Department of Science, Information Technology, Innovation and the Arts

Land Use Summary 1999–2011

for the Maroochy and Noosa catchments within SEQ

Prepared by: Remote Sensing Centre, Science Division, Department of Science, Information Technology, Innovation and the Arts, GPO Box 5078, BRISBANE QLD 4001

Telephone: (07) 3170 5664

Email: craig.shephard@dsitia.qld.gov.au

Web: www.qld.gov.au/environment/land/vegetation/mapping/qlump/

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Citation

DSITIA. 2014, Land use Summary 1999–2011: Maroochy and Noosa catchments, Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

To access land use datasets it is recommended that the Queensland Government Information Service (QGIS) be used. Search for **"land use mapping"** in the type of data search after restricting your search to **"cadastral and land planning"** in the topic category field. Metadata is also available from QGIS.

Acknowledgements

We wish to acknowledge the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) who coordinate the Australian Collaborative Land Use and Management Program (ACLUMP).

The QLUMP team includes staff from DSITIA in Brisbane and four business centres of the Department of Natural Resource and Mines (DNRM) South Region. The input from the regions has been extremely valuable in respect of their mapping skills, local knowledge and capacity to engage regional experts in compiling updated land use mapping data.

June 2014

CCI job number: cs0213

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Introduction

The Queensland Land Use Mapping Program (QLUMP) is a joint initiative of the Department of Science, Information Technology, Innovation and the Arts (DSITIA) and the Department of Natural Resources and Mines (DNRM). QLUMP is part of the Australian Collaborative Land Use and Management Program (ACLUMP) coordinated by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). ACLUMP promotes nationally consistent land use information.

Land use and land management practices have a profound impact on Queensland's natural resources, agricultural production and the environment. The availability of consistent and reliable spatial information regarding land use is critical for sustainable natural resource management by Australian, Queensland and local Governments, Natural Resource Management regional groups, industry groups, community groups and land managers.

QLUMP has updated land use mapping in the South-East Queensland (SEQ) Natural Resource Management Region to 2011 or later. Mapping has been compiled at the catchment level, with the exception of the Brisbane catchment, which has been divided into its sub-catchments (Brisbane River, Stanley River, Lockyer Creek and Bremer River) due to the size and diversity of the area. Apart from the Maroochy and Noosa catchments (2011) and the Brisbane River sub-catchment (2013), remaining catchments in SEQ were updated to 2012.

This report presents and summarises land use mapping in the Maroochy and Noosa catchments (which accounts for 11% of SEQ total area) including:

- revised 1999 and 2006 land use datasets including improvements and corrections to the originals
- 2011 land use dataset
- land use change dataset from 1999–2006, 2006–2011 and 1999–2011
- summary statistics derived from the above spatial datasets
- results of the accuracy assessment of the 2011 land use dataset

Methodology

Mapping is performed in accordance with ACLUMP guidelines. The methodology is accurate, reliable, cost-effective, and makes best use of available databases, satellite imagery and aerial photography. QLUMP maps each catchment with the most recent suitable imagery available. The updated land use datasets for each catchment within SEQ range from 2011 to 2013.

The Australian Land Use and Management (ALUM) classification (Figure 1, page 5) shows five primary classes, identified in order of increasing levels of intervention or potential impact of land use; *water* is included separately as a sixth primary class. Within the primary classes is a three-level hierarchical structure. Primary, secondary and tertiary levels broadly describe the potential degree of modification of or impact of land use on the landscape. The secondary level in the three-level hierarchical structure is the minimum attribution level for land use mapping in Queensland.

Primary and secondary levels relate to land use (i.e. the principal use of the land in terms of the objectives of the land manager). The tertiary level includes data on commodities or infrastructure, (e.g. crops such as cereals or infrastructure such as *urban residential*). Where possible, class

attribution is performed to the tertiary level. For instance, QLUMP consistently maps land use classes *sugar* and *cotton* (dryland and irrigated) to tertiary level.

The mapping scale is 1:50,000 with a minimum mapping unit of two hectares and a width of 50 metres for linear features.

The 1999 (or later where available) baseline land use dataset formed the basis for the 2011 land use dataset. The 1999 and 2006 land use maps were revised and improved in addition to compiling an updated land use map for 2011. This was achieved primarily by interpretation of SPOT5 satellite imagery, high-resolution orthophotography, scanned aerial photography and inclusion of expert local knowledge. An ESRI ArcSDE geodatabase replication environment was utilised to overlay land use datasets on imagery and digitise or modify areas previously omitted or incorrectly mapped in the 1999 and 2006 mapping, as well as areas of actual land use change (2011). A land use change mapping product was then derived (at the secondary level of the ALUM classification) between 1999–2006, 2006–2011 and 1999–2011.

