

Document Citation: Lewis, B. D (2016). Significance Assessment in accordance with the *Environmental Protection and Biodiversity Conservation Act (1999)* for the Three-toed Snake Tooth Skink (*Saiphos reticulatus*). Prepared by Lewis Ecological Surveys for the Roads and Maritime, Grafton.

1.0 Description of the Action

The action consists of the following:

- Construction of a new bridge over the Clarence River about 70 metres downstream of the existing road and rail bridge (which is to be retained);
- Upgrades to parts of the road network in Grafton and South Grafton to connect the new bridge to the existing road network, including:
 - Widening Iolanthe Street to four lanes;
 - Widening the Gwydir Highway to four lanes between Bent Street and the Pacific Highway;
 - Realigning the existing Pacific Highway to join Iolanthe Street near Through Street;
 - Providing a new roundabout at the intersection of the Pacific Highway and Gwydir Highway;
 - Providing a new roundabout at the intersection of Through Street and Iolanthe Street;
 - Limiting Spring Street and the Old Pacific Highway to left in and left out only where they meet Iolanthe Street;
 - Realigning Butters Lane;
 - Widening Pound Street to four lanes between Villiers Street and the approach to the new bridge;
 - Providing traffic signals at the intersection at Pound Street and Clarence Street;
 - Closing Kent Street where it is crossed by the bridge approach road;
 - Realigning and lowering Greaves Street beneath the new bridge;
 - Realigning Bridge Street to join directly to the southern part of Pound Street (east of the new bridge approach). There would be no direct connection between Pound Street south and the new bridge approach;
 - Widening Clarence Street to provide formal car park spaces; and
 - Minor modifications to the existing Dobie Street and Villiers Street roundabout.
- The existing rail viaduct section across Pound Street would be replaced with a new bridge structure to provide sufficient vertical clearance for the upgrade of Pound Street;
- Construction of a pedestrian and cycle path and signalised pedestrian crossings for access to and across the new bridge and throughout Grafton and South Grafton;
- Flood mitigation works, which includes raising the height of sections of the existing levee upstream of the existing bridge in Grafton and South Grafton; and
- Ancillary works such as public utility adjustments, construction compounds and stockpile areas and water management measures.

2.0 Nature of the Impacts and Determination of TTSTS Habitat

2.1 Types of Impacts

The works summarised above are variable in the way they may impact on biota. This is due to the fact that some impacts are of a **permanent** nature (i.e. beneath the completed works footprint) whilst others will be progressively rehabilitated over a 2 year construction period and are considered of an **intermediate** nature. In some cases, particularly the flood mitigation works (i.e. levee), the duration for these works will generally be less than 2 weeks and have been considered **temporary** and more akin to habitat disturbance in most instances. How this may impact on the Three-toed Snake-tooth Skink (*Saiphos reticulatus*; hereafter TTSTS) will vary depending on the extent, nature and duration of the works and to more clearly define this, a summary of impacts have been prepared in Table 2-1. This table contains both a permeability factor expressed as a percentage and quantifies the area of impact based on the five categories used to determine the likelihood of TTSTS. Each are explained in more detail below.

2.2 Determining Habitat Permeability

The Project study area is located within the industrial and residential urban landscape of Grafton which comprises both permeable (i.e. lawns, parks, gardens) and impermeable (i.e. bitumen roads, concrete footpaths, buildings) surfaces. As impermeable surfaces don't tend to represent habitat for the TTSTS they have been removed from any area calculations to derive the amount of habitat present, and similarly, the amount of habitat potentially being removed as a result of the action. GIS was used to calculate the extent of these unsuitable microhabitats in two ways, firstly, simply by adding up all of the impermeable surfaces within the construction works footprint and subtracting this from the total construction works area footprint. The resulting figure equating to the area or percentage of permeable habitat which has been calculated for each of the construction works precincts (Table 2-1).

In those areas adjacent to the construction works footprint, a permeability figure was required as a correction factor to determine on average how much of the residential urban landscape was permeable versus impermeable. This was achieved by dividing the urban area into 140 x 6.25 ha grids (250 x 250 m) and randomly selecting 14 (i.e. 10%) to derive a standard mean figure which could be used as the correction factor. Outliers including the Grafton CBD area and the racecourse were excluded from the assessment given they contain high percentages of one, but not the other, thus randomly selected grids within these two areas would skew the number used in the correction factor. The resulting approach identified 59% of Grafton's urban residential area contains permeable surfaces which could be inhabited by the TTSTS. Consequently, this was used as the correction factor over the mapped population extent of 425 ha to derive a figure of 251 ha of TTSTS habitat (*see* Section 3.0).

2.3 Qualification on TTSTS Likelihood

Impacts have only been considered where there is some likelihood of the TTSTS occurring and these areas have been assigned a likelihood rating of moderate, high or known. Consequently, the low and unlikely rating have been excluded from any calculations. Moreover, the likelihood rating themselves have been qualified following completion of the field surveys and are considered site or Grafton locality specific for this population. The definitions for each of the categories is outlined below.

Unlikely – Areas generally more than 100 m from drainage lines and water courses and/or hardstand surfaces such as roads, building, footpaths where no leaf litter build up occurs.

Low – Permeable lands which generally lacked important micro habitat features such as loose friable soil or a leaf litter/humus layer. In South Grafton, areas may have contained some of these features but were retained in this category given there were no historic records of TTSTS and this was confirmed with the recent field surveys (Bionet 2016; Lewis 2016).

Moderate – Permeable lands with friable alluvial soils and generally within 100 m of drainage line. In South Grafton, some areas were assigned to this category on the basis that the habitat was highly suitable yet there are no records to confirm their presence (Bionet 2016; Lewis 2016).

High – Site contains suitable habitat in form of alluvial soils, leaf litter/humus and within 100 m of drainage line and nearby records which confirm the existence of TTSTS in that area.

Known – TTSTS recorded nearby (<100 m) during the course of the field survey.

Table 2-1. TTSTS habitat identified for removal or disturbance based on RMS concept design.

