

# Five-Clawed Worm Skink (*Anomalopus mackayi*) Management Plan

Rev E

4-0014-270-PES-C0-PL-0001

# Five-Clawed Worm Skink Management Plan

## Document and revision history

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## Terms and Definitions

The following terms, abbreviations and definitions are used in this plan.

Table A-1: Terms and definitions

Term	Description
<b>ARs</b>	Artificial Refuges
<b>ARTC</b>	Australian Rail Track Corporation
<b>BACI</b>	Before-After-Control-Impact
<b>BAM</b>	Biodiversity Assessment Method
<b>BAR</b>	Biodiversity Assessment Report
<b>BC Act (2016)</b>	Biodiversity Conservation Act (2016)
<b>BCS</b>	Biodiversity, Conservation and Science Directorate
<b>BCT</b>	Biodiversity Conservation Trust
<b>BDAR</b>	Biodiversity Development Assessment Report
<b>BMP</b>	Biodiversity Management Plan
<b>BoM</b>	Bureau of Meteorology
<b>CEMP</b>	Construction Environmental Management Plan
<b>CIZ</b>	Construction Impact Zone
<b>Construction</b>	Construction (as defined in the MCoA)
<b>CSSI</b>	Critical State Significant Infrastructure
<b>DAWE</b>	Commonwealth Department of Agriculture, Water and the Environment
<b>DCCEEW</b>	Department of Climate Change, Energy, the Environment and Water
<b>DPE</b>	NSW Department of Planning and Environment
<b>EA</b>	Environmental Adviser
<b>ECPs</b>	Environmental Control Plans
<b>EES</b>	Environmental Effects Statement
<b>EIS</b>	Environmental Impact Statement
<b>EM</b>	Environmental Manager
<b>EMS</b>	Environmental Management System
<b>EP&amp;A Act (1979)</b>	<i>Environmental Planning and Assessment Act (1979)</i>
<b>EPA</b>	Environmental Protection Authority
<b>EPBC Act (1999)</b>	<i>Environment Protection and Biodiversity Conservation Act (1999)</i>
<b>ER</b>	Environmental Representative
<b>EWMS</b>	Environmental Work Method Statements

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Term	Description
<b>EWEMP</b>	Early Works Environmental Management Plan
<b>FCWS</b>	Five-clawed Worm Skink ( <i>Anomalopus mackayi</i> )
<b>FCWS Habitat Area</b>	Defined in Appendix A for this FCWS Management Plan
<b>FFB</b>	Framework for Biodiversity
<b>GIS</b>	Geographic Information Systems
<b>IFC</b>	Issued for Construction
<b>LGA</b>	Local Government Area
<b>LIW</b>	Low Impact Works (as defined in the MCoA)
<b>LLS</b>	Local Land Services (formerly LHPA)
<b>LOR</b>	Laing O'Rourke
<b>MCoA</b>	Minister's Conditions of Approval
<b>MNES</b>	Matters of National Environmental Significance
<b>N2NS SP1</b>	Narrabri to North Star Separable Portion 1
<b>NSW</b>	New South Wales
<b>PAS</b>	Priorities Action Statement
<b>PCT</b>	Plant Community Type
<b>REMMs</b>	Revised Environmental Management Measure
<b>RFI</b>	Request for Information
<b>RtS</b>	Response to Submissions
<b>SSI</b>	State Significant Infrastructure
<b>SPIR</b>	Submissions and Preferred Infrastructure Report
<b>OEH</b>	Office of Environment and Heritage
<b>Threatened</b>	Species listed on either the NSW <i>Biodiversity Conservation Act</i> (2016) and/or Commonwealth <i>Environment Protection and Biodiversity Conservation Act</i> (1999).
<b>TBDC</b>	Threatened Biodiversity Data Collection
<b>TSR</b>	Travelling Stock Reserves
<b>FCWS</b>	Five-clawed Worm Skink ( <i>Anomalopus mackayi</i> )
<b>Endangered</b>	Species listed as endangered under the NSW <i>Biodiversity Conservation Act</i> (2016)
<b>Vulnerable</b>	Species listed as vulnerable under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act</i> (1999).

# Five-Clawed Worm Skink Management Plan

## 1. Introduction

### 1.1 Executive Summary

This Five-Clawed Work Skink Management Plan (FCWS Management Plan) provides a structured approach to the management and mitigation of potential impacts to the threatened FCWS during the delivery of the Central Civil Works Program (CCWP) scope of works described in Section 1 of this document. This FCWS Management Plan also demonstrates how LOR will comply with Ministers Conditions of Approval E30 (SSI-9371). In accordance with E30, this plan has been adapted from a previous plan prepared by ARTC Inland Rail, this previous plan being the Narrabri to North Star Separable Portion 1 (SSI-7474) plan; which was approved by the Planning Secretary on 1 February 2023.

Findings from the Inland Rail - Narrabri to North Star Separable Portion 1 N2NS SP1 (SSI-7474) project, indicate that FCWS Habitat Areas are determined by soil type (cracking clays) and not vegetation types, with this finding also supported by SPRAT database records. Existing soil classification information is large scale mapping requiring further field investigation to provide finer scale detail. Works (as defined by SSI-9371) cannot commence until this FCWS Management Plan is approved by the Planning Secretary in accordance with Condition of Approval E30, including low impact works geotechnical activities. Subsequent to Planning Secretary approval of the FCWS Management Plan the additional soil type data would be collected as detailed in this FCWS Management Plan, thereby allowing refinement of FCWS Habitat Area.

Several mitigation measures are proposed in the N2NS SP1 plan for implementation during construction activities in FCWS Habitat Areas, focussed on high-risk activities such as large-scale topsoil stripping.

This plan distinguishes between Low Impact Works and Construction Activities using a risk-based approach to assess proposed works potential impact on the FCWS, determined by scope of the activity and extent of ground disturbance; with mitigation measures assigned based on level of risk.

### 1.2 Purpose and Scope

Laing O'Rourke (LOR) have been engaged by Australian Rail Track Corporation (ARTC) to undertake the Inland Rail Central Civil Works Program (CCWP) under a Collaborative Framework Agreement (CFA) executed on 26 November 2021.

Under the CFA, the full scope of works for the Central program will be progressively delivered under four separate work packages and associated early works packages.

The first works package to be released is the North Star to NSW/Qld Border.

The purpose of this Five-Clawed Work Skink Management Plan (FCWS Management Plan) is to provide a structured approach to the management of potential impacts to the threatened FCWS during the delivery of the Central Civil Works Program (CCWP) scope of works described in Section 1.3 of this document. This FCWS Management Plan will also serve to demonstrate how LOR will comply with Ministers Conditions of Approval E30.

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## 1.3 Construction Scope



Figure 1-1: Central Civil Works Program and C2/C3 Scope



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The scope of the Central Civil Works Program - C2 / C3 includes the design of the alignment for approximately 38km, though plan for construction up to approximately 29km only. The alignment is located in northern NSW and southern Queensland, and will provide a route from North Star, NSW to the alignment of the existing Southwestern Line in Queensland. Starting at North Star, the alignment runs north for approximately 26km along an existing, abandoned ARTC railway line up to approximately 1.5km south of the intersection between Bruxner Highway and Tucka Tucka Road, Boggabilla.

- Up to approximately Ch 26 km, the proposed alignment follows the existing, currently abandoned rail alignment. The existing rail embankment consists of ballast, a nominal capping layer and nominal structural fill, with the sleepers (generally steel) and rail still in place.
- The alignment then passes northeast through greenfield land, to the Macintyre River which forms the NSW/Qld border.
- The ballast comprises an upper, approximately 100 mm to 200 mm thick, clean layer with angular basaltic rock and a lower, approximately 150 mm to 250 mm thick fouled ballast layer
- The sub-ballast layer is similar to a capping layer and comprises clayey sandy gravel with typically less than 20 mm maximum particle size
- The gravel component of the capping layer comprises mainly durable, sub-rounded quartz gravel and other similar material.

This FCWS Management Plan addresses both *Low Impact Works* and *Construction* (as per MCoA definitions in Schedule 1 – Table 1).

### 1.3.1 Low Impact Works

The Low Impact Works will be undertaken early and prior to Construction to obtain information for design and to de-risk the overall delivery program. Low Impact Works are defined as per Figure 1-2. Note that additional information will be collected during these Low Impact Works via the management and mitigation measures contained in this plan. This additional information will be utilised in adaptive management in accordance with Sections 1.3.1.2, 1.7 and 5.1.1.

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Term	Definition
Low Impact work	<p>a) survey works including carrying out general alignment surveys, installing survey controls (including installation of global positioning system (GPS)), installing repeater stations, carrying out surveys of existing and future utilities and building and road dilapidation surveys;</p> <p>b) investigations including investigative drilling, contamination investigations and excavation;</p> <p>c) site establishment work approved under a <b>Site Establishment Management Plan</b> in accordance with <b>Condition A20</b>;</p> <p>d) operation of ancillary facilities if the ER has determined the operational activities will have minimal impact on the environment and community;</p> <p>e) treatment of contaminated sites subject to the recommendations of a Remediation Report prepared in accordance with <b>Condition E147</b>;</p> <p>f) minor clearing and relocation of native vegetation, as identified in the documents listed in <b>Condition A1</b>;</p> <p>g) installation of mitigation measures including erosion and sediment controls, temporary exclusion fencing for sensitive areas and acoustic treatments;</p> <p>h) property acquisition adjustment work including installation of property fencing;</p> <p>i) relocation and connection of utilities where the relocation or connection has been determined by the ER to have a minor impact to the environment;</p> <p>j) establishing minor ancillary facilities in accordance with <b>Condition A24</b>;</p> <p>k) archaeological testing under the <i>Code of practice for archaeological investigation of Aboriginal objects in NSW</i> (Department of Environment Climate Change and Water, 2010) or archaeological monitoring undertaken in association with Low Impact work to ensure that there is no impact on heritage items;</p> <p>l) archaeological and cultural salvage undertaken in accordance with a strategy or salvage operation required by the conditions of this approval;</p> <p>m) maintenance work to existing buildings and structures as required to facilitate the carrying out of the CSSI; and</p> <p>n) other activities determined by the ER to have minimal environmental impact which may include construction of minor access roads, temporary relocation of pedestrian paths and the provision of property access.</p> <p>Despite the above, the following works are not Low Impact Work:</p> <p>a) where heritage items, or threatened species or their habitat, or threatened ecological communities (within the meaning of the <i>Biodiversity Conservation Act 2016</i>), are adversely affected or potentially adversely affected by any low impact work as defined in (a) to (n) above, that work is construction, unless otherwise determined by the Planning Secretary in consultation with Heritage NSW, BCS or DPI Fisheries (in the case of impact upon fish, aquatic invertebrates or marine vegetation); and</p> <p>b) any night time work that exceeds noise management levels as defined in the ICNG.</p> <p>The low impact work described in this definition becomes Construction with the approval of a CEMP. Where low impact work has already commenced, this is considered to remain as low impact work and is managed in accordance with the framework under which it commenced.</p>

Figure 1-2: Activities defined as Low Impact Works in Minister's Conditions of Approval for CSSI 9371

Given the nature of the Low Impact Works, these are considered to have a low risk of impacting the Five Clawed Worm Skink after mitigation measures have been implemented, as detailed in Appendix B Activity Risk Matrix. Control measures outlined in Section 5.2 applicable to the Low Impact Works have been identified Table 1-1, which provides a summary of the Appendix B Activity Risk Matrix.

Control measures identified as applicable (green) will be implemented as per Section 5.2. Where control measures are identified as partial applicability (orange), elements of the measures from 5.2 will be implemented as reasonable and practical. Determination as to what measures are reasonable and practical is based on a risk assessment of the proposed activities (Appendix B) looking at scope of working including footprint of impact,

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type of impact, plant & machinery utilised. Some activities will be excluded from required measures (as Not applicable) due to low level of risk and/or control measure not being reasonable based on the activities impact.

Table 1-1: Low Impact Works Management Actions Matrix

Section	Control Measure	Heritage Test Excavations	Geotechnical Investigations	Utilities Investigations	General Survey	Other Non-Intrusive
5.2.1	FCWS Habitat Areas identified on Environmental Control Plans	Applicable	Applicable	Applicable	Applicable	Applicable
5.2.2	Specific FCWS Induction	Applicable	Applicable	Applicable	Applicable	Applicable
5.2.3	Survey Prescription – Before & During activities.	Partial	Partial	Partial	Partial	Partial
5.2.4	Data Collection Requirements for Captured FCWS	Applicable	Applicable	Applicable	Applicable	Applicable
5.2.5	Identifying and Establishing FCWS Relocation Sites	Applicable	Applicable	Applicable	Applicable	Applicable
5.2.6	Habitat Enhancement and Refuge Replacement	Not applicable	Partial	Not applicable	Not applicable	Not applicable
5.2.7	Five Claw Worm Skink Encounter Procedure	Applicable	Applicable	Applicable	Applicable	Applicable

### 1.3.1.1 Archaeological Test Excavation & Salvage

Archaeological excavations are required prior to construction to further characterise, and if required salvage (preservation and record) any cultural materials across the project footprint. For the purposes of test excavations, a 25 m grid would be initially established across each site, and it is expected that some  $\geq 300$  test pits would be required to investigate the locations. Test pits are approximately 0.25m<sup>2</sup> (0.5m x 0.5m) with a conservative assessment indicating that ground penetration impact will approximately 300m<sup>2</sup>. This is approximately 0.016% ground penetration impact of the 185Ha FCWS Habitat area. Total extent of slashing required to provide a safe working area for crews is approximately 4.3Ha (pending vegetation cover condition), which is approximately 2% of the 185Ha FCWS Habitat. Test excavations pits will be dug carefully using hand tools in 10cm stages to a depth of approximately 1.5m with shovels, mattocks and other hand tools in such a way to avoid damage to potential artefacts and also potential FCWS. The excavated material is then passed through a sieve, with artefacts recovered for analysis in collaboration with the Registered Aboriginal Parties. Figure 1-3 is an indication of the distribution of sites proposed for investigative archaeological excavations required prior to construction. These works will be undertaken in accordance with the approved Aboriginal Cultural Heritage Management Plan (4-0014-270-PM-C0-PL-0013).

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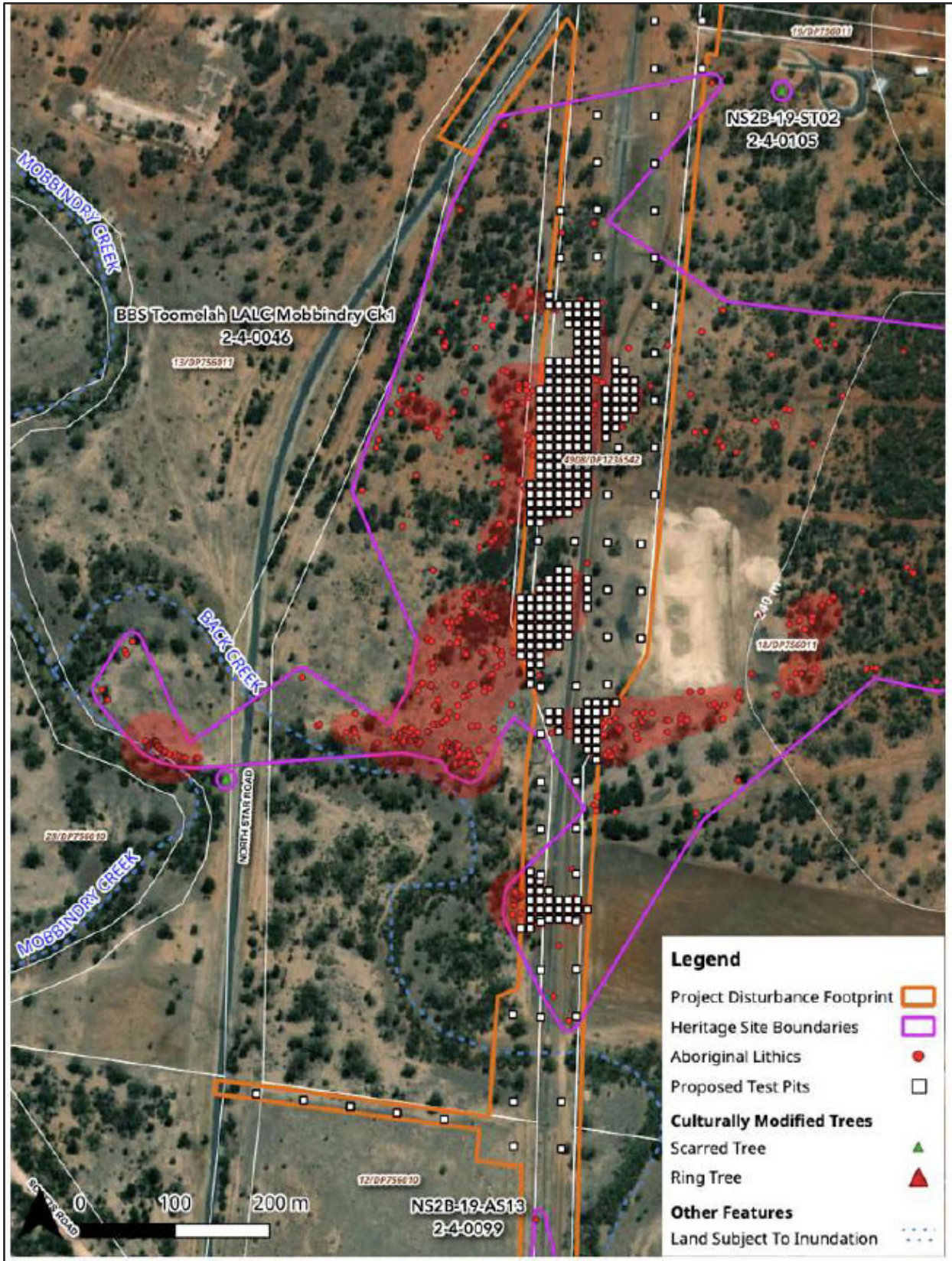


Figure 1-3: Example of proposed Test Excavation locations & distribution

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Due to the slow and careful hand tool excavation process associated with this archaeological test excavation methodology, supervision of this ground disturbance activity by ecologist/fauna spotter catcher is not considered warranted based on low risk of FCWS impact. This will be ensured via training of the Supervising archaeologists and participating Registered Aboriginal Parties as per the applicable management actions in Table A-1 & Appendix B.

### 1.3.1.2 Geotechnical & Soil Investigations

In order to facilitate design for the project, Geotechnical Investigations will be undertaken at multiple locations along the alignment. The investigations include drilling boreholes, test pit excavations, plate load testing & light weight deflectometer tests. In addition to these activities, temporary minor access tracks (4m – 6m) need to be created to allow the safe, all-weather passage of plant & equipment. This will include slashing of ground cover and in some cases minor earthworks to cut safe level working pads including placement of rock mattress. Approximate total area of access tracks potentially required to facilitate geotechnical works is 5Ha which is 2.7% of the FCWS Habitat. Full details on number of tracks required and ground penetration works required for track establishment is to be determined based on on-site conditions. Most locations where leveling off for safe drill rig operation (topsoil stripping) is required, is on rail embankments – not specified FCWS Habitat soil types (ie not cracking clay). Boreholes will be drilled to depths between approximately 15m & 35m with a diameter of approximately 400mm. A footprint of approximately 20m x 9m is required to be slashed to provide a safe working area, however, will not impact on trees or shrubs.

Test pits will be excavated with dimensions of approximately ~300mm x 1000mm to an approximate depth of ~3m by a 5-12t excavator. Material will be backfilled post investigation. A footprint of approximately 10m x 5m is required to be slashed to provide a safe working area, however, will not impact on trees or shrubs.

Conservative assessments of total geotechnical investigation impacts indicate a total of 2.1Ha of slashing for safe working areas (1.1% of FCWS Habitat) and total ground penetration of 180m<sup>2</sup> (0.01% of FCWS Habitat).

All plate load testing & lightweight deflectometer sites are located within the geotechnical test pit excavation work areas (as discussed above) and there are no further impacts incurred. Testing utilises the test excavation backhoe / excavator bearing down on a small plate on natural ground surface - to determine the bearing capacity of the ground.

### 1.3.1.3 Utilities Investigations

In order to inform detailed design, a series of utilities investigations will occur within the project footprint to identify and confirm locations of services. These investigations include service scanning & tracing with handheld scanning devices that incur no ground penetration.

Some locations require non-destructive digging (potholing with a vac track) to physically locate known services. An 1m<sup>2</sup> area is required to be slashed to provide a safe working area (pending grass height) with the truck opening ~400mm diameter pothole. Any potholes are backfilled post service identification.

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### 1.3.1.4 General Survey Investigations

As part of inputs into the design process, detailed survey is to be undertaken along the alignment. The only ground disturbance associated with this, is installation of survey markers, pegs and the set-out of control points.

Survey Control locations involve hand digging a penetration (approx. 250mm x 250mm), placement of precast box with a driven steel rod, backfilled with soil, to remain in place for the duration of the project.

### 1.3.1.5 Other Non-Intrusive Investigations

A series of other non-intrusive / non-ground disturbing activities are required as part of the pre-construction Low Impact Works. This may include but is not limited to non-intrusive assessments such as ecological inspections & assessments, and cultural heritage investigation site walks.

