in Development Envelope (MIA, Rimfire bore field) | Confirmed                              |
| <i>Corynotheca asperata</i>  | P3                |        |          | *           | *          | Biota (2021); Western Botanical (2022, 2023b)                  | Western Botanical (2021)                       | Rhizomatous, much-branched perennial, herb, to 0.6 m high. Fl. green-white. Red sand. Sand dunes. East Pilbara LGA.                                                                                                                                                                              | Recorded in Development Envelope (MIA)                     | Confirmed                              |
| <i>Croton aridus</i>         | P3                |        |          |             |            | Biota (2018a)                                                  |                                                | Monoecious, multi-stemmed, evergreen shrub, to 1.5 m high. Flowers yellow, Aug. Deep red sand, pindan soil. Sandplains or ridges, spinifex sandplains. Undulating crest of a sand dune, including an elevated depression. Reddish brown sand. Broome, East Pilbara, Wyndham-East Kimberley LGAs. | Recorded in AREH study area 47 km E of RAC                 | Possible                               |
| <i>Dampiera atriplicina</i>  | P3                |        |          | *           | *          |                                                                | Spectrum Ecology & Spatial (2022) <sup>9</sup> | Spreading, robust shrub, to 0.5(-1.2) m high. Flowers pink, May or Jul. Red sand. Sand ridges. Red sand. Sand ridges. East Pilbara, Wiluna LGAs.                                                                                                                                                 | 75km SW                                                    | Possible                               |
| <i>Dasymalla chorisekala</i> | P3                |        |          | *           |            | Biota (2021); Western Botanical (2023b, 2023c)                 | Western Botanical (2021)                       | Interdunal sandplains. Broome, Derby-West Kimberley, East Pilbara LGAs.                                                                                                                                                                                                                          | Recorded in Development Envelope (MIA, RAC)                | Confirmed                              |

<sup>8</sup> *Comesperma sabulosum* was recorded by Ecologia Environment (2003) during a three-phase Targeted flora survey, as cited in Spectrum Ecology & Spatial (2022).

<sup>9</sup> *Dampiera atriplicina* was recorded by Ecologia Environment (2003) during a three-phase Targeted flora survey, as cited in Spectrum Ecology & Spatial (2022).

| Taxon                                             | Conservation rank |        |          | Data Source |            |                                                                                          |                                                 | Description, habitat and current known distribution (local government areas) (WAH, 1998)                                                                                                                   | Nearest recorded location to Development Envelope                                                                      | Likelihood within Development Envelope |
|---------------------------------------------------|-------------------|--------|----------|-------------|------------|------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
|                                                   | DBCA              | BC Act | EPBC Act | TPFL/ WAH   | Nature Map | Previous Winu Surveys                                                                    | Literature Review                               |                                                                                                                                                                                                            |                                                                                                                        |                                        |
| <i>Eragrostis lanicaulis</i>                      | P3                |        |          | *           | *          |                                                                                          |                                                 | Knotty or bulbous rhizomatous, perennial, grass-like or herb, 0.45-0.5 m high. Flowers Mar to May or Aug to Oct. Red sandy clay. Flats East Pilbara, Karratha, Wyndham-East Kimberley LGAs.                | 90km SW                                                                                                                | Possible                               |
| <i>Eucalyptus rowleyi</i>                         | P3                |        |          |             |            |                                                                                          | Western Botanical (2021)                        | Grey-brown sandy loam. Drainage and creek lines. Ashburton, East Pilbara LGAs.                                                                                                                             | 200km S                                                                                                                | Unlikely                               |
| <i>Euphorbia clementii</i>                        | P3                |        |          |             |            |                                                                                          | Spectrum Ecology & Spatial (2022) <sup>10</sup> | Erect herb, to 0.6 m high. Gravelly hillsides, stony grounds. East Pilbara, Port Hedland LGAs.                                                                                                             | 120km S                                                                                                                | Unlikely                               |
| <i>Fuirena incrassata</i>                         | P3                |        |          |             |            |                                                                                          | Spectrum Ecology & Spatial (2022) <sup>11</sup> | Annual, grass-like or herb (sedge), 0.1-0.3 m high. Flowers May to Aug. Sand, sandy clay. Swamps, creek beds, claypans, semi-saline lakes. Broome, East Pilbara, Halls Creek, Wyndham-East Kimberley LGAs. | 165km S (WAH)<br>120km SE (Hart, 2002)                                                                                 | Unlikely                               |
| <i>Indigofera ammobia</i>                         | P3                |        |          | *           | *          | Astron (2018, 2019a, 2019b); Biota (2018a, 2021); Western Botanical (2022, 2023b, 2023c) | Western Botanical (2021)                        | Many-stemmed shrub, to 0.5 m high. Flowers green and purple, Sep. Red sand. Sand dunes. Broome, Derby-West Kimberley, East Pilbara, Halls Creek, Wyndham-East Kimberley LGAs.                              | Recorded in Development Envelope (MIA, RAC, Wallal bore field, Texas bore field, Rimfire bore field)                   | Confirmed                              |
| <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) | P3                |        |          |             |            | Biota (2018a); Western Botanical (2023c)                                                 | Biota (2018b)                                   | Coastal dunes. Broome, Derby-West Kimberley LGAs.                                                                                                                                                          | Reported in AREH survey area Astron and Biota (outside of Development Envelope). Recorded by Western Botanical in RAC. | Confirmed                              |

<sup>10</sup> *Euphorbia clementii* was recorded by Ecologia Environment (2003) during a three-phase Targeted flora survey, as cited in Spectrum Ecology & Spatial (2022).

<sup>11</sup> *Fuirena incrassata* was recorded by Hart (2002) during a two-phase detailed flora survey of the Telfer Project (no WAH specimen), as cited in Spectrum Ecology & Spatial (2022).

| Taxon                                                 | Conservation rank |        |          | Data Source |            |                                                             |                          | Description, habitat and current known distribution (local government areas) (WAH, 1998)                                                                        | Nearest recorded location to Development Envelope                                                    | Likelihood within Development Envelope |
|-------------------------------------------------------|-------------------|--------|----------|-------------|------------|-------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------|
|                                                       | DBCA              | BC Act | EPBC Act | TPFL/ WAH   | Nature Map | Previous Winu Surveys                                       | Literature Review        |                                                                                                                                                                 |                                                                                                      |                                        |
| <i>Pterocaulon xenicum</i>                            | P3                |        |          |             | *          |                                                             |                          | Broome, Derby-West Kimberley, East Pilbara, Halls Creek LGAs.                                                                                                   | 67km SW                                                                                              | Possible                               |
| <i>Rostellularia adscendens</i> var. <i>latifolia</i> | P3                |        |          | *           | *          |                                                             |                          | Herb or shrub, 0.1-0.3 m high. Fl. blue-purple-violet, Apr to May. Ironstone soils. Near creeks, rocky hills. Ashburton, East Pilbara LGAs.                     | 70km SW                                                                                              | Unlikely                               |
| <i>Sida</i> sp. Barlee Range (S. van Leeuwen 1642)    | P3                |        |          |             |            |                                                             | Western Botanical (2021) | Spreading shrub, to 0.5 m high. Flowers yellow, Aug. Skeletal red soils pockets. Steep slope. Ashburton, East Pilbara, Meekatharra LGAs.                        | 170km SW                                                                                             | Unlikely                               |
| <i>Synostemon arenosus</i> <sup>12</sup>              | P3                |        |          | *           | *          | Biota (2021), Western Botanical (2022, 2023b, 2023c)        | Western Botanical (2021) | Red sand dunes. East Pilbara, Wiluna LGAs.                                                                                                                      | Recorded in Development Envelope (MIA, RAC)                                                          | Confirmed                              |
| <i>Terminalia kumpaja</i>                             | P3                |        |          |             |            | Biota (2018a, 2021); Western Botanical (2023c)              | Biota (2018b)            | Sand, pindan plains. Broome, East Pilbara LGAs.                                                                                                                 | Recorded in Development Envelope (RAC, Wallal Borefield)                                             | Confirmed                              |
| <i>Tribulopsis marliesiae</i>                         | P3                |        |          |             |            | Biota (2018a, 2021); Western Botanical (2022, 2023b, 2023c) | Biota (2018b)            | Interdunal sandplains. Broome, Derby-West Kimberley, East Pilbara LGAs.                                                                                         | Recorded in Development Envelope (MIA, RAC, Wallal bore field, Texas bore field, Rimfire bore field) | Confirmed                              |
| <b>Priority 4</b>                                     |                   |        |          |             |            |                                                             |                          |                                                                                                                                                                 |                                                                                                      |                                        |
| <i>Ptilotus mollis</i>                                | P4                |        |          |             |            | *<br>Biota (2022)                                           | Western Botanical (2021) | Compact, perennial shrub, to 0.5 m high, soft grey foliage. Flowers white/pink, May or Sep. Stony hills and screes. Ashburton, East Pilbara, Port Hedland LGAs. | 115km NW                                                                                             | Unlikely                               |

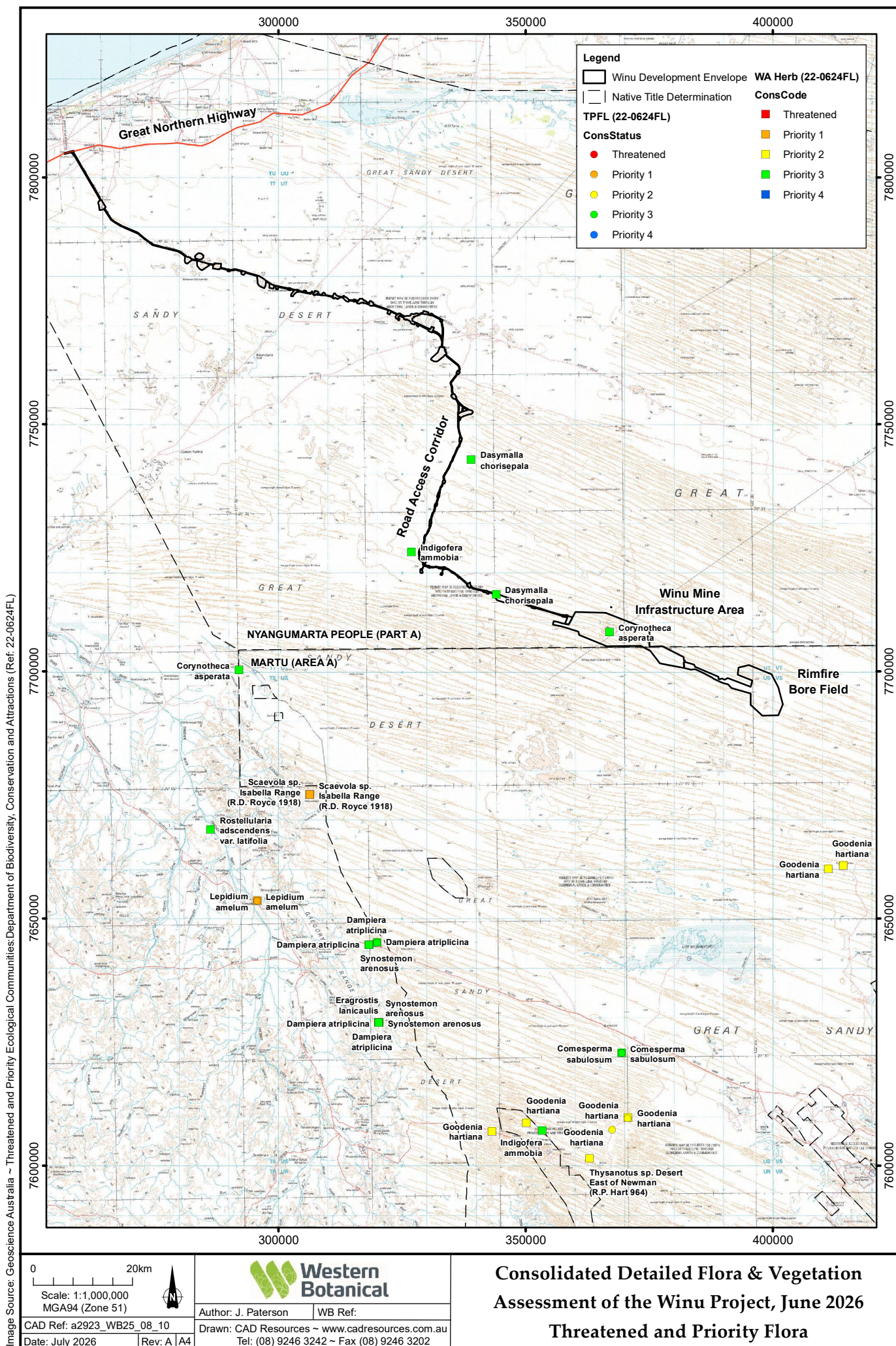
<sup>12</sup> Formerly known as *Sauropus arenosus* (P3)

| Taxon                         | Conservation rank |        |          | Data Source |            |                       |                   | Description, habitat and current known distribution (local government areas) (WAH, 1998)                                                                                                                                         | Nearest recorded location to Development Envelope | Likelihood within Development Envelope |
|-------------------------------|-------------------|--------|----------|-------------|------------|-----------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------|
|                               | DBCA              | BC Act | EPBC Act | TPFL/ WAH   | Nature Map | Previous Winu Surveys | Literature Review |                                                                                                                                                                                                                                  |                                                   |                                        |
| <i>Rhynchosia bungarensis</i> | P4                |        |          |             | *          |                       |                   | Compact, prostrate shrub, to 0.5 m high. Fl. yellow. Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.<br>Ashburton, East Pilbara, Exmouth, Halls Creek, Karratha LGAs. | 220km SW <sup>13</sup>                            | Unlikely                               |

<sup>13</sup> NatureMap search results indicated *R. bungarensis* recorded within 100km of the Winu Project, however, nearest WAH specimen recorded 220km SW of Development Envelope.

**Figure 10. Regional Flora of Conservation Significance (Database searches)**







### 5.2.2. Threatened and Priority Ecological Communities

There are no Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) occurring within the Development Envelope. Within the broader region of the Winu Project, one TEC and five PECs are associated with the Walyarta (Mandora Marsh) and coastal area of Eighty Mile Beach (DBCA, 2024f) (discussed in Sections 2.4.4 – 2.4.5; significant wetlands and ESAs). A summary of these significant ecological communities and their proximity to the Development Envelope is presented in Table 9.

The closest listed TEC or PEC is the Eighty Mile Beach Land System. This Priority 3 PEC occurs along the coastline, approximately 7 km from the northern end of the Development Envelope (intersection with Great Eastern Highway).

The PMST identifies the Winu Project (Development Envelope) being located within 10 km of a Ramsar site (DCCEEW, 2024) (as discussed in Section 2.4.4) (Appendix 5).

**Table 9. Threatened and Priority Ecological Communities within the Winu Project region (DBCA, 2024f, DBCA, 2023a, DBCA, 2023b).**

| Name                                                                                                   | Category (WA)                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ~ Distance to Development Envelope (km) |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <b>Threatened Ecological Community</b>                                                                 |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                         |
| Mandora Mounds – Assemblages of the organic springs and mound springs of Walyarta (Mandora Marsh) area | Critically Endangered ( <i>BC Act</i> ); not listed under <i>EPBC Act</i> | <p>Occurs in the Walyarta (Mandora Marsh) area. Plant assemblages associated with the springs include:</p> <ul style="list-style-type: none"> <li>○ paperbark <i>Melaleuca leucadendra</i> or <i>Melaleuca cajuputi</i> forest and <i>Sesbania formosa</i> (white dragon tree) woodland, with or without an understorey of <i>Acrostichum speciosum</i> (mangrove fern);</li> <li>○ stands of bulrush <i>Typha domingensis</i> and sedgelands dominated by <i>Schoenoplectus</i> spp. with <i>Fimbristylis</i> spp., along with patches <i>Sporobolus virginicus</i> (marine couch grass);</li> <li>○ few <i>Avicennia marina</i> (white mangroves) on the more brackish springs. <i>Acacia ampliceps</i> often present in the mid-storey but is not abundant; and</li> <li>○ <i>Typha domingensis</i> (bulrush) and sedges with a few emergent trees or mangroves dominate the vegetation on some of the small mound springs.</li> </ul> <p>Invertebrate fauna from mound springs of the Walyarta (Mandora Marsh) area are much richer than in springs further north in the Kimberley, with very few species being common to both</p> | 35 km north of RAC                      |

| Name                                                  | Category (WA) | Description                                                                                                                                                    | ~ Distance to Development Envelope (km)                            |
|-------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|                                                       |               | areas. The permanent water and dense vegetation of the springs provide a refuge for fauna within an otherwise arid desert landscape (DBCA, 2023a).             |                                                                    |
| <b>Priority Ecological Community</b>                  |               |                                                                                                                                                                |                                                                    |
| Salt Creek – Inland mangroves community of Salt Creek | Priority 1    | Inland Mangrove ( <i>Avicennia marina</i> ) community of Salt Creek. Anna Plains Station, Mandora.                                                             | 46 km north of RAC (located adjacent to Walyarta (Mandora Marsh))  |
| Mandora Land System                                   | Priority 3    | Land system surrounding Walyarta (Mandora Marsh)                                                                                                               | 33 km north of RAC                                                 |
| Lime Land System                                      | Priority 3    | Calcareous plains supporting soft and hard spinifex grasslands and melaleuca shrublands (Dampierland IBRA region).                                             | 62 km west-south-west of RAC (Great Northern Highway intersection) |
| Roebuck Land System                                   | Priority 3    | Paleo-tidal coastal plains and tidal flats with saline soil supporting salt-water couch grasslands, samphire low shrublands, melaleuca thickets and mangroves. | 37 km north – east of RAC (Great Northern Highway intersection)    |
| Eighty Mile Land System                               | Priority 3    | Beach foredunes, longitudinal coastal dunes and sandy plains with tussock grasslands and spinifex grasslands.                                                  | 7 km north-west of RAC (Great Northern Highway intersection)       |

### 5.2.3. Invasive Species

Within the Shire of East Pilbara there are currently 49 flora taxa listed as Declared Plants under Section 22(2) of the *BAM Act* (DPIRD, 2024c). This includes 30 taxa which are listed as Weeds of National Significance (WoNS) (DAFF, 2024) (Appendix 7). In addition to these 49 taxa a further two are listed as Declared Plants within the Shire of Broome: *\*Azadirachta indica* (Indian lilac) and *\*Themeda quadrivalvis* (grader grass) (neither are listed as WoNS).

Of these, none are classified as Weeds of National Significance (WoNS) or as Declared Pests under s.11 of the Biosecurity and Agriculture Management Act 2007 (BAM Act). Four are considered environmental weeds in the Pilbara region, and seven in the adjacent Kimberley region. Ecological impact and invasiveness ratings are summarised in (DBCA 2026).

Annual targeted weed monitoring recorded Buffel Grass, Bitter Melon and Tomato around the exploration camp, all of which have been manually removed (Western Botanical 2025d).

### 5.3. Field Assessment

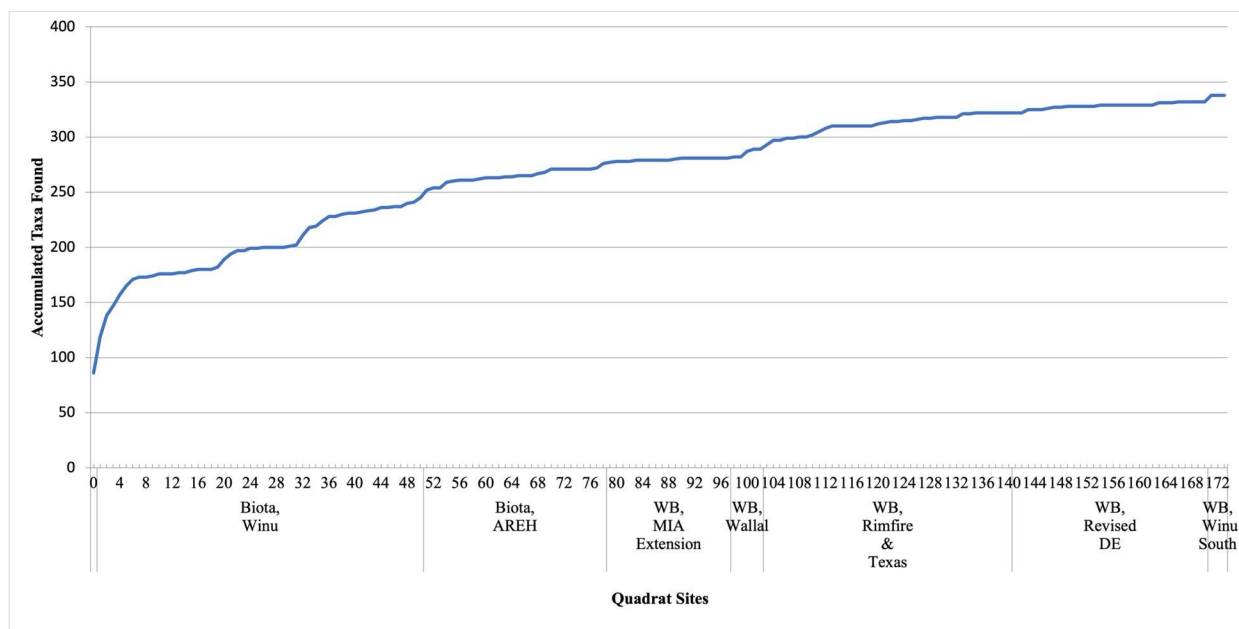
#### 5.3.1. Flora

A total of 342 flora species from 147 genera and 52 families have been recorded across the Winu Project to June 2026. A consolidated systematic species list is presented in Appendix 8.

The Fabaceae family was the most dominant across the Project, with 75 species. This was followed by the Poaceae family with a total of 53 species. *Acacia* was the most prevalent genus, with a total of 33 different *Acacia* species recorded across the Project area to June 2026.

Of the 342 flora species, 252 (73.7%) were recorded within quadrat sites, while 90 (26.3%) were recorded opportunistically, during relevé assessments or traverses. These results are considered typical for a project of such scale in the Great Sandy Desert biogeographic region.

A species accumulation curve displaying the progression of newly observed flora species within quadrat sites is presented in Figure 11. The graph begins at 90 species to include opportunistic records, and appears to level out around the MIA Extensions before a minor increase during the surveys around the former Wallal Borefield, before arriving at an asymptote around the Rimfire & Texas Borefields and Revised DE work. An asymptotic progression is indicative of survey adequacy in capturing the majority of the flora species present within a study area. These results suggest this has been achieved across the Winu Project.



**Figure 11: Species Accumulation Curve Displaying New Species Encountered with the Progression of New Quadrat Sites.**

### 5.3.2. Unresolved Specimens

Sixty-four flora specimens recorded over the cumulative years of survey inclusive of Biota and Western Botanical surveys 2018 – 2026 were not able to be identified to species level. The majority of these specimens represent collections of plants where the sampled material was insufficient to enable definitive identification with half of the specimens constituting ‘historical’ samples collected prior to Western Botanical’s involvement in the program. It is suggested the number of species represented by these poor-quality collections is significantly less than 64.

Subject to seasonal variations, a body of ‘incomplete’ flora samples and consequent unresolved identifications is a feature of any thorough, Detailed flora survey. In this instance, many of the specimens are duplicates, and include sterile and senesced grasses. The numerous botanical surveys completed to date collectively describe a flora assemblage characterised by extensive populations, limited only by survey extent as opposed to isolated populations and single records. Western Botanical is confident the specimens unable to be fully identified are most probably samples of taxa previously catalogued across the Winu Project area.

One undescribed species initially reported as *Polymeria* ? sp. Broome (K.F. Kenneally 9759), has been confirmed as that species and is listed as a Priority 3 flora species by the DBCA. This is discussed in detail in subsequent sections.

The remainder of unresolved specimens are considered to represent duplicate poor material of species otherwise already recorded. They are unlikely to represent species of interest and do not represent any Priority flora species.

No additional Priority flora species or Species of Interest were encountered during the intensive Targeted surveys undertaken in early 2026 within the MIA. This indicates that the works done to date are comprehensive and conclusive in relation to significant flora.

A consolidated list of unresolved specimens recorded across the Winu Project is presented in Table 10.

**Table 10. Unresolved Flora specimens of the Winu Project**

| Family               | Specimen Field Label                                | Likely Matching Species                    |
|----------------------|-----------------------------------------------------|--------------------------------------------|
| <b>Aizoaceae</b>     | <i>Trianthema ?triquetrum</i>                       | <i>Trianthema triquetrum</i>               |
| <b>Amaranthaceae</b> | <i>?Achyranthes aspera</i>                          | <i>Achyranthes aspera</i>                  |
| <b>Amaranthaceae</b> | <i>Gomphrena</i> sp. Indet.                         | Insufficient material available to confirm |
| <b>Amaranthaceae</b> | <i>?Ptilotus exaltatus</i>                          | <i>Ptilotus exaltatus</i>                  |
| <b>Asteraceae</b>    | <i>Genus</i> sp.                                    | Insufficient material available to confirm |
| <b>Boraginaceae</b>  | <i>Euploca ?vestita</i>                             | <i>Euploca vestita</i>                     |
| <b>Boraginaceae</b>  | <i>Euploca</i> sp. Indet.                           | Insufficient material available to confirm |
| <b>Boraginaceae</b>  | Unknown sp. Indet. ( <i>?Euploca cunninghamii</i> ) | Insufficient material available to confirm |

| Family                   | Specimen Field Label                                    | Likely Matching Species                                                                                |
|--------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Chenopodiaceae</b>    | <i>Dysphania</i> sp. Indet                              | <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i>                                           |
| <b>Cleomaceae</b>        | <i>Arivela</i> ? <i>microphylla</i>                     | Insufficient material available to confirm                                                             |
| <b>Convolvulaceae</b>    | <i>Bonamia</i> ? <i>alatisemina</i>                     | <i>Bonamia alatisemina</i>                                                                             |
| <b>Convolvulaceae</b>    | <i>Polymeria</i> ?sp. Broome (K.F. Kenneally 9759)      | <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)                                                 |
| <b>Cyperaceae</b>        | <i>Fimbristylis</i> ? <i>depauperata</i>                | <i>Fimbristylis depauperata</i> or <i>F. dichotoma</i>                                                 |
| <b>Cyperaceae</b>        | <i>Fimbristylis</i> ? <i>dichotoma</i>                  | <i>Fimbristylis depauperata</i> or <i>F. dichotoma</i>                                                 |
| <b>Cyperaceae</b>        | <i>Fimbristylis</i> sp. Indet.                          | <i>Fimbristylis depauperata</i> or <i>F. dichotoma</i>                                                 |
| <b>Euphorbiaceae</b>     | ? <i>Euphorbia</i> sp. Indet.                           | Insufficient material available to confirm                                                             |
| <b>Euphorbiaceae</b>     | <i>Euphorbia</i> ? <i>albrechtii</i>                    | <i>Euphorbia albrechtii</i>                                                                            |
| <b>Euphorbiaceae</b>     | <i>Euphorbia</i> sp. Indet.                             | Insufficient material available to confirm                                                             |
| <b>Fabaceae</b>          | <i>Acacia</i> ? <i>adsurgens</i>                        | <i>Acacia adsurgens</i>                                                                                |
| <b>Fabaceae</b>          | <i>Acacia</i> ? <i>drepanocarpa</i>                     | <i>Acacia drepanocarpa</i>                                                                             |
| <b>Fabaceae</b>          | <i>Acacia</i> ? <i>hilliana</i>                         | <i>Acacia hilliana</i>                                                                                 |
| <b>Fabaceae</b>          | <i>Acacia</i> ? <i>melleodora</i>                       | <i>Acacia melleodora</i>                                                                               |
| <b>Fabaceae</b>          | <i>Cullen</i> ? <i>pustulatum</i>                       | Insufficient material available to confirm                                                             |
| <b>Fabaceae</b>          | <i>Senna</i> sp. Indet.                                 | Insufficient material available to confirm                                                             |
| <b>Fabaceae</b>          | <i>Tephrosia</i> sp. Indet.                             | Insufficient material available to confirm                                                             |
| <b>Fabaceae</b>          | Unknown sp. Indet. (? <i>Tephrosia rosea</i> )          | <i>Tephrosia rosea</i>                                                                                 |
| <b>Fabaceae</b>          | Unknown sp. Indet. (Fabaceae)                           | Insufficient material available to confirm                                                             |
| <b>Hemerocallidaceae</b> | ? <i>Corynotheca gracillis</i>                          | <i>Corynotheca gracilis</i>                                                                            |
| <b>Lamiaceae</b>         | <i>Clerodendrum</i> sp. Indet.                          | <i>Clerodendrum floribundum</i> var. <i>floribundum</i> or <i>C. tomentosum</i> var. <i>tomentosum</i> |
| <b>Lamiaceae</b>         | <i>Clerodendrum tomentosum</i> var. ? <i>tomentosum</i> | <i>Clerodendrum tomentosum</i> var. <i>tomentosum</i>                                                  |
| <b>Lamiaceae</b>         | <i>Dicrastylis</i> sp. Indet.                           | Insufficient material available to confirm                                                             |
| <b>Malvaceae</b>         | ? <i>Sida arenicola</i>                                 | <i>Sida arenicola</i>                                                                                  |
| <b>Malvaceae</b>         | <i>Abutilon</i> sp. Indet.                              | Insufficient material available to confirm                                                             |
| <b>Malvaceae</b>         | <i>Seringia</i> sp. Indet.                              | Insufficient material available to confirm                                                             |
| <b>Malvaceae</b>         | <i>Sida</i> ? <i>arenicola</i> (A.A. Mitchell PRP 360)  | Insufficient material available to confirm                                                             |
| <b>Malvaceae</b>         | <i>Sida</i> sp? <i>Excedentifolia</i> (J.L. Egan 1925)  | <i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)                                                 |
| <b>Malvaceae</b>         | <i>Sida</i> sp. Indet.                                  | Insufficient material available to confirm                                                             |
| <b>Malvaceae</b>         | <i>Triumfetta</i> ? <i>maconochieana</i>                | <i>Triumfetta maconochieana</i>                                                                        |
| <b>Malvaceae</b>         | <i>Triumfetta</i> sp. Indet.                            | Insufficient material available to confirm                                                             |
| <b>Malvaceae</b>         | Unknown sp. Indet. (Malvaceae)                          | Insufficient material available to confirm                                                             |
| <b>Myrtaceae</b>         | <i>Corymbia</i> ? <i>deserticola</i>                    | Insufficient material available to confirm                                                             |
| <b>Nyctaginaceae</b>     | <i>Boerhavia</i> ? <i>gardneri</i>                      | Insufficient material available to confirm                                                             |
| <b>Phrymaceae</b>        | <i>Peplidium</i> sp. Indet.                             | Insufficient material available to confirm                                                             |
| <b>Phyllanthaceae</b>    | ? <i>Lysiandra eremica</i>                              | Insufficient material available to confirm                                                             |
| <b>Poaceae</b>           | ? <i>Amphipogon sericeus</i>                            | <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138)                                       |
| <b>Poaceae</b>           | ? <i>Digitaria brownii</i>                              | Insufficient material available to confirm                                                             |
| <b>Poaceae</b>           | <i>Aristida</i> sp. Indet.                              | Insufficient material available to confirm                                                             |
| <b>Poaceae</b>           | <i>Eragrostis</i> ? <i>eriopoda</i>                     | <i>Eragrostis eriopoda</i>                                                                             |
| <b>Poaceae</b>           | <i>Eragrostis</i> aff. <i>eriopoda</i>                  | <i>Eragrostis eriopoda</i>                                                                             |



| Family         | Specimen Field Label                                                                 | Likely Matching Species                    |
|----------------|--------------------------------------------------------------------------------------|--------------------------------------------|
| Poaceae        | <i>Eragrostis</i> sp. Indet.                                                         | Insufficient material available to confirm |
| Poaceae        | <i>Eriachne</i> ? <i>helmsii</i>                                                     | <i>Eragrostis helmsii</i>                  |
| Poaceae        | <i>Eriachne</i> ? <i>lanata</i>                                                      | <i>Eriachne lanata</i>                     |
| Poaceae        | <i>Eriachne</i> ? <i>obtusata</i>                                                    | <i>Eriachne obtusata</i>                   |
| Poaceae        | <i>Eriachne</i> ? <i>pulchella</i>                                                   | <i>Eriachne pulchella</i>                  |
| Poaceae        | <i>Eriachne</i> sp. Indet.                                                           | Insufficient material available to confirm |
| Poaceae        | <i>Triodia</i> sp. (sterile soft spinifex; <i>T. epactia</i> or <i>T. schinzii</i> ) | <i>T. epactia</i> or <i>T. schinzii</i>    |
| Poaceae        | <i>Triodia</i> sp. Indet.                                                            | Insufficient material available to confirm |
| Poaceae        | Unknown sp. Indet. (? <i>Cynodon anisocarpus</i> )                                   | Insufficient material available to confirm |
| Poaceae        | Unknown sp. Indet. (? <i>Sorghum plumosum</i> )                                      | Insufficient material available to confirm |
| Poaceae        | Unknown sp. Indet. (Poaceae)                                                         | Insufficient material available to confirm |
| Polygalaceae   | Unknown sp. Indet. (? <i>Polygala isingii</i> )                                      | Insufficient material available to confirm |
| Solanaceae     | <i>Solanum</i> ? <i>centrale</i>                                                     | <i>Solanum centrale</i>                    |
| Solanaceae     | <i>Solanum</i> sp. Indet.                                                            | Insufficient material available to confirm |
| Zygophyllaceae | <i>Tribulus</i> sp. Indet.                                                           | Insufficient material available to confirm |

### 5.3.3. Numbers of Plants of Priority Flora and Species of Interest

Thirteen Priority flora species have been recorded across the Winu Project area and surrounds, of which two have been noted solely outside of the Development Envelope.

*Goodenia hartiana* (P2) is by far the most common and widespread within (552,280 plants, 62.19%) and outside (335,702 plants, 37.81%) the Development Envelope. *Cynodon anisocarpus* (P1) is relatively abundant within the DE (63,587 plants, 14.73%) and very abundant outside the DE (367,972 plants, 85.27%). Other species such as *Comesperma sabulosum* (P3), *Corynotheca asperata* (P3), *Dasymala chlorisepala* (P3) *Synostemon arenosus* (P3), *Terminalia kumpaja* (P3) and *Tribulopsis marliesiae* (P3) are relatively uncommon within the DE and also have relatively low numbers recorded outside the DE, Table 11 and Figure 12.

Two Priority flora species (*Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1) and *Eragrostis lanicaulis* (P3) are only known from outside the DE.

*Polymeria* sp. Broome (K.F. Kenneally 9759) (P3)<sup>14</sup>, has no numbers of plants occurring within the DE, however, a population was recorded within the DE in August 2019, prior to confirmation of this as a Priority species, but no numbers were attributed to this at that time.

<sup>14</sup> Record of *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3) made in quadrat WIN036, August 2019, prior to confirmation of identity of that specimen.

The relative numbers of each priority species within and outside the Development Envelope is considered an artefact of survey effort to date and not indicative of a greater propensity for species to occur within the DE versus the areas outside given physical landscape, soil or other habitat related factors. The two dominant Land systems described in the region encompassing the Winu DE (Little Sandy System and AB40 Land System) are very large and extensive in area and it is expected, with reasonable confidence, that additional survey outside the DE will find similar numbers of all the Priority Flora and novel species that have been encountered within the DE to date.

Three Species of Interest have been recorded across the Winu Project: *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138), *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB41179) and *Portulaca* sp. Nyangumarta (B. Eckermann Opp01).

*Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) is widespread and abundant within the DE and has also been observed outside the DE though no systematic surveys for this species have been conducted outside the DE as yet. *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB41179) has only been observed outside the DE to date. *Portulaca* sp. Nyangumarta (B. Eckermann Opp01) was noted in May-June 2026 on the edge of the RAC portion of the DE and is being treated as a SOI while its taxonomy is being confirmed.

Each Priority flora species and Species of Interest (novel species) is discussed in detail in the following sections.

**Table 11. Priority Flora Numbers Within and Outside the Winu Project Area**

| Taxon                                                            | Numbers of Individuals               |             |                                       |              |             |
|------------------------------------------------------------------|--------------------------------------|-------------|---------------------------------------|--------------|-------------|
|                                                                  | Inside Proposed Development Envelope | % Inside DE | Outside Proposed Development Envelope | % Outside DE | Grand Total |
| <b>Priority 1</b>                                                |                                      |             |                                       |              |             |
| <i>Cynodon anisocarpus</i> (P1)                                  | 63,587                               | 14.73%      | 367,973                               | 85.27%       | 431,560     |
| <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) (P1) | -                                    | 0.00%       | 1                                     | 100.00%      | 1           |
| <b>Priority 2</b>                                                |                                      |             |                                       |              |             |
| <i>Goodenia hartiana</i> (P2)                                    | 552,280                              | 62.19%      | 335,702                               | 37.81%       | 887,982     |
| <b>Priority 3</b>                                                |                                      |             |                                       |              |             |
| <i>Bonamia oblongifolia</i> (P3)                                 | 3                                    | 0.24%       | 1,263                                 | 99.76%       | 1,266       |
| <i>Comesperma sabulosum</i> (P3)                                 | 51                                   | 18.80%      | 220                                   | 81.18%       | 271         |
| <i>Corynotheca asperata</i> (P3)                                 | 2,554                                | 29.99%      | 5,962                                 | 70.01%       | 8,516       |
| <i>Dasymalla chorisepala</i> (P3)                                | 118                                  | 31.30%      | 259                                   | 68.70%       | 377         |
| <i>Eragrostis lanicaulis</i> (P3)                                | -                                    | 0.00%       | 1                                     | 100.00%      | 1           |
| <i>Indigofera ammobia</i> (P3)                                   | 18,658                               | 49.26%      | 19,217                                | 50.74%       | 37,875      |

| Taxon                                                                     | Numbers of Individuals               |             |                                       |              |                  |
|---------------------------------------------------------------------------|--------------------------------------|-------------|---------------------------------------|--------------|------------------|
|                                                                           | Inside Proposed Development Envelope | % Inside DE | Outside Proposed Development Envelope | % Outside DE | Grand Total      |
| <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)                    | -                                    | 0.00%       | 73                                    | 100.00%      | 73               |
| <i>Synostemon arenosus</i> (P3)                                           | 2,467                                | 49.59%      | 2,508                                 | 50.41%       | 4,975            |
| <i>Terminalia kumpaja</i> (P3)                                            | 110                                  | 49.33%      | 113                                   | 50.67%       | 223              |
| <i>Tribulopsis marliesiae</i> (P3)                                        | 787                                  | 47.50%      | 870                                   | 52.50%       | 1,657            |
| <b>Species of Interest</b>                                                |                                      |             |                                       |              |                  |
| <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138)          | 111,003                              | 99.97%      | 33 (Not Assessed)                     | 0.03%        | 111,036          |
| <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB41179) | -                                    | 0.00%       | 500                                   | 100.00%      | 500              |
| <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01)                     | 77                                   | 56.62%      | 59                                    | 43.38%       | 136              |
| <b>Grand Total</b>                                                        | <b>696,536</b>                       |             | <b>734,087</b>                        |              | <b>1,486,449</b> |

### Population Analysis for Priority Flora and Species of Interest

Many of the species in the MIA and Rimfire Borefield demonstrate a habitat-specific distribution that corresponds to the topography, landform and soils of the Study Area. Landforms of the DE are largely characterised by (i) sub-parallel dune system with (ii) intervening sand plains or swales. Typically, the WNW-ESE oriented dunes are 10m to 20m high and 30m to 50m wide ranging approximately 500m to 1,500m apart. The dunes extend for many tens of kilometres each with occasional anastomoses.

In this setting the definition of a population or sub-population inherently needs a flexible adoption of the typical criteria to inform consideration of potential impacts of ‘stochastic’ events (such as fire and maturity of vegetation). A population of each species is designated if (i) there is a discontinuity within the landscape of 500m or more between records of plants within the same continuous habitat unit; (ii) if there is a significant potential geographical impediment to pollinator activity and inferred gene flow; or (iii) if there is a change in land tenure meaning differing management regimes could apply. Significant landscape features in the Great Sandy Desert inclusive of the Winu DE include (i) sand dune systems separating patches of species which occur on the swales between the dunes, and conversely (ii) broad sandy flats separating populations of flora which occur on the parallel, linear dunes. Consequently, populations of species occurring on these differential habitat units are therefore separated when populations are shown to be discontinuous.

An analysis of number of populations or sub-populations of each Priority Flora species within and outside the Development Envelope is presented in Table 12. These analyses are heavily biased to

records within the Development Envelope as few records, and limited systematic studies, have been conducted outside the DE for these species at this stage. As discussed elsewhere within this document, given the relatively uniformity of the land systems and habitats in the broader region around the Winu Project, it is considered highly likely that these species will be regionally widespread and more abundant outside the DE than current data represents.

This analysis shows that, based on current data (focussed almost entirely within the DE), that:

- Eleven of the Priority flora (*Cynodon anisocarpus* (P1), *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1), *Goodenia hartiana* (P2), *Bonamia oblongifolia* (P3), *Comesperma sabulosum* (P3), *Corynotheca asperata* (P3), *Eragrostis lanicaulis* (P3), *Indigofera ammobia* (P3), *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3), *Synostemon arenosus* (P3), *Terminalia kumpaja* (P3)) have less than 30% of their local populations within the Development Envelope, Table 12.
- Two Priority 3 species have about 50% of their known local populations within the DE: *Dasymalla chorisepala* (P3) and *Tribulopsis marliesiae* (P3).
- Two Priority species (*Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1) and *Eragrostis lanicaulis* (P3)) and one SOI species (*Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB41179) (SOI) have no individuals recorded within the DE, and therefore no populations within the DE, Table 12.
- A Record of *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3)<sup>15</sup> was made in quadrat WIN036, in August 2019, prior to confirmation of identity of that specimen, and no numbers of plants attributed at that time. Hence there is a population is recorded within the DE but has no number of individuals noted.
- One Species of Interest, *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB41179), is only known from one population outside the DE to date.
- One Species of Interest, *Portulaca* sp. Nyangumarta (B. Eckermann Opp01), is known from one area on the RAC and which is found on either side of the DE boundary. Being within and outside the DE, it is recorded in two populations, divided only by this cadastral boundary.
- The widespread and common to co-dominant species *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) known in detail from within the DE and has been observed outside the DE though it has not been systematically assessed outside. It is also known from near

<sup>15</sup> *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3), has no numbers of plants occurring within the DE, however, a population was recorded within the DE in August 2019, prior to confirmation of this as a Priority species, but no numbers were attributed to this at that time.

the Telfer minesite (J. Warden pers. obs.) though it was not recognised as significant at that time and has not been mapped or quantified there.