Works Area	Impact Type	Permeability %	Area Extent According to Likelihood Rating For TTSTS (ha)					Total (Ha) Amount of Moderate, High Known Habitat in Each Work Zone
			Unlikely	Low	Moderate	High	Known	
Grafton Levee	Temporary	84	0	0	1.90	0.23	0.14	2.27
South Grafton Levee	Temporary	95	5.71	0.30	0.14	0	0	0.14
Bridge and Associated Roadworks – South	Intermediate + Permanent	98	9.29	0.32	0	0	0	0
Bridge and Associated Roadworks – North	Intermediate + Permanent	58	0.58	0	0.39	0.18	0.24	0.81
Totals			15.58	0.62	2.43	0.41	0.38	3.22

Notes on levee works; Rural – Allowance of a 20 m work zone and Urban – Allowance of a 10 m work zone

3.0 Qualification as an Important Population

The TTSTS is currently listed as a vulnerable species pursuant to both the *EPBC Act* (1999) and the *TSC Act* (1995). Consequently, significant impact criteria must be addressed where the vulnerable population qualifies as

an 'important population' which is necessary for a species' long-term survival and recovery (DoE 2013). This may include populations specifically identified in recovery plans or qualify as:

- key source populations either for breeding or dispersal;
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range (DoE 2013).

The Grafton TTSTS population that resides within and beyond parts of the Project study area may be an important population on the basis that it may be necessary for maintaining genetic diversity given this geographic locality occurs outside the core distribution of the Border Ranges north to the Brisbane Ranges and DoE survey guidelines encourage the collection of tissue samples (see DEWHA 2011; Figure 3-1). The mapped extent of the population, currently known and confined to Grafton is not at the limit of this species range as records confirm its existence around 200 km to the south at Hat Head and there are some other reported records around Glenreagh and Nana Glen approximately 50 km to the south (Figure 3-1; OEH 2016; R. Jago pers. comm 31st March 2016). The population has not been identified as a key source population for either breeding or dispersal in any recovery or action plans (Cogger *et al.* 2000).

As a significance assessment had been previously prepared as part of the EIS (see Biosis 2014) it has been subsequently updated to reflect the current findings and knowledge.

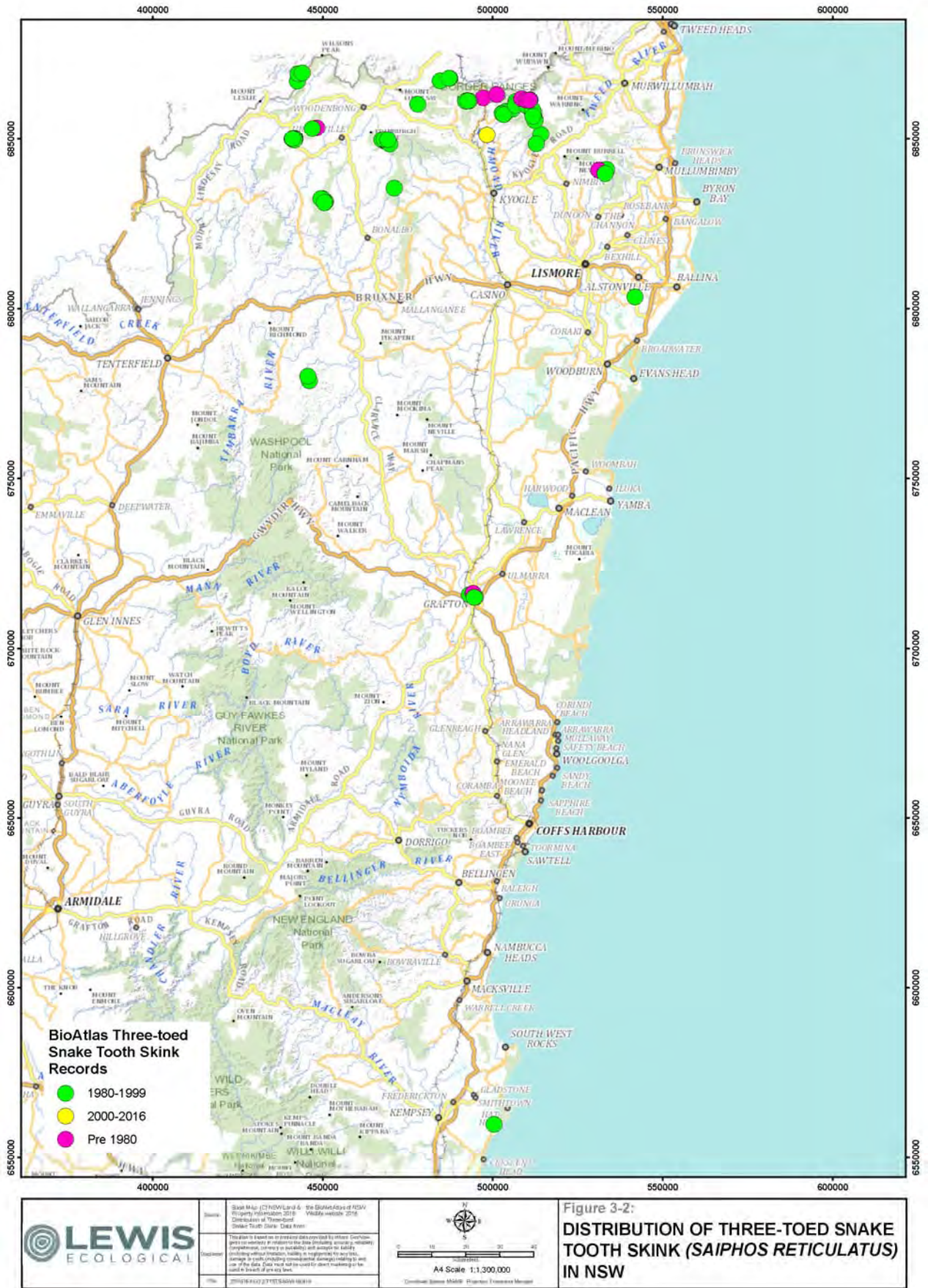


Figure 3-1. TTSTS distribution in NSW.

4.0 Status of Three-toed Snake-tooth Skink (*Saiphos reticulatus*) in Grafton

The following provides a brief summary on the local ecology of the TTSTS in Grafton and specifically:

- Survey methods and rationale;
- Distribution and Predicted Population Extent;
- Habitat Preferences and Associations; and
- Population Size.

Further information can be found within the TTSTS Management Plan prepared as part of the proposed action (Lewis 2016).

4.1 Survey Methods

Field surveys undertaken between February and April 2016 at all locations within the proposed construction works boundary. This included all of the treatment areas within the levee works construction footprint apart from a portion of land managed by the Australian Rail Track Corporation (ARTC) in the upstream or western end of the northern levee (Figure 4-1). These areas were subsequently assigned a moderate likelihood given TTSTS had been recorded in this general area and consequently treated as TTSTS habitat for the purposes of this significance assessment.

Field surveys were conducted at another 78 locations in the Grafton locality (Figure 4-1). Generally, surveys were only conducted outside or adjacent to the proposed construction works footprint if they had been recorded within or in close proximity to the proposed construction works footprint. Some additional outlining areas were also surveyed but are not shown on Figure 4-1. They include four satellite locations around 3 km to the north at Junction Hill and Alamy Creek Reserve.

