



Koala regulations spatial analysis

Report for Post-implementation Review

Department of Environment and Science

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Executive summary – User Guide

BACKGROUND CONTEXT

The 2020 'koala regulations' under the *Planning Regulation 2017* seek to regulate development within South East Queensland (SEQ) koala (*Phascolarctos cinereus*) habitat areas to provide increased protection for koala habitat in SEQ. The framework does not regulate matters that are triggered and assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

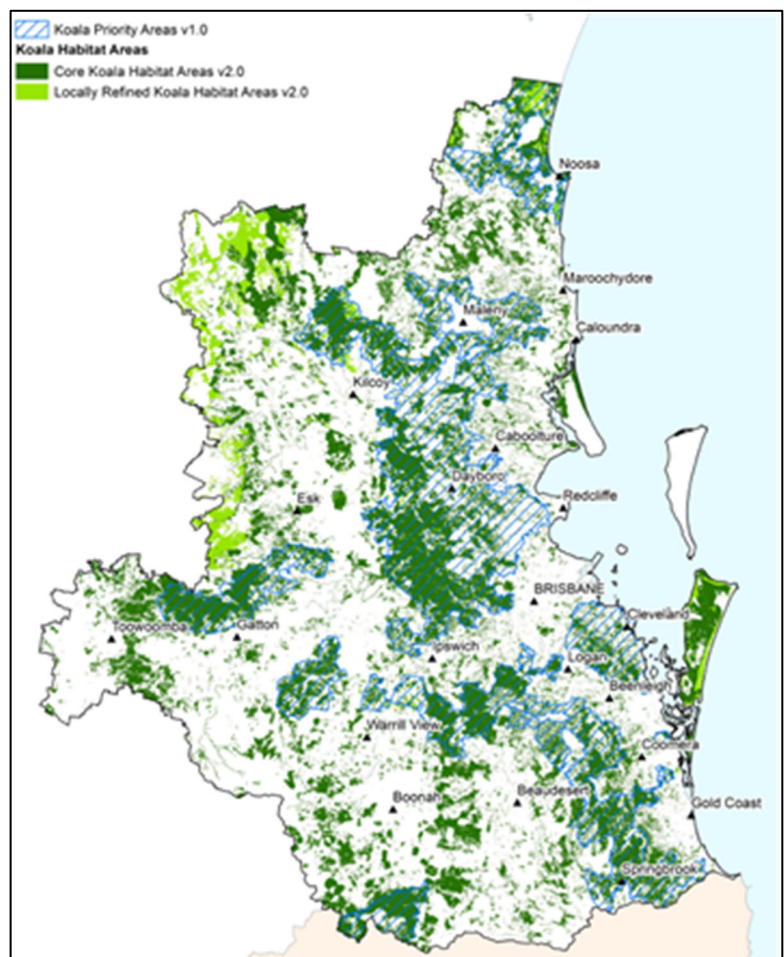
To support these regulations, new koala habitat area maps for the SEQ region were developed. These have increased the extent of regulated area compared with the State's previous regulatory framework overall.

New mapping was based on internationally recognised habitat suitability modelling techniques and was gazetted through the *Nature Conservation (Koala) Conservation Plan 2017*. The new maps represent the highest quality habitat for koala populations in SEQ, based on biophysical measures such as altitude and climate, suitable koala vegetation and two decades of koala records.

Maps are updated annually to continue to accurately identify and protect the best quality habitat in the long term and track changes over time.

The SEQ koala plan map (see figure at right) establishes three classes of koala habitat:

- **Koala Priority Areas or KPAs** are hundreds to thousands of hectares in extent, and strategically focus protections on large, connected areas of koala habitat with the greatest likelihood of sustaining koala populations in the long term. Within KPAs, development applications proposing to interfere with koala habitat are prohibited.
- **Core koala habitat areas or KHA** represent the best quality koala habitat areas, based on modelling of biophysical measures (such as climate), suitable vegetation (for food and shelter) and koala sighting records.
- **Locally refined koala habitat areas (LRKHA)** are areas of mature vegetation that may contain locally important vegetation for koalas, including some areas previously protected under local government planning schemes. The department has been working closely with SEQ local governments to validate and transition LRKHA that meets the State's mapping methodology into core koala habitat within two years of the map's release.



CHALLENGE

New protections for koala habitat in SEQ came into force in February 2020. These reforms were effected through the *Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation 2020* and the *Planning Regulation 2017* (hereafter, the 'new regulations'). The Queensland Department of Environment and Science (DES) engaged GHD Pty Ltd (GHD) to examine the effectiveness of the new regulations, to inform a requisite 'Post-implementation Review' of the policy change.

METHODS

Data on observed or proposed vegetation clearing, conditions placed on approved developments, exempt clearing activities, and offset requirements, at sites across SEQ, were provided to GHD by Local Governments and DES. These data were not a complete representation of clearing that interferes with (or potentially interferes with) koala habitat – rather, they were a snapshot of observed or proposed events across a subset of sites from SEQ. Summary analyses, and examination of spatial patterns of clearing, were conducted on these datasets.

OUTCOMES

Based on data considered in this analysis:

- A relatively small extent of KHA (<72 ha) has been approved for removal since February 2020. Of this, approximately 56 ha was reported by Local Governments from case study sites (although this is an overestimate as not all of this clearing was necessarily approved), while approximately 15 ha was approved development triggering an offset requirement as catalogued by the Queensland Government. This value (72 ha) pertains only to a subset of observed/proposed clearing, and is based upon information from Local Government case studies and data catalogued in the DES' koala offsets database. It is not necessarily representative of all approved (or otherwise) clearing of koala habitat since February 2020.
- Exempted clearing was noted from a number of properties from Local Government case study sites, including several instances of multiple exemptions being invoked on a single property. Accepted development under vegetation clearing codes was notified across a large aggregate area across the region since February 2020.
- Clear spatial patterns in approved/exempted/accepted development were not apparent (which is, in part, a reflection of the input data).
- Under the new regulations (post-February 2020), the average cost of offsetting per authority is estimated as 24% higher than under the former policy. However, the average cost of offsetting per hectare impacted is estimated as 15% lower. These values pertain to a small number of sites for which offset costs have been catalogued by DES.

LIMITATIONS

Two overarching limitations must be considered when interpreting and using these results:

- First, the datasets were incomplete, and provide only a snapshot of the possible clearing within KHA and associated drivers of this clearing.
- Second, to determine the *impact* of the new regulations – that is, the difference their enactment has made to changes in koala habitat area – a detailed analysis utilising long-term data on vegetation extent and scenarios of changes would be required.

FUTURE RECOMMENDATIONS

The overarching success measure of the effectiveness of the new regulations would be the determination of a reduction in vegetation clearing, and ultimately, an aspirational no net loss or even net gain in koala habitat *in areas over which the regulations have remit*. To achieve this, the following may be considered:

- Monitor and account for patterns of *losses* (from development, exempt clearing) and *gains* (from offsets).
 - Consider approaches to limit 'uncompensated' losses arising from compliant (i.e. exempted development; accepted development) and non-compliant interference with koala habitat.
 - Consider how offsets are delivered (for what losses, where sited, when delivered and how) to maximise potential for actual on-ground gains in koala habitat that counterbalance all losses within the remit of the new regulations.

- Monitor and analyse the application and outcomes of conditions placed on approved development.
- Undertake a statistical matching analysis to determine the impact and outcome of the new regulations, when time-series vegetation extent data is available corresponding with the regulations' enactment.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3.1 and Section 2.6 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Overview of project

GHD Pty Ltd (GHD) was engaged by the Queensland Department of Environment and Science (DES) to analyse government-provided information and spatial datasets on the clearing of koala habitat. This analysis was undertaken to assist in evaluating the effectiveness of new koala planning regulations at providing strong protection for koala habitat across the South East Queensland (SEQ) region.

1.2 Project background

A key action of the 'South East Queensland Koala Conservation Strategy 2020 – 2025' (DES 2020) was the introduction of reforms to the State's planning framework. The *Nature Conservation and Other Legislation (Koala Protection) Amendment Regulation 2020* effected reforms to four pieces of subordinate legislation include major amendments to the *Planning Regulations 2017*, *Nature Conservation (Koala) Conservation Plan 2017* and minor amendments to the *Environmental Offsets Regulation 2014* and vegetation clearing codes under the *Vegetation Management Act 1999* to establish the new koala regulations. These reforms – hereafter, the 'new regulations' – were introduced on 7 February 2020 to broaden and strengthen the level of protection for koala habitat within SEQ.

To evaluate the impacts, effectiveness, efficiency and continued relevance of the new regulations, DES is required to undertake a Post-implementation Review (PIR) within two years of policy commencement. Key to the PIR is analysis and interpretation of trends in vegetation clearing (and biodiversity offsetting requirements) within and outside of **Koala Habitat Areas** (KHAs) and **Koala Priority Areas** (KPAs), as mapped under the new regulations. Fundamentally, such an analysis is focussed on losses and gains of koala habitat in the region – namely, how much koala habitat is being approved for removal, how much compensation (offset) is being provided for this loss (and how this translates to actual gains in koala habitat), and how much koala habitat loss is going uncompensated (because it is exempted or accepted development; because it is non-compliant).

To contribute to the PIR requirements, GHD was engaged to:

Analyse spatial and temporal datasets to determine whether the new regulations have indeed delivered improved koala conservation outcomes, such as would be indicated by a reduction in vegetation clearing rates and increased offset delivery within areas that the new regulation applies.

The scope of works comprised two components:

- Activity 1: Analysis of the extent and type of observed or proposed vegetation clearing activities at a selection of sites across SEQ, since February 2020
- Activity 2: Identification of the cost implications of offsets since the new regulations came into force.

The analysis required the identification and assessment of cleared, or proposed to be cleared, sites within and outside mapped KHAs and KPAs across 12 SEQ Local Governments, using data inputs from Local and State Government agencies. Data were collated with the aim of providing insight into (1) the relative amount and spatial distribution of vegetation clearing, and (2) the regulatory context of this clearing (e.g. development approved clearing, clearing for accepted or exempted development, and unexplained clearing).

The 12 Local Governments to which the new regulations apply are:

- Brisbane City
- City of Gold Coast
- Ipswich City
- Lockyer Valley Regional
- Logan City
- Moreton Bay
- Noosa Shire

- Redland City
- Scenic Rim Regional
- Somerset Regional
- Sunshine Coast Regional
- Toowoomba Regional

It is important to note that the new regulations are but one of several 'layers' of protection on koala habitat in SEQ. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires proponents of actions that may have a 'significant impact' on koala habitat to 'refer' their action for Commonwealth assessment. Where an action is deemed likely to have a significant residual impact, this may be deemed unacceptable by the Commonwealth Environment Minister, or it may be approved with conditions. Often, the provision of offsets for significant residual impacts are attached to such approvals. Many activities – especially those with 'large' development footprints (a relative term, although the (now redundant) Commonwealth 'Referral Guidelines for the Vulnerable Koala' do outline area-based thresholds as to what constitutes a significant impact) in SEQ will trigger Commonwealth oversight and a requirement to comply with the EPBC Act. As such, koala conservation outcomes linked to losses and gains from development will often be delivered under the EPBC Act in SEQ. Nonetheless, the new regulations play a crucial role in framing losses and gains where the EPBC Act may not be triggered. Linked to this, the new regulations have dispensed with the previous exemption for clearing for urban purposes in an urban area, and thus, there has been an increase in the number of koala offsets in urban areas.

1.3 Purpose of this report

The aim of this report is to present the methods and results of the analysis of data undertaken as part of the PIR process for DES.

1.3.1 Assumptions and Limitations

This report: has been prepared by GHD for Department of Environment and Science and may only be used and relied on by Department of Environment and Science for the purpose agreed between GHD and Department of Environment and Science as set out in Section 1.3 of this report.

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The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section(s) 2.6 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

2. Method

2.1 Overview

This study comprised the following steps:

- A workshop was held with Local and State Government stakeholders to identify (1) PIR objectives for the spatial analysis, and (2) potential sources of data and information, noting that SEQ Local Governments were specifically tasked with providing data on clearing that interfered with KHA (within and outside of the KPA)
- Data were collated from SEQ Local Government stakeholders as case studies of vegetation clearing since February 2020. Several State Government datasets that were considered appropriate for the various analyses detailed below were also obtained
- A GIS analysis was undertaken to intersect the SEQ Local Government case study and other (DES-provided) data with a selection of mapping layers to identify the spatial attributes of sites in these respective datasets
- Analysis of the results of the spatial intersections was carried out to identify spatial or other trends in vegetation clearing and offsets. Summary statistics and graphs were produced to guide inference about the impacts of the new regulations.

2.2 Stakeholder workshop

A stakeholder workshop was held on 14 December 2021, run by DES and GHD, with relevant representatives invited from each Local Government within SEQ. Representatives from the following Local Governments were in attendance:

- Brisbane City Council
- City of Gold Coast
- Ipswich City Council
- Lockyer Valley Regional Council
- Logan City Council
- Moreton Bay Regional Council
- Noosa Shire Council
- Redland City Council

The objective of this workshop was to (1) describe the process of gathering case study data from the SEQ Local Government stakeholders; (2) determine what data held by these respective SEQ Local Governments could inform the spatial analysis of the effectiveness, efficiency and continued relevance of the new koala regulatory framework; and (3) discuss potential limitations and examine approaches to spatial analysis of the data provided.

2.3 Data collation

The following data were collated from Local and State Government sources:

- **Case study sites** – sites where clearing of native vegetation has occurred/is proposed at properties containing mapped KHA that are both within and outside of the KPA since February 2020
- **Comparison sites** – sites (i.e. properties where clearing of native vegetation has occurred) that are *outside* mapped KHAs or KPAs. These sites were identified to provide a comparator against which the effectiveness of the regulations could be assessed.

Data on clearing of native vegetation (and the regulatory context of this observed/proposed loss) at these two categories of site were obtained from the following sources:

- Case study sites:
 - Participating SEQ Local Governments, who attended an online workshop on 14 December 2021, provided details on a selection of observed or proposed clearing events within their respective

jurisdictions. These data are representative of a subset of approved/observed clearing events potentially interfering with koala habitat across a subset of SEQ Local Governments

- A register of 'accepted development' under the Accepted Development Vegetation Clearing Codes (ADVCC), which is regulated under the *Vegetation Management Act 1999* and *Planning Act 2016* (a complete set of all notified ADVCC clearings since February 2020, curated and provided by DES on 8 February 2022). ADVCCs are a notification register of a stakeholder's intention to clear under an exempted development purpose.
- Comparison sites: The Queensland Government 'Environmental Offsets Public Register' (DES 2022) is a database of offsets (legally required; delivered) under the Queensland *Environmental Offsets Act 2014*. GHD downloaded this database on 9 January 2022, for the purposes of identifying sites at which an offset was required under the Queensland planning framework, where the significant residual impact triggering the offset *did not* relate to koala habitat. Such sites were representative of 'comparison sites', being locations outside of mapped KHA in which development has been assessed and approved. Identification of these sites allowed for an interpretation of how much assessed and approved clearing with residual impacts on 'non-koala' matters of state environmental significance had occurred since February 2020. In order to identify such sites, the following 'filters' were applied to the Environmental Offsets Public Register:
 - 'Type' of action = Impact
 - 'Bioregion' = South East Queensland
 - 'LGA' = City of Gold Coast; Ipswich City; Lockyer Valley Regional; Logan City; Redland City (i.e. the five Local Governments that provided case study data)
 - 'Date conditioned' = after 1/02/2020
 - 'Matter group' = Animals – protected wildlife habitat; Connectivity; Plants – protected wildlife habitat; Regulated vegetation; VMA Essential Habitat

A de-identified internal government database ('Koala Assessment Tracker') providing information on a subset of referred or proposed development in SEQ KHAs, which has been assessed to some extent by the DES Koala Assessment and Compliance Team, was provided by DES on 25 January 2022. This dataset, which tabulated a list of Department of State Development, Infrastructure, Local Government and Planning's State Assessment and Referral Agency (hereafter, 'SARA') approved developments since February 2020, provided details on 'koala-specific' conditions attached to approvals. This information allowed for an exploration of the type, frequency and spatial distribution of conditions being invoked for approved development across the region. The specifics of the developments (type of development, footprint area, amount of clearing) captured in this dataset were not considered in this analysis; rather, a summary of the types of conditions being attached to approvals was collated. Exploration of trends in condition requirements – for example, with respect to spatial parameters – is beyond the scope of this study. Such an analysis, however, would allow for examination of whether conditions are being applied consistently given particular local and landscape contextual features (e.g. amount and pattern of koala habitat; exposure to threats; connectivity, etc.).