Incorporating publicly available information on these species available from the Australia's Virtual Herbarium, and limiting populations there-in to those in Western Australia, provides the following analysis:

- No Priority species has 30% or greater number of its state-wide populations within the Winu DE, Table 13. The Priority species are sufficiently well-known outside the DE (both locally and more broadly in WA) that the proportions within the DE are relatively low.
- The only species which has a high proportion of its state-wide population within the DE is *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138), and this is considered an artefact of (i) the recent recognition of the taxon as a potential new species and (ii) the local survey effort within the DE focussing on this and other Priority and SOI flora. This species is expected to be locally and regionally abundant and widespread within and beyond the Great Sandy Desert BGR.

It should be noted that if the Winu DE and State-wide populations of Priority Flora were assessed on the same scale, the entire Winu population of each species could be regarded as one population, further reducing the calculated proportional impact.

### Area of Occupancy Analysis for Priority Flora and Species of Interest

The Area of Occupancy (AOO) for all Priority flora and Species of Interest are presented in Table 12. This shows that six Priority species (*Cynodon anisocarpus* (P1), *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1), *Bonamia oblongifolia* (P3), *Comesperma sabulosum* (P3), and *Eragrostis lanicaulis* (P3) and *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3)) have AOO of less than 30% within the DE. The remainder of species have an AOO between 30.1% and 70.9% within the DE. However, there is little contextual information available outside the DE for all these species and the focus of surveys to date biases the proportions of populations to within the DE. In particular, 70% of the quantified AOO of *Goodenia hartiana* is recorded within the DE, though the species has been commonly observed, but not specifically mapped, outside the DE in the south-western part of the Great Sandy Desert BGR.

Similarly, *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) has a high proportion (100%) of its AOO known within the DE and is data-deficient outside this area, an artefact of (i) the recent recognition of the taxon as a potential new species and (ii) the local survey effort within the DE focussing on this and other Priority and SOI flora.

*Portulaca* sp. Nyangumarta (B. Eckermann Opp01) is known from one population (50% of populations) within the DE and from one population (50% of populations) from outside the DE. These are located close together and effectively separated only by the cadastral boundary of the DE.



**Table 12. Populations Analysis of Priority Flora of the Winu Project**

| Taxon                                                            | Inside Development Envelope |        |                          |       |                   |       | Outside Development Envelope |        |             |        |                   |        |
|------------------------------------------------------------------|-----------------------------|--------|--------------------------|-------|-------------------|-------|------------------------------|--------|-------------|--------|-------------------|--------|
|                                                                  | Plants                      |        | Populations <sup>1</sup> |       | Area of Occupancy |       | Plants                       |        | Populations |        | Area of Occupancy |        |
|                                                                  | Number                      | %      | Number                   | %     | (ha)              | %     | Number                       | %      | Number      | %      | (ha)              | %      |
| <b>Priority 1</b>                                                |                             |        |                          |       |                   |       |                              |        |             |        |                   |        |
| <i>Cynodon anisocarpus</i> (P1)                                  | 63,587                      | 14.7%  | 4                        | 16.7% | 4.28              | 26.4% | 367,973                      | 85.3%  | 20          | 83.3%  | 11.91             | 73.6%  |
| <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) (P1) | 0                           | 0.0%   | 0                        | 0.0%  | 0                 | 0.0%  | 1                            | 100.0% | 1           | 100.0% | 0.01              | 100.0% |
| <b>Priority 2</b>                                                |                             |        |                          |       |                   |       |                              |        |             |        |                   |        |
| <i>Goodenia hartiana</i> (P2)                                    | 552,280                     | 62.2%  | 43                       | 22.6% | 81.42             | 70.9% | 335,702                      | 37.8%  | 147         | 77.4%  | 33.39             | 29.1%  |
| <b>Priority 3</b>                                                |                             |        |                          |       |                   |       |                              |        |             |        |                   |        |
| <i>Bonamia oblongifolia</i> (P3)                                 | 3                           | 0.2%   | 2                        | 28.6% | 0.02              | 2.9%  | 1,263                        | 99.8%  | 5           | 71.4%  | 0.66              | 97.1%  |
| <i>Comesperma sabulosum</i> (P3)                                 | 51                          | 18.8%  | 3                        | 11.1% | 0.22              | 18.2% | 220                          | 81.2%  | 24          | 88.9%  | 0.99              | 81.8%  |
| <i>Corynotheca asperata</i> (P3)                                 | 2,554                       | 30.0%  | 19                       | 26.8% | 7.2               | 37.3% | 5,962                        | 70.0%  | 52          | 73.2%  | 12.12             | 62.7%  |
| <i>Dasymalla chorisepala</i> (P3)                                | 118                         | 31.3%  | 5                        | 50.0% | 0.59              | 30.1% | 259                          | 68.7%  | 5           | 50.0%  | 1.36              | 69.9%  |
| <i>Eragrostis lanicaulis</i> (P3)                                | 0                           | 0.0%   | 0                        | 0.0%  | 0                 | 0.0%  | 1                            | 100.0% | 1           | 100.0% | 0.01              | 100.0% |
| <i>Indigofera ammobia</i> (P3)                                   | 18,658                      | 49.3%  | 23                       | 27.7% | 17.32             | 51.6% | 19,217                       | 50.7%  | 60          | 72.3%  | 16.23             | 48.4%  |
| <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)           | 0                           | 0.0%   | 1                        | 16.7% | 0                 | 0.0%  | 73                           | 100.0% | 5           | 83.3%  | 0.07              | 100.0% |
| <i>Synostemon arenosus</i> (P3)                                  | 2,467                       | 49.6%  | 9                        | 22.5% | 11.31             | 54.9% | 2,508                        | 50.4%  | 31          | 77.5%  | 9.31              | 45.1%  |
| <i>Terminalia kumpaja</i> (P3)                                   | 110                         | 49.3%  | 2                        | 28.6% | 0.26              | 64.9% | 113                          | 50.7%  | 5           | 71.4%  | 0.14              | 35.1%  |
| <i>Tribulopsis marliesiae</i> (P3)                               | 787                         | 47.5%  | 42                       | 51.2% | 3.15              | 49.4% | 870                          | 52.5%  | 40          | 48.8%  | 3.23              | 50.6%  |
| <b>Species of Interest</b>                                       |                             |        |                          |       |                   |       |                              |        |             |        |                   |        |
| <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138) | 111,003                     | 100.0% | 7                        | 77.8% | 80.76             | 99.9% | 33 (Not Assessed)            | 0.0%   | 2           | 22.2%  | 0.04              | 0.1%   |

| Taxon                                                                     | Inside Development Envelope |         |                          |        |                   |       | Outside Development Envelope |        |             |        |                   |        |
|---------------------------------------------------------------------------|-----------------------------|---------|--------------------------|--------|-------------------|-------|------------------------------|--------|-------------|--------|-------------------|--------|
|                                                                           | Plants                      |         | Populations <sup>1</sup> |        | Area of Occupancy |       | Plants                       |        | Populations |        | Area of Occupancy |        |
|                                                                           | Number                      | %       | Number                   | %      | (ha)              | %     | Number                       | %      | Number      | %      | (ha)              | %      |
| <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB41179) | 0                           | 0.0%    | 0                        | 0.0%   | 0                 | -     | 500                          | 100.0% | 1           | 100.0% | 0.01              | 100.0% |
| <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01)                     | 77                          | 56.6.0% | 1                        | 50.00% | 0.14              | 73.7% | 59                           | 43.4%  | 1           | 50.0%  | 0.05              | 26.3%  |

**Table 13. Population Analysis for Priority Flora incorporating Regional Data in Western Australia**

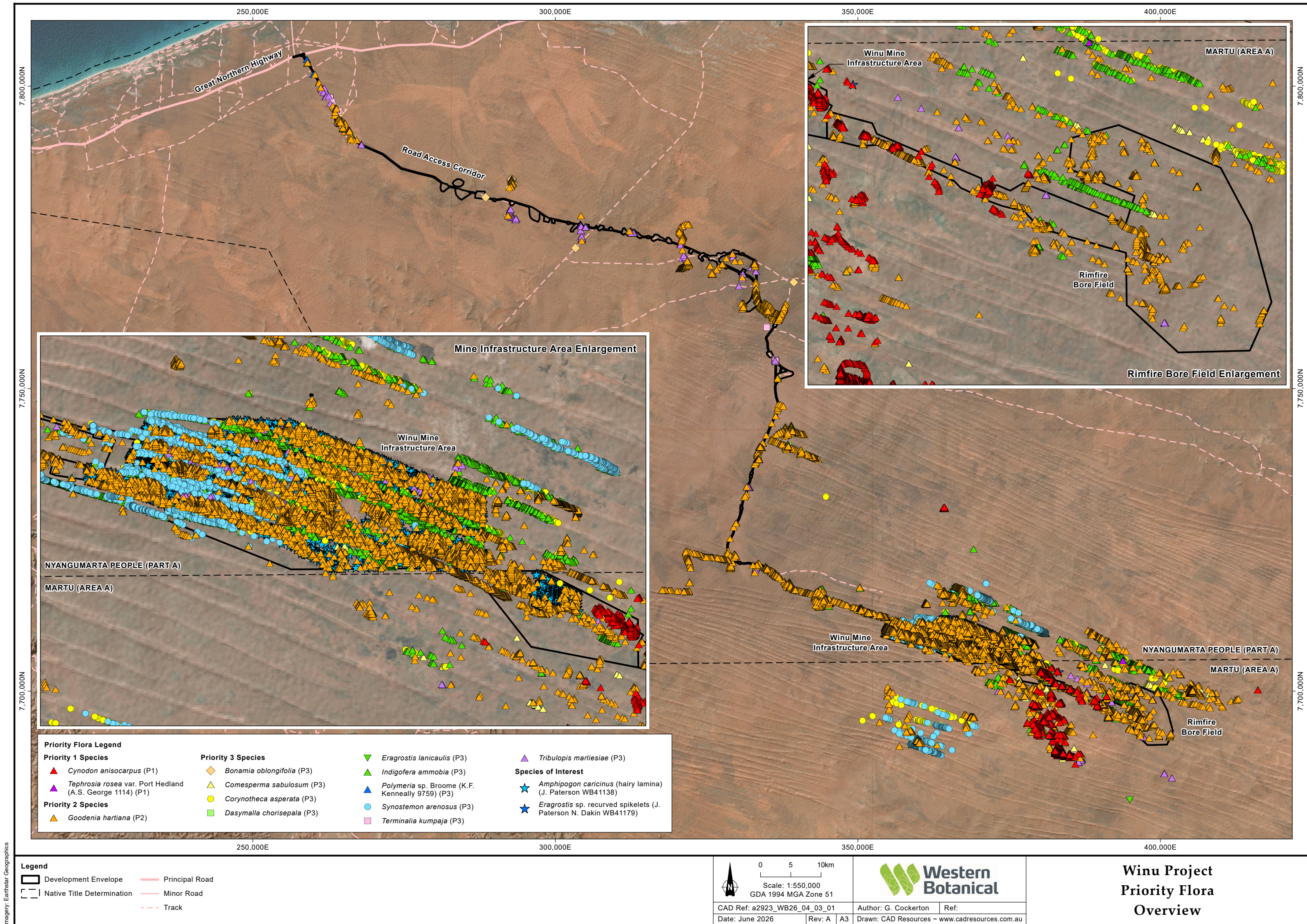
|                                                                           | Populations within Winu DE | Populations Outside and adjacent to Winu DE | Regional Populations in WA | Total Populations | % Within Winu DE |
|---------------------------------------------------------------------------|----------------------------|---------------------------------------------|----------------------------|-------------------|------------------|
| <b>Priority 1</b>                                                         |                            |                                             |                            |                   |                  |
| <i>Cynodon anisocarpus</i> (P1)                                           | 4                          | 20                                          | 5                          | 29                | 13.8%            |
| <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) (P1)          | -                          | 1                                           |                            | 1                 | 0.0%             |
| <b>Priority 2</b>                                                         |                            |                                             |                            |                   |                  |
| <i>Goodenia hartiana</i> (P2)                                             | 43                         | 147                                         | 19                         | 209               | 20.6%            |
| <b>Priority 3</b>                                                         |                            |                                             |                            |                   |                  |
| <i>Bonamia oblongifolia</i> (P3)                                          | 2                          | 5                                           | 6                          | 13                | 15.4%            |
| <i>Comesperma sabulosum</i> (P3)                                          | 3                          | 24                                          | 19                         | 46                | 6.5%             |
| <i>Corynotheca asperata</i> (P3)                                          | 19                         | 52                                          | 8                          | 79                | 24.1%            |
| <i>Dasymalla chorisepala</i> (P3)                                         | 5                          | 5                                           | 7                          | 17                | 29.4%            |
| <i>Eragrostis lanicaulis</i> (P3)                                         | -                          | 1                                           | 11                         | 12                | 0.0%             |
| <i>Indigofera ammobia</i> (P3)                                            | 23                         | 60                                          | 19                         | 102               | 22.5%            |
| <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3)                    | 1 <sup>16</sup>            | 5                                           | 16                         | 22                | 4.5%             |
| <i>Synostemon arenosus</i> (P3)                                           | 9                          | 31                                          | 12                         | 52                | 17.3%            |
| <i>Terminalia kumpaja</i> (P3)                                            | 2                          | 5                                           | 15                         | 22                | 9.1%             |
| <i>Tribulopsis marliesiae</i> (P3)                                        | 42                         | 40                                          | 92                         | 174               | 24.1%            |
| <b>Species of Interest</b>                                                |                            |                                             |                            |                   |                  |
| <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138)          | 7                          | 2                                           | -                          | 9                 | 77.8%            |
| <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB41179) | -                          | 1                                           | -                          | 1                 | 0.0%             |
| <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01)                     | 1                          | 1                                           | -                          | 2                 | 50.0%            |

A map depicting the distribution of each Priority flora species and Species of Interest, where known, is presented under respective discussions of each species.

<sup>16</sup> Record of *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3) made in quadrat WIN036, August 2019, prior to confirmation of identity of that specimen, and no numbers of plants attributed at that time.

**Figure 12. Priority Flora Locations Across the Winu Project.**





Imagery: Earthstar Geographics

- Legend**
- Development Envelope
  - Native Title Determination
  - Principal Road
  - Minor Road
  - Track

0 5 10km  
Scale: 1:550,000  
GDA 1994 MGA Zone 51

CAD Ref: a2923\_WB26\_04\_03\_01  
Date: June 2026

Rev: A A3

**Western Botanical**

Author: G. Cockerton Ref:  
Drawn: CAD Resources ~ www.cadresources.com.au

**Winu Project  
Priority Flora  
Overview**



#### **5.3.4. Descriptions of Priority Flora of the Winu Project**



### ***Cynodon anisocarpus* (Priority 1)**

*Cynodon anisocarpus* (P1) is a member of the Poaceae family. It is described as a tufted annual growing to 0.15m high (Plate 1); sometimes producing adventitious roots at the lower nodes (Albrecht & McLay 2022). Following recent discourse in the naming convention, *Cynodon anisocarpus* has recently been included in the WA plant census and given a Priority one Conservation listing.

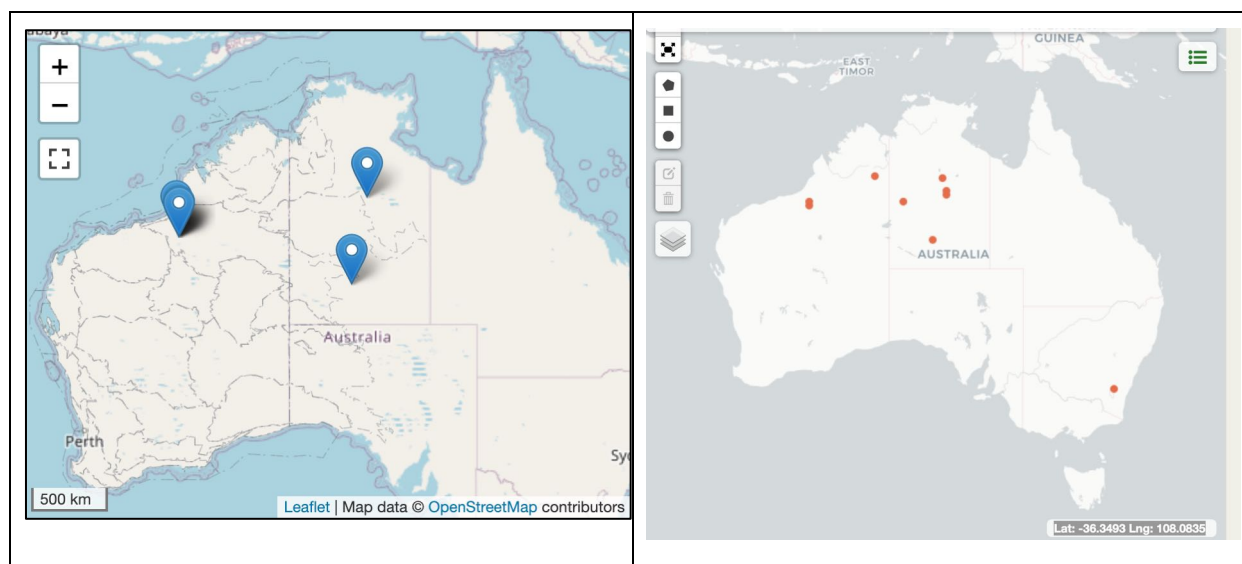


**Plate 1. *Cynodon anisocarpus* (P1) during growth (left) and senescence (right)**

*Cynodon anisocarpus* (P1) is distributed across central parts of northern Western Australia and the Northern Territory, known by the Western Australian Herbarium from five records (WA Herbarium 1998-2026), and a further six populations (seven records) on AVH (Australasian Virtual Herbarium 2026) (Figure 13).

A total of 431,559 *Cynodon anisocarpus* (P1) have been recorded in the Winu Project DE in 4 populations (1.7% of populations). A further 20 populations (83.3% of populations) are known outside the DE. These are predominantly located within C2 – *Acacia bivenosa* Scattered Low Shrubs over *Triodia brizoides* and *Triodia epactia* (*Triodia schinzii*), and the R1 – *Acacia bivenosa* (*Acacia ancistrocarpa*) Low Open Shrubland over *Triodia brizoides* (*Triodia schinzii*). Both Vegetation Associations consistently feature small low-lying claypan scattered throughout extensive *Triodia brizoides* hummocks – C2 being associated with more clayey soils, whilst R1 is associated with gravelly soils approaching rocky rises (Plate 2). It is also known in low abundances in the C3 – *Acacia bivenosa* (*Acacia stellaticeps*) Low Shrubland over *Triodia epactia*; C5 – Claypan Playa (*Diplachne fusca* subsp. *muelleri*, *Eragrostis falcata*) with Scattered Herbs; and P15c – *Corymbia candida* Open Low Woodland over *Triodia brizoides* communities.

Associated species include, *Acacia bivenosa*, *Senna artemisioides* subsp. *oligophylla*, *Senna sericea*, *Acacia stellaticeps*, *Triodia epactia*, *Triodia brizoides*, *Ptilotus exaltatus*, *Aristida contorta*, *Sporobolus australasicus*, *Sporobolus actinocladus* and *Trianthema triquetrum*.



**Figure 13. Current *Cynodon anisocarpus* distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

The approximate distribution of *Cynodon anisocarpus* (P1) across the Winu Project is presented in Figure 14. As it is a short-lived annual, and it is only present and observable following good seasonal rainfall. During adequate conditions, plants were observed to occur in large quantities (c.a. 2000 plants recorded at each waypoint). The number of plants that actually occur across the Winu Project area is considered to be significantly greater than the current data indicates.

Based on traverse work conducted in continuous habitat in Texas South, *Cynodon anisocarpus* has been estimated to occur at a rate of approximately 4,000 plants per ha. Further survey is required to gain more accurate estimates within relevant parts of the Project and in regional areas of similar land system and habitat. This Targeted survey needs to be conducted in appropriate seasonal conditions following good rainfall events.

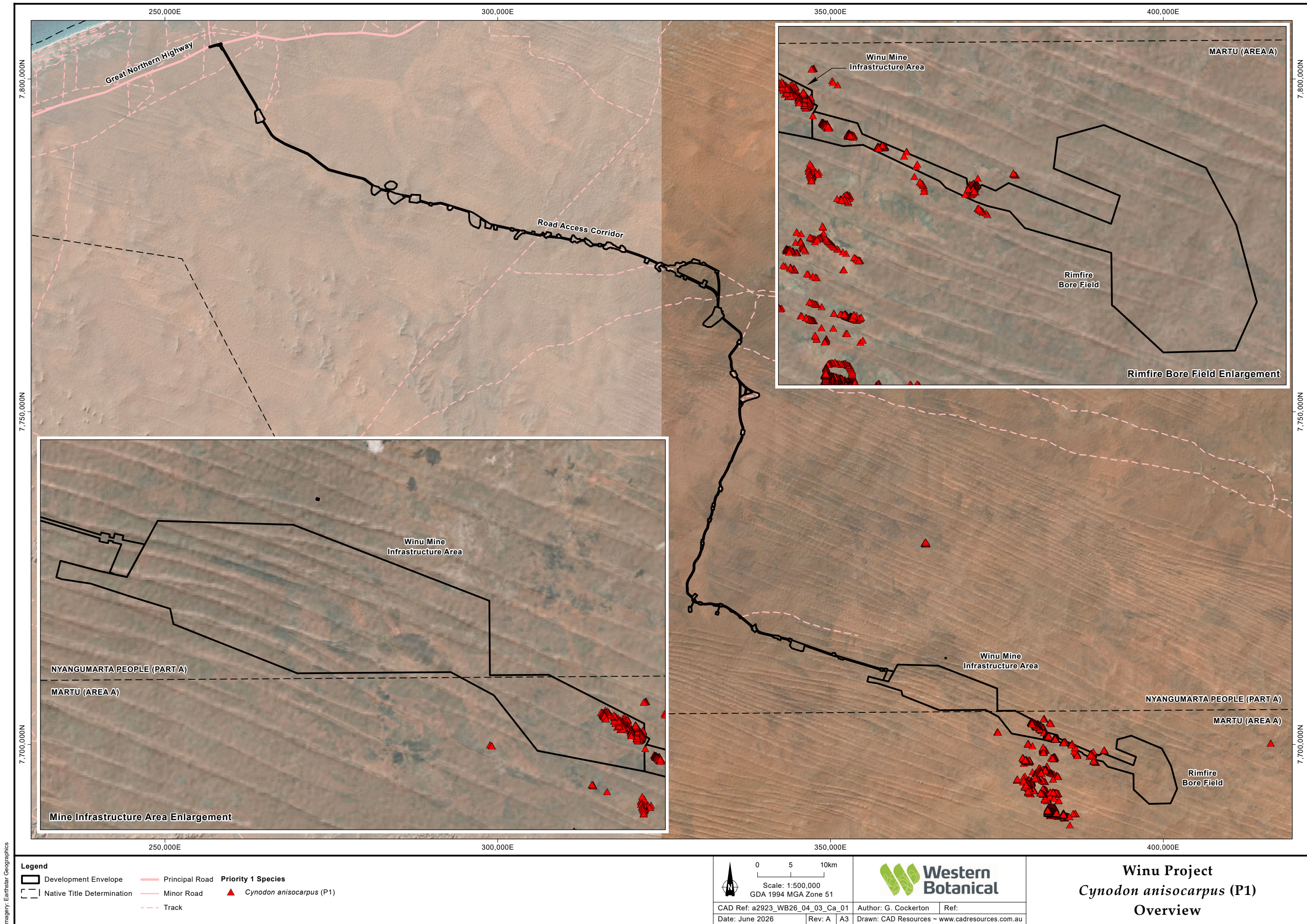




**Plate 2. *Cynodon anisocarpus* (P1) habitat as encountered on the Winu Project**

**Figure 14. *Cynodon anisocarpus* (P1) Distribution Across the Winu Project**







***Goodenia hartiana* (Priority 2)**

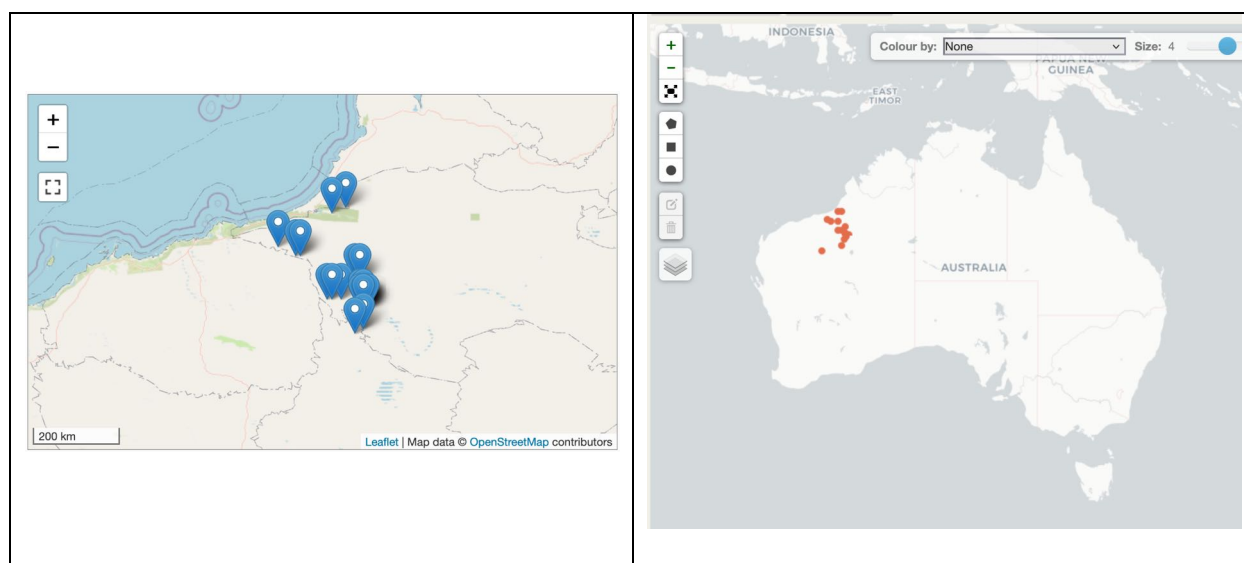
*Goodenia hartiana* (P2) is an erect to spreading, multi-stemmed perennial, herb or shrub (sub-shrub) with blue/purple flowers, growing to a height of 0.5-0.8 m (WA Herbarium 1998-2026) (Plate 3). It grows on red interdunal sandplains, occurring from south of Telfer to Eighty Mile Beach (Figure 15).



**Plate 3. *Goodenia hartiana* (Priority 2) flower**

*Goodenia hartiana* (P2) is endemic to Western Australia, known by the Western Australian Herbarium from 27 records (WA Herbarium 1998-2026) representing 16 populations, and 34 records on AVH (Australasian Virtual Herbarium 2026) representing 19 populations, Figure 15.

It is common across the Winu Project, occurring within the various interdunal sandplain Vegetation Associations. In many cases, it was observed as an early and prolific post-disturbance colonizer. Excavation of plants during a recent survey (March 2024), have confirmed previous theories that *Goodenia hartiana* (P2) is clonal. Plants appear to be connected by underground rhizomes, which eventually break down, forming new individuals (Plate 4).



**Figure 15. Current *Goodenia hartiana* (P2) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**



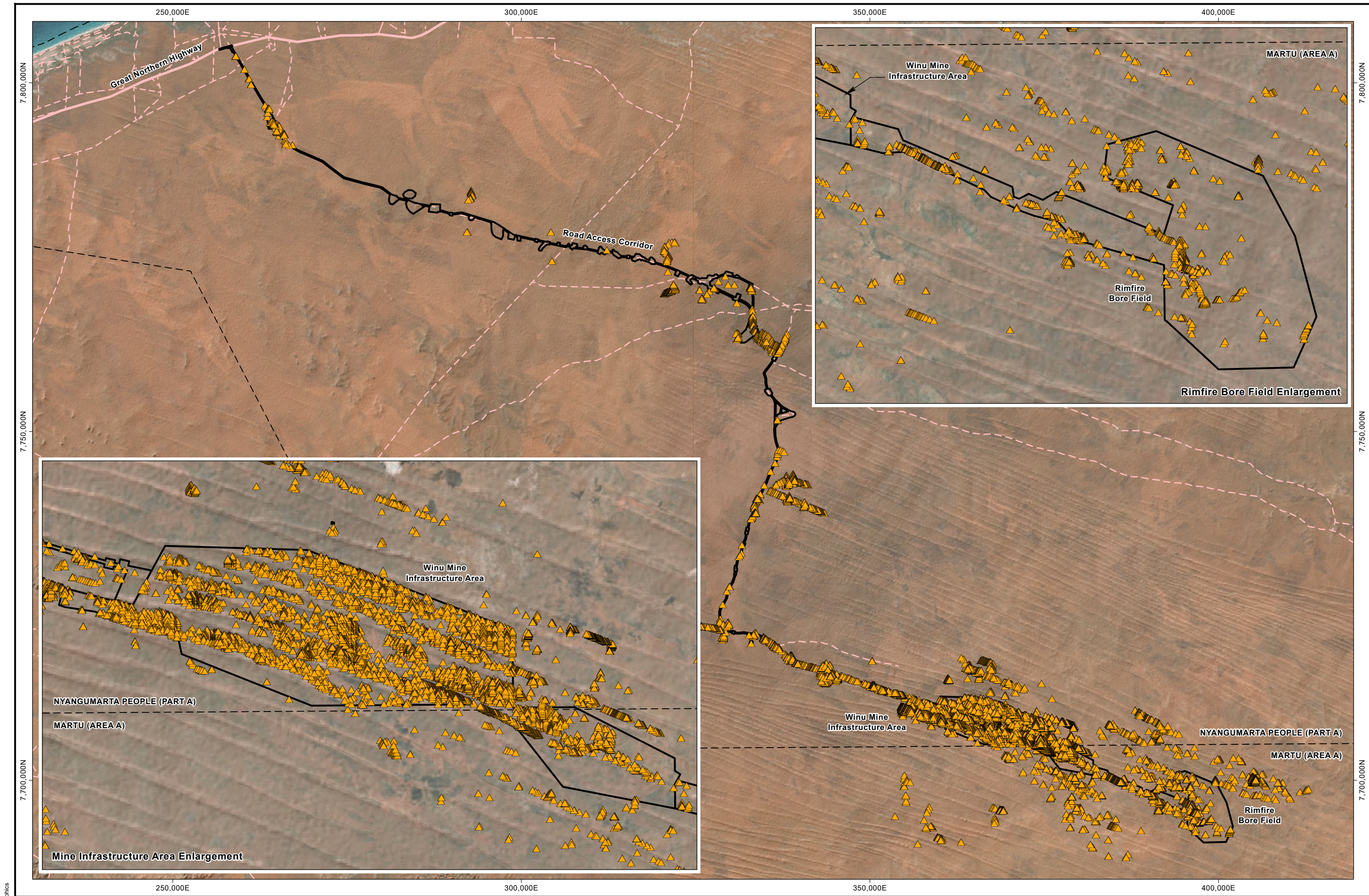
**Plate 4. *Goodenia hartiana* (P2) (left) excavation revealing connective rhizomes and (right) example of prolific post-fire recruitment**

A total of 887,982 *Goodenia hartiana* (P2) plants have been recorded in botanical assessments across the Winu Project, including 552,280 plants (62.2% of plants) in 43 populations (22.6% of populations) inside the current Development Envelope and 335,702 plants (37.81% of plants) outside the DE in 147 populations (77.4% of populations), Figure 16.

Considering the extensive *Goodenia hartiana* (P2) numbers recorded across the Winu Project, and given the generally uniform nature of the Great Sandy Desert bioregion and the distribution of historical records, it is most likely this taxon is a regionally-common but under-surveyed species. Additional regional surveys for *Goodenia hartiana* (P2), are likely to provide a solid basis for revision of the Conservation significance of this species.

**Figure 16. *Goodenia hartiana* (P2) Distribution Across the Winu Project.**





Imagery: Earthstar Geographics

**Legend**  
Development Envelope  
Native Title Determination

Principal Road  
  
Minor Road  
  
Track

**Priority 2 Species**  
  
*Goodenia hartiana* (P2)

0 5 10km  
Scale: 1:500,000  
GDA 1994 MGA Zone 51

CAD Ref: a2923\_WB26\_04\_03\_Gh\_01  
Date: June 2026

Rev: A A3

**Western Botanical**

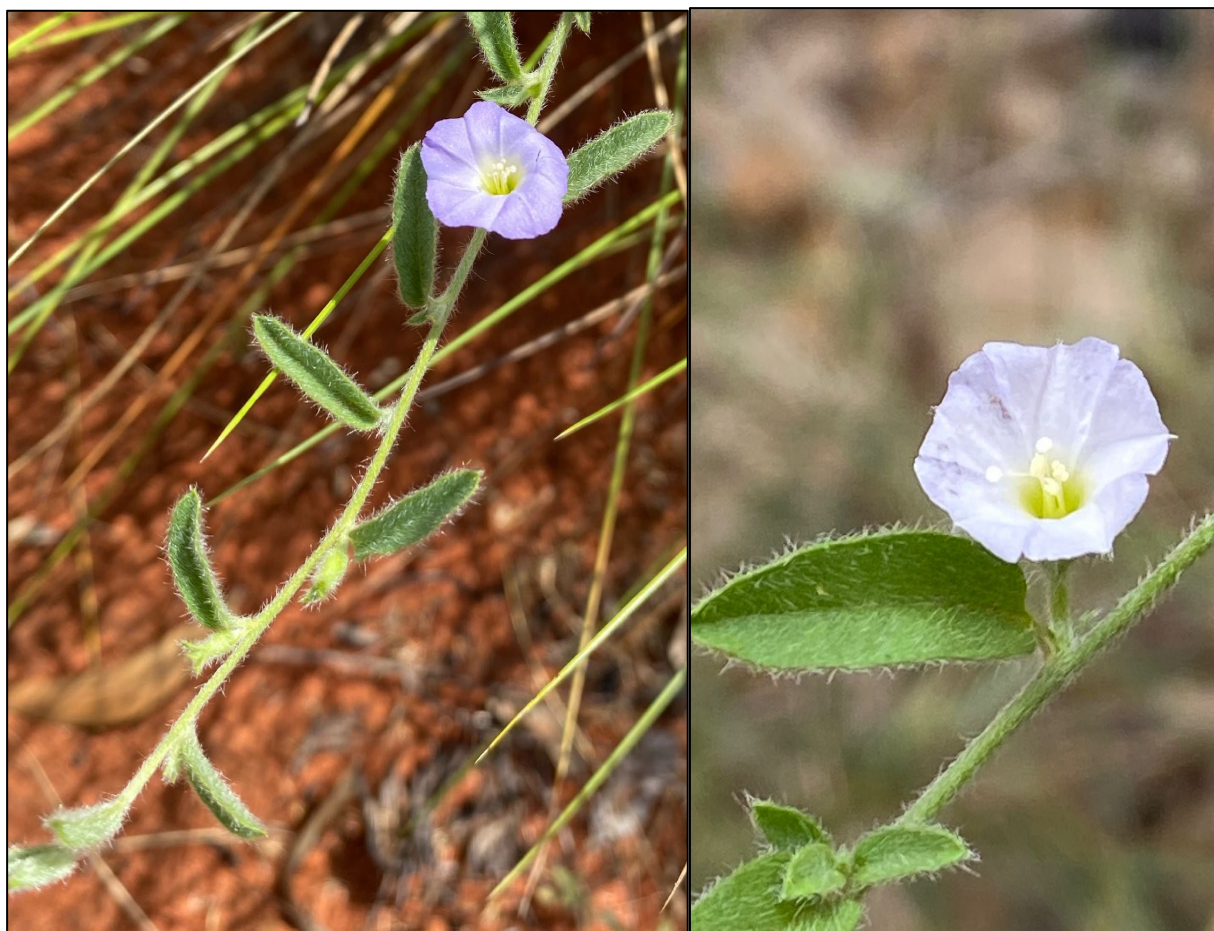
Author: G. Cockerton Ref:  
Drawn: CAD Resources ~ [www.cadresources.com.au](http://www.cadresources.com.au)

**Winu Project**  
*Goodenia hartiana* (P2)  
**Overview**



***Bonamia oblongifolia* (P3)**

*Bonamia oblongifolia* (P3) is an herbaceous perennial with blue flowers, and hairy stems arising from a woody base (Plate 5). The leaves are shortly petiolate (1–2 mm) or sessile (with indistinct petioles), with oblong blades that are densely sericeous or villous with rust-coloured hairs (DBCA 2018). It is similar to other *Bonamia* species in the region, and is differentiated primarily by leaf shape.



**Plate 5. *Bonamia oblongifolia* (P3) detail of flowers and petiolate leaves**

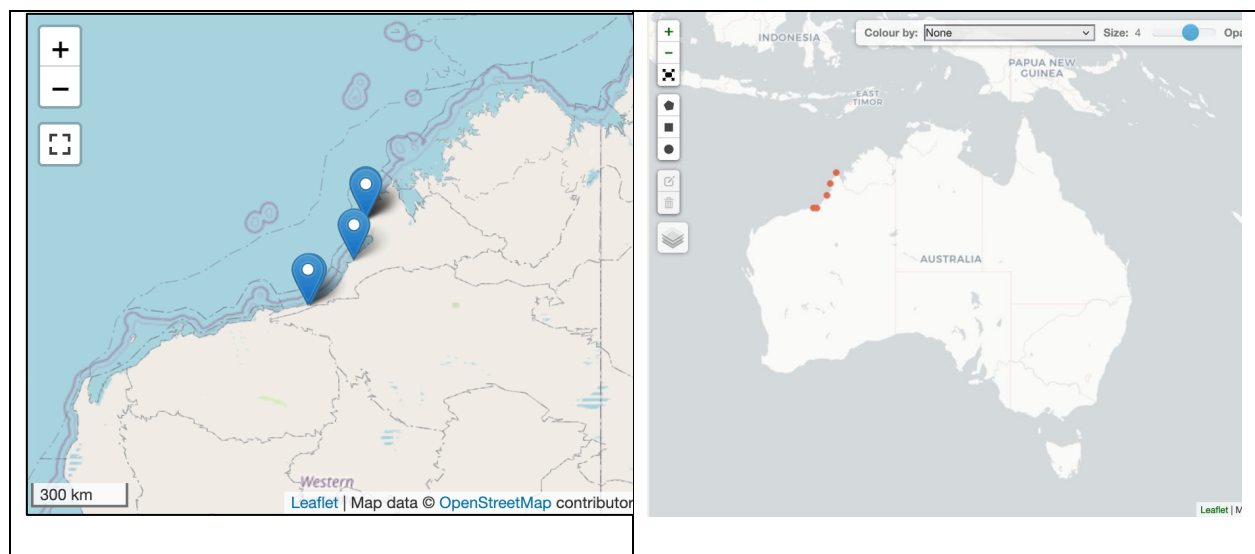
*Bonamia oblongifolia* (P3) is endemic to Western Australia, known by the Western Australian Herbarium from seven vouchered records (WA Herbarium 1998-2024) from five populations, and 10 records by the Australasian Virtual Herbarium (AVH 2023) from six populations (Figure 17). It has a predominantly coastal distribution, occurring intermittently from Broome to Pardoo (WA Herbarium 1998-2024) or north of Dampier Peninsular to Port Hedland within the Dampierland IBRA region (AVH 2024).

A total of 1,266 individuals have been recorded to June 2026, with three plants (0.2% of plants) occurring in two populations (28.6% of populations) inside the DE and 1,263 plants (99.8% of plants) in five populations (71.4% of populations) outside the DE, Figure 18. Most of these plants were encountered during the reconnaissance survey of the potential Wallal Bore Field. Additional



records of the species obtained in surveys for the AREH project, are not included in the census numbers reported above.

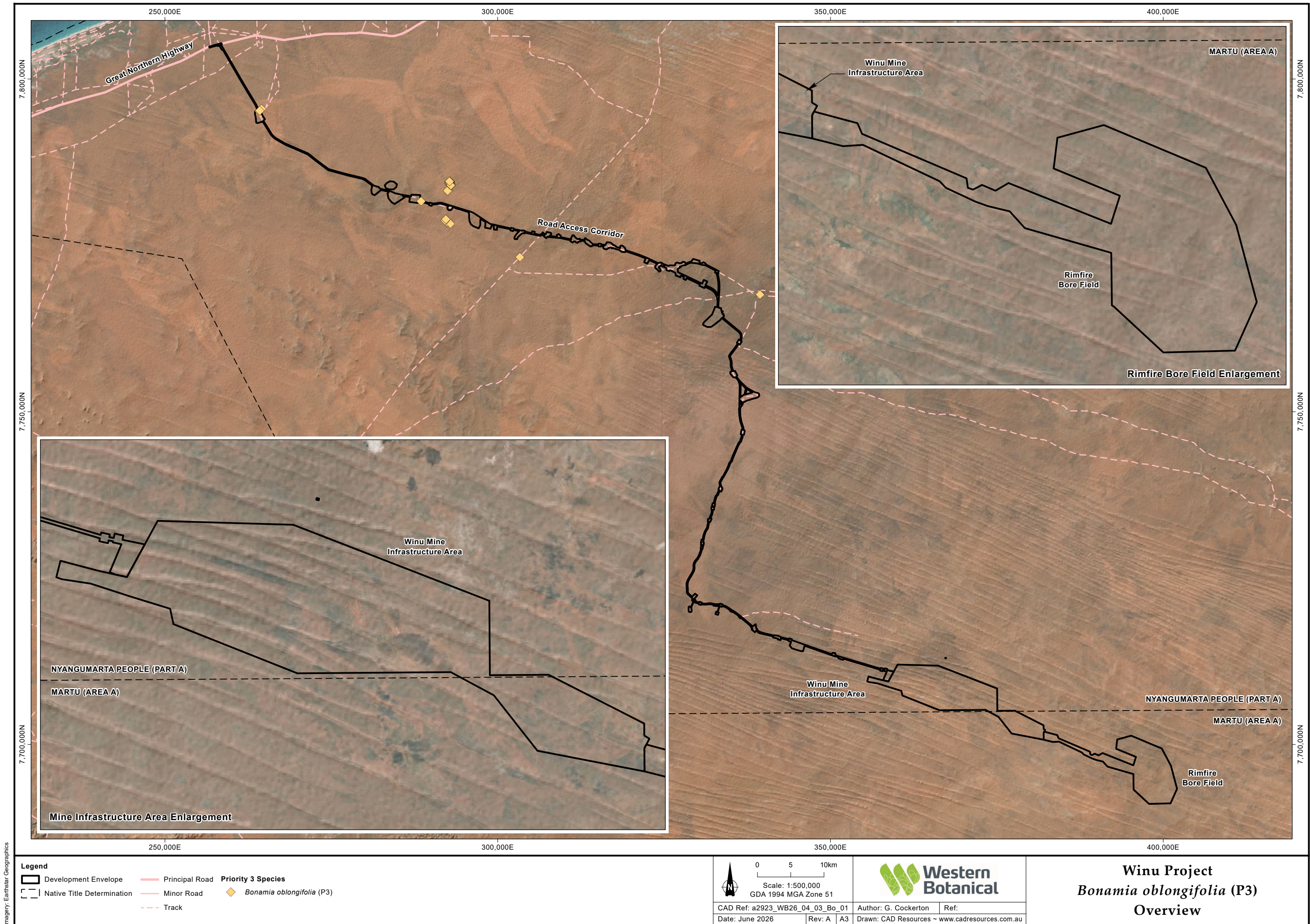
Other populations of *Bonamia oblongifolia* have been identified on Mandora Station, approximately 20 km northeast of the northern extent of Section 1 of the RAC (Biota 2021). Further populations have also been recorded on Pardoo Station, 120 km west of the Section 1 by EnviroWorks Consulting (2017a), and on Anna Plains Station, ~200 km northeast of Section 1 (EnviroWorks 2017b). The combined populations at Wallal Downs, Pardoo and Anna Plains were estimated at over 1,200,000 plants (EnviroWorks 2017a). Considered together, these records demonstrate that the species is relatively widespread and not uncommon in suitable habitat.