### 1.3.2 Construction

Construction is defined as follows in Schedule 1 – Table 1 of NS2B SSI-9371 approval: “Includes all work required to construct the CSSI as defined in the Project Description provided in the documents listed in **Condition A1**, including commissioning trials of equipment and temporary use of any part of the CSSI, but excluding **low impact work** which is commenced prior to approval of the CEMP”. Construction activities are listed within Condition A1 of document *Inland Rail – North Star to NSW/Qld Border Environmental Impact Statement, in particular Chapter 7-Construction of the Proposal* (refer <https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-9371%2120200819T054005.358%20GMT>). In summary LOR's Civil Works scope will include these activities:

- Earthworks: including clearing, grubbing and topsoil stripping of CIZ
- Drainage Works: including culverts and track drainage
- Bridgeworks
- Roadworks: local road re-alignments and realignment of Bruxner Way

These “Construction” activities will be managed in accordance with this FCWS Management Plan, in particular management actions defined in Section 5.2.

### 1.3.3 Potential Impacts to FCWS Species and Habitat

Potential impacts to FCWS species and its habitat from the construction of CSSI 9371 may involve:

Table 1-2: CSSI Activities potential impacts to FCWS & FCWS Habitat

Potential Impacts	Evidence from N2NS SP1	Mitigation Measures (Refer Appendix B)
<b>Vehicle Movement causing compaction</b>	0 recorded injuries / mortalities of 248 records (N2NS SP1)	• Vehicles remain on designated accesses
<b>Slashing causing habitat reduction or injury / mortality</b>	0 injuries & 2 mortalities = 0.8% of 248 records (N2NS SP1)	• Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing

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Potential Impacts	Evidence from N2NS SP1	Mitigation Measures (Refer Appendix B)
		<ul style="list-style-type: none"> <li>Ecologist or Fauna Spotter supervise slashing activity</li> </ul>
<b>Drilling / Test Pitting causing habitat reduction or injury / mortality</b>	0 recorded injuries / mortalities of 248 records (N2NS SP1)	<ul style="list-style-type: none"> <li>Ecologist or Fauna Spotter observe ground penetration of drilling location. Not required for duration of drilling. Drilling location can be prepared in days leading up to works by hand excavating a 500mm x 500mm pit in the borehole location. Pit to be excavated to change in soil horizon / end of vertisol soil layer under Ecologist / Fauna Spotter observation. Excavation becomes a hostile FCWS environment, is covered as an end of day control and does not require Ecologist / Fauna Spotter presence for drilling mechanism penetration.</li> </ul>
<b>Hand Excavation causing habitat reduction or injury / mortality</b>	0 recorded injuries / mortalities of 248 records (N2NS SP1)	<ul style="list-style-type: none"> <li>Ecologist or Fauna Spotter undertake pre-clearing survey prior to commencing works</li> <li>Work crews tool-boxed on how to search for and avoid impact to FCWS prior to commencing hand tool archaeological test pit digging; then self-management of archaeological excavation program by archaeologists and Registered Aboriginal Parties</li> </ul>
<b>Habitat Removal (Logs, sleepers etc)</b>	0 injuries & 1 mortalities = 0.4% of 248 records (N2NS SP1)	<ul style="list-style-type: none"> <li>Ecologist or Fauna Spotter undertake pre-clearing survey prior to commencing works.</li> <li>Relocation sites to be established based on capture sites</li> </ul>
<b>Topsoil Stripping causing habitat reduction or injury / mortality</b>	84 mortalities = 34% of 248 records	<ul style="list-style-type: none"> <li>All mitigation measures as per FCWS MP Section 5.2 and Appendix B Section 9.</li> </ul>

### 1.4 Site Overview

The NS2B project will occur between North Star and the NSW/QLD border. Between North Star and a greenfield deviation around Whalan Creek, the proposal is within the existing brownfield non-operational rail corridor and will consist of approximately 25 km of upgraded track. Between Whalan Creek and the NSW/QLD border, the proposal will occur within a greenfield rail corridor and consist of 5 km of new track.

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The proposal is made up of permanent and temporary construction footprints. The permanent impact footprint will be a minimum width of 40m with an increased width to approximately 200m in the vicinity of the Bruxner Way realignment. The temporary construction footprint incorporates additional areas outside of the permanent footprint to accommodate laydown areas, access tracks etc. This additional footprint comprises of approximately 112 Ha, not included in the permanent footprint.

The subject land is situated within the New England North-West region of NSW and traverses the Brigalow Belt South bioregion defined by the Interim Biogeographic Regionalisation for Australia (IBRA). The subject land has been significantly modified by agricultural land use, where the clearing of native vegetation has been extensive. Current dominant land cover types include exotic pasture grasslands, irrigated and dryland crops, and fallow fields. Large tracts of remnant vegetation are rare within the subject land, with the majority of remaining native vegetation occurring in small fragments, often in a highly degraded state. Some connectivity is provided by riparian vegetation along drainage lines.

## 1.4.1 Watercourses

The proposal is located within the Border Rivers Catchment Management Area in NSW. This catchment is one of the northern-most catchments within the Murray Darling Basin and is made up of a group of waterways that straddle the NSW/QLD border.

A number of watercourses and waterbodies occur in and around the project and is referred to as the Border Rivers and they traverse the Border Rivers Valley Floodplain

The proposal site crosses several anabranch streams of the Macintyre River, including Whalan Creek, that convey significant portions of the flood flow during moderate-to-major flood events. In addition, there are several smaller local creeks that cross the proposed alignment, including Forest Creek, Back Creek and Mobbindy Creek.

## 1.4.2 Soil

Transecting layers of chromosol and dermosol underlay the surface of the study area between North Star and the section of the rail west of Humptybung, as well as along the banks of Whalan Creek.

The chromosol highlands surround North Star with a strong texture contrast between A and B horizon. Areas of alluvial soil, consisting of dermosols, transect layers of vertosols and chromosols along the project footprint north of North Star and around Mungle. Dermosols are soils with well-structured B2 horizons. Dermosols are identified as a good agricultural soil because they have good structure and moderate-to-high chemical fertility as well as water holding capacity.

Vertosol is the dominant soil type along the proposed rail corridor, heavily featuring between Mungle and the Macintyre River. Vertosols are clay rich soils (>35 per cent) with shrink-swell properties that exhibit strong cracking when dry. Because of their high chemical fertility and water-holding capacity, vertosols have high agricultural potential.

## 1.4.3 Vegetation

A total of four Threatened Ecological Communities (TEC) listed under the NSW Biodiversity Conservation Act and five TECs listed under the EPBC Act have been located in the construction area with details available in the NS2B EIS Appendix B – Terrestrial Biodiversity Technical Report (Appendix B – Terrestrial Biodiversity Technical Report 2-0001-270-EAP-10-RP-0401 Rev 10 dated 20 October 2021).



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The FCWS was assessed in the NS2B EIS Appendix B – Terrestrial Biodiversity Technical Report (Appendix B – Terrestrial Biodiversity Technical Report 2-0001-270-EAP-10-RP-0401 Rev 10 dated 20 October 2021). The species was not detected during a range of reptile surveys which were completed under favourable conditions in early 2021 or incidentally during other surveys.

The proposal area is located entirely within areas of likely predicted habitat, as mapped within the SPRAT database profile for the species (Department of the Environment, 2023), refer to Section 4.3.

## 1.5 Planning Framework

The NSW Minister for Planning and Public Spaces approved the NS2B Project (SSI-9371) under Section 5.19 of the Environmental Planning and Assessment Act 1979 (EP&A Act) on 20 February 2023. The approval for NS2B SSI-9371 incorporated the Minister's Conditions of Approval (MCoA), refer to Section 2.

## 1.6 FCWS at N2NS Separable Portion 1

A significant population of FCWS was discovered at Inland Rail - Narrabri to North Star Separable Portion 1 (SSI-7474) following an initial unexpected find, with the final population size encountered constituting the largest population in NSW or Queensland. Details of this population including locations of finds and analysis of habitat types is included in the Inland Rail Narrabri to North Star Phase 1: Five-clawed Worm Skink (*Anomalopus mackayi*) Species Management Plan (Lewis, 2022), as approved by the Planning Secretary on 1 February 2023. A summary of the initial find and subsequent process and total finds of FCWS is detailed below. 248 specimens were recorded in 2021-22 at Bellata, Croppa Creek at the Inland Rail Narrabri to North Star SP1 project. For complete details including map references and summary of all FCWS finds at N2NS SP1 refer to <https://shorturl.at/wKSTY>.

*A spotter-catcher contractor conducting pre-clearing surveys in the Stage 3 section of N2NS SP1 recorded a potential FCWS at chainage 741.225 on the 5 July 2021. Specifically, the location was within Zone 4 - PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains of the northern- eastern Darling Riverine Plains Bioregion (GeoLink 2021).*

*Through consultation with the NSW Department of Planning and Environment (DPE) and the Commonwealth Department of Agriculture, Water and the Environment (DAWE), a clearing procedure for the FCWS was agreed on following the requirements of the 'unexpected finds procedure' as detailed in the approved Construction Biodiversity Management Subplan – N2NS SP1 (Trans4m Rail 2021). Following this clearance procedure, an additional 248 individuals have been recorded up to 16 September 2022 during pre-clearing and post-clearing works between chainage 609 and 614 in Stage 1, vicinity of chainage 629 in Stage 2 and between chainage 736 and 742 in Stage 3. Of these, 87 individuals (35% total records) have been recorded as dead as a result of the clearing works, 116 individuals relocated and 45 recorded as dropped tails. More details are provided in Section 4.12.*

## 1.7 Construction Environmental Management Plan – Framework

The EWEMP is the overarching 'road map' and management tool in relation to environmental performance during commencement of Low Impact Works as per the definitions in Schedule 1 – Table 1 of the MCoA and requirements of ARTC Specification –

## Five-Clawed Worm Skink Management Plan

Construction Environmental Management Framework – Civil Works (0-0000-900-EEC-00-SP-0001). The EWEMP links the relevant legislative and client requirements to the project's Environmental Management System (EMS) and describes the construction environmental management framework for the Project and the system for minimising and managing environmental risks.

It should be noted that for this early version of the FCWS Management Plan, that the CEMP and Biodiversity Management Plan, which are required prior to Construction are not yet finalised. Whereas the FCWS Management Plan is required prior to Works, and as such is developed prior to the CEMP and Biodiversity Management Plan. As such the FCWS Management Plan will be combined with and attached to the Biodiversity Management Plan as these are finalised and approved. This FCWS Management Plan will be reviewed, and updated utilising additional information gathered during the initial Low Impact Works in accordance with adaptive management principles (refer to Section 5.1.1), with the FCWS Management Plan to be re-issued with the Biodiversity Management Plan prior to Construction. The target information to be obtained during Low Impact Works scope is in relation to cracking clay habitat type, which analysis of N2NS SP1 data shows accounts for 97.2% of FCWS records at N2NS SP1, with this finding also supported by SPRAT database habitat notes. Analysis of N2NS SP1 data, SPRAT database information and assumptions derived for NS2B are detailed in Table 2-1. This cracking clay habitat type will be collected via the Geotechnical and Soil Investigation Low Impact Works activity, refer to Sections 1.3.1.2 and 5.1.1; following approval of this FCWS MP by the Planning Secretary which is a Hold Point prior to commencing these Works in accordance with MCoA E30.

# Five-Clawed Worm Skink Management Plan

## 2. Project Conditions and Management Measures Applicable to FCWS

The FCWS was assessed in the NS2B EIS Appendix B – Terrestrial Biodiversity Technical Report (Appendix B – Terrestrial Biodiversity Technical Report 2-0001-270-EAP-10-RP-0401 Rev 10 dated 20 October 2021). As part of the assessment, targeted surveys were carried out for FCWS. The species was not detected during a range of reptile surveys which were completed under favourable conditions in early 2021 or incidentally during other surveys; however, this is not considered definitive due to the cryptic nature of the species and corresponding difficulty in detection through targeted surveys.

A significant population of FCWS has been encountered on the adjacent Narrabri to North Star Separable Portion 1 project of Inland Rail, with 248 records of FCWS. This represents one of the largest populations detected to date in NSW or Queensland, as detailed in Section 4 and Table 2-1 below.

Minister's Condition of Approval E30 for SSI-9371 specifies the requirements for Five-clawed worm Skink Management Plan, refer to Table 2-1 below for compliance information.

Table 2-1: MCoA E30 compliance information

MCoA E30 requirements	Compliance Information
<p><i>The Proponent must prepare a Five-clawed Worm Skink Management Plan (the FCWS Management Plan) to detail how impacts on the Five-clawed Work Skink and its habitat will be managed and minimised during the construction and operation of the CSSI. The FCWS Management Plan may be adapted from an existing FCWS Management Plan prepared by the Proponent. The FCWS Management Plan must be prepared in consultation with BCS and DCCEE. The FCWS Management Plan must be submitted to and approved by the Planning Secretary prior to Work. The approved FCWS Management Plan must be implemented.</i></p>	<ul style="list-style-type: none"> <li>• This FCWS Management Plan is adapted from and utilises Narrabri to North Star Phase 1 (SSI-7474) Condition C4 FCWS Management Plan (Rev 2 - dated 23 December 2022) as approved by Planning Secretary on 1 February 2023.</li> <li>• Consultation with BCS and DCCEE effected via meetings (30 January 2023 and 6 February 2023) and review of this FCWS Management Plan.</li> <li>• This FCWS Management Plan is submitted for approval from Planning Secretary in accordance with MCoA E30.</li> <li>• Once approved the FCWS Management Plan shall be implemented.</li> </ul>
<p><i>The FCWS Management Plan must include:</i></p> <p>a. <i>identification of potential habitat prior to Work commencing;</i></p>	<p>Analysis of results for the N2NS SP1 records (248 in total) of FWCS found soil types rather than plant community type tends to form an important microhabitat feature with the highest densities occurring in cracking black clays (94.4%) although lower densities do occur on red cracking clays (2.8%) and seldom red gravel loam (0.4%). It is noted that the single record of FCWS associated with red gravel loam represents 0.4% of total encounters of FCWS at N2NS SP1; therefore, this soil type is not considered to represent a FCWS Habitat Area for the purposes of this plan, with this soil type managed via the Five Clawed Worm Skink Encounter Procedure (Appendix</p>

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## Five-Clawed Worm Skink Management Plan

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E). This procedure addresses the measures in place where FCWS are found within identified Habitat Areas, as well as measures and requirements in place for where FCWS are found outside of identified FCWS Habitat Areas.

Review of the DCCEEW Species Profile and Threats Database (SPRAT @ [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=25934](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25934)) for NSW habitat on the floodplains such as the Macintyre River and tributaries floodplain for the NS2B project "*On the floodplains within its range in north-eastern New South Wales, the Five-clawed Worm-skink occurs in grasslands and grassy, open woodlands on heavy black and grey, alluvial cracking clay soils from 135–200 m above sea level (NSW DECCW 2005ab; Sadler & Pressey 1994; Spark 2010). During dry periods, the species is likely to shelter where moisture is available. For example, they may take refuge in deep cracks within alluvial clay soils. Sufficient rainfall following extended dry conditions is likely to bring the skink to the surface (Brigalow Belt Reptiles Workshop 2010).*" Further the SPRAT habitat on NSW floodplains listing also notes "*Floodplain surveys have shown, however, that the species has no preference for particular vegetation types on alluvial cracking clays. Cracking clay soils on the Namoi and Gwydir floodplains support a wide variety of vegetation communities which can be considered suitable habitat for the Five-clawed Worm-skink (Spark 2010).*" Further information regarding potential FCWS habitat is included in the Queensland part of the SPRAT listing including "*the species is not likely to be found in soils in which deep cracks do not form, such as hard-setting brown clays or sandy soils types (Spark 2010).*", this also supports the N2NS SP1 findings that cracking clays represent the defining microhabitat type for FCWS; and that non-cracking or for example hard-setting brown clays or red gravel loam do not represent FCWS habitat of significance.

On the basis of this dominant cracking clay soil type correlation at N2NS SP1 (97.2% of total records at N2NS SP1) which is also supported by the DCCEEW SPRAT habitat notes above, it has been determined that cracking clays should be utilised to identify FCWS Habitat Areas for the purposes of this plan. The latest and best available information available prior to commencement of Works is sourced from NSW DPE SEED (Central Resource for Sharing and Enabling Environmental Data in NSW <https://datasets.seed.nsw.gov.au/dataset/australian-soil-classification-asc-soil-type-map-of-nsw-eaa10>) and in particular *Australian Soil Classification (ASC) soil type map of NSW* (data date Apr 2021). To correlate with the N2NS SP1 learnings above potential FCWS Habitat Area identification in this plan is based on soil type, and in particular cracking clays. This cracking clay soil type is represented by Vertosols, and it is these areas which are identified as potential FCWS Habitat Areas as shown in Appendix A maps and Chainage definitions

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## Five-Clawed Worm Skink Management Plan

to which the Management Measures as per the Activity Risk Assessment (Appendix B) and Section 5 shall apply:

- **Southern FCWS Habitat Area:** CH 5,500 (EIS reference)/**CH 765,058(IFC) to CH 8,500 (EIS reference)/CH768,058(IFC)**
- **Central FCWS Habitat Area:** CH 16,000 (IES reference)/**CH775,558(IFC) to CH 17,000/CH776,558(IFC)**
- **Northern FCWS Habitat Area:** North of CH 20,000 (EIS reference)/**CH779,558(IFC) to NSW/Qld Border**

It is noted that extents of the soil type is based off of the Australian Soil Classification with a scale of 1:250,000. A buffer of approximately 250m has been added to the targeted soil classification to create an initial habitat footprint.

It is recognised that the identification of FCWS habitat prior to Work commencing as per this MCoA 30(a) is subject to refinement and continuous improvement as delivery of NS2B SSI9371 progresses. As part of continuous improvement, the principle of adaptive management shall be applied to FCWS and identification of habitat areas. Refer to Section 5.1.1 for further details. The collection of additional data during the initial Low Impact Works phase will enhance the soil type data set and correspondingly improve and contribute to finer scale resolution of this soil type-based definition of FCWS Habitat Area. It should also be noted that this additional data cannot be collected until this FCWS Management Plan is approved, as the FCWS Management Plan is a Hold Point prior to Works (with Works including collection of this data).

The FCWS Habitat Areas identified in Appendix A will be included in Project induction, ECP, EWMS and ongoing Toolbox training so that all staff and construction workers are aware of the FCWS Habitat Areas and requirements of this FCWS Management Plan.

- b. *details of potential impacts on the species and its habitat from the construction and operation of the CSSI;*
- Refer to Section 1.3 and Appendix B for details of potential impacts to FCWS from construction of NS2B Inland Rail Civil Works within LOR scope
  - Note: Operation of the CSSI is explicitly outside of LOR scope and is therefore excluded from this FCWS Management Plan. Operational Phase management of FCWS will be addressed by ARTC prior to Operation of SSI-9371.

- c. *details of proposed management and mitigation measures that would be implemented during the construction and operation of the CSSI to minimise impacts to the species;*

Mitigation measures as specified in Section 5 shall be applied to all FCWS Habitat areas as identified in E30(a) and Appendix A as determined in Appendix B.

Where 'cracking clay soils' are identified outside of the nominated FCWS habitat areas, the nominated chainages (extents) will be updated in required documentation. This includes information in sensitive area plans, inductions, signage and toolbox talks.

Ecological due diligence processes shall continue to be implemented for other species as part of general Biodiversity Management requirements; if any FCWS are detected outside

## Five-Clawed Worm Skink Management Plan

of the FCWS Habitat Areas identified in E30(a), these shall be managed in accordance with Section 5.2.7. In addition, ongoing monitoring shall be developed in accordance with E30(g).

Note: Operation of the CSSI is explicitly outside of LOR scope and is therefore excluded from this FCSW Management Plan. Operational Phase management of FCWS will be addressed by ARTC prior to Operation of SSI-9371.

d. *procedure for the relocation of individuals recovered before and during construction and details of the relocation sites;*

As per Section 5.2.5 of this FCWS Management Plan.

e. *goals and performance indicators to measure the success of the mitigation measures;*

Goal

- Avoid harm to FCWS
- Increase currently limited knowledge of the cryptic FCWS to enhance and improve future recovery efforts
- Refine FCWS Habitat Area based on data collected during Low Impact Works

SMART Performance Indicators

- Refer to Section 5.4

f. *a procedure for recording discoveries of individuals and regular reporting to BCS and DCCEEW; and*

- Utilise data collection form as per Section 5.2.4 and Appendix C.
- Reporting on FCWS in accordance with Section 7.1 of this FCWS MP.
- FCWS harmed during works to be reported as per MCoA A43 & A44.

g. *where individuals are recorded on site, ongoing monitoring of the species and its habitat during construction must occur, and for a minimum of five monitoring events post-construction in suitable conditions, with timing agreed by BCS and DCCEEW.*

- Monitoring and recording of FCWS from commencement of Works in accordance with E30(f).
- As at the time of this revision of the FCWS Management Plan no FCWS individuals have been detected within the SSI-9371 Construction Boundary. If this changes during delivery of SSI-9371, where individual FCWS are recorded, monitoring during and post construction shall be developed in consultation with BCS and DCCEEW in accordance with E30(g) and adaptive management principles, refer to Section 5.1.1. The FCWS Management Plan will be revised and re-issued accordingly including the agreed monitoring provisions.

# Five-Clawed Worm Skink Management Plan

## 3. Project Roles and Responsibilities

The key roles associated with this FCWS Management Plan include:

- Project Director;
- Construction Manager;
- Environmental Manager;
- Project Ecologist; and
- Environmental Representative.

Their roles have been summarised in Table 3-1, and as a team, they are responsible for the successful implementation of this plan. ARTC Inland Rail will work closely with LOR in managing this plan and managing compliance with this plan, incident investigation and learning.