Analyses of the extent to which offsets have been triggered under Queensland's *Environmental Offsets Act 2014* were undertaken as part of 'Activity 2' of this project (described in more detail in Section 2.5.2, below). Data on catalogued offsets for significant residual impacts to mapped koala habitat (spanning 2011-2022) were provided to GHD by DES. This dataset allowed for approximations of the amount, cost, and spatial distribution of offsets for koala habitat pre- and post-enactment of the new regulations. Specifically, DES provided a dataset of registered koala offset requirements to GHD on 20 January 2022. This dataset summarised offset obligations on approved development, and included information on the area of residual loss, the area of offset, and the proportional losses of koala habitat relative to the amount of (mapped) koala habitat remaining.

More details about these various datasets, including how they were considered in this study, are summarised in Table 1.

Table 1 Summary of datasets obtained for analysis

Data source	Dataset reference name	Category of site	Number of sites	Description	Utility in analysis
SEQ Local Governments* City of Gold Coast Ipswich City Lockyer Valley Logan City Redland City	SEQ Local Government case studies	Case study	50 (total) 4 16 23 4 3	Spatially-explicit sites at which vegetation clearing proposed/undertaken since February 2020, where details on planning context of clearing (approved, exempted development etc.) available	Data on amount and type of clearing inside KHA/KPA since February 2020 – for analysis against amount/type of clearing at comparison sites (from Environmental Offsets Public Register – see row below)
Department of Environment and Science	Environmental Offsets Public Register	Comparison	2	Spatially-explicit sites at which approved vegetation clearing# (post-February 2020) outside of KPA/KHA triggered an offset requirement	Data on amount and type of clearing outside KHA/KPA since February 2020 – for analysis against amount/type of clearing at case study sites (provided by SEQ Local Governments – see row above)
Department of Environment and Science (curated data from the online notification register post July 2016)	ADVCC	Case study – accepted development	462 (with clearing data) 337 (spatially referenced)	Accepted development including within KHA/KPA, notified since 7 February 2020 within SEQ only	Supplementary information to SEQ Local Government case studies on the use of the ADVCC
Department of Environment and Science (curated data from the Koala Assessment and Compliance Team)	Koala Assessment Tracker	Case study – conditions on approved development	48	Referred or assessed developments with proposed clearing within KHA/KPA since February 2020	Information about the type of koala-related conditions (management requirements, offsets etc.) for assessed and approved developments
Department of Environment and Science	Koala offsets	Activity 2 – koala offsets analysis	Spatially referenced impact sites with an offset condition: 11 (2018-19) 31 (2020-21)	A database of approved developments for which koala offset requirements triggered under the <i>Environmental Offsets Act 2014</i>	Used to draw inference about the extent and cost of offsetting koala habitat loss, including any temporal trends (e.g. pre- and post-new regulation coming into force)

* It is noted that Moreton Bay Regional Council provided case study data, however this dataset did not have location information, so it has not been included in the analysis. Furthermore, some of the data provided by the other five SEQ Local Governments could not be located in GIS (due to suspected errors in lot on plan references) – this meant that a small number of sites were excluded from the analysis, with a final dataset of n=50 clearing events.

Where (1) clearing involves loss of terrestrial woodland/forest vegetation (i.e. not mangroves, seagrass, saltmarsh, grassland or impact to fish passage or other aquatic or marine matters) AND (2) occurred within one of the five SEQ Local Government Areas from which Local Government-provided case study data available

2.4 Spatial analysis

Local Government case study data were modified to be readily transferrable to a GIS shapefile to allow for spatial intersection with cadastral lots and other layers so that sites could be classified by various spatial parameters (e.g.

inside/outside the Urban Footprint, coastal/inland regions). The SEQ Local Government areas that provided data for this analysis were:

- City of Gold Coast
- Ipswich City Council
- Lockyer Valley Regional Council
- Logan City Council
- Redland City Council

For the remaining datasets, being the Environmental Offsets Public Register database, the ADVCC data, Koala Assessment and Compliance Unit ('Koala Assessment Tracker') data, and the Koala offsets data (the latter three provided by DES), sites were filtered within spreadsheets to select only those sites that met particular criteria to suit the respective analyses. Where it was evident upon filtering and viewing the source spreadsheets, the following data rows were removed:

- Unidentifiable locations
- Duplicate locations or information
- Data-deficient fields that were needed for results analysis – for example rows that lacked information on impact (vegetation clearing) area.

Upon curation of the above data, spatial attributes of each site were derived using ArcGIS through intersections with publicly-available spatial datasets (shapefile formats). The spatial data were obtained from QSpatial and included the layers listed in Table 2.

Table 2 Datasets for identifying spatial attributes of koala habitat clearing sites

Layer name	Source	Version	Published date	Download date	Attributes
Local Government area boundaries - Queensland	QSpatial		03/03/2022	4/3/2022	LGA name
Cadastral data weekly - whole of State Queensland	QSpatial		28/02/2022	4/3/2022	Lot on plan Tenure Lot size
Digital cadastral database (pre-2020)	QSpatial		07/01/2018	unknown	Former lot on plan (where lot no longer exists post-February 2020)
Phascolarctos cinereus (Koala) Habitat Areas (KHA) – South East Queensland Regional Plan (SEQRP): remnant and regrowth, core habitat	QSpatial	v2.0	08/09/2021	4/3/2022	Core Koala Habitat Areas Locally refined Koala Habitat Areas
Koala Priority Areas	QSpatial	v1.0	20/01/2020	4/3/2022	Koala Priority Area
Regional land use categories - South East Queensland Regional Plan 2005 - 2026 - Amendment 1	QSpatial		30/06/2005	Unknown	Urban Footprint
Queensland coastline	Geoscience Australia		01/01/2015	Unknown	Distance to mapped edge of coastline

2.5 Summary analysis

2.5.1 Activity 1

A comparative and descriptive analysis was undertaken of the extent and type of actual vegetation clearing activities at:

- Sites that are mapped as containing KHAs and sites occurring within the KPA (SEQ Local Government case study sites); and
- Sites that are outside mapped KHAs and/or KPA – i.e. those at which an approved development did *not* trigger a koala offset (comparison sites).

Using these data, the following analyses were undertaken to address the scope of Activity 1: *Analysis of the extent and type of actual vegetation clearing activities at a selection of sites across South East Queensland, since February 2020.*

- Quantification of KHA clearing inside/outside of KPA at SEQ Local Government case study sites
- Quantification of vegetation clearing at comparison sites with broadly similar environmental and planning characteristics as case study sites (e.g. same Local Government area)
- Descriptive comparison of amount and spatial characteristics of clearing between case study and comparison sites
- Summary of the types of exemptions that are being used, how, and in which contexts, for the removal of vegetation at case study sites that are overlapped by KHA and/or KPA
- Summary of the types of conditions placed on approved development.

2.5.2 Activity 2

Using the data described for Activity 1, the extent and spatial distribution of koala offsets was summarised, and the cost of offsetting estimated, both pre- and post- the new regulation coming into force. This process involved an analysis of SEQ Local Government and DES-provided data on approved developments for which a koala offset was/was likely to be a condition of approval. An estimate of the cost per hectare of offsetting koala habitat, and the aggregate dollar amount of potential koala offset liabilities arising from (approved) clearing was conducted.

The potential offsets costs arising from approved development in the SEQ Local Governments case studies dataset were analysed. To inform the cost of offsets, a 'financial settlement' offset liability of \$920 for each tree lost at an impact site (this equates to \$306.67 per replacement tree at an offset site) was considered. This value was deduced from the maximum (capped) financial settlement of \$230,000 per hectare, which pertains to a particular region of the northern Gold Coast (this region/value is the focus of other work being delivered under the broader scope of works for this project; hence its consideration here). This costing was adopted for the analyses presented here to provide an illustration of offset costs for losses from approved development in the SEQ Local Government case study dataset. It is noted though that cost implications vary sub-regionally across SEQ, and this will have a bearing on the actual financial settlement obligations on any given development. To further inform the offset cost implications of development, a nominal assessment cost was considered. Ecological assessment (i.e. baseline description of impact site) costs were based on a value of \$1,500 per hectare, as per the document *Habitat mapping spatial data review and targeted dwelling supply impact assessment report* (New Ground, 2019), provided to GHD by DES.

Using information from the Queensland Environmental Offsets Public Register – namely, the comparison sites described for Activity 1 above – offset costs where the trigger for the offset was *not* koala habitat were also summarised. To determine whether offsets costs per unit and in sum are more/less expensive since the new regulations commenced, a 'before/after' assessment was undertaken on the data provided by DES. Offset data for the years prior to the new regulation coming into force (e.g. 2011-Jan 2020) as the 'before' component of the analysis were analysed, with data on offset liabilities and costs post-February 2020 constituting the 'after' data. Summary statistics for these two time periods were compiled (area of residual impact; offset costs), and spatial patterns of development that triggered these offsets for the two years either side of the new regulations coming into force were examined.

2.5.3 Overview of analysis

An overview of the datasets used, and the analyses that they informed in Activity 1 and Activity 2, is provided in Table 3.

Table 3 Overview of how each dataset was considered in this analysis

Dataset	Activity 1			Activity 2	
	Amount of clearing inside/outside KHA – comparative analysis	Exempted development/Accepted development	Conditions on approved development	Offset costs – spatial comparison (post-Feb 2020)	Offset costs – spatial and temporal comparison (pre/post Feb 2020)
SEQ Local Government case studies					
QLD Env Offsets Public Register – comparison sites					
ADVCC accepted development in KHA/KPA					
DES referred and proposed clearing in KHA ('Koala Assessment Tracker' dataset)					
DES-provided 'Koala offsets' dataset					

Case study sites

Comparison sites

2.6 Assumptions and limitations of analysis

GHD note the following caveats (in addition to those described in the methods above, and accompanying the results below), which were considered when undertaking the analyses detailed above, and when interpreting their results:

- No detailed statistical analysis was undertaken, due to limitations of scope, available data and timeframes.
- SEQ Local Government case study data:
 - A limited number of case studies were provided by a limited number of Local Governments, which provides a subset of information for the broader SEQ region.
 - The selection of those case study sites is likely to be based on knowledge of local development and clearing activities, amongst other factors.
 - Data attributes varied between case studies provided (e.g. some clearing extent values provided in hectares, some in number of trees), therefore data were categorised as much as possible to encompass the different attributes provided.
 - Clearing areas were sometimes provided as a range, estimation or upper or lower limit, which restricted the accuracy when comparing between them.
 - Some provided data was excluded from the analysis due to lack of identifying attributes or other key attributes. This particularly pertained to lot on plan values which could not be located in the GIS (n=11). Of the 50 clearing events in the final dataset, 10 did not provide any information on observed/proposed clearing extent.
 - GHD's ability to analyse how much clearing of KHA occurred (be it inside or outside the KPA) was constrained by the fact that the clearing data was unavailable in a spatial format.

- ADVCC data:
 - Data was current up to January 2022.
 - Clearing notified through the ADVCC database appears to have a two-year expiry date from receipt of notice, so it is possible that any clearing pre-approved from 7 February 2018 onwards may have actually taken place since the regulation commenced. Conversely, clearing which has been approved may not have actually occurred yet.
 - GHD removed rows for which no clearing area data were included (n=95).
 - For the spatial analysis of this dataset, a number of properties (n=125) were not identifiable when intersected with the digital cadastral database spatial layer, therefore these were removed from the analysis. This was considered to have occurred because some lot/plans become obsolete after a reconfiguration of a lot.
- Offsets register and offset cost data:
 - Cost implications vary sub-regionally across SEQ, and this will have a bearing on the actual financial settlement obligations on any given development.
 - Noting the substantial difference in the timeframe over which the Queensland's various koala offsets frameworks were/have been in force (approximately 10 years for the now superseded State Planning Regulatory Provisions (SPRP) compared with two years for the new planning regulations), drawing inferences about implications for offset costs between the two frameworks is constrained.
- Relating to GHD's ability to determine the planning context under which clearing was or was not undertaken at case study sites (i.e. those provided by SEQ Local Governments), the following considerations were accounted for when interpreting the results presented:
 - Some clearing after February 2020 may have been permitted under previous regulations. This may have been associated with clearing for development that was approved under previous regulations, as per the new regulation's transitional provisions. The impact of this type of clearing is therefore transitional in nature and will not have ongoing effects on koala habitat.
 - Clearing undertaken under a non-notifiable exemption is difficult to distinguish from non-compliant ('unexplained') clearing without detailed investigations of specific locations.
 - Clearing that was rejected under the new regulation at the pre-lodgement phase of a Development Application is not systematically captured in any (local or state government) database, to GHD's knowledge. This has a bearing on the ability to determine the impact of the new regulations – in effect, the regulations are preventing clearing, but the magnitude of this effect cannot be systematically quantified.
 - Similar to the point above, clearing that a proponent chose to avoid in project planning/design/due diligence (e.g. upon application of the mitigation hierarchy) because of the new koala regulations is not systematically quantified and reported on to GHD's knowledge. Again, this prevention/reduction of clearing may be fully or in part linked to the new koala regulations, yet this policy impact cannot be explicitly measured and assessed.
- Relating to GHD's ability to determine the impact of the new koala regulations:
 - Using a case study sites/comparison sites design across a selection of sites for which vegetation clearing has been assessed and/or undertaken will provide a snapshot of the new koala regulation's implementation. GHD's ability to draw rigorous conclusions about the *impact* of the new regulation in driving the assessed/observed clearing events is limited to a descriptive overview of how the policy is being implemented, and inferences about the effect of the policy on assessed/observed clearing. This is described in more detail in Section 4, below.
 - Data amenable to a detailed policy impact analysis – such as the Queensland Statewide Landcover and Trees Study (SLATS) dataset – was not available for the period during which the new regulations have been in effect.

3. Results

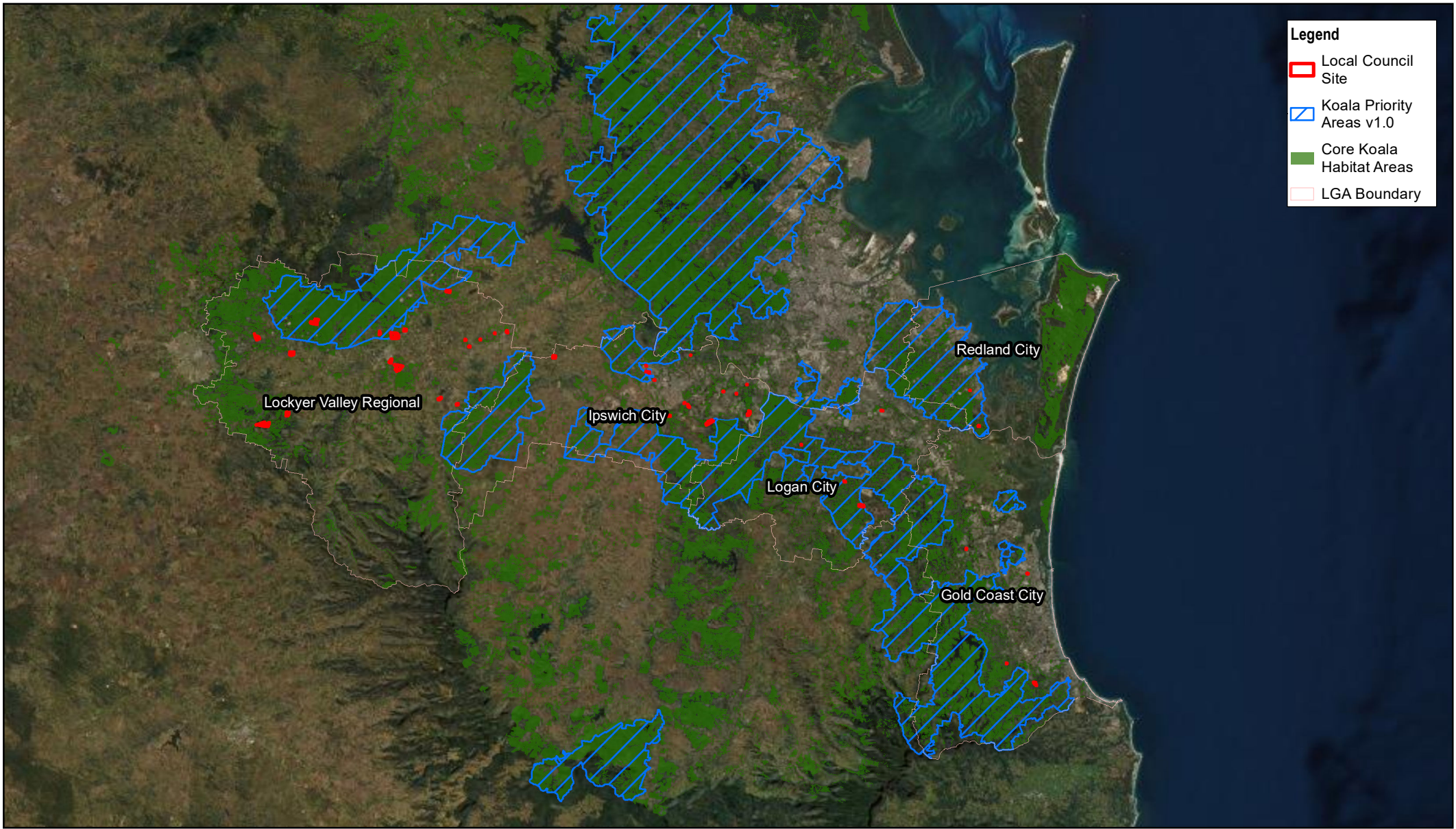
3.1 Activity 1

3.1.1 Amount of clearing in KHA/KPA – SEQ Local Government case study sites





The SEQ Local Government case study dataset comprised 50 observed clearing events across five SEQ Local Government areas (see Figure 1 for spatial distribution of these sites). To reiterate, these sites represent a subset of clearing events (potentially interfering with koala habitat) since the new regulations came into effect – they should not be viewed as representing the full quantum of impact to koala habitat in the SEQ region since February 2020. The majority of clearing (32 out of 50 events) involved the removal of 2 ha or less of vegetation (Figure 2). Exempted development was the most prevalent 'type' of clearing from a regulatory perspective (22 out of 50 clearing events), followed by approved clearing (nine out of 50 clearing events) and 'unexplained' clearing (nine out of 50 events) (Figure 3).