Some land uses are difficult to differentiate using satellite imagery and existing databases, for example, dryland and irrigated *agriculture*. To overcome this, local expert knowledge was an important component of the mapping methodology. This was provided by regional staff in state government agencies, natural resource management groups, shires, agricultural industries and landholders. Field survey is also undertaken to verify areas of uncertainty in the land use mapping.

The land use mapping methods used by QLUMP are described in full in the ABARES handbook: Guidelines for land use mapping in Australia: principles, procedures & definitions – Edition 4

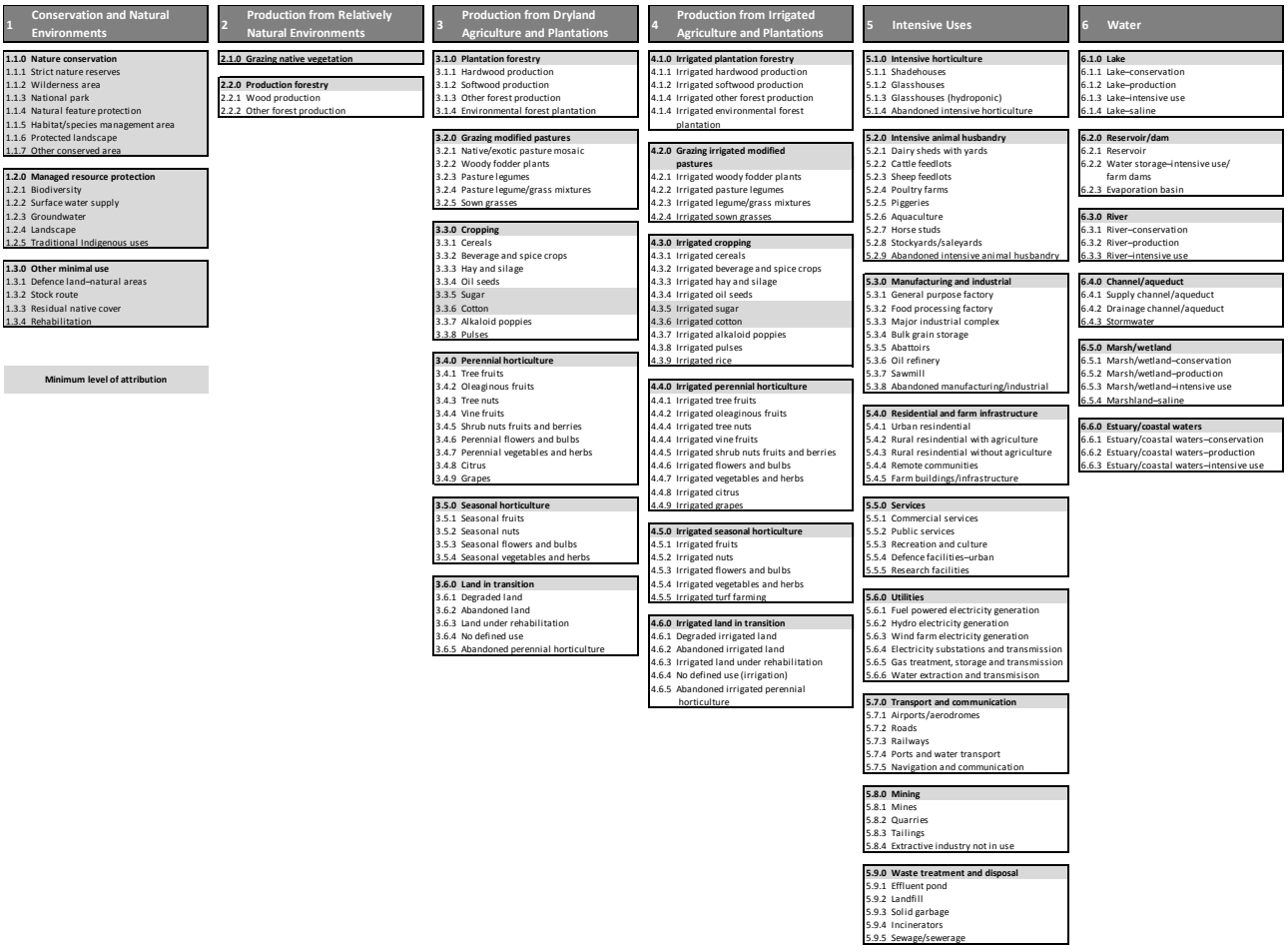

Figure 1: Australian Land Use and Management (ALUM) classification, Version 7

Data Limitations

Land use features that are linear, such as roads and railways, are not mappable at a scale of 1:50,000 with a specified minimum mapping width of 50 metres. As a result, the area estimates of these **linear features** represent only a small proportion of the actual area within this land use type in Queensland. This is of relevance to the following land use classes:

- *transport and communication*
- *utilities*
- *rivers*

Similarly, land uses that fall under the QLUMP minimum mapping area of two hectares are not explicitly mapped but aggregated into the surrounding land use class. This will have the effect of over-estimating the area of some land use classes, for example *other minimal use* and *grazing native vegetation*, whereby tracks and farm infrastructure, road reserves, drainage lines, cleared and uncleared land adjacent to rivers as well as land immediately adjacent to or between cropped paddocks are included.