The key roles pertaining to this plan have been highlighted in Table 3-1.

Table 3-1: Summary of roles and responsibilities for key personnel associated with this FCWS Construction Plan of Management.

Role	Responsibility	Organisation
<b>ARTC Inland Rail Representative</b>	<ul style="list-style-type: none"> <li>• Notifying relevant agencies of all environmental incidents, and live captures of FCWS in accordance with reporting process in Section 7.1</li> <li>• ARTC is responsible for managing the implementation of the Project's Biodiversity Offset Strategy (BOS)</li> </ul>	ARTC
<b>Project Director</b>	<ul style="list-style-type: none"> <li>• Ensure that all personnel including sub-contractors complete an induction prior to mobilising for work.</li> <li>• Provide necessary resources / facilities for the protection of the FCWS and its associated Habitat Area as directed by the Environmental Manager.</li> <li>• Ensure that all environmental incidents involving FCWS Habitat Area disturbance, relocation or death are reported appropriately to the nominated ARTC Inland Rail representative.</li> <li>• Ensure that corrective actions including FCWS management, communicated by the Environmental Manager are closed out within the stipulated timeframe.</li> </ul>	LOR

## Five-Clawed Worm Skink Management Plan

Role	Responsibility	Organisation
<b>Construction Manager</b>	<ul style="list-style-type: none"> <li>• Confirm as part of inductions/pre-start and toolbox meetings that all personnel are familiar with the requirements for management of FCWS protection.</li> <li>• Confirm with and report to the Environmental Manager, any suspected non-compliance by subcontractors or any contractor employees and site visitors over protection methods as per this FCWS Construction Management Plan.</li> <li>• Follow instructions from Environmental Manager and Environmental Adviser in relation to the requirements for the management of FCWS Habitat Area removal/relocation, open excavations, structural demolition/removal and FCWS relocation.</li> </ul>	LOR
<b>Environmental Manager</b>	<ul style="list-style-type: none"> <li>• Undertake the investigation of any FCWS environmental incidents involving unplanned FCWS Habitat Area disturbance, relocation failure or accidental death and incident reporting requirements in consultation with ARTC Inland Rail</li> <li>• Provide senior support to the Environmental Adviser(s) and site staff to ensure environmental works are carried out in accordance with the FCWS Management Plan.</li> <li>• Ensure toolbox talks cover procedures associated with FCWS including its identification.</li> <li>• Consult as necessary, with ARTC Inland Rail Representative and Project Environmental Representative on matters relating to the FCWS.</li> <li>• Control access into FCWS Relocation Sites</li> </ul>	LOR
<b>Environmental Adviser</b>	<ul style="list-style-type: none"> <li>• Assist in the delivery of Project specific inductions, environmental awareness training sessions, pre-starts and toolbox meetings.</li> <li>• Ensure all employees and sub-contractors are aware of the protocols relating to FCWS Habitat Area removal/relocation, open excavations and FCWS relocation in accordance with this FCWS Construction Management Plan.</li> <li>• Submit incident reports when required for due diligence and communicate with</li> <li>• the Environment Manager and client's Environmental Representative as necessary.</li> </ul>	LOR
<b>Project Ecologist</b>	<ul style="list-style-type: none"> <li>• Be present (in person or virtually) during the removal or disturbance of all known or potential FCWS Habitat Areas in accordance with the FCWS Management Plan</li> </ul>	LOR / Project Ecologist



## Five-Clawed Worm Skink Management Plan

Role	Responsibility	Organisation
	<ul style="list-style-type: none"> <li>• Determine appropriate relocation points for captured FCWS in accordance with the FCWS Management Plan.</li> <li>• Assist both the Environmental Manager and Environmental Adviser.</li> <li>• Prepare a summary report following the completion of FCWS Habitat Area removal and disturbance works.</li> </ul>	
<b>Environmental Representative</b>	<ul style="list-style-type: none"> <li>• Monitor the implementation of this FCWS Management Plan.</li> <li>• Approve or reject out of hours works in accordance with MCoA for matters relating to FCWS surveys and implementation of this construction management plan.</li> </ul>	Consultant

## Five-Clawed Worm Skink Management Plan

### 4. Five-Clawed Worm Skink (*Anomalopus Mackayi*)

#### 4.1 Taxonomy

**Scientific name:** *Anomalopus mackayi*

**Common name:** Five-clawed Worm Skink



Figure 4-1: Adult five-clawed worm skink (Photo – Steve K Wilson ©).

#### 4.2 Description

The Five-clawed Worm-skink (*Anomalopus mackayi*) is a burrowing lizard with a worm-like body that can grow up to 270 mm total length. It tends to be dark brown above with a green-yellow underside (Swan 1990). This skink has short limbs with three fingers and two toes, and this feature is used to distinguish this species from the more common Two-clawed Worm Skink (*Anomalopus leuckartii*) which only has two toes on the front limbs (Cogger 1993; OEH 2017).

#### 4.3 Distribution

The FCWS has been recorded along the western slopes of the Great Dividing Range, in north-eastern NSW and south-eastern Queensland (Wilson and Knowles 1988; Swan 1990; Sadlier et al. 1996; Figure 4-2). Within this distribution, the skink generally inhabits grassy white box woodlands supported by moist black soils and river red gum – Coolibah – Bimble box woodland on deep cracking clay soils (OEH 2017), and lives in tunnel-like burrows within the soil, coming to the surface under fallen timber and leaf litter.

# Five-Clawed Worm Skink Management Plan

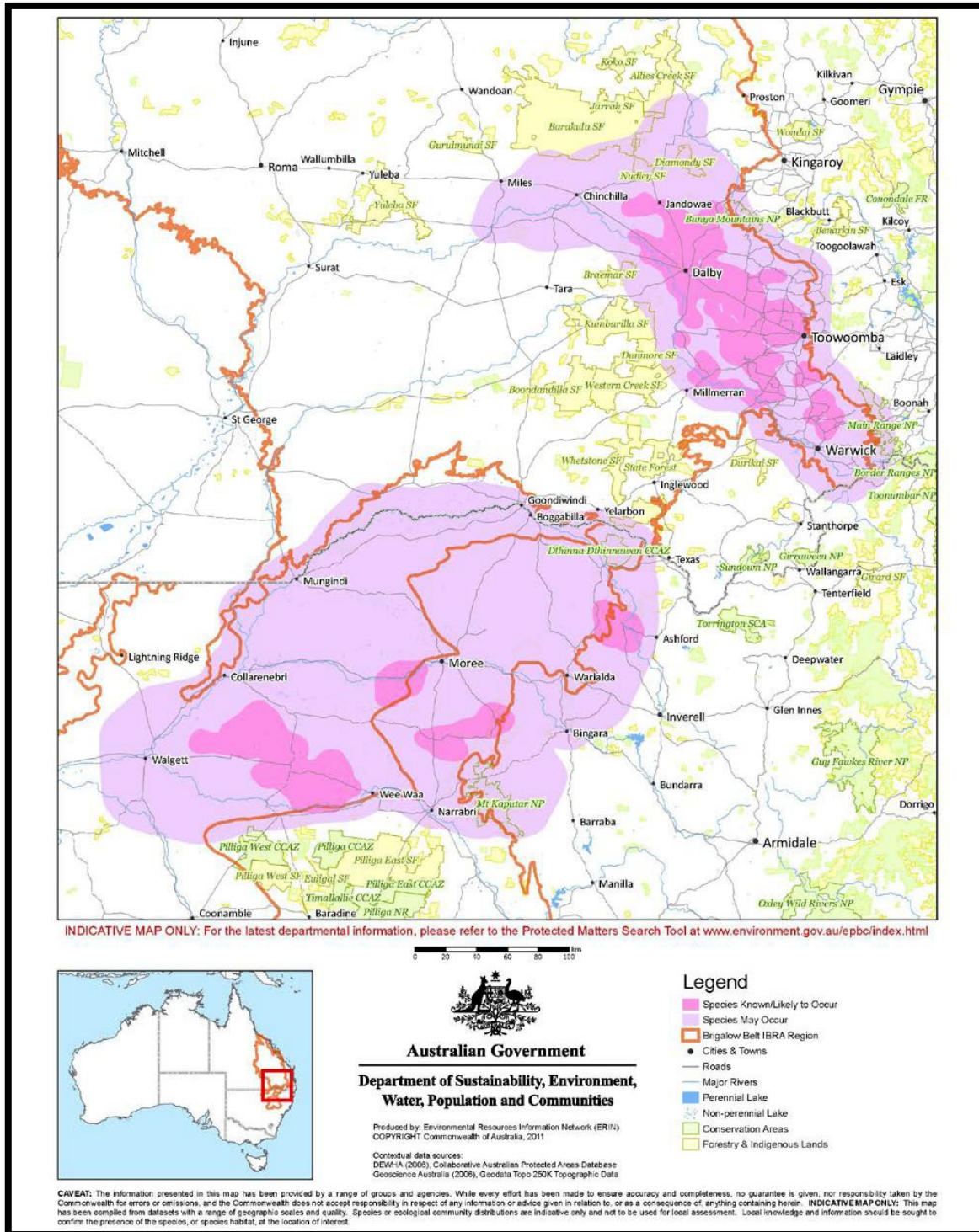


Figure 4-2: Known and predicted distribution of Five-clawed Worm Skink (source: DAWE 2022).

In New South Wales, FCWS is confined to the Namoi River and Gwydir River floodplains and the lower north-western slopes of the Great Dividing Range. The species ranges from the Wallangra-Masterman Range area in the east, south-west to the Narrabri-Wee Waa area, west along the northern edge of the Pilliga outwash demarcation to the south-west corner of the Namoi catchment south of Walgett and bordered by the Barwon River in the west to the Mungindi area near the Queensland border (Spark 2010).

## Five-Clawed Worm Skink Management Plan

There is some thought of a range contraction eastwards. The most western record was made in the Goodooga area approximately 80 km west-north-west of Lightning Ridge sometime prior to 1970 (Sadler & Pressey 1994; Spark 2010). Another specimen was found approximately 20 km south of Walgett in 1905. Until Spark's survey of the Namoi catchment in late 2009–early 2010, no specimens had been found in the Namoi catchment since 1976 when the species was found at a site in the Narrabri-Wee Waa area (Cogger et al. 1993; NSW DECCW 2005ab; Spark 2010).

Specimens have been recorded from Old Burren, Goodooga, Burren Junction, Culgoora, Yetman Road 6.9 km north- north west of Wallangra, Wee Waa, Millie, Terry Hie and Bellata (Greer & Cogger 1985; Shea et al. 1987; NSW DECCW cited in Sass et al. 2009). 248 specimens were recorded in 2021-22 at Bellata, Croppa Creek at the Inland Rail Narrabri to North Star SP1 project.

Updates to the SPRAT species listing at [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=25934](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25934) (accessed April 2023) includes an updated distribution map as shown in Figure 4-3. Note that this map includes closure of the prior gap between the predicted populations in NSW and Queensland (compare to Figure 4-2) and expansion of the zone FCWS habitat may occur. The result being that the alignment of NS2B SSI-9371 changes from an area where FCWS “species or species habitat may occur” to an area where FCWS “species or species habitat likely to occur.” This is likely associated with the significant FCWS population encountered at the N2NS SP1 project and other updates to available species information. This status is addressed for NS2B SSI-9371 via inclusion of MCoA E30 and the preparation of this FCWS Management Plan.

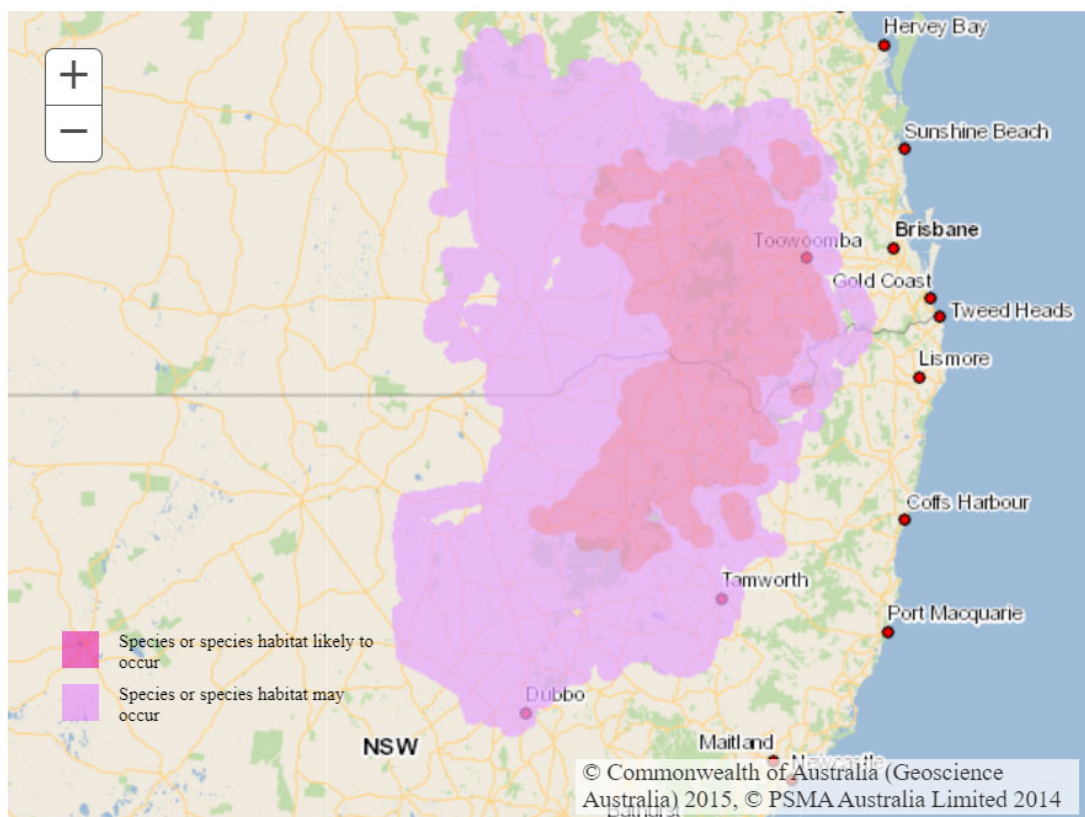


Figure 4-3: Updated distribution map known and predicted distribution of Five-clawed Worm Skink (source: Department of the Environment 2023).

## Five-Clawed Worm Skink Management Plan

### 4.4 Population Information

Prior to works on the N2NS SP1, there were no population or density estimates for the FCWS. This is most probably due to its cryptic habits which has also made its detection difficult. The N2NS SP1 project contributes to the species knowledge with some population density estimates provided in Section 4.12.

### 4.5 Land Tenure of Populations

Most known populations of FCWS occur outside of the reserve system on private lands and within transport corridors and travelling stock reserves. A population is known from within the Terry Hie Community Conservation Area (BioNet 2022).

Potential habitat may be inferred based on the presence of soil types and PCTs known to support FCWS within a region where FCWS is predicted to occur (refer Figure 4-3). Potential distribution and habitat associations for the FCWS are described further at Section 4.3 and Section 4.6 respectively.

Potential habitat exists at Lake Broadwater Conservation Park, Southwood National Park, Narran Lake Nature Reserve, Killamey State Conservation Area, Bobbiwa State Conservation Area, Couradda State Conservation Area, Moema State Conservation Area, Bullala, Burrell Yurrul National Park, Burrell Yurrul Nature Reserve, Boomi Nature Reserve, Dthinna Dthinnawan National Park, Kwiambal National Park, Careunga Nature Reserve, Budelah Nature Reserve, Gwydir Wetlands State Conservation Area, Kirramingly Nature Reserve, Barwon Nature Reserve, Barwon State Conservation Area, Midkin Nature Reserve, Gamilaroi Nature Reserve and Taringa Nature Reserve (Cogger et al. 1993; pers. obs). Some other public reserves such as Yetman, Culgoora and Jacks Creek State Forest also provide potential habitat for FCWS.

### 4.6 Habitat Associations

#### 4.6.1 Habitat on the Floodplains

On the floodplains of northern New South Wales, the FCWS occurs in grasslands and grassy, open woodlands on heavy black and grey, alluvial cracking clay soils from 135–200 m above sea level (Sadler & Pressey 1994; NSW DECCW 2005ab; Spark 2010). During dry periods, the species tends to shelter where moisture is available. For example, they may take refuge in deep cracks within alluvial clay soils. Sufficient rainfall following extended dry conditions is likely to bring the skink to the surface (Brigalow Belt Reptiles Workshop 2010). The species has been recorded in grasslands dominated by Mitchell Grass (*Astrebula* spp.) and River Red Gum (*Eucalyptus camaldulensis*) - Coolibah (*E. coolabah* subsp. *coolabah*) - Bimble/Poplar Box (*E. populnea* subsp. *bimbil*) - Weeping Myall (*Acacia pendula*) grassy woodlands to open forests with grasses typically of the genera *Austrodanthonia*, *Austrostipa*, *Bothriochloa*, *Chloris*, *Enteropogon* and *Themeda* (Brigalow Belt Reptiles Workshop 2010).

Floodplain surveys have shown, however, that the species has no preference for particular vegetation types on alluvial cracking clays. Cracking clay soils on the Namoi and Gwydir floodplains support a wide variety of vegetation communities which can be considered suitable habitat for the FCWS (Spark 2010; GeoLink 2022).

#### 4.6.2 Habitat on the lower western slopes of the Great Dividing Range

On the lower north-western slopes of the Great Dividing Range in New South Wales, the species occurs in White Box (*Eucalyptus albens*) and sometimes ironbark-mixed, grassy

## Five-Clawed Worm Skink Management Plan

woodland on self-mulching, friable, basalt derived, red-black to black clay-loam soils. The species has been found occurring in burrows in open paddocks with few trees, cropped grass and moist black soil (Swan 1990; Sadlier & Pressey 1994; Spark 2010). Shea et al. (1987) found five specimens under logs in open paddocks surrounded by open eucalypt woodland, and one specimen under a log in a largely cleared woodland in the vicinity of granite outcrops.

### 4.6.3 Microhabitat Observations

FCWS tends to shelter at the soil surface where moisture is sufficiently retained under decaying leaf litter, coarse woody debris or artificial debris. The species also lives in cavities in rotting tree bases, logs and in tussock bases. It is known to dig permanent tunnel-like burrows in loose, friable, humic soils in woodlands on slight basalt rises (Sadlier & Pressey 1994; NSW DECCW 2005ab).

### 4.6.4 N2NS SP1 Inland Rail Project Observations

Refer to Section 4.12 for details of FCWS habitat associations observed during the construction of the N2NS SP1 Inland Rail Project. These learnings have been used to determine FCWS Habitat Area for this FCWS Management Plan.

### 4.6.5 NS2B Inland Rail FCWS Habitat Areas

FCWS Habitat Area identification is based on soil type, and in particular cracking clays. This cracking clay soil type is represented by Vertosols, and it is these areas which are identified as potential FCWS Habitat Area as shown in Appendix A and below. These chainages define the extents of FCWS Habitat Area and therefore the extents to which the management measures in the Activity Risk Assessment (Appendix B) and Section 5 shall apply:

- **Southern FCWS Habitat Area:** CH 5,500 (EIS reference)/**CH 765,058(IFC) to CH 8,500** (EIS reference)/**CH768,058(IFC)**
- **Central FCWS Habitat Area:** CH 16,000 (IES reference)/**CH775,558(IFC) to CH 17,000/CH776,558(IFC)**
- **Northern FCWS Habitat Area:** North of CH 20,000 (EIS reference)/**CH779,558(IFC) to NSW/Qld Border**

## 4.7 Life Cycle

Very little is known about the biology of FCWS. Average clutch size or mortality rates for newborns is unknown. One specimen was observed laying three eggs in spring (NSW DECCW 2005ab). The few known adults collected in spring were reproductively active, with females carrying one or two eggs.

## 4.8 Feeding

No information is available about the species' feeding behaviour in the wild; however, it is believed to feed on arthropods, such as white ants. Captive specimens have been recorded eating mealworms (NSW DECCW 2005ab; Brigalow Belt Reptiles Workshop 2010). In captivity, it has been known to eat crawling insects and insect larvae.

## 4.9 Movement Patterns

Nothing is known on the movement patterns of the FCWS. The Department of Environment and Conservation has prepared a Priorities Action Statement (PAS) that identifies studying

## Five-Clawed Worm Skink Management Plan

the movement patterns and habitat use of FCWS through mark-recapture techniques as having a 'medium' priority.

### 4.10 Threats and Conservation Status

The FCWS has undergone a decline in the past few decades. A number of factors that may contribute to this decline have been identified as (Cogger et al. 1993; NSW DECCW 2005ab; TSN 2008b):

- Land clearing for agriculture has been particularly severe within the species' range (Brigalow Belt Reptiles Workshop 2010).
- Overgrazing which compacts soil, making it difficult for the species to find suitable shelter (Brigalow Belt Reptiles Workshop 2010).
- Removal of ground debris including ground litter, fallen timber and logs that results in reduced soil moisture. This means the soils are drier, making it harder for the species to access suitable habitat. Removing logs and timber also reduces the amount of shelter available for the species (Brigalow Belt Reptiles Workshop 2010).
- Use of agricultural chemicals that poison and pollute the soil which may adversely affect the species (Brigalow Belt Reptiles Workshop 2010).
- Feral species resulting in their predation from cats and foxes, is a threat facing much of Australia's native wildlife including the FCWS (NSW NPWS 1999av).