**Figure 17. Current *Bonamia oblongifolia* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

**Figure 18. *Bonamia oblongifolia* (P3) Distribution Across the Winu Project.**







### ***Comesperma sabulosum* (Priority 3)**

*Comesperma sabulosum* (P3) is a member of the Polygalaceae family. It is an erect shrub to 2m tall, with small leaves and glaucous young fruits (Plate 6). It is associated with sand dune slopes, occurring from Newman, across the Great Sandy Desert and Little Sandy Desert; the Northern Territory, and one record in northern Qld (Figure 19). *Comesperma sabulosum* (P3) is currently known from 18 vouchered records within the Western Australian Herbarium (WA Herbarium 1998-2024); and 42 records on AVH (Australasian Virtual Herbarium, 2024). It is known from in 19 populations within WA, 16 populations in the NT and one in Qld.

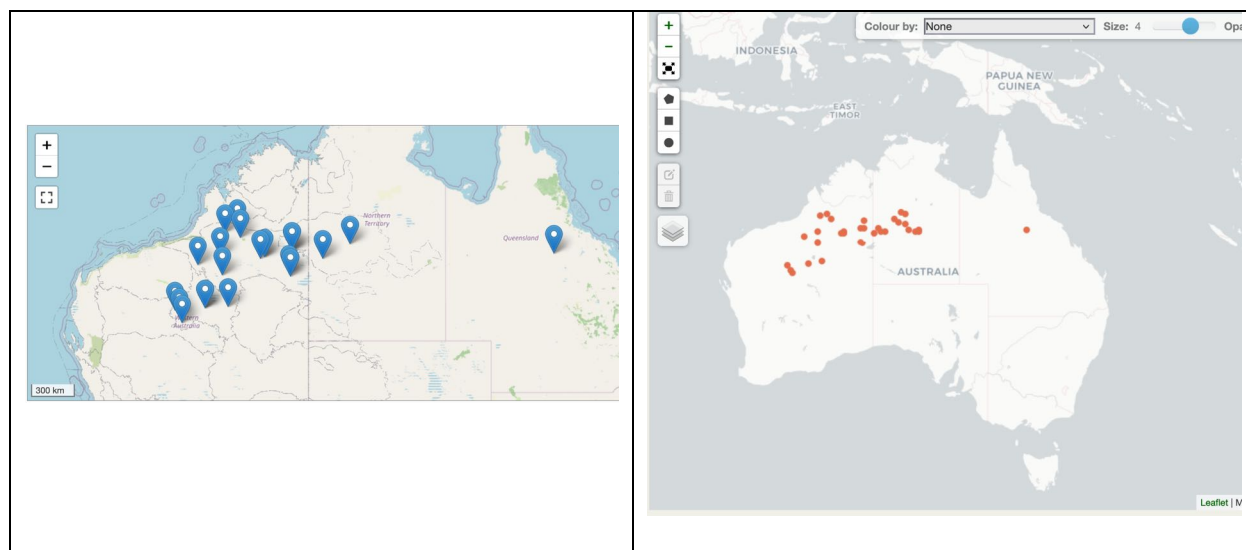
A total of 271 *Comesperma sabulosum* (P3) have been recorded across the Winu Project to June 2026, including 51 plants (18.8%) inside the DE in 3 populations (11.1% of populations), and 220 plants (81.2% of plants) in 24 populations (88.9% of populations) outside the DE, Figure 20.

*Comesperma sabulosum* (P3) is primarily associated with the D1 – *Corymbia chippendalei* Low Open Woodland over *Triodia schinzii*, and D2 – *Owenia reticulata* Scattered Low Trees over *Triodia schinzii* Vegetation Associations.



**Plate 6 *Comesperma sabulosum* (P3) shrub and flower**

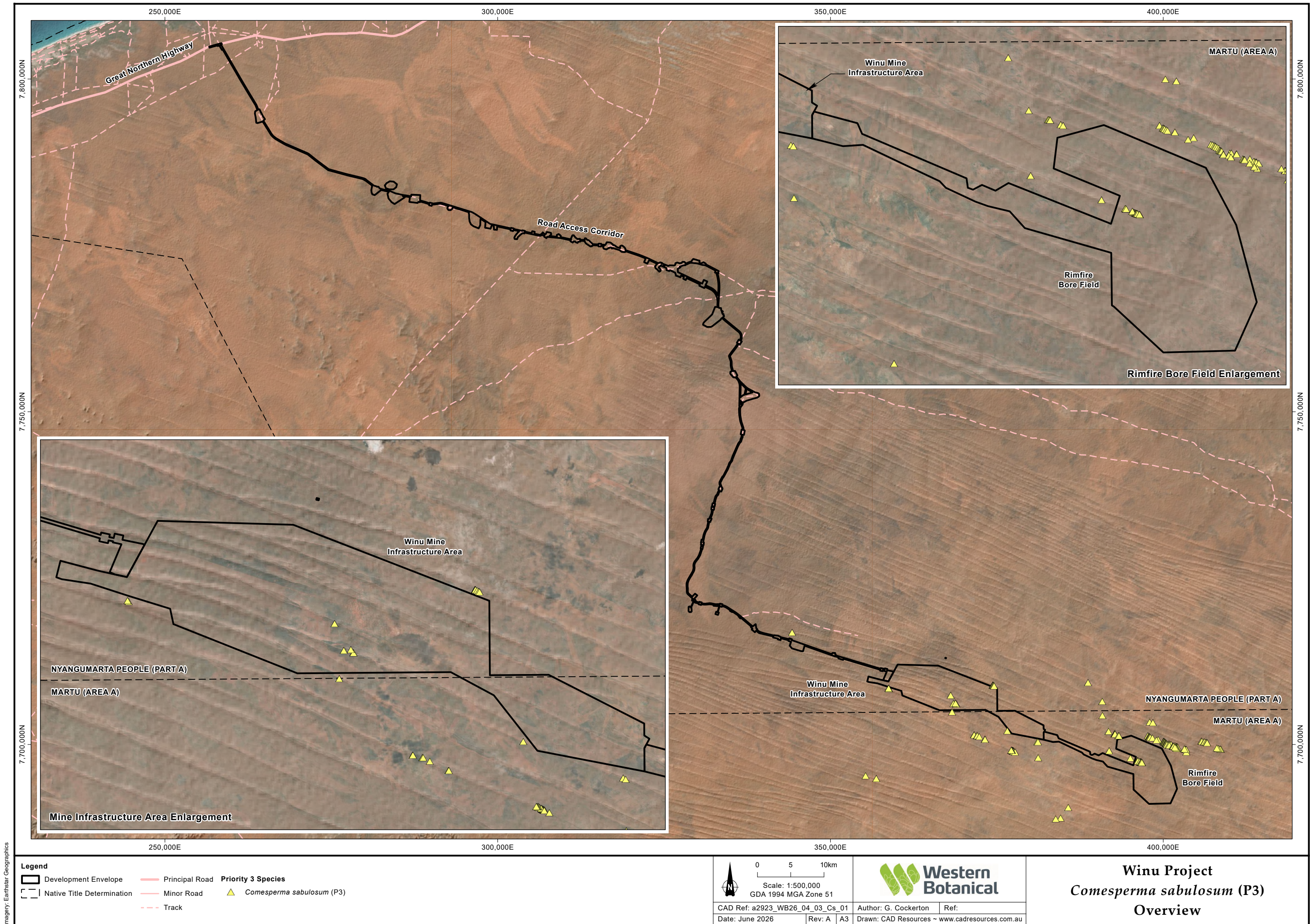




**Figure 19. Current *Comesperma sabulosum* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

**Figure 20. *Comesperma sabulosum* (P3) Distribution across the Winu Project Area**







### ***Corynotheca asperata* (Priority 3)**

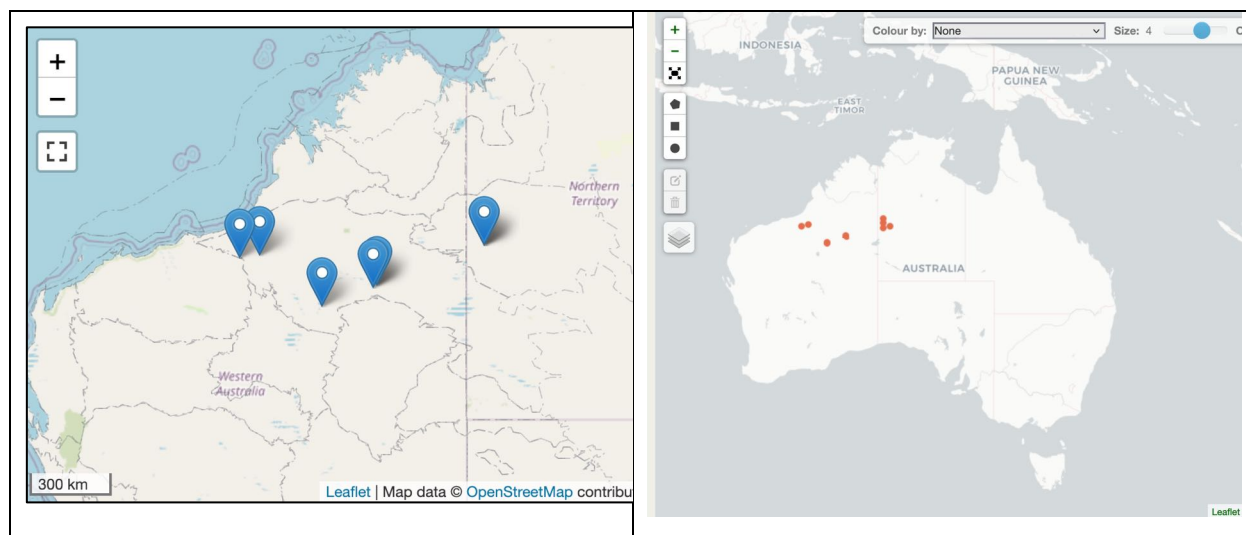
*Corynotheca asperata* (P3) is a rhizomatous, divaricately branched perennial herb with green-white flowers, growing to 0.6 m high (WA Herbarium 1998-2024) (Plate 7). It occurs on red sand dunes, in several disjunct locations across the Great Sandy Desert from Marble Bar, Western Australia to Tanami in the Northern Territory (Figure 21). *Corynotheca asperata* (P3) is known from five vouchered records within the Western Australian Herbarium (WA Herbarium 1998-2024); and 17 records on AVH (Australasia Virtual Herbarium, 2024).

Throughout the Winu Project, *Corynotheca asperata* (P3) has typically been recorded on mid to lower slopes of sand dunes comprising the D1 – *Corymbia chippendalei* Low Open Woodland over *Triodia schinzii*; and the D2 – *Owenia reticulata* Scattered Low Trees over *Triodia schinzii* Vegetation Associations. A total of 8,516 *Corynotheca asperata* (P3) have been recorded to June 2026, with 2,554 plants (29.99% of plants) recorded inside the current DE in 19 populations (26.8% of populations) and 5,962 plants (70.01% of plants) recorded outside the DE in 52 populations (73.2% of populations), Figure 22.



**Plate 7 *Corynotheca asperata* (P3) plant and flower**

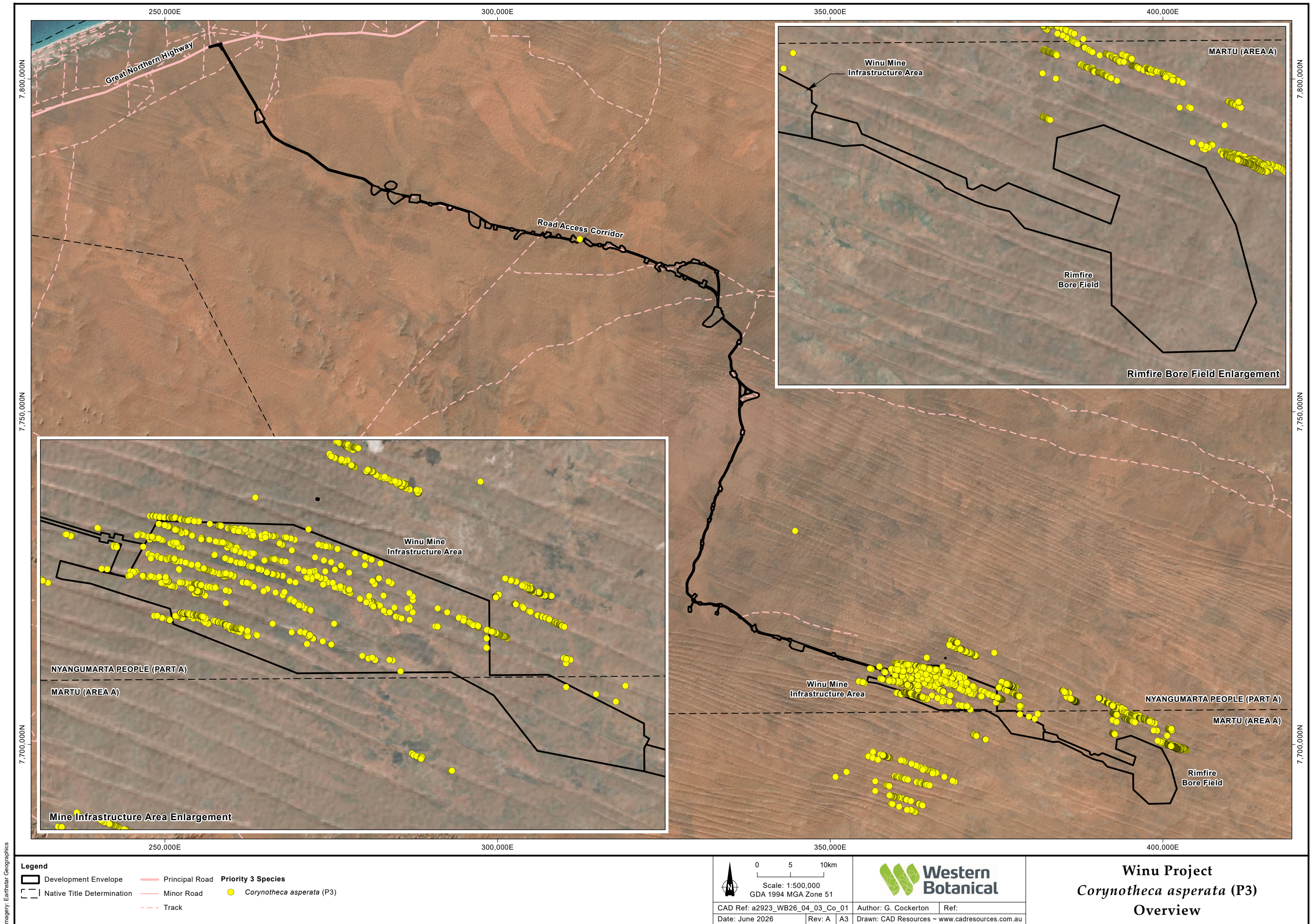




**Figure 21. Current *Corynotheca asperata* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

**Figure 22. *Corynotheca asperata* (P3) Distribution across the Winu Project Area**







***Dasymalla chorisepala* (P3)**

*Dasymalla chorisepala* (P3), a member of the Lamiaceae family, is a low shrub growing to 1m tall, with white flowers (Plate 8). It occurs on red sand, extending across the northwest region of the Great Sandy Desert Bioregion, and possibly into the Dampierland bioregion.

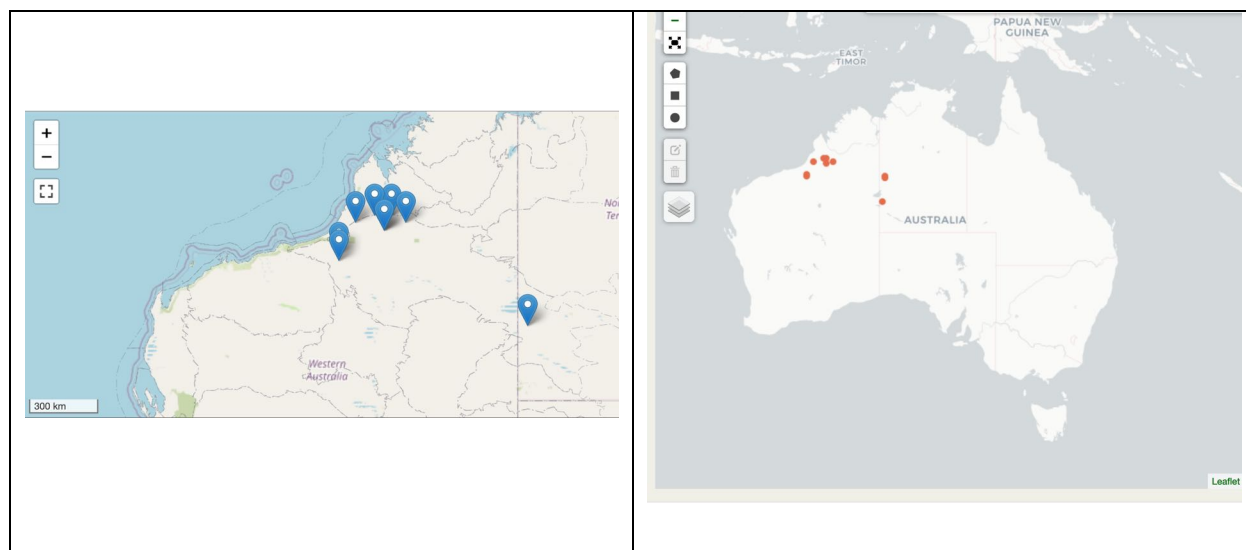
*Dasymalla chorisepala* (P3) is known from eight vouchered records from seven populations in the Western Australian Herbarium (WA Herbarium 1998-2026) and 19 records by the Australasian Virtual Herbarium, including nine records from three populations known from the western Northern Territory (AVH 2026) (Figure 23).

Three hundred and seventy-seven *Dasymalla chorisepala* (P3) plants have been recorded across the Project to June 2026 with 118 plants (31.30% of plants) within the DE in five populations (50% of populations) and 259 plants (68.70% of plants) outside the DE in five populations (50% of populations), Figure 24. These records predominantly occur towards the western end of the MIA, within the P1 – *Acacia platycarpa* (*Acacia tumida* var. *kulparn*) Open Shrubland over *Triodia schinzii* Vegetation Association; and midway along Section 3 of the RAC, within the P2 – *Acacia ancistrocarpa* Tall Shrubland over *Triodia schinzii* Vegetation Association.



**Plate 8.** *Dasymalla chorisepala* (P3) flower and plant

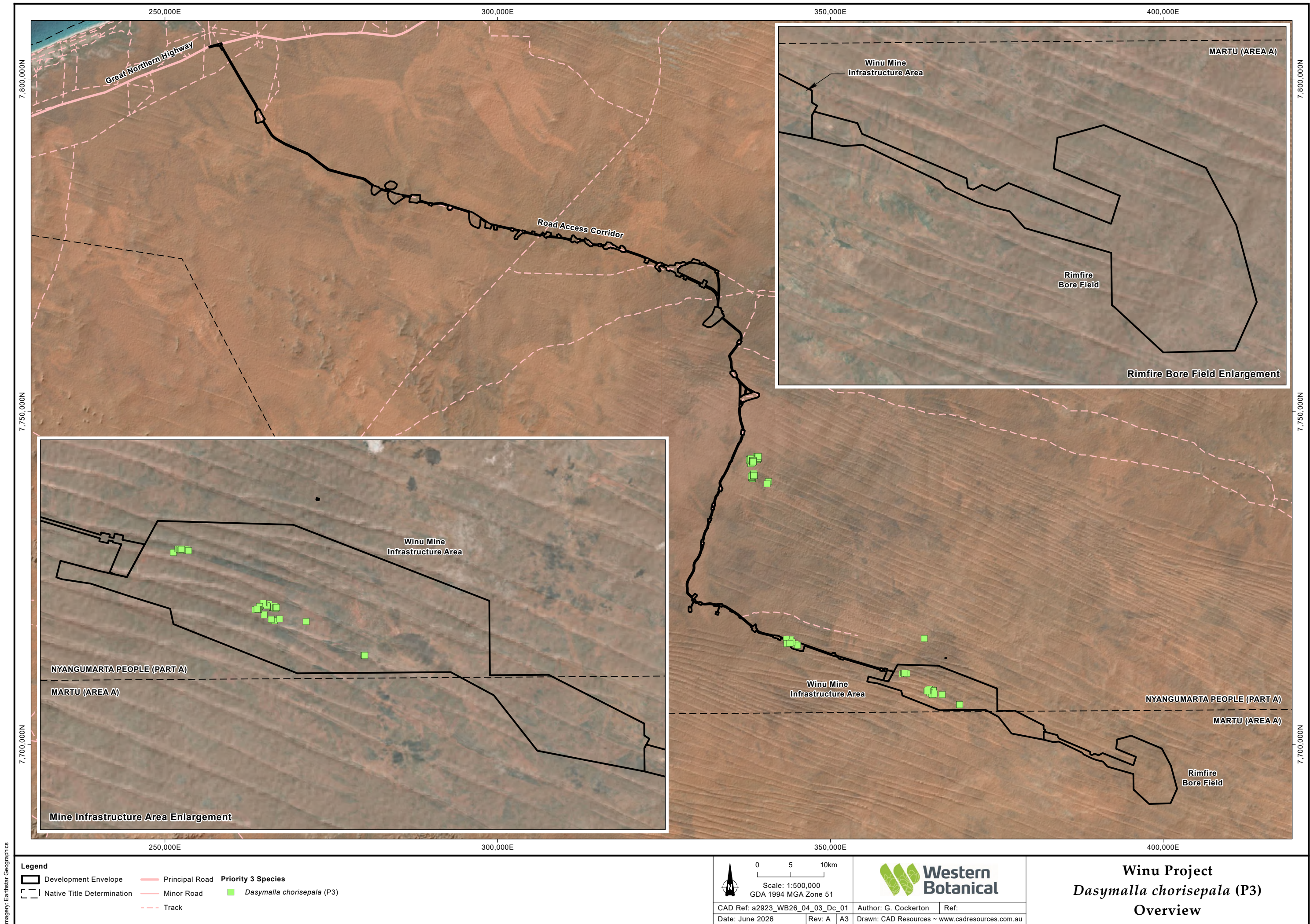




**Figure 23. Current *Dasymalla chorisepala* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

**Figure 24. *Dasymalla chorisepala* (P3) Distribution across the Winu Project Area**







***Eragrostis lanicaulis* (Priority 3)**

*Eragrostis lanicaulis* is wiry erect or decumbent perennial grass, growing 40 to 50 cm high (Simon and Alfonso, 2011), (Plate 9). The culms are five to seven noded, with the mid-culm internodes pubescent, hispid or woolly, and the mid-culm nodes either glabrous or pubescent. The leaf sheaths are glabrous and the ligule has a fringe of hairs 0.5 mm long. The leaf blades are straight, and either flat, involute or convolute. The leaf blade surface can have a scabrous or glabrous surface, measuring 2 to 7 cm long and 1 to 2 mm wide. The compound inflorescence is a linear and loose panicle, measuring 8 to 15 cm long and 1 to 2 cm wide. The linear and terete spikelets are sessile or pedicelled, measuring 8 to 46 mm long, and are comprised of 17 to 94 fertile florets. Distinguishing characters of *Eragrostis lanicaulis* include: bulbous or knotty root base; biconvex or terete spikelets, with numerous tightly imbricate florets; 3-toothed palea with relatively short keels.

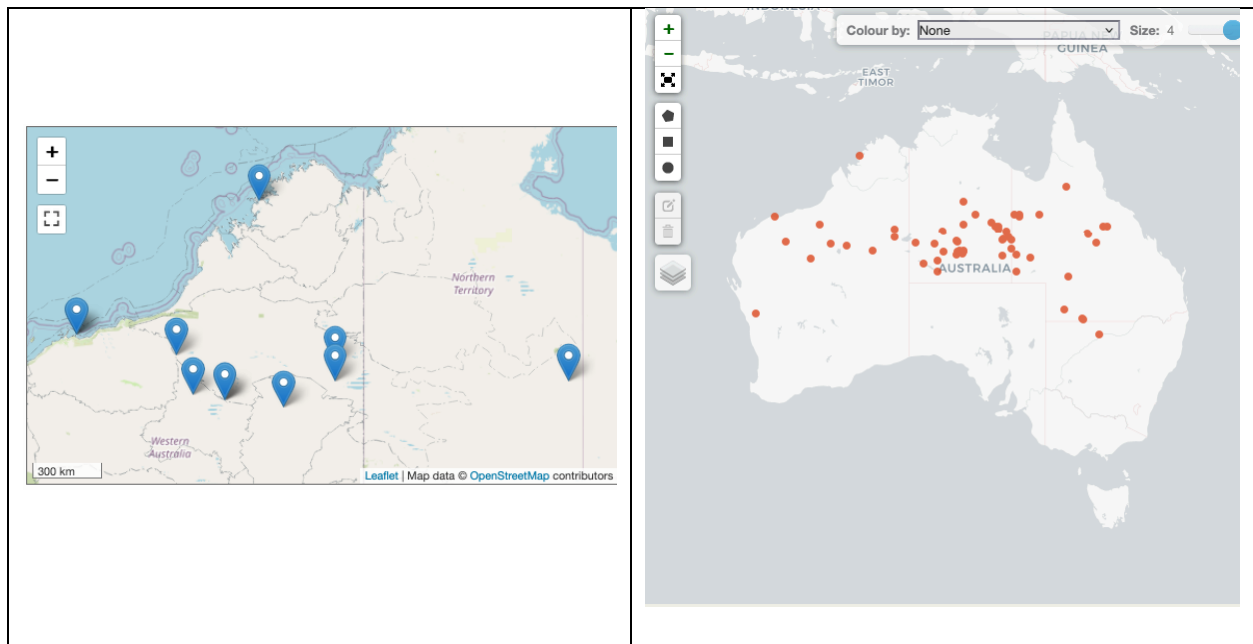


**Plate 9. *Eragrostis lanicaulis* showing the characteristic knotty woolly nodes, Western Australia Herbarium (WA Herbarium 1998-2026)**

*Eragrostis lanicaulis* grows on red or red-brown, sometimes lateritic, loams, clays and sands in flood outs, drainage channels, broad shallow depressions, on sand dunes, and limestone rises. It is currently recognised from 14 records at 11 populations within Western Australia across the Gibson Desert, Great Sandy Desert, Little Sandy Desert and Pilbara IBRA regions. It is more



widespread within Australia, with 83 records recognised by AVH (2025), most of which occur in the Northern Territory, with some records in Queensland and northern New South Wales (Figure 25).



**Figure 25. Current *Eragrostis lanicaulis* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

*Eragrostis lanicaulis* has been recorded at one location, 8.3 km south of the Rimfire Borefield. It is not known within the Winu DE, Figure 26. The species is acknowledged as being difficult to identify and is easily overlooked.

**Figure 26. Distribution of *Eragrostis lanicaulis* nearby the Winu Development Envelope**







### *Indigofera ammobia* (Priority 3)

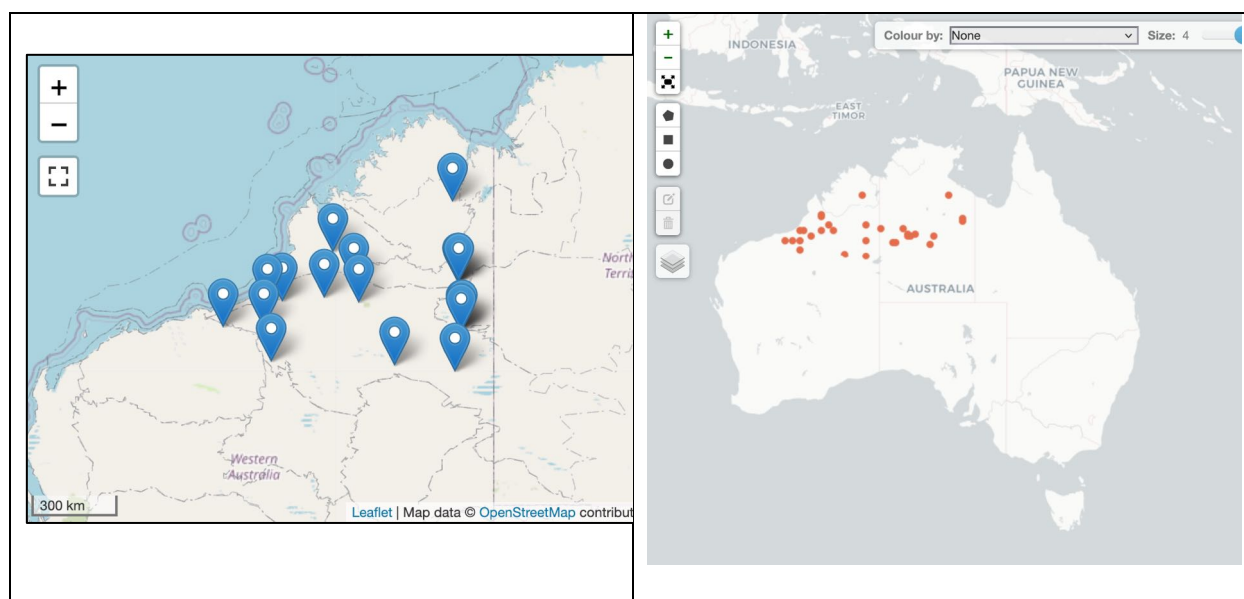
*Indigofera ammobia* (P3) is a member of the Fabaceae family. It is a many-stemmed shrub with green and purple flowers, growing to 0.5 m high (WA Herbarium 1998-2026) (Plate 10). It occurs in the north of Western Australia, distributed throughout the Great Sandy Desert (Figure 27). It is associated with red sand dunes. It is known from 18 vouchered records in the Western Australia Herbarium (WA Herbarium 1998-2026) and 46 records within the Australasian Virtual Herbarium (AVH 2024), 17 of which are in W.A.

A total of 37,875 *Indigofera ammobia* (P3) have been recorded across the Winu Project to June 2026. This includes 18,658 plants (49.26% of plants) recorded within the DE in 23 populations (27.7% of populations) and 19,217 plants (50.74% of plants) outside the DE in 60 populations (72.3% of populations), Figure 28.

This taxon is associated with sand dune slopes, occurring within the D1 – *Corymbia chippendalei* Low Open Woodland over *Triodia schinzii*; and the D2 – *Owenia reticulata* Scattered Low Trees over *Triodia schinzii* Vegetation Associations.



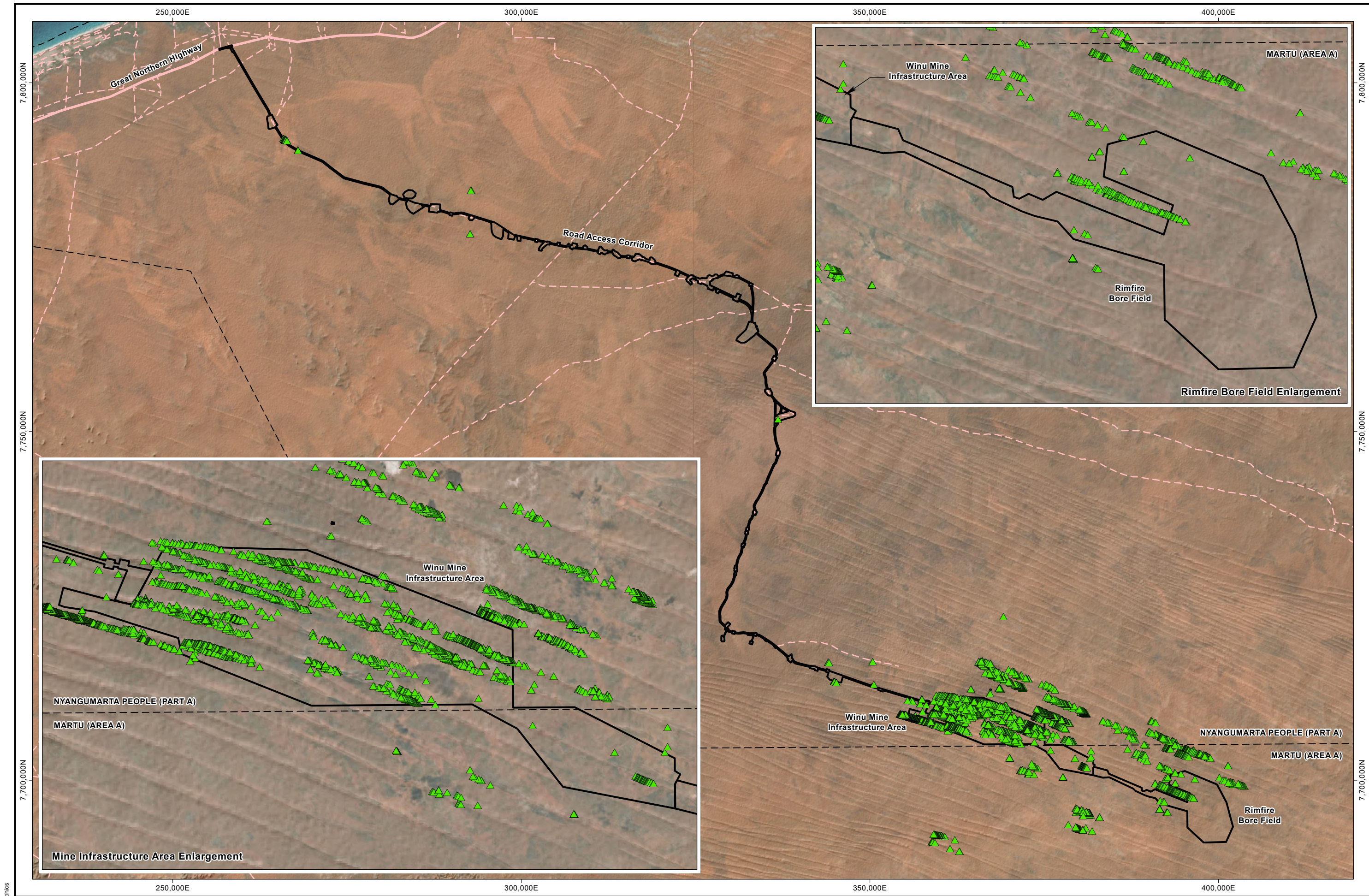
Plate 10. *Indigofera ammobia* (P3) plant, seed pod and flower



**Figure 27. Current *Indigofera ammobia* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

**Figure 28 *Indigofera ammobia* (P3) Distribution across the Winu Project Area**





|                                                                                                     |  |                                                                  |                                                                                     |                                                                                              |                                           |                                                                                    |                                                                   |                                                                                        |
|-----------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Legend</b><br><div> <div>Development Envelope</div> <div>Native Title Determination</div> </div> |  | <div>Principal Road</div> <div>Minor Road</div> <div>Track</div> | <b>Priority 3 Species</b><br><div> <div><i>Indigofera ammobia</i> (P3)</div> </div> | <div> <div>0 5 10km</div> <div>Scale: 1:500,000</div> <div>GDA 1994 MGA Zone 51</div> </div> | <div> <div>Western Botanical</div> </div> | <div> <div>CAD Ref: a2923_WB26_04_03_la_01</div> <div>Date: June 2026</div> </div> | <div> <div>Author: G. Cockerton</div> <div>Rev: A A3</div> </div> | <div> <div>Ref:</div> <div>Drawn: CAD Resources ~ www.cadresources.com.au</div> </div> |
|-----------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------|

Winu Project  
*Indigofera ammobia* (P3)  
 Overview



***Polymeria* sp. Broome (K.F. Kenneally 9759) (Priority 3)**

*Polymeria* sp. Broome (K.F. Kenneally 9759) (P3) is phrase name taxon raised by R.W. Johnson (Markey *et. al.* 2018). It is a member of the Convolvulaceae family. It is a perennial herb or subshrub with both erect stems 10-15 cm and long, trailing, prostrate stems 30-50 cm long. Flowers have a pale pink corolla 2 cm long, with a style divided into 2-3 stigmatic lobes. Seeds are black and shortly hirsute (Plate 11).

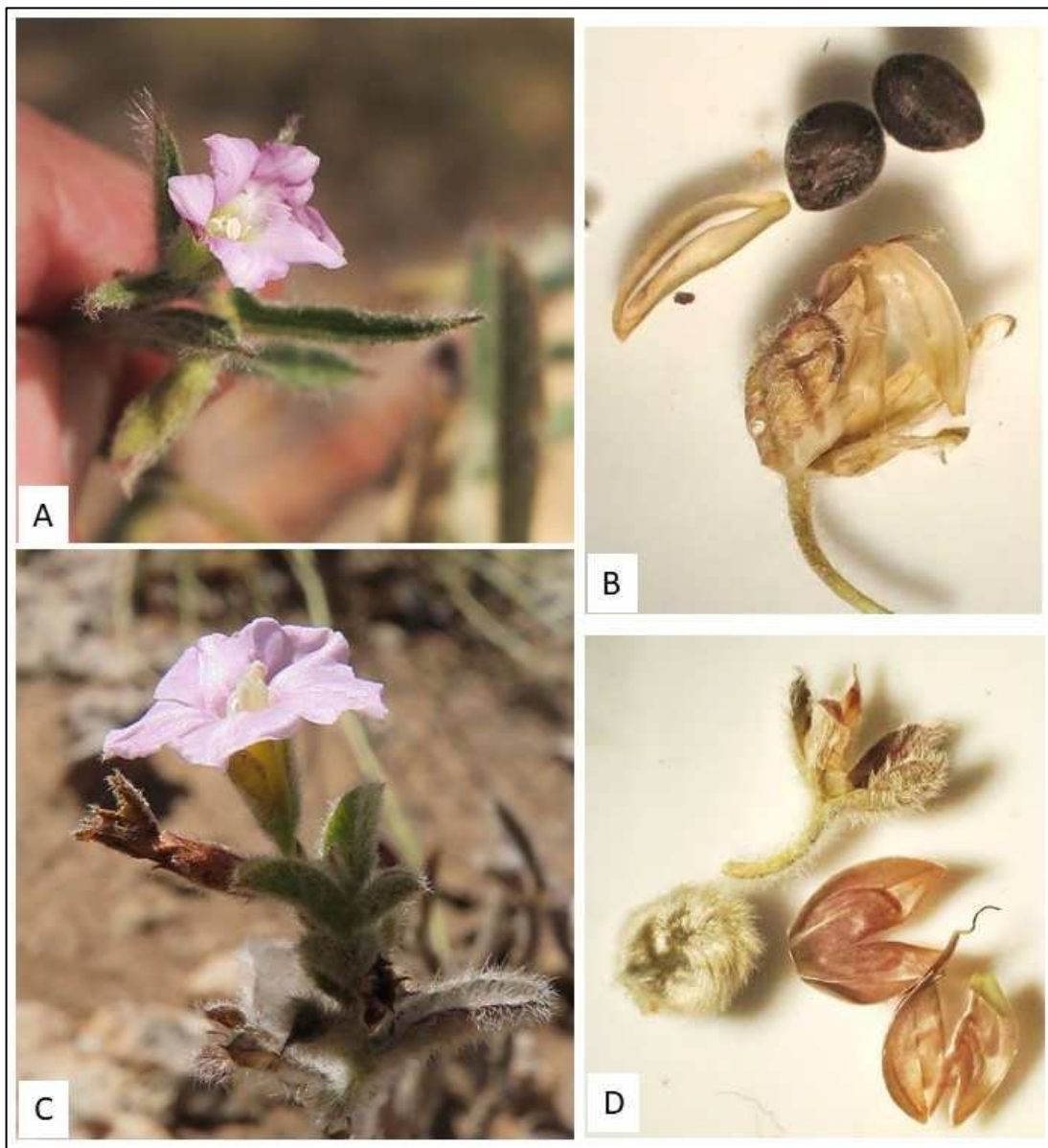
*Polymeria* sp. Broome (K.F. Kenneally 9759) is endemic to Western Australia known from 15 vouchered records within Western Australia (WA Herbarium 1998-2026; Australasia Virtual Herbarium 2026) from 16 populations. Its current range extends coastally from east of Wallal Downs, to Dampier Peninsular (Figure 29). It occurs on deep red soils on pindan sandplains, in a range of typical pindan vegetation communities that include sparse open *Corymbia* woodlands over *Acacia* and *Triodia* / *Chrysopogon* grasslands and *A. monticola* / *A. eriopoda* shrublands.