4.2 Distribution and Predicted Population Extent

TTSTS were recorded at 17 locations with all of these restricted to the northern side of the Clarence River (Figure 4-2). This included the proposed construction footprint for the northern bridge abutment and there were sufficient numbers of records to suggest all of the North Grafton levee provides habitat, albeit in a disturbed state consistent with a residential urban landscape. No TTSTS were recorded on the southern side of the Clarence River, and only a few areas were deemed as being suitable or having a moderate likelihood of supporting TTSTS, namely some vegetated areas forming the riparian zone of Cowans Creek where minor levee treatments are planned (Figure 4-3). The remaining sites were assigned as having a low likelihood, and at distances much beyond 100 m from drainage lines they were assigned an unlikely likelihood of supporting TTSTS.

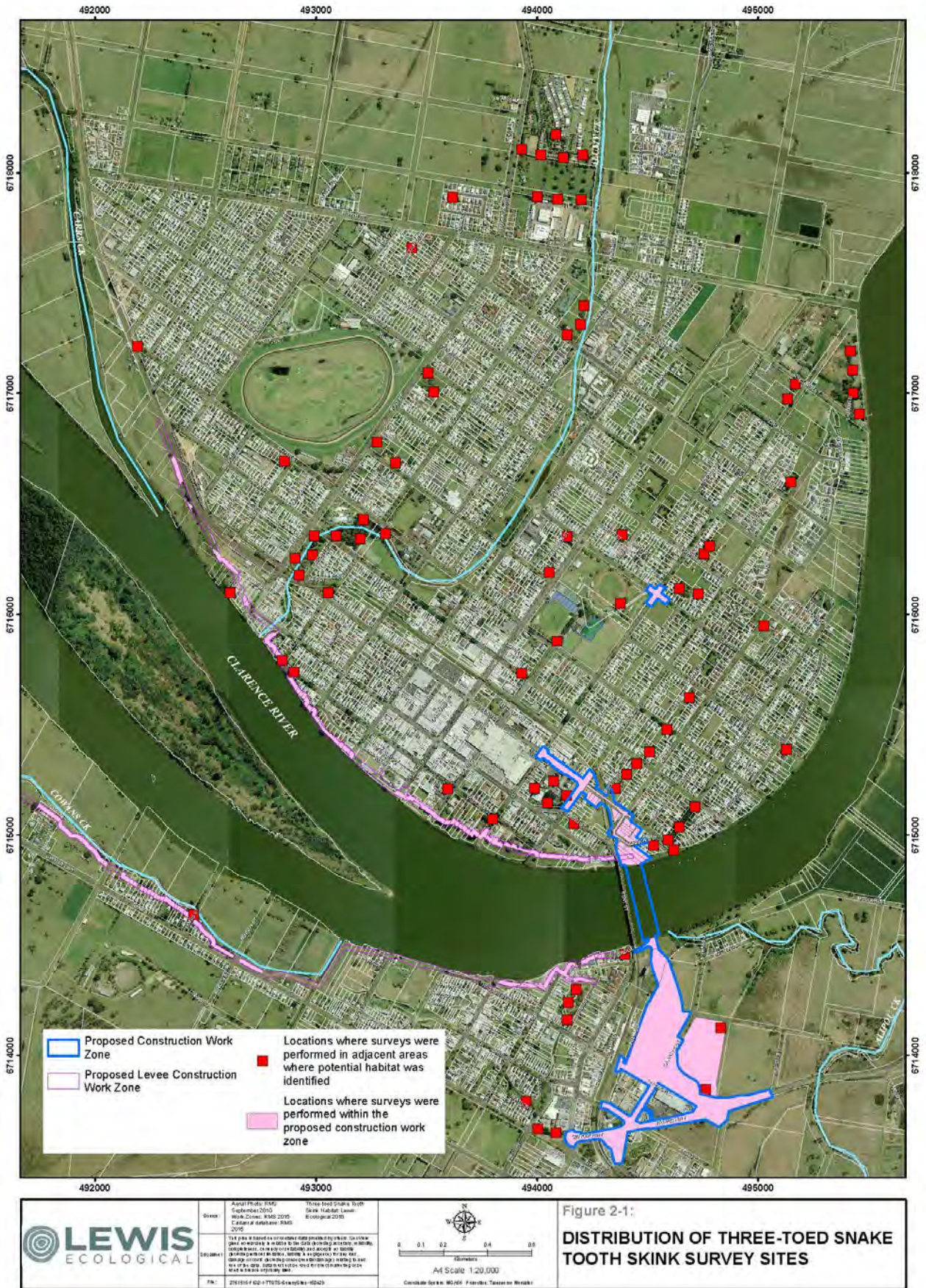


Figure 4-1. Distribution of survey sites for the TTSTS.

Following surveys throughout the proposed construction footprint and at another 82 locations scattered throughout Grafton, the 17 recorded locations were overlaid with the four historic records (Figure 4-2). One of the historic records (i.e. Prince St) presented as an outlier (see Figure 4-4) and upon review of this record, it was found to have a 10 km accuracy which meant that it could have originated anywhere from within 10 km of that location. Following surveys of this area and combined with the accuracy concerns it was removed from the dataset as a known or reliable location. After vetting the location data, a close association with drainage lines and flood channels of the Clarence River and Alamy Creek became evident and this enabled the population to be mapped with a high degree of confidence as skinks were rarely found at distances beyond 100 m from drainage lines. (Figure 4-4). This resulted in a mapped extent of 425 ha restricted to Grafton, however, not all of this could reasonably be considered suitable habitat as the residential urban landscape contains an array of impermeable surfaces including but not necessarily limited to dwellings, bitumen roads and footpaths. To adjust for this, the correction factor (see Sect. 2.2) of 0.59 resulted in an adjusted population size or area of habitat refined down to 251 ha which forms the basis for the impact assessment where quantities of habitat are concerned.

4.3 Habitat Preferences/Associations

TTSTS were recorded inhabiting non native ornamental gardens in residential areas and council parks, street tree plantings and on two occasions, residential yards that have undergone regeneration projects, one a sub tropical lowland rainforest, the other a composite representation or sub tropical coastal floodplain forest (Lewis 2016). Skinks were consistently recorded where leaf litter covered loose friable soil and were often encountered in association with earthworms and slaters which this species probably forages on. As this species burrows, it would be expected to utilise other areas where surveys were less effective such as gardens with dense ferns and other ground covers and lawn areas with thick thatch cover.