### 4.11 Threat Abatement and Recovery

The Action Plan for Australian Reptiles states that knowledge of the FCWS is inadequate. More research into the species is needed in order to define objectives and actions to assist in recovery (Cogger et al. 1993). The report identifies three crucial research areas:

- ground surveys to determine the full geographic range and habitat requirements of the species;
- research into basic biology and ecology of the species, and
- research into the species' decline and major factors behind the decline.

Six management actions were identified in the plan. These include:

- deferring of licenses to clear remnant woodland within the species' known range;
- surveying known habitat in reserves;
- surveying known habitat outside of reserves;
- developing and promoting guidelines for landowners to help reduce the impact of current land use;
- establishing appropriate reserves if the existing reserves are deemed inadequate, and
- developing community awareness of the species (Cogger et al. 1993).

These actions are combined with three objectives also detailed in the plan. The objectives include:

- conducting the research required;
- ensuring existing populations are managed in reserve systems, and

## Five-Clawed Worm Skink Management Plan

- implementing land management practices which promote the maintenance of secure, viable populations outside of reserve systems (Cogger et al. 1993).

Approved conservation advice given by the Department (TSSC 2008) outlines a number of actions essential to the conservation of the FCWS. The actions and objectives of the advice are sourced from various State agencies; hence they are consistent with those mentioned above. Mitigation measures or approaches that have been developed for the FCWS are (Brigalow Belt Reptiles Workshop 2010):

- alternative project locations;
- avoid clearing/ retain habitat;
- design proposed action to avoid habitat disturbance;
- establish adequate buffer zones to protect habitat;
- implement measures to exclude cattle from habitats;
- maintain habitat connectivity across the landscape, e.g., along roadside reserves, uncultivated lands between cropped and pasture-improved areas;
- retain shelter habitat features in place;
- devise and implement a habitat management plan specific to the FCWS;
- implement measures to reduce the risk of invasive and predatory species accessing reptile habitat species habitat, e.g. Buffel Grass;
- devise and implement an appropriate fire management plan, and
- devise and implement water management, sediment erosion and pollution control plans.

### 4.12 Current Context of FCWS and the Project

The FCWS was assessed in the NS2B EIS Appendix B – Terrestrial Biodiversity Technical Report (Appendix B – Terrestrial Biodiversity Technical Report 2-0001-270-EAP-10-RP-0401 Rev 10 dated 20 October 2021). The species was not detected during a range of reptile surveys which were completed under favourable conditions in early 2021 or incidentally during other surveys; however, this is not considered definitive due to the cryptic nature of the species and corresponding difficulty in detection through targeted surveys. Accordingly, the precautionary principle has been applied with the management measures and controls specified in this plan developed to minimise risk of harm to FCWS in habitat areas nominated as per MCoA E30(a) – refer to Section 2.

An unexpected ecological find was made on the 5 July 2021 at the N2NS SP1 Project when a spotter-catcher contractor recorded a FCWS (GeoLink 2021). An additional 247 FCWS were recorded in the 14-month following the initial July 2021 record. Analysis undertaken for the N2NS SP1 FCWS Management Plan indicates the highest density of FCWS tends to occur in Zone - 4 - PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains (GeoLink 2022). A summary of the PCTs at capture sites is shown in Table 4-1.

Table 4-1: Plant Community Types at N2NS SP1 Project FCWS capture sites (GeoLink 26/05/2022)

Plant Community Type at Capture Site	Number	Percentage
<b>27 Weeping Myall Woodland</b>	3	1.2%



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Plant Community Type at Capture Site	Number	Percentage
	156	62.9%
	20	8.1%
	69	27.8%
	248	

The GeoLink surveys found soil types rather than plant community type tends to form an important microhabitat feature with the highest densities occurring in cracking black clays although lower densities do occur on red cracking clays and seldom red gravel loam as per records in Table 4-2. On the basis of this finding, soil types of cracking clays have been utilised to identify FCWS habitat in this FCWS Management Plan for NS2B SSI-9371, refer to Appendix A.

Table 4-2: Soil Type at N2NS SP1 Project FCWS capture sites (GeoLink 26/05/2022)

Soil Type	Number	Percentage
	234	94.4%
	7	2.8%
	1	0.4%
	6	2.4%
	248	

To address potential impacts, a series of management actions have been proposed and are outlined in Section 5. The application of these management actions is addressed based on the risk profile of the activity impacting any FCWS. The GeoLink records in Table 4-3 demonstrate high risk activities being related to mass ground disturbance as opposed to small footprint ground disturbance activities.

Table 4-3: Construction activities resulting in FCWS capture

Construction Activity	Number	Percentage
Topsoil Removal	229	92.4%
Topsoil Ripping	4	1.6%
Slashing	9	3.6%
Tree Clearing	2	0.8%
Other	4	1.6%
<b>Total</b>	<b>248</b>	

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### 5. Five-Clawed Worm Skink Management

ARTC – Inland Rail propose the following management actions to reduce impacts on the FCWS population during the Work, Low Impact Work, Construction and operation of the Project. The management actions fall into three broad categories.

1. Management actions developed for inclusion in this plan and to be implemented by LOR:
  - (a) Completing Activity Risk matrix to control application of mitigation measures proportionate to identified risks; particularly with respect to Low Impact Works and Construction in accordance with Appendix B, Section 5.2 and Section 5.3; and
  - (b) Developing a species management plan (i.e. this report) for FCWS that can assist the current NS2B project and provide the platform for FCWS consideration at other locations where the species may occur.
  - (c) Develop a survey prescription for adequately surveying areas prior to and during various construction activities;
  - (d) Outline the data collection requirements for all captured FCWS;
  - (e) Develop management initiatives for the protection of FCWS habitat adjacent to the construction impact zone and protection of relocation sites;
  - (f) Outline a framework for allowing this management plan to be progressively updated in light of new findings and information.
2. Management actions to be implemented during Work (as defined by the project approval) by LOR in accordance with this plan:
  - (a) Performing additional studies to understand the potential for FCWS encounters in accordance with Section 5.1.1;
  - (b) Investigate opportunities to reduce clearing of FCWS Habitat Area;
  - (c) Known and likely FCWS Habitat Area identified on Environmental Control Plans (ECPs);
  - (d) Implementation of mitigation measures based on Activity Risk matrix, particularly with respect to Low Impact Works and Construction in accordance with Appendix B, Section 5.2 and Section 5.3;
  - (e) Develop guidelines that provide improved opportunities for habitat augmentation of relocation sites and areas nominated for landscape treatments;
  - (f) Implementation of identified mitigation measures.
3. Operational management actions include (outside LOR scope – will be addressed by ARTC prior to operation of SSI-9371):
  - (a) Implementation of the FCWS monitoring program as required.

# Five-Clawed Worm Skink Management Plan

## 5.1 Management Actions

### 5.1.1 Additional Studies and Adaptive Management

On the basis of this dominant cracking clay soil type correlation at N2NS SP1 (97.2% of total records at N2NS SP1) which is also supported by the DCCEE SPRAT habitat notes (refer to Table 2-1), it has been determined that cracking clays should be utilised to identify FCWS Habitat Area for the purposes of this plan.

Adaptive Management: It is recognised that the identification of FCWS Habitat Area prior to Work commencing as per this MCoA 30(a) is subject to refinement and continuous improvement as delivery of NS2B SSI-9371 progresses. As part of continuous improvement, the principle of adaptive management shall be applied to FCWS and identification of Habitat Areas, with particular focus during the initial Low Impact Works (refer Section 1.3.1). The mechanism that this shall be implemented is via collection of additional information by the following experts who will be engaged in delivery of NS2B SSI-9371, these experts include:

- Project Ecologists: identification of FCWS encounters (in person or remotely via photos / video – where appropriate), including development of FCWS monitoring and/or Habitat Area refinements in accordance with MCoA E30(g) and Section 5.2.7.
- Project Soil Scientists: refinement of FCWS Habitat Area based on soil type information gathered during delivery of NS2B SSI-9371. In particular this adaptive management measure is based on N2NS SP1 findings that soil types rather than plant community type tends to form an important microhabitat feature with the highest densities occurring in cracking black and red clays. The target information is refinement of cracking clay habitat type spatial data at finer scale. This finer scale data will be collected via the Geotechnical and Soil Investigation Low Impact Works activity at approximately ~155 locations along the NS2B alignment, refer to Sections 1.3.1.2; following approval of this FCWS MP by the Planning Secretary which is a Hold Point prior to commencing these Works in accordance with MCoA E30. Distribution of geotechnical investigation locations across the NS2B footprint as shown in Figure 5-1 & Figure 5-2
- Project Archaeologist: refinement of FCWS Habitat Area based on soil type information gathered during delivery of NS2B SSI-9371. In particular the Project Archaeologist has skill set including geomorphological capability, with this skill set suitable to identify cracking clay soil types. As an example Figure 1-3 shows test pit excavation locations and distribution at site “BBS Toomelah LALC Mobbindry Ck1 2-4-0046”, which is one of the major archaeological sites at NS2B with over 500 surface artefacts detected during prior studies. This results in a significant number of test pits for subsurface investigation, providing opportunity for very fine scale refinement of soil type data including definition of FCWS Habitat Area. In this example “BBS Toomelah LALC Mobbindry Ck1 2-4-0046” spans the northern boundary of Mobbindry / Back Creek Habitat Area (Southern FCWS Habitat Area – refer Appendix A). In similar way major archaeological site NS2B-19-AS-5 (also with over 500 surface artefacts) spans the southern boundary of the Northern FCWS Habitat Area in the area of where North Star Road turns to join the Bruxner Highway. As such it is expected that these archaeological test excavation works will facilitate very fine scale refinement of FCWS Habitat Areas within the zones where Archaeological Test Excavations will be undertaken in accordance with methodology approved via MCoA E134.

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## Five-Clawed Worm Skink Management Plan

- Where extents of identified FCWS Habitat Area are updated following information attained in the field, then reviewed and endorsed by the Environmental Representative, the project will update extents on FCWS in the General Project Induction slides, the FCWS Toolbox talk, Environmental Control Maps and any on site signage. The Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE, with any refinements to FCWS Habitat Areas consolidated into this FCWS MP at formal revisions as per Section 5.2.8.

Adaptive Management shall be considered and applied at reviews of the FCWS Management Plan in accordance with Section 5.2.8.

# Five-Clawed Worm Skink Management Plan

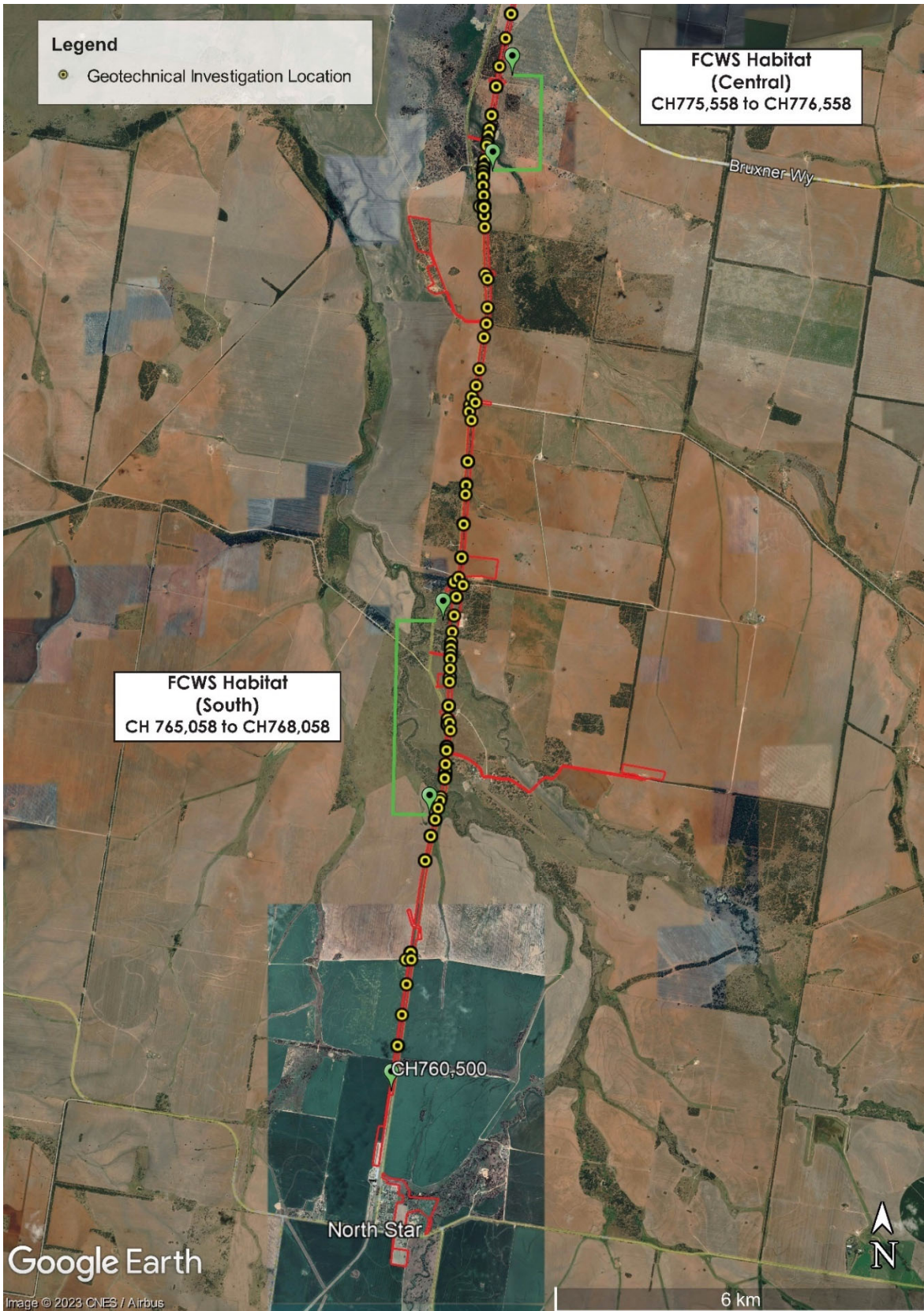


Figure 5-1: Geotechnical Investigation distribution along the NS2B corridor. Data from investigation will be used to inform FCWS Habitat Area

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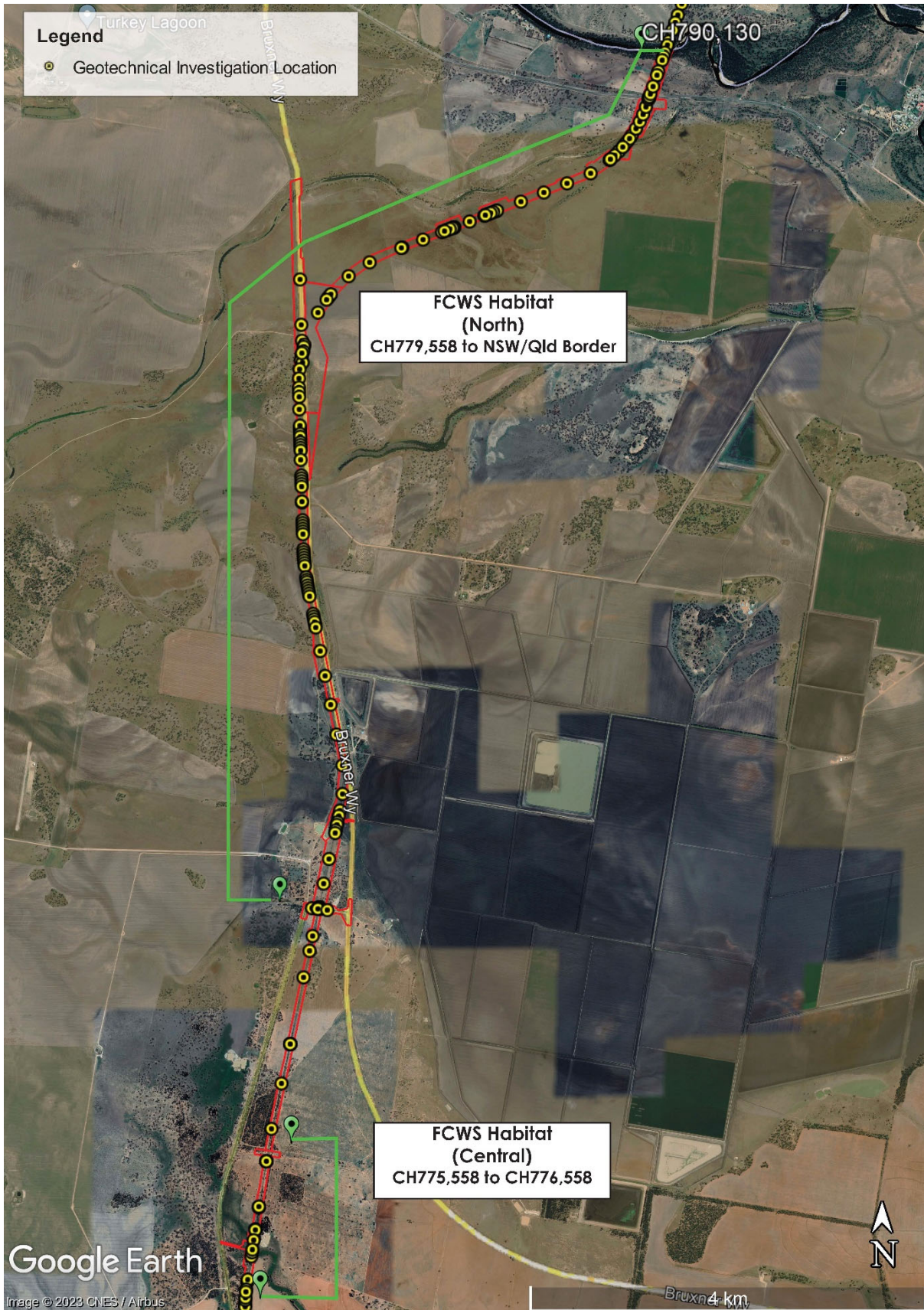


Figure 5-2: Geotechnical Investigation distribution along the NS2B corridor. Data from investigation will be used to inform FCWS Habitat Area

# Five-Clawed Worm Skink Management Plan

## 5.1.2 Reduce Clearing in FCWS Habitat Areas

The project team would explore opportunities to reduce the CIZ clearing footprint. This would be managed by LOR and the design contractors FFJV, in collaboration with ARTC, through the detailed design process. Detailed design will commence following award of this part of the Contract by ARTC, with forecast commencement date of detailed design in Q4 2023 through to design completion in Q2 2024. There will be multiple design gateways through this detailed design period which will include interrogation and challenge to the CIZ clearing footprint, targeting reduction in clearing impact to sensitive areas including FCWS Habitat Area, Threatened Species and TEC.

## 5.1.3 Developing a Species Management Plan

This document represents the species management plan and is designed to bring together the available information including the commitments and management actions that have been formulated between stakeholder groups in accordance with MCoA E30.

## **5.2 General Construction Management Actions for FCWS**

### 5.2.1 Identification of FCWS Habitat Area on Environmental Control Plans

Locations of potential FCWS Habitat Areas (in accordance with MCoA E30(a) – refer to Section 2) will be updated on Environmental Control Plans (ECPs) from commencement of Work and throughout Construction. This will assist in the implementation of agreed to management actions outlined in this plan of management. Environmental Control Plans would be updated from time to time or on an as required basis as new information informs the project.

Additionally, Environmental Control Plans will be updated periodically to include 'Known' FCWS Habitat Areas as determined from FCWS finds during the construction of the Central Civil Works Program, including North Star to NSW/Qld Border (SSI-9371), refer to Appendix A and Section 5.1.1.

Where FCWS habitat is identified outside of the nominated FCWS Habitat Areas based on field assessments, the nominated chainages (extents) will be endorsed by the Environmental Representative and updated in required documentation. This includes information in sensitive area plans, inductions, signage and toolbox talks.

### 5.2.2 Specific FCWS Induction

All personnel including sub-contractors are required to undergo an induction to work on the project. This induction addresses FCWS and provides information in relation to:

- A general description of the FCWS (including photos and key identification features).
- Locations where FCWS Habitat Area is located on the project site (refer to Appendix A), and key mitigation measures as per Section 0.
- Activity based risk assessment and corresponding proportionate mitigation measures (refer Appendix B)
- FCWS Encounter Procedure
- Records kept from the induction / toolbox training.
- Visitors and delivery personnel are to be accompanied by a full inducted person at all times. Signage is also provided at work sites.

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### 5.2.3 Develop a Survey Prescription to Adequately Survey Area Before and During Construction Activities

Developing a survey prescription to adequately survey the area before Work and during Construction activities (refer to Appendix B) would involve the following in FCWS Habitat Areas:

- An ecologist would perform a pre-clearing inspection to determine the suitability of the site for pre-clearing surveys before slashing commences. A pre-clearing survey involving active searches under logs and shelter sites would only be undertaken where these attributes occur. No pre-clearing survey involving active search would be undertaken in areas that comprise only dense tall grasses given there is little opportunity for the surveyor to actively search and locate FCWS. The same approach would occur where the area is inundated. Targeted pre-clearing surveys would comprise a minimum of 1.5 person hours per hectare for FCWS Habitat Areas of average complexity (scaled up or down depending on site complexity as detailed in preceding sentences as determined by Project Ecologist). Skinks captured during this stage would need to be retained until such a time the slashing has been completed adjacent to the relocation site. In most cases, this should not last for more than a few hours and accord with the Ecologists Animal Care and Ethics Approval Permit.
- An ecologist or spotter-catcher to perform clearing supervision when the slasher is mowing vegetation. The slasher should be set at a cutting height that is near to the ground (<100 mm) in order to reduce the suitability of the retained habitat. The ecologist/spotter-catcher would turn suitable materials such as logs, disused sleepers, refuse whilst looking for dispersing skinks. Skinks captured during this stage would need to be retained until such a time the slashing has been completed adjacent to the relocation site noting that a series of measurements and habitat information is to be recorded (see Section 5.2.4).
- Slashed vegetation should be wind rowed to the edge of the CIZ to provide temporal refuge sites. The slashed area reduces reduce the suitability / creates a hostile habitat for FCWS within the CIZ and encourages the FCWS to move into the remaining vegetation / windrowed material. Ideally, slashing should seek to windrow the slashing material with each up and down pass so that it concentrates the windrowed material to enable more efficient FCWS checks prior to soil disturbance works.