Markey *et. al.* (2018) state that *Polymeria* sp. Broome (K.F. Kenneally 9759) can be confused with *P. ambigua*, however, *P. ambigua* tends to occur more on gravelly substrates than sand. It appears that *Polymeria* sp. Broome (K.F. Kenneally 9759) replaces *P. ambigua* in the La Grange and Broome region. *Polymeria ambigua* can be distinguished from *Polymeria* sp. Broome (K.F. Kenneally 9759) by broader sepals, narrower leaves with acute apices, styles with several lobes that are not exerted beyond the anthers, and seed that are densely tomentose with long, white hairs (Plate 11).

This information was not known to Western Botanical at the time of the survey in 2024 and not all individuals encountered were sampled/inspected. The specimens that were collected had insufficient flowering material to enable definitive identification using the resources of the Western Australian Reference Herbarium. Considering habitat information discussed in Markey *et. al.* (2018), the entities that have been recorded are more than likely *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3).

A total of 73 *Polymeria* sp. Broome (K.F. Kenneally 9759) have been recorded across the Winu Project in five populations to June 2026, predominantly around the western section of the RAC and all outside the current Development Envelope, Figure 30. *Polymeria* sp. Broome (K.F. Kenneally 9759) was also recorded in quadrat WIN036 adjacent to the RAC, however, the specimen was not fully identified until after the field works were completed and prior to confirmation of this as a Priority species, and no number of individuals was attributed at that time.

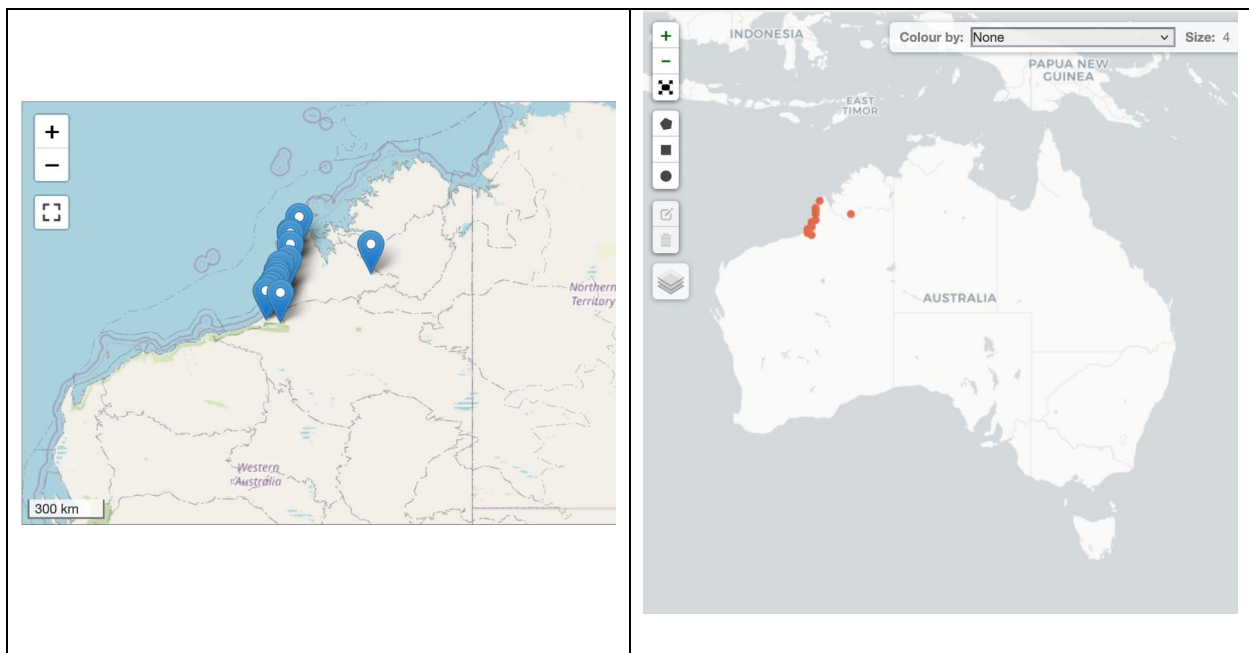
This taxon has likely been recorded in greater quantities in surveys of the AREH project area given suitable habitat being present. Anecdotal evidence suggests it could occur slightly further east of its current distribution. Further work is required to ascertain whether these eastern plants represent *Polymeria* sp. Broome (K.F. Kenneally 9759) *sens strict* (P3). This would be focused around the RAC as *Polymeria* sp. Broome (K.F. Kenneally 9759) has not been reported, nor is it expected to occur, as far south as the MIA, due to habitat preferences.



**Plate 11. *Polymeria* sp. Broome (K.F. Kenneally 9759)**

A: Showing flower with two fine style lobes exserted beyond the anthers, B: fruit and seed of *Polymeria* sp. Broome (K.F. Kenneally 9759) showing the black, shortly hirsute seeds C: Flower of *Polymeria ambigua* showing anthers concealing style lobes, D: fruit and seed of *Polymeria ambigua* showing the densely tomentose seed with long, white hairs (Markey *et. al.* 2018).

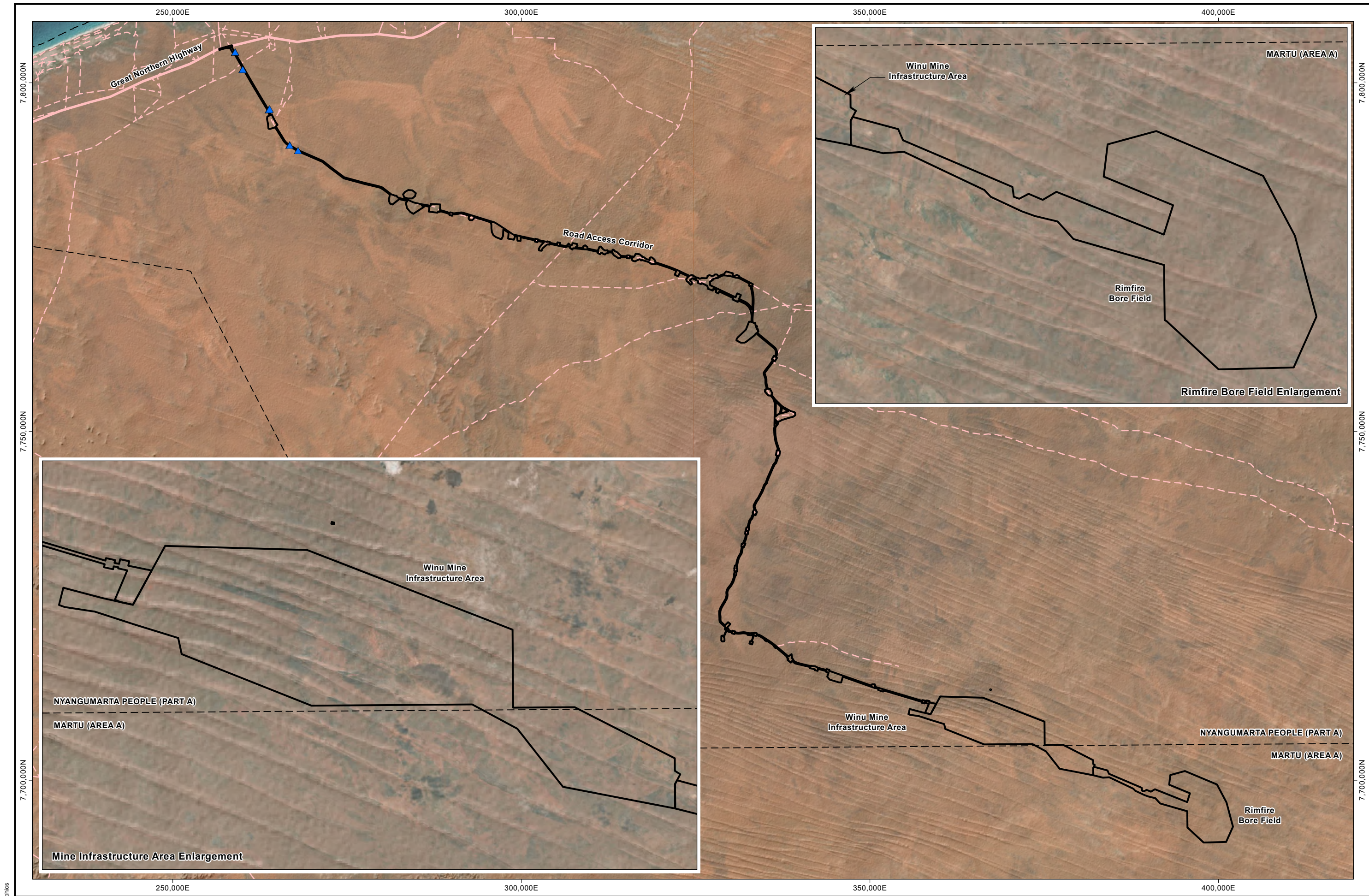




**Figure 29. Current *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**

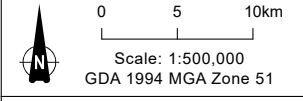
**Figure 30 *Polymeria* sp. Broome (K.F. Kenneally 9759) Distribution across the Winu Project Area**





Imagery: Earthstar Geographics

- Legend**
  - Development Envelope
  - Native Title Determination
  - Principal Road
  - Minor Road
  - Track
- Priority 3 Species**
  - Polymeria* sp. Broome (K.F. Kenneally 9759) (P3)



|                                 |        |                      |                                                |
|---------------------------------|--------|----------------------|------------------------------------------------|
| CAD Ref: a2923_WB26_04_03_PB_01 |        | Author: G. Cockerton | Ref:                                           |
| Date: June 2026                 | Rev: A | A3                   | Drawn: CAD Resources ~ www.cadresources.com.au |



**Winu Project**  
***Polymeria* sp. Broome**  
**(K.F. Kenneally 9759) (P3) - Overview**



### *Synostemon arenosus* (Priority 3)

*Synostemon arenosus* (P3), recently renamed from *Sauropus arenosus* (P3), is a member of the Phyllanthaceae family. It is a spreading shrub, growing to 1 m high, with flowers that are initially yellow/green, turning red/pink with age (Plate 12). It occurs on red sand dunes, predominantly within the Great Sandy Desert bioregion.

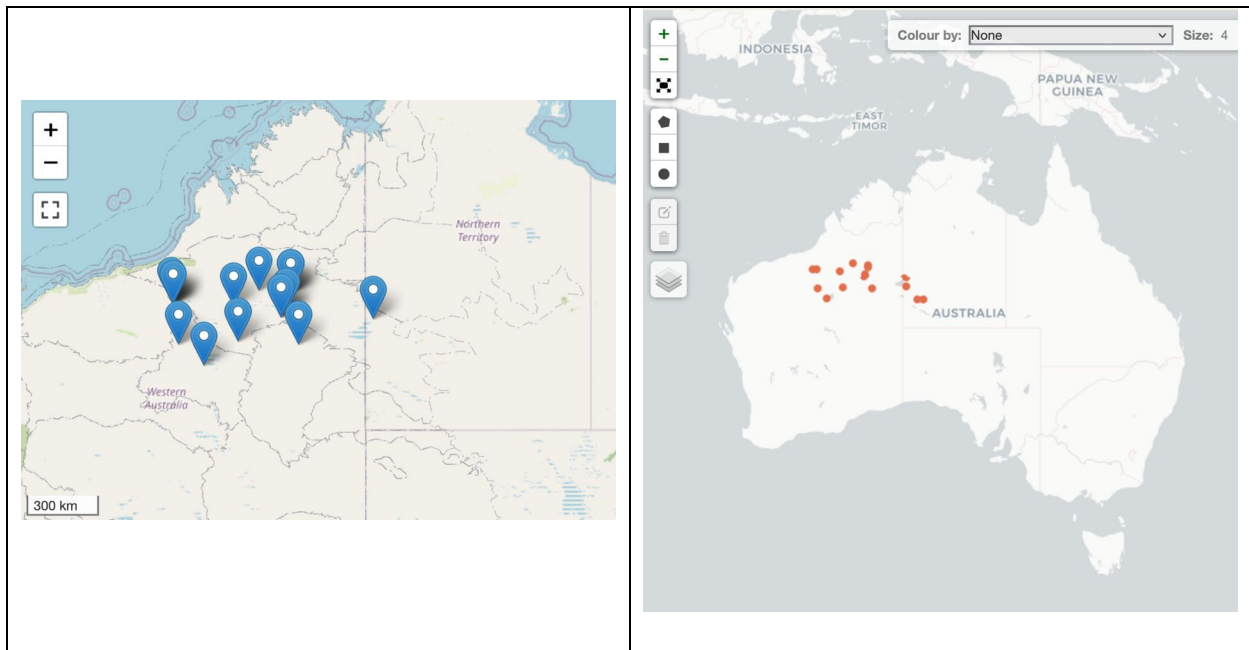
*Synostemon arenosus* (P3) is currently known from sixteen records within Western Australia (WA Herbarium 1998-2026) (Figure 31). AVH currently recognises the formerly named *Sauropus arenosus* (P3) from 30 records (Australasian Virtual Herbarium 2026) and 12 populations in W.A.

This taxon is associated with mid to lower slopes of sand dunes forming the D1 – *Corymbia chippendalei* Low Open Woodland over *Triodia schinzii*; and the D2 – *Owenia reticulata* Scattered Low Trees over *Triodia schinzii* Vegetation Associations. A total of 4,975 *Synostemon arenosus* (P3) have been recorded across the Winu Project to June 2026, consisting of 2,467 plants (49.59% of plants) inside the DE in nine populations (22.5% of populations) and 2,508 plants (50.4% of plants) outside the DE in 31 populations (77.5% of populations), Figure 32.

The majority of records were encountered in the north-western sections of the MIA, and the Proposed MIA Extensions.



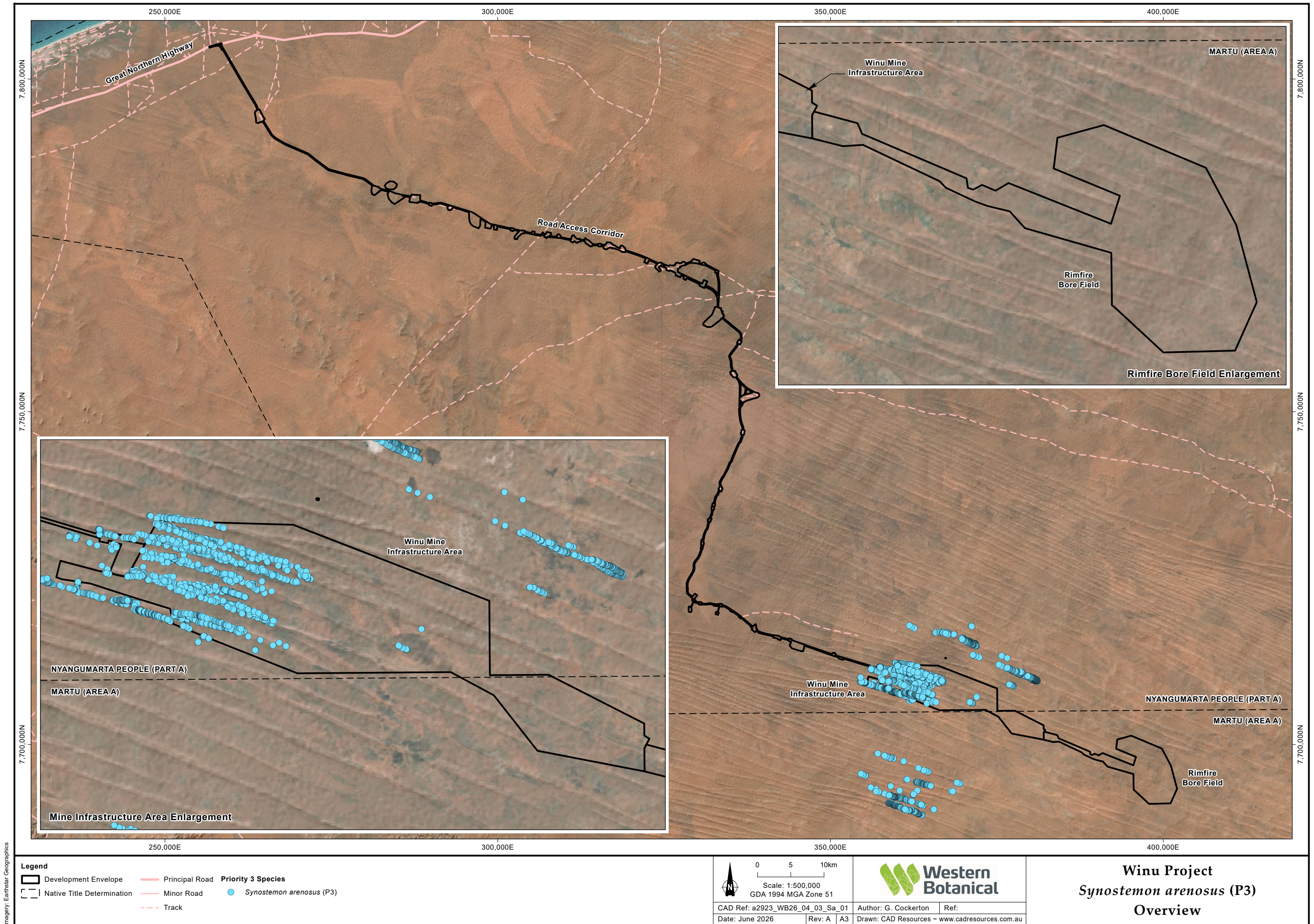
Plate 12. *Synostemon arenosus* (P3), plant and flower



**Figure 31. Current *Synostemon arenosus* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (202)**

**Figure 32** *Synostemon arenosus* (P3) Distribution across the Winu Project Area





Imagery: Earthstar Geographics

- Legend**
- Development Envelope
  - Native Title Determination
  - Principal Road
  - Minor Road
  - Track
  - Priority 3 Species**
  - Synostemon arenosus* (P3)

0 5 10km  
Scale: 1:500,000  
GDA 1994 MGA Zone 51

CAD Ref: a2923\_WB26\_04\_03\_Sa\_01  
Date: June 2026

Rev: A A3

**Western Botanical**

Author: G. Cockerton Ref:  
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**Winu Project**  
***Synostemon arenosus* (P3)**  
**Overview**



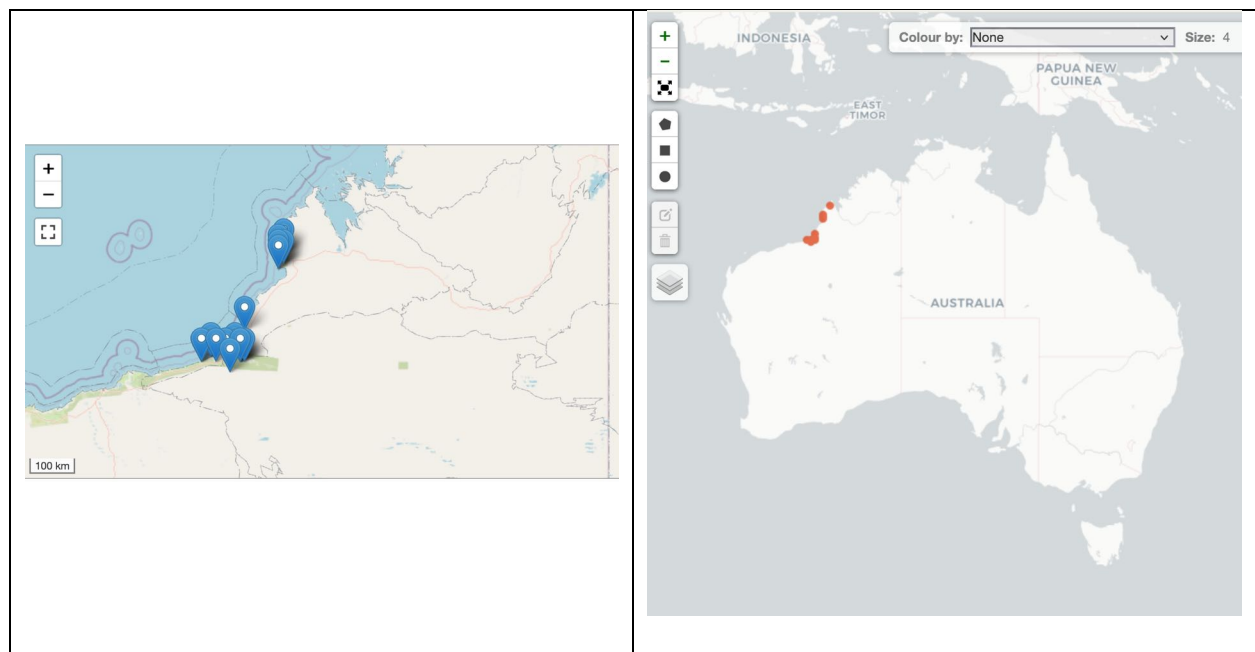
### *Terminalia kumpaja* (Priority 3)

*Terminalia kumpaja* (P3) is a tall shrub to low spreading tree with a dense canopy, distinct divaricate branching, and dark purple globular fruit with a walnut-like kernel (Plate 13). This species was relatively recently distinguished as distinct from *T. cunninghamii* (Barrett 2015). The closest vouchered record (PERTH 03561321) is approximately 15 km from the RAC (WA Herbarium 2020). *Terminalia kumpaja* (P3) has been recorded from pindan vegetation over a range of approximately 280 km, from Wallal Downs Station to north of Broome (Figure 33). Populations have been recorded along the Cape Leveque Road approximately 278 km north-northeast of the study area (66 individuals at 14 locations; Biota 2018c).

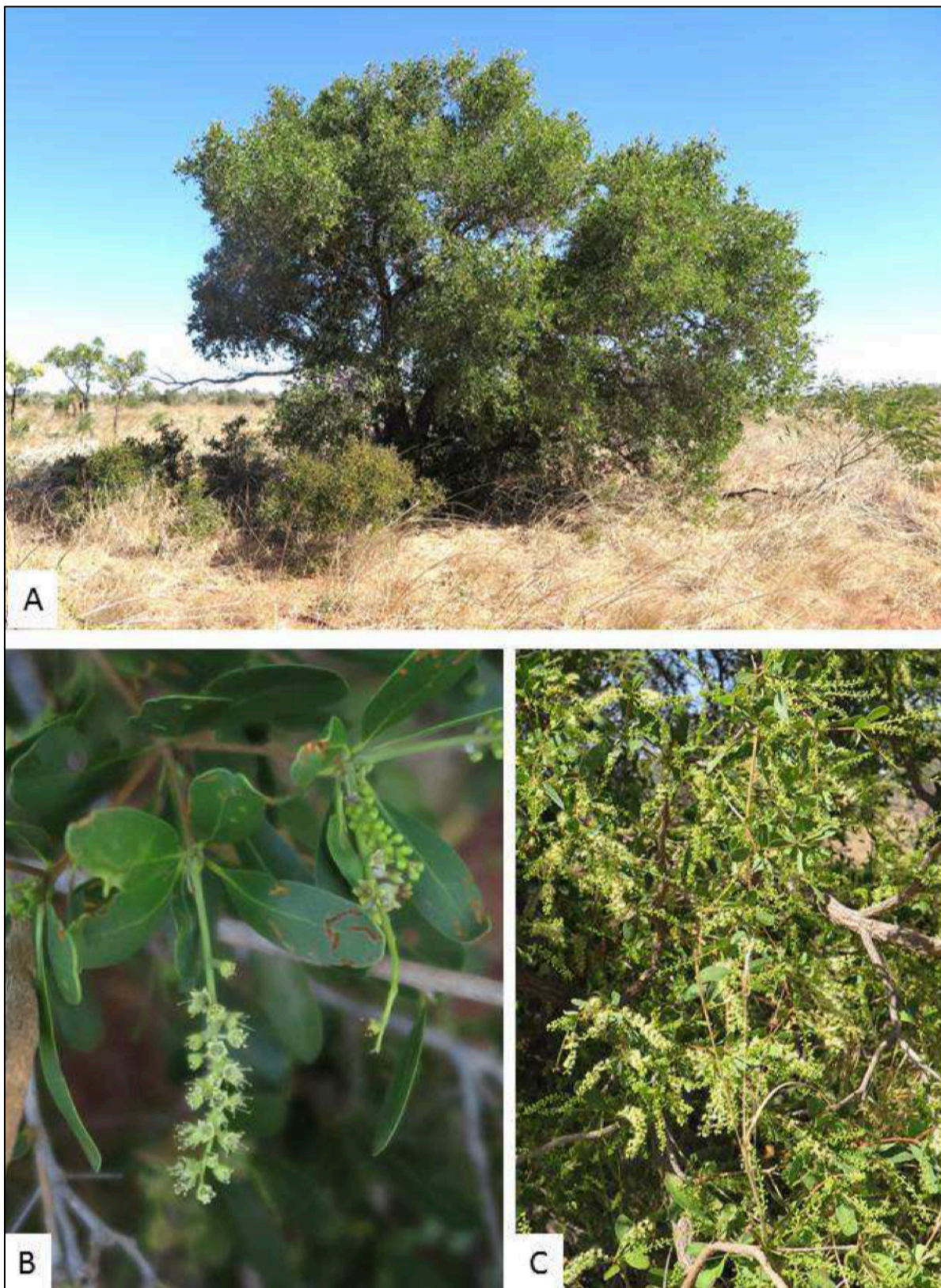
*Terminalia kumpaja* (P3) is known from 22 vouchered records in Western Australia (WA Herbarium 1998-2026) and 28 records within the Australasian Virtual Herbarium (AVH 2026), being representative of 15 populations in W.A., Figure 33.

A total of 223 individuals have been recorded around the Winu Project area, comprised of 110 plants (49.3% of plants) in 2 populations (28.6% of populations) within the current DE and 113 plants (50.7% of plants) outside the DE in five populations (71.4% of populations), Figure 34. *Terminalia kumpaja* (P3) was not recorded within the MIA or Rimfire and Texas Bore Fields.

Additional plants have been recorded during surveys of the AREH project area, including 68 records south of Section 2 of the RAC. These have not been included in the Winu Project census numbers.



**Figure 33. Current *Terminalia kumpaja* (P3) distribution recognised by a) Western Australian Herbarium (1998-2026) and b) Australasian Virtual Herbarium (2026)**



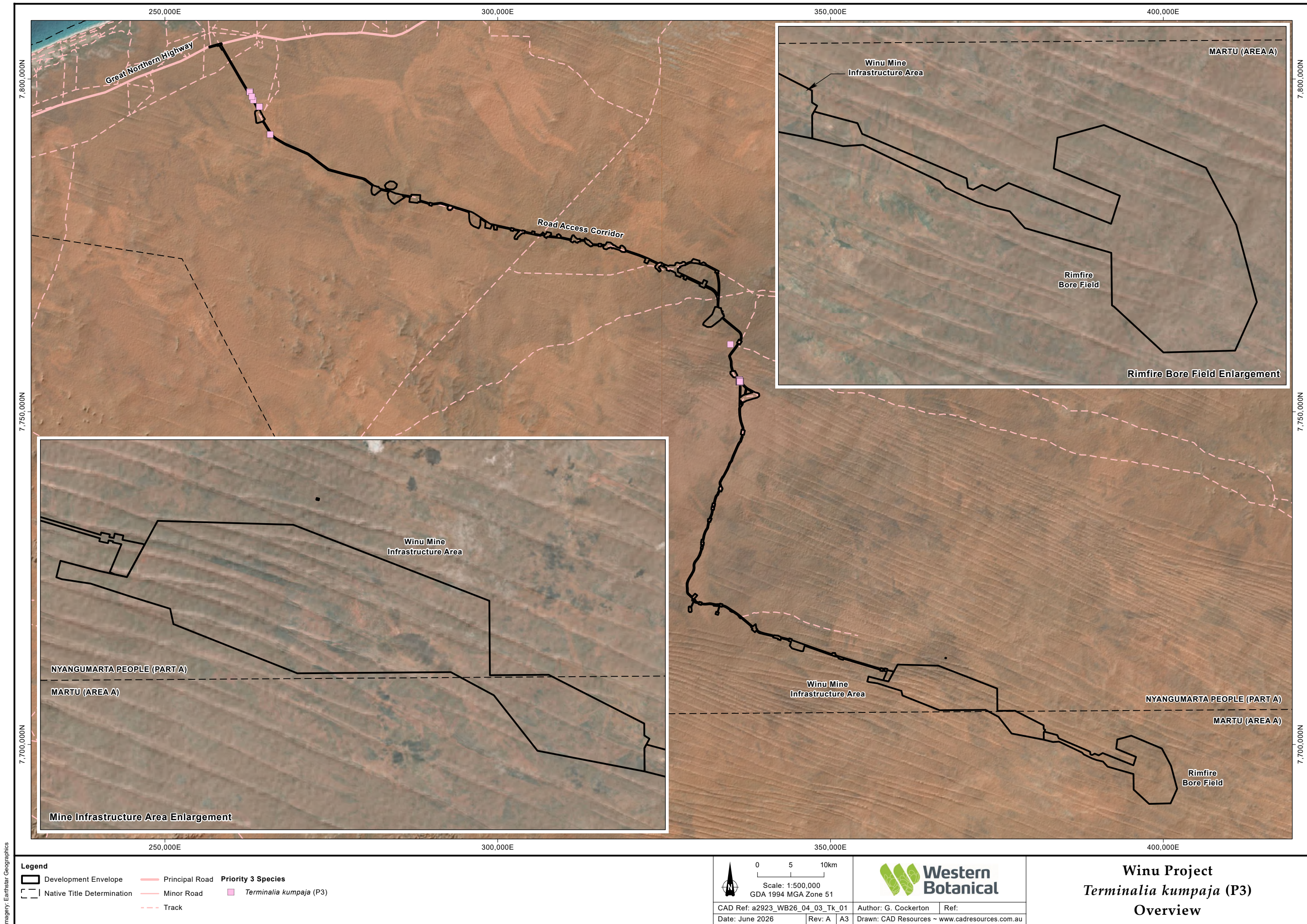
**Plate 13. *Terminalia kumpaja* (Priority 3)**

A: adult tree with several juvenile saplings at the base exhibiting a divaricate growth form, B: detail of flowers, C: example of massed flowering in *Terminalia kumpaja* (Markey I. 2018).



**Figure 34** *Terminalia kumpaja* (P3) Distribution across the Winu Project Area

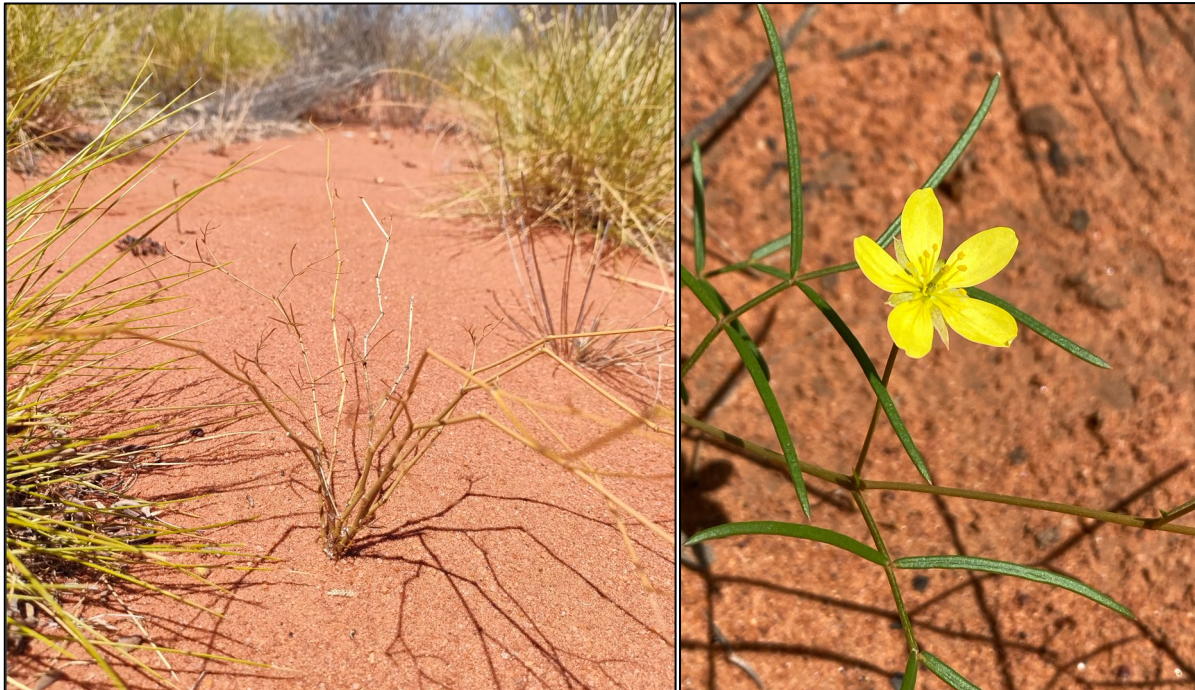






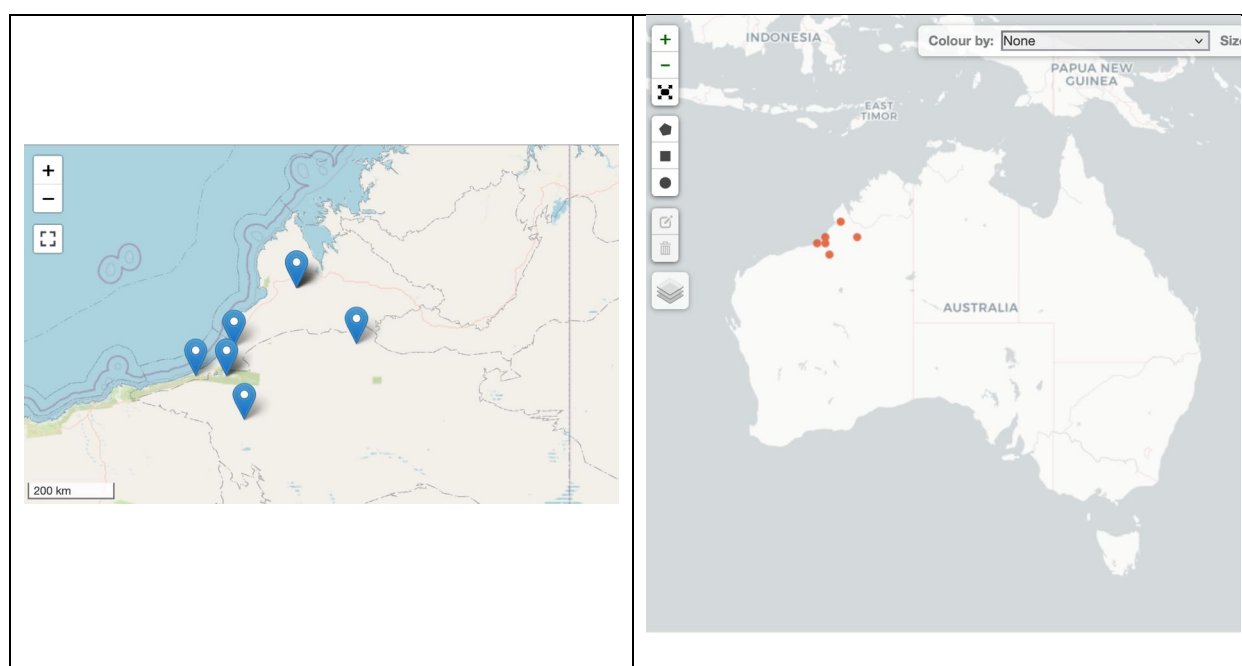
***Tribulopsis marliesiae* (Priority 3)**

(P3) is a member of the Zygophyllaceae family. It is a straggly shrub with compound leaves and terete leaflets (Plate 14). It grows on interdunal sandplains, occurring in north of Western Australia between Karratha and Broome (Figure 35). *Tribulopsis marliesiae* (P3) is endemic to Western Australia, known from nine vouchered records from 6 populations within Western Australia (WA Herbarium 1998-2026; Australasian Virtual Herbarium 2026). The common species, *Tribulopsis angustifolia* appears to overlap in distribution in some instances. *Tribulopsis marliesiae* (P3) can be distinguished from *T. angustifolia* by its corky stem and typically more upright habit (Barrett & Barret 2015).



**Plate 14. *Tribulopsis marliesiae* (Priority 3)**





**Figure 35. Current *Tribulopsis marliesiae* (P3) distribution recognised by a) Western Australian Herbarium (1998-2024) and b) Australasian Virtual Herbarium (2024)**

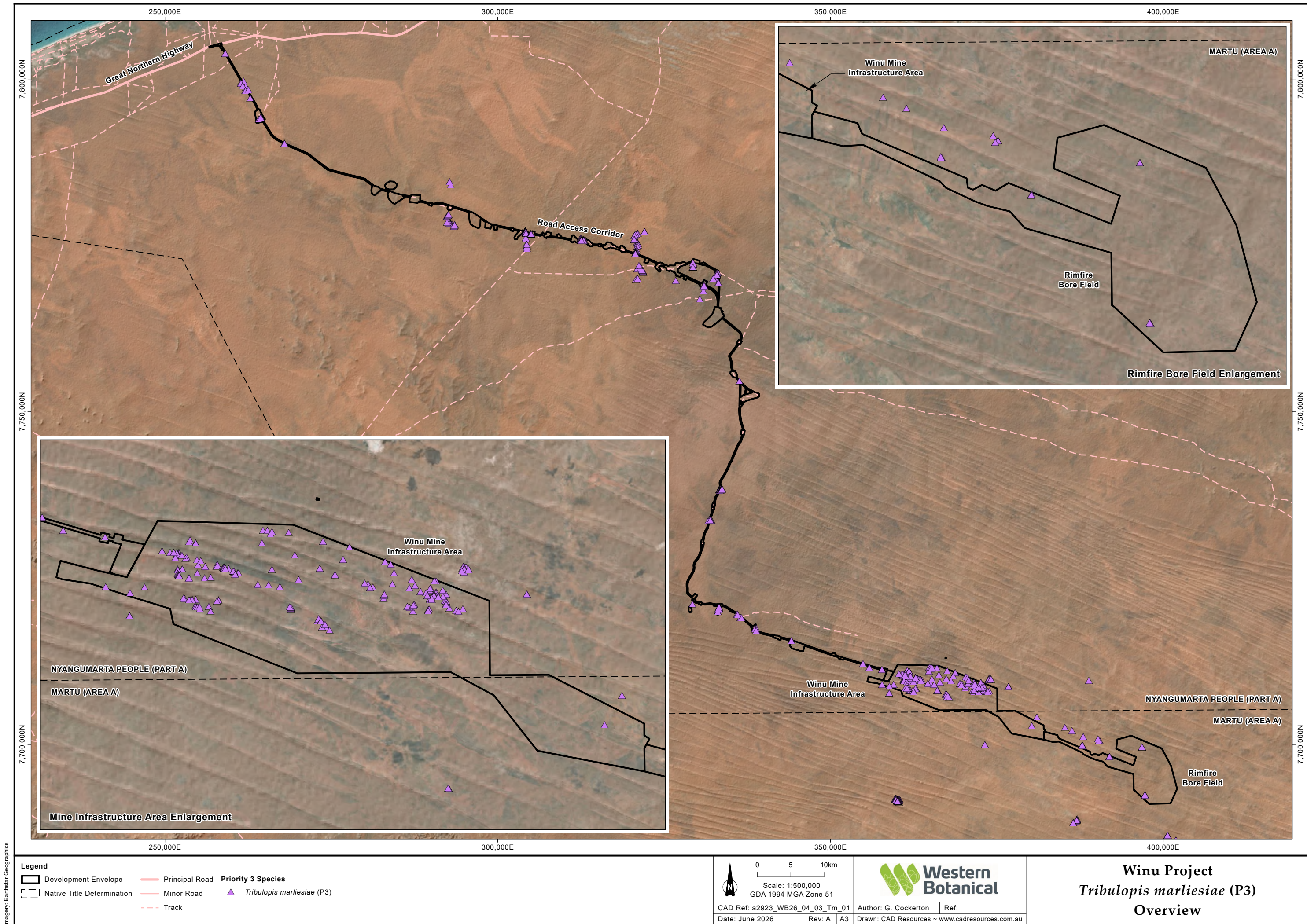
A total of 1,657 individuals have been recorded, with 787 plants (47.5% of plants) in 42 populations (51.2% of populations) occurring within the DE and 870 plants (52.5% of plants) in 40 populations (48.8% of populations) outside the DE, Figure 36. A further 148 records known from AREH surveys have not been included in the Winu Project census numbers.

These primarily occur within the P3 – *Acacia drepanocarpa* subsp. *latifolia* Tall Shrubland over *Triodia schinzii*, Vegetation Association and were also encountered within several quadrat sites located within the P4 – *Acacia orthocarpa* Open Shrubland over *Triodia schinzii* and P14 – *Acacia monticola* & *Acacia drepanocarpa* (*Acacia orthocarpa* & *Acacia ancistrocarpa*) Open Shrubland over *Triodia schinzii* Vegetation Associations.

*Tribulopsis marliesiae* (P3) is a cryptic species – difficult to observe in the field unless it is flowering. Surveys conducted in early 2026 were in sub-optimal, relatively dry conditions, however, *Tribulopsis* was reasonably confidently recognised. However, it is recommended that surveys for *Tribulopsis marliesiae* should be conducted in favourable seasonal conditions (*i.e.*, average or above wet season rainfall) and coincide with its flowering period (*i.e.*, March-April).

**Figure 36** *Tribulopsis marliesiae* (P3) Distribution across the Winu Project Area





Imagery: Earthstar Geographics

- Legend**
- Development Envelope
  - Native Title Determination
  - Principal Road
  - Minor Road
  - Track
  - Priority 3 Species**
  - Tribulopsis marliesiae* (P3)

0 5 10km  
Scale: 1:500,000  
GDA 1994 MGA Zone 51

CAD Ref: a2923\_WB26\_04\_03\_Tm\_01  
Date: June 2026

Rev: A A3

**Western Botanical**

Author: G. Cockerton Ref:  
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**Winu Project**  
***Tribulopsis marliesiae* (P3)**  
**Overview**



### 5.3.5. Range Extensions

Prior to the Winu Project, botanical surveys within the Great Sandy Desert bioregion have been limited. Relative to other regions of Western Australia, this has contributed to large gaps in recorded plant distributions within the Great Sandy Desert bioregion.

Of the 342 flora species encountered across the Winu Project, 68 represent extensions to current known distributions. A list of flora species representing Range Extensions or Range Infills equal to or greater than 100 km is presented in Table 14. Given the general lack of survey across this region the amount of Range Extensions or Range Infills is not unexpected.