A total of 35 of the 40 properties where (1) clearing occurred/is proposed, and (2) an indication of clearing extent was provided by SEQ Local Governments (n=40) were overlapped by KHA Figure 4 and Figure 5). Of these, 12 properties were at least in part within the KPA (Figure 4 and Figure 5). The ability to analyse how much clearing of KHA occurred (be it inside or outside the KPA) was constrained by the fact that the clearing data was unavailable in a spatial format.

Clearing events from the case study data were approximately evenly split between inside and outside the Urban Footprint (n=26 for inside; n=24 for outside), while the distance from the coast of clearing events reflected the geographic location of the five jurisdictions considered in this analysis (Figure 6).

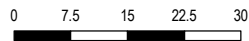


Legend

-  Local Council Site
-  Koala Priority Areas v1.0
-  Core Koala Habitat Areas
-  LGA Boundary

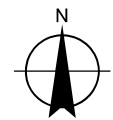
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Kilometres

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994



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SEQ koala regulations spatial analysis

Spatial distribution of
Local Government case study sites

Project No. 12566725
Revision No. A
Date 12/04/2022

FIGURE 1

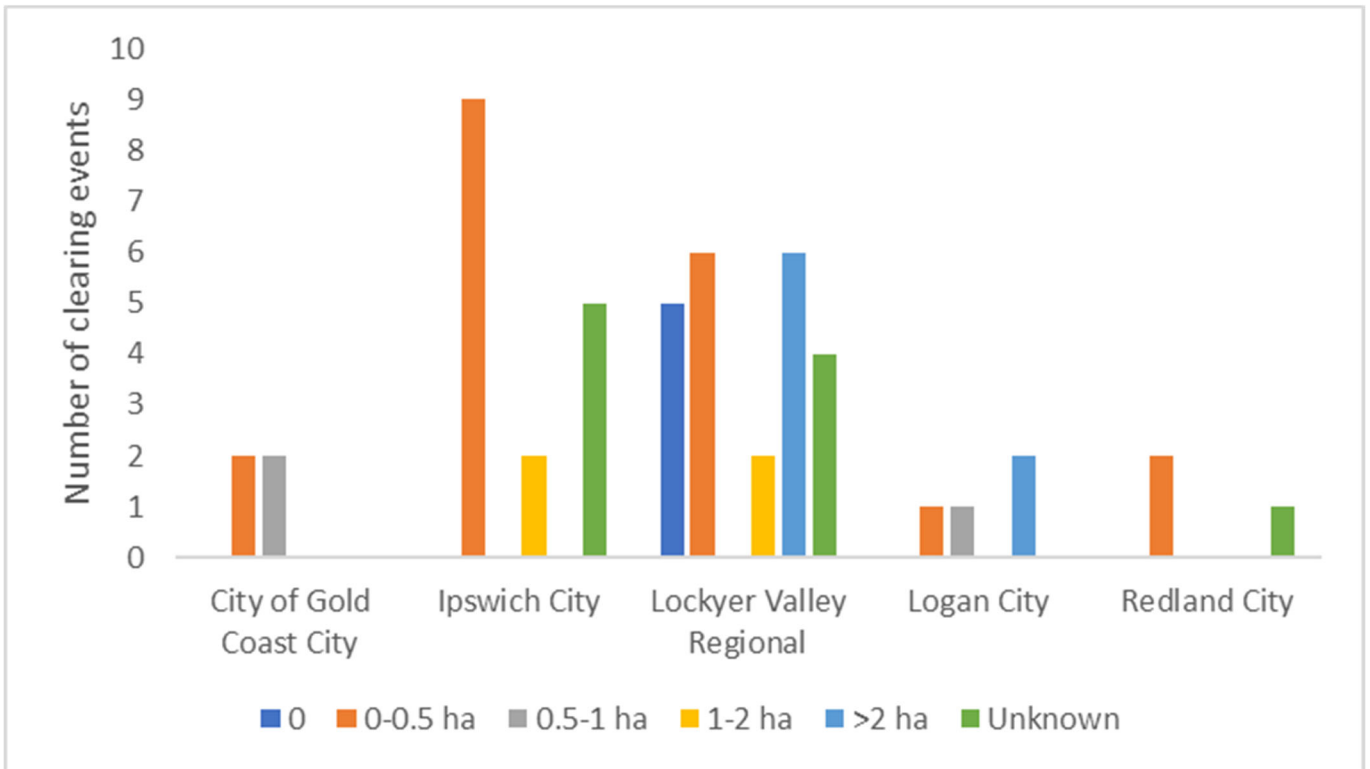


Figure 2 Observed or proposed clearing at 50 properties across five SEQ Local Government areas since February 2022.

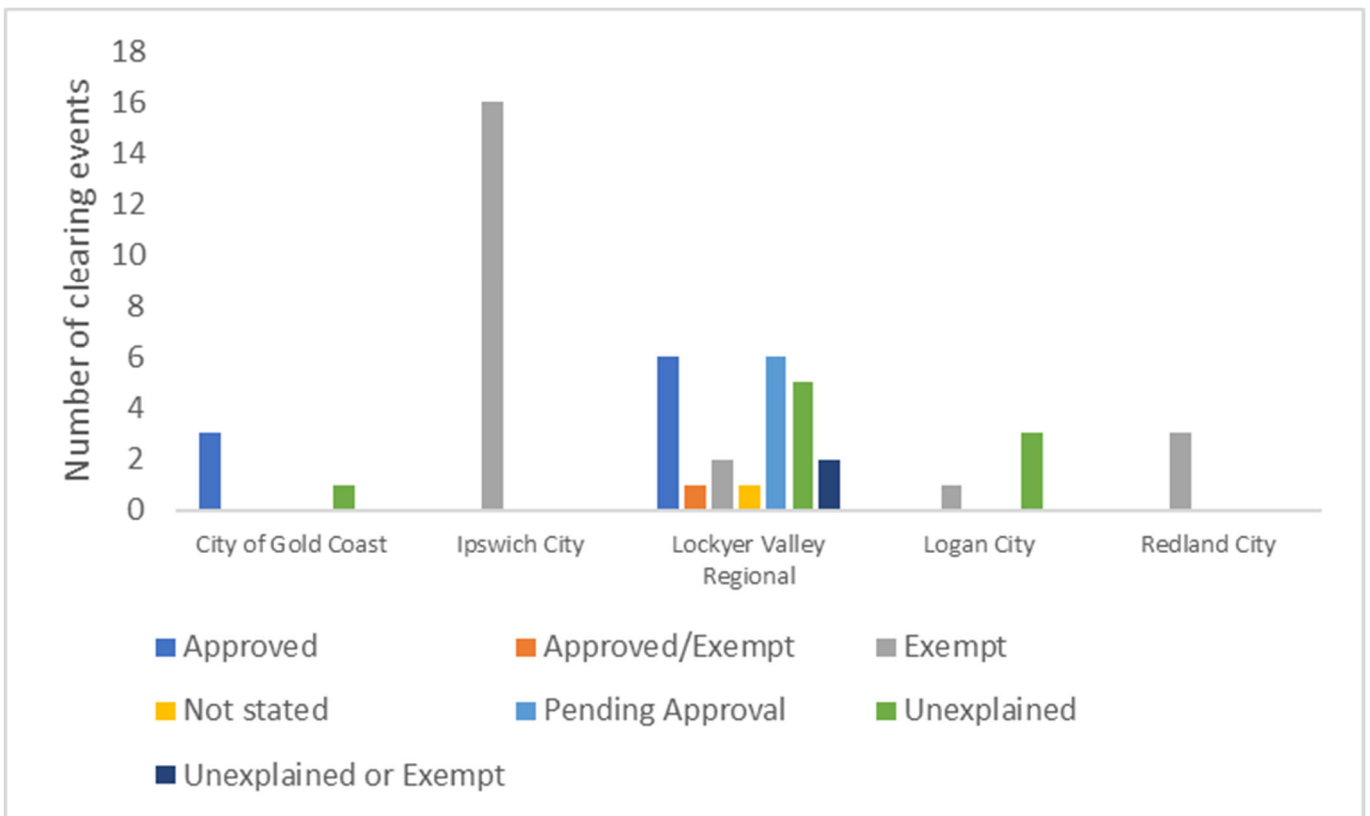
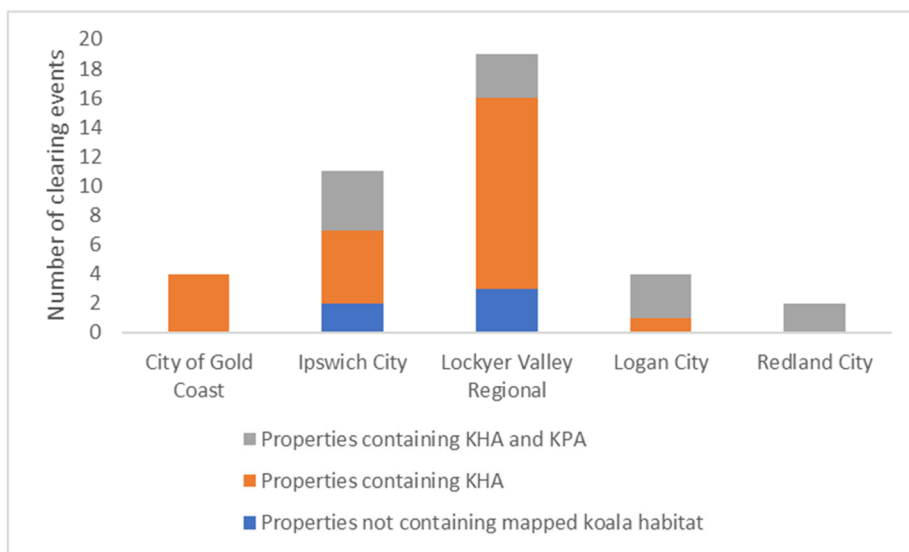


Figure 3 Assessment / approval status of clearing from observed or proposed clearing events (n=50) recorded by five SEQ Local Governments



Spatial reference	Indicative clearing area (ha)
City of Gold Coast	3.0
KHA	3.0
Ipswich City	8.5
KHA	2.5
KHA and KPA	5.0
None	1.0
Lockyer Valley Regional	39.0
KHA	33.5
KHA and KPA	2.0
None	3.4
Logan City	8.9
KHA	2.4
KHA and KPA	6.5
Redland City	1
KHA and KPA	1

Figure 4 Indicative clearing footprints (ha) in properties from SEQ Local Government case study dataset and overlap with KHA or KPA

For Figure 4 above (n=40; 10 properties had ‘unknown’ clearing amount), the indicative clearing area (ha) was deduced based on attributing each property the upper limit of the clearing classes shown in Figure 2. For example, a property where the clearing extent was classed as 0.5-1ha was attributed a clearing area of 1 ha here (thus, reported extents here are likely an overestimate). For those properties attributed a clearing class of >2 ha, the approximate footprint from the SEQ Local Government dataset was used.

Of the 55.9 ha of reported clearing (observed, proposed) that was on properties overlapped by KHA, 14.5 ha occurred on properties wholly or partially within the KPA. This corresponded to 12 properties for which clearing was observed or proposed – an average of 1.2 ha of clearing per property that intersected the KPA (min = 0.5; max = 5; median = 0.5). For the properties containing KHA (but outside the KPA), 41.4 ha was observed or proposed to be cleared across 23 clearing events – an average of 1.8 ha per property (min = 0; max = 9.21; median = 1.0). These results are potentially indicative of prohibitions within the KPA driving reductions (in relative terms) of koala habitat removal, compared to losses outside the KPA (albeit, noting that the actual clearing footprints considered here were not available in spatial format, and so their respective intersection with KPA is unknown).

For the five SEQ Local Governments, median and mean clearing at properties for intersected by KHA and KPA are presented in Table 4.

Table 4 Observed and proposed clearing summary statistics by SEQ Local Government

	Properties containing KHA			Properties containing KHA and KPA	
	Median clearing (ha)	Mean clearing (ha)		Median clearing (ha)	Mean clearing (ha)
City of Gold Coast (n=4)	0.75	0.75	City of Gold Coast (n=0)	-	-
Ipswich City (n=5)	0.50	0.50	Ipswich City (n=4)	1.25	1.25
Lockyer Valley Regional (n=13)	1.50	2.58	Lockyer Valley Regional (n=3)	0.50	0.63

	Properties containing KHA			Properties containing KHA and KPA	
	Median clearing (ha)	Mean clearing (ha)		Median clearing (ha)	Mean clearing (ha)
Logan City (n=1)	2.40	2.40	Logan City (n=3)	1.00	2.17
Redland City (n=0)	-	-	Redland City (n=2)	0.50	0.50



Figure 5 Clearing by purpose in properties containing KHA (top row), and KHA and KPA (bottom row). The bar charts show the area of observed/proposed clearing, while the pie chart shows the proportion of clearing events for each purpose.

Notwithstanding clearing that was ‘pending approval’ for properties containing KHA (Figure 5 – top row), observed/proposed clearing that was unexplained or exempted development accounted for the greatest extent of clearing. The areas of clearing reported here are not necessarily the extent of KHA – rather, they represent clearing extents on properties containing KHA. A similar result was observed for properties both containing KHA and intersected by KPA – unexplained clearing was the most prevalent (by area, and by the number of properties for which this clearing purpose was reported), followed by exempted development. Taken together, and noting the caveats outlined hereabouts relating to these analyses reporting not on loss of KHA, but of vegetation on properties containing KHA, the finding presented in Figure 4 and Figure 5 that the KPA is having an effect on the quantum of vegetation being removed, but that exempt and unexplained clearing continue to cause (uncompensated) losses on properties where koala habitat occurs.