Figure 5-3: Slashing on vegetation prior to stripping at N2NS SP1.



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- Relocation sites should be established based on the capture sites. Silt fence is proposed to assist in delineating these areas and to reduce habitat permeability between the relocation site and the CIZ (Figure 5-4).
- Once the above works are completed within a given area, a minimum waiting period of 2 days/nights and up to 5 days/nights is proposed before topsoil stripping can commence. This adopted period should enable sufficient time for uncaptured FCWS to move of their own accord and be determined in consultation with Project Ecologist. The Project Ecologist should consider site-specific conditions at the time of clearing including the outcomes of any pre-clearing surveys, soil conditions (presence of moisture / cracking / baking), daytime temperatures and other factors that in the opinion of the Project Ecologist may or may not contribute to hostile ground conditions for the FCWS.



Figure 5-4 - Example of a FCWS relocation hub installed at N2NS SP1 supported by environmental signage

Once the adopted period has elapsed within a slashed area, the ecologist/spotter-catcher will implement the following measures during soil disturbance activities (e.g. topsoil stripping):

- A site assessment by a Project ecologist to determine the site suitability for FCWS. This survey is to determine if the area contains suitable habitat as opposed to unsuitable habitat which could include inundated or saturated areas or simply non-black cracking soils or highly trafficked areas such as driveways and road verges. Area still deemed as suitable habitat for FCWS would have the following procedures:
  - A daytime pre-stripping survey for FCWS focusing on the most likely micro habitat components in the CIZ. This survey would occur within 2 days of the topsoil stripping with the completed survey area being clearly demarcated by either plastic bollards, witches' hats or pennant flagging to ensure no topsoil stripping occurs in areas not yet surveyed.

## Five-Clawed Worm Skink Management Plan

- Topsoil stripping surveys to a depth of 100 mm would then be performed to capture and relocate displaced FCWS (Figure 5-5). At least one ecologist or spotter catcher will be assigned per machine (i.e. excavator, dozer, grader or scrapper). Should a scrapper be used, an ecologist or spotter catcher will be present to inspect the material at the recipient site.
- Salvaged FCWS would be assessed for signs of injury, measurements recorded, and habitat data collected as per Section 5.2.4.



Figure 5-5 – Example of topsoil stripping to 100 mm depth at N2NS SP1.

### 5.2.4 Data Collection Requirements for Captured FCWS

Any FCWS captured during the course of implementing this plan would have the following data collected and recorded in the register:

- Stage of project and chainage;
- Confirmation of whether the find was **inside** or **outside** of identified FCWS Habitat Areas
- Capture date and time;
- Condition of the skink (Good, Injured, Deceased);
- Microhabitat at capture site;
- Soil at the capture site;
- Activity undertaken at time of find;

## Five-Clawed Worm Skink Management Plan

- Detection method (e.g. survey);
- GPS coordinates for capture and relocation site;
- Details of the person/s who made the discovery;
- Description of vegetation / PCT;
- Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hind limbs;
- Series of measurements including; snout-vent length, tail length and total length,
- Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) were captured each day for each work area, and
- Deceased or euthanised individuals, or parts thereof will be forwarded to the Australian Museum for research purposes.
  - IR will endeavour, notwithstanding practical and safety considerations, to collect all samples and send to the relevant independent, publicly owned museum (Australian museum as a priority) to verify if they are FCWS or not. IR will fund further analysis by the museum where the Australian Museum is willing and able to accept the specimens.
  - Specimens should be preserved as follows (as advised by the Australian Museum):
    - Each specimen to be placed in an individual ziplocked bag with location (including lat/long) and date of collection written on the bag in permanent marker.
    - Stored frozen.
    - Provided to the Australian Museum in a maximum of six months.

The following habitat data would be collected from a 100m<sup>2</sup> area from the capture site if it is undisturbed from construction otherwise the adjacent area outside of the CIZ:

- Soil crack density and size range (depth if possible);
- Percentage (%) litter cover;
- Percentage (%) bare ground;
- Percentage (%) grass cover and/or tussock spacing;
- Three most abundant groundcover species;
- Soil type, soil structure (blocky, small peds, massive) and pH if possible;
- Large surface debris abundance expressed as percentage (%) cover over 100m<sup>2</sup>, and
- Ground moisture levels (including recent rainfall amount if known/relevant).

The Project Ecologist or the Environmental Manager for LOR will manage this register. The register will be provided with each incident notification and live FCWS find report, and it will be made available to regulatory agencies. A copy of the register is provided in Appendix C.

### 5.2.5 Identifying and Establishing FCWS Relocation Sites

#### 1. Site Identification

## Five-Clawed Worm Skink Management Plan

Relocation sites will be identified based on the captures from pre-clearing and clearing supervision surveys. This will ensure FCWS are moved a minimal distance from their capture site and still potentially within their home range. In some cases, FCWS relocation sites may be identified based on suitable habitat along the alignment and before the commencement of construction works so as to assist in the scheduling of construction resources. When this occurs, a relocation site will be selected using the following criteria:

- The area is adjacent to or comprises native grassland or woodland on public land;
- A relocation site must be as close as possible to the capture site;
- Sites must support suitable microhabitat of loose friable soil, with areas of leaf litter, mulch or dense vegetative groundcover which provides cover and foraging resources at least 100m<sup>2</sup> in area, and
- Relocation sites will be mapped and a GIS layer developed.

### 2. Site Establishment

Establishing a FCWS relocation site will involve:

#### Low Impact Works

- Creating a minimum two relocation areas within the South, Central or Northern FCWS Habitat Area (refer to Appendix A) prior to commencement of any ground disturbing Low Impact Works (as defined in Schedule 1 – Table 1 of MCoA). On the basis that Low Impact Work have a limited area of ground disturbance and associated lower risk profile.

#### Construction

- Creating a minimum 100 m<sup>2</sup> relocation area at 200 m intervals (where possible during mainline topsoil stripping works);
- Installing hay bales (minimum one per 25m<sup>2</sup>) with each bale measuring approximately 1m x 0.4 x .46. Slashed vegetation and/or woody debris should also be used as an alternative;
- Erection of an exclusion fence (silt fence) along the CIZ boundary at the hub plus 10 m either side of the relocation hub where practicable. If this is not possible, it must be documented within the FCWS capture register (see Section 5.2.4).
- Appropriate signage and a high visibility boundary at every relocation site, where practicable.
- Relocation of up to 10 adults and 5 sub adult skinks per 100m<sup>2</sup>.
- Sites that receive captured/relocated FCWS will be GPS and a register created as part of an environmental sensitive zone for ARTC operations.

#### 5.2.6 Habitat Enhancement and Refuge Replacement

Two phases of habitat enhancement / refuge placement would be implemented during construction:

- Phase 1: temporary habitat enhancement comprising works undertaken during clearing and grubbing activities.

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Its key objective is to enhance the retained habitat and assist in the relocation of FCWS captured during the clearing and topsoil stripping stage of works (Figure 5-6).

- Phase 2: permanent habitat enhancement with works scheduled to be undertaken during landscaping activities.

Its key objective is to encourage re-colonisation of the site and improve or at least restore areas impacted by construction for FCWS.

Phase 1 temporary habitat enhancement includes the placement of hay bales at 100 m intervals on land within the construction boundary.

More permanent habitat enhancement in Phase 2 will include the placement of coarse woody debris (e.g. logs, sleepers, or mulched woody vegetation piles) within the construction boundary. Where available, woody debris will be placed in a manner that is reflective of the pre-construction landscape where opportunity is identified by Project Ecologist.



Figure 5-6 – Example temporary habitat enhancement works in N2NS SP1 Stage 3 using timber and hay biscuits to increase ground cover for relocated FCWS.

### 5.2.7 Five-clawed Worm Skink Encounter Procedure

The Five-clawed Worm-skink Encounter Procedure (Appendix E) has been developed to manage instances where FCWS is detected during Low Impact Works or Construction within the project boundary. Section 1 of the procedure manages FCWS encounters within the following footprints (refer to Appendix A):

- Southern FCWS Habitat Area: CH 5,500 (EIS reference)/CH 765,058(IFC) to CH 8,500 (EIS reference)/CH768,058(IFC)
- Central FCWS Habitat Area: CH 16,000 (EIS reference)/CH775,558(IFC) to CH 17,000/CH776,558(IFC)
- Northern FCWS Habitat Area: North of CH 20,000 (EIS reference)/CH779,558(IFC) to NSW/Qld Border

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For instances where a FCWS is identified outside of the above footprints, the management strategies outlined in this plan will be adopted for up to 200m on either side of the capture, with applicable FCWS Habitat Area update determined by the Project Ecologist, and include:

- Implement FCWS Encounter Procedure (Appendix E)
- Relocation of individuals using the framework developed in this plan;
- Data capture of the individual and habitat data outlined in this plan;
- Project Ecologist assess and advise if FCWS Habitat Area needs to be updated based on inspection of Habitat / Soil type within 200m of encounter, with reference to SPRAT listing and Section 2 FCWS MP regarding FCWS Habitat Areas.
- Any refinements to FCWS Habitat Area would be addressed as per Section 5.1.1; with the Environmental Representative considering the Project Ecologist advice. Where the Environmental Representative endorses the Project Ecologist advice the FCWS Habitat Area shall be updated, and the Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE.
- Updating of relocation sites, FCWS register, construction drawings and environmental control plans;
- A periodic examination and review of the adequacy of the proposed mitigation measures proposed in consultation with DPE, BCS and DCCEEW.

The requirements of MCoA E22 are generally exceeded for the FCWS as detailed within this FCWS Management Plan. It is also noted that reporting to DPE, BCS and DCCEEW in accordance with Section 7.1 shall be implemented, allowing appropriate review and oversight by these regulatory agencies.

### 5.2.8 Updates to this Plan

This plan should be updated in circumstances where new information necessitates such an update is required in consultation with the relevant departments (i.e. DPE; BCS, DCCEEW), including adaptive management principles as per Sections 5.1.1 and 1.7.

Should the document review process identify any issues or items within the FCWS Management Plan that are either redundant or in need of updating, it is the responsibility of the LOR Environmental Manager to revise the documents. The revised document will then be issued to ARTC, BCS and DCCEEW for consultation and DPE Planning Secretary for approval.

Project subcontractors will be advised when this FCWS Management Plan is updated. They will be required to review their own environmental management documentation and make the necessary amendments to remain compliant with this FCWS Management Plan.

### **5.3 Low Impact Works Management Actions of FCWS**

Low Impact Works are defined in the Minister's Conditions of Approval for CSSI-9371 as all activities listed in Figure 1-2 that have commenced prior to approval of the CEMP. Due to the low impact / disturbance nature of these activities, the full extent of general construction management actions listed in Section 5.2 are not proportionate to the level of risk for these works. As such, the project has adopted a risk-based approach to applying suitable management actions to works based on levels of disturbance and risk to

# Five-Clawed Worm Skink Management Plan

the Five-clawed Worm Skink. Management actions for specific Low Impact Works are detailed in the Appendix B: Activity Risk Matrix.

## 5.3.1 Low Impact Works – Pre-Clearance Procedure

Following commencement of Low Impact Works in accordance with Appendix B of this plan, a management review was undertaken to review the level of impact of activities, ground conditions of the site and findings to date.

The delivery of LIW works to date has demonstrated a level of impact and ground disturbance footprint consistent with the definition of LIW and the figures nominated in Appendix B (Column “Additional Comments”). As such an additional procedure – “Five-Clawed Worm-Skink Pre-Clearance Procedure” (Appendix F) has been implemented for certain activities with small, discrete footprints of works.

It should be noted that the implementation of this procedure is based on:

- The current soil conditions of site being extremely dry and likely to remain so for a significant period, given current climatic forces (El Nino) ~ Q4 2023.
- The proposed geotechnical investigation works included in the procedure are mainly confined to the existing rail formation. While there is friable soil present, it does not represent the undisturbed cracking clay soil away from the rail formation. Five-Clawed Worm-Skinks may still be present, but the likelihood is reduced.
- One skink has been found to date during LIW (within a FCWS Habitat Area), with slashing activities for site preparation creating the most potential impact to date.
- The area of impact is minor and limited to discrete footprints.

This procedure will be presented to the workforce by the Project Ecologist or the Project Environmental Team. It is intended that all personnel involved in the FCWS Pre-Clearance tasks will be tool boxed on the procedure.

Any Five-Clawed Worm-Skink sightings are to managed, reported and recorded in accordance with the FCWS Encounter Procedure (Appendix E).

## 5.4 FCWS Management Performance Indicators

The following performance indicators are derived from the goals listed in Table 2-1, and have been developed based on SMART principles as shown in Table 5-1.

Table 5-1: FCWS Management SMART Performance Indicators

#	Specific	Measurable	Achievable	Repeatable	Time-bound
1.	Induction and Training of 100% of NS2B SSI-9371 workforce with respect to FCWS Habitat Areas and the requirements of this FCWS MP	Induction and Training records	All Project Workforce required to attend Project Induction (including FCWS MP requirements) prior to commencement. Ongoing training via Toolbox training with	Training of workforce essential to ensure protection of FCWS and implementation of FCWS Mitigation Measures	Project induction (including FCWS MP requirements) for 100% of workforce prior to commencement on site. Toolbox training prior to

## Five-Clawed Worm Skink Management Plan

#	Specific	Measurable	Achievable	Repeatable	Time-bound
			records of attendance maintained		commencement of activity within FCWS Habitat Area.
2.	Target 100% data collection in accordance with Section 5.2.4	FCWS register	The NS2B delivery team are appropriately resourced as per [Section 3 and trained as above	FCWS data capture and sharing with regulatory agencies important to ensure increase in knowledge for this cryptic threatened species	For each and every FCWS encounter
3.	Meet reporting requirements and timeframes as per Section 7.1	Section 7.1 defines what information needs to be reported and required timeframes for each type of information	The NS2B delivery team are appropriately resourced as per [Section 3]	Reporting to regulatory agencies important to ensure increase in knowledge for this cryptic threatened species and compliance the Conditions of Approval	Section 7.1 defines what information needs to be reported and required timeframes for each type of information
4.	Collection of additional soil type data to refine FCWS Habitat Areas based on dominant cracking clay soil correlation	Data collected in accordance with Section 5.1.1 including Geotechnical investigations and Archaeological Test pits	Both Geotechnical investigations and Archaeological test pits Low Impact Works are engaged and prepared to collect this cracking soil type data	Cracking clay soil confirmed as dominant determinant of FCWS Habitat Areas; with this spatial, finer scale refinement improving definition of FCWS Habitat Areas	The Geotechnical investigations and Archaeological test pits Low Impact Works are programmed to be completed after approval of this FCWS Management Plan, in the second half of 2023; prior to commencement of "Construction"



## Five-Clawed Worm Skink Management Plan

#	Specific	Measurable	Achievable	Repeatable	Time-bound
5.	Flexibility to refine FCWS Habitat Area to incorporate new data	Updates endorsed by Environmental Representative and included in ER monthly report to DPE	ER has been approved by DPE as per MCoA A28. ER endorsed refinements will be consolidated into any FCWS MP update as per Section 5.1.1	Refinement of FCWS Habitat Area with refined and finer scale cracking clay soil data important for protection of FCWS	Progressive as new information available as per previous SMART goal, updates in ER monthly report
6.	FCWS Mitigation measures proportionate to risk	FCWS Risk measured and mitigated via Appendix B	Implementation of Mitigation measures as per Appendix B	Scale of activities and associated risks are vastly different (e.g. Archaeological Test excavation vs NS2B Topsoil stripping), proportionate application of mitigation measures to the large order of magnitude difference in risk is relevant and appropriate	Applicable for duration of each construction activity within FCWS Habitat as per Appendix B

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## Five-Clawed Worm Skink Management Plan

### 6. Five-Clawed Worm Skink Monitoring Program

As at the time of this revision of the FCWS Management Plan, a single FCWS individual has been detected within the SSI-9371 Construction Boundary. If this changes during delivery of SSI-9371, where individual FCWS are recorded, monitoring during and post construction shall be developed in consultation with BCS and DCCEEW in accordance with E30(g) and adaptive management principles, refer to Section 5.1.1. The monitoring program may be subject to change dependant on the success or otherwise of the N2NS SP1 monitoring program.

ARTC IR will consult with BCS prior to developing any monitoring program for FCWS within the NS2B Project area. ARTC IR considers that any monitoring program should be designed following consideration of Project specific finds data and success therein of the N2NS SP1 operational monitoring program.

*MCoA 30(g): where individuals are recorded on site, ongoing monitoring of the species and its habitat during construction must occur, and for a minimum of five monitoring events post-construction in suitable conditions, with timing agreed by BCS and DCCEEW.*

The FCWS Management Plan will be revised and re-issued accordingly including the agreed monitoring provisions.

# Five-Clawed Worm Skink Management Plan

## 7. Inspection, Monitoring and Reporting in Relation to the FCWS

The table below summarise important actions relevant to FCWS management.

Table 7-1: Environmental Monitoring requirements relevant to FCWS management

Table 7-1. Environmental monitoring requirements relevant to FCWS management.

Inspection	Objectives	Responsibility	Output	Timing
Site Inspection	Review status of all controls and general environmental performance	Environmental Coordinator/s	Weekly Environmental Checklist	Weekly (and post rainfall events that trigger runoff)
Site Inspection	Observe general environmental performance	Environmental Manager/ Environmental Advisor	Correct any observed Non-Conformances as they arise	As required to coincide with inspections
Site surveys	Ensure surveys are being completed prior to and during the disturbance and removal of known and potential FCWS habitat and relocating individual FCWS in accordance with this plan	Project Ecologist	Daily pre-clearing checklist and post clearing report	Daily and at completion of construction activities that seek to disturb and remove known and potential FCWS habitat

### 7.1 Regulator Notification and Reporting Requirements for the Five-clawed Worm Skink

#### 7.1.1 Incident Notification Requirements – Mortality or Injury of FCWS

In the event of a Five-clawed Worm Skink mortality or injury LOR will immediately notify the nominated ARTC Representative/s who will arrange regulatory notification/s in accordance with MCoA A43 and A44 of the CSSI, and relevant conditions of any EPBC Approval. ARTC will notify DPE, BCS and DCCEEW of all FCWS mortalities and injuries. Notification timeframes will be in accordance with MCoA A43 and A44 of the CSSI, and relevant conditions of any EPBC Approval.

Incident notifications relating to mortality or injury of a Five-clawed Worm Skink should address:

- Capture date and time.
- Confirmation of whether the find was **inside** or **outside** of identified FCWS Habitat Areas
- GPS Coordinates for capture and relocation site.
- Condition (Injured, Deceased).
- Microhabitat at capture site.
- Soil at capture site.
- Activity undertaken at time of find.
- Detection method (e.g. survey).
- Where find is deceased, confirmation whether the deceased individual has been collected and preserved for the Australian Museum.

#### 7.1.2 Reporting of Live Capture and Relocation of FCWS

In the event of a live capture and relocation of a Five-Clawed Worm Skink LOR will provide details of the live capture and relocation within 24 hours to the nominated ARTC

## Five-Clawed Worm Skink Management Plan

Representative/s who will arrange reporting to BCS and DCCEEW within 48 hours of the proponent (ARTC) becoming aware of the live capture and relocation, or as otherwise agreed at the time with the Agencies.

Recording by the Project Ecologist or Fauna Spotter relating to the live capture and relocation of a Five-Clawed Worm Skink will address:

- Capture date and time.
- Confirmation of whether the find was **inside** or **outside** of identified FCWS Habitat Areas
- GPS Coordinates for capture and relocation site.
- Condition.
- Microhabitat at capture site.
- Soil at capture site.
- Activity undertaken at time of find.
- Detection method (e.g. survey).

The requirements of MCoA E22 are generally exceeded for the FCWS as detailed within this FCWS Management Plan. It is also noted that reporting to DPE, BCS and DCCEEW in accordance with Section 7.1 shall be implemented, allowing appropriate review and oversight by these regulatory agencies.

### 7.1.3 Monthly Updates – BCS and DCCEEW

A copy of the Five-clawed Worm Skink Register detailing all FCWS encounters as outlined in Section 5.2.4 will be provided to BCS and DCCEEW each month, or upon request by either Agency.