**Table 14. Flora species encountered across the Winu Project, representing Extensions >100 km to Current Known Distributions.**

| Family          | Species                                                      | Comment       |
|-----------------|--------------------------------------------------------------|---------------|
| Amaranthaceae   | <i>Alternanthera nana</i>                                    | RE 140 km E   |
| Amaranthaceae   | <i>Gomphrena lanata</i>                                      | RI 130 km     |
| Amaranthaceae   | <i>Gomphrena leptoclada</i> subsp. <i>leptoclada</i>         | RE 180 km E   |
| Apocynaceae     | <i>Cynanchum pedunculatum</i>                                | RI 250 km     |
| Asteraceae      | <i>Pluchea ferdinandi-muelleri</i>                           | RI 120 km E   |
| Asteraceae      | <i>Pluchea tetranthera</i>                                   | RI 110 km E   |
| Boraginaceae    | <i>Euploca pachyphylla</i>                                   | RI 150 km E   |
| Boraginaceae    | <i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>         | RE 150 km N   |
| Byblidaceae     | <i>Byblis pilbarana</i>                                      | RE 100 km N   |
| Caryophyllaceae | <i>Polycarpaea holtzei</i>                                   | RE 100 km N   |
| Celastraceae    | <i>Macgregoria racemigera</i>                                | RE 100 km N   |
| Celastraceae    | <i>Stackhousia</i> sp. swollen gynophore (W.R. Barker 2041)  | RE 100 km E   |
| Chenopodiaceae  | <i>Dysphania platycarpa</i>                                  | RE 360 km NE  |
| Chenopodiaceae  | <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> | RE 170 km N   |
| Cleomaceae      | <i>Areocleome oxalidea</i>                                   | RE 215 km E   |
| Cleomaceae      | <i>Arivela microphylla</i>                                   | RE 200 km W   |
| Cleomaceae      | <i>Arivela viscosa</i>                                       | RE 130 km E   |
| Cyperaceae      | <i>Fimbristylis depauperata</i>                              | RE 250 km NE  |
| Fabaceae        | <i>Acacia aptaneura</i>                                      | RE 210 km N   |
| Fabaceae        | <i>Acacia bivenosa</i>                                       | RE 100 km NE  |
| Fabaceae        | <i>Acacia sphaerostachya</i>                                 | RE 100 km N   |
| Fabaceae        | <i>Cullen pustulatum</i>                                     | RI 130 km S   |
| Fabaceae        | <i>Erythrophleum chlorostachys</i>                           | RE 400 km S   |
| Fabaceae        | <i>Indigofera boviparda</i> subsp. <i>boviparda</i>          | RE 250 km NE  |
| Fabaceae        | <i>Indigofera colutea</i>                                    | RI 110k km NE |
| Fabaceae        | <i>Indigofera hirsuta</i>                                    | RI 160k km NE |
| Fabaceae        | <i>Petalostylis cassioides</i>                               | RE 160 km N   |
| Fabaceae        | <i>Tephrosia simplicifolia</i>                               | RI 100 km E   |
| Fabaceae        | <i>Zornia chaetophora</i>                                    | RE 140 km E   |
| Goodeniaceae    | <i>Brunonia australis</i>                                    | RE 140 km N   |
| Goodeniaceae    | <i>Goodenia connata</i>                                      | RE 220 km N   |
| Goodeniaceae    | <i>Goodenia panduriformis</i>                                | RE 120 km S   |

| Family        | Species                                                           | Comment      |
|---------------|-------------------------------------------------------------------|--------------|
| Goodeniaceae  | <i>Goodenia vilmoriniae</i>                                       | RE 170 km N  |
| Goodeniaceae  | <i>Scaevola parvifolia</i> subsp. <i>parvifolia</i>               | RI 180 km S  |
| Haloragaceae  | <i>Haloragis gossei</i> var. <i>gossei</i>                        | RE 100 km E  |
| Lamiaceae     | <i>Clerodendrum floribundum</i> var. <i>floribundum</i>           | RE 500km S   |
| Lauraceae     | <i>Cassytha capillaris</i>                                        | RI 100 km S  |
| Loranthaceae  | <i>Amyema ?miquelii</i>                                           | RE 270km NW  |
| Malvaceae     | <i>Abutilon oxycarpum</i> sp. Prostrate (A. A. Mitchell PRP 1266) | RE 320 km E  |
| Malvaceae     | <i>Sida rohlenae</i> subsp. <i>rohlenae</i>                       | RE 140 km NE |
| Malvaceae     | <i>Sida</i> sp. Articulation below (A.A. Mitchell PRP 1605)       | RE 140 km NE |
| Myrtaceae     | <i>Corymbia candida</i>                                           | RE 120 km E  |
| Nyctaginaceae | <i>Boerhavia gardneri</i>                                         | RI 110 km E  |
| Nyctaginaceae | <i>Commicarpus australis</i>                                      | RE 300 km NE |
| Phrymaceae    | <i>Peplidium muelleri</i>                                         | RE 120 km E  |
| Poaceae       | <i>Aristida inaequiglumis</i>                                     | RI 110 km E  |
| Poaceae       | <i>Dactyloctenium aegyptium</i>                                   | RI 220 km W  |
| Poaceae       | <i>Diplachne fusca</i> subsp. <i>muelleri</i>                     | RE 260 km NE |
| Poaceae       | <i>Eragrostis exigua</i>                                          | RE 190 km E  |
| Poaceae       | <i>Eriachne sulcata</i>                                           | RI 100 km E  |
| Poaceae       | <i>Paspalidium reflexum</i>                                       | RE 250 km NE |
| Poaceae       | <i>Sorghum plumosum</i> var. <i>plumosum</i>                      | RE 140 km SE |
| Poaceae       | <i>Sporobolus actinocladius</i>                                   | RE 150 km N  |
| Poaceae       | <i>Themeda triandra</i>                                           | RE 180 km N  |
| Poaceae       | <i>Tripogonella loliiformis</i>                                   | RE 200 km E  |
| Portulacaceae | <i>Portulaca bicolor</i>                                          | RE 300 km SW |
| Portulacaceae | <i>Portulaca filifolia</i>                                        | RE 160 km E  |
| Rubiaceae     | <i>Paranotis mitrasacmoides</i>                                   | RE 260 km SW |

### 5.3.6. Species of Taxonomic Interest

#### ***Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138)**

*Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138), a species with taxonomic significance, has been encountered within the Winu Project. It is described as a perennial grass, growing to 0.4m (Plate 15). Multiple collections have been made and submitted to the WA Herbarium for assessment (ACC # 11,039). This taxon was initially thought to be a variant of *Amphipogon sericeus* due to the hairier-than-usual leaves, however, the species epithet, *sericeus*, is in reference to the sericeus hairs found on the lemma – which differ in density and arrangement from other *Amphipogon*. Ongoing taxonomic work by Terry Macfarlane of the WA Herbarium has found that it is more likely a regional variant of *Amphipogon caricinus* var. *caricinus*. Given the current inconclusive taxonomy, *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) will not be formally named until future taxonomic work on the genus has been completed.

Observations of two distinct forms were made during recent survey work. Western Botanical have noted both a hairy form *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) occurring on sandy soils on interdunal sandplains (Figure 37); and a non-hairy form (which was identified as *Amphipogon sericeus* sens. str.) associated with gravely clay soils, particularly around the Texas and Rimfire Bore Fields.

Further taxonomic review may show *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) to merit status as a variety or subspecies of *A. caricinus* (Dr. Terry Macfarlane, pers. comm.). As taxonomic review of the *Amphipogon* genus is ongoing, the lodged specimens will remain under consideration pending outcomes from the review. Further collections at a regional level will help to better understand variation within and distribution of this group.

Until the taxonomy is resolved, in accordance with EPA guidance (EPA 2016b), *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) is treated as significant for the purposes of impact assessment.

*Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) was recognised in late 2025 and historical surveys at Winu have not accounted for this species. It has been recorded throughout the Winu MIA where it has been intensively assessed in 2026, Figure 37, however the distribution appears discontinuous. This discontinuity is an artefact of survey timing and the species is known to be widespread and populations relatively contiguous through the DE. Assessments for *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) were constrained within the DE and no systematic assessments for the species have been conducted outside this Study Area. However, populations of the species were observed to continue outside the DE during surveys and a few records (33 plants) have been recorded outside and adjacent to the DE. It is expected to be locally abundant and widespread outside the Winu DE.



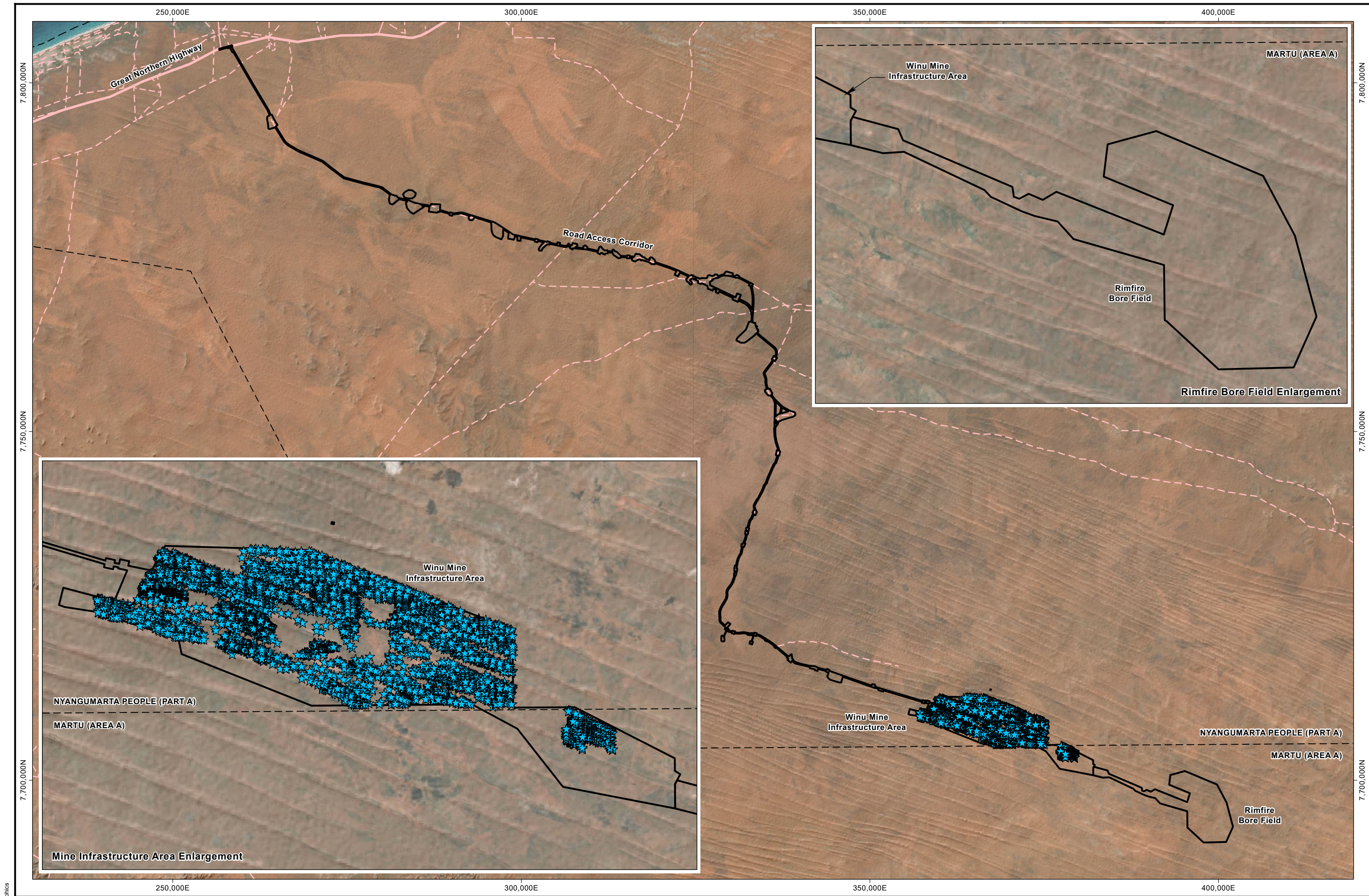
*Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) has also been recorded by the authors near the Nifty minesite, prior to recognition of its taxonomic status.



**Plate 15.** *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138)

**Figure 37** *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) Distribution across the Winu Project Area





Imagery: Earthstar Geographics

**Legend**  
Development Envelope  
Native Title Determination

Principal Road  
 Minor Road  
 Track

**Species of Interest**  
 *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138)

0 5 10km  
Scale: 1:500,000  
GDA 1994 MGA Zone 51

Western Botanical

|                                                |                      |      |
|------------------------------------------------|----------------------|------|
| CAD Ref: a2923_WB26_04_03_Ac_01                | Author: G. Cockerton | Ref: |
| Date: June 2026                                | Rev: A               | A3   |
| Drawn: CAD Resources ~ www.cadresources.com.au |                      |      |

**Winu Project**  
*Amphipogon caricinus* (hairy lamina)  
(J. Paterson WB41138) - Overview



***Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179)**

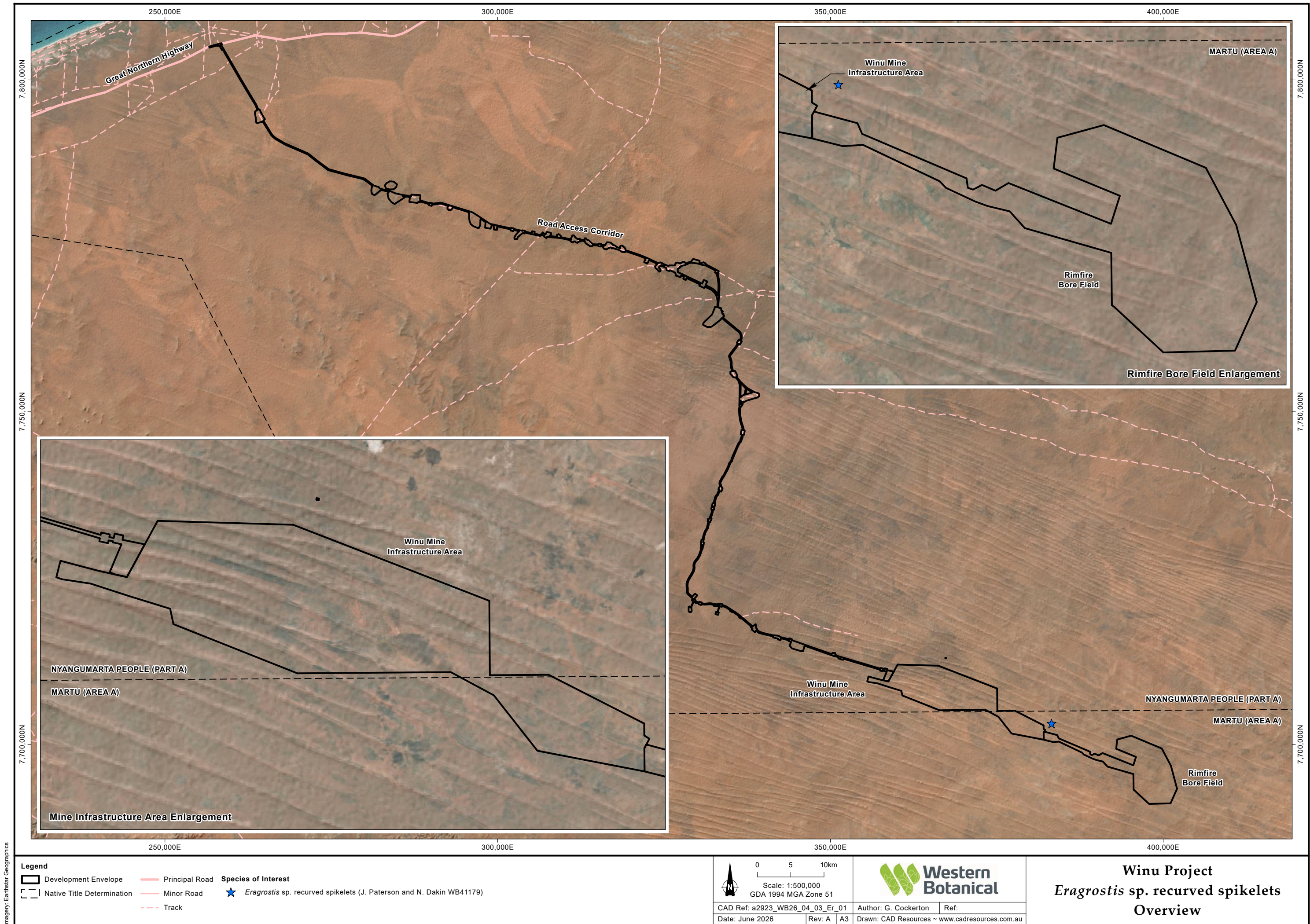
A species of taxonomic interest, *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179), has been recorded near the proposed Winu airfield. This is a small annual grass to 20 cm tall (Plate 16) and approximately 500 plants were observed growing amongst other annual grasses on the margin of a small claypan in the C7 Vegetation Association (Figure 38). It is most similar to *Eragrostis dielsii*, but differs due to its recurved spikelets and erect stature. Subsequent surveys for this species have failed to locate it due to dry seasonal conditions.



**Plate 16. *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179),**

**Figure 38. *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179) Distribution across the Winu Project Area**







A further potential undescribed species, *Portulaca* sp. Nyangumarta (B. Eckermann Opp01) was recorded on the margin of a proposed borrow pit on the RAC in early June 2026. While not discussed in detail here, specimens will be reviewed by Dr. Matt Barrett (James Cook University) via WA Herbarium to confirm its taxonomic status. It has been included in species statistics within this document and is discussed in relation known *Portulaca* species housed at the WA Herbarium and is depicted in Western Botanical (2026).

| Taxon (Species of Interest)                           | Consolidated Abundances to June 2026 |       |                           |       |       |
|-------------------------------------------------------|--------------------------------------|-------|---------------------------|-------|-------|
|                                                       | Inside DE (number and %)             |       | Outside DE (number and %) |       | Total |
| <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01) | 77                                   | 56.6% | 59                        | 43.4% | 136   |

### 5.3.7. Introduced Species

Four Targeted surveys have been completed by Western Botanical. Results of these surveys are presented in Table 15. Locations of weeds recorded across the Winu Project area are presented in Figure 39.

**Table 15. Summary of findings for previous weed surveys across the Winu Project.**

| Survey Year | WB Report Ref: | Study location                            | Findings                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|----------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Jun-22      | WB984          | RAC, MIA                                  | <ul style="list-style-type: none"> <li>• 12 <i>Cenchrus ciliaris</i>;</li> <li>• 2 <i>Citrullus amarus</i>.</li> </ul>                                                                                                                                                                                                                                                                                                |
| Mar-23      | WB1008         | Wallal Tanks, MIA                         | <ul style="list-style-type: none"> <li>• 1 <i>Cenchrus ciliaris</i>;</li> <li>• 106 <i>Citrullus amarus</i>;</li> <li>• 76 <i>Dactyloctenium aegyptium</i>;</li> <li>• 2 <i>Solanum lycopersicum</i>.</li> </ul>                                                                                                                                                                                                      |
| April-24    | WB1036         | MIA, Wallal Tanks, Camp 1, Copperhead Rd. | <ul style="list-style-type: none"> <li>• 17 <i>Cenchrus ciliaris</i>;</li> <li>• 13 <i>Citrullus amarus</i>;</li> </ul>                                                                                                                                                                                                                                                                                               |
| April 2025  | WB1068         | Winu Camp, MIA and Magnum                 | <ul style="list-style-type: none"> <li>1 <i>Trianthema portulacastrum</i>;</li> <li>2 <i>Alternanthera pungens</i>;</li> <li>43 <i>Tridax procumbens</i>;</li> <li>231 <i>Citrullus amarus</i>;</li> <li>250 <i>Euphorbia prostrata</i>;</li> <li>1 <i>Stylosanthes hamata</i>;</li> <li>16 <i>Cenchrus ciliaris</i>;</li> <li>164 <i>Dactyloctenium aegyptium</i>;</li> <li>2 <i>Tribulus terrestris</i>.</li> </ul> |

Ten weed species have been recorded across the Winu Project to date: *Alternanthera pungens*; *Cenchrus ciliaris* (Buffel Grass); *Citrullus amarus* (a Melon); *Dactyloctenium aegyptium* (Coast Button Grass); *Euphorbia prostrata*; *Stylosanthes hamata* (Verano Stylo); *Trianthema portulacastrum* (Giant Pigweed), *Tribulus terrestris* (Caltrop), *Tridax procumbens* (Tridax); *Solanum lycopersicum* (Tomato). Of these, the *Cenchrus ciliaris*, *Citrullus amarus* and *Solanum lycopersicum* were encountered at the Winu Camp and removed immediately. *Citrullus amarus* and *Dactyloctenium aegyptium* were predominantly encountered at the Wallal Tanks area, within the pastoral lease area on the Nyangumarta Highway. *Alternanthera pungens* and *Tridax procumbens* were recorded at the Magnum Camp in April 2025.

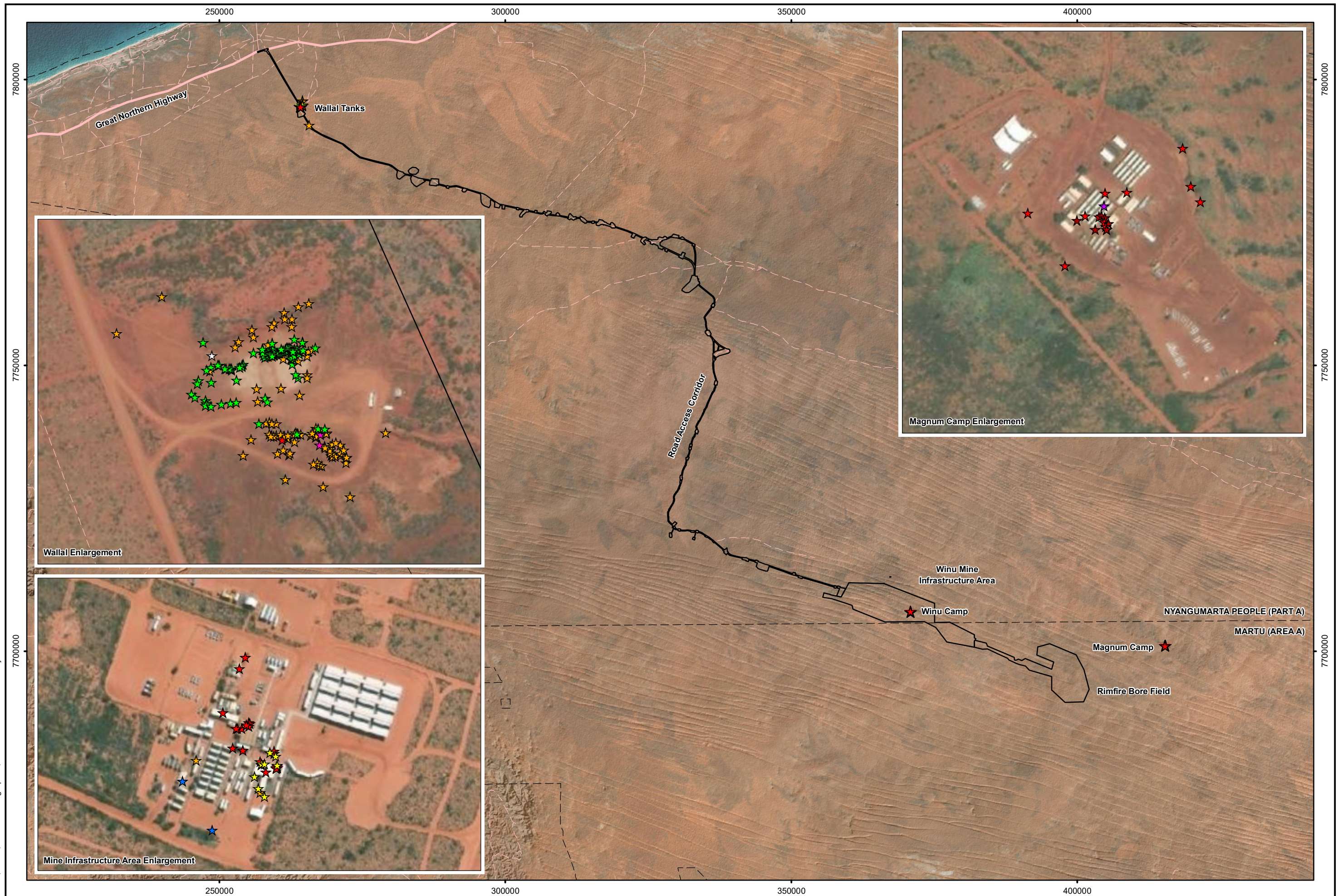
Prior to botanical surveys, the Winu Project was considered relatively weed-free, with the potential introductions of weeds to the project being recognised as a significant biodiversity risk. Targeted weed monitoring surveys are conducted annually. Additional controls to prevent the further introduction of weed species are strongly recommended. This could include a washdown station located at the entrance of the Indigenous Projected Area (IPA) to ensure soil and weed seeds are removed from vehicles prior to travel through the Great Sandy Desert bioregion; and would be beneficial to multiple Rio Tinto operations in the region.



**Figure 39. Introduced Flora Species Occurring across the Winu Project.**



Image Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



| Legend |                            | Weed |                                  |
|--------|----------------------------|------|----------------------------------|
|        | Winu Development Envelope  |      | Principal Road                   |
|        | Native Title Determination |      | Minor Road                       |
|        | Track                      |      | <i>Alternanthera pungens</i>     |
|        |                            |      | <i>Cenchrus ciliaris</i>         |
|        |                            |      | <i>Citrullus amarus</i>          |
|        |                            |      | <i>Dactyloctenium aegyptium</i>  |
|        |                            |      | <i>Euphorbia prostrata</i>       |
|        |                            |      | <i>Solanum lycopersicum</i>      |
|        |                            |      | <i>Stylosanthes hamata</i>       |
|        |                            |      | <i>Trianthema portulacastrum</i> |
|        |                            |      | <i>Tribulus terrestris</i>       |
|        |                            |      | <i>Tridax procumbens</i>         |



|                                     |        |      |
|-------------------------------------|--------|------|
| 0                                   | 5      | 10km |
| Scale: 1:600,000<br>MGA94 (Zone 51) |        |      |
| Ref: a2923_WB25_05_03               |        |      |
| Date: Jun 2025                      | Rev: A | A3   |



|                                                                                             |  |                |
|---------------------------------------------------------------------------------------------|--|----------------|
| Author: J. Paterson                                                                         |  | WB Ref: WB1069 |
| Drawn: CAD Resources ~ <a href="http://www.cadresources.com.au">www.cadresources.com.au</a> |  |                |
| Tel: (08) 9246 3242 ~ Fax (08) 9246 3202                                                    |  |                |

## Significant Vegetation of the Winu Project, June 2026 Weeds



### 5.3.8. Culturally Significant Species

A number of flora species in the region are considered culturally significant. Ethnobotanic surveys of the Nyangumarta Warrarn Indigenous Protected Area have documented numerous species occurring in the area, principally those with traditional uses (see Nyangumarta Warrarn Aboriginal Corporation 2016).

Forty-one flora species considered to have ethno-botanical significance occur across the Winu Project. All flora taxa of ethno-botanical significance recorded within the Project Area are considered to be both common and widespread.

These taxa are listed in Table 16 which reports the total recorded area and area of occurrence of each taxon within the Development Envelope as derived from the mapped vegetation associations.

**Table 16. Culturally Significant Plant Species Occurring Across the Winu Project**

| Growth Form               | Species                                               | Area within DE (ha) | Total Area (ha) |
|---------------------------|-------------------------------------------------------|---------------------|-----------------|
| Tree Species              | <i>Corymbia opaca</i>                                 | 205.7               | 495.3           |
|                           | <i>Corymbia zygophylla</i>                            | 4,714.6             | 16,223.0        |
|                           | <i>Erythrophleum chlorostachys</i>                    | 19,155.1            | 44,335.5        |
|                           | <i>Ficus brachypoda</i>                               | 0.2                 | 0.2             |
|                           | <i>Gardenia pyriformis</i> subsp. <i>keartlandii</i>  | 7,064.2             | 18,243.7        |
|                           | <i>Owenia reticulata</i>                              | 15,933.0            | 37,399.7        |
| Low Shrub or Tree Species | <i>Acacia colei</i>                                   | 8,218.3             | 12,595.9        |
|                           | <i>Codonocarpus cotinifolius</i>                      | 15,836.4            | 33,113.8        |
|                           | <i>Grevillea pyramidalis</i>                          | Not Quantified      | Not Quantified  |
|                           | <i>Grevillea refracta</i> subsp. <i>refracta</i>      | Not Quantified      | Not Quantified  |
|                           | <i>Grevillea wickhamii</i>                            | 9,874.8             | 24,984.9        |
|                           | <i>Hakea lorea</i> subsp. <i>lorea</i>                | 4,381.4             | 14,914.3        |
|                           | <i>Hakea macrocarpa</i>                               | 14,214.8            | 29,379.7        |
|                           | <i>Melaleuca lasiandra</i>                            | 243.1               | 319.5           |
| Shrub Species             | <i>Acacia anaticeps</i>                               | 4,575.5             | 10,366.8        |
|                           | <i>Acacia drepanocarpa</i> subsp. <i>drepanocarpa</i> | 916.7               | 1,975.1         |
|                           | <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i>    | 17,487.0            | 37,634.3        |
|                           | <i>Acacia hilliania</i>                               | 4,681.1             | 7,676.1         |
|                           | <i>Acacia melleodora</i>                              | 919.1               | 5,143.2         |
|                           | <i>Acacia monticola</i>                               | 19,026.7            | 42,773.7        |
|                           | <i>Acacia orthocarpa</i>                              | 7,807.5             | 19,642.2        |
|                           | <i>Acacia stellaticeps</i>                            | 12,308.8            | 26,134.2        |
|                           | <i>Carissa lanceolata</i>                             | Not Quantified      | Not Quantified  |
|                           | <i>Crotalaria cunninghamii</i>                        | Not Quantified      | Not Quantified  |
|                           | <i>Cullen martini</i>                                 | 1,755.7             | 3,374.4         |
|                           | <i>Grevillea stenobotrya</i>                          | 4,484.0             | 9,824.0         |
|                           | <i>Gyrostemon tepperi</i>                             | 20,675.6            | 42,391.9        |
|                           | <i>Jacksonia aculeata</i>                             | 20,866.7            | 46,918.3        |



| Growth Form               | Species                                             | Area within DE (ha) | Total Area (ha) |
|---------------------------|-----------------------------------------------------|---------------------|-----------------|
|                           | <i>Santalum lanceolatum</i>                         | 919.1               | 5,143.2         |
|                           | <i>Senna notabilis</i>                              | 7,332.6             | 19,985.8        |
| Perennial Herb Species    | <i>Cyanostegia cyanocalyx</i>                       | 11,401.4            | 21,145.5        |
|                           | <i>Euphorbia australis</i> var. <i>subtomentosa</i> | Not Quantified      | Not Quantified  |
|                           | <i>Solanum dioicum</i>                              | 2,591.5             | 5,089.1         |
|                           | <i>Solanum diversiflorum</i>                        | 6,593.0             | 16,732.3        |
|                           | <i>Streptoglossa macrocephala</i>                   | 2,825.1             | 5,859.6         |
|                           |                                                     |                     |                 |
| Vines and Creeper Species | <i>Cassytha capillaris</i>                          | 21,758.5            | 46,281.3        |
|                           | <i>Tinospora smilacina</i>                          | 4,713.8             | 14,233.8        |
| Grass Species             | <i>Chrysopogon fallax</i>                           | 6,823.3             | 10,725.0        |
|                           | <i>Eragrostis eriopoda</i>                          | 22,994.8            | 51,193.0        |
|                           | <i>Triodia epactia</i>                              | 12,194.0            | 32,361.1        |
|                           | <i>Triodia schinzii</i>                             | 22,919.0            | 51,116.1        |

### 5.3.9. Landforms

The landforms present across the Winu Project are categorised into four major groups:

- (i) Sand dunes and associated swales associated with deep red sand;
- (ii) Interdunal sand plains associated with deep to shallow red to pale orange sands;
- (iii) Stony rises and gentle outcroppings associated with gravely clay soils; and
- (iv) Claypans and low-lying clay flats, associated with deeper clays and subject to seasonal inundation.

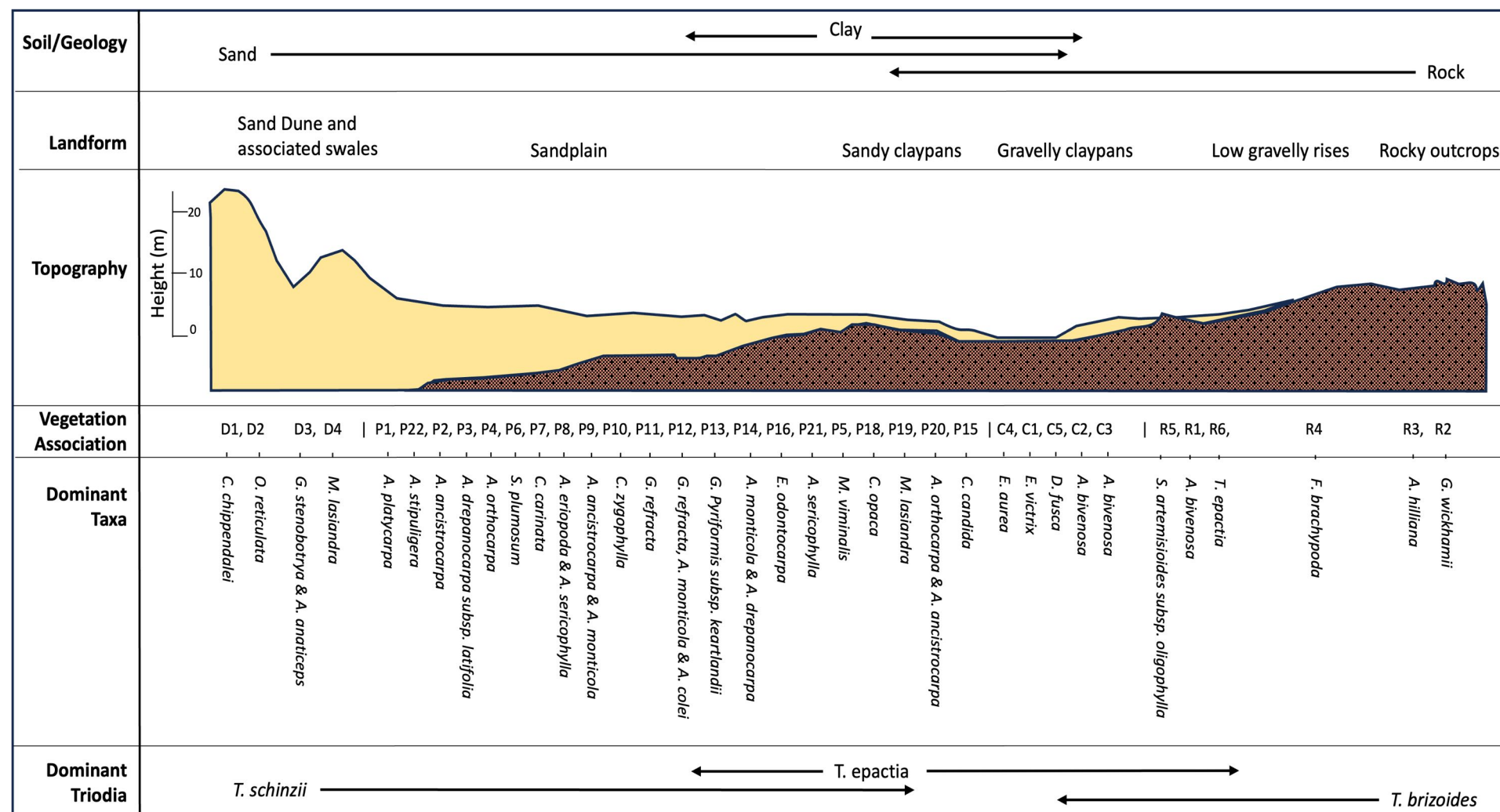
Sandplain landforms were recorded across the entire Winu Project, Sand dunes were more prevalent across the MIA and Texas and Rimfire Bore Fields; Stony rises and gentle outcroppings predominantly occurred around the RAC and Rimfire Bore Fields, and Claypans and low-lying clay flats occurred within Texas Bore Fields only.

The characteristic soils and geology of each of these landforms govern the plant species, and more broadly, the vegetation associations occurring on them. Sand dunes and associated swales support low *Acacia* spp. shrublands with occasional scattered *Corymbia* trees over *Triodia schinzii* hummock grasslands; Interdunal sandplains support open *Acacia*, and *Grevillea* spp. shrublands with occasional *Corymbia* woodlands and *Eucalypt* mallee woodlands, over *Triodia schinzii* and *Triodia epactia* hummock grasslands; Stony rises and gentle outcroppings support open *Acacia* spp., and *Grevillea* spp. shrublands with occasional *Corymbia* woodlands over *Triodia brizoides* and *Triodia epactia* hummock grasslands; while the Claypans and low-lying clay flats support occasional *Eucalyptus victrix* woodlands over dense *Triodia brizoides* and *Triodia epactia* hummock grasslands or *Eulalia aurea* tussock grasslands.

A conceptualised diagram of landforms occurring across the Winu Project is presented in Figure 40.

**Figure 40. Conceptualised diagram of landforms and vegetation occurring across the Winu Project**





### 5.3.10. Vegetation Associations

Forty-one Vegetation Associations at NVIS Level (V) *Association* have been recorded within the Winu Project area, including four occurring on Sand dunes and associated swales (D1-4); 22 occurring on Interdunal sand plains (P1-23, inclusive of multiple subgroups for P10, P15 & P23); seven occurring on Stony rises and gentle outcroppings (R1-7); and eight occurring on Claypans and low-lying clay flats (C1-8). Vegetation Associations were also observed to form mosaics in which a single vegetation association could not be readily distinguished and mapped separately ( $n=26$ ). Areas that are cleared (Completely Degraded Condition, EPA 2016) within the DE are denoted as Disturbed.

A further 38 Vegetation Associations and mosaics of these Associations are also known exclusively from outside the DE. These latter units have not been included in detailed discussions or statistical analyses within this report.

Naming conventions have been modified/ simplified from previous works by Biota (2021). A list of Vegetation Associations and their extent across the Winu Project is presented in Table 17. A 1:500,000 scale overview map and a corresponding legend of the Vegetation Associations of the Winu Project are presented in Figure 41 & Figure 42. A 1:25,000 scale detailed map set is presented in Appendix 9.