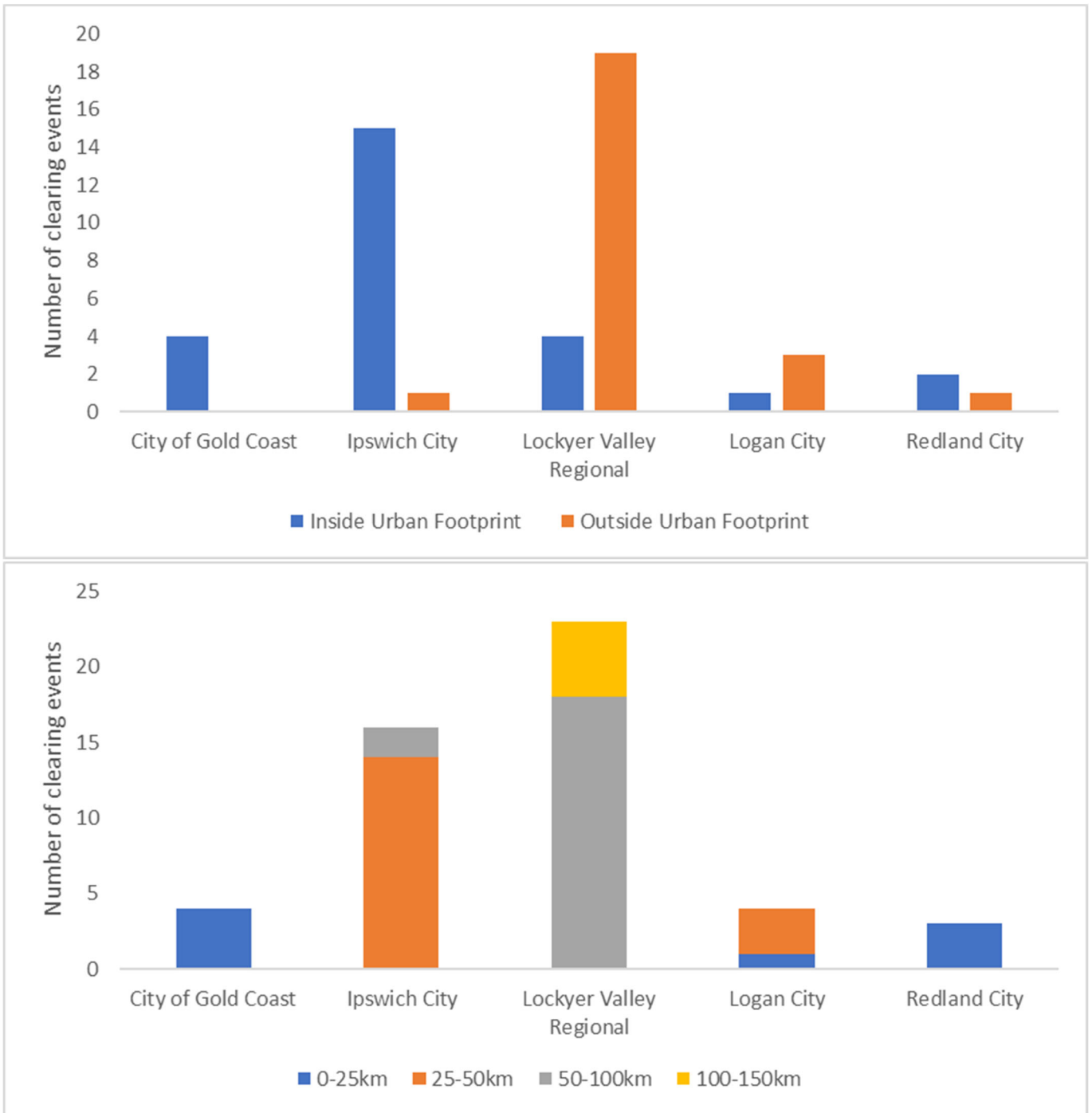


Figure 6 Spatial attributes of SEQ Local Government case study sites – inside/outside Urban Footprint (top); distance from the coast (bottom)

3.1.2 Amount of clearing in KHA/KPA at SEQ Local Government case study sites and comparison sites

Across the 40 (out of 50) SEQ Local Government case study sites that provided (indicative or specific) details of the extent of clearing, it was approximated that clearing at properties that were overlapped by KHA, or KHA and KPA since February 2020 was **55.9 ha**. This value must be considered in terms of the following:

- This does not necessarily represent the loss of actual KHA across these properties, as the location of clearing within each property was not made available to GHD (and therefore, the spatial overlap of clearing sites and KHA could not be determined)
- The value of 55.9 ha is likely an overestimate for these specific case studies, both because of the point above, and because there was a need to attribute clearing events into clearing classes due to a lack of specificity in some of the data provided by SEQ Local Governments (see interpretation of Figure 4 above for explanation).

Comparison sites were considered to contextualise this loss. As per the approach outlined in Section 2.3, this process yielded **two** sites for which a significant residual impact has triggered an offset requirement under Queensland legislation:

- A 0.23 ha impact on 'Protected wildlife habitat' (short-beaked echidna (*Tachyglossus aculeatus*) – special least concern under the *Nature Conservation Act 1992*)
- A 2.71 ha impact on 'Regulated vegetation' (Regional Ecosystem 12.9-10.12 – endangered under the *Vegetation Management Act 1999*)

Both of these impacts occurred in Logan City. The aggregate of significant residual impacts to matters of state environmental significance outside of mapped KHA since February 2020 is **2.94 ha**. Expansion of the dataset to all 12 SEQ Local Government areas only identified one additional offset. This was a development in the Sunshine Coast jurisdiction, where the residual impact triggering the offset was a 2.38 ha loss of 'Of concern Regional Ecosystem 12.9-10.1'.

Comparing the two values of the SEQ Local Government case study sites (**55.9 ha**) and comparison sites (**2.94 ha**) requires caution. The SEQ Local Government dataset comprises observed/proposed clearing under a range of planning provisions (including exempted development), while some of the clearing tabulated in this dataset is 'unexplained'. The comparison sites are locations for which assessment and approval has been undertaken under a Development Application process. Thus, the two datasets are not directly comparable. Nonetheless, across both datasets (noting they only comprise five of 12 SEQ Local Government Areas), the extent of vegetation loss since February 2020 is small.

3.1.3 Exempted development and accepted development

3.1.3.1 Exempted development – SEQ Local Government case studies

Of the 50 clearing events (observed/proposed) in the SEQ Local Government case studies dataset, 22 were deemed to be exempted development (Figure 3). All clearing events documented in Ipswich City (n=16) and Redland City (n=3) were exempted development. Explanatory notes provided alongside clearing data by SEQ Local Governments revealed that multiple exemptions were being applied in some instances – for example (anonymised):

- “500 m² of clearing for a house, 200-300 m² of clearing for on-site wastewater, with further clearing of up to 500 m² allowable at the same time or a later date. A landowner may also clear to establish significant firebreaks (unspecified) around the structures, plus 5-10m wide clearing for a fence, road or track (depending on property size)”.
- “Clearing entirely within KHA/KPA carried out to create an access track/fire management line. Clearing met Planning Regulation 2017 definition of exempted development under point (o). Also accepted development under Schedule 7, Part 3, s13 of the Regulation”.
- “Clearing entirely within KHA/KPA. Clearing determined to be exempt when considered against items of the exempted development definition. Item (l) applied – 500 m² for non-linear infrastructure; Item (k) applied for additional 500 m²; Item (n) applied for establishing a necessary firebreak”.

– “Total clearing of more than 500 m², but because it covers multiple reasons it is allowed”.

In total, four observed/proposed developments from the SEQ Local Government case studies dataset invoked multiple (exempt) clearing purposes, which in aggregate, exceeded 500 m² but for which offsets were not required.

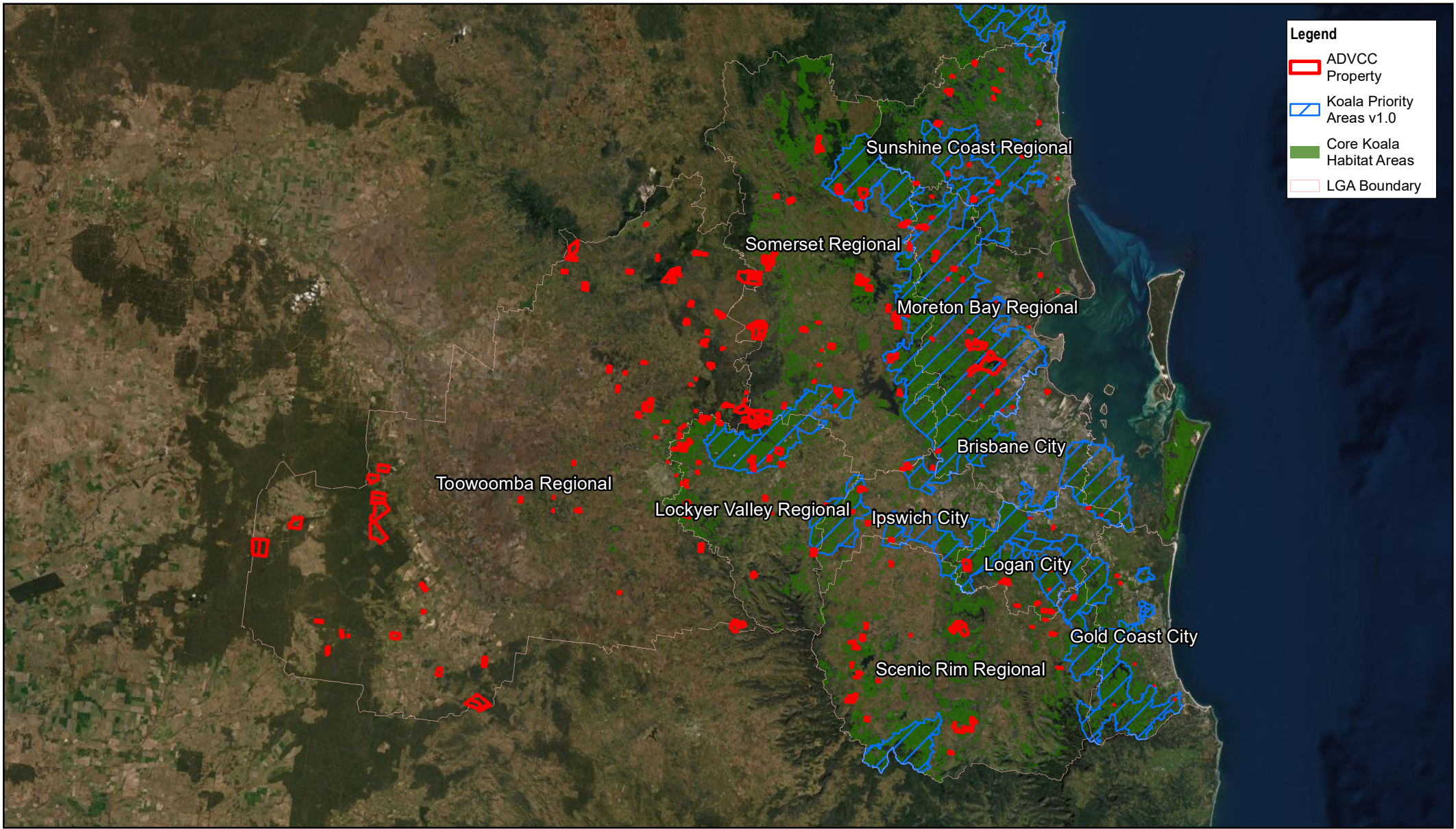
It is important to note that many of the exempted developments from Ipswich City (Figure 3) were due to a combination of falling below the 500 m² threshold, and/or being the subject of prior approvals. One such exemption highlighted the extension of an existing approval owing to delays caused by the Covid pandemic.

3.1.3.2 Accepted development – ADVCC dataset

A total of 557 individual clearing events deemed to be accepted development under the ADVCC were tabulated in data provided to GHD by DES (see Figure 7 and Figure 8 for spatial distribution of where this clearing was undertaken/is proposed). It is important to note that the extent of the SEQ KHA is restricted to the SEQ Regional Plan area which only incorporates the urban extent of Toowoomba rather than the full council area. Most of the accepted development/ADVCC clearing in Toowoomba is outside of the extent of mapped KHA and the scope of the new regulations.

This dataset was restricted to observed or proposed clearing that has been notified since February 2020. Of the 557 events (i.e. rows of data in the spreadsheet), 95 did not stipulate the area of vegetation that was/is proposed to be cleared. These sites were not considered in this analysis. Of the 462 sites for which an area of clearing was provided, the total extent of vegetation cleared or permitted to be cleared was 20,039 ha. Accepted development under the ADVCC was concentrated in four SEQ Local Government areas: Toowoomba (139 out of 462 = 30%); Somerset (14%); Lockyer Valley (14%); and Scenic Rim (12%) (Figure 9). Two ‘purposes’ dominated ADVCC accepted development: “native forest practice” (246 out of 462 = 53%); and “managing weeds” (32%) (Figure 10). The use of multiple accepted development ‘purposes’ on an individual property was identified from 51 sites (Table 5; Figure 11).

Note: the figures and text described in this section pertains to accepted development activities that *may* involve clearing or interference with koala habitat. However, the actual extent of any clearing is unknown. Overall, it reflects an intention to clear some or part of the area reported, and may be selective. It is noted that selective logging is required to comply with a code of practice that prescribes measures to manage the retention of density for wildlife trees.



Legend

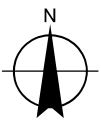
- ADVCC Property
- Koala Priority Areas v1.0
- Core Koala Habitat Areas
- LGA Boundary

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

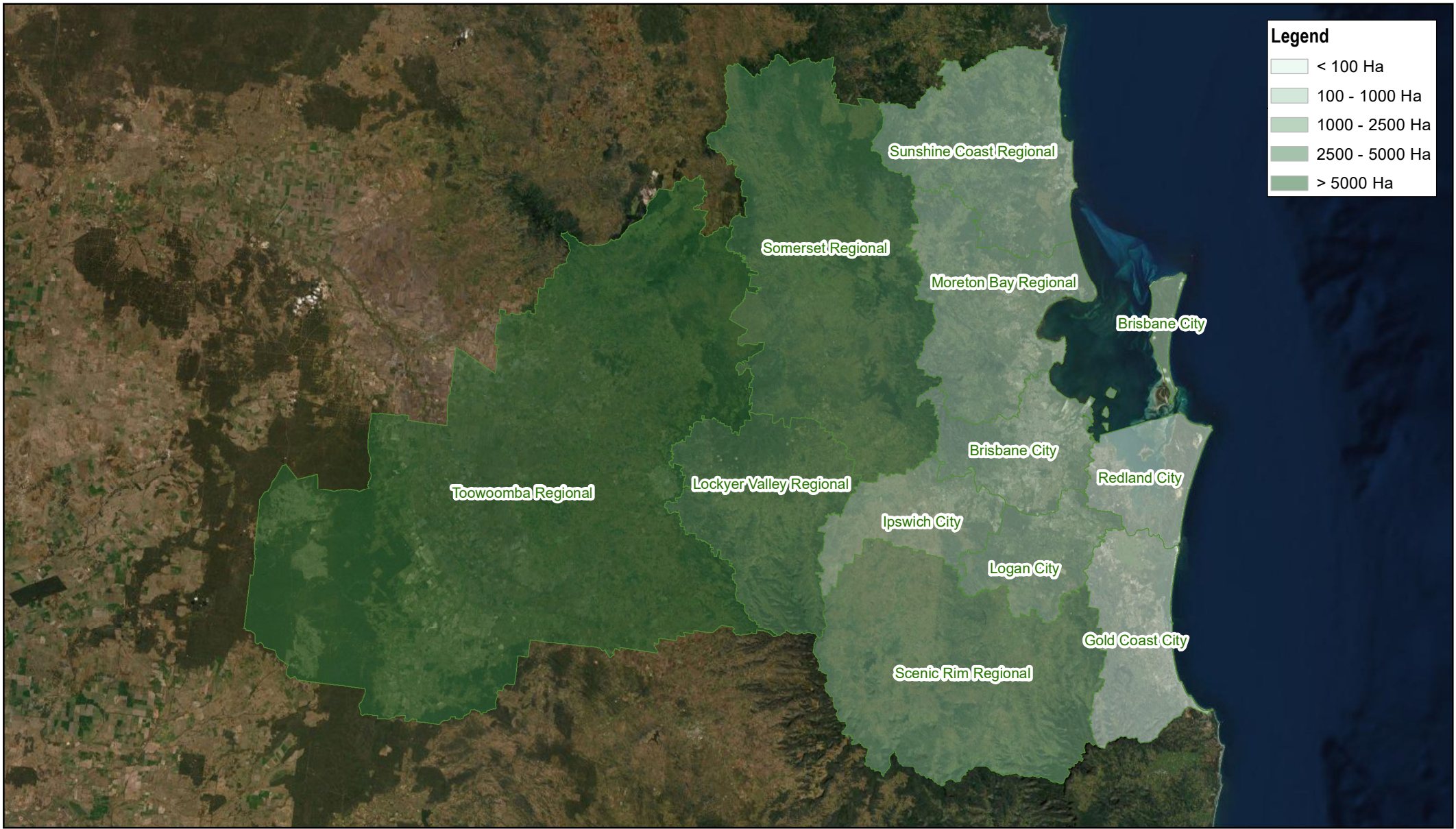


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Revision No. A
Date 12/04/2022

Spatial distribution of ADVCC properties

FIGURE 7



Legend

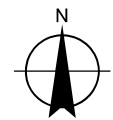
- < 100 Ha
- 100 - 1000 Ha
- 1000 - 2500 Ha
- 2500 - 5000 Ha
- > 5000 Ha

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Department of Environment and Science
SEQ koala regulations spatial analysis