4.4 Population Size

The detection rates of TTSTS were highly variable throughout the survey with some sites requiring as few as 5 minutes or 5 m² of habitat searched to locate an individual, whilst at other locations more than 2000 m² of habitat required survey before an individual could be located. As the detection rate can be highly influenced by the micro habitat being surveyed, these two figures tend to represent the extremities with which TTSTS were recorded. A cursory estimate of one adult skink per 100 m² would be expected based on the field survey results.

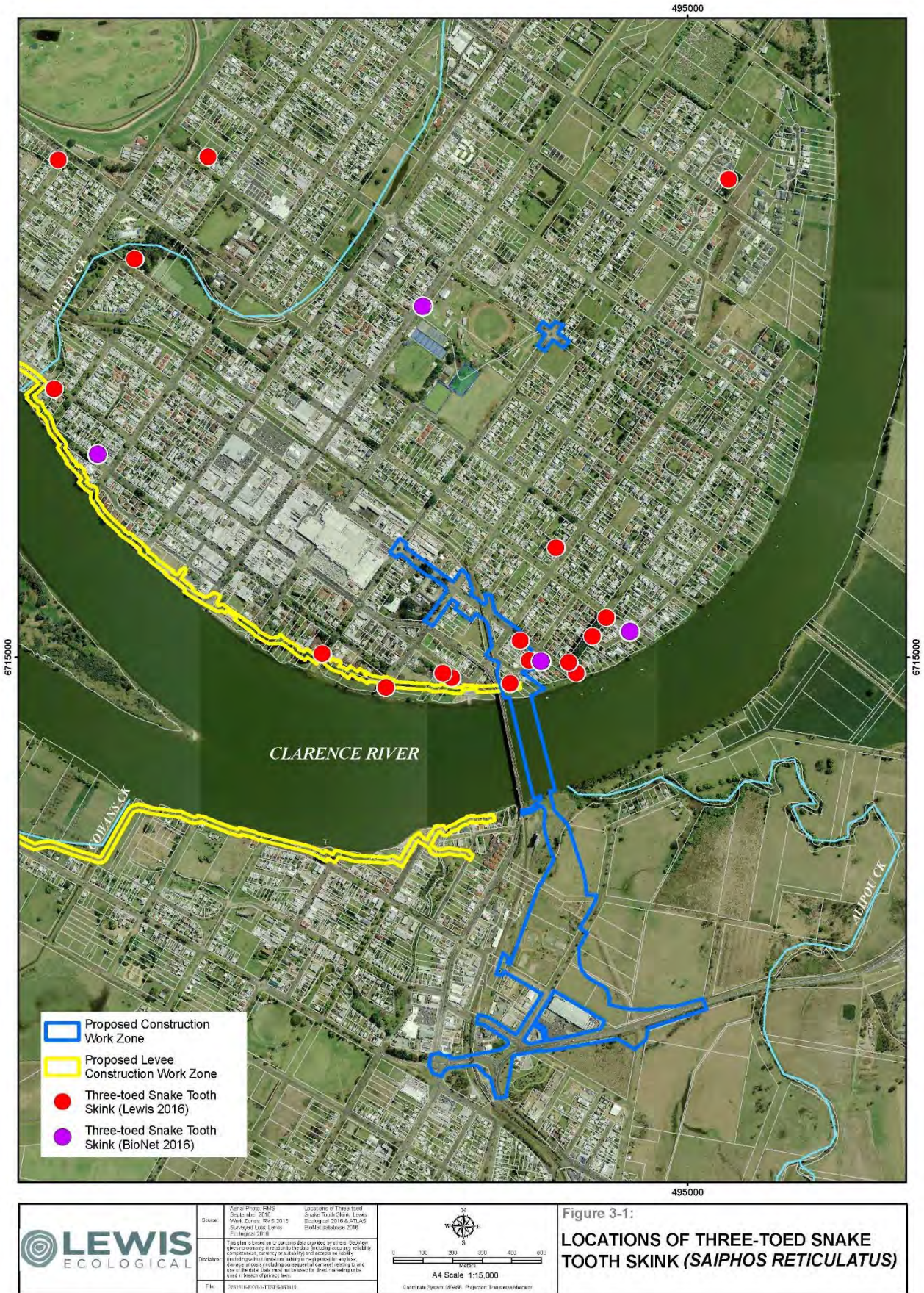


Figure 4-2. Distribution of TTSTS and proximity to Project.