**Table 17. Vegetation Associations Described across the Winu Project.**

| Landform                         | Veg Code | Vegetation Association                                                                                                                    | Total Extent (ha) | Extent Inside DE (ha) |
|----------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|
| Sand Dunes and Associated Swales | D1       | <i>Corymbia chippendalei</i> Low Open Woodland over <i>Triodia schinzii</i>                                                               | 2,999.90          | 1,951.23              |
|                                  | D2       | <i>Owenia reticulata</i> Scattered Low Trees over <i>Triodia schinzii</i>                                                                 | 3,449.89          | 1,098.96              |
|                                  | D3       | <i>Grevillea stenobotrya</i> , <i>Grevillea wickhamii</i> & <i>Acacia anaticeps</i> Tall Shrubland over <i>Triodia schinzii</i>           | 260.66            | 81.05                 |
|                                  | D4*      | <i>Melaleuca lasiandra</i> Open Low Shrubland over <i>Triodia schinzii</i>                                                                | 167.86            | 0                     |
| Interdunal Sand Plain            | P1       | <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i>                     | 10,725.01         | 6,823.30              |
|                                  | P2       | <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i>                                                                   | 6,045.03          | 1,978.02              |
|                                  | P3       | <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i>                                            | 3,113.55          | 1,352.72              |
|                                  | P4       | <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i>                                                                      | 3,324.98          | 721.64                |
|                                  | P5       | <i>Acacia</i> spp. Scattered Shrubs over <i>Triodia schinzii</i>                                                                          | 551.89            | 551.29                |
|                                  | P6       | <i>Owenia reticulata</i> & <i>Erythrophleum chlorostachys</i> Scattered Low Trees over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> ) | 221.38            | 103.67                |

| Landform              | Veg Code | Vegetation Association                                                                                                                                                         | Total Extent (ha) | Extent Inside DE (ha) |
|-----------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|
| Interdunal Sand Plain | P7       | <i>Calytrix carinata</i> Low Shrubland over <i>Triodia schinzii</i>                                                                                                            | 129.06            | 0                     |
|                       | P8       | <i>Acacia eriopoda</i> & <i>Acacia sericophylla</i> Open Shrubland over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> )                                                     | 5,143.24          | 919.05                |
|                       | P9       | <i>Acacia ancistrocarpa</i> & <i>Acacia monticola</i> Open Shrubland over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> )                                                   | 731.85            | 532.52                |
|                       | P10a     | <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia epactia</i>                                                                                                  | 526.79            | 71.63                 |
|                       | P10b     | <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia schinzii</i> and <i>Triodia epactia</i> ( <i>Acacia stellaticeps</i> )                                       | 342.61            | 324.52                |
|                       | P10c     | <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia schinzii</i>                                                                                                 | 1,844.73          | 423.64                |
|                       | P10d     | <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia brizoides</i>                                                                                                | 51.08             | 0                     |
|                       | P11      | <i>Grevillea refracta</i> ( <i>Acacia ancistrocarpa</i> & <i>Acacia monticola</i> ) Scattered Tall Shrubs over <i>Triodia epactia</i>                                          | 1,975.12          | 916.68                |
|                       | P12      | <i>Grevillea refracta</i> , <i>Acacia monticola</i> & <i>Acacia colei</i> var. <i>colei</i> Open Shrubland over <i>Acacia adoxa</i> var. <i>adoxo</i> & <i>Triodia epactia</i> | 164.32            | 143.24                |
|                       | P13      | <i>Gardenia pyriformis</i> subsp. <i>keartlandii</i> Scattered Low Trees over <i>Triodia schinzii</i>                                                                          | 942.23            | 624.52                |
|                       | P14      | <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i>                    | 1,099.05          | 317.68                |
|                       | P15a     | <i>Corymbia candida</i> Open Low Woodland over <i>Triodia schinzii</i>                                                                                                         | 221.08            | 49.38                 |
|                       | P15b     | <i>Corymbia candida</i> Open Low Woodland over <i>Acacia monticola</i> shrubland over <i>Triodia epactia</i>                                                                   | 86.47             | 18.75                 |
|                       | P15c     | <i>Corymbia candida</i> Open Low Woodland over <i>Triodia brizoides</i>                                                                                                        | 105.54            | 0                     |
|                       | P16      | <i>Eucalyptus odontocarpa</i> Very Open Shrub Mallee over <i>Triodia schinzii</i>                                                                                              | 20.75             | 13.71                 |
|                       | P18      | <i>Corymbia opaca</i> Open Woodland over <i>Triodia schinzii</i>                                                                                                               | 474.59            | 191.96                |
|                       | P19 *    | <i>Melaleuca lasiandra</i> Low Open Shrubland over <i>Triodia schinzii</i>                                                                                                     | 319.53            | 243.11                |
|                       | P20      | <i>Acacia ancistrocarpa</i> & <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> & <i>Triodia epactia</i>                                                    | 921.31            | 248.52                |
|                       | P21      | <i>Acacia sericophylla</i> Open Shrubland over <i>Triodia schinzii</i>                                                                                                         | 45.42             | 0                     |
|                       | P22      | <i>Acacia stipuligera</i> Open Shrubland over <i>Triodia schinzii</i>                                                                                                          | 40.28             | 0                     |
|                       | P23 *    | <i>Melaleuca</i> spp. (boundaries defined, excludes subcategorization)                                                                                                         | 7,082.05          | 0                     |



| Landform                            | Veg Code            | Vegetation Association                                                                                                                                                                                                | Total Extent (ha) | Extent Inside DE (ha) |
|-------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|
|                                     | P23a *              | <i>Melaleuca lasiandra</i> , <i>Melaleuca glomerata</i> ( <i>Eucalyptus victrix</i> , <i>Acacia colei</i> var. <i>colei</i> ) Open Shrubland over <i>Triodia basedowii</i> ( <i>Acacia stellaticeps</i> )             | 929.4             | 0                     |
|                                     | P23b *              | <i>Melaleuca lasiandra</i> ( <i>Hakea lorea</i> , <i>Melaleuca glomerata</i> ) Open Shrubland over <i>Triodia epactia</i> ( <i>Euploca glandulifera</i> , <i>Ptilotus axillaris</i> )                                 | 92.45             | 0                     |
|                                     | P23c *              | Interzone - <i>Melaleuca lasiandra</i> , <i>Melaleuca glomerata</i> , <i>Acacia ancistrocarpa</i> ( <i>Acacia drepanocarpa</i> , <i>Acacia monticola</i> ) Open Shrubland over <i>Triodia schinzii</i>                | 565.52            | 0                     |
|                                     | P23d *              | <i>Melaleuca glomerata</i> Scattered Low Shrubs over <i>Trianthema turgidifolium</i> ( <i>Triodia basedowii</i> )                                                                                                     | 49.77             | 0                     |
|                                     | Melaleuca Habitat * | Approximated area, mapped <i>Melaleuca</i> habitat (observed from Helicopter, not ground-truthed)                                                                                                                     | 4,819.49          | 4,819.49              |
| Stony Rises and Gentle Outcroppings | R1                  | <i>Acacia bivenosa</i> ( <i>Acacia ancistrocarpa</i> ) Scattered Shrubs <i>Triodia brizoides</i> ( <i>Triodia schinzii</i> )                                                                                          | 641.71            | 233.77                |
|                                     | R2                  | <i>Grevillea wickhamii</i> Scattered Tall Shrubs over <i>Mirbelia viminialis</i> ( <i>Acacia hilliana</i> ) & <i>Triodia brizoides</i> ( <i>Triodia epactia</i> )                                                     | 1,870.84          | 1,395.04              |
|                                     | R3                  | <i>Acacia hilliana</i> ( <i>Acacia adoxa</i> var. <i>adoxo</i> ) Low Open Shrubland over <i>Triodia epactia</i>                                                                                                       | 3,113.72          | 1,674.64              |
|                                     | R4                  | <i>Ficus brachypoda</i> Scattered Low Trees over <i>Acacia monticola</i> , <i>Grevillea pyramidalis</i> & <i>Triodia epactia</i>                                                                                      | 0.23              | 0.17                  |
|                                     | R5                  | <i>Senna artemisioides</i> subsp. <i>oligophylla</i> , <i>Senna sericea</i> ( <i>Acacia bivenosa</i> ) Scattered Low Shrubs over <i>Triodia epactia</i> ( <i>Aristida contorta</i> , <i>Dactyloctenium radulans</i> ) | 0.98              | 0                     |
|                                     | R6                  | <i>Grevillea wickhamii</i> , <i>Acacia monticola</i> & <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia epactia</i>                                                                                         | 75.89             | 75.89                 |
|                                     | R7                  | Isolated outcropping with <i>Acacia colei</i> Scattered Low Shrubs over <i>Eriachne mucronata</i>                                                                                                                     | 0.13              | 0                     |
| Claypans and Low-Lying Clay Flats   | C1                  | <i>Eucalyptus victrix</i> Open Woodland over <i>Triodia epactia</i>                                                                                                                                                   | 229.61            | 0                     |
|                                     | C2                  | <i>Acacia bivenosa</i> Scattered Low Shrubs over <i>Triodia brizoides</i> & <i>Triodia epactia</i> ( <i>Triodia schinzii</i> )                                                                                        | 1,448.81          | 14.55                 |
|                                     | C3                  | <i>Acacia bivenosa</i> ( <i>Acacia stellaticeps</i> ) Low Shrubland over <i>Triodia epactia</i>                                                                                                                       | 897.7             | 0                     |
|                                     | C4                  | <i>Acacia ancistrocarpa</i> Open Low Shrubland over <i>Eulalia aurea</i> & <i>Triodia epactia</i>                                                                                                                     | 378.6             | 145.72                |
| Claypans and Low-Lying Clay Flats   | C5                  | Claypan Playa ( <i>Diplachne fusca</i> subsp. <i>muelleri</i> , <i>Eragrostis falcata</i> ) with Scattered Herbs                                                                                                      | 4.79              | 0                     |
|                                     | C6                  | Claypan ( <i>Cullen pustulatum</i> , <i>Gossypium australe</i> ) over <i>Eulalia aurea</i> ( <i>Eragrostis xerophila</i> )                                                                                            | 8.41              | 0                     |

| Landform     | Veg Code | Vegetation Association                                                                                                                                                                                                                                                                      | Total Extent (ha) | Extent Inside DE (ha) |
|--------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|
|              | C7       | Clay-Pan with annual herbs and grasses ( <i>Sporobolus actinocladus</i> , <i>Eragrostis cumingii</i> & <i>Eriachne obtusa</i> )                                                                                                                                                             | 1.94              | 0                     |
|              | C8 *     | Clay-Pan ( <i>Eragrostis cumingii</i> ) with Scattered Herbs and Grasses                                                                                                                                                                                                                    | 3.42              | 0                     |
| Mosaic units | C1+P23   | Mosaic: <i>Eucalyptus victrix</i> Open Woodland over <i>Triodia epactia</i> + <i>Melaleuca</i> spp. (boundaries defined, excludes subcategorization)                                                                                                                                        | 21.07             | 0                     |
|              | C1+P8    | Mosaic: <i>Acacia ancistrocarpa</i> Open Low Shrubland over <i>Eulalia aurea</i> & <i>Triodia epactia</i> + <i>Acacia eriopoda</i> & <i>Acacia sericophylla</i> Open Shrubland over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> )                                                      | 11.22             | 0                     |
|              | D2+P8    | Mosaic: <i>Owenia reticulata</i> Scattered Low Trees over <i>Triodia schinzii</i> + <i>Acacia eriopoda</i> & <i>Acacia sericophylla</i> Open Shrubland over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> )                                                                              | 33.71             | 0                     |
|              | P1+D2    | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Owenia reticulata</i> Scattered Low Trees over <i>Triodia schinzii</i>                                                                                   | 2.58              | 2.58                  |
|              | P1+P14   | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i> | 36.96             | 5.29                  |
|              | P1+P18   | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Corymbia opaca</i> Open Woodland over <i>Triodia schinzii</i>                                                                                            | 38.87             | 8.07                  |
|              | P1+P2    | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i>                                                                                     | 49.73             | 0                     |
|              | P1+P3    | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i>                                                              | 16.05             | 0                     |
|              | P1+P4    | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i>                                                                                        | 15.26             | 7.17                  |
|              | P1+P5    | Mosaic: <i>Acacia platycarpa</i> ( <i>Acacia tumida</i> var. <i>kulparn</i> ) Open Low Shrubland over <i>Triodia schinzii</i> + <i>Acacia</i> spp. Scattered Shrubs over <i>Triodia schinzii</i>                                                                                            | 86.78             | 86.78                 |
|              | P10c+P8  | Mosaic: <i>Corymbia zygophylla</i> Scattered Tree Mallees over <i>Triodia schinzii</i> + <i>Acacia eriopoda</i> & <i>Acacia sericophylla</i> Open Shrubland over <i>Triodia schinzii</i> ( <i>Triodia epactia</i> )                                                                         | 33.79             | 0                     |

| Landform     | Veg Code     | Vegetation Association                                                                                                                                                                                                                                                                                                                     | Total Extent (ha) | Extent Inside DE (ha) |
|--------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|
|              | P15a+P3      | Mosaic: <i>Corymbia candida</i> Open Low Woodland over <i>Triodia schinzii</i> + <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i>                                                                                                                                                            | 36.83             | 0                     |
|              | P15c+ P18    | Mosaic: <i>Corymbia candida</i> Open Low Woodland over <i>Triodia brizoides</i> + <i>Corymbia opaca</i> Open Woodland over <i>Triodia schinzii</i>                                                                                                                                                                                         | 48.19             | 0                     |
|              | P18+C2       | Mosaic: <i>Corymbia opaca</i> Open Woodland over <i>Triodia schinzii</i> + <i>Acacia bivenosa</i> Scattered Low Shrubs over <i>Triodia brizoides</i> & <i>Triodia epactia</i> ( <i>Triodia schinzii</i> )                                                                                                                                  | 26.51             | 0                     |
|              | P2+C3        | Mosaic: <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i> + <i>Acacia bivenosa</i> ( <i>Acacia stellaticeps</i> ) Low Shrubland over <i>Triodia epactia</i>                                                                                                                                                          | 40.51             | 0                     |
|              | P2+P14       | Mosaic: <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i> + <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i>                                                                                              | 16.55             | 11.41                 |
|              | P2+P3        | Mosaic: <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i> + <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i>                                                                                                                                                           | 141.82            | 49.77                 |
|              | P20+C3       | Mosaic: <i>Acacia ancistrocarpa</i> & <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> & <i>Triodia epactia</i> +                                                                                                                                                                                                      | 23.8              | 0                     |
|              | P3 + P4 +P14 | Mosaic <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i> & <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> & <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i> | 7.64              | 0                     |
|              | P4 + C7      | Mosaic <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> & <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i>                                                                                                  | 7.71              | 0                     |
|              | P4+P14       | Mosaic: <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> + <i>Acacia monticola</i> & <i>Acacia drepanocarpa</i> ( <i>Acacia orthocarpa</i> & <i>Acacia ancistrocarpa</i> ) Open Shrubland over <i>Triodia schinzii</i>                                                                                                 | 32.19             | 0                     |
|              | P4+R1        | Mosaic: <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> + <i>Acacia bivenosa</i> ( <i>Acacia ancistrocarpa</i> ) Scattered Shrubs <i>Triodia brizoides</i> ( <i>Triodia schinzii</i> )                                                                                                                                | 9.97              | 2.05                  |
| Mosaic units | P4+R4        | Mosaic: <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i> + <i>Ficus brachypoda</i> Scattered Low Trees over <i>Acacia monticola</i> , <i>Grevillea pyramidalis</i> & <i>Triodia epactia</i>                                                                                                                            | 1.52              | 1.52                  |



| Landform | Veg Code  | Vegetation Association                                                                                                                                                                                                                                                    | Total Extent (ha) | Extent Inside DE (ha) |
|----------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|
|          | R1+C7     | Mosaic: <i>Acacia bivenosa</i> ( <i>Acacia ancistrocarpa</i> ) Scattered Shrubs <i>Triodia brizoides</i> ( <i>Triodia schinzii</i> ) + Clay-Pan with annual herbs and grasses ( <i>Sporobolus actinocladus</i> , <i>Eragrostis cumingii</i> & <i>Eriachne obtusa</i> )    | 41.68             | 0                     |
|          | R2+P18    | Mosaic: <i>Grevillea wickhamii</i> Scattered Tall Shrubs over <i>Mirbelia viminalis</i> ( <i>Acacia hilliana</i> ) & <i>Triodia brizoides</i> ( <i>Triodia epactia</i> ) + <i>Corymbia opaca</i> Open Woodland over <i>Triodia schinzii</i>                               | 33.84             | 0                     |
|          | R2+P2     | Mosaic: <i>Grevillea wickhamii</i> Scattered Tall Shrubs over <i>Mirbelia viminalis</i> ( <i>Acacia hilliana</i> ) & <i>Triodia brizoides</i> ( <i>Triodia epactia</i> ) + <i>Acacia ancistrocarpa</i> Open Shrubland over <i>Triodia schinzii</i>                        | 5.12              | 0                     |
|          | R2+P3     | Mosaic: <i>Grevillea wickhamii</i> Scattered Tall Shrubs over <i>Mirbelia viminalis</i> ( <i>Acacia hilliana</i> ) & <i>Triodia brizoides</i> ( <i>Triodia epactia</i> ) + <i>Acacia drepanocarpa</i> subsp. <i>latifolia</i> Open Shrubland over <i>Triodia schinzii</i> | 133.71            | 133.36                |
|          | R2+P4     | Mosaic: <i>Grevillea wickhamii</i> Scattered Tall Shrubs over <i>Mirbelia viminalis</i> ( <i>Acacia hilliana</i> ) & <i>Triodia brizoides</i> ( <i>Triodia epactia</i> ) + <i>Acacia orthocarpa</i> Open Shrubland over <i>Triodia schinzii</i>                           | 4.24              | 0                     |
| Other    | Disturbed | Cleared or disturbed vegetation                                                                                                                                                                                                                                           | 107.89            | 100.5                 |

\* Vegetation Associations D4, P19 and P23 to P23d and the approximated *Melaleuca* habitat (as observed from helicopter and not ground-truthed) and the Mosaic unit C1+P23 are found south of the Rimfire Borefield.

In total, there are 15 Vegetation Associations within the MIA, 26 within the Rimfire Borefield and 16 within the RAC.

Four *Melaleuca*-dominated Vegetation Associations were encountered within the Percival Paleochannel area, as well as one clay-pan and two previously described units (D4 & P19). Vegetation mapping was of greater accuracy and intensity towards the northern areas of the *Melaleuca* habitat (i.e., closer to the Rimfire Borefield). Mapping within southern areas was largely conducted via helicopter survey and lacks definition to the degree of subcategorization (i.e., either mapped as P23, or as *Melaleuca* habitat and not adequately assessed).

The vegetation occurring south of the previously assessed areas within the Rimfire Bore Field differ from the P19 – *Melaleuca lasiandra* Low Open Shrubland over *Triodia schinzii*; tending to *Melaleuca glomerata* and *Eucalyptus victrix* Open Shrubland over *Triodia basedowii* Hummock Grassland associations. The extent of the *Melaleuca*-dominated vegetation appears to correlate well with the Percival Paleovalley, with minor variations in floristics driven by

proximity to underlying geomorphological and groundwater features (i.e., low lying clay-pans, calcrete rises etc).

Those Vegetation Associations with a 'zero' area of occurrence within the DE are found wholly outside the DE. These Vegetation Associations do not have sufficient replication of quadrats (no quadrats in some cases as sites were described using relevés) and therefore have not been utilised in statistical analyses within this report.

Descriptions of Vegetation Associations are presented in Appendix 10.

Quadrat Site locations are presented in Figure 43 and quadrat data is presented in Appendix 11. GPS Track Logs are presented in Appendix 12.

### **5.3.11. Patch Analysis**

The Winu Development Envelope is a long and somewhat sinuous Study Area, extending from near the coast to some 183 km inland. It traverses three IBRA subregions (Pindarland subregion of Dampierland on the coast; McLarty and Mackay subregions of the Great Sandy Desert, inland). Accordingly, vegetation shows a clear association with these subregions across the DE from near the coast in the west to the Rimfire Borefield in the east. The DE is also narrow for much of its length, meaning vegetation associations are intersected in relatively small areas in comparison to the vast area of the McLarty and Mackay IBRA subregions in particular.

The majority of survey effort has been focussed within the DE and comparatively little has been assessed outside the DE to date. Consequently, an analysis of vegetation is biased to within the DE without significant external reference.

An indication of the resilience of each vegetation unit in light of various potential threats may be gained through interpretation of the number of patches (discrete mapped unit) and overall total area of each vegetation unit. A summary of these attributes for the 41 vegetation units (& sub-units) recorded within the DE is presented in Tables 18 and Table 19.

As an initial filter for examination of potential impacts, a criterion of 30% or greater representation within the DE was applied to determine the vegetation associations at most risk of significant proportional loss (acknowledging that vegetation mapping outside of the DE is relatively limited, and that in practice not all of the DE will be cleared in the implementation of the proposal).

A review of data presented within Table 18 shows:

- A clear regionalisation of vegetation associations, correlating with IBRA subregions from west (sub-coastal) to east (inland);

- Forty-one vegetation associations (and a further nine ‘sub-associations’) are recognised throughout the DE.
- Within the MIA, 15 vegetation units occur in 1 to 28 patches with areas from 0.1 ha to 1,950.7 ha;
- Within the Rimfire Borefield, all but one of the MIA vegetation associations are well represented with an additional 18 vegetation associations. These occur in 1 to 29 patches and range from 1.0 ha to 100 ha in area, with 17 of the 18 units only being found in this part of the Study Area;
- The road access corridor has 16 vegetation associations, of which one is present in the Rimfire Borefield, eight occurring in the MIA. Eight are only recorded in the RAC. These occur in 1 to 40 patches.

### **Assessment of Area of Occurrence (AOO) (ha) of Each Vegetation Association within the Development Envelope**

An analysis of the AOO of each vegetation association, Table 19, shows that:

- Based on data available to date, eight vegetation associations (19.5% of the vegetation associations within the DE) are sufficiently well mapped outside the DE to show a proposed impact of 30% or less on their AOOs from the Winu project.
  - Nine vegetation associations are known from 70% or greater area (ha) outside the DE. These are C2, P8, P15b, P4, P15a, PP10c, P20 and P14. These are considered well represented outside the DE.
  - Three vegetation mosaics (P1\_P14, P4+R1, P1+P18) are similarly known from 70% or greater area (ha) outside the DE. These are considered well represented outside the DE.
- By subtraction, 33 vegetation associations (80.5% of the vegetation associations within the DE) are therefore known from less than 70% of their respective AOOs outside the DE.
  - Seventeen vegetation associations are known from between 30% and 69% in area (ha) outside the DE and eight vegetation associations are known from less than 30% area (ha) outside the DE.
  - Three vegetation association mosaics (P1+D2, P1+P5, P4+R4 mosaics) are only known within the Rimfire Borefield and not mapped outside. However, the component units P1, D2, P4, P5 and R4 of the mosaics are all known separately



from outside the DE and it is only the small areas of the mosaic units that are not mapped outside. The R4 unit is only known from very small areas within and outside the Rimfire Borefield (1 patch, 0.2ha within and 1 patch, 0.1 ha outside).

- One association (R6) is known only from one patch of 75.9 ha in the Rimfire Borefield and is not mapped outside.

### **Assessment of Patches of Each Vegetation Association within the Development Envelope**

An analysis of patches of each vegetation association, Table 19, shows that:

- Based on data available to date, eight vegetation associations (C2, P20, P15a, P10c, C4, P14, P4 and R3) and one mosaic (P1+P14) occur sufficiently commonly outside the DE that 70% or more of their patches are known from outside the DE.
- By subtraction, 32 vegetation associations or mosaics do not have fewer than 30% of patches of each vegetation association within the proposed DE.

### **Summary and Regional Context**

The paucity of vegetation association areas and patches mapped outside the DE is considered simply an artefact of the focus of survey being within the DE to date.

Given the large areas, and relatively uniformity at a large-scale of the IBRA subregions of the Great Sandy Desert (GSD), and the relatively narrow alignments and small area assessed as part of the DE compared to the area of the broader GSD, it is expected that all vegetation associations will be found to be more widely distributed and occupying significantly greater area in numerous patches outside the DE.

**Table 18. Number of Patches and Areas of Vegetation Associations within the Development Envelope**

| Vegetation Association |                        | Mine Infrastructure Area |         |      | Rimfire Borefield |        |       | Road Access Corridor |       |      | Outside Development Envelope |        |      |
|------------------------|------------------------|--------------------------|---------|------|-------------------|--------|-------|----------------------|-------|------|------------------------------|--------|------|
| Code                   | Total Mapped Area (ha) | Patches                  | Area    |      | Patches           | Area   |       | Patches              | Area  |      | Patches                      | Area   |      |
|                        |                        |                          | (ha)    | %    |                   | (ha)   | %     |                      | (ha)  | %    |                              | (ha)   | %    |
| C4                     | 378.6                  | 1                        | 137.6   | 36.3 |                   |        |       | 1                    | 8.1   | 2.1  | 7                            | 232.9  | 61.5 |
| D1                     | 2999.9                 | 11                       | 1,950.7 | 65.0 | 1                 | 0.5    | 0.02  |                      |       |      | 22                           | 1048.7 | 35.0 |
| D2                     | 3449.9                 | 10                       | 615.9   | 17.9 | 24                | 447.4  | 13.0  | 3                    | 35.7  | 1.0  | 55                           | 2350.9 | 68.1 |
| P1                     | 10725.0                | 25                       | 4,156.2 | 38.8 | 25                | 2233.3 | 20.8  | 11                   | 433.8 | 4.0  | 112                          | 3901.7 | 36.4 |
| P10c                   | 1844.7                 | 1                        | 30.1    | 1.6  | 3                 | 54.7   | 3.0   | 8                    | 338.8 | 18.4 | 49                           | 1421.1 | 77.0 |
| P14                    | 1099.0                 | 2                        | 19.0    | 1.7  | 16                | 298.6  | 27.2  |                      |       |      | 51                           | 781.4  | 71.1 |
| P15b                   | 86.5                   | 1                        | 18.8    | 21.7 |                   |        |       |                      |       |      | 2                            | 67.7   | 78.3 |
| P2                     | 6045.0                 | 28                       | 1,272.4 | 21.0 | 11                | 234.7  | 3.9   | 11                   | 470.9 | 7.8  | 102                          | 4067.0 | 67.3 |
| P2+P3                  | 141.8                  | 1                        | 0.1     | 0.3  | 4                 | 49.6   | 35.0  |                      |       |      | 5                            | 92.0   | 64.9 |
| P3                     | 3113.6                 | 16                       | 644.9   | 20.7 | 25                | 642.6  | 20.6  | 2                    | 65.2  | 2.1  | 64                           | 1760.8 | 56.6 |
| P4                     | 3325.0                 | 6                        | 324.9   | 9.8  | 15                | 396.8  | 11.9  |                      |       |      | 55                           | 2603.3 | 78.3 |
| P5                     | 551.9                  | 10                       | 540.6   | 98.0 | 1                 | 10.7   | 1.9   |                      |       |      | 1                            | 0.6    | 0.1  |
| P6                     | 221.4                  | 2                        | 59.9    | 27.0 | 1                 | 43.7   | 19.7  | 1                    | 0.1   | 0.05 | 9                            | 117.7  | 53.2 |
| R1                     | 641.7                  | 3                        | 146.1   | 22.8 | 8                 | 87.6   | 13.7  |                      |       |      | 15                           | 407.9  | 63.6 |
| R2                     | 1870.8                 | 16                       | 189.5   | 10.1 | 29                | 1205.5 | 64.4  |                      |       |      | 38                           | 475.8  | 25.4 |
| C2                     | 1448.8                 |                          |         |      | 2                 | 14.6   | 1.0   |                      |       |      | 20                           | 1434.2 | 99.0 |
| P1+D2                  | 2.6                    |                          |         |      | 1                 | 2.6    | 100.0 |                      |       |      | 0                            | 0.0    | 0.0  |
| P1+P14                 | 37.0                   |                          |         |      | 1                 | 5.3    | 14.3  |                      |       |      | 3                            | 31.7   | 85.7 |
| P1+P18                 | 38.9                   |                          |         |      | 1                 | 8.1    | 20.7  |                      |       |      | 1                            | 30.8   | 79.3 |
| P1+P4                  | 15.3                   |                          |         |      | 2                 | 7.2    | 47.0  |                      |       |      | 2                            | 8.1    | 53.0 |
| P1+P5                  | 86.8                   |                          |         |      | 1                 | 86.8   | 100.0 |                      |       |      | 0                            | 0      | 0    |

| Vegetation Association |                        | Mine Infrastructure Area |      |   | Rimfire Borefield |       |       | Road Access Corridor |        |      | Outside Development Envelope |        |      |
|------------------------|------------------------|--------------------------|------|---|-------------------|-------|-------|----------------------|--------|------|------------------------------|--------|------|
| Code                   | Total Mapped Area (ha) | Patches                  | Area |   | Patches           | Area  |       | Patches              | Area   |      | Patches                      | Area   |      |
|                        |                        |                          | (ha) | % |                   | (ha)  | %     |                      | (ha)   | %    |                              | (ha)   | %    |
| P15a                   | 221.1                  |                          |      |   | 3                 | 49.4  | 22.3  |                      |        |      | 13                           | 171.7  | 77.7 |
| P16                    | 20.8                   |                          |      |   | 1                 | 13.7  | 66.0  |                      |        |      | 1                            | 7.0    | 34.0 |
| P18                    | 474.6                  |                          |      |   | 10                | 192.0 | 40.4  |                      |        |      | 14                           | 282.6  | 59.6 |
| P19                    | 319.5                  |                          |      |   | 3                 | 243.1 | 76.1  |                      |        |      | 4                            | 76.4   | 23.9 |
| P2+P14                 | 16.5                   |                          |      |   | 1                 | 11.4  | 69.0  |                      |        |      | 1                            | 5.1    | 31.0 |
| P4+R1                  | 10.0                   |                          |      |   | 1                 | 2.1   | 20.6  |                      |        |      | 1                            | 7.9    | 79.4 |
| P4+R4                  | 1.5                    |                          |      |   | 1                 | 1.5   | 100.0 |                      |        |      | 0                            | 0      | 0    |
| R2+P3                  | 133.7                  |                          |      |   | 5                 | 133.4 | 99.7  |                      |        |      | 3                            | 0.3    | 0.3  |
| R3                     | 3113.7                 |                          |      |   | 2                 | 17.6  | 0.6   | 36                   | 1657.1 |      | 89.0                         | 1439.1 | 46.2 |
| R6                     | 75.9                   |                          |      |   | 1                 | 75.9  | 100.0 |                      |        |      | 0                            | 0      | 0    |
| P20                    | 921.3                  |                          |      |   | 5                 | 248.5 | 27.0  |                      |        |      | 22                           | 672.8  | 73.0 |
| D3                     | 260.7                  |                          |      |   | 18                | 81.1  | 31.1  |                      |        |      | 20                           | 179.6  | 68.9 |
| P10a                   | 526.8                  |                          |      |   |                   |       |       | 5                    | 71.6   | 13.6 | 3                            | 455.2  | 86.4 |
| P10b                   | 342.6                  |                          |      |   |                   |       |       | 3                    | 324.5  | 94.7 | 5                            | 18.1   | 5.3  |
| P11                    | 1975.1                 |                          |      |   |                   |       |       | 40                   | 916.7  | 46.4 | 57                           | 1058.4 | 53.6 |
| P12                    | 164.3                  |                          |      |   |                   |       |       | 10                   | 143.2  | 87.2 | 16                           | 21.1   | 12.8 |
| P13                    | 942.2                  |                          |      |   |                   |       |       | 17                   | 624.5  | 66.3 | 37                           | 317.7  | 33.7 |
| P8                     | 5143.2                 |                          |      |   |                   |       |       | 18                   | 919.1  | 17.9 | 37                           | 4224.2 | 82.1 |
| P9                     | 731.9                  |                          |      |   |                   |       |       | 22                   | 532.5  | 72.8 | 35                           | 199.3  | 27.2 |
| R4                     | 0.2                    |                          |      |   |                   |       |       | 1                    | 0.2    | 74.4 | 1                            | 0.1    | 25.6 |



**Table 19. Number of Patches and Areas of Vegetation Associations within the Development Envelope Sorted In Order of Decreasing Representation Outside the DE**

| Vegetation Association |                           | Mine Infrastructure Area |          |      | Rimfire Borefield |        |      | Road Access Corridor |        |      | Outside Development Envelope |                            |        |      |
|------------------------|---------------------------|--------------------------|----------|------|-------------------|--------|------|----------------------|--------|------|------------------------------|----------------------------|--------|------|
| Code <sup>17</sup>     | Total Mapped Area<br>(ha) | Number of Patches        | Area     |      | Number of Patches | Area   |      | Number of Patches    | Area   |      | Number of Patches            | % of <sup>18</sup> Patches | Area   |      |
|                        |                           |                          | (ha)     | %    |                   | (ha)   | %    |                      | (ha)   | %    |                              |                            | (ha)   | %    |
| C2                     | 1448.8                    |                          |          |      | 2                 | 14.6   | 1    |                      |        |      | 20                           | 91%                        | 1434.2 | 99   |
| P20                    | 921.3                     |                          |          |      | 5                 | 248.5  | 27   |                      |        |      | 22                           | 81%                        | 672.8  | 73   |
| P15a                   | 221.1                     |                          |          |      | 3                 | 49.4   | 22.3 |                      |        |      | 13                           | 81%                        | 171.7  | 77.7 |
| P10c                   | 1844.7                    | 1                        | 30.1     | 1.6  | 3                 | 54.7   | 3    | 8                    | 338.8  | 18.4 | 49                           | 80%                        | 1421.1 | 77   |
| C4                     | 378.6                     | 1                        | 137.6    | 36.3 |                   |        |      | 1                    | 8.1    | 2.1  | 7                            | 78%                        | 232.9  | 61.5 |
| P1+P14                 | 37                        |                          |          |      | 1                 | 5.3    | 14.3 |                      |        |      | 3                            | 75%                        | 31.7   | 85.7 |
| P14                    | 1099                      | 2                        | 19       | 1.7  | 16                | 298.6  | 27.2 |                      |        |      | 51                           | 74%                        | 781.4  | 71.1 |
| P4                     | 3325                      | 6                        | 324.9    | 9.8  | 15                | 396.8  | 11.9 |                      |        |      | 55                           | 72%                        | 2603.3 | 78.3 |
| R3                     | 3113.7                    |                          |          |      | 2                 | 17.6   | 0.6  | 36                   | 1657.1 |      | 89                           | 70%                        | 1439.1 | 46.2 |
| P6                     | 221.4                     | 2                        | 59.9     | 27   | 1                 | 43.7   | 19.7 | 1                    | 0.1    | 0.05 | 9                            | 69%                        | 117.7  | 53.2 |
| P13                    | 942.2                     |                          |          |      |                   |        |      | 17                   | 624.5  | 66.3 | 37                           | 69%                        | 317.7  | 33.7 |
| P8                     | 5143.2                    |                          |          |      |                   |        |      | 18                   | 919.1  | 17.9 | 37                           | 67%                        | 4224.2 | 82.1 |
| P2                     | 6045                      | 28                       | 1,272.40 | 21   | 11                | 234.7  | 3.9  | 11                   | 470.9  | 7.8  | 102                          | 67%                        | 4067   | 67.3 |
| P15b                   | 86.5                      | 1                        | 18.8     | 21.7 |                   |        |      |                      |        |      | 2                            | 67%                        | 67.7   | 78.3 |
| P1                     | 10725                     | 25                       | 4,156.20 | 38.8 | 25                | 2233.3 | 20.8 | 11                   | 433.8  | 4    | 112                          | 65%                        | 3901.7 | 36.4 |
| D1                     | 2999.9                    | 11                       | 1,950.70 | 65   | 1                 | 0.5    | 0.02 |                      |        |      | 22                           | 65%                        | 1048.7 | 35   |
| P10b                   | 342.6                     |                          |          |      |                   |        |      | 3                    | 324.5  | 94.7 | 5                            | 63%                        | 18.1   | 5.3  |
| P12                    | 164.3                     |                          |          |      |                   |        |      | 10                   | 143.2  | 87.2 | 16                           | 62%                        | 21.1   | 12.8 |

<sup>17</sup> Yellow shading in column “Vegetation Association Code” indicates a vegetation association mosaic<sup>18</sup> Outside Development Envelope columns: Green shading = Less than 30% Impacts from Winu DE; Orange = 30 to 70% impacts from Winu DE; Pale Brown = 70% or greater from Winu DE.

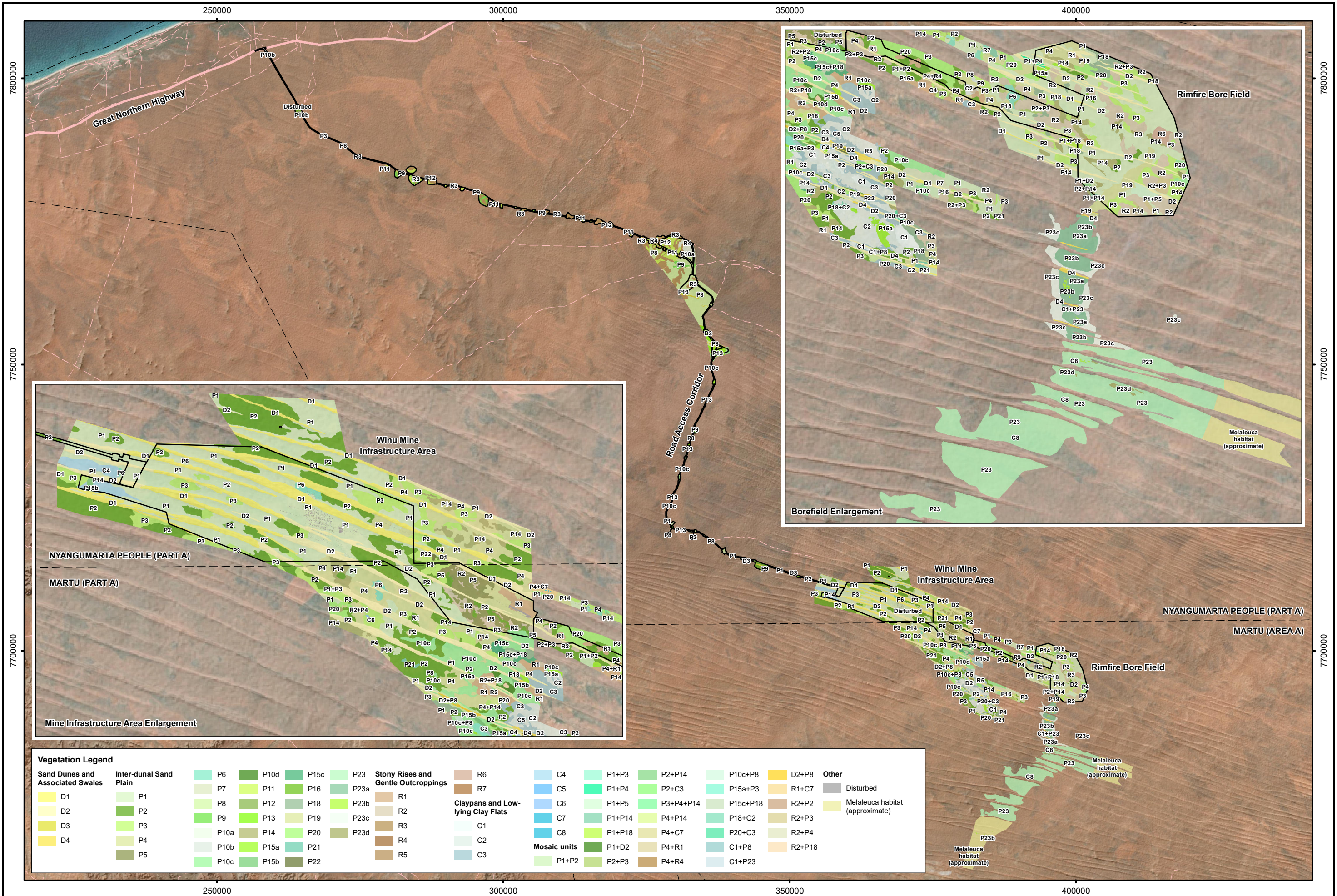
| Vegetation Association |                           | Mine Infrastructure Area |       |      | Rimfire Borefield |        |      | Road Access Corridor |       |      | Outside Development Envelope |                            |        |      |
|------------------------|---------------------------|--------------------------|-------|------|-------------------|--------|------|----------------------|-------|------|------------------------------|----------------------------|--------|------|
| Code <sup>17</sup>     | Total Mapped Area<br>(ha) | Number of Patches        | Area  |      | Number of Patches | Area   |      | Number of Patches    | Area  |      | Number of Patches            | % of Patches <sup>18</sup> | Area   |      |
|                        |                           |                          | (ha)  | %    |                   | (ha)   | %    |                      | (ha)  | %    |                              |                            | (ha)   | %    |
| P9                     | 731.9                     |                          |       |      |                   |        |      | 22                   | 532.5 | 72.8 | 35                           | 61%                        | 199.3  | 27.2 |
| P3                     | 3113.6                    | 16                       | 644.9 | 20.7 | 25                | 642.6  | 20.6 | 2                    | 65.2  | 2.1  | 64                           | 60%                        | 1760.8 | 56.6 |
| D2                     | 3449.9                    | 10                       | 615.9 | 17.9 | 24                | 447.4  | 13   | 3                    | 35.7  | 1    | 55                           | 60%                        | 2350.9 | 68.1 |
| P11                    | 1975.1                    |                          |       |      |                   |        |      | 40                   | 916.7 | 46.4 | 57                           | 59%                        | 1058.4 | 53.6 |
| P18                    | 474.6                     |                          |       |      | 10                | 192    | 40.4 |                      |       |      | 14                           | 58%                        | 282.6  | 59.6 |
| R1                     | 641.7                     | 3                        | 146.1 | 22.8 | 8                 | 87.6   | 13.7 |                      |       |      | 15                           | 58%                        | 407.9  | 63.6 |
| P19                    | 319.5                     |                          |       |      | 3                 | 243.1  | 76.1 |                      |       |      | 4                            | 57%                        | 76.4   | 23.9 |
| D3                     | 260.7                     |                          |       |      | 18                | 81.1   | 31.1 |                      |       |      | 20                           | 53%                        | 179.6  | 68.9 |
| P4+R1                  | 10                        |                          |       |      | 1                 | 2.1    | 20.6 |                      |       |      | 1                            | 50%                        | 7.9    | 79.4 |
| P1+P18                 | 38.9                      |                          |       |      | 1                 | 8.1    | 20.7 |                      |       |      | 1                            | 50%                        | 30.8   | 79.3 |
| P2+P3                  | 141.8                     | 1                        | 0.1   | 0.3  | 4                 | 49.6   | 35   |                      |       |      | 5                            | 50%                        | 92     | 64.9 |
| P1+P4                  | 15.3                      |                          |       |      | 2                 | 7.2    | 47   |                      |       |      | 2                            | 50%                        | 8.1    | 53   |
| P16                    | 20.8                      |                          |       |      | 1                 | 13.7   | 66   |                      |       |      | 1                            | 50%                        | 7      | 34   |
| P2+P14                 | 16.5                      |                          |       |      | 1                 | 11.4   | 69   |                      |       |      | 1                            | 50%                        | 5.1    | 31   |
| R4                     | 0.2                       |                          |       |      |                   |        |      | 1                    | 0.2   | 74.4 | 1                            | 50%                        | 0.1    | 25.6 |
| R2                     | 1870.8                    | 16                       | 189.5 | 10.1 | 29                | 1205.5 | 64.4 |                      |       |      | 38                           | 46%                        | 475.8  | 25.4 |
| P10a                   | 526.8                     |                          |       |      |                   |        |      | 5                    | 71.6  | 13.6 | 3                            | 38%                        | 455.2  | 86.4 |
| R2+P3                  | 133.7                     |                          |       |      | 5                 | 133.4  | 99.7 |                      |       |      | 3                            | 38%                        | 0.3    | 0.3  |
| P5                     | 551.9                     | 10                       | 540.6 | 98   | 1                 | 10.7   | 1.9  |                      |       |      | 1                            | 8%                         | 0.6    | 0.1  |
| P1+D2                  | 2.6                       |                          |       |      | 1                 | 2.6    | 100  |                      |       |      | 0                            | 0%                         | 0      | 0    |
| P1+P5                  | 86.8                      |                          |       |      | 1                 | 86.8   | 100  |                      |       |      | 0                            | 0%                         | 0      | 0    |
| P4+R4                  | 1.5                       |                          |       |      | 1                 | 1.5    | 100  |                      |       |      | 0                            | 0%                         | 0      | 0    |
| R6                     | 75.9                      |                          |       |      | 1                 | 75.9   | 100  |                      |       |      | 0                            | 0%                         | 0      | 0    |





**Figure 41. Overview Map of Vegetation Associations Occurring across the Winu Project.**







**Figure 42. Vegetation Mapping Legend**



## Legend

### Sand Dunes and Associated Swales

- D1 - *Corymbia chippendalei* Low Open Woodland over *Triodia schinzii*
- D2 - *Owenia reticulata* Scattered Low Trees over *Triodia schinzii*
- D3 - *Grevillea stenobotrya*, *Grevillea wickhamii* and *Acacia anaticeps* Tall Shrubland over *Triodia schinzii*
- D4 - *Melaleuca lasiandra* Open Low Shrubland over *Triodia schinzii*

### Inter-dunal Sand Plain

- P1 - *Acacia platycarpa* (*Acacia tumida* var. *kulparn*) Open Low Shrubland over *Triodia schinzii*
- P2 - *Acacia ancistrocarpa* Open Shrubland over *Triodia schinzii*
- P3 - *Acacia drepanocarpa* subsp. *latifolia* Open Shrubland over *Triodia schinzii*
- P4 - *Acacia orthocarpa* Open Shrubland over *Triodia schinzii*
- P5 - *Acacia* spp. Scattered Shrubs over *Triodia schinzii*
- P6 - *Owenia reticulata* and *Erythrophleum chlorostachys* Scattered Low Trees over *Triodia schinzii* (*Triodia epactia*)
- P7 - *Calytrix carinata* Low Shrubland over *Triodia schinzii*
- P8 - *Acacia eriopoda* and *Acacia sericophylla* Open Shrubland over *Triodia schinzii* (*Triodia epactia*)
- P9 - *Acacia ancistrocarpa* and *Acacia monticola* Open Shrubland over *Triodia schinzii* (*Triodia epactia*)
- P10a - *Corymbia zygophylla* Scattered Tree Mallees over *Triodia epactia*
- P10b - *Corymbia zygophylla* Scattered Tree Mallees over *Triodia schinzii* and *Triodia epactia* (*Acacia stellaticeps*)
- P10c - *Corymbia zygophylla* Scattered Tree Mallees over *Triodia schinzii*
- P10d - *Corymbia zygophylla* Scattered Tree Mallees over *Triodia brizoides*
- P11 - *Grevillea refracta* (*Acacia ancistrocarpa* and *Acacia monticola*) Scattered Tall Shrubs over *Triodia epactia*
- P12 - *Grevillea refracta*, *Acacia monticola* and *Acacia colei* var. *colei* Open Shrubland over *Acacia adoxa* var. *adoxo* and *Triodia epactia*
- P13 - *Gardenia pyrifolia* subsp. *keartlandii* Scattered Low Trees over *Triodia schinzii*
- P14 - *Acacia monticola* and *Acacia drepanocarpa* (*Acacia orthocarpa* and *Acacia ancistrocarpa*) Open Shrubland over *Triodia schinzii*
- P15a - *Corymbia candida* Open Low Woodland over *Triodia schinzii*
- P15b - *Corymbia candida* Open Low Woodland over *Acacia monticola* shrubland over *Triodia epactia*
- P15c - *Corymbia candida* Open Low Woodland over *Triodia brizoides*
- P16 - *Eucalyptus odontocarpa* Very Open Shrub Mallee over *Triodia schinzii*
- P18 - *Corymbia opaca* Open Woodland over *Triodia schinzii*
- P19 - *Melaleuca lasiandra* Low Open Shrubland over *Triodia schinzii*
- P20 - *Acacia ancistrocarpa* and *Acacia orthocarpa* Open Shrubland over *Triodia schinzii* and *Triodia epactia*
- P21 - *Acacia sericophylla* Open Shrubland over *Triodia schinzii*
- P22 - *Acacia stipuligera* Open Shrubland over *Triodia schinzii*

### Stony Rises and Gentle Outcroppings

- R1 - *Acacia bivenosa* (*Acacia ancistrocarpa*) Scattered Shrubs *Triodia brizoides* (*Triodia schinzii*)
- R2 - *Grevillea wickhamii* Scattered Tall Shrubs over *Mirbelia viminalis* (*Acacia hilliana*) and *Triodia brizoides* (*Triodia epactia*)
- R3 - *Acacia hilliana* (*Acacia adoxa* var. *adoxo*) Low Open Shrubland over *Triodia epactia*
- R4 - *Ficus brachypoda* Scattered Low Trees over *Acacia monticola*, *Grevillea pyramidalis* and *Triodia epactia*
- R5 - *Senna artemisioides* subsp. *oligophylla*, *Senna sericea* (*Acacia bivenosa*) Scattered Low Shrubs over *Triodia epactia* (*Aristida contorta*, *Dactyloctenium radulans*)
- R6 - *Grevillea wickhamii*, *Acacia monticola* and *Acacia ancistrocarpa* Open Shrubland over *Triodia epactia*

### Claypans and Low-lying Clay Flats

- C1 - *Eucalyptus victrix* Open Woodland over *Triodia epactia*
- C2 - *Acacia bivenosa* Scattered Low Shrubs over *Triodia brizoides* and *Triodia epactia* (*Triodia schinzii*)
- C3 - *Acacia bivenosa* (*Acacia stellaticeps*) Low Shrubland over *Triodia epactia*
- C4 - *Acacia ancistrocarpa* Open Low Shrubland over *Eulalia aurea* and *Triodia epactia*
- C5 - Clay-Pan Playa (*Diplachne fusca* subsp. *muelleri*, *Eragrostis falcata*) with Scattered Herbs
- C6 - Clay-Pan (*Cullen pustulatum*, *Gossypium australe*) over *Eulalia aurea* (*Eragrostis xerophila*)

### Other

- Disturbed - Cleared or disturbed vegetation



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Rev: A A4

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## Consolidated Detailed Flora & Vegetation Assessment of the Winu Project, June 2026 Vegetation Mapping Legend

**Figure 43. Consolidated Quadrat Site Locations of the Winu Project**







### **5.3.12. Vegetation Condition**

The Condition of the vegetation across the Winu Project is considered mostly Excellent (i.e., Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement). The exceptions are cleared access tracks, drill pads and existing infrastructure areas which are considered Disturbed (EPA 2016b).