Area of ADVCC accepted development
since 2020 by Local Government area

Project No. 12566725
Revision No. A
Date 12/04/2022

FIGURE 8

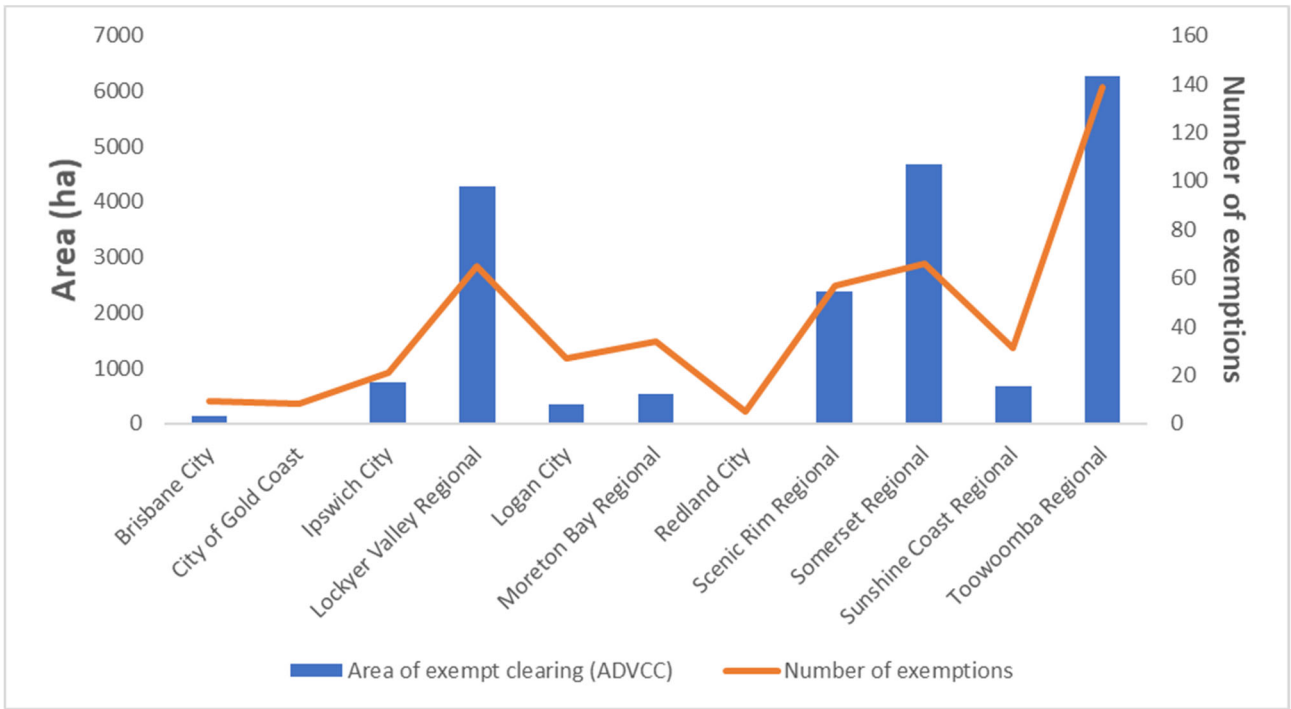


Figure 9 ADVCC accepted development by SEQ Local Government area (n= 462 sites). Note that no ADVCC accepted development was reported from Noosa Shire

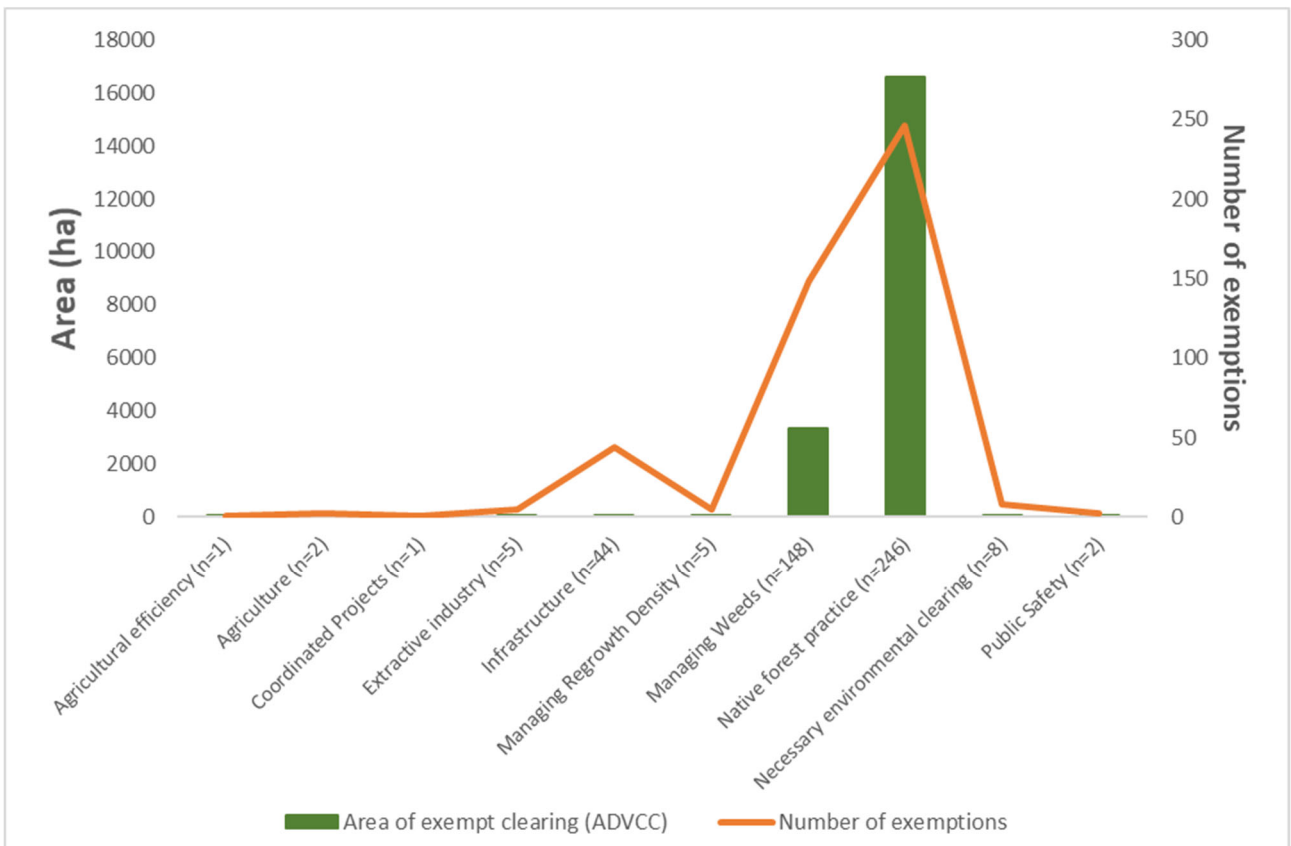


Figure 10 ADVCC accepted development clearing by purpose (n=462 sites)

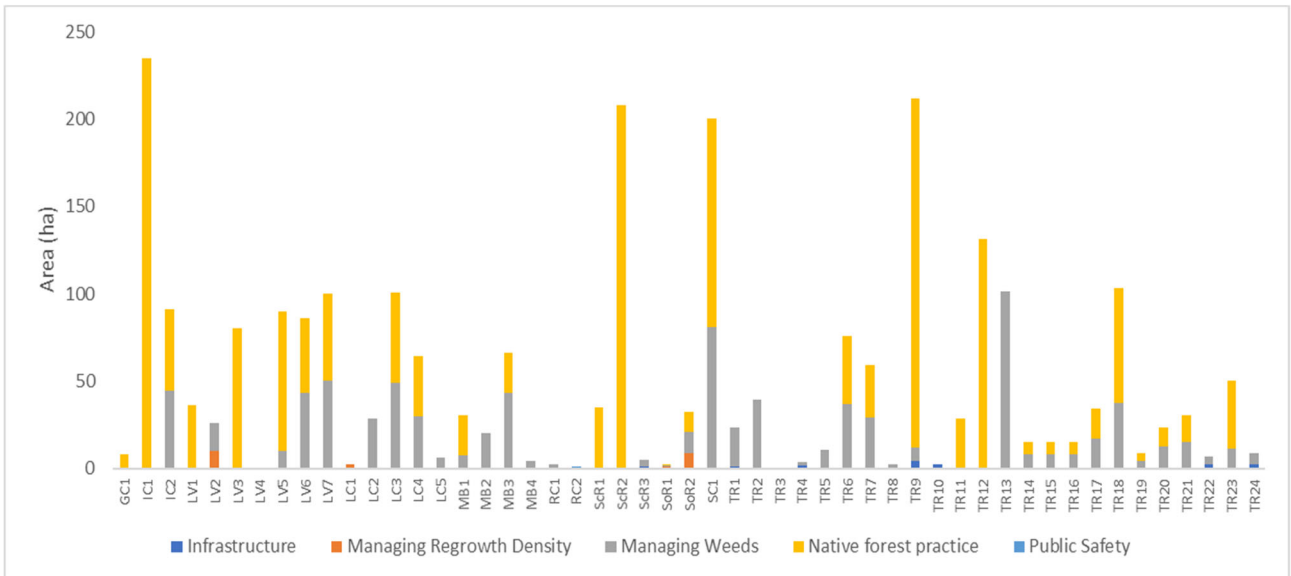


Figure 11 Properties with more than one instance of notified ADVCC accepted development

For Figure 11 above, there were 51 out of n=462 sites at which more than one ADVCC accepted development proposal had been notified. Refer to Table 5 below for key to property references as displayed in x-axis on this plot.

Table 5 Number of ADVCC accepted development notifications per property

Local Government area	Anonymised property reference	Infrastructure	Managing Regrowth Density	Managing Weeds	Native forest practice	Public Safety
City of Gold Coast	GC1				2	
Ipswich City	IC1				2	
Ipswich City	IC2			1	1	
Lockyer Valley Regional	LV1				2	
Lockyer Valley Regional	LV2		1	2		
Lockyer Valley Regional	LV3				2	
Lockyer Valley Regional	LV4	2				
Lockyer Valley Regional	LV5			1	1	
Lockyer Valley Regional	LV6			1	1	
Lockyer Valley Regional	LV7			1	1	
Logan City	LC1	1	2			
Logan City	LC2			2		
Logan City	LC3			1	1	
Logan City	LC4			1	1	
Logan City	LC5			2		
Moreton Bay Regional	MB1			1	1	

Local Government area	Anonymised property reference	Infrastructure	Managing Regrowth Density	Managing Weeds	Native forest practice	Public Safety
Moreton Bay Regional	MB2			2		
Moreton Bay Regional	MB3			1	1	
Moreton Bay Regional	MB4	2		1		
Redland City	RC1			2		
Redland City	RC2	1				1
Scenic Rim Regional	ScR1				3	
Scenic Rim Regional	ScR2				2	
Scenic Rim Regional	ScR3	1		1		
Somerset Regional	SoR1		1	1	1	
Somerset Regional	SoR2		1	1	1	
Sunshine Coast Regional	SC1			1	1	
Toowoomba Regional	TR1	2		1		
Toowoomba Regional	TR2			2		
Toowoomba Regional	TR3	1		1		
Toowoomba Regional	TR4	3		1		
Toowoomba Regional	TR5	1		1		
Toowoomba Regional	TR6			1	1	
Toowoomba Regional	TR7			1	1	
Toowoomba Regional	TR8	1		1		
Toowoomba Regional	TR9	1		1	1	
Toowoomba Regional	TR10	2				
Toowoomba Regional	TR11				2	
Toowoomba Regional	TR12				2	
Toowoomba Regional	TR13			2		
Toowoomba Regional	TR14			1	1	
Toowoomba Regional	TR15			1	1	
Toowoomba Regional	TR16			1	1	
Toowoomba Regional	TR17			1	1	
Toowoomba Regional	TR18			1	1	
Toowoomba Regional	TR19			1	1	
Toowoomba Regional	TR20			1	1	
Toowoomba Regional	TR21			1	1	
Toowoomba Regional	TR22	1		1		
Toowoomba Regional	TR23			1	1	
Toowoomba Regional	TR24	1		1		

*Anonymised property reference key: GC = City of Gold Coast; IC = Ipswich City; LV = Lockyer Valley Regional; LC = Logan City; MB = Moreton Bay Regional; RC = Redland City; ScR = Scenic Rim Regional; SoR = Somerset Regional; SC = Sunshine Coast Regional; TR = Toowoomba Regional

Cells highlighted in blue indicate an individual property where ADVCC clearing was notified for the same purpose more than once.

ADVCC accepted development patterns were examined considering the following spatial parameters: (1) inside or outside the Urban Footprint; (2) distance to the coast; (3) overlapped by (contains) mapped KPA and/or KHA. This was done to determine whether there were any spatial patterns in accepted development. Due to discrepancies in the lot/plan data provided, only a subset of the ADVCC data (n=337 out of sites) were considered in this spatial analysis.

Most (95%) ADVCC accepted development was conducted/proposed for outside the Urban Footprint (Figure 12). The majority (40%) of ADVCC accepted development occurred between 25 and 50 km from the coastline (Figure 13). Almost three quarters of ADVCC accepted development occurred on properties that contained mapped koala areas (KHA, KPA, or both) (Figure 14). The ability to quantify the extent of loss of these areas linked to ADVCC accepted development was constrained, as the ADVCC data were not available in a shapefile – therefore, these data provide an indicative representation of the extent to which this type of development is being invoked at properties for which koala habitat protection triggers likely apply.

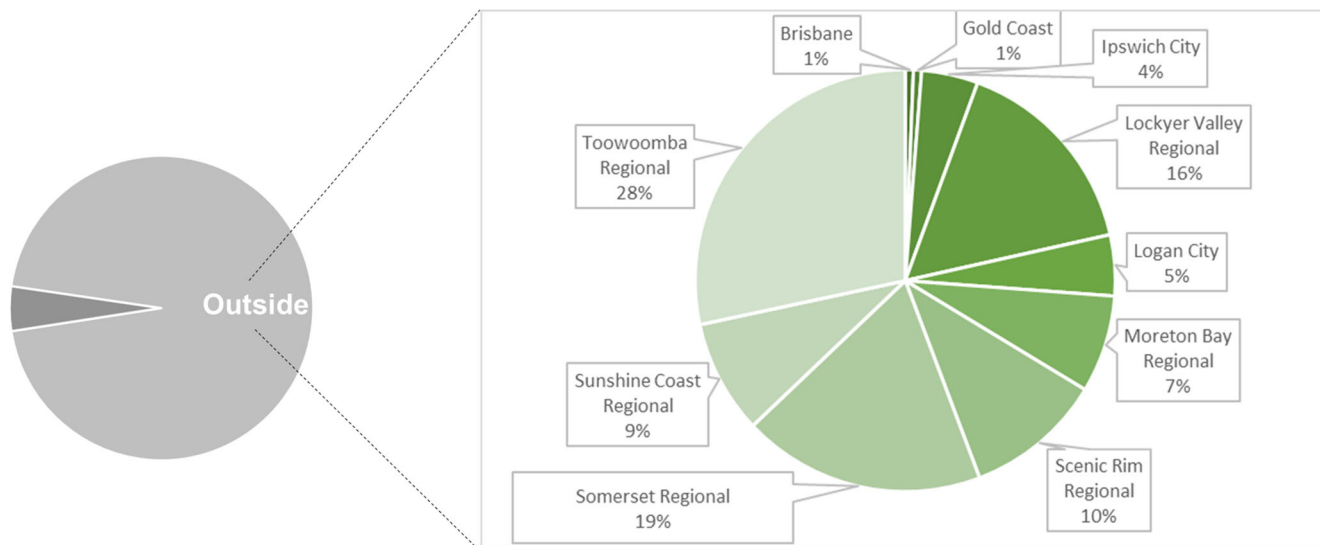


Figure 12 ADVCC accepted development clearing inside and outside of the Urban Footprint

Figure 12 above shows that, of the 337 sites, 5% of accepted development occurred inside the Urban Footprint and 95% outside. The breakdown of ADVCC accepted development outside of the Urban Footprint by SEQ Local Government area is provided in the sub-figure at the right.