### 7.1.4 Summary Report – DPE, BCS, DCCEEW

A final report will be prepared for submission to BCS, DCCEEW and DPE at the conclusion of construction works detailing all Five-clawed Worm-skink finds. The report should include:

- A copy of the fauna register, including information outlined in Section 5.2.4 above.
- A detailed description of all survey methods and mitigation measures and subsequent outcomes.
- A description of all relocation sites and the number of skinks relocated into each site.
- Any other relevant information collected, or activities/procedures undertaken, including adaptive management.
  - Updates to FCWS Habitat Area following field data (Appendix A)

## Five-Clawed Worm Skink Management Plan

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## Appendix A: FCWS Mapping

Analysis of results for the N2NS SP1 records (248 in total) of FCWS found **soil types rather than plant community type** tends to form an important microhabitat feature **with the highest densities occurring in cracking black clays (94.4%) although lower densities do occur on red cracking clays (2.8%) and seldom red gravel loam (0.4%)**. It is noted that the single record of FCWS associated with red gravel loam represents 0.4% of total encounters of FCWS at N2NS SP1; therefore, this soil type is not considered to represent a FCWS Habitat Area for the purposes of this plan, with this soil type managed via the Five Clawed Worm Skink Encounter Procedure (Appendix E). This procedure addresses the measures in place where FCWS are found within identified Habitat Areas, as well as measures and requirements in place for where FCWS are found outside of identified FCWS Habitat Areas.

Review of the DCCEEW Species Profile and Threats Database (SPRAT @ [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=25934](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=25934)) for NSW habitat on the floodplains such as the Macintyre River and tributaries floodplain for the NS2B project "*On the floodplains within its range in north-eastern New South Wales, the Five-clawed Worm-skink occurs in grasslands and grassy, open woodlands on heavy black and grey, alluvial cracking clay soils from 135–200 m above sea level (NSW DECCW 2005ab; Sadlier & Pressey 1994; Spark 2010). During dry periods, the species is likely to shelter where moisture is available. For example, they may take refuge in deep cracks within alluvial clay soils. Sufficient rainfall following extended dry conditions is likely to bring the skink to the surface (Brigalow Belt Reptiles Workshop 2010).*" Further the SPRAT habitat on NSW floodplains listing also notes "*Floodplain surveys have shown, however, that the species has no preference for particular vegetation types on alluvial cracking clays. Cracking clay soils on the Namoi and Gwydir floodplains support a wide variety of vegetation communities which can be considered suitable habitat for the Five-clawed Worm-skink (Spark 2010).*" Further information regarding potential FCWS habitat is included in the Queensland part of the SPRAT listing including "*the species is not likely to be found in soils in which deep cracks do not form, such as hard-setting brown clays or sandy soils types (Spark 2010).*", this also supports the N2NS SP1 findings that cracking clays represent the defining microhabitat type for FCWS; and that non-cracking or for example hard-setting brown clays or red gravel loam do not represent FCWS habitat of significance.

On the basis of this dominant cracking clay soil type correlation at N2NS SP1 (97.2% of total records at N2NS SP1) which is also supported by the DCCEEW SPRAT habitat notes above, it has been determined that cracking clays should be utilised to identify FCWS Habitat Areas for the purposes of this plan. The latest and best available information available prior to commencement of Works is sourced from NSW DPE SEED (Central Resource for Sharing and Enabling Environmental Data in NSW

<https://datasets.seed.nsw.gov.au/dataset/australian-soil-classification-asc-soil-type-map-of-nsw-10>) and in particular *Australian Soil Classification (ASC) soil type map of NSW* (data date Apr 2021). To correlate with the N2NS SP1 learnings above potential FCWS Habitat Area identification in this plan is based on soil type, and in particular cracking clays. This cracking clay soil type is represented by Vertosols, and it is these areas which are identified as potential FCWS Habitat Areas as shown in Appendix A maps and Chainage definitions to which the Management Measures as per the Activity Risk Assessment (Appendix B) and Section 5 shall apply:

- **Southern FCWS Habitat Area:** CH 5,500 (EIS reference)/**CH 765,058(IFC) to CH 8,500** (EIS reference)/**CH768,058(IFC)**



## Five-Clawed Worm Skink Management Plan

- **Central FCWS Habitat Area:** CH 16,000 (IES reference)/**CH775,558(IFC) to CH 17,000/CH776,558(IFC)**
- **Northern FCWS Habitat Area:** North of CH 20,000 (EIS reference)/**CH779,558(IFC) to NSW/Qld Border**

It is noted that extents of the soil type is based off of the Australian Soil Classification with a scale of 1:250,000. A buffer of approximately 250m has been added to the targeted soil classification to create an initial habitat footprint.

It is recognised that the identification of FCWS habitat prior to Work commencing as per this MCoA 30(a) is subject to refinement and continuous improvement as delivery of NS2B SSI9371 progresses. As part of continuous improvement, the principle of adaptive management shall be applied to FCWS and identification of habitat areas. Refer to Section 5.1.1 for further details. The collection of additional data during the initial Low Impact Works phase will enhance the soil type data set and correspondingly improve and contribute to finer scale resolution of this soil-type based definition of FCWS Habitat Area. It should also be noted that this additional data cannot be collected until this FCWS Management Plan is approved, as the FCWS Management Plan is a Hold Point prior to Works (with Works including collection of this data).

The FCWS Habitat Areas identified in Appendix A will be included in Project induction, ECP, EWMS and ongoing Toolbox training so that all staff and construction workers are aware of the FCWS Habitat Areas and requirements of this FCWS Management Plan.

# Five-Clawed Worm Skink Management Plan

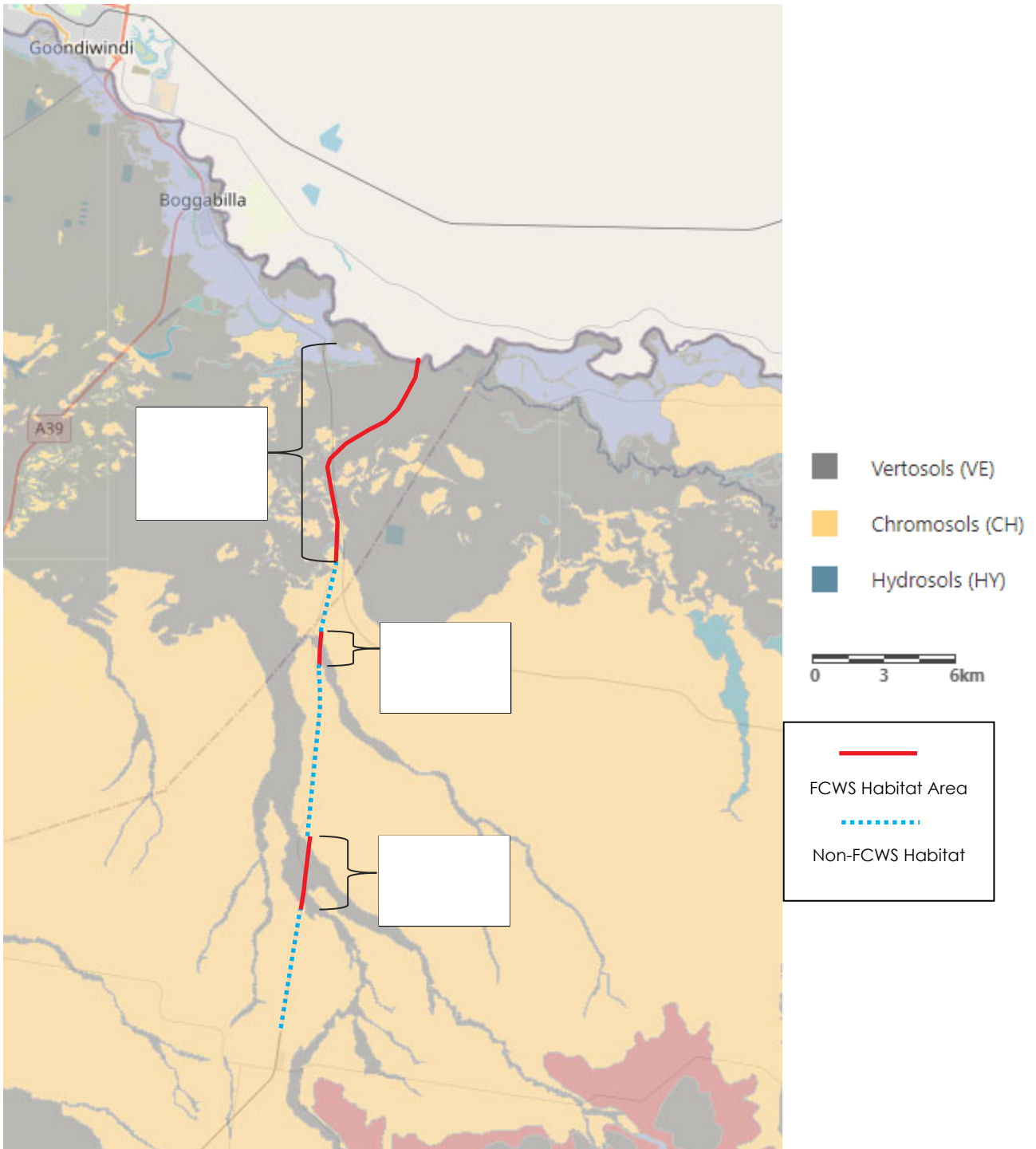


Figure A-1: FCWS Habitat Areas (red marked alignment NS2B)

# Five-Clawed Worm Skink Management Plan

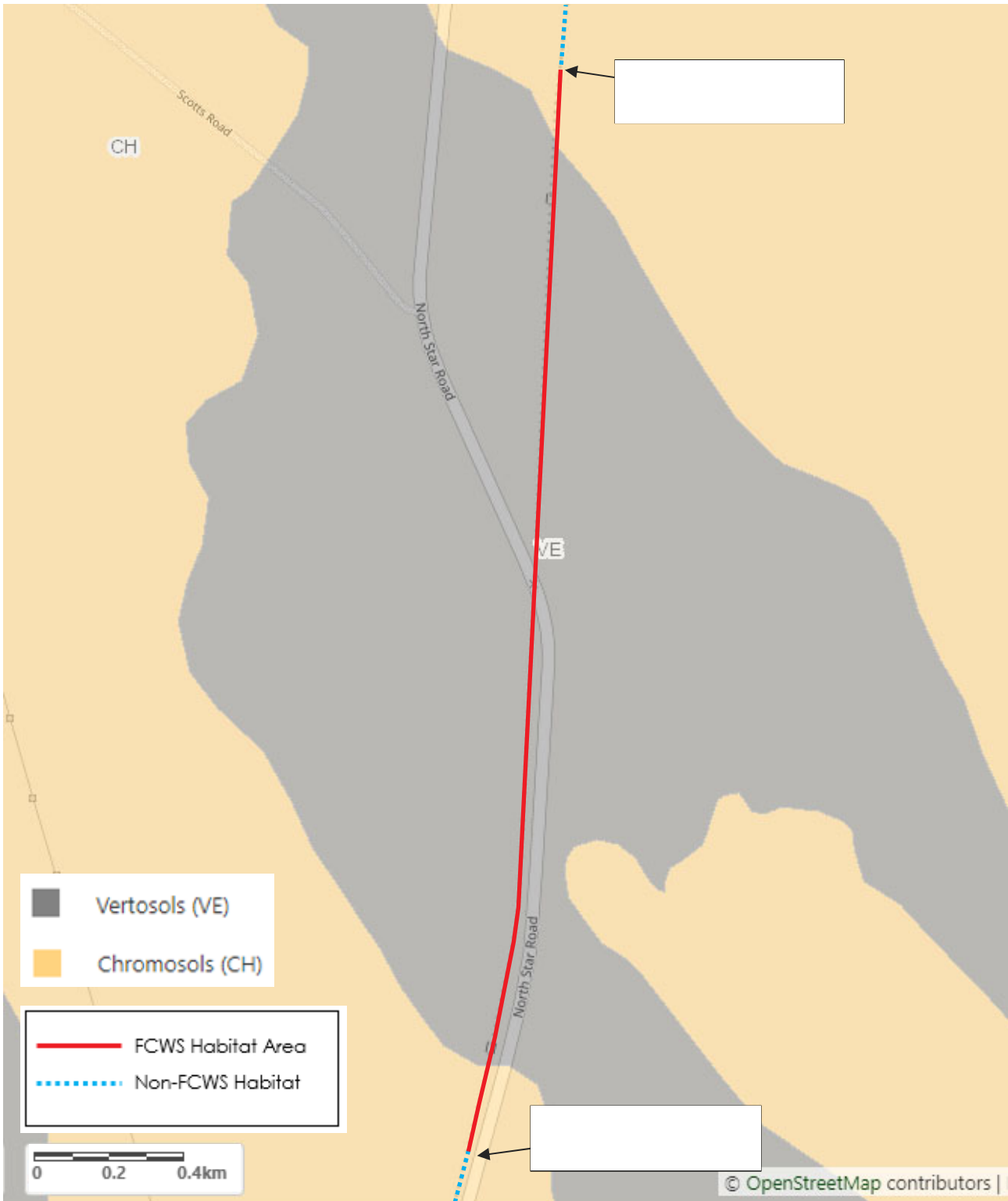


Figure A-2 : Southern FCWS Habitat Area: CH 5,500 (EIS reference)/CH765,058(IFC) to CH 8,500 (EIS reference)/CH768,058(IFC)

# Five-Clawed Worm Skink Management Plan

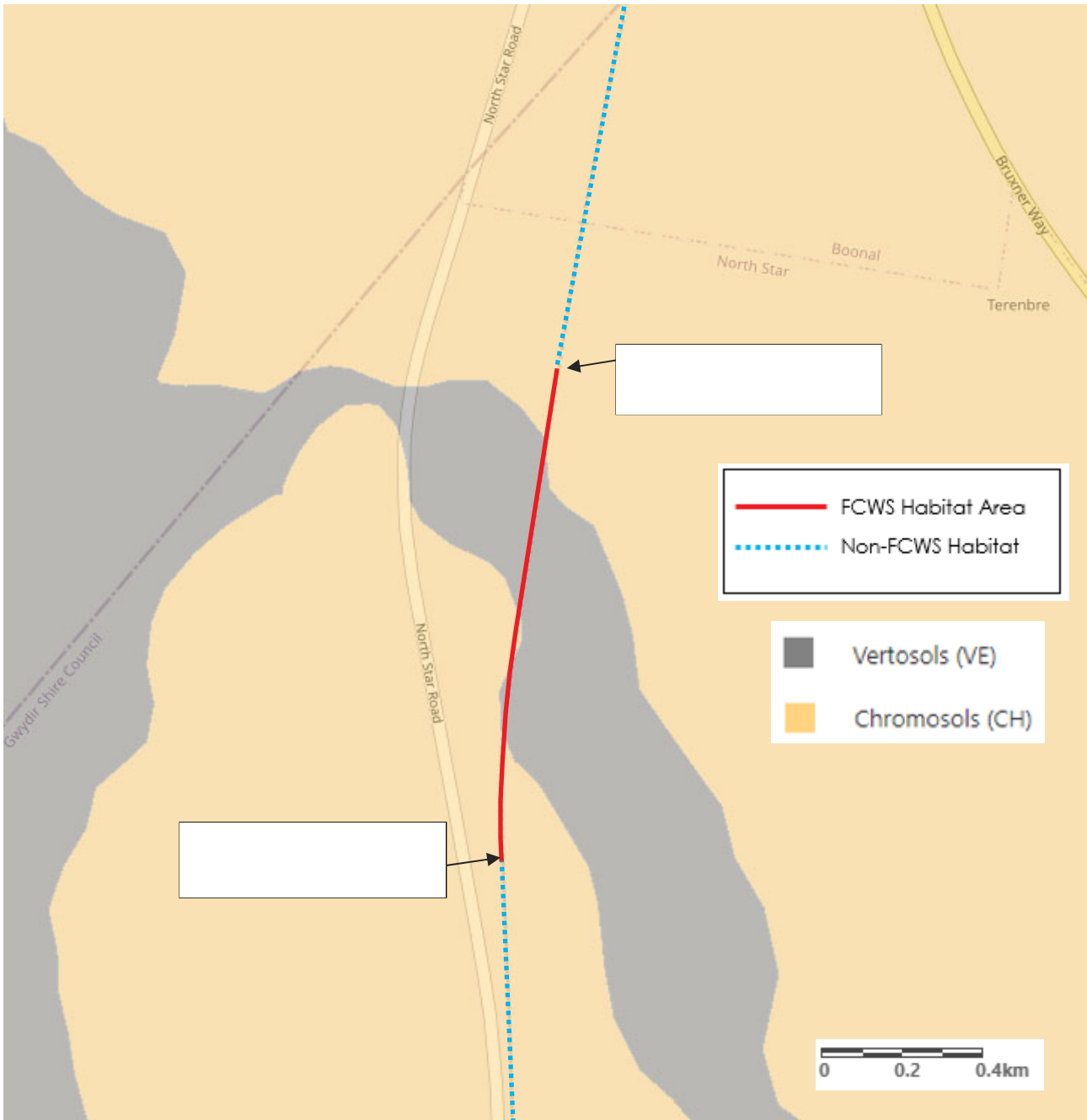


Figure A-3: **Central FCWS Habitat Area: CH16000 (EIS reference) /CH775,558 (IFC) to CH17000 (EIS reference) /CH776,558 (IFC)**

# Five-Clawed Worm Skink Management Plan

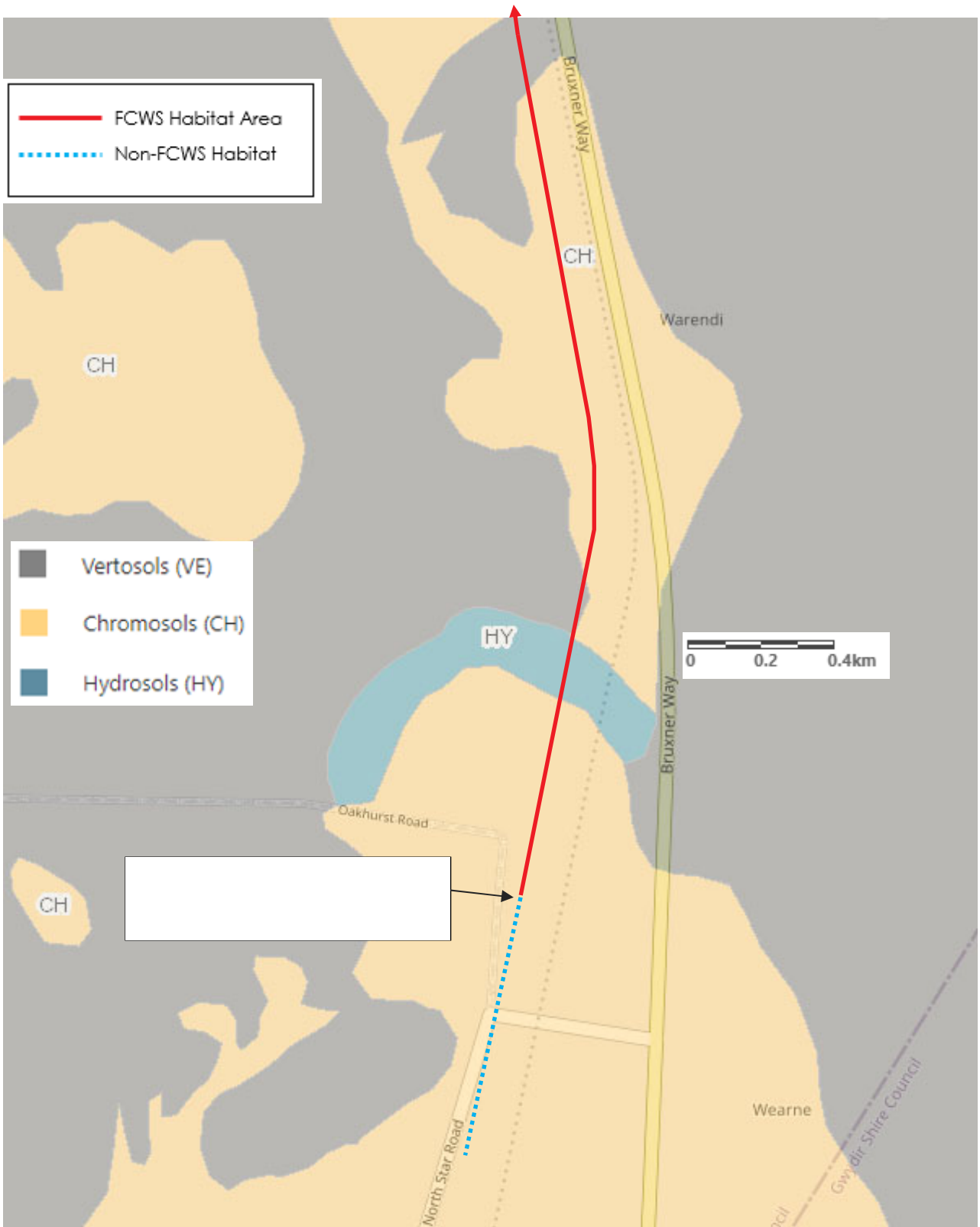


Figure A-4: **Northern FCWS Habitat Area:** North of CH 20,000 (EIS Reference) / CH 779,558 (IFC) to NSW/Qld Border (detail southern boundary)