Consolidated Vegetation Condition across the Winu Project is presented in Figure 44.

### **5.3.13. Fire**

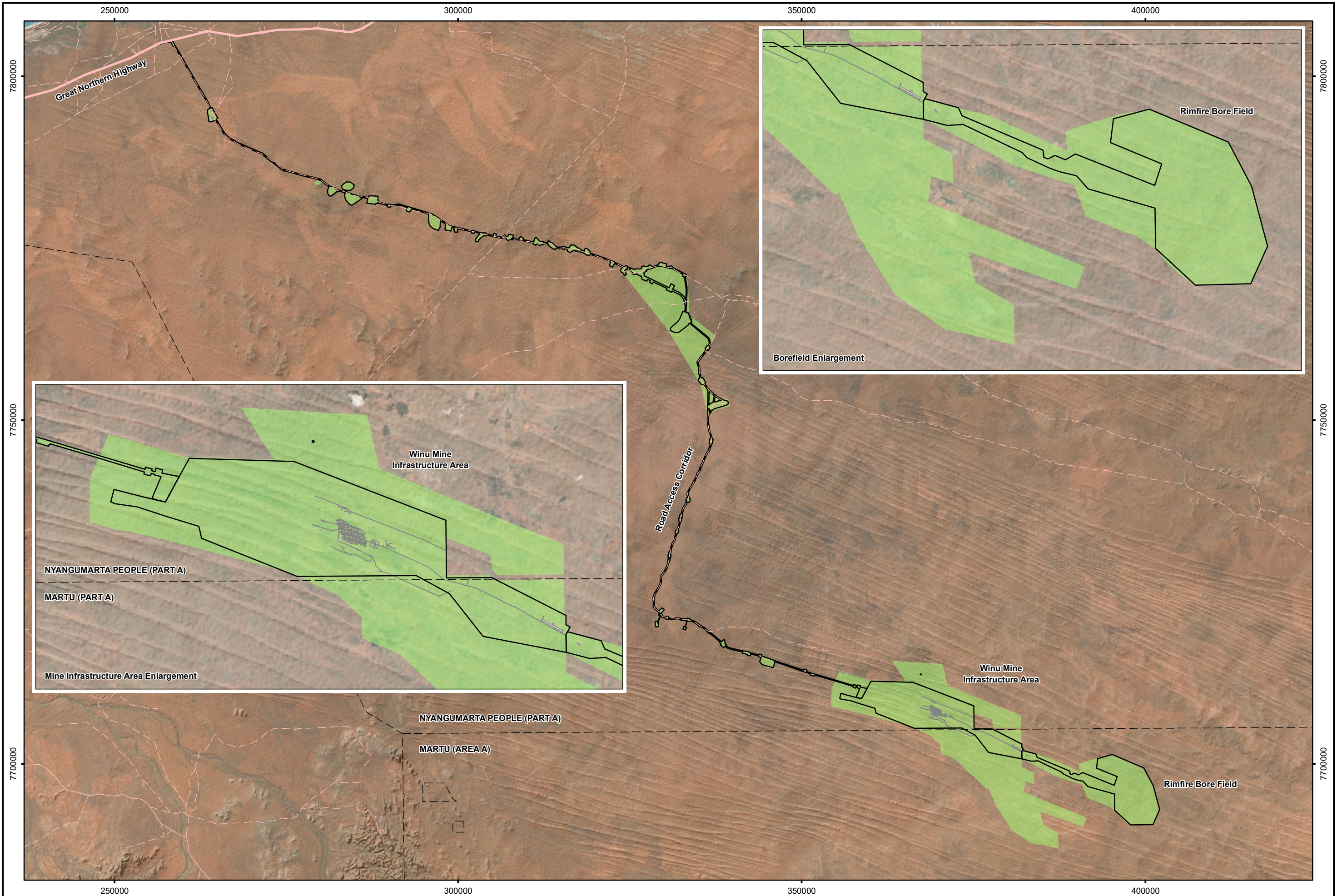
Fires play a major role in shaping vegetation communities. The Great Sandy Desert is subject to frequent fire events. According to regional fire data, the majority of Winu Project has been burnt at least once in the last decade, with some areas burnt as many as four times. As discussed in Biota (2021), this has resulted in alternative species compositions during early survey work, and difficulties with floristic sampling. Fire disturbance prevented some areas being effectively investigated during some survey trips, which was remedied in subsequent surveys following sufficient time for vegetation recovery post-fire.

Regional fire frequency (2014-2024) is presented in Figure 45.

**Figure 44. Vegetation Condition of the Winu Project**



Image Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community



|                           |                     |
|---------------------------|---------------------|
| <b>Legend</b>             |                     |
| Winu Development Envelope | Excellent Condition |
| Disturbed                 | Principal Road      |
|                           | Minor Road          |
|                           | Track               |

0 5 10km  
Scale: 1:500,000  
MGA94 (Zone 51)  
Ref: a2923\_WB25\_08\_14\_01  
Date: Jul 2026 | Rev: A | A3

Author: J. Paterson | WB Ref:  
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**Consolidated Detailed Flora & Vegetation  
Assessment of the Winu Project, June 2026**

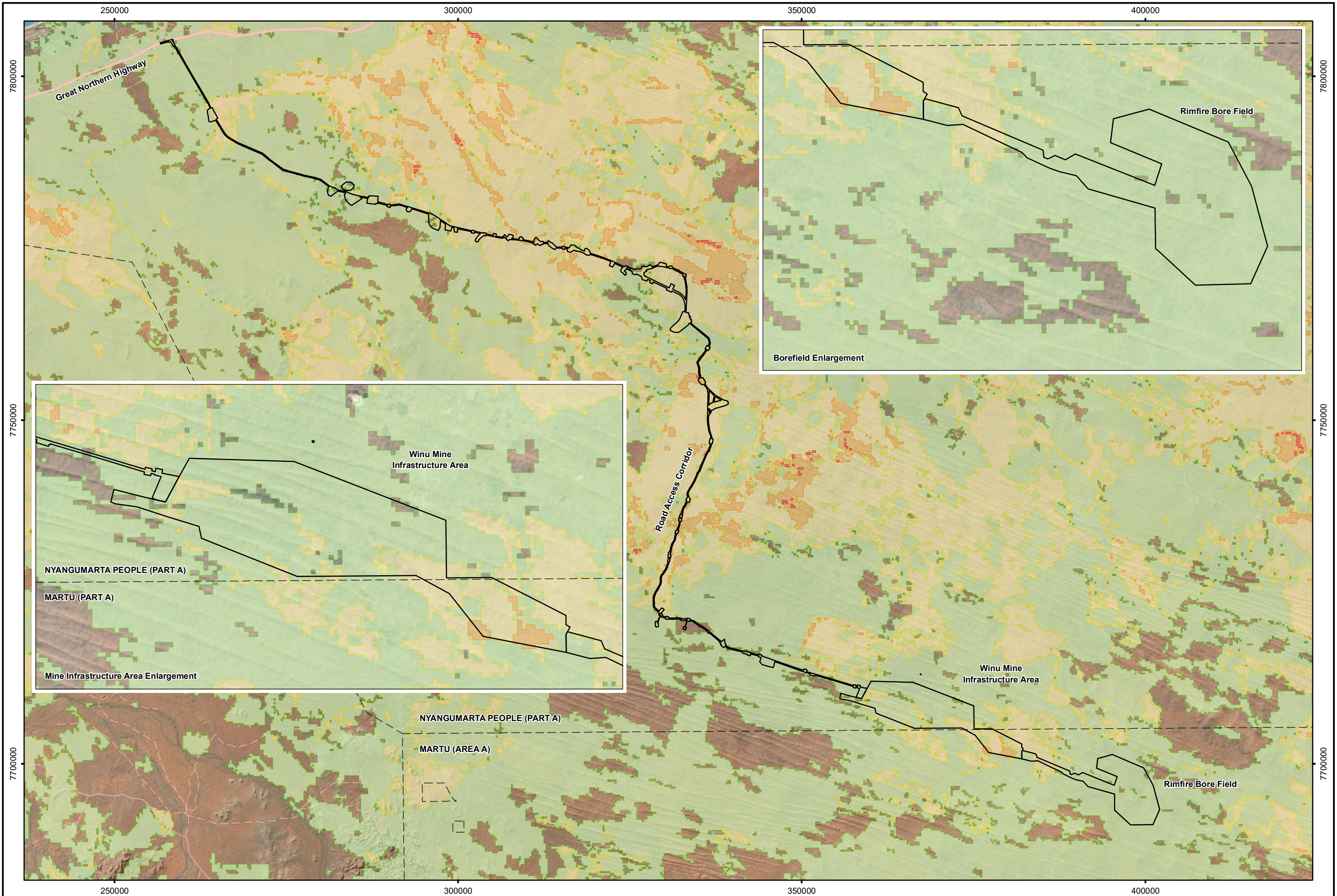
**Vegetation Condition**

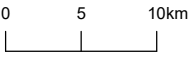


**Figure 45. Regional Fire Frequency (2014-2024).**



Image Source: Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community



|                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                       |                                                                                       |                                                                                                                                                                                          |                                                                                                                                                                                                                      |                                                                                                                   |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--|
| <b>Legend</b>                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                       |  | <br>Scale: 1:500,000<br>MGA94 (Zone 51)<br>Ref: a2923_WB25_08_16_01<br>Date: Jul 2026   Rev: A   A3 | <br>Author: J. Paterson   WB Ref:<br>Drawn: CAD Resources ~ www.cadresources.com.au<br>Tel: (08) 9246 3242 ~ Fax (08) 9246 3202 | <b>Consolidated Detailed Flora &amp; Vegetation<br/>Assessment of the Winu Project, June 2026<br/>Burnt Areas</b> |  |
|  Winu Development Envelope                                                                                                                                                                                     | <b>Last 10 Yrs Fire Frequency (NAFI)</b>                                                                                                                                                              |                                                                                       |                                                                                                                                                                                          |                                                                                                                                                                                                                      |                                                                                                                   |  |
|  Burnt 4 times<br> Burnt 3 times                                                                                            |  Burnt 2 times<br> Burnt 1 time |                                                                                       |                                                                                                                                                                                          |                                                                                                                                                                                                                      |                                                                                                                   |  |
|  Principal Road<br> Minor Road<br> Track |                                                                                                                                                                                                       |                                                                                       |                                                                                                                                                                                          |                                                                                                                                                                                                                      |                                                                                                                   |  |



### 5.3.14. Priority Ecological Communities

An ecological community is defined as a naturally occurring biological assemblage that occurs in a particular type of habitat (Department of Environment and Conservation 2013). A Threatened Ecological Community (TEC) is one that is categorised as being either “presumed totally destroyed”, “critically endangered”, “endangered”, or “vulnerable”.

No TECs were found within the Winu Project Area. While one TEC was identified in the desktop assessment, Mandora Mounds - Assemblages of the organic springs and mound springs of Walyarta (Mandora Marsh) area, none of the Vegetation encountered within the Winu Project match its description.

Priority Ecological Communities (PEC) are defined as possibly Threatened Ecological Communities that do not meet survey criteria or that are not adequately defined due to lack of knowledge. They are ranked in order of priority based on their frequency and extent (Priority 1, 2 and 3), and the likelihood of becoming threatened in the future (Priority 4 and 5).

No PECs were found within the Winu Project Area. While five PECs were identified in the desktop assessment; i) Salt Creek – Inland mangroves community of Salt Creek; ii) Mandora Land System; iii) Lime Land System; iv) Roebuck Land System and v) Eighty Mile Land System; none of the Vegetation encountered within the Winu Project match their descriptions.

### 5.3.15. Groundwater-Dependant Ecosystems (GDE)

Groundwater-dependent ecosystems (GDEs) are defined as ‘ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystems services’ (Richardson et al., 2011). Previous remote sensing studies have suggested that no GDEs occur across the Winu Project (Naaykens 2020), and that surface water features consist predominantly of ephemeral soaks.

Vegetation mapping initially flagged the possibility that one area of vegetation unit P19 (*Melaleuca lasiandra* Shrubland over *Triodia schinzii*) recorded in the Rimfire Borefield area may have been groundwater dependent. This particular area of P19 is located on a relatively elevated northern branch of the Percival Palaeovalley and hydrogeological investigations, which are ongoing, have indicated a depth to groundwater in a central location of the vegetation unit to be 10 metres (Rio Tinto pers. comm.). Coupled with the understanding that *Melaleuca lasiandra* is not typically recognised as a significant GDE indicator (Mattiske 2019), this area of vegetation unit P19 is likely not a potential GDE, (Brimbox *et. al.*, 2022). Other areas of P19 that occur within and outside the Rimfire Borefield area are not associated with the Percival Palaeovalley.

The topography dips along the branch of the Percival Palaeovalley south of vegetation unit P19. An historic bore located in the palaeovalley south of the Development Envelope has indicated a shallow water table 10m below the surface (Rio Tinto pers. comm.). The bore is within an area mapped as vegetation unit P23a, which includes *Melaleuca glomerata* and *Eucalyptus victrix*



(Western Botanical 2025c). This apparent water table is within the rooting depth of both dominant genera, *Melaleuca* and *Eucalyptus* and the coincidence of these species over a shallow depth to groundwater is suggestive of a GDE.

Depth to groundwater surrounding the MIA is typically more than 50 m below ground level (mbgl) (Golder 2022, as cited in Rio Tinto Winu Pty Ltd, 2023). At this stage, connectivity between the Percival Palaeovalley shallow aquifer and the broader, deep groundwater system is not well characterised.

### 5.3.16. Statistical Analysis

Statistical analyses were conducted to assess the designation of Vegetation Associations across the Winu Project based on the field data obtained to June 2026. An iterative approach was employed to assess the effects of excluding annual species and singleton sites on the clustering of sites (floristic groups). The analysis will be re-run on the slightly extended data set following the processing and upload of field data from surveys undertaken between March and June 2026.

Initial analyses incorporated all quadrat site data collected over the history of the Project (including relevant AREH sites located within the Development Envelope). In order to reduce noise from the large number of quadrat sites (n=159), statistical analyses were partitioned with discrete runs conducted for respective landform groups. All analyses were performed using both cover value (CV) and presence/absence (PA) data.

Taxonomically similar species, and collections of taxa unable to be identified to subspecies level were respectively merged or simplified to species level or removed. A list of all referred species names is presented in Table 20. Parameters for analyses and associated Stress Values are presented in Table 21.

**Table 20. Species Name Conversions for Statistical Analysis**

| Species                                                  | Referred name / Status                                | Quadrat Site |
|----------------------------------------------------------|-------------------------------------------------------|--------------|
| ? <i>Achyranthes aspera</i>                              | <i>Achyranthes aspera</i>                             | WIN040-P8    |
| ? <i>Amphipogon sericeus</i>                             | <i>Amphipogon sericeus</i>                            | WIN103-P19   |
| ? <i>Digitaria brownii</i>                               | <i>Digitaria brownii</i>                              | WIN054-R4    |
| ? <i>Euphorbia</i> sp. Indet                             | Removed                                               | WIN101-C3    |
| ? <i>Lysiandra eremica</i>                               | <i>Lysiandra eremica</i>                              | WIN037-P2    |
| <i>Abutilon</i> sp.                                      | Removed                                               | WIN085-P15a  |
| <i>Acacia</i> ? <i>drepanocarpa</i>                      | <i>Acacia drepanocarpa</i> subsp. <i>drepanocarpa</i> | WIN005-C4    |
| <i>Acacia</i> ? <i>drepanocarpa</i> × <i>trachycarpa</i> | <i>Acacia drepanocarpa</i> subsp. <i>drepanocarpa</i> | WIN036-P3    |
| <i>Acacia</i> ? <i>melleodora</i>                        | <i>Acacia melleodora</i>                              | WIN037-P2    |
| <i>Acacia colei</i> var. <i>colei</i>                    | <i>Acacia colei</i>                                   |              |
| <i>Acacia platycarpa</i> 'Desert Form Non-Pruinose'      | <i>Acacia platycarpa</i>                              |              |
| <i>Acacia platycarpa</i> 'Desert Form Pruinose'          | <i>Acacia platycarpa</i>                              |              |
| <i>Amphipogon sericeus</i> (non-hairy form)              | <i>Amphipogon sericeus</i>                            |              |
| <i>Aristida</i> sp.                                      | Removed                                               | WIN001-D2    |

| <i>Species</i>                                          | <i>Referred name / Status</i>                          | <i>Quadrat Site</i> |
|---------------------------------------------------------|--------------------------------------------------------|---------------------|
| <i>Arivela ?microphylla</i>                             | <i>Arivela microphylla</i>                             | WIN046-D3           |
| <i>Boerhavia ?gardneri</i>                              | <i>Boerhavia gardneri</i>                              |                     |
| <i>Boerhavia ?repleta</i>                               | <i>Boerhavia gardneri</i>                              |                     |
| <i>Bonamia ?alatisemina</i>                             | <i>Bonamia alatisemina</i>                             | WIN100-P14          |
| <i>Clerodendrum floribundum</i>                         | <i>Clerodendrum</i> sp.                                |                     |
| <i>Clerodendrum floribundum</i> var. <i>floribundum</i> | <i>Clerodendrum</i> sp.                                |                     |
| <i>Clerodendrum</i> sp. Indet.                          | <i>Clerodendrum</i> sp.                                |                     |
| <i>Clerodendrum tomentosum</i>                          | <i>Clerodendrum</i> sp.                                |                     |
| <i>Clerodendrum tomentosum</i> var? <i>tomentosum</i>   | <i>Clerodendrum</i> sp.                                |                     |
| <i>Corchorus sidoides</i> subsp. <i>sidoides</i>        | <i>Corchorus sidoides</i>                              |                     |
| <i>Corchorus sidoides</i> subsp. <i>vermicularis</i>    | <i>Corchorus sidoides</i>                              |                     |
| <i>Corymbia</i> sp. 'Ring stems'                        | <i>Corymbia zygophylla</i>                             | WIN093-P16          |
| <i>Cullen ?pustulatum</i>                               | <i>Cullen pustulatum</i>                               | WIN055-P10b         |
| <i>Dicrastylis</i> sp.                                  | Removed                                                | WIN019-R2           |
| <i>Eragrostis</i> aff. <i>eriopoda</i>                  | <i>Eragrostis eriopoda</i>                             | WIN015-R2           |
| <i>Eragrostis</i> aff. <i>eriopoda</i>                  | <i>Eragrostis eriopoda</i>                             | WIN030-P2           |
| <i>Eragrostis</i> sp.                                   | Removed                                                |                     |
| <i>Eriachne ?helmsii</i>                                | <i>Eriachne helmsii</i>                                |                     |
| <i>Eriachne ?lanata</i>                                 | <i>Eriachne lanata</i>                                 | WIN111-C3           |
| <i>Eriachne ?obtusata</i>                               | <i>Eriachne obtusata</i>                               | WIN106-C1           |
| <i>Eriachne ?pulchella</i>                              | Removed                                                | WIN099-R6           |
| <i>Eriachne mucronata</i> (typical form)                | <i>Eriachne mucronata</i>                              |                     |
| <i>Eriachne pulchella</i> subsp. <i>dominii</i>         | <i>Eriachne pulchella</i>                              | WIN049-P10a         |
| <i>Eriachne</i> sp.                                     | Removed                                                | WIN128-C3           |
| <i>Euphorbia ?albrechtii</i>                            | Removed                                                | AH35-D3             |
| <i>Euphorbia</i> sp. Indet                              | Removed                                                | WIN135-P21          |
| <i>Euploca ?vestita</i>                                 | <i>Euploca vestita</i>                                 | WIN108-P8           |
| <i>Euploca</i> sp.                                      | Removed                                                | WIN020-R1           |
| <i>Euploca</i> sp.                                      | Removed                                                | WIN022-R1           |
| <i>Evolvulus alsinoides</i> var. <i>decumbens</i>       | <i>Evolvulus alsinoides</i>                            |                     |
| <i>Fimbristylis ?depauperata</i>                        | <i>Fimbristylis depauperata</i>                        |                     |
| <i>Fimbristylis ?dichotoma</i>                          | <i>Fimbristylis dichotoma</i>                          |                     |
| <i>Fimbristylis</i> sp.                                 | Removed                                                | WIN081-R6           |
| <i>Gossypium australe</i> (Burrup Peninsula Form)       | <i>Gossypium australe</i>                              | WIN037-P2           |
| <i>Grevillea pyramidalis</i> subsp?                     | <i>Grevillea pyramidalis</i>                           |                     |
| <i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i>  | <i>Grevillea pyramidalis</i>                           |                     |
| <i>Grevillea wickhamii</i> subsp. <i>hispidula</i>      | <i>Grevillea wickhamii</i>                             |                     |
| <i>Grevillea wickhamii</i> subsp. <i>macrodonata</i>    | <i>Grevillea wickhamii</i>                             |                     |
| <i>Paspalidium clementii</i>                            | <i>Paspalidium</i> sp.                                 | WIN054-R4           |
| <i>Paspalidium gracilis</i>                             | <i>Paspalidium</i> sp.                                 | WIN124-P15b         |
| <i>Paspalidium rarum</i>                                | <i>Paspalidium</i> sp.                                 | AH07-P11            |
| <i>Paspalidium reflexum</i>                             | <i>Paspalidium</i> sp.                                 | WIN126-P10c         |
| <i>Paspalidium tabulatum</i>                            | <i>Paspalidium</i> sp.                                 | AH56-R4             |
| <i>Polymeria</i> ? sp. Broome (K.F. Kenneally 9759)     | <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759)      | AH47-P3             |
| <i>Scaevola parvifolia</i>                              | <i>Scaevola parvifolia</i> subsp. <i>parvifolia</i>    | AH30-P8             |
| <i>Senna ?ferraria</i> ×                                | Removed                                                | WIN124-P15b         |
| <i>Seringia</i> sp.                                     | Removed                                                | AH44-P11            |
| <i>Sida</i> sp? <i>Excedentifolia</i> (J.L. Egan 1925)  | <i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925) | WIN124-P15b         |
| <i>Sida</i> sp. Indet.                                  | Remove                                                 | WIN124-P15b         |
| <i>Solanum ?centrale</i>                                | <i>Solanum centrale</i>                                | WIN076-P14          |

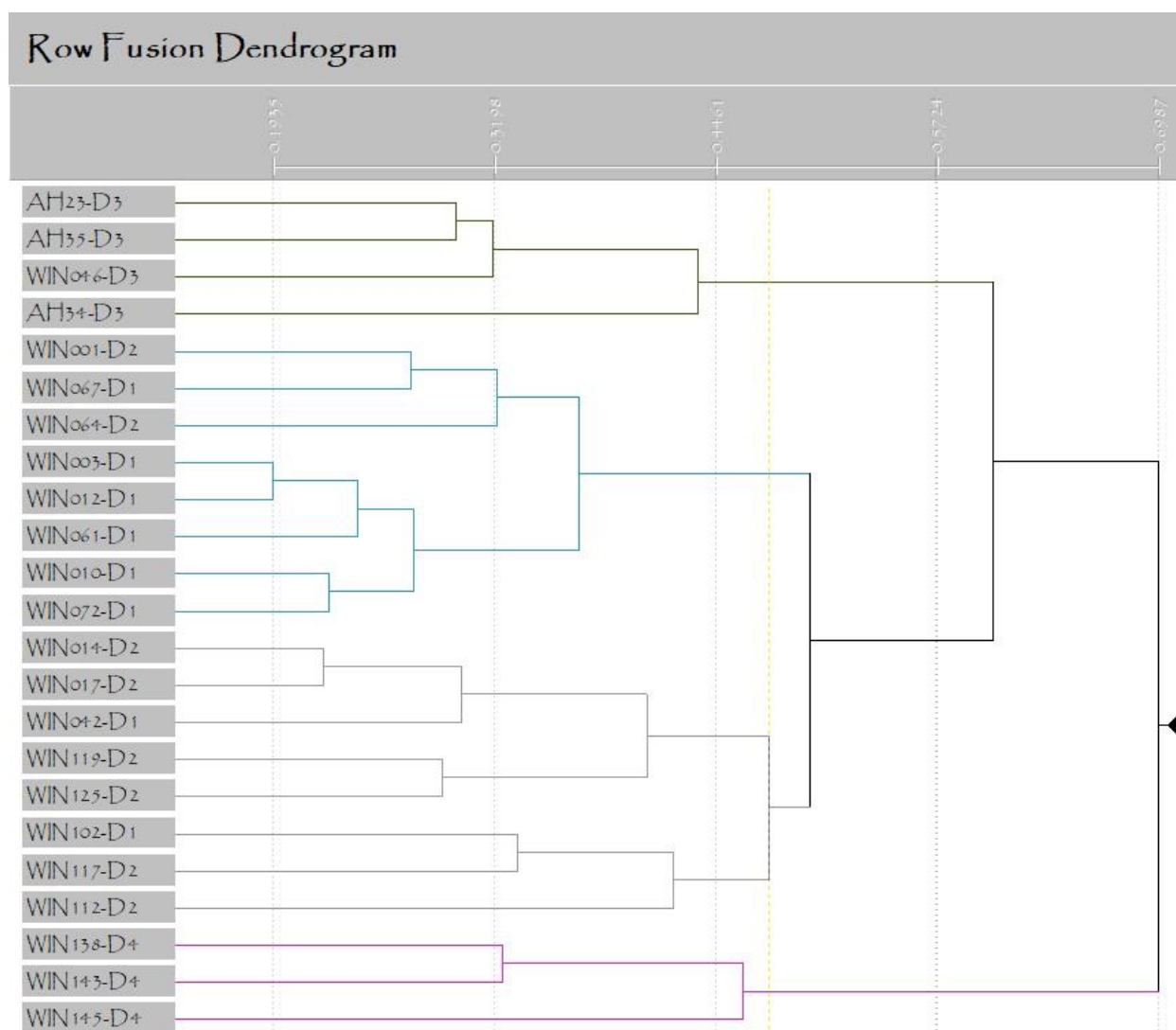
| <i>Species</i>                               | <b>Referred name / Status</b>   | <b>Quadrat Site</b> |
|----------------------------------------------|---------------------------------|---------------------|
| <i>Solanum</i> sp.                           | Removed                         | WIN071-P4           |
| <i>Streptoglossa</i> sp.                     | Removed                         | WIN020-R1           |
| <i>Triodia</i> sp. ? <i>pungens</i>          | <i>Triodia basedowii</i>        | WIN145-D4           |
| <i>Triumfetta</i> ? <i>maconochieana</i>     | <i>Triumfetta maconochieana</i> | AH56-R4             |
| Unknown sp. (? <i>Euploca cunninghamii</i> ) | Removed                         | WIN036-P3           |
| Unknown sp. Indet (Poaceae)                  | Removed                         | WIN101-C3           |
| Unknown sp. Indet (Poaceae)                  | Removed                         | WIN104-P22          |
| Unknown sp. Indet. (Malvaceae)               | Removed                         | WIN131-C4           |
| Unknown sp. Indet. (Malvaceae)               | Removed                         | WIN137-P7           |



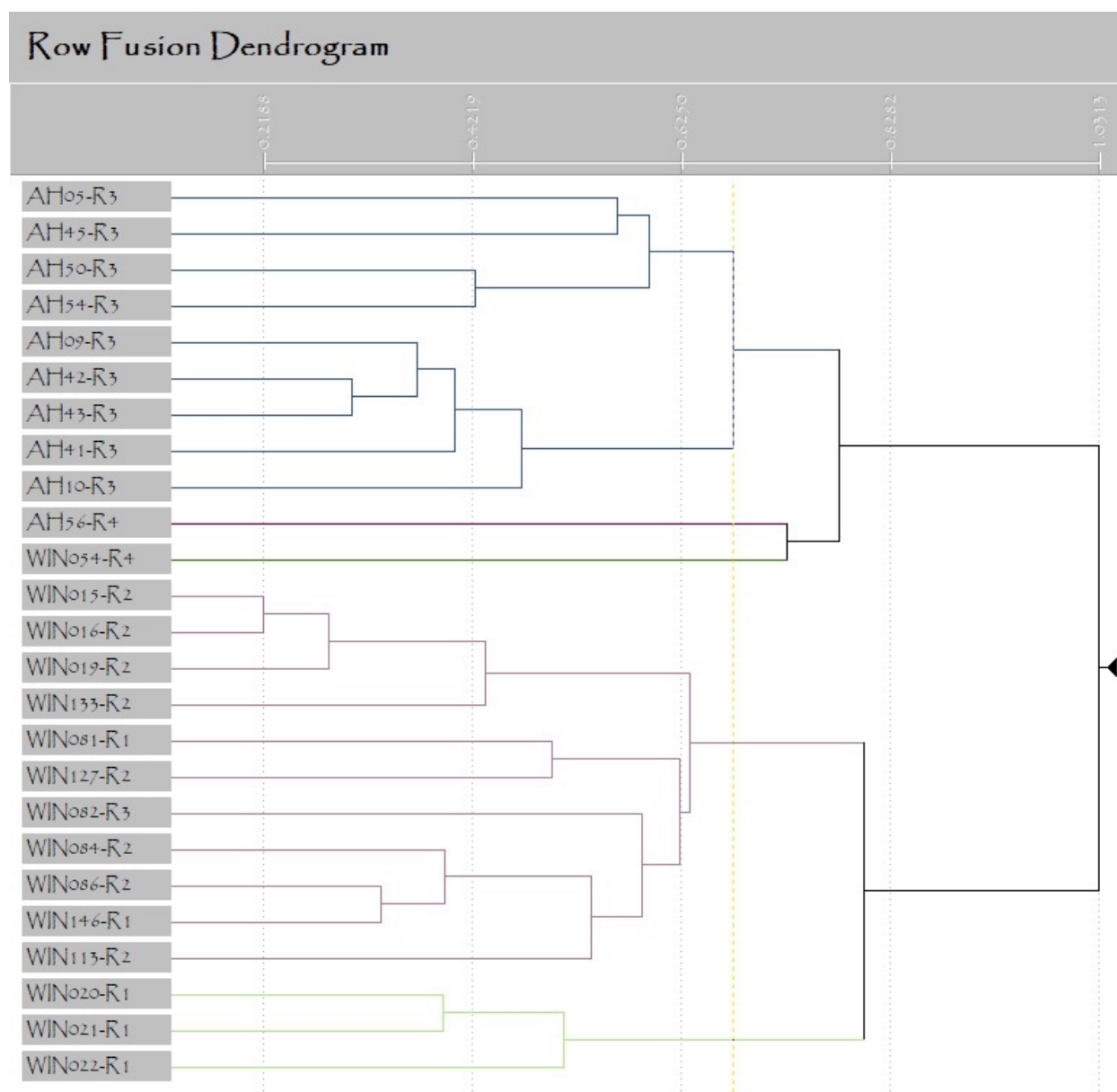
**Table 21. Parameters of Statistical Analyses and Associated Stress Values**

| Iteration | Project | Study Area | Landform   | Inc. Annuals | Inc. Outs | PFC or P/A | Sites # | Species # | Stress | Groups | Comments                                          |
|-----------|---------|------------|------------|--------------|-----------|------------|---------|-----------|--------|--------|---------------------------------------------------|
| 1.1       | WIN/AH  | All        | All        | Yes          | No        | PFC        | 159     | 247       | N/A    |        | Sample sizes of >100 unable to produce dendrogram |
| 2.1       | WIN/AH  | All        | Sand Dune  | Yes          | No        | PFC        | 23      | 103       | 0.1772 | 4      |                                                   |
| 2.2       | WIN/AH  | All        | Sand Dune  | Yes          | No        | P/A        | 23      | 103       | 0.1607 | 4      | <b>D Analysis based on this dendrogram</b>        |
| 2.3       | WIN/AH  | All        | Sand Dune  | No           | No        | PFC        | 23      | 88        | 0.1859 | 4      |                                                   |
| 2.4       | WIN/AH  | All        | Sand Dune  | No           | No        | P/A        | 23      | 88        | 0.1859 | 4      |                                                   |
| 3.1       | WIN/AH  | All        | Rocky      | Yes          | No        | PFC        | 26      | 144       | 0.177  | 5      |                                                   |
| 3.1.2     | WIN/AH  | All        | Rocky      | Yes          | No        | PFC        | 25      | 142       | 0.1781 | 5      |                                                   |
| 3.2       | WIN/AH  | All        | Rocky      | Yes          | No        | P/A        | 26      | 144       | 0.1934 | 5      |                                                   |
| 3.2.2     | WIN/AH  | All        | Rocky      | Yes          | No        | P/A        | 25      | 142       | 0.1928 | 5      |                                                   |
| 3.3       | WIN/AH  | All        | Rocky      | No           | No        | PFC        | 26      | 117       | 0.169  | 5      |                                                   |
| 3.3.2     | WIN/AH  | All        | Rocky      | No           | No        | PFC        | 25      | 115       | 0.1737 | 5      | <b>R Analysis based on this dendrogram</b>        |
| 3.4       | WIN/AH  | All        | Rocky      | No           | No        | P/A        | 26      | 117       | 0.1729 | 5      |                                                   |
| 3.4.2     | WIN/AH  | All        | Rocky      | No           | No        | P/A        | 25      | 115       | 0.1734 | 5      |                                                   |
| 4.1       | WIN/AH  | All        | Claypan    | Yes          | No        | PFC        | 15      | 100       | 0.1729 | 4      |                                                   |
| 4.2       | WIN/AH  | All        | Claypan    | Yes          | No        | P/A        | 15      | 100       | 0.1604 | 4      | <b>C Analysis based on this dendrogram</b>        |
| 4.3       | WIN/AH  | All        | Claypan    | No           | No        | PFC        | 15      | 80        | 0.1610 | 4      |                                                   |
| 4.4       | WIN/AH  | All        | Claypan    | No           | No        | P/A        | 15      | 80        | 0.1695 | 4      |                                                   |
| 5.1       | WIN/AH  | All        | Sand Plain | Yes          | No        | PFC        | 106     | 195       | N/A    |        | Sample sizes of >100 unable to produce dendrogram |
| 6.1       | WIN/AH  | All        | Sand Plain | Yes          | No        | PFC        | 100     | 189       | 0.2186 | 20     |                                                   |
| 6.1.2     | WIN/AH  | All        | Sand Plain | Yes          | No        | PFC        | 100     | 184       | 0.2178 | 20     | Outliers omitted                                  |
| 6.2       | WIN/AH  | All        | Sand Plain | Yes          | No        | P/A        | 100     | 189       | 0.2097 | 20     |                                                   |
| 6.2.2     | WIN/AH  | All        | Sand Plain | Yes          | No        | P/A        | 100     | 184       | 0.2100 | 20     | Outliers omitted                                  |
| 6.3       | WIN/AH  | All        | Sand Plain | No           | No        | PFC        | 100     | 155       | 0.2157 | 20     |                                                   |
| 6.4       | WIN/AH  | All        | Sand Plain | No           | No        | P/A        | 100     | 155       | 0.2113 | 20     |                                                   |

The initial pattern analysis (iteration 1.1), which incorporated all 159 sites including 28 AREH sites, was too large to effectively perform clustering analysis on (production of a PATN dendrogram requires  $n < 100$  sites). Following partitioning of the data into landform types, the final dendrograms assessed and presented in this report include; i) Sand dunes (iteration 2.2) (Figure 48); ii) Rocky (iteration 3.3.2) (Figure 49); iii) Claypan (iteration 4.2) (Figure 50); and iv) Sandplain (iteration 6.1) (Figure 51). These are based on varying data transformations (P/A or PFC), and the inclusion or exclusion of annual species.