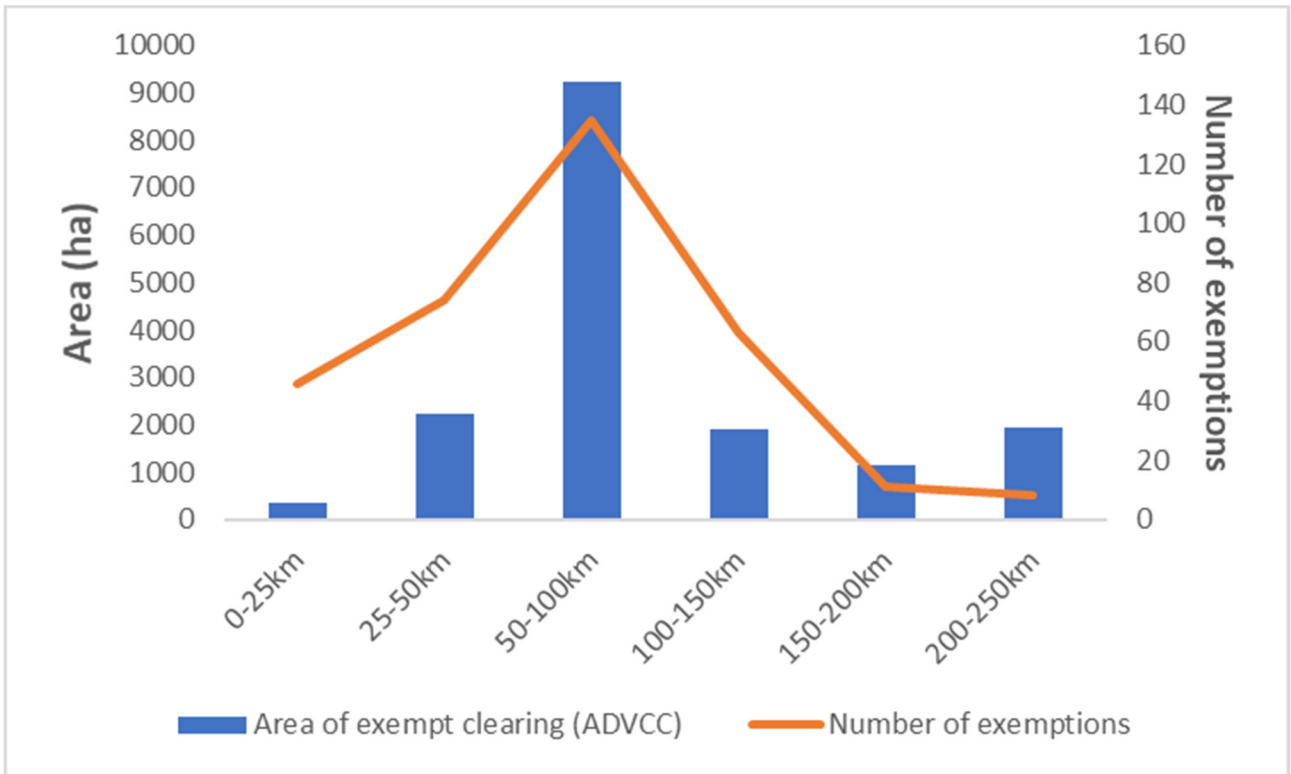


Figure 13 ADVCC accepted development clearing and distance to the coastline (n=337 sites)

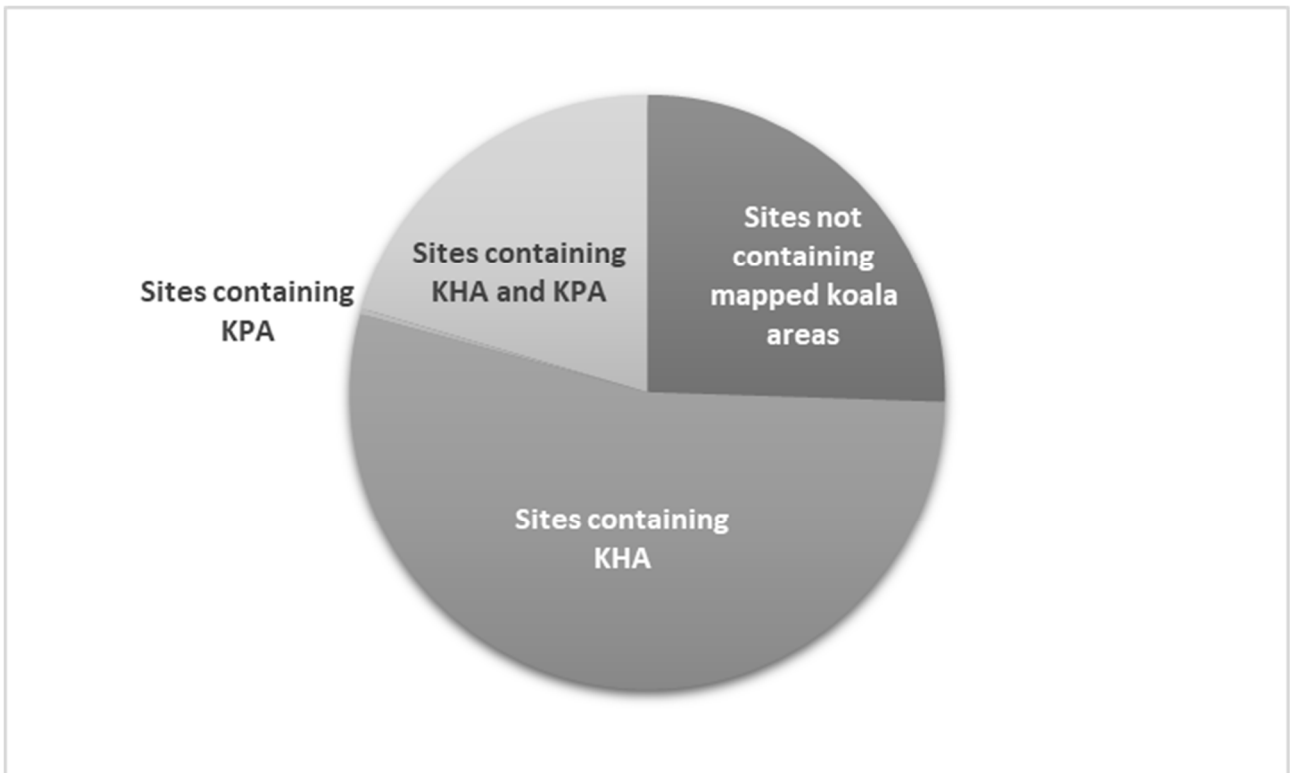


Figure 14 ADVCC accepted development clearing and overlap with mapped koala areas (n=337 sites).

Note that calculation of the exact overlap between clearing areas and mapped koala areas was not possible, as the former was not available in a spatial format. Figure 14 demonstrates that the majority of sites (74%) at which ADVCC accepted development has occurred/is proposed contain at least some mapped KHA and/or is within a mapped KPA.

3.1.4 Koala-specific conditions on development

Summary information on 48 SARA-approved Development Applications (DAs) with conditions linked to koala conservation were made available to GHD by DES. These data represented developments approved in SEQ since February 2020. A wide variety of conditions were attached to approved DAs, with requirements for koala management plans, offsets and koala-friendly/ koala-exclusion fencing being the most prominent (Figure 15). The requirement for particular conditions on DAs did not show clear trends when examined by SEQ Local Government area (Figure 16), although developments in Logan City had a proportionately higher requirement to provide offsets when compared with other SEQ Local Government areas. In addition to the conditions captured in Figure 15 and Figure 16, a range of other requirements were attached to the various DAs in the dataset (Table 6). Amongst the most frequently applied conditions were:

- To notify the DES when approved clearing was to commence
- To comply with strict limits on what could be cleared (i.e. number of trees cleared)
- Where on the site the clearing could occur (i.e. spatial configuration of clearing, including areas of avoidance).

A number of these 'additional' requirements may, in practice, be incorporated into the conditions presented in Figure 15 and Figure 16 (e.g. be captured in a 'koala management plan').

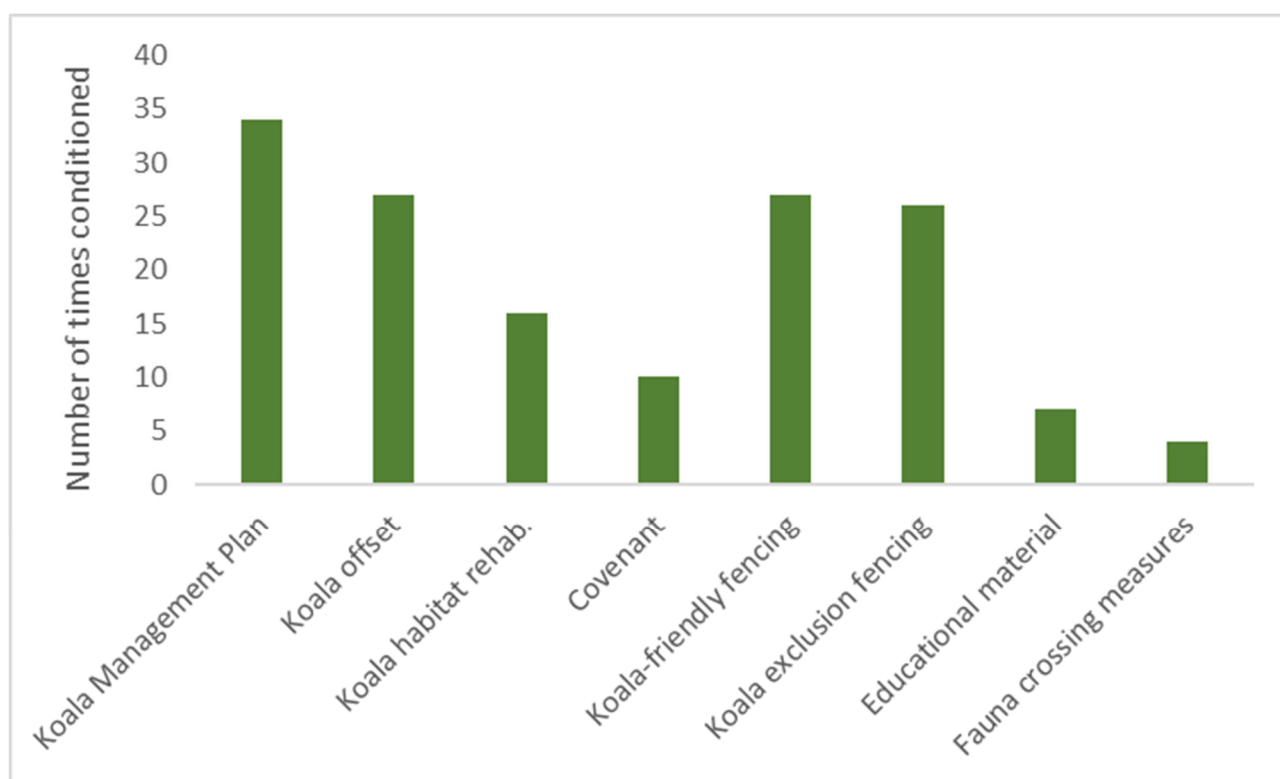


Figure 15 Koala-specific/applicable conditions placed on SARA approved DAs (n=48) in SEQ since February 2020

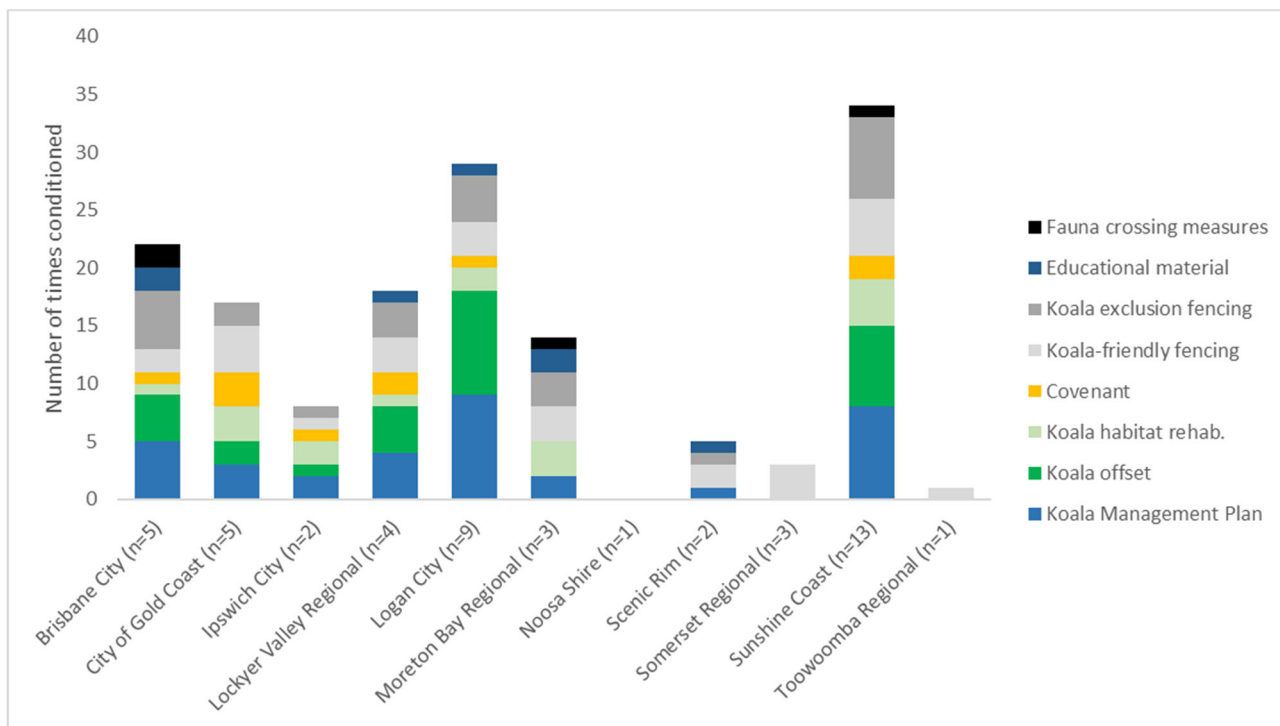


Figure 16 Koala-specific/applicable conditions placed on SARA approved DAs (n=48) since February 2020 by SEQ Local Government area

As shown in Figure 16 above, the number of developments (n) for each SEQ Local Government area is less than the number of conditioned requirements, as typically a single development was required to satisfy more than one condition.

Table 6 Additional conditions placed on SARA approved DAs (n=48) in SEQ since February 2020

	Lighting	Clearing notification	Clearing limits	Koala safe pools	Spatial configuration of clearing	Spotter-catcher	Rehab. / Landscape	Signage	Traffic calming
Brisbane City (n=5)		1	3	2	1	1	2		
City of Gold Coast (n=5)		1			1				
Ipswich City (n=2)	1		2				1	1	
Lockyer Valley Regional (n=4)		3	2	1	2				
Logan City (n=9)		6	5		1	1			
Moreton Bay Regional (n=3)		2	2					2	2
Noosa Shire (n=1)			1						
Scenic Rim (n=2)			1		2				
Somerset Regional (n=3)			1		2				
Sunshine Coast (n=13)		4	9	3	3	2	2	3	1
Toowoomba Regional (n=1)					1				
TOTAL	1	17	26	6	13	4	5	6	3

Definitions: 'Lighting': limits on when lighting at development can be used; 'Clearing notification': department must be notified prior to clearing; 'Clearing limits': maximum number of trees that can be cleared; 'Koala safe pools': swimming pool design must comply with koala safe design requirements; 'Spatial configuration of clearing': clearing must only proceed in accordance with clearing plan in DA; 'Spotter-catcher': must be onsite during clearing; 'Rehabilitation/landscaping': must be undertaken as stipulated, using koala habitat trees; 'Signage': koala awareness, speed limits; Traffic calming: measures to slow traffic.

3.2 Activity 2

3.2.1 Estimate of offset liabilities – SEQ Local Government case studies and comparison sites

Of the 50 clearing events recorded in the SEQ Local Government case studies dataset, nine were 'approved' and six were 'pending approval'. Using the approach detailed in Section 2.5.2, where a 'financial settlement' offset liability of \$920 per tree removed (i.e. lost at the impact site) was identified as a reasonable approximation of koala habitat offset liabilities, an indicative offset requirement for these 15 developments is outlined in Table 7. Indicative offset costs ranged from approximately \$20,000 to >\$2 million. Across the sites, this comes to an average of \$231,500 per ha (i.e. capped price of \$230,000 per ha for offset financial settlement and \$1,500 per ha for ecological assessment). This analysis is illustrative, and does not account for regional variation in offset costs, nor other costs involved in delivering the offset obligation.