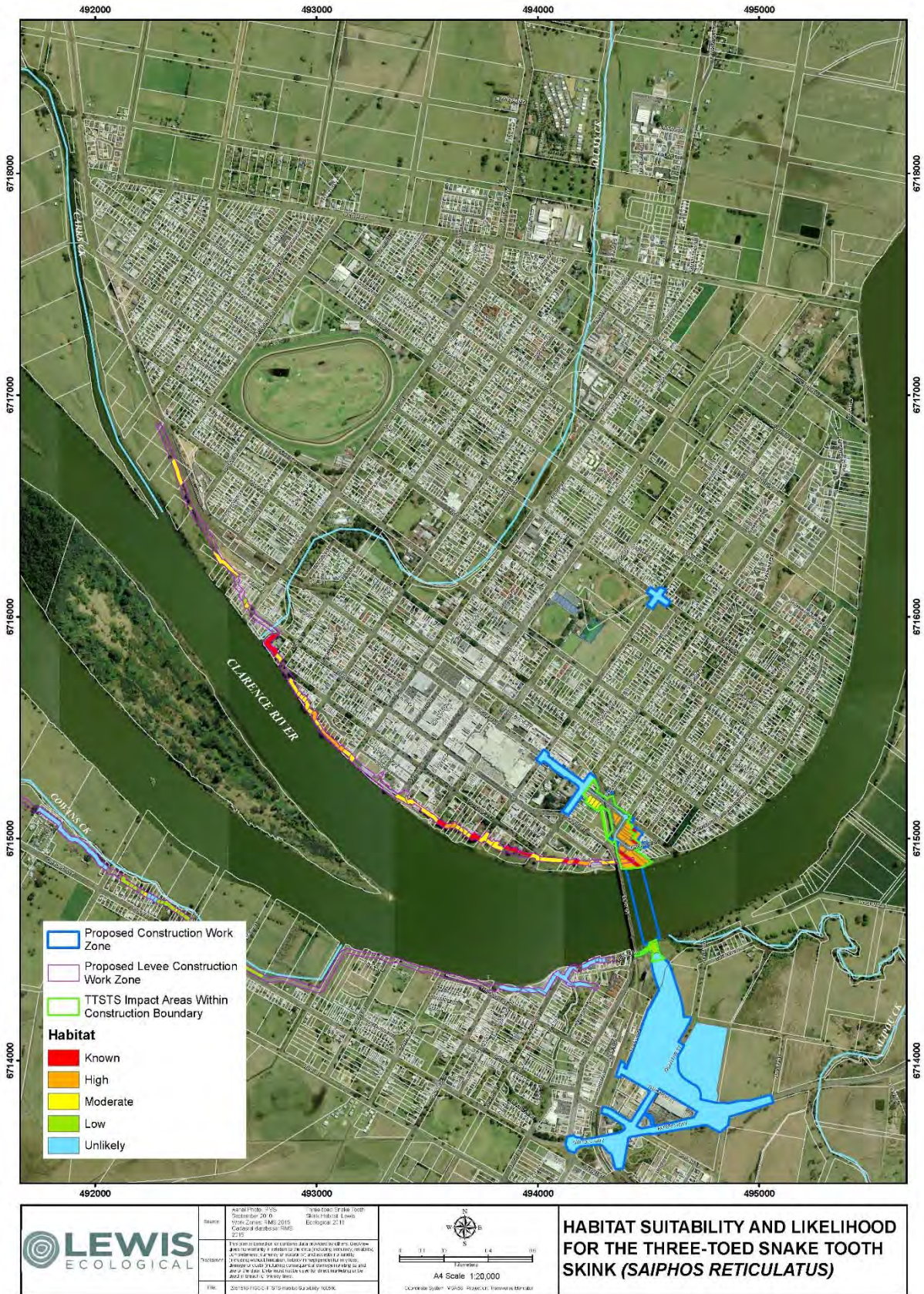


Figure 4-3. Suitability or habitat or the likelihood of TTSTS within the proposed construction works footprint.

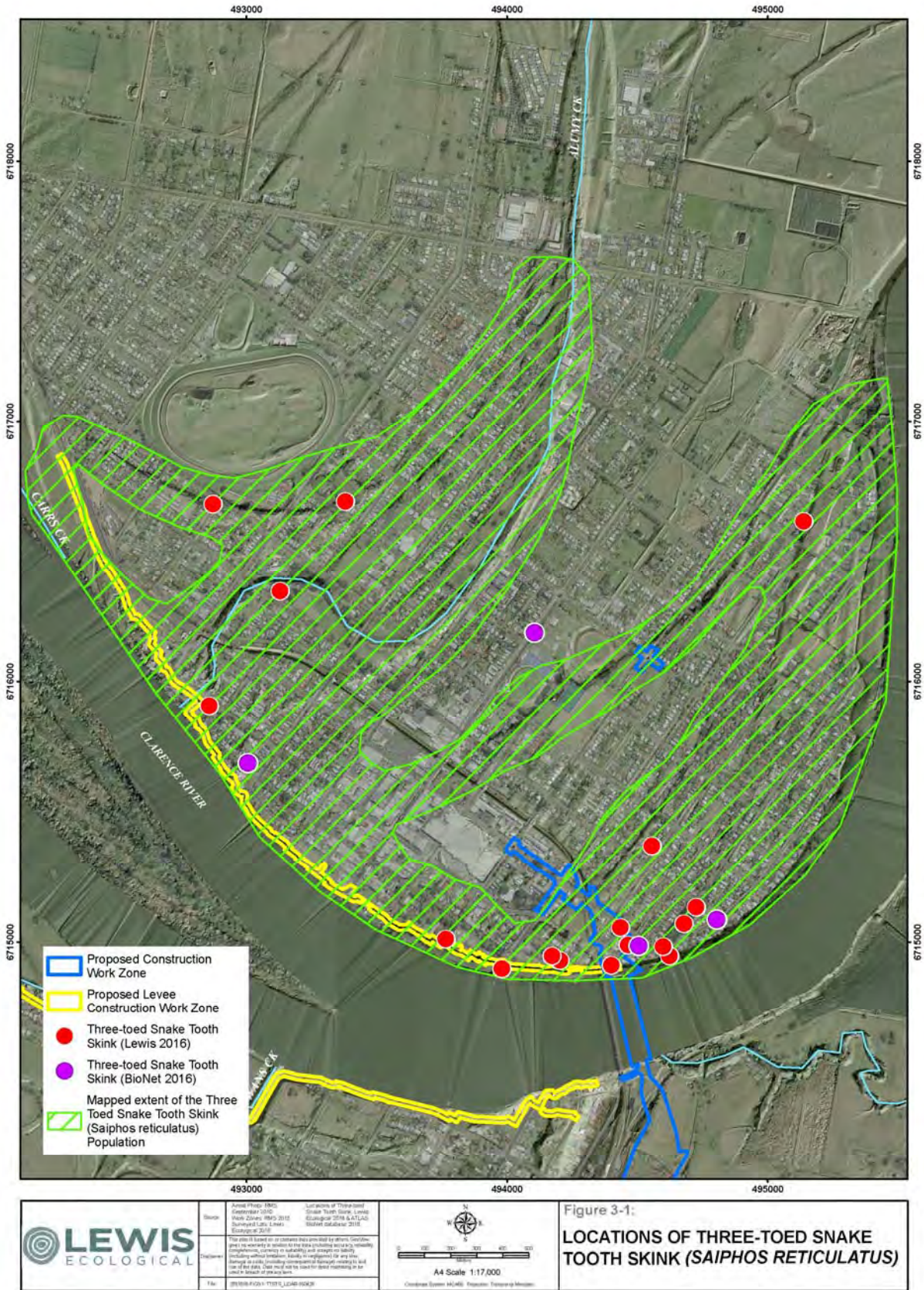


Figure 4-4. Mapped distribution of the TTSTS population in relation to the Project study area.

5.0 Significance Assessment for an Important Vulnerable Population

The following addresses the nine significant impact criteria for a vulnerable population pursuant to the *EPBC Act* (1999).

5.1 Is there a real chance or possibility that the action will lead to a long-term decrease in the size of an important population of a species

The action is unlikely to lead to a long term decrease in the size of the local TTSTS population. This is due to a number of factors including:

- Area of habitat to be permanently removed;
- Short duration of other areas being of habitat being removed;
- The existing site conditions which suggests the species is tolerant to disturbance; and
- The management actions outlined in the TTSTS MP.

Area of Habitat Removed

The TTSTS population is known from a relatively widespread area of Grafton (i.e. northern side of the Clarence River) with its distribution quantified at 425 ha (Figure 4-4). After applying the correction factor of 0.59 (see Sect 2.1), the area of suitable habitat within this broader was reduced to 251 ha.