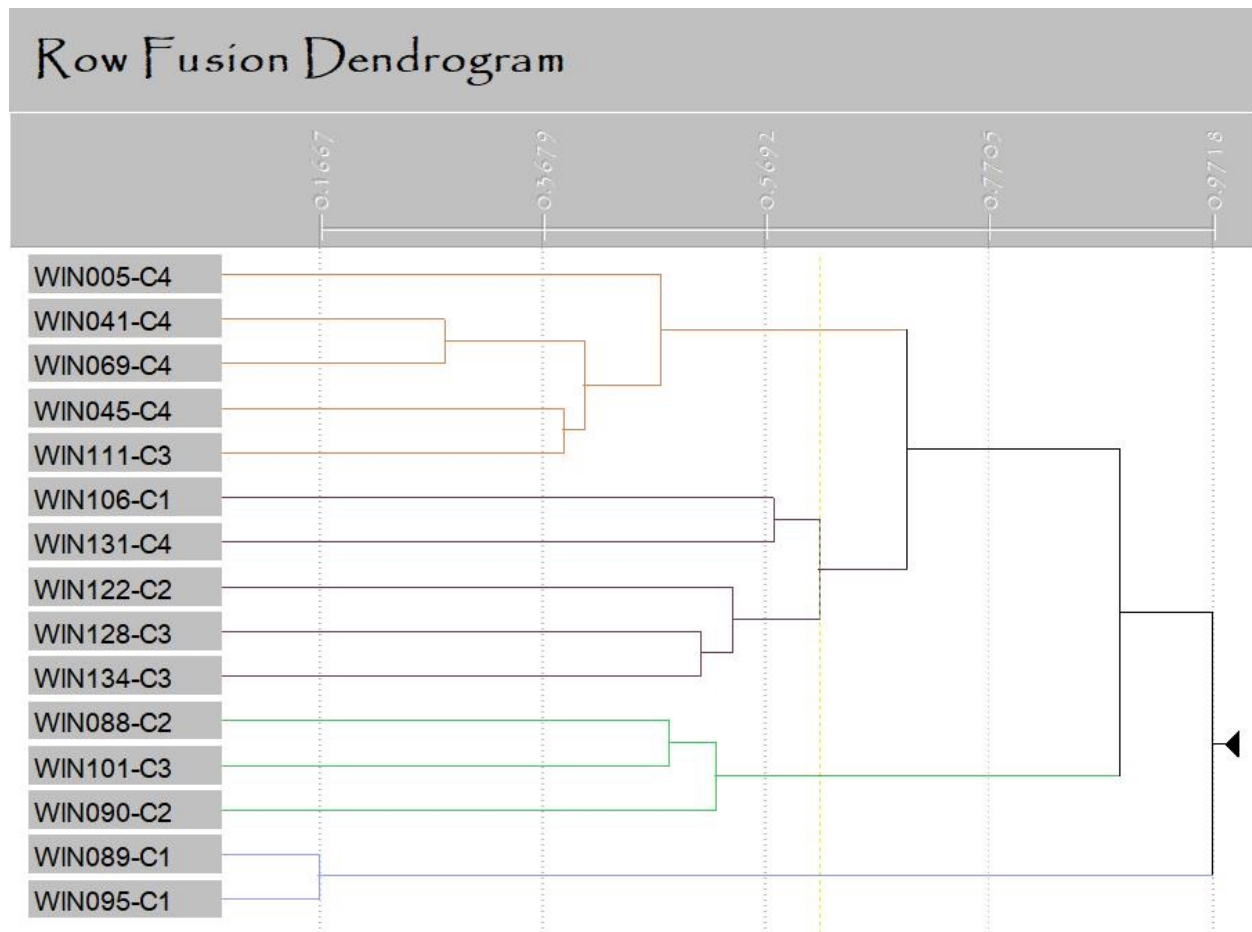


**Figure 46. (Iteration 2.2) Dendrogram Illustrating Clustering of Sand Dune Quadrat Sites Across the Winu Project (P/A; 23 sites; 103 species; Stress = 0.1607)**

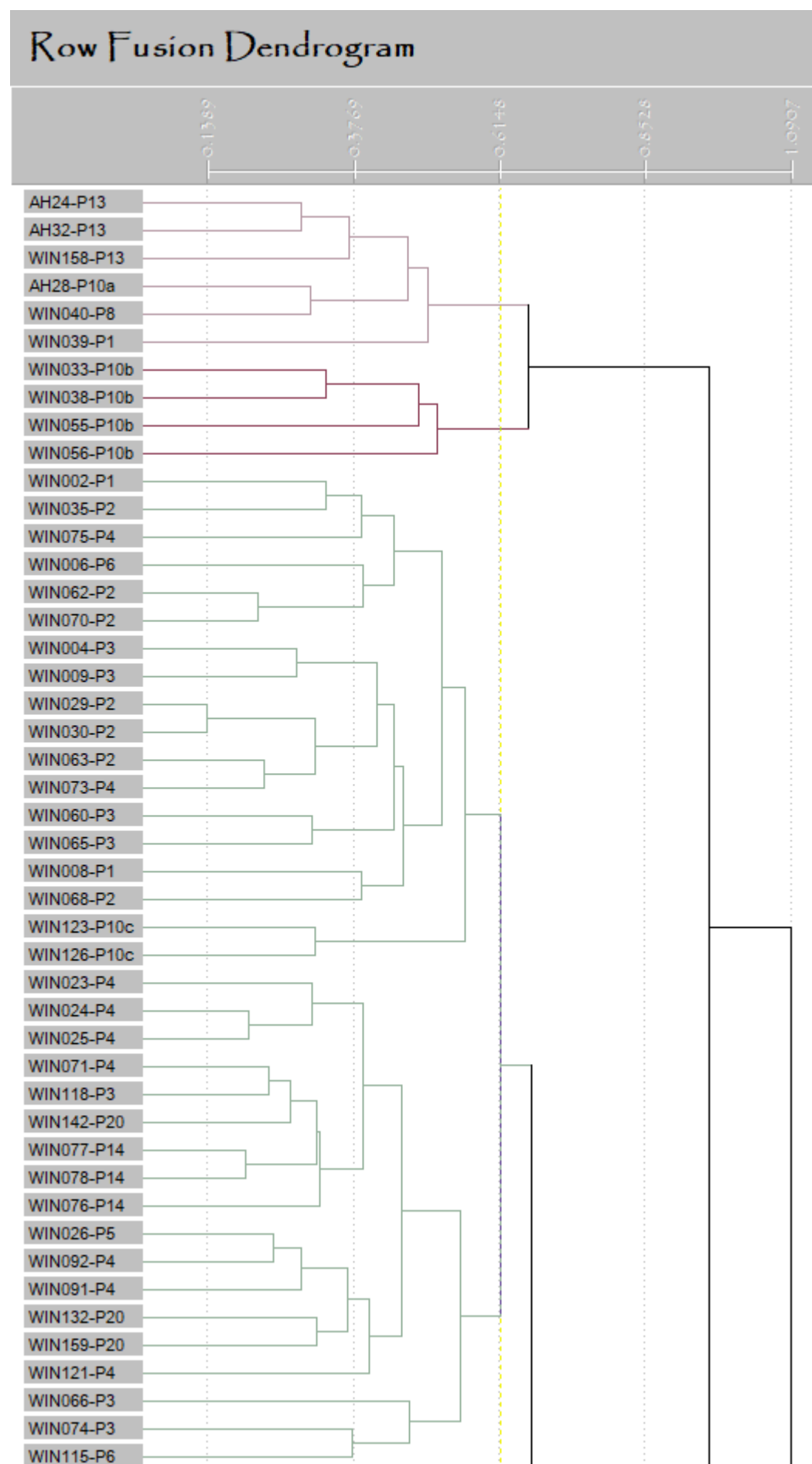


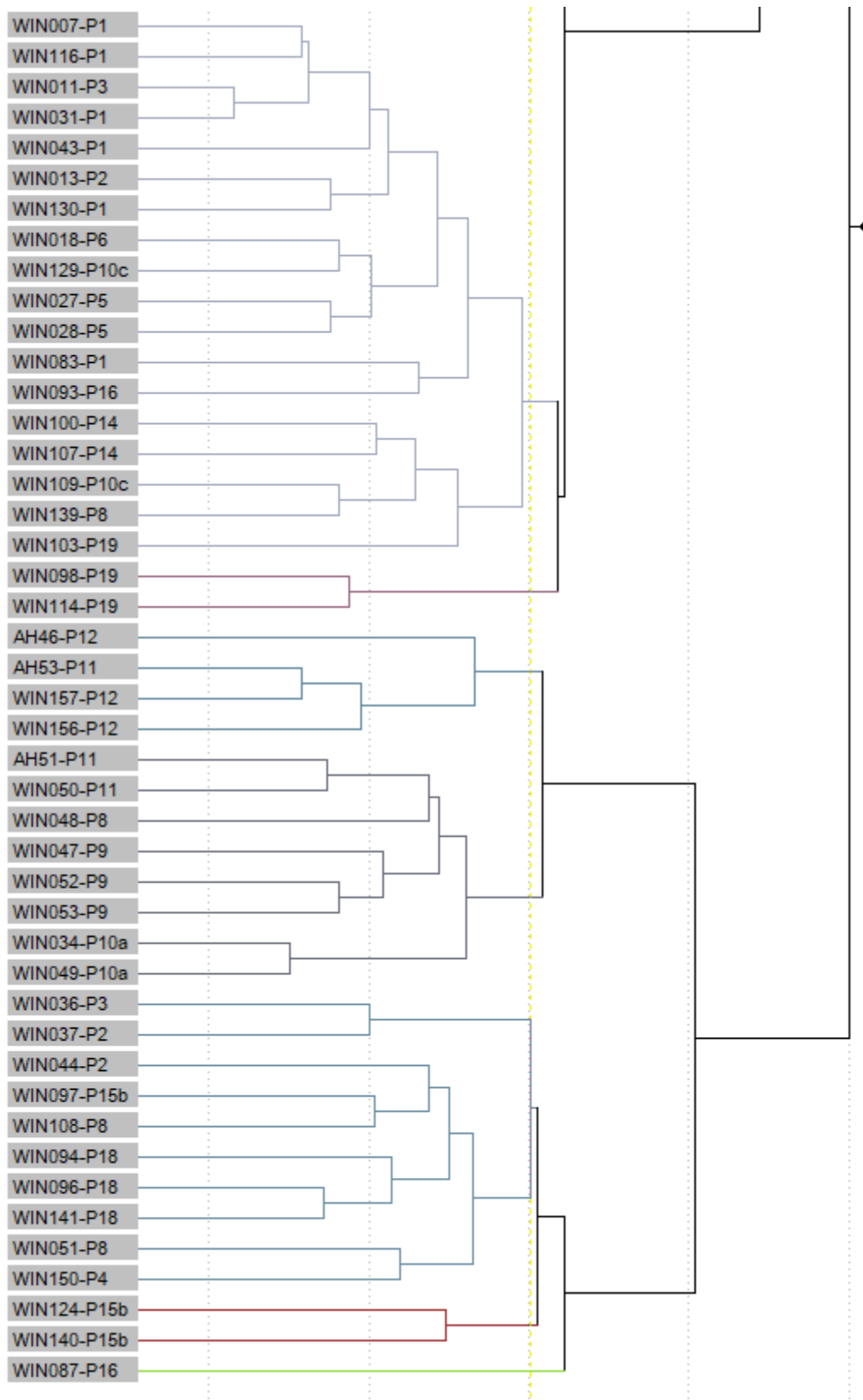
**Figure 47. (Iteration 3.3.2) Dendrogram Illustrating Clustering of Rocky Quadrat Sites Across the Winu Project (PFC; 25 sites; 115 species; Stress = 0.1737)**





**Figure 48. (Iteration 4.2) Dendrogram Illustrating Clustering of Claypan Quadrat Sites Across the Winu Project (P/A; 25 sites; 100 species; Stress = 0.1604)**





**Figure 49. (Iteration 6.3.1) Dendrogram Illustrating Clustering of Sandplain Quadrat Sites Across the Winu Project) (PFC; 191 sites; 183 species; Stress = 0.2171)**



Broadly speaking, the sand dune, rocky and claypan dendrograms demonstrate good clustering of sites. The sand dune sites are divided into four major branches corresponding to the described floristic groups, and with minimal outliers (Figure 48). The rocky sites are divided into four major branches, with the R1, R2 and R3 sites forming discrete groups (Figure 49). The R2 group contains several outliers from R1 and R3. The R4 sites do not appear to have a strong relationship, with the branches diverging outside of the significance threshold.

The claypan sites also have adequate clustering, with the four major dendrogram branches reflecting the four floristic groups assessed (Figure 50). At least one site within each group appears to fall outside of its nominal group. The C5 vegetation association did not have any sample sites and could not be included in the analysis, while the C6 was a singleton and was omitted.

The sandplain dendrogram also demonstrates good clustering overall (Figure 51). The first major division on the sandplain dendrogram appears to separate the sites located in the northern sections of the RAC, from sites located in the MIA and Texas and Rimfire Bore Fields. This is expected given the long, linear nature of the DE and spatial separation of the communities. Sites that form good floristic groups include the P1, P2, P3, P4, P5, P6, P9, P10a, P10b, P11, P12, P13, P14, P15b, P18, P19, and P20 groups. These sites all have at least three replicate sites. Some sites appear to form composite groups, while others form more discrete groups.

Quadrat WIN157 occurs within the P12 vegetation association, and is located on the boundary of the P12 and R3 vegetation associations. However, this quadrat appears to be located in the R3 association according to the vegetation mapping. The in-field assessment of WIN157 occurring within the P12 vegetation association is supported by the results of the statistical analysis, with the site forming a strong association and discrete group with the other P12 quadrats.

To achieve adequate replication of the P10a, P11, P12, and P13 vegetation associations, AREH quadrat sites were included in the analysis. When multiple AREH sites were available for an association, a comparative matrix assessment of floristic composition was conducted to deduce the most appropriate sites to be included in the statistical analysis.

Non-conforming sites include P8, P10c, and P16. The P8 group is scattered throughout the dendrogram with no apparent relationship, except for two sites that occur within a composite of multiple outliers. This group is characterised by having a dominant overstorey of *Acacia eriopoda* with *Acacia sericophylla* over *Triodia schinzii* with *Triodia epactia*. High variation in the cover or presence of each of these species is the likely cause of this outcome. Two P10c sites formed a strong association within a broader composite of P6, P10c and P19. The remaining sites occurred within the P1 group, and within a broader P2 composite group.

Non-conformity of the P16 sites was somewhat expected as the unit has only two replicate sites. The P16 vegetation association occurs in two locations within the Development Envelope, with both sites small in size and subject to influences from neighbouring associations. No further P16

association sites were recognised as occurring across the Development Envelope and AREH Project, impeding the establishment of additional quadrat sites.

Sites falling outside of the current Development Envelope were removed from the final analysis of the Interdunal Sand Plain landform, and included those from the P7, P10d, P15a, P15c, P21, P22, and P23 associations.

Overall, the dendrograms provide strong support for the Vegetation Associations described across the Winu Project, with broadscale conformity evident across majority of the sampling sites. A summary of the key analysis points is presented in Table 22. Raw quadrat data is presented in Appendix 11.

**Table 22. Summary of Floristic Analysis**

| Landform                         | Veg Code | Analysis Comments                                                                                                                                                                                                                                                      | Total Sites (n) | Conforming Sites (n) |
|----------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|
| Sand Dunes and Associated Swales | D1       | Strong group; defined by presence of <i>Corymbia chippendalei</i> . Adequate number and distribution of replicate sites (n=8). 2 outliers, WINO42 and WIN02 (more closely related to the D2 group). D1 appears to form a composite group with D2 sites.                | 8               | 6                    |
|                                  | D2       | Strong group; defined by presence of <i>Owenia reticulata</i> . Adequate number and distribution of replicate sites (n=8). 2 outliers, WIN001, WIN064 (more closely related to the D1 group). D2 forms a composite group with D1 sites.                                | 8               | 6                    |
|                                  | D3       | Excellent group; defined by the dominance of <i>Grevillea stenobotrya</i> & <i>Grevillea eriostachya</i> . Adequate number of replicate sites (n=4).                                                                                                                   | 4               | 4                    |
|                                  | D4       | Excellent group; defined by the dominance of <i>Melaleuca lasiandra</i> . Adequate number of replicate sites (n=3).                                                                                                                                                    | 3               | 3                    |
| Interdunal Sand Plain            | P1       | Strong group; defined by the dominance of <i>Acacia ancistrocarpa</i> . Adequate number of replicate sites (n=10). 2 outliers, WIN037 (more closely related with WIN036-P3, due to close proximity), and WIN044 (more closely related with WIN096-P18 and WIN141-P18). | 9               | 8                    |
|                                  | P2       | Strong group; defined by the dominance of <i>Acacia drepanocarpa</i> . Adequate number of replicate sites (n=9). 2 outliers, WIN036 and WIN118.                                                                                                                        | 10              | 8                    |
|                                  | P3       | Strong group; defined by dominance of <i>Acacia orthocarpa</i> over <i>Triodia schinzii</i> . Adequate number of replicate sites (n=10). 2 outliers, WIN073 (related to P2 group) and WIN150. Two subgroups formed within P4 and P14 composite group.                  | 9               | 6                    |
|                                  | P4       | Excellent group; defined by dominance of <i>Sorghum plumosum</i> var. <i>plumosum</i> and <i>Triodia schinzii</i> . Adequate replication (n=3). Forms a discrete group within a broader P4 and P14 composite group.                                                    | 10              | 8                    |

| Landform | Veg Code | Analysis Comments                                                                                                                                                                                                                                                                                                             | Total Sites (n) | Conforming Sites (n) |
|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|
|          | P5       | Strong group; defined by the dominance of <i>Acacia ancistrocarpa</i> . Adequate number of replicate sites (n=10). 2 outliers, WIN037 (more closely related with WIN036-P3, due to close proximity), and WIN044 (more closely related with WIN096-P18 and WIN141-P18).                                                        | 3               | 3                    |
|          | P6       | Moderate group; defined by lack of <i>Acacia</i> overstorey and dominance of <i>Sorghum plumosum</i> . Adequate number of replicate sites (n=3). One outlier, WIN006 due to relatively higher <i>Triodia schinzii</i> and <i>Triodia epactia</i> cover. Forms composite group with multiple outlier sites.                    | 3               | 2                    |
|          | P7       | Sites not occurring within Winu DE (n=3), not analysed                                                                                                                                                                                                                                                                        | 0               | 0                    |
|          | P8       | Poor group; sites scattered throughout dendrogram with no apparent relation. Adequate number of replicate sites (n=5). WIN051 and WIN108 most closely related within composite group of multiple outlier sites.                                                                                                               | 5               | 2                    |
|          | P9       | Excellent group; adequate number of replicate sites (n=3). Forms a discrete group within a broader P9, P10a and P11 composite group.                                                                                                                                                                                          | 3               | 3                    |
|          | P10a     | Moderate subgroup; defined by presence of <i>Corymbia zygophylla</i> over <i>Triodia epactia</i> . Adequate number of replicate sites (n=3). 1 outlier, AREH site AH28, related to P13 group.                                                                                                                                 | 3               | 2                    |
|          | P10b     | Excellent subgroup; further separated due to lack of <i>Corymbia zygophylla</i> , and presence of <i>Gardenia pyriformis</i> , <i>Acacia anaticeps</i> , <i>Acacia stellaticeps</i> over <i>Triodia schinzii</i> / <i>Triodia epactia</i> . Adequate number of replicate sites (n=4).                                         | 4               | 4                    |
|          | P10c     | Poor subgroup; sites scattered throughout dendrogram with no apparent relation. Adequate number of replicate sites (n=4). WIN123 and WIN126 form discrete group within a P6 and P19 composite group.                                                                                                                          | 4               | 2                    |
|          | P10d     | Sites not occurring within Winu DE (n=1), not analysed                                                                                                                                                                                                                                                                        | 0               | 0                    |
|          | P11      | Strong group; defined by presence of <i>Grevillea refracta</i> and <i>Acacia ancistrocarpa</i> over <i>Triodia epactia</i> . Adequate number of replicate sites (n=3). AH51 and WIN050 form discrete group within composite group with P9 and P10a. AH53 related to P12 within broader P9, P10a, P11 and P12 composite group. | 3               | 2                    |
|          | P12      | Excellent group; adequate number of replicate sites (n=3). Forms discrete group within a broader P9, P10a, P11 and P12 composite group. Outlier P11 site located within.                                                                                                                                                      | 3               | 3                    |
|          | P13      | Strong group; adequate number of replicate sites (n=3). Forms discrete group with some outlier sites from other groups scattered within.                                                                                                                                                                                      | 3               | 3                    |
|          | P14      | Moderate group; defined by dominance of <i>Acacia monticola</i> over <i>Triodia schinzii</i> . Adequate number of replicate sites (n=5). Forms two strong subgroups within the broader P4 and P14 composite group.                                                                                                            | 5               | 5                    |
|          | P15a     | Sites not occurring within Winu DE (n=2), not analysed                                                                                                                                                                                                                                                                        | 0               | 0                    |



| Landform                            | Veg Code | Analysis Comments                                                                                                                                                                                                                                                                                                       | Total Sites (n) | Conforming Sites (n) |
|-------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|
|                                     | P15b     | Moderate subgroup; adequate number of replicate sites (n=3). 1 outlier, WIN097, occurs within a composite cluster of multiple outliers.                                                                                                                                                                                 | 3               | 2                    |
|                                     | P15c     | Sites not occurring within Winu DE (n=2), not analysed                                                                                                                                                                                                                                                                  | 0               | 0                    |
|                                     | P16      | Weak group; defined by dominance of <i>Eucalyptus odontocarpa</i> . Inadequate number of replicate sites (n=2). Sites scattered throughout dendrogram with no apparent relation.                                                                                                                                        | 2               | 0                    |
|                                     | P18      | Strong group; defined by dominance of <i>Corymbia opaca</i> . Adequate number and distribution of replicate sites (n=3). 1 outlier, WIN094, within composite group of multiple outlier sites.                                                                                                                           | 3               | 2                    |
|                                     | P19      | Moderate group; defined by dominance of <i>Melaleuca lasiandra</i> . Adequate number of replicate sites (n=3). One outlier, WIN103, occurs within composite group of multiple outliers.                                                                                                                                 | 3               | 2                    |
|                                     | P20      | Moderate group; adequate number of replicate sites (n=3); sites occur within P4 and P14 composite, no discrete P20 group formed.                                                                                                                                                                                        | 3               | 3                    |
|                                     | P21      | Sites not occurring within Winu DE (n=2), not analysed                                                                                                                                                                                                                                                                  | 0               | 0                    |
|                                     | P22      | Sites not occurring within Winu DE (n=2), not analysed                                                                                                                                                                                                                                                                  | 0               | 0                    |
| Stony Rises and Gentle Outcroppings | R1       | Strong group; defined by the presence of <i>Acacia bivenosa</i> over <i>Triodia brizoides</i> . Adequate number of replicate sites (n=5). 2 outliers, WIN081, WIN146, more closely related to the R2 group, likely due to the lack <i>Acacia bivenosa</i> cover, however, plants were observed outside of the quadrats. | 5               | 3                    |
|                                     | R2       | Excellent group; defined by the presence of <i>Acacia hilliana</i> , <i>Triodia brizoides</i> , <i>Goodenia azurea</i> subsp. <i>hesperia</i> and <i>Calytrix carinata</i> . Adequate number and distribution of replicate sites (n=10).                                                                                | 8               | 8                    |
|                                     | R3       | Excellent group; defined by the dominance of <i>Acacia hilliana</i> , <i>Acacia adoxa</i> and <i>Triodia epactia</i> . Adequate number of replicate sites (n=10). One outlier, WIN082, more closely related to R2 group. Occurs in Rimfire bore fields                                                                  | 10              | 9                    |
|                                     | R4       | Poor group; should be defined by presence of <i>Ficus brachypoda</i> . Inadequate number of quadrat sites (n=2).                                                                                                                                                                                                        | 2               | 0                    |
|                                     | R5       | No quadrats established within this association                                                                                                                                                                                                                                                                         | 0               | 0                    |
|                                     | R6       | Singleton site (n=1), removed from analysis.                                                                                                                                                                                                                                                                            | 0               | 0                    |
| Claypans and Low-Lying Clay Flats   | C1       | Strong group; defined by dominance of <i>Eucalyptus victrix</i> over <i>Eulalia aurea</i> and <i>Triodia epactia</i> . Adequate number of replicate sites (n=3). One outlier, WIN106 - Site influenced by adjacent C3 association.                                                                                      | 3               | 2                    |
|                                     | C2       | Strong group; defined by the dominance of <i>Triodia brizoides</i> and presence of <i>Triodia epactia</i> and <i>Acacia bivenosa</i> . Adequate number of replicate sites (n=3). One outlier, WIN122, more closely related to C3 group due to higher <i>T. epactia</i> cover.                                           | 3               | 2                    |

| Landform | Veg Code | Analysis Comments                                                                                                                                                                                                                                                                                                                               | Total Sites (n) | Conforming Sites (n) |
|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|
|          | C3       | Moderate group; defined by the dominance of <i>Triodia epactia</i> and presence of <i>Acacia stellaticeps</i> and <i>Acacia bivenosa</i> . Adequate number of replicate sites (n=4). Two outliers, WIN111, more closely related to the C4 group; and WIN102, more closely related to the C2 group, likely due to lower <i>T. epactia</i> cover. | 4               | 2                    |
|          | C4       | Very strong group; defined by the dominance of <i>Acacia ancistrocarpa</i> over <i>Triodia epactia</i> . Adequate number of replicate sites (n=5). 1 outlier, WIN131, more closely related to WIN106. It is possible that vegetation at this site constitutes a new Vegetation Association.                                                     | 5               | 4                    |
|          | C5       | No quadrats established within this association                                                                                                                                                                                                                                                                                                 | 0               | 0                    |
|          | C6       | Singleton site (n=1), removed from analysis.                                                                                                                                                                                                                                                                                                    | 0               | 0                    |

## 6. Assessment Against the 10 Clearing Principles

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

The Winu Project contains species that are typical of sand dune, interdunal sandplain, stony rises and gentle outcroppings and claypans and low-lying clay flats; and more broadly, representative of flora and vegetation within the wider Great Sandy Desert bioregion. In total, 342 flora species from 147 genera and 52 families have been recorded across the Winu Project to date. Considering the size of the Project, this could be considered low when compared with other locations around W.A. Considering the uniformity of the landscape, the diversity of flora observed across the Study Area is consistent with what is expected and typical of flora and vegetation of the Great Sandy Desert bioregion.

The Project is not at variance with this principle.

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

While flora and vegetation are utilised by fauna for food and habitat, there are no known obligate fauna-flora correlations within the Winu Project. Importantly, Western Botanical specialize in botanical assessments and do not assess fauna during survey work.

To Western Botanicals knowledge, the Project is not at variance with this principle.

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

The Study Area does not contain any Threatened (Declared Rare) flora.

Thirteen Priority flora species have been encountered within the Winu Project area. Of these, two species: *Eragrostis lanicaulis* (P3), noted south of the Rimfire Borefield; *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (P1), noted adjacent to the RAC, have been recorded exclusively outside the Study Area. Consolidated abundance figures of species within and outside the Development Envelope to June 2026 are tabulated below.

| Taxon                                                            | Consolidated Abundances to June 2026 |       |                              |       |         |
|------------------------------------------------------------------|--------------------------------------|-------|------------------------------|-------|---------|
|                                                                  | Inside DE<br>(number and %)          |       | Outside DE<br>(number and %) |       | Total   |
| <i>Cynodon anisocarpus</i> (P1)                                  | 63,587                               | 14.7% | 367,972                      | 85.3% | 431,559 |
| <i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) (P1) | 0                                    | 0%    | 1                            | 100%  | 1       |



| Taxon                                                                | Consolidated Abundances to June 2026 |       |                              |        |         |
|----------------------------------------------------------------------|--------------------------------------|-------|------------------------------|--------|---------|
|                                                                      | Inside DE<br>(number and %)          |       | Outside DE<br>(number and %) |        | Total   |
| <i>Goodenia hartiana</i> (P2)                                        | 552,280                              | 62.2% | 335,702                      | 37.8%  | 887,982 |
| <i>Bonamia oblongifolia</i> (P3)                                     | 3                                    | 0.2%  | 1,263                        | 99.8%  | 1,266   |
| <i>Comesperma sabulosum</i> (P3)                                     | 51                                   | 18.8% | 220                          | 81.2%  | 271     |
| <i>Corynotheca asperata</i> (P3)                                     | 2,554                                | 30.0% | 5,962                        | 70%    | 8,516   |
| <i>Dasymalla chorisepala</i> (P3)                                    | 118                                  | 31.3% | 259                          | 68.7%  | 377     |
| <i>Eragrostis lanicaulis</i> (P3)                                    | 0                                    | 0%    | 1                            | 100%   | 1       |
| <i>Indigofera ammobia</i> (P3)                                       | 18,658                               | 49.2% | 19,217                       | 50.8%  | 37,875  |
| <i>Polymeria</i> sp. Broome (K.F. Kenneally 9759) (P3) <sup>19</sup> | 0                                    | 0.0%  | 73                           | 100.0% | 73      |
| <i>Synostemon arenosus</i> (P3)                                      | 2,467                                | 49.6% | 2,508                        | 50.4%  | 4,975   |
| <i>Terminalia kumpaja</i> (P3)                                       | 110                                  | 49.3% | 113                          | 50.7%  | 223     |
| <i>Tribulopsis marliesiae</i> (P3)                                   | 787                                  | 47.5% | 870                          | 52.5%  | 1,657   |

Considering the current known distributions of these Priority taxa – many of which are broadly spread over the Great Sandy Desert, in conjunction with the extensive size and uniformity of the landsystems of the region, it is highly likely that all of these taxa are regionally common, and remain under-surveyed. *Cynodon anisocarpus* (P1) may be an exception, known only from several locations in Western Australia and the Northern Territory (Figure 13). The *Cynodon anisocarpus* (P1) population centered south of the Development Envelope within the previously proposed Texas Bore Field area appears to correlate with the B30 soil-landscape system (DPIRD 2024a). This system has a limited distribution, with a cumulative area of 195,230ha and has been intensively surveyed within the proposed DE. A small area west of the proposed airfield, inside the DE, may benefit from additional survey for this species. Further survey for *Cynodon anisocarpus* (P1) should be conducted in good seasonal conditions, following average to above-average rainfall.

Two undescribed taxa have been recorded during the botanical assessments: *Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138) and *Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179). These are discussed as Species of Interest (SOI).

*Amphipogon caricinus* (hairy lamina) (J. Paterson WB41138), a robust perennial grass, is abundant and widespread on sand plains within the DE and has also been observed by the authors outside the DE and near the Nifty Copper Mine. It is considered highly likely to be similarly abundant within the Little Sandy Land System outside the DE. Only recently recognised, its distribution regionally is yet to be assessed.

<sup>19</sup> *Polymeria* sp. Broome (K.F. Kenneally 9759) (P3), has no numbers of plants occurring within the DE, however, a population was recorded within the DE in August 2019, prior to confirmation of this as a Priority species, but no numbers were attributed to this at that time.

*Eragrostis* sp. recurved spikelets (J. Paterson & N. Dakin WB1179), a small annual to 20cm on the margins of small claypans, has been recorded outside the DE, 1.22 km NE of the proposed Winu airfield. Attempts to assess this species since it was recognised have been hampered by unfavourable (i.e. dry) seasonal conditions.

Both grass species are subject to on-going taxonomic review by Dr. Terry MacFarlane at the WA Herbarium. Consolidated abundance figures of species within and outside the Development Envelope to June 2026, where known, are tabulated below.

| Taxon (Species of Interest)                                              | Consolidated Abundances to June 2026 |        |                           |       |         |
|--------------------------------------------------------------------------|--------------------------------------|--------|---------------------------|-------|---------|
|                                                                          | Inside DE (number and %)             |        | Outside DE (number and %) |       | Total   |
| <i>Amphipogon caricinus</i> (hairy lamina) (J. Paterson WB41138)         | 111,003                              | 99.97% | 33                        | 0.03% | 111,036 |
| <i>Eragrostis</i> sp. recurved spikelets (J. Paterson & N. Dakin WB1179) | 0                                    | 0%     | 500                       | 100%  | 500     |

A further potential undescribed species, *Portulaca* sp. Nyangumarta (B. Eckermann Opp01) was recorded on the margin of a proposed borrow pit on the RAC in early June 2026. While not discussed in detail here, specimens will be reviewed by Dr. Matt Barrett (James Cook University) via WA Herbarium to confirm its taxonomic status, (Western Botanical 2026).

| Taxon (Species of Interest)                           | Consolidated Abundances to June 2026 |       |                           |       |       |
|-------------------------------------------------------|--------------------------------------|-------|---------------------------|-------|-------|
|                                                       | Inside DE (number and %)             |       | Outside DE (number and %) |       | Total |
| <i>Portulaca</i> sp. Nyangumarta (B. Eckermann Opp01) | 77                                   | 56.6% | 59                        | 43.4% | 136   |

The Project is not at variance with this principle.

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

The Study Area does not lie within any known Threatened or Priority Ecological Communities, and conversely, the Vegetation Associations present do not represent any known TEC's or PEC's. The described communities are predominantly considered well represented throughout the Great Sandy Desert Bioregion.

The Project is not at variance with this principle.

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

The Study Area does not represent a significant remnant of native vegetation in an extensively cleared area. The Great Sandy Desert bioregion remains at approximately 99% of its pre-European extent (Government of Western Australia, 2019).

The Project is not at variance with this principle.

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

No significant watercourses are present within the Study Area.

The Project is not at variance with this principle.

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

The proposed development is not likely to cause significant land degradation beyond that caused by the mining and development of infrastructure, itself.

The Project is not at variance with this principle.

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

There are no conservation areas in the vicinity of the Study Area.

The Project is not at variance with this principle.

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

Within the MIA the groundwater table sits around 50m below the surface. Clearing of vegetation is unlikely to cause deterioration in the quality of surface or underground water in this location. In contrast, a shallow groundwater associated with the Percival Palaeovalley located within the southern portion of the Rimfire Bore Field reportedly sits 10m below the surface. As limited clearing activities are intended for this area, this is not a concern.

The Project is not at variance with this principle.

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

The development is unlikely to cause or exacerbate any flooding.

The Project is not at variance with this principle.



## 7. Limitations

| Limitation                                               | Discussion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Available sources of contextual information</b>       | <p>Adequate contextual information was available for this project, including previous reports from Western Botanical (2021 &amp; 2022) and Biota (2021), as well as data collected from adjoining tenements as part of the AREH Project for British Petroleum (BP) (Biota 2021). A further three were reviewed as part of the desktop assessment, however, limited survey work has been conducted in the Great Sandy Desert previously.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>The Scope of the survey</b>                           | <p>Cumulatively, the scope of survey work was sufficient in bringing all Study Area components of the Winu Project to Detailed assessment level. While additional targeted survey work will be required following further definition of the disturbance footprints, all project domains have been surveyed to Detailed level, e.g., all quadrats (with exception of the most recent three and those falling within heritage or priority fauna exclusion zones) have been scored at least twice, typically once within wet season and once within dry season; all areas mapped and a detailed level of targeted survey work (at 50m spacings) conducted in each area.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Proportion of flora collected and identified</b>      | <p>Three hundred and forty-two flora species from 147 genera and 52 families have been recorded across the Winu Project to date. Of these 252 (74.5%) were recorded within quadrat sites, while 86 (25.4%) were recorded opportunistically, during relevé assessments or traverses. These results are considered typical for a project of such scale. All taxa have been collected at least once (either by Western Botanical or previous consultants) to perform identification using the resources of the WA Herbarium.</p> <p>Sixty-four poor plant specimens were unable to be definitively identified to species level. Many of the specimens are duplicates, and include sterile and senesced grasses. Half of these were collected by Biota within the WRAC prior to Western Botanical's involvement. Western Botanical is confident the specimens unable to be identified are most probably samples of taxa previously catalogued across the Winu Project area. One of these taxa, <i>Polymeria</i> ?sp. Broome (K.F. Kenneally 9759) (P3) was confirmed as a Priority flora species, and has been treated as such in this assessment. The remainder are not considered to possess or warrant Conservation significance.</p> <p>This is not a limitation for the project.</p> |
| <b>Completeness and further work which may be needed</b> | <p>Survey work is considered mostly complete across the Winu Project. Of the 159 quadrats scored for the Winu Project, 58 occur inside the Development Envelope. Of these, 56 have been rescored, while the final two occur in heritage exclusion areas and are unable to be revisited.</p> <p>This is not a limitation.</p> <p>Targeted Priority flora searches have been conducted at 50m spacings over the Winu Project (Appendix 12).</p> <p>Further work in appropriate seasonal conditions (following good rainfall) may be required to expand <i>Cynodon anisocarpus</i> (P1) distribution outside the DE at the western end of the proposed borefield.</p> <p>Provided the latter item is addressed, this is not a limitation for the project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Mapping reliability</b>                               | <p>Mapping was captured at a 1:10,000 scale and assisted with Google Earth imagery. Unfortunately, satellite imagery available at the time of the initial surveys was in significantly lower quality compared to current imagery. This coupled with complexities caused by the mosaic of multiple fire ages across the Study Area made mapping difficult in some cases. Areas that were traversed on-foot and in-vehicle are generally more reliable than extrapolated regions, or areas surveyed via helicopter (Appendix 12).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Limitation                     | Discussion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | <p>Additionally, the change of consultancies from Biota to Western Botanical has likely resulted in minor inconsistencies in vegetation mapping – particularly as mapping was being conducted by Western Botanical prior to familiarisation of all existing vegetation associations. This was unavoidable due to access limitations during latter survey work.</p> <p>Furthermore, the combination of the large study area and the relative uniformity of the landscape results in minor and often imperceptible changes in floristic composition occurring over broad areas (for example, the gradual change of <i>Triodia</i> species below continuous overstories) which proved difficult to map under NVIS Level 5.</p> <p>Overall, vegetation mapping is considered complete and largely reliable across the Winu Project.</p> <p>This is not a limitation for the project.</p> |
| <b>Timing: weather, season</b> | <p>The field assessments were conducted over multiple seasons (i.e., wet and dry season). While previous surveys (Biota 2021) were conducted under poor (dry) seasonal conditions, all recent botanical surveys have taken place during good conditions (i.e., average or above average wet season rainfall). Subsequent analyses of differences in species composition within quadrats between wet and dry periods has been conducted by Western Botanical (2022), finding no significant differences in the level of flora present between each.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                              |
| <b>Disturbances</b>            | <p>Apart from ‘Disturbed’ access tracks and cleared areas for existing infrastructure, the vegetation across the Winu Project was typically in ‘Excellent’ condition. The Project is typically weed-free, apart from three locations including the Winu Camp (which weeds have now been removed), the Wallal Tanks (within Pastoral Lease) along Nyangumarta Hwy and the Magnum Camp.</p> <p>Frequent fire over the landscape resulted in a mosaic of fire scars within the vegetation, which did make mapping more difficult, yet still achievable.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                            |
| <b>Intensity</b>               | <p>Survey intensity (Survey tracklogs, Appendix 12) reflects the appropriate level required for a Detailed Flora and Vegetation Survey, including comprehensive i) flora species inventory, ii) Vegetation Association mapping, iii) opportunistic targeted searches for weeds, (iv) Intensive Priority flora and other species of taxonomic interest surveys, and v) vegetation condition assessment.</p> <p>Targeted Priority flora searches across the Project Area have been conducted at 50m intervals to inform impact assessment.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                                        |
| <b>Resources</b>               | <p>Adequate resources were available over the total duration of each survey.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Access</b>                  | <p>Access was good across the Winu Project, with all study area components visited at least once. Considering the size of the Project, existing tracks and the availability of helicopter usage on multiple occasions resulted in adequate coverage.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Experience levels</b>       | <p>Jonathan Warden has over 17 years of experience in the assessment of flora and vegetation in WA, Jason Paterson has 6 years of experience, Lindsay Shelton has 4 years’ experience, Dr. Nicole Dakin has 3 years experience.</p> <p>Personnel involved in the 2026 surveys had between 3 and 25 years’ experience in flora and vegetation assessments and were directed in the field by personnel familiar with the flora and vegetation of the DE.</p> <p>Nyangumarta and Martu Traditional Owners possessed intimate knowledge of the landscape and provided good insight to common flora species.</p> <p>This is not a limitation for the project.</p>                                                                                                                                                                                                                         |

## 8. List of Participants

| Staff Member                                                                                                                                                                                                         | Field Surveys | Specimen Identification | Data Analysis | Report Preparation | Report Review |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------|---------------|--------------------|---------------|
| Jonathan Warden B.Sc. (Environmental Biology) <i>License No. – FB62000044</i>                                                                                                                                        | 1             | 1                       |               |                    | 1             |
| Jason Paterson B.Sc. (Hons) (Environmental Science) <i>License No. – FB62000299</i>                                                                                                                                  | 1             | 1                       | 1             | 1                  | 1             |
| Nicole Dakin Ph.D. (Molecular Biology) <i>License No. – FB62000492 PhD</i>                                                                                                                                           | 1             | 1                       |               |                    | 1             |
| Lindsay Shelton B.Sc. (Botany) <i>License No. – FB62000496</i>                                                                                                                                                       | 1             | 1                       |               |                    | 1             |
| Belinda Jeanes B.Sc. (Environmental Biology)                                                                                                                                                                         |               |                         |               | 1                  |               |
| Ben Eckermann B.Sc. (Hons.) <i>License No. – FB62000262-2</i>                                                                                                                                                        | 1             | 1                       |               |                    |               |
| Lyndon Kidman B.Sc.                                                                                                                                                                                                  | 1             |                         |               |                    |               |
| Peter Smith (B. App. Sci) <i>License No: - FB62000968</i>                                                                                                                                                            | 1             |                         |               |                    |               |
| Felicity Keety (B.Sc. Hons) <i>License No. – FB62000530</i>                                                                                                                                                          | 1             | 1                       | 1             | 1                  |               |
| Julie Fielder (B.Sc. Hons. Botany)                                                                                                                                                                                   | 1             |                         |               |                    |               |
| Phoenix Environmental Staff:<br><br>Brody Loneragan B.Sc.<br><br>Luis Buchan B.Sc.<br><br>Calvin Williams B.Sc.<br><br>Ben Southern B.Sc.<br><br>Terri Jones B.Sc.<br><br>Tim Morald B.Sc.<br><br>Bailey Field B.Sc. | 1             |                         |               |                    |               |
| Piers Goodman B.Sc.                                                                                                                                                                                                  |               |                         |               | 1                  | 1             |
| Geoff Cockerton B.Sc.                                                                                                                                                                                                |               |                         |               | 1                  | 1             |



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- Chris Eason, Health, Safety & Environment Business Partner
- Lily Deveroux, Advisor Environment
- Orlando Kirby Knox, Advisor Environment
- Hans Bjorkman, Senior Advisor Environment
- William Davey, Advisor Environment
- Mike Rouse, GIS Specialist

### **Martu Rangers:**

#### **- October 2022 – Phase 1 Detailed Survey of the Rimfire Bore Field**

- Damien Miller
- Chris Miller

#### **- October 2023 – Phase 1 Detailed Survey of the Rimfire Bore Field**

- Anthony Ginger
- Richard Marney
- Kyle Eaton
- Charles Lethbridge

#### **- March 2024 –**

- Alistair Williams
- Jeffrey Balbal

#### **- April 2024 –**

- Clifford Warney
- Tyross Aspro

#### **- June/ July 2024 – Phase 1 Detailed Survey of the Revised DE**

- Gilbert Williams
- Dakota Seconda Dunn

- Peter Horace
- Paul Horace

**- October 2024 – Phase 1 Survey of South Granites/ Phase 2 Survey of Revised DE**

- Fabian Walters
- Johnson Taylor

**- December 2024 – Phase 2 Survey of South Granites**

- Christopher Ginger
- Paul Walters

**Nyangumarta Rangers:**

**- October 2022 – Proposed MIA Extensions Targeted Priority Flora Searches**

- Kerri Hunter
- Keithen Toby

**- April 2023 – MIA Targeted Priority Flora Searches**

- Ronald Yanawana
- Huzlemi Hunter

**- June 2023 – RAC/ Winu Soak Targeted Priority Searches**

- Edward Badal
- Gabriel Yanawana

**- April 2024 – Regional Targeted Priority Searches**

- Augustine Badal
- Gabriel Yanawana

**CAD Resources:**

- Brian White, CAD Resources Pty Ltd. GIS Specialist.

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