Table 7 Indicative offset liabilities arising from proposed developments in the SEQ Local Government case studies dataset

Development status	Area to be cleared (NJKHT)	Area to be cleared (ha)*	Ecological Assessment cost#	Offset liability##	Indicative cost
Approved	23	0.09	\$135	\$21,160	\$21,295
Approved	0	0	-	-	-
Approved	65	0.26	\$390	\$59,800	\$60,190
Approved	0	0	-	-	-
Approved	150	0.6	\$900	\$138,000	\$138,900
Approved	15	0.06	\$90	\$13,800	\$13,890
Approved	0	0	-	-	-
Approved	0	0	-	-	-
Approved	Unknown	Unknown	-	-	-
Pending Approval	Unknown	Unknown	-	-	-
Pending Approval	Unknown	Unknown	-	-	-
Pending Approval	2295	9.18	\$13,770	\$2,111,400	\$2,125,170
Pending Approval	2295	9.18	\$13,770	\$2,111,400	\$2,125,170
Pending Approval	853	3.41	\$5,115	\$784,760	\$789,875
Pending Approval	125	0.5	\$750	\$115,000	\$115,750

NJKHT: non-juvenile koala habitat trees

* Based on 250 trees per ha

\$1,500 per ha, as per New Ground (2019) – note this value has been taken at face value, and indexation has not been applied

Based on liability of \$920 per tree removed – this equates to a capped offset liability of \$230,000 per ha of impact

For comparison's sake, offset requirements arising from non-koala habitat triggers for terrestrial matters of state environmental significance since the start of 2020 have been of considerably lower cost/value. Of the two offsets captured in the Environmental Offsets Public Register, a single financial settlement for an impact of 2.71 ha to endangered Regional Ecosystem 12.9-10.12 has been delivered. This offset settlement was \$647,700. The other (as yet, undelivered) offset is for 0.23 ha of echidna habitat.

3.2.2 Pre- and post-regulation offset liabilities

Data provided by DES ('Koala Offsets' dataset) captured summary information on the extent of, and impact to, protected koala habitat in SEQ before and after the introduction of the new regulations in February 2020. Under the new regulations, the area of habitat protected in the region has increased significantly (Figure 17).

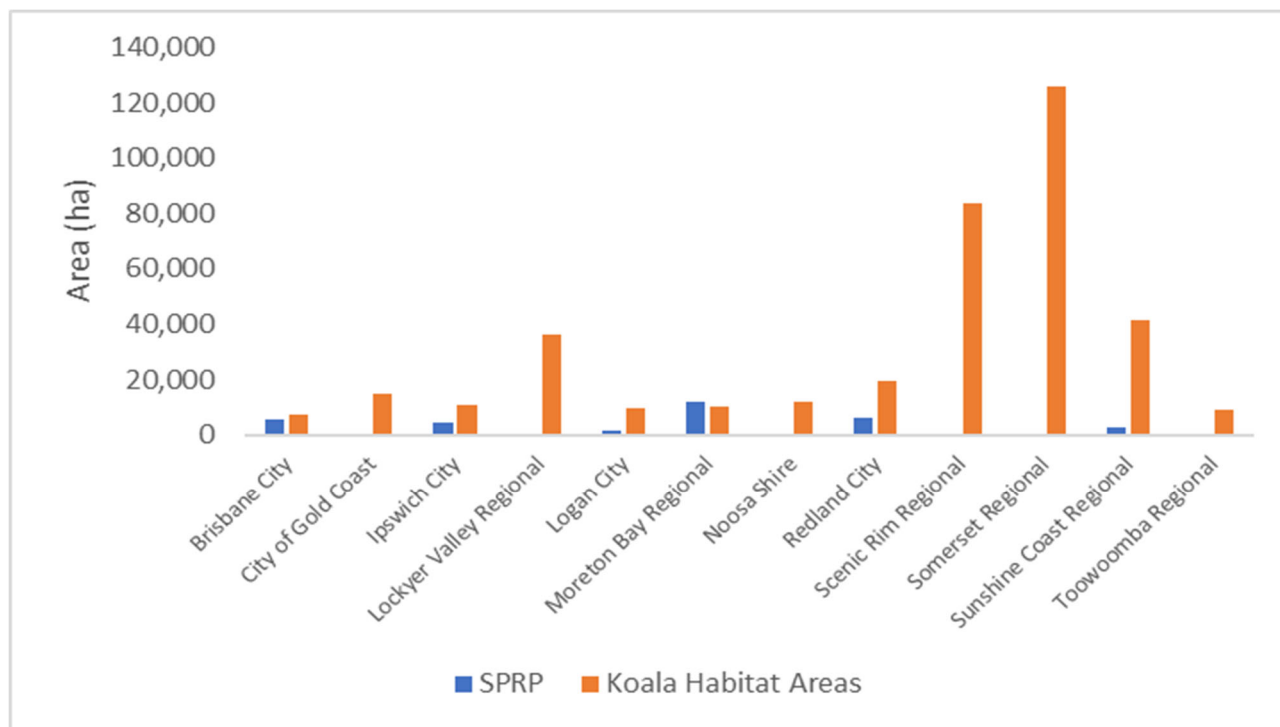


Figure 17 The area of mapped koala habitat in each SEQ Local Government jurisdiction

For Figure 17 above, the area of mapped koala habitat to which koala planning instruments applied/apply is shown, including pre-February 2020, under the State Planning Regulatory Provisions (SPRP) and post-February 2020 under the new provisions of the Planning Regulation ('Koala Habitat Areas'). Note that four SEQ Local Government areas were not captured under the SPRP (Lockyer Valley, Scenic Rim, Somerset, Toowoomba). This graph does not capture areas that are within the mapped KPA under the new regulation, as interference with koala habitat is prohibited in these areas (noting that some exemptions apply).

Using data collated by DES for assessed developments that triggered an offset under the respective regulatory approaches, an overview of offset cost liabilities was summarised (Figure 18). Noting the substantial difference in the timeframe over which the frameworks were/have been in force (approximately 10 years for the now superseded SPRP compared with two years for the new planning regulations), drawing inferences about implications for offset costs between the two frameworks is constrained. Nonetheless, considering averages (offset liability per authority; offset liability per hectare of impact) does provide a basis for examining differences between the two policy approaches. Using data on 'Financial Settlement Offsets' from the DES dataset, under the new regulations (post-February 2020) the *average cost of offsetting per authority* is 24% higher than under the SPRP (Figure 18). However, the *average cost of offsetting per hectare impacted* is 15% lower (Figure 18). Noting the limitations on deriving robust conclusions on these datasets given their lack of comparability, the aforementioned findings *may* be indicative of a situation where under the new regulations, larger impacts are occurring, but for which cheaper offsets (per ha) can be delivered – a possible reflection of the broadening of the scope of the new regulations to include four 'western' SEQ Local Government areas. Summary data on koala habitat loss that has triggered an offset requirement since February 2020 are presented in Table 8.

It is also important to recognise that these data only relate to offsets delivered under a matter of state environmental significance designation under Queensland legislation (see also Section 1.2). It may be the case that offsets for losses of koala habitat have been conditioned under a Commonwealth approval (under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and that these losses/offsets are not captured in the Queensland Environmental Offsets Public Register. This will be of consequence for evaluating losses and especially gains of koala habitat in the region. In particular, losses triggering the EPBC Act (e.g.

warranting scrutiny as a potential 'significant impact') may be larger than those captured only by Queensland offsets triggers. That is, the Queensland policy may be triggered by losses that are not significant at a Commonwealth level (small losses), whereas larger losses may be being assessed under the EPBC Act, with offsets (and the gains they entail for SEQ koala habitat) subsequently conditioned under the Commonwealth *Environmental Offsets Policy 2012*.

Table 8 Summary data on koala habitat loss that has triggered an offset requirement since February 2020

SEQ Local Government	KHA outside KPA (ha)	Percent KHA	Area impacted (ha)	Percent of impact	Percent of KHA impacted
Brisbane City	7421	2%	0.2	1.01%	0.00%
City of Gold Coast	14993	4%	1.3	8.25%	0.01%
Ipswich City	11003	3%	0.2	1.28%	0.00%
Lockyer Valley Regional	36257	9%	0.3	2.24%	0.00%
Logan City	9716	3%	5.3	34.30%	0.05%
Moreton Bay Regional	10425	3%	2.6	17.18%	0.03%
Noosa Shire	12146	3%	-	0.00%	0.00%
Redland City	19716	5%	-	0.00%	0.00%
Scenic Rim Regional	83483	22%	-	0.00%	0.00%
Somerset Regional	126042	33%	-	0.00%	0.00%
Sunshine Coast Regional	41561	11%	5.5	35.75%	0.01%
Toowoomba Regional	8959	2%	-	0.00%	0.00%
TOTAL AREA	381722	100%	15.4	100.00%	0.004%

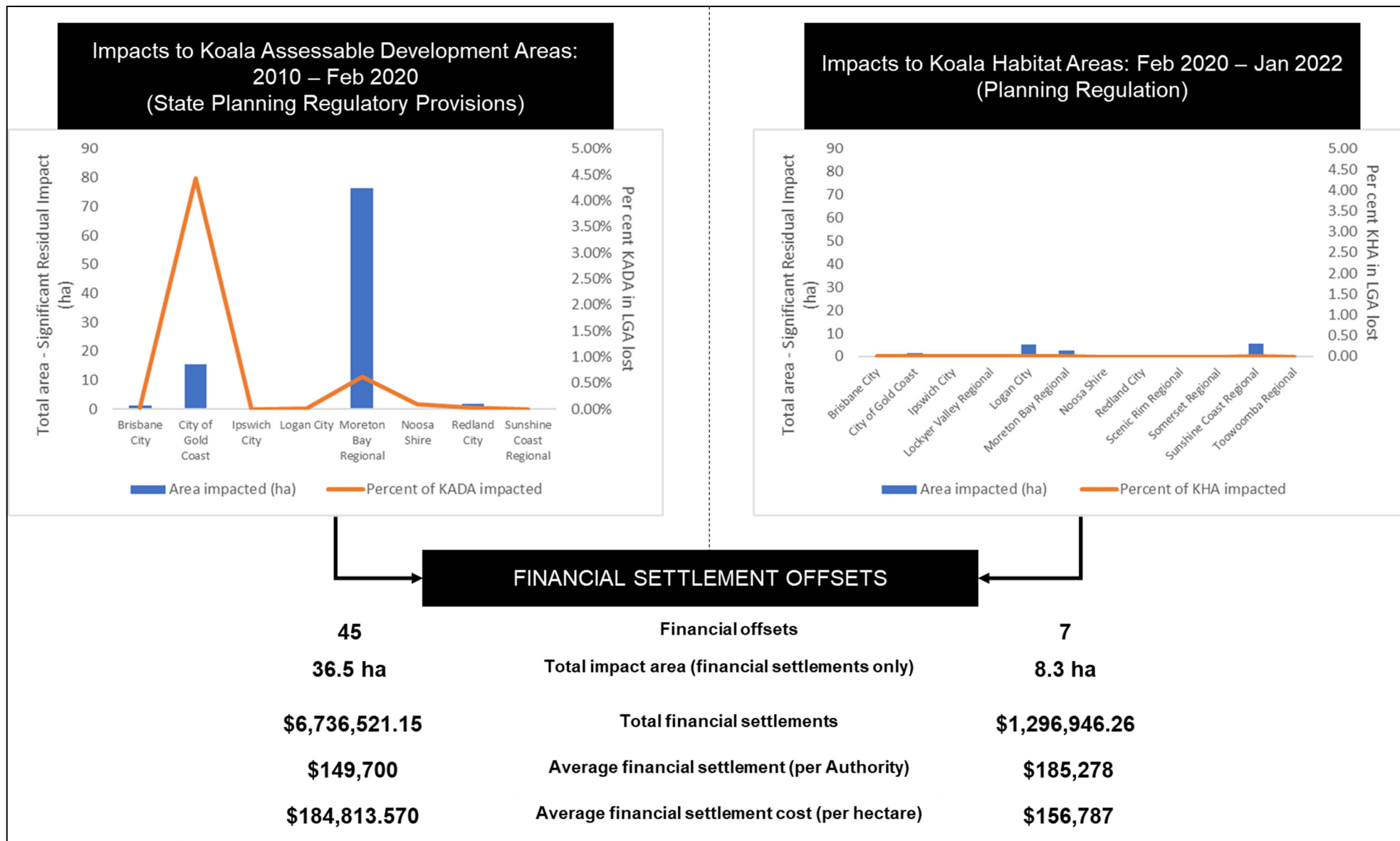


Figure 18 Significant residual impacts to koala habitat triggering offsets under Queensland legislation (the superseded SPRP (chart at top left) and the new regulations (chart at top right)), and (Financial Settlement) offset liabilities which have been delivered for a subset of these offsets

When considering the two years either side of the enactment of the new regulations (i.e. the last two years of the SPRP (2018, 2019); the first two years of the new regulations (2020,2021)), two spatial trends emerge with respect to requirements for koala offsets (Figure 19). First, most offsets have been triggered by impacts inside the Urban Footprint. Second, most offsets have been triggered by impacts close to the coast. Further monitoring of these trends is recommended – over time, should this trend continue, it would be instructive to examine *why* these patterns are presenting. Key questions to consider would be whether the new regulations are incentivising developers to site projects away from mapped koala habitat in LGAs where (relatively) large areas of habitat remain (e.g. western LGAs/outside Urban Footprint) – a ‘positive’ policy impact; or whether clearing of vegetation in (potential) koala habitat at inland locations/outside the Urban Footprint is not triggering offsets (exemptions) and/or whether observed clearing events are ‘unexplained’.