Livestock grazing occurs on a range of pasture types including native and exotic as well as mixtures of both. Identifying and separating these using imagery, aerial photography and field observation is difficult and unreliable. Therefore, the ALUM classification secondary classes of *grazing modified pastures* and *irrigated grazing modified pastures* have not been mapped explicitly by QLUMP. Where possible (for example, with the benefit of field verification), these classes can be mapped (for example, dairy pastures and fodder crops). Areas of pasture which appeared to be harvested for fodder or grazed off were mapped as *cropping*. This may contribute an over-estimation of cropping in the region. The appearance of these can be highly variable and classification may therefore not be consistent.

The distinction between (dryland) *cropping* and *irrigated cropping* was not always evident and it is likely there is some misclassification in these classes. Proximity to water sources (watercourse or dam) as well as information from water entitlements (irrigation licences), field survey and local knowledge were used to confirm areas of irrigation as much as possible. Areas mapped as *irrigated cropping* are potentially irrigated on a supplementary basis and may not have actually been irrigated in 1999, 2006 or 2011.

The *rural residential* land use class is a source of possible thematic error. Properties on the fringes of suburban settlements, hobby farms and subdivisions in isolated localities with comparatively small lot sizes were mapped to this class. The use of Queensland Valuation System (QVAS) (valuation information) was helpful in mapping this class, based on whether or not the land owner was classified as a primary producer. Residential features greater than 0.2 hectares and less than 16 hectares were mapped as *rural residential.* This class may be misclassified with *grazing native vegetation* and o*ther minimal use*, especially on larger properties.

A combination of the Queensland Herbarium's wetlands and regional ecosystem datasets provided the basis for mapping *marsh/wetlands*, *lakes*, *rivers* and *reservoir/dams*. The ephemeral nature of many of these **water features** can lead to confusion insofar as they may be present in imagery of one date and either absent or of differing extent in imagery of subsequent or previous dates. As a result, there may be errors, omissions and disagreement in the mapping of features such as farm dams, reservoirs, lakes, wetlands and other water features. Many water features, whilst exceeding the minimum mappable area requirements, do not meet the criteria for linear or uniform features.

The 1999, 2006 and 2011 land use datasets are a snapshot of what was interpreted as the primary land use in these years. However, effort was given to distinguishing between an actual land use change and a rotation. For example, an area that is usually cropped, but is not used for that particular purpose in the year of interest, was still mapped as *cropping* in the 2011 dataset even though no crop was present in that year. This was not considered an actual land use change, but rather a rotation, as the primary land use for that paddock would still be *cropping*.

Some confusion in thematic accuracy occurred in the Maroochy and Noosa catchments between the *cropping - sugar* and *grazing native vegetation* and/or *land in transition* land use classes. The point in time at which an area of *cropping - sugar* changes land use due to degradation or abandonment varies depending on individual interpretation and additional information. These thematic errors are shown in the accuracy assessment (page 24).

Refer to metadata for details on the mapping of specific classes.

Products

1999, 2006 and 2011 land use datasets

Figure 2 (page 9), Figure 3 (page 10) and Figure 4 (page 11) show the 1999, 2006 and 2011 land use datasets respectively, for the Maroochy and Noosa catchments, presented at the secondary level of the ALUM classification (Figure 1, page 5). Table 1 (page 12), Table 2 (page 13) and Table 3 (page 14) provide the summary statistics for each. All statistics presenting the area of land use classes are reported in hectares (ha).

Table 3 (page 14) shows that *nature conservation* (30%) and *residential and farm infrastructure* (18%) are the major land use classes for 2011 in the Maroochy and Noosa catchments.

Analysis of the overall change between land use classes shows the primary class of *production from relatively natural environments* decreased significantly by 21% or 9,521ha from 1999–2006. At the secondary level, the land use classes of *production forestry* decreased significantly by 47% or 7,658ha, whilst the *managed resource protection* land use class increased substantially (428% or 7,652ha) from 1999–2006. From 2006–2011 the *managed resource protection* land use class decreased by 78% or 7,320ha whilst the *nature conservation* secondary land use class increased significantly by 23% or 13,914ha. These changes were a result of the SEQ Forest Agreement, (whereby state forests have been progressively added to the conservation reserves estates),

The *intensive uses* primary land use class has increased by 9% or 4,043ha from 1999–2006 then again by 6% or 2,862ha from 2006–2011. The majority of this growth was observed in the *residential and farm infrastructure* secondary land use class