The action proposed is one of essentially a linear nature with 3.22 ha identified for either disturbance or removal, and this equates to 1.28% of TTSTS habitat after taking into account all areas of habitat that qualify as having a moderate, high or known likelihood (Table 2-1). It is important to note that only an estimated 0.81 ha (0.40%) of suitable habitat would be impacted to accommodate the bridge and associated road works on the northern side whilst 2.27 ha (i.e. 0.90%) would be impacted by the levee works on the north Grafton side. Just 0.14 ha of 'moderate' likelihood habitat would be impacted by the works on the south Grafton levee. Consequently, 2.41 ha (0.75%) of the 3.22 ha would be impacted by temporary works of a short duration, lasting only a few weeks as treatment works are of a minor nature (e.g. raising an existing masonry block wall ~ 50 mm). Based on permanent and intermediate impacts, the areal extent of habitat loss at 0.81 ha equates to 0.32% of TTSTS habitat (Table 2-1).

Short Duration of Works

The action proposes to disturb 2.41 ha of TTSTS habitat as opposed to removing it. This is due to the works being of a temporary nature as the existing masonry block walls receives a minor increase in height of not more than 100 mm or unsuitable materials are striped from the earth levee mounds and their impermeable layer increased up to 50-250 mm. Works of this nature are expected to be completed within a 2 week period at any given site, after which the site will be rehabilitated to its pre-existing state. The time taken for this to be returned to suitable TTSTS habitat will be almost immediately as the impacts in these areas are more concerned with direct mortality whilst the works are being undertaken or movement opportunities are reduced as the humus layer and the soils A horizon is stripped and stock piled.

Species Tolerance to Habitat Disturbance

Surveys located TTSTS inhabiting leaf litter, building refuse and loose friable soils in ornamental gardens and council parks, street tree plantings in the residential urban landscape of Grafton (Lewis 2016). On two occasions, TTSTS were recorded in gardens rehabilitated as sub tropical lowland rainforest (263 Oliver St) and a composite form of sub tropical floodplain forest (80 Arthur St) established 30 years ago in what was formerly a cleared grazing paddock. On other occasions, TTSTS were found inhabiting leaf litter that had built up on concrete pathways and building foundations. Typically, skinks were found on the soils surface beneath leaf litter ranging in depth from 50-300 mm and the location data infers the species is capable of sustaining a viable population within the existing residential urban landscape (Lewis 2016). This is further supported by the fact that TTSTS could be located at all three historic sites which dates back into the 1980's and 1990's whilst the fourth record (i.e. Prince St) proved unreliable due to its 10 km accuracy.

Given the fact that TTSTS continue to inhabit the existing disturbed landscape, the rehabilitation times are expected to be almost immediately where works are of a temporary nature. In areas where works will be ongoing for longer periods (i.e. bridge), habitat will be progressively rehabilitated and once construction is completed the revegetated areas will be considered suitable habitat soon after a mulch cover has been established.

Management Actions Outlined in the TTSTS MP

A management plan has been prepared to manage impacts leading up to and during the construction of the action (Lewis 2016). This includes the use of pre clearing surveys to reduce any direct mortality during the removal and disturbance of habitat that has been given a moderate, high or known likelihood. Other measures include the identification of relocation sites that are within 100 m of the capture site, occur outside of the construction works footprint, contain suitable micro habitat consisting of loose friable soil with areas of litter, humus or dense vegetative groundcover that provide both cover and foraging resources, and stocking rate considerations with not more than 10 adults and 5 sub adults or hatchlings per 100 m² of suitable habitat. An effective TTSTS exclusion fence will be designed and installed to reduce the likelihood of skinks moving onto the construction site where works are of a longer duration. At sites where temporary works are planned, TTSTS would be retained and released after the works have been completed.

The management plan also allows for design refinement in the Urban Design and Landscape Plan. This includes a number of design principals that would restore and in some cases improve the overall habitat quality to what currently exists via the following:

- Install mulch beds around established isolated planted trees of at least 1 m radius;
- Mulch including tea tree mulch, bark chip or coarse woody vegetation processed using a grinder is not deemed suitable;
- Integrate planting beds with groundcover species listed in the planting schedule of the urban design and landscaping concept plan;
- Mulch beds at least 200 mm depth at their time of installation, and

- Refine existing plantings schedule to increase trees with dense canopy traits.

5.2 Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population?

The area of habitat inhabited by the TTSTS has been estimated at 20,000 km² (7000 km² in NSW and 13,000 km² in Queensland), although this estimate excludes outlying records and areas of disjuncture (DoE SPRAT 2013).

The Grafton TTSTS population is restricted to the northern side of the Clarence River where the population is distributed over an area of 425 ha with 251 ha considered suitable habitat, after accounting for impermeable (i.e. roads, buildings, concrete footpaths) versus permeable (lawns, gardens, street tree plantings) habitat (Lewis 2016).

The action will not reduce the area of occupancy as TTSTS will still remain over this extent shown presented in Figure 4-4. The loss of 0.81 ha of habitat within this extent will be offset via the Urban Design and Landscape Plan which seeks to adopt principals that will improve the suitability of plantings as TTSTS habitat. They include:

- Installation of mulch beds around established isolated planted trees of at least 1 m radius;
- Mulch including tea tree mulch, bark chip or coarse woody vegetation processed using a grinder is not deemed suitable;
- Integrate planting beds with groundcover species listed in the planting schedule of the urban design and landscaping concept plan;
- Mulch beds at least 200 mm depth at their time of installation, and
- Refine existing plantings schedule to increase trees with dense canopy traits.

This approach is supported by the locations where TTSTS have been recorded and consequently considered suitable habitat. For example, street tree plantings, ornamental gardens in private residences and council maintained parks and reserves within and close to drainage lines (see Lewis 2016)..

5.3 Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?

The action is unlikely to fragment the existing population into two or more populations. This is due to the fact the TTSTS population extends throughout the urban residential landscape of Grafton where there are a variety of impermeable surfaces and structures that would normally be perceived as a barrier to dispersal. The existing road network with its varying widths and configurations of one to four lanes, North Coast Railway, Grafton Central Business District and the existing Grafton Bridge are all obvious examples and occur within the mapped population extent which is supported by both historic (i.e. 1980's) and recent records (2016; see Figure 4-4). The fact that TTSTS could be found at or close to those locations where historic records date back to the 1980's indicates the population has been able to survive and function in a viable capacity.

The Urban Design and Landscape Plan will also provide opportunities to restore and improve habitat connectivity (Figure 5-1). Areas where impermeable surfaces such as roads and dwellings will be replaced with a bridge and vegetated using landscaping principals that align with suitable TTSTS habitat.

5.4 Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species?