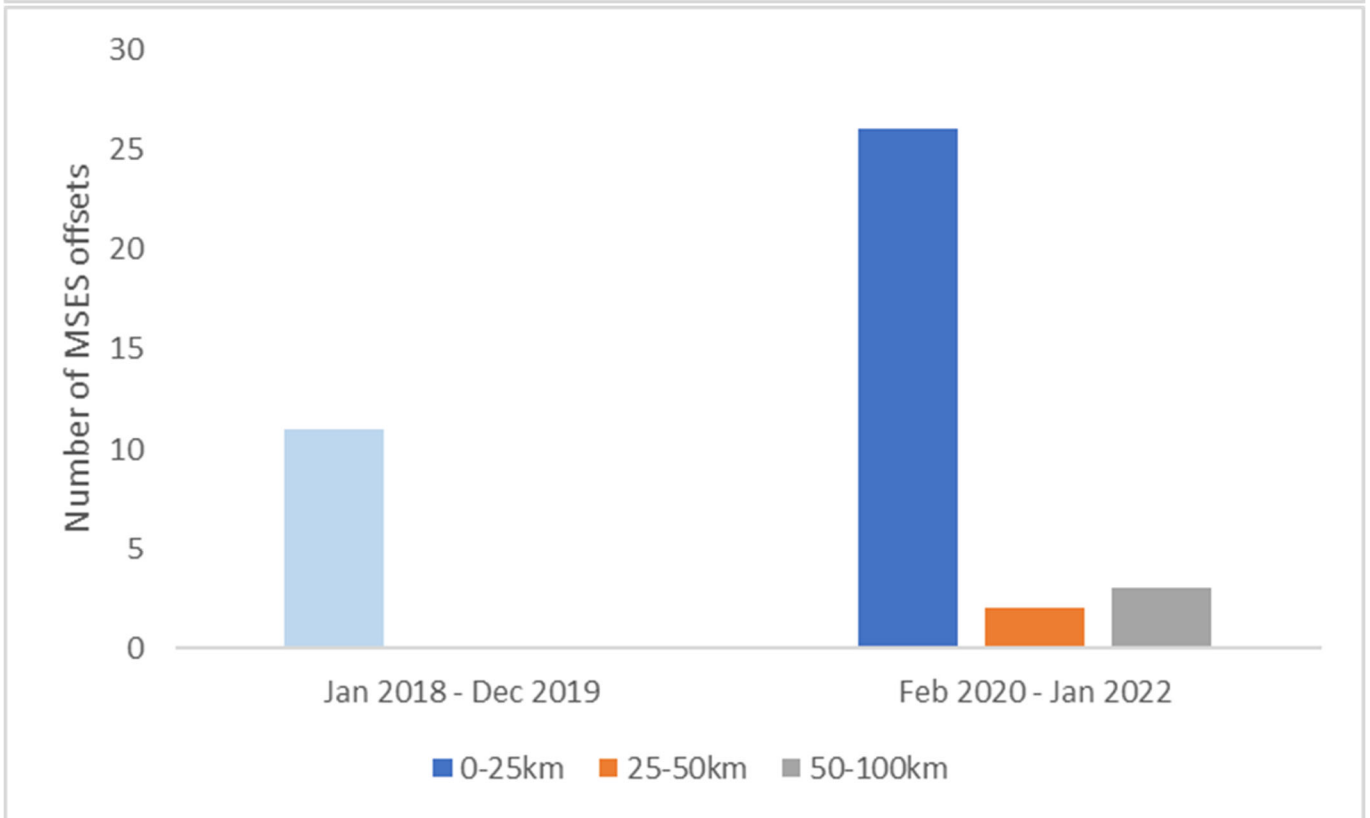
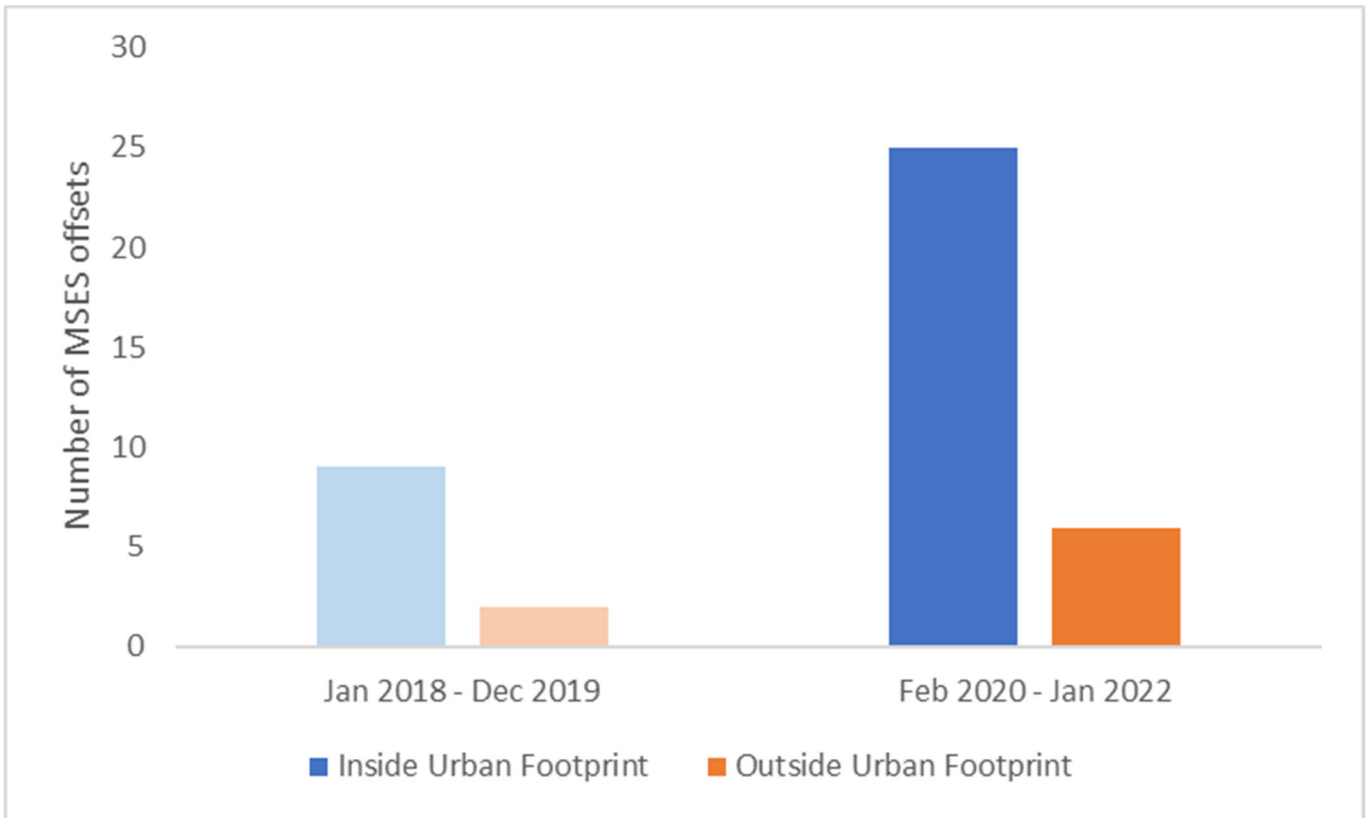


Figure 19 Spatial attributes of sites triggering koala offsets under Queensland legislation for the two years either side of the new regulations coming into force - inside/outside Urban Footprint (left); distance to the coast (right)

4. Discussion

4.1 Summary of key findings

It is understood that the PIR has four key focus areas: *prohibited development*, *assessable development*, *exempted development* and *mapping*. Commentary on SEQ koala mapping is beyond the scope of this project, and is not provided here. A list of high-level findings, and interpretations of these, is presented here for the other three themes.

Prohibited development – clearing of KHA and KPA:

- Observed or proposed clearing was documented for properties overlapped by KPA in both the SEQ Local Government case studies and ADVCC datasets. As noted in Section 3, determining whether clearing events at properties overlapped by KPA actually involved the removal of koala habitat *within* the KPA was not possible, as these data were not available in a spatial format.
- In the SEQ Local Government case studies dataset, a number of clearing events (n=9 out of 50) were described as ‘unexplained’ – these events *may* be representative of clearing (and subsequent development) that is/should have been prohibited. It follows that these losses likely went uncompensated.
- All clearing on properties overlapped by KPA was labelled as exempt or unexplained (Figure 5). This is potentially indicative of the new regulations diverting assessable development to outside the KPA.
- The average area of vegetation loss per clearing event on properties containing KPA was 1.2 ha. This was less than the average loss per clearing event on properties containing KHA (but not in the KPA; 1.8 ha). This is potentially indicative of the KPA acting to reduce clearing for (large) developments – noting that all such clearing on KPA properties was exempt or unexplained.

Assessable development – clearing of KHA and KPA:

- Based on the data made available to GHD by SEQ Local Governments and DES (‘Koala Offsets’ dataset), the total area of proposed koala habitat removal *that has undergone assessment and approval* coincident with the new regulation being in force (since February 2020), is small: less than 56 ha based on the SEQ Local Government case studies (some of which *may* have been KHA; noting that some of this loss was exempted development or ‘unexplained’), and approximately 15 ha according to the DES-supplied data on impacts triggering koala habitat offsets. It is important to note that these data are not representative of all assessed and approved clearing of koala habitat across SEQ since February 2020 – the datasets are a subset of information that were available for this analysis.
- As a comparison, only two assessed developments (across the same five SEQ Local Government areas considered in the SEQ Local Government case studies dataset), triggered offsets for (non-koala) terrestrial matters of state environmental significance since February 2020. These impacts, both in Logan City, totalled less than 3 ha of vegetation (habitat) loss.
- All clearing on properties overlapped by KPA was labelled as exempt or unexplained (Figure 5). This is potentially indicative of the new regulations diverting assessable development to outside the KPA.
- There was little discernible pattern or trend in *where* assessable development was occurring, with respect to parameters including distance to the coast and inside/outside the Urban Footprint.
- Commonly applied conditions attached to development approvals where koala habitat was proposed to be impacted included requirements for a ‘koala management plan’, offsets, and koala-friendly/koala-exclusion fencing. Other conditions that were frequently invoked included a requirement to comply with strict clearing limits, and to notify DES prior to the commencement of clearing. Based on data provided by DES, 48 SARA-approved DAs with conditions linked to koala conservation have been catalogued since February 2020. Of these, 27 were required to provide an offset for koala habitat loss.
- Using data on ‘Financial Settlement Offsets’ from the DES Koala offsets dataset, under the new regulations (post-February 2020) the average cost of offsetting per authority is 24% higher than under the superseded SPRP. However, the average cost of offsetting per hectare impacted is 15% lower. Noting limitations on deriving robust conclusions on these datasets given their lack of comparability (namely, the different timeframes over which the SPRP and new regulations have been/were in force), these findings *may* be

indicative of a situation where under the new regulations, larger impacts are occurring, but for which cheaper offsets (per ha) can be delivered. This in turn may be a reflection of the broadening of the scope of the new regulations to include four 'western' SEQ Local Government areas, where larger impacts *may* be less (spatially) constrained, and offset delivery *may* be cheaper.

Exempted development:

- Exemptions for clearing of vegetation on properties that are overlapped by KHA and KPA appear to have been widely invoked since February 2020. For the SEQ Local Government case studies dataset, exempted development was the most frequently identified type of clearing (from a regulatory perspective), comprising 22 out of 50 clearing events.
- The use of multiple exemptions ('stacking' of exemptions) was noted from at least four clearing events catalogued in the Local Government case studies dataset.
- All clearing (observed/proposed) on properties overlapped by the KPA was labelled as 'exempt' or 'unexplained' in Local Government case studies dataset. The lack of approved (i.e. assessable) development in the KPA is potentially indicative of this regulatory measure working to prohibit development in these most important areas for koala. However, ongoing losses (albeit, small – average size per loss = 1.2 ha) that go uncompensated (no offset) risk the cumulative drawdown of habitat quantity and quality in the KPA.
- Examination of the DES-provided ADVCC dataset revealed the following about accepted development:
 - The total extent of vegetation cleared or permitted to be cleared under ADVCC accepted development was 20,039 ha (this includes properties that are not overlapped by KHA or KPA (~24% of dataset)). Accepted development under the ADVCC was concentrated in four SEQ Local Government areas: Toowoomba (139 out of 462 = 30%); Somerset (14%); Lockyer Valley (14%); and Scenic Rim (12%) (i.e. the four 'western' SEQ Local Government areas). Two 'purposes' dominated accepted development under the ADVCC: "native forest practice" (246 out of 462 = 53%); and "managing weeds" (32%).
- The majority of ADVCC events were outside of the Urban Footprint (95%), and 64% of ADVCC clearing events were greater than 50 km from the coast.
- Multiple instances of ADVCC accepted development were notified at 51 properties. On 20 properties, more than one ADVCC notification for the same clearing purpose was recorded.

4.2 Effectiveness and limitations of regulations

The new regulations cover a much broader geographic extent than the regulatory framework they supersede. They entail greater coverage of koala habitat across SEQ, including in four 'western' SEQ Local Government areas, and embed stricter limits and prohibitions on development – especially in the newly designated KPA. This study, premised on data provided by five SEQ Local Governments and DES, provides a snapshot of clearing/proposed clearing at properties including those overlapped by KHA and KPA, since the new regulations commenced in February 2020. Noting that this analysis is limited to a subset of data on clearing across the region, it is concluded that a relatively small number of clearing events involving *potential* or actual KHA have occurred since February 2020 under an approved Development Application. Such developments have been conditioned to comply with a range of requirements, including in some instances, an offset liability under the *Environmental Offsets Act 2014*. Notably though, not all assessed developments considered here were conditioned to provide offsets for koala habitat loss.

The use of exemptions to clear on properties containing KHA or KPA (not necessarily indicative of clearing of KHA) appears to be commonplace. While some exemptions may be a legacy of approvals under previous regulatory instruments, it is nonetheless evident that instances of multiple exemptions being applied on a single property is occurring. Again, it is reiterated that these results must be considered as incomplete – the data informing these conclusions are an incomplete picture of clearing across the region since the new regulations commenced.

When considering that (1) some assessable (approved) development is proceeding without a condition to offset residual losses to koala habitat; (2) exemptions are being invoked (often multiple on a single property) to clear vegetation (which may be KHA, outside *and inside* the KPA); and (3) accepted development under mechanisms like the ADVCC is being notified across hundreds of sites across SEQ, the outcome is an ongoing, uncompensated loss of koala habitat. If the aspirational intent of the new regulations is to achieve a benchmark outcome of, for example, *no net loss* of koala habitat within those areas over which the policy has jurisdiction (i.e.

KHA including the KPA), then losses which are largely compliant with the new regulations (i.e. excluding instances of non-compliance (unexplained clearing)), but for which the response does not entail compensatory gains, detracts from the achievement of this aspiration.

4.2.1 Recommendations for ongoing policy impact assessment

Uncompensated losses of koala habitat compromise the contribution that the new regulations can make towards delivering outcomes that are consistent with the headline targets of the 'South East Queensland Koala Strategy 2020-2025' (DES 2020). Perhaps of most direct applicability to the regulation of development/clearing of native vegetation under the new regulations is Target 2 of the Strategy: *a net gain in the total core koala habitat area*. While this study can only provide limited recommendations given the caveats on the analysis and its data inputs, it is noted that careful consideration and examination of the use of exemptions (and 'unexplained' clearing) should be undertaken, lest these losses detract from the achievement of Target 2. For the new regulations to balance losses and gains in such a way that helps in achieving the broader Target 2 outcome, the following recommendations, which are focussed on addressing the 'drawdown' of koala habitat through uncompensated losses, should be considered:

- A requirement that all assessed and approved development with a residual significant impact on koala habitat provide an offset.
- A review of the use of exemptions including thresholds of exempt loss, and the use of multiple exemptions for different purposes on a property.
- Compliance and enforcement where clearing is non-compliant with the new regulations.

The achievement of gains from offsets also warrants scrutiny, especially noting a potential disconnect between the definition of net gains in the Strategy (*Net gain consists of actual on-ground changes to koala habitat extent since 2020, such as through regrowth reaching 15 year maturity, restored habitat and cleared habitat*), and the delivery of offsets through a financial settlement. Key considerations for delivering net gains via offsets 'on the ground' include ecological feasibility, social, legal and governance conditions, and the meaningful and proactive engagement of Indigenous custodians in decisions about offset siting and delivery (Simmonds *et al.* 2022). With respect to the aspiration of the new regulations (for example, to achieve at least a *no net loss*), as an element of a broader net gain objective for koala habitat across SEQ as part of the Strategy, the only way this can be achieved is if 'new' koala habitat is created to replace lost (cleared) habitat, at a ratio of at least 1:1. To exemplify, for every 1 ha of koala habitat that is lost within the remit of the policy, the only way a no net loss (or better) outcome can truly be achieved is if 1 ha of koala habitat is created (via replanting, rehabilitation) at a site where it was not present at the time of the loss. Important considerations here include the time lag between the loss and the gain, and the recognition that considerably more than 1 ha of management (e.g. replanting, rehabilitation) would likely be needed to achieve an ecologically-equivalent 1 ha gain (because of failure of rehabilitation, die-off of replanted trees etc.). On the latter, the *ratio* to achieve no net loss will therefore need to be greater than 1:1. The way in which offsets are delivered - how much offset per unit of loss, and how this is provided (on-the-ground versus non-land based) – in addition to how often/for what they are applied (see previous paragraph), will have a significant bearing on the achievement of desirable policy and broader conservation outcomes for the species.

This report provides a range of recommendations about ongoing monitoring and trend analysis to inform a more detailed and holistic assessment of the impact of the new regulations. Key points raised in this assessment include suggestions to (1) monitor the application and outcomes of conditions placed on approved development (see Section 3.1.4), and (2) examine spatial and temporal trends in offsets (impact sites *and* offset sites) and the use of exemptions to identify potential benefits of and flaws in the new framework. As noted immediately above, scrutiny on losses (via exempt or unexplained development) and gains (via offsets) is fundamental to tracking the effectiveness of the new regulations (see below), and ultimately, progress towards Target 2 of the Strategy.

With that said, the overarching success measure of the effectiveness of the new regulations will be the determination of a reduction in vegetation clearing *coupled with* the management of losses and gains in a way that contributes to broader objectives (the Strategy – net gain in habitat) across the areas to which the new regulations have effect. It is noted that determination of reductions (in clearing) and increases (in offset delivery, such that real compensatory gains are delivered) in koala habitat *that are attributable to the policy* (i.e., the impact of the policy), require a comparator – a baseline or frame of reference against which such change can be assessed.

The **impact** of a policy is the observed difference in the entity (in this case, koala habitat) that can be directly attributed to the policy's intervention/s (in this case, prohibiting/regulating habitat clearing (losses) and requiring offsets (gains)). This is distinct from the **outcome** of a policy, which is the status of the entity (the amount of koala habitat) at some time after the policy was introduced (Schleicher *et al.* 2019). To determine the impact of the new koala regulations, that is, the contribution that the new regulations have made towards a change in koala habitat area in SEQ (the outcome), it would be necessary to undertake an analysis of a counterfactual scenario (i.e. how much clearing/koala habitat loss (but also gain) would have occurred if the new regulation had not been introduced). There are several methods to do this, one of which is statistical matching. This approach was recently used to assess the impact of Queensland protected area policy on deforestation rates (Hernandez *et al.* 2021).

In the case of the new koala regulations, to determine the policy's impact (the difference it has made to SEQ koala habitat area by reducing clearing rates and driving gains), statistical matching could be used to analyse the observed patterns of clearing inside and outside the KHA/KPA in statistically-similar sites. Such an approach requires detailed spatial and statistical analysis, and is reliant on up-to-date (and to increase the power of analysis, long-term) data on vegetation clearing (Queensland's SLATS monitoring program would be a suitable dataset). This is beyond the scope of this project (and to GHD's knowledge, suitable vegetation clearing data at the required temporal and spatial scale is currently unavailable). However, it is noted here for the Department's consideration for future policy impact analysis.

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