# Five-Clawed Worm Skink Management Plan

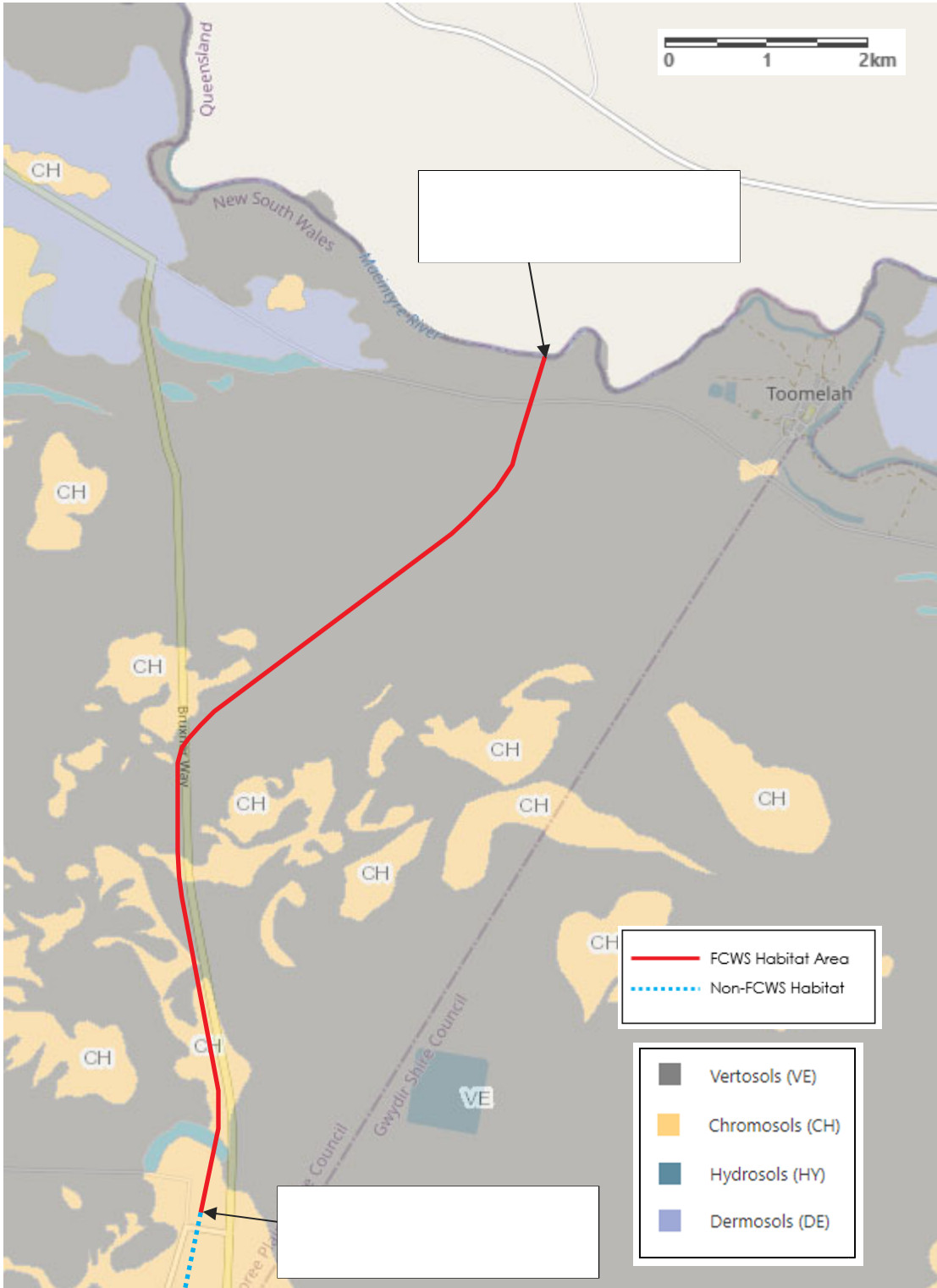


Figure A-5: Northern FCWS Habitat Area: North of CH 20,000 (EIS Reference) / CH 779,558 (IFC) to NSW/Qld Border

**Appendix B: Activity Risk Matrix**

The following mitigation measures are applicable to the nominated works within areas identified as potential FCWS Habitat Area (see Appendix A).

Table B-1: Activity Risk Matrix

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
<b>Low Impact Works</b>	Archaeological Test Excavations	1. Slashing	Possible	Moderate	Medium	1.1. Identification of FCWS Habitat Area on Environmental Control Plans 1.2. Specific FCWS Induction 1.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 1.4. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 1.5. Ecologist or Fauna Spotter supervise slashing activity 1.6. Slashed material windrow 1.7. Relocation sites to be established based on capture sites 1.8. The above mitigations (1.3 – 1.7) are not applicable to handheld slashing (lawn trimmer) activity 1.9. Data Collection of captured FCWS as per Appendix C 1.10. Five Clawed Worm Skink Encounter Procedure as per Appendices E. 1.11. Where FCWS observed during these works, LOR Supervisor and/or Environmental Team can self-perform the relocation and recording of the find. 1.12. Vehicles to remain on designated accesses	Unlikely	Minor	Low	Note: Total construction impact footprint in FCWS Habitat Area during construction is approximately 185Ha. An extremely conservative assessment of impact of heritage test excavation's slashing extent is approximately 4.3Ha. This equates to slashing of approximately 2% of FCWS Habitat Area.

## Five-Clawed Worm Skink Management Plan

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
		2. Ground penetration (hand tools)	Possible	Moderate	Medium	2.1. Identification of FCWS Habitat Area on Environmental Control Plans 2.2. Specific FCWS Induction 2.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 2.4. Ecologist or Fauna Spotter undertake pre-clearing survey prior to commencing works 2.5. Work crews tool-boxed on how to search for and avoid impact to FCWS prior to commencing hand tool archaeological test pit digging; then self-management of archaeological excavation program by archaeologists and Registered Aboriginal Parties 2.6. Any Five Clawed Worm Skink found during works to be managed per Appendix E 2.7. Relocation sites to be established based on capture sites 2.8. Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix E (FCWS Encounter Procedure) 2.9. Where FCWS observed during these works, LOR Supervisor and/or Environmental Team can self-perform the relocation and recording of the find. 2.10. Vehicles to remain on designated accesses	Unlikely	Minor	Low	Toolbox by Ecologist or Fauna Spotter for Test Excavation crews on how to search for and avoid impact to FCWS  Note: Total construction impact footprint in FCWS Habitat Area during construction is approximately 185Ha. An extremely conservative assessment of impact of Test excavation ground penetration works is approximately 300m <sup>2</sup> . This equates to a ground penetration impact approximately 0.016% of the FCWS Habitat Area, presenting negligible risks to FCWS; particularly for the slow and careful hand tool excavation / sieving associated with archaeological test excavation.
	Geotechnical Activities	3. Slashing	Likely	Moderate	High	3.1. Identification of FCWS Habitat Area on Environmental Control Plans 3.2. Specific FCWS Induction	Possible	Minor	Medium	Note: Total construction impact footprint in FCWS Habitat Area during construction is approximately 185Ha. An extremely conservative



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Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						<p>3.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception.</p> <p>3.4. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing</p> <p>3.5. Ecologist or Fauna Spotter supervise slashing activity</p> <p>3.6. The above mitigations (3.3 – 3.5) are not applicable to handheld slashing (lawn trimmer) activity however – pre-clearance checks should be made prior to handheld slashing to ensure no fauna visible</p> <p>3.7. Slashed material windrowed</p> <p>3.8. Any Five Clawed Worm Skink found during works to be managed per Appendix E</p> <p>3.9. Where FCWS observed during these works, LOR Supervisor and/or Environmental Team can self-perform the relocation and recording of the find.</p> <p>3.10. Relocation sites to be established based on capture sites</p> <p>3.11. Data Collection of captured FCWS as per Appendix C</p> <p>3.12. Vehicles to remain on designated accesses</p>				assessment of impact of geotechnical investigation's slashing extent is approximately 2.1Ha. This equates to ground cover change of approximately 1.1% in FCWS Habitat Area.
		4. Ground penetration (Drill Rig / Excavator)	Possible	Moderate	Medium	<p>4.1. Identification of FCWS Habitat Area on Environmental Control Plans</p> <p>4.2. Specific FCWS Induction</p>	Unlikely	Minor	Low	Note: Total construction impact footprint in FCWS Habitat Area during construction is approximately 185Ha. An extremely conservative assessment of impact of

## Five-Clawed Worm Skink Management Plan

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						<p>4.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception.</p> <p>4.4. Relocation sites to be established based on capture sites</p> <p>4.5. Any Five Clawed Worm Skink found during works to be managed per Appendix E</p> <p>4.6. Ecologist or Fauna Spotter observe ground penetration of drilling or test pit location. Not required for duration of drilling or test pit. Drilling location can be prepared in days leading up to works by hand excavating a 500mm x 500mm pit in the borehole location. Borehole pre-dug pit to be excavated to change in soil horizon / end of vertisol soil layer under Ecologist / Fauna Spotter observation. Excavation becomes a hostile FCWS environment, is covered as an end of day control and does not require Ecologist / Fauna Spotter presence for drilling mechanism penetration.</p> <p>4.7. Work crews tool-boxed on how to search for and avoid impact to FCWS prior to commencing hand tool removal of topsoil layer within ground penetration area of borehole (500mm x 500mm) or test pit (3m x 1m); then self-management of LIW Geotechnical Investigation program by Geotechnical Investigation crews.</p>				<p>geotechnical investigation's ground penetration works in FCWS Habitat Area is approximately 180m<sup>2</sup>. This equates to a ground penetration impact approximately 0.010% of the FCWS Habitat Area.</p> <p>Note: Geotechnical investigation works are mainly confined to the existing rail formation. While there is friable soil present, it doesn't represent the undisturbed cracking clay soil away from the rail formation – reducing likelihood of FCWS being present</p> <p>It should also be noted that one skink has been found to date during LIW – the slashing activities would have created the most potential impact to date (as of 01/12/2023).</p>

## Five-Clawed Worm Skink Management Plan

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						4.8. Any Five Clawed Worm Skink found during works to be managed per Appendix E 4.9. Relocation sites to be established based on capture sites 4.10. Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix E (FCWS Encounter Procedure) 4.11. Where FCWS observed during these works, LOR Supervisor and/or Environmental Team can self-perform the relocation and recording of the find. 4.12. Vehicles to remain on designated accesses				
	5. Minor Access Tracks & Levelling Off of Drilling Pads for Safe and All-Weather working areas		Likely	Moderate	High	5.1. Identification of FCWS Habitat Area on Environmental Control Plans 5.2. Specific FCWS Induction 5.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 5.4. Ecologist or Fauna Spotter undertake pre-clearing survey prior to minor earthworks 5.5. Relocation sites to be established based on capture sites 5.6. Waiting period prior to topsoil stripping or rock placement of 2 nights post slashing but no more than 5 nights post slashing 5.7. Project Ecologist to determine site suitability for FCWS. Where site deemed as suitable FCWS Habitat: Ecologist or Fauna Spotter daytime pre-stripping survey. Extent of	Possible	Moderate	Medium	Note: Total construction impact footprint in FCWS Habitat Area during construction is approximately 185Ha. An extremely conservative assessment of impact of geotechnical investigation's minor access track slashing extent across the entire project is approximately 5Ha. This equates to ground cover change of approximately 2.7% of the FCWS Habitat Area.  Full details on required ground penetration works required for track establishment is to be determined based on-site conditions. Most locations where leveling off for safe drill rig operation (topsoil stripping) is required, is on rail embankments – not specified FCWS Habitat soil types (ie not cracking clay).

## Five-Clawed Worm Skink Management Plan

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						survey to be delineated with high-vis markers 5.8. Ecologist or Fauna Spotter supervise stripping activity (where not in rail embankment) or prior to placing rock material 5.9. Topsoil stripping to depth of 100mm with 1 ecologist or fauna spotter per machine 5.10. Any Five Clawed Worm Skink found during works to be managed per Appendix E 5.11. Salvaged FCWS assessments for injury by project ecologist or fauna spotter 5.12. Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix E (FCWS Encounter Procedure) 5.13. Where FCWS observed in during these works, LOR Supervisor and/or Environmental Team can self-perform the relocation and recording of the find. 5.14. Vehicles to remain on designated accesses				
	Utilities Investigations	6. Non-Destructive Digging	Unlikely	Moderate	Medium	6.1. Identification of FCWS Habitat Area on Environmental Control Plans 6.2. Specific FCWS Induction 6.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception. 6.4. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 6.5. Ecologist & Fauna Spotter supervise slashing activity	Unlikely	Minor	Low	Toolbox by Ecologist or Fauna Spotter for Utilities Non-Destructive Digging crews on searching for FCWS & FCWS Habitat Area  Note: Total construction impact footprint in FCWS Habitat Area during construction is approximately 185Ha. An extremely conservative assessment of impact of total non-destructive digging penetration is approximately 15m2. This equates to a ground penetration impact approximately 0.001% of the FCWS Habitat Area.

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						<p>6.6. Slashed material windrow</p> <p>6.7. Work crews' tool-boxed on how to search for and avoid impact to FCWS prior to commencing pothole digging; then self-management of non-destructive digging program by utilities work crew</p> <p>6.8. Any Five Clawed Worm Skink found during works to be managed per Appendix E</p> <p>6.9. Relocation sites to be established based on capture sites</p> <p>6.10. The above mitigations (6.3 – 6.5) are not applicable to handheld slashing (lawn trimmer) activity</p> <p>6.11. Data Collection of captured FCWS as per Appendix C (FCWS Register) and Appendix E (FCWS Encounter Procedure)</p> <p>6.12. Where FCWS observed during these works, LOR Supervisor and/or Environmental Team can self-perform the relocation and recording of the find.</p> <p>6.13. Vehicles to remain on designated accesses</p>				
	General Survey	7. Survey Control Setout	Possible	Moderate	Medium	<p>7.1. Identification of FCWS Habitat Area on Environmental Control Plans</p> <p>7.2. Specific FCWS Induction</p> <p>7.3. Site review of soil types and implementation of appropriate measures by Project Ecologist / Fauna Spotter Catcher / Environmental Team / Project Archaeologist. Report by exception.</p> <p>7.4. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing</p>	Unlikely	Minor	Low	<p>Toolbox by Ecologist or Fauna Spotter for Survey crews on searching for FCWS &amp; FCWS Habitat Area</p> <p>Note: Total ground disturbance footprint during construction is approximately 185Ha. Impact of ground penetration works is approximately 22m2 which represents approximately 0.001% of the FCWS Habitat Area.</p>

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						7.5. Ecologist & Fauna Spotter supervise slashing activity 7.6. Slashed material windrowed 7.7. Relocation sites to be established based on capture sites 7.8. The above mitigations (7.3 – 7.7) are not applicable to handheld slashing (lawn trimmer) activity 7.9. Survey crew tool-boxed on how to search for and avoid impact to FCWS prior to commencing works (minor control install); then self-management of survey work crew 7.10. Hand Auger control installation location 7.11. Any Five Clawed Worm Skink found during works to be managed per Appendix E. Data Collection of captured FCWS as per Appendix C FCWS Register) and Appendix E (FCWS Encounter Procedure) 7.12. Where FCWS observed during these works, LOR Supervisor / Environmental Team can self-perform the relocation and recording of the find 7.13. Vehicles to remain on designated accesses				
	Other Investigations	8. Activities without Ground Disturbance	Rare	Moderate	Low	8.1. Identification of FCWS Habitat Area on Environmental Control Plans 8.1. Identification of FCWS Habitat Area on Environmental Control Plans 8.2. Specific FCWS Induction 8.3. Any Five Clawed Worm Skink found during works to be managed per Appendix E. 8.4. Vehicles to remain on designated accesses	Rare	Minor	Low	

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
Construction	Earthworks	9. Clearing / Grubbing / Topsoil Stripping	Almost Certain	Moderate	High	9.1. All mitigation measures as per FCWS MP Section 5.2 9.2. Identification of FCWS Habitat Area on Environmental Control Plans 9.3. Specific FCWS Induction 9.4. Develop a Survey Prescription 9.5. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 9.6. Ecologist & Fauna Spotter supervise slashing activity 9.7. Slashed material windrow 9.8. Relocation sites to be established based on capture sites 9.9. Waiting period prior to topsoil stripping 9.10. Site Assessment by a Project ecologist to determine FCWS Habitat Area 9.11. Daytime stripping & associated controls 9.12. Ecologist or Fauna Spotter Catcher to supervise ground disturbance works 9.13. Salvaged FCWS assessments for injury by project ecologist or fauna spotter 9.14. Data Collection of captured FCWS as per Appendix C 9.15. Identify and establish FCWS relocation Sites by project ecologist or fauna spotter 9.16. Habitat Enhancement & Refuge Replacement 9.17. Five Clawed Worm Skink Encounter Procedure as per Appendices E.	Likely	Moderate	High	

## Five-Clawed Worm Skink Management Plan

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
	Drainage Works	10. Culverts & Track Drainage				Note: Drainage, Bridge and Road works are all successors to Earthworks (specifically topsoil stripping), so whilst these works will be undertaken in areas considered FCWS Habitat Area, the risk of impacting upon FCWS is greatly reduced due to the topsoil layer being removed. As such, the only applicable mitigation measures are:				
	Bridgeworks	11. Piling				<ul style="list-style-type: none"> <li>• Specific FCWS Induction</li> <li>• Five Clawed Worm Skink Encounter Procedure (Appendix E)</li> </ul>				
	Roadworks	12. Bruxner Way Re-alignment  13. Local Road Re-alignments								
	Project Delineation	14. Fencing	Possible	Moderate	Medium	14.1. Identification of FCWS Habitat Area on Environmental Control Plans 14.2. Specific FCWS Induction 14.3. Ecologist or Fauna Spotter undertake pre-clearing survey prior to slashing 14.4. Ecologist & Fauna Spotter supervise slashing activity 14.5. Slashed material windrowed 14.6. Relocation sites to be established based on capture sites 14.7. The above mitigations (14.3 – 14.6) are not applicable to handheld slashing (lawn trimmer) activity 14.8. Work crews tool-boxed on how to search for FCWS prior to commencing fencing (where Ecologist or Fauna Spotter is not required) 14.9. Data Collection of captured FCWS as per Appendix C	Unlikely	Minor	Low	Note: Total construction impact footprint during construction is approximately 185Ha. An extremely conservative assessment of impact of ground penetration works is approximately 265m <sup>2</sup> .



## Five-Clawed Worm Skink Management Plan

Construction Phase	Activity	Aspect / Impact	Likelihood	Impact	Initial Risk	Mitigation Measures	Likelihood	Impact	Residual Risk	Additional Comments or Documents / Procedures / Training Required
						14.10. Five Clawed Worm Encounter Skink Procedure as per Appendices E. 14.11. Vehicles to remain on designated accesses				

<b>Financial</b>			Up to \$200K	>\$200K to \$2M	>\$2M to \$6M	>\$6M to \$20M	>\$20M	
<b>Environment</b>			Minimal environmental impact	Limited and recoverable environmental impact	Significant and recoverable environmental impact	Permanent impact to area of less than high environmental significance	Permanent impact to area of high environmental significance	
<b>Regulatory</b>			Expected to prompt regulatory interest	Increased oversight by regulator	Limited fine, official caution and / or direction to act	Formal regulatory action impacting on operating activities and / or material fine	Prosecution of the company and / or its office holders	
<b>Reputation</b>			Short term loss of confidence from other than key stakeholders	Sustained loss of confidence from other than key stakeholders	Short-term loss of confidence from a key stakeholder	Sustained loss of confidence from a key stakeholder	Loss of Shareholder support	
<b>Schedule</b>			Up to 2 weeks	>2 weeks to 2 months	>2 months to 4 months	>4 months to 6 months	>6 months	
			<b>Not Significant</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Extreme</b>	
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
<b>Likelihood</b>	<b>Almost Certain &gt;80%</b>	Once per month (Is expected to occur in most circumstances)	<b>A</b>	Medium: 9 (1A)	Medium: 13 (2A)	High: 19 (3A)	Very High: 23 (4A)	Very High: 25 (5A)
	<b>Likely 60% to 80%</b>	Between once a month and once a year (Will probably occur in most circumstances)	<b>B</b>	Low: 7 (1B)	Medium: 10 (2B)	High: 17 (3B)	Very High: 21 (4B)	Very High: 24 (5B)
	<b>Possible 40% to 60%</b>	Between once a year and once in five years (Might occur at some time)	<b>C</b>	Low: 6 (1C)	Medium: 8 (2C)	Medium: 14 (3C)	High: 18 (4C)	Very High: 22 (5C)
	<b>Unlikely 20% to 40%</b>	Between once in 5 years and once in 20 years (Could occur at some time)	<b>D</b>	Low: 3 (1D)	Low: 4 (2D)	Medium: 11 (3D)	Medium: 15 (4D)	High: 20 (5D)
	<b>Rare &lt; 20%</b>	Once in more than 20 years (May occur in exceptional circumstances)	<b>E</b>	Low: 1 (1E)	Low: 2 (2E)	Low: 5 (3E)	Medium: 12 (4E)	Medium: 16 (5E)

Figure B-6: Risk matrix



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# Five-Clawed Worm Skink Management Plan

## Appendix D: Agency/Key Stakeholder Comments on this Plan

NSW Biodiversity, Conservation and Science Directorate (BCS)

[PLACEHOLDER]

Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW)

[PLACEHOLDER]

NSW Department of Planning and Environment

[PLACEHOLDER]

# Five-Clawed Worm Skink Management Plan

## Appendix E: Five Clawed Worm Skink Encounter Procedure

### Purpose

This procedure details the actions to be taken when a Five-Clawed Worm-skink is encountered during all works associated with the North Star to Border Project.

### Induction / Training

All Project personnel will undergo a project induction including specific Five-clawed Worm-skink information that includes:

- A general description of the Five-clawed Worm-skink (including photos and key identification features).
- Locations where Five-clawed Worm-skink Habitat is located on the project site
- Information on & reference to, the FCWS Encounter Procedure

Records of induction / toolbox training would be retained.