The TTSTS population is known to inhabit ornamental gardens, street tree plantings and parks in Grafton's urban residential landscape (Lewis 2016). Terrain mapping revealed all of the records were in close proximity to drainage lines and associated riparian areas with alluvial soils (Figure 4-4). This habitat type, rather than vegetation community is thought to determine the presence of TTSTS and was the basis for mapping of the population extent at 425 ha before revising this down to 251 ha of permeable habitat. Consequently, it could be perceived that alluvial soils supporting some form of vegetative cover within 100 m of drainage lines is important habitat for maintaining the survival of TTSTS in Grafton.

The action will permanently remove 0.81 ha of habitat and temporarily disturb a further 2.41 ha of habitat. This loss equates to 0.32% of habitat and disturbance of a further 0.96% with none of these extents occurring in a naturally occurring native plant community type. Such a small incremental loss is not considered adverse in the current context as extensive areas of alluvial soils with some form of vegetative cover will remain and the Urban Design and Landscape Plan makes further contributions which seek to offset any permanent loss of TTSTS habitat using the aforementioned principals.

5.5 Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population?

The TTSTS population extends over an area covering 425 ha in the urban residential landscape of Grafton. Within this area, there are many existing activities which could disrupt the breeding cycle of this population, including but not limited to individuals being run over by vehicles, predation by cats, foxes, dogs and chooks, destroyed by residents or general public as they misidentify the animal as a snake, maintenance works of public gardens and street trees and event stochastic events such as flooding. The Project study area is not exempt from these activities and whilst the action will pose a risk of disrupting the breeding cycle, this will be limited to only a small number of individuals within a narrow and predominantly linear area. Such an impact is considered relatively benign, made more so by the management actions outlined in the TTSTS management plan which allow for pre clearing surveys to capture and relocate individuals, thereby reducing the risk of direct mortality and the Urban Design and Landscape Plan seeks to promote and improve the existing TTSTS habitat using the principals identified in the TTSTS Management Plan.

5.6 Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Most of the Project study area is covered by either urban residential areas with ornamental gardens, cleared mown areas associated with council reserves or grazed paddocks that contain little native vegetation. Consequently, the landscape is considered highly disturbed and degraded. The subterranean habitat consists predominantly of flood alluvium.

The action proposes to remove and disturb up to 3.22 ha which equates to 1.28% of suitable habitat after taking into account all areas of habitat that qualify as having a moderate, high or known likelihood (Table 2-1). Most of this can be categorised as a temporary disturbance as 2.41 ha (0.96%) will receive levee treatment works lasting only 2 weeks within any given area. This combined with management actions outlined in the TTSTS management plan including but not limited to pre clearing surveys and retention of individuals until the works are complete will ensure there is no real chance for the action to cause a decline in the population. Where the action proposes to remove 0.81 ha of habitat (0.32%) to accommodate the bridge and its abutments and associated road upgrades, there are a number of management actions that will similarly ensure the species does not decline. They include the use of pre-clearing surveys, a relocation strategy that releases captured TTSTS into nearby areas of known habitat and the use of an effective exclusion fence to reduce the likelihood of individuals moving back into the construction work zone. Moreover, the TTSTS management plan also allows for design refinement in the Urban Design and Landscape Plan for the Action. This includes a number of design principals that would restore and in some cases improve the overall habitat quality to what currently exists via the following:

- Install mulch beds around established isolated planted trees of at least 1 m radius;
- Mulch including tea tree mulch, bark chip or coarse woody vegetation processed using a grinder is not deemed suitable;

- Integrate planting beds with groundcover species listed in the planting schedule of the urban design and landscaping concept plan;
- Mulch beds at least 200 mm depth at their time of installation, and
- Refine existing plantings schedule to increase trees with dense canopy traits.

5.7 Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Invasive species including the Red Fox (*Vulpes vulpes*), domestic Dog (*Canis lupus familiaris*) and Cat (*Felis catus*) are already present in the Project study area. Domestic fowl also pose a threat to this species and they too are known from the Project study area. Consequently, the action is unlikely to facilitate the increase in either their extent or abundance nor introduce additional invasive species within the Project area that are harmful to the TTSTS.

5.8 Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

No known disease is known to affect the TTSTS, and therefore the project is considered highly unlikely to introduce a disease that may cause the species to decline.

5.9 Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?

An Approved Conservation Advice has been developed for TTSTS (TSSC 2008). The regional and local priority recovery and threat abatement actions identified include:

- Habitat Loss, Disturbance and Modification via:
 - Identifying sites of high conservation priority.
 - Manage threats to areas of vegetation that contain populations/occurrences of the Three- toed Snake-tooth Skink.
 - Ensure development activities in areas where the Three-toed Snake-tooth Skink occurs do not adversely affect known populations.
 - Prevent clearing of woodland and forest habitats where the species is known to occur.
 - Prevent the collection of dead fallen timber for firewood in areas where the species is known to occur.
 - Provide firewood in areas where recreational use overlaps with the species habitat to preserve large fallen logs, leaf litter and groundcover vegetation.
 - Do not stock-pile or burn logging waste in forest or woodland where the species occurs.
 - Monitor known populations to identify key threats.
 - Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

- Minimise adverse impacts from land use at known sites.
- Protect populations of the listed species through the development of conservation agreements and/or covenants.
- Trampling, Browsing or Grazing including:
 - Develop and implement a stock management plan to reduce grazing pressure in areas where the species is known to occur to prevent soil compaction and to maintain ground and litter cover.
 - Prevent or appropriately limit grazing pressure at known sites on leased crown land through exclusion fencing or other barriers.
- Fire including:
 - Develop and implement a suitable fire management strategy for the Three-toed Snake- tooth Skink.
 - Provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigative measures in bush fire risk management plans, risk register and/or operation maps.
- Conservation Information including:
 - Raise awareness of the Three-toed Snake-tooth Skink within the local community.
- Enable Recovery of Additional Sites and/or Populations via:
 - Investigate options for linking, enhancing or establishing additional populations.

The action conflicts with some of these, namely the removal of TTSTS habitat, however, it is unlikely to interfere substantially with the recovery of the species given only a small area of habitat will be removed (0.81 ha or 0.32%), a further 2.41 ha (0.96%) will receive some temporary disturbance. Moreover, a number of management actions identified in the TTSTS management plan will reduce impacts with regard to direct mortality via pre-clearing surveys, relocation procedures, use of exclusion fencing notwithstanding the use of landscaping that will take into account preferred micro habitat attributes for the TTSTS to further offset any habitat loss.

The action has brought about a number of positive initiatives consistent with the approved conservation advice. Among them, broader and more systematic surveys have been performed to identify the current status of the TTSTS population in and around Grafton which had not been recorded in almost 30 years, the population extent has been mapped and refined to understand its size and viability, fostered a greater awareness among the

community and local government authority where it is known to occur. Additionally, the action will not remove any native plant community types which support known TTSTS habitat.