### Scope

This procedure is applicable to all activities conducted by Laing O'Rourke and sub-Contractor personnel that have the potential to come into contact with Five-clawed Worm Skinks.

- Where FCWS are found inside of identified FCWS Habitat Areas – follow Procedure Section 1.
- Where FCWS are found outside of identified FCWS Habitat Areas – follow Procedure Section 2.

Identified FCWS Habitat Areas:

- **North:** CH779,558 to NSW Border
- **Central:** CH775,558 to CH776,558
- **South:** CH765,058 to CH768,058

### Procedure

#### Section 1. Five Clawed Worm Skink identified during all project activities – **Inside** of identified FCWS Habitat Areas

If a Five-clawed Worm-skink is encountered prior to or during all project activities, **inside** identified FCWS Habitat Areas:

- **STOP ALL WORK** in close vicinity of the find, or that would impact upon the find.
- Notify Laing O'Rourke Supervisor and LOR Environmental Team. LOR Environment team to notify ARTC and contact Ecologist and/or Fauna Spotter.
- The Project Ecologist or Fauna Spotter-Catcher will confirm the species, and record details of the find as per FCWS MP Appendix C, including below:
  - **Note:** Where FCWS is found in FCWS Habitat Areas during Low Impact Work stages listed in Appendix B – LOR Supervisor / Environmental Team can record and relocate the find.
- Section and Chainage

## Five-Clawed Worm Skink Management Plan

- Capture date and time;
- Confirmation that the find was inside identified FCWS Habitat Areas.
- Condition (Good, Injured, Deceased);
- Microhabitat at capture site;
- Soil at capture site;
- Activity undertaken at time of find;
- Detection method (e.g. survey);
- GPS Coordinates for capture and relocation site;
- Details of the person/s who made the discovery;
- Description of microhabitat at capture site;
- Description of vegetation/PCT;
- Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hindlimbs; and
- Series of measurements including: snout-vent length, tail length and total length.
- Microhabitat details of find location:
  - Soil crack density and size range (depth if possible)
  - % litter cover
  - % bare ground
  - % grass cover and/or tussock spacing
  - 3 most abundant groundcover species
  - Soil type, soil structure (blocky, small peds, massive) and pH if possible
  - Large surface debris abundance
  - Ground moisture levels (including recent rainfall amount if known/relevant).

Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) shall be captured for each individual discovered. Photographs to be taken by the Project Ecologist, Fauna Spotter-Catcher or Laing O'Rourke Supervisor/Environmental Team as part of recording the data of the find.

- The Project Ecologist or Fauna Spotter Catcher will assess the condition (either in person or remotely using photos/video) of the Five-clawed Worm-skink and determine whether it can be relocated.
  - If relocated, the details of the relocation site and condition will be recorded
  - If injured and unable to be relocated, the Project Ecologist or Fauna Spotter Catcher would determine requirement for euthanasia, rest period or veterinary treatment.
  - If deceased, specimens shall be preserved and sent to the Australian Museum in accordance with the approved FCWS Management Plan – Section 5.2.4.

## Five-Clawed Worm Skink Management Plan

- Report on the finding, alive & relocated or deceased must be in accordance with Section 4 of this procedure (Section 7.1 of the FCWS MP).

**NOTE:** Five-clawed Worm-skink finds will be immediately notified to ARTC and ARTC will notify the relevant regulatory agencies as per Section 7.1 of the FCWS MP, and Section 4 below.

### Section 2. Five-Clawed Worm-Skink identified during all project activities – **Outside of identified FCWS Habitat Areas**

**2.1** If a Five-clawed Worm-skink is encountered prior to or during project activities, **outside** identified FCWS Habitat Areas:

- **STOP ALL NATURAL SURFACE GROUND DISTURBANCE WORK within 200m of the find**
- The Laing O'Rourke Supervisor and any other personnel working in the area must be immediately notified of the find and the area surrounding the find must be protected.
- The Laing O'Rourke Environment Team must also be notified immediately who will contact ARTC and the Project Environmental Representative (ER) with initial report:
  - (i) Date & Time of discovery
  - (ii) Details of discovery site (GPS Points, description of vegetation, soil, microhabitat features present)
  - (iii) Proposed Relocation site
  - (iv) Details of person making discovery
- LOR team to contact Ecologist and/or Fauna Spotter.

**2.2** The Project Ecologist or Fauna Spotter-Catcher will confirm the species, and record details of the find as per FCWS MP Appendix C, including below:

- Section and Chainage
- Capture date and time;
- Confirmation that the find was outside of identified FCWS Habitat Areas.
- Condition (Good, Injured, Deceased);
- Microhabitat at capture site;
- Soil at capture site;
- Activity undertaken at time of find;
- Detection method (e.g. survey);
- GPS Coordinates for capture and relocation site;
- Details of the person/s who made the discovery;
- Description of microhabitat at capture site;
- Description of vegetation/PCT;
- Where practicable, validation photos from on top, side, below and close-up photos of forelimbs and hindlimbs; and

## Five-Clawed Worm Skink Management Plan

- Series of measurements including: snout-vent length, tail length and total length.
- Microhabitat details of find location:
  - Soil crack density and size range (depth if possible)
  - % litter cover
  - % bare ground
  - % grass cover and/or tussock spacing
  - 3 most abundant groundcover species
  - Soil type, soil structure (blocky, small peds, massive) and pH if possible
  - Large surface debris abundance
  - Ground moisture levels (including recent rainfall amount if known/relevant).
- Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) shall be captured for each individual discovered. Photographs to be taken by the Project Ecologist, Fauna Spotter-Catcher or Laing O'Rourke Supervisor/Environmental Team as part of recording the data of the find.
- The Project Ecologist or Fauna Spotter Catcher will assess the condition (either in person or remotely using photos/video) of the Five-clawed Worm-skink and determine whether it can be relocated.
  - If relocated, the details of the relocation site and condition will be recorded
  - If injured and unable to be relocated, the Project Ecologist or Fauna Spotter Catcher would determine requirement for euthanasia, rest period or veterinary treatment.
  - If deceased, specimens shall be preserved and sent to the Australian Museum in accordance with the approved FCWS Management Plan – Section 5.2.4.
- Report on the finding, alive & relocated or deceased must be in accordance with Section 4 of this procedure (Section 7.1 of the FCWS MP).
- **Note:** Where FCWS is found **outside** FCWS Habitat Areas during Low Impact Work stages listed in Appendix B – LOR Supervisor / Environmental Team can record and relocate the find.

**NOTE:** Five-clawed Worm-skink finds will be immediately notified to ARTC and ARTC will notify the relevant regulatory agencies as per Section 7.1 of the FCWS MP, and Section 4 below.

**2.3** The Project Ecologist will determine if the FCWS Habitat Area needs to be updated and below steps to be followed:

- a. Relocation of individuals using the framework developed as per Section 5.2.5 of the FCWS MP;



## Five-Clawed Worm Skink Management Plan

- b. Data capture of the individual and habitat data outlined in Appendix C of the FCWS MP;
- c. Project Ecologist assess and advise if FCWS Habitat Area needs to be updated based on inspection of Habitat / Soil type within 200m of encounter, with reference to SPRAT listing and Section 2 of FCWS MP regarding FCWS Habitat Areas.
- d. Any refinements to FCWS Habitat Area would be addressed as per Section 5.1.1 of FCWS MP; with the Environmental Representative considering the Project Ecologist advice. Where the Environmental Representative endorses the Project Ecologist advice the FCWS Habitat Area shall be updated, and the Environmental Representative will include any endorsements of refined FCWS Habitat Areas in monthly reports to DPE.
- e. Updating of relocation sites, FCWS register, construction drawings and environmental control plans

### Section 3. Resumption of works

- Where Five-clawed Worm-skink is encountered prior to or during all project activities, **inside** identified FCWS Habitat Areas – works may recommence following advice from the LOR Environmental Team that all information required in Section 1 has been captured.
- Where Five-clawed Worm-skink is encountered prior to or during all project activities, **outside** identified FCWS Habitat Areas – works may recommence following advice from the LOR Environmental Team that all information and process required in Section 2.1 – 2.2 has been completed.

### Section 4. Reporting

In the event of a Five-clawed Worm Skink **mortality or injury** LOR will immediately notify the nominated ARTC Representative/s who will arrange regulatory notification/s in accordance with MCoA A43 and A44 of the CSSI, and relevant conditions of any EPBC Approval. ARTC will notify DPE, BCS and DCCEEW of all FCWS mortalities and injuries. Notification timeframes will be in accordance with MCoA A43 and A44 of the CSSI, and relevant conditions of any EPBC Approval.

**Incident notifications** relating to mortality or injury of a Five-clawed Worm Skink should address:

- Capture date and time.
- Confirmation of whether the find was inside or outside of identified FCWS Habitat Areas.
- GPS Coordinates for capture and relocation site.
- Condition (Injured, Deceased).
- Microhabitat at capture site.
- Soil at capture site.
- Activity undertaken at time of find.
- Detection method (e.g. survey).

## Five-Clawed Worm Skink Management Plan

IR will endeavour, notwithstanding practical and safety considerations, to collect all samples and send to the relevant independent, publicly owned museum (Australian museum as a priority) to verify if they are FCWS or not. IR will fund further analysis by the museum where the Australian Museum is willing and able to accept the specimens.

In the event of a **live capture and relocation** of a Five-Clawed Worm Skink, regardless of if identified in FCWS Habitat Areas, LOR will provide details of the live capture and relocation Report on the finding, alive & relocated or deceased must be in accordance with Section 7.1.2 of the FCWS MP. Laing O'Rourke will provide details of the live capture and relocation within 24 hours to the nominated ARTC Representative/s who will arrange reporting to BCS and DCCEEW within 48 hours of ARTC becoming aware of the live capture and relocation, or as otherwise agreed at the time with the Agencies.

Reporting relating to the live capture and relocation of a Five-Clawed Worm Skink should address:

- Capture date and time.
- Confirmation of whether the find was inside or outside of identified FCWS Habitat Areas.
- GPS Coordinates for capture and relocation site.
- Condition.
- Microhabitat at capture site.
- Soil at capture site.
- Activity undertaken at time of find.
- Detection method (e.g. survey).

A copy of the Five-clawed Worm Skink Register detailing all FCWS encounters as outlined in **Appendix C** of the FCWS MP will be provided to BCS and DCCEEW each month, or upon request by either Agency

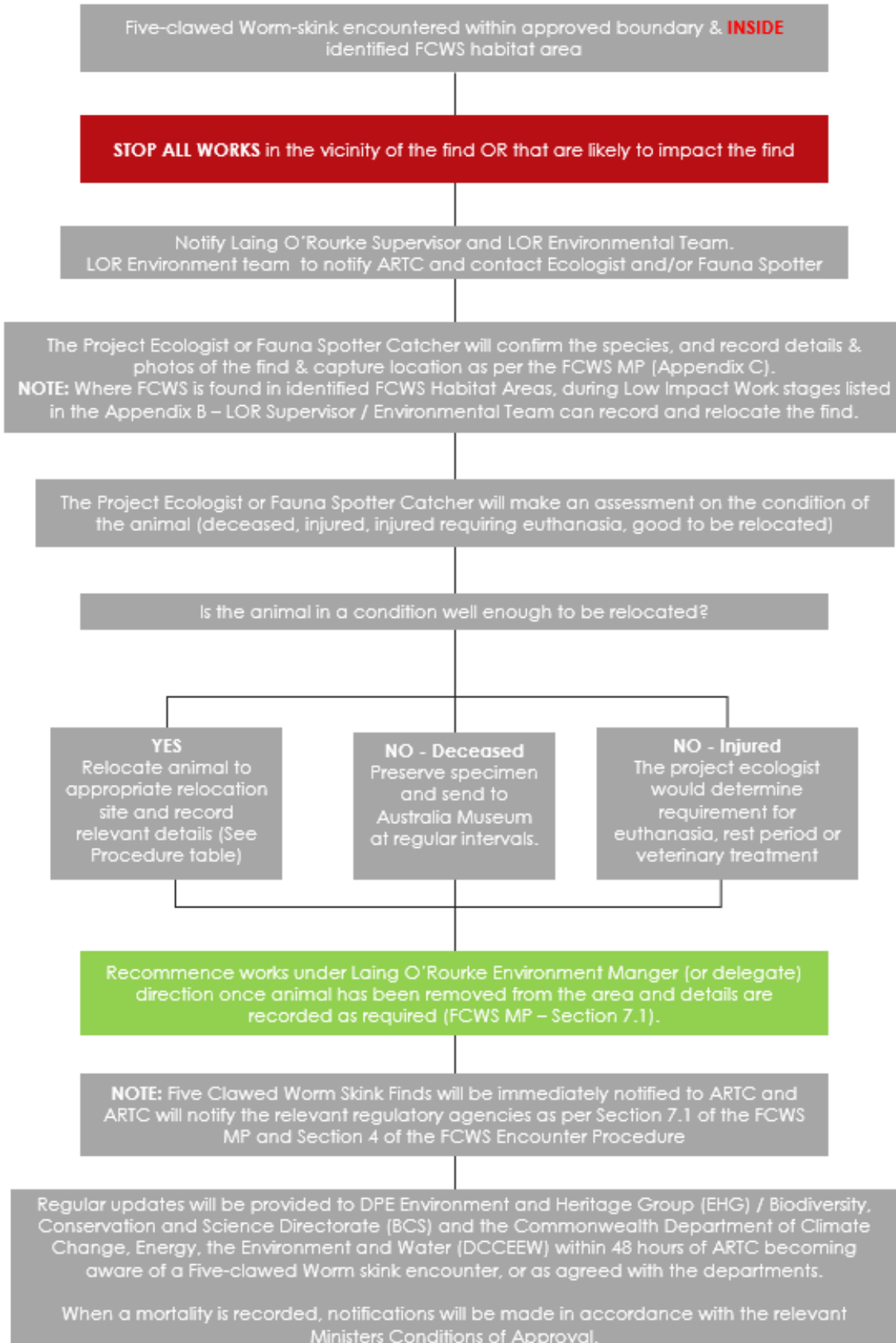
### 5. Contact Details

**Following contact details accurate at time of document release. Refer to relevant contact details on site (ie – Daily Activity Briefing, Site Notice Boards etc)**

- **LOR Supervisor:**
  - Jimmy Williams – 0407 183 684
- **LOR Environmental Team:**
  - Dylan Greeff – 0467 761 995
  - Martin Mulhearn – 0427 727 286
- **Project Ecologist:**
  - Andrew Jensen (EMM) – 0404 348 638
  - Robert (Bob) Johnston (Ecosure) – 0429 948 443
- **WIRES: 1300 094 737**

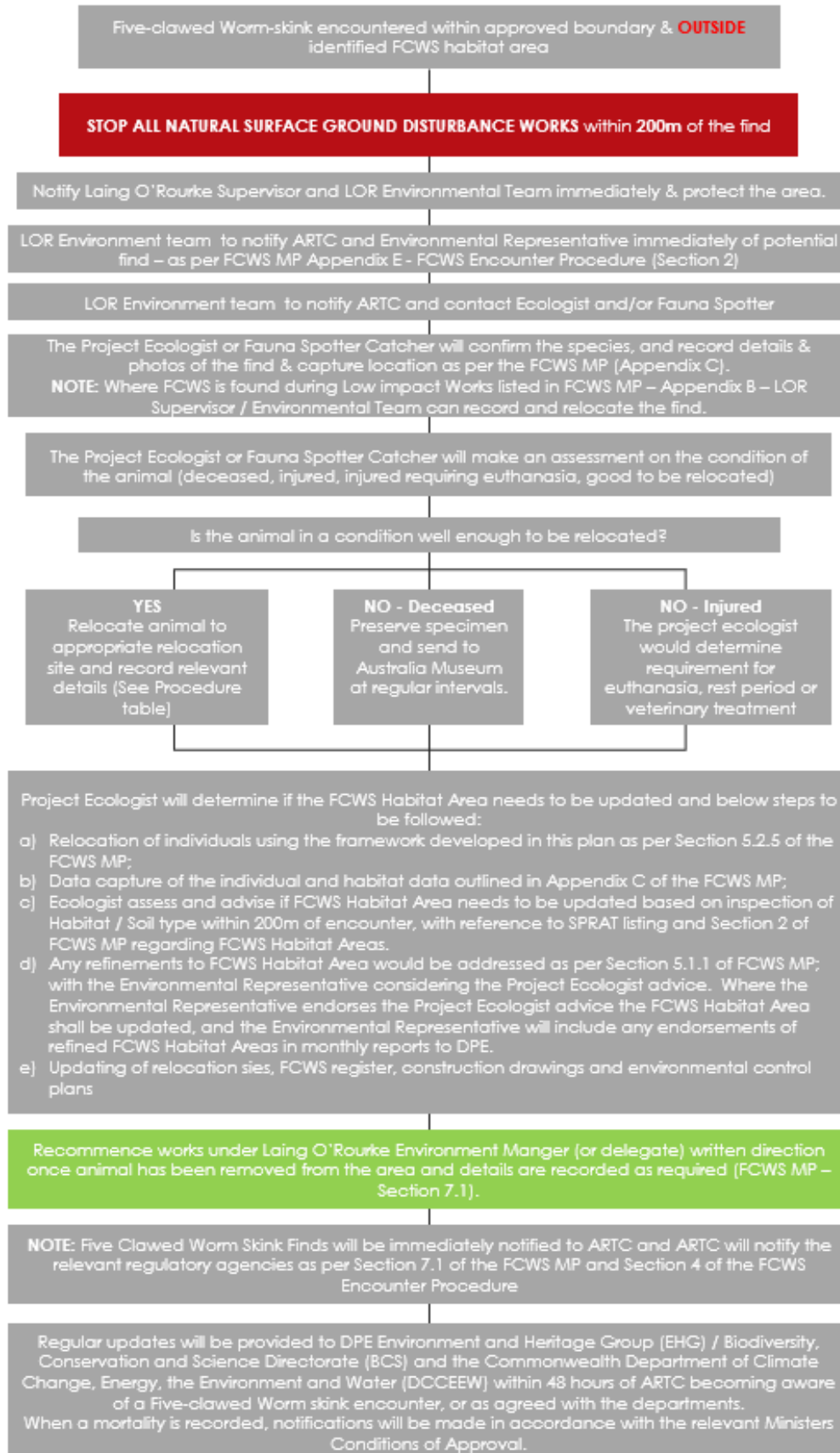
# Five-Clawed Worm Skink Management Plan

**Figure 1: FCWS Find Inside Identified FCWS Habitat Flow Chart**



# Five-Clawed Worm Skink Management Plan

**Figure 2: FCWS Find Outside Identified FCWS Habitat Flow Chart**



# Five-Clawed Worm Skink Management Plan

## Appendix F: Five-Clawed Worm-Skink Pre-Clearance Procedure – Low Impact Works

**Note:** This procedure is only applicable when used in conjunction with the approved Five-Clawed Worm-Skink Management Plan (Rev E or more recent) and only for activities allowed for under Appendix B of the FCWS MP.

### Activities include:

Localised vegetation slashing (ie whipper snipper), heritage test pit manual excavations, geotechnical investigations pre-borehole digging and geotechnical investigations/utility test pit excavations (mechanical).

### Prior to undertaking disturbance works:

1. Geotechnical Investigation / Heritage test excavation / utilities investigation personnel and LOR site teams to be toolboxed / trained in the requirements of the FCWS Pre-Clearance procedure by Project Ecologist or LOR Environmental Team
2. Identify / confirm location of FCWS relocation habitat areas
3. Confirm Ecologist / Fauna Spotter contact details in case of requiring call out in event of finding FCWS.
4. Confirm with LOR Environmental team and/or LOR Supervisor that proposed ground disturbance is within the approved project boundary and has had vegetation pre-clearance surveys undertaken.
5. Review FCWS MP, in particular Appendix B (Low Impact Works mitigation measures) and Appendix E (Five-Clawed Worm-Skink Encounter Procedure)

### Undertaking disturbance works:

1. Ecologist, Fauna Spotter and/or appropriately toolboxed personnel to undertake a pre-clearing assessment of the immediate area.
  - (a) Search for habitat features, such as old wooden rail sleepers, branches, logs, etc
    - (i) Gently lift / disturb and where practical, remove
  - (b) Rake / scrape over and through ballast (where applicable)
  - (c) Identify any visible cracks in soil and avoid if possible. If not possible check within cracks for any fauna
2. Undertake whipper snipper activities (if required), watching for fauna.
  - (a) Heritage test pits ~1m x 1m
  - (b) Boreholes ~ 1m x 1m
  - (c) Geotechnical investigation test pits ~4m x 3m
3. Remove the slashed grass to expose the ground to be excavated and windrow grass away from ground disturbance works (to reduce the likelihood of enhancing FCWS habitat close to disturbance works).
4. Undertake another inspection of the proposed works area following vegetation removal. If cracks are present, thoroughly inspect it with a torch.

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## Five-Clawed Worm Skink Management Plan

5. If no FCWS or any other fauna is present, proceed with the relevant excavations. Carefully remove topsoil layer until confirmation that no cracking soil habitat visible at bottom of investigation location.
  - Ground disturbance to be approximately:
    - Heritage test pits ~50cm x 50cm
    - Boreholes ~ 50cm x 50cm
    - Geotechnical Investigation Test Pits ~ 3m x 1m
  - Inspect the soil removed to confirm absence of any fauna.
  - Report any fauna sightings to LOR Supervisor and/or Environmental team

**Note** – if Five-Clawed Worm-Skink is sighted, enact the FCWS Encounter Procedure immediately (FCWS MP – Appendix E).