5.10 Conclusion

Targeted surveys for the TTSTS have demonstrated that a population still exists in the urban residential landscape of Grafton. The distillation of records overlaid with terrain mapping and some cursory habitat assessments enabled the population to be mapped over an extent of 425 ha. After accounting for the array of impermeable surfaces deemed unsuitable as habitat for the TTSTS, a correction factor of 0.59 was applied to derive an area of habitat calculated at 251 ha. Field validation surveys at historic sites confirmed all of the historic known locations still supported skinks apart from an outlier location which was later found to be inaccurately plotted with a 10 km accuracy or error margin.

Within the mapped extent, TTSTS were recorded from a range of non-native ornamental gardens, council maintained parks and street tree plantings, but all shared a common association being within 100 m of drainage lines on alluvial soils. This at least forms the basis of what could be interpreted as important habitat required to maintain a viable population of TTSTS in the Grafton locality.

The Project will permanently remove 0.81 ha of this land (0.32%) and further disturb an area of 2.41 ha (0.96%) but this is unlikely to impact on the stability of the population to an extent that could lead to a localised decline in the population. Moreover, a number of safeguards have been proposed in the TTSTS Management Plan to alleviate any potential impacts including but not limited to the use of pre-clearing surveys by an experienced ecologist, the construction of an effective TTSTS exclusion fence and the refinement of the Urban Design and Landscape Plan to provide plantings more commensurate to the existing habitat values of the TTSTS will ensure little to no net loss of habitat.

Given the action is located in an area best described as a disturbed urban residential landscape and will remove less than 1 % of TTSTS habitat that will be managed via the safeguards outlined in the TTSTS Management Plan, it is considered of insufficient magnitude and therefore unlikely to have a significant impact .

Table 5-1. Summary of the significant impact criteria and key comments

Assessment Criteria	Impact of the Action	Key Comments
<i>Is there a real chance or possibility that the action will lead to a long-term decrease in the size of an important population of a species</i>	No	<ul style="list-style-type: none"> • Population occurs over 425 ha with 251 ha considered habitat. • 0.96% of habitat will be impacted by works of a temporary nature. • 0.32% of population will be impacted by permanent works. • TTSTS Management plan with safeguards to reduce direct impacts, improve habitat quality.
<i>Is there a real chance or a possibility that the action will reduce the area of occupancy of an important population?</i>	No	<ul style="list-style-type: none"> • Population will still occur over 425 ha • 0.81 ha removed to accommodate the works and this will be replaced with landscape plantings suitable for TTSTS
<i>Is there a real chance or a possibility that the action will fragment an existing important population into two or more populations?</i>	No	<ul style="list-style-type: none"> • Levee works focus on existing treatment type of block wall or earth mound • Riparian area of Clarence River will be bridged • Riparian area will feature landscape plantings guided by principals to promote their suitability as TTSTS habitat
<i>Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species?</i>	No	<ul style="list-style-type: none"> • 0.96% of habitat will be impacted by works of a temporary nature. • 0.32% of population will be impacted by permanent works. • TTSTS Management plan with safeguards to reduce direct impacts, improve habitat quality.
<i>Is there a real chance or a possibility that the action will disrupt the breeding cycle of an important population?</i>	No	<ul style="list-style-type: none"> • Disturbances including roads, exotic predators, developments, maintenance activities exist throughout the entire population extent including the Project study area. • Potential for the action to have only minor disturbance as individuals will be captured and relocated short distance or retained over a small period until the works are completed.
<i>Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?</i>	No	<ul style="list-style-type: none"> • Population occurs over 425 ha with 251 ha considered habitat. • 0.96% of habitat will be impacted by works of a temporary nature. • 0.32% of population will be impacted by permanent works.

Assessment Criteria	Impact of the Action	Key Comments
		<ul style="list-style-type: none"> • TTSTS Management plan with safeguards to reduce direct impacts, improve habitat quality.
<p><i>Is there a real chance or a possibility that the action will result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?</i></p>	<p>No</p>	<ul style="list-style-type: none"> • Invasive species including dogs, foxes, cats and fowl already exist in the Project study area.
<p><i>Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?</i></p>	<p>No</p>	<ul style="list-style-type: none"> • No disease is known to impact on TTSTS.
<p><i>Is there a real chance or a possibility that the action will interfere substantially with the recovery of the species?</i></p>	<p>No</p>	<ul style="list-style-type: none"> • Proposed construction work zone occupies only a very small percentage of the entire population extent (1.28%). Most (0.96%) will only be impacted by temporary works. • Action has assisted in the recovery via performing broader surveys, collecting genetic samples, critiquing habitat attributes and ultimately mapping a population with a disturbed residential urban landscape.

6.0 References

BioNet (2016) Atlas of NSW Wildlife. NSW Office of Environment and Heritage. Accessed online 30/9/2013 - <http://www.BioNet.nsw.gov.au/>

Biosis (2011) Main Road 83 Summerland Way- Additional Crossing of the Clarence River at Grafton: Preliminary Route Options Report. Technical Paper: Ecology. Report to Arup on behalf of the Roads and Maritime Services – Northern Regional Office

Biosis (2013) Field surveys conducted as part of the Grafton Highway Upgrade Flora and Fauna Assessment. October, 2013. Biosis Pty Ltd

Cogger, H.G., Cameron, E.E., Sadler, R.A and Egger, P. 1993, *The Action Plan for Australian Reptiles*, Australian Nature Conservation Agency, ANCA, Canberra, viewed 7 March 2008,

<<http://www.environment.gov.au/biodiversity/threatened/publications/action/reptiles/8.html>>.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011m). *Survey guidelines for Australia's threatened reptiles. EPBC Act survey guidelines 6.6* . [Online]. Canberra, ACT: DSEWPaC. Available from: <http://www.environment.gov.au/epbc/publications/threatened-reptiles.html>.

Department of Environment (DoE) 2016. Three-toed Snake Tooth Skink Species Profile: [Online]. Canberra, ACT: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=88328

Lewis, B.D (2016). Additional crossing of the Clarence River at Grafton: Three-toed Snake-tooth Skink Construction Management Plan. Report prepared for the Roads and Maritime Services by Lewis Ecological Surveys. ©

TSSC (2008) Approved Conservation Advice for *Coeranoscincus reticulatus* (Three-toed snake-tooth skink). Threatened Species Scientific Committee. Accessed online 21/11/2013 - <http://www.environment.gov.au/biodiversity/threatened/species/pubs/59628-conservation-advice.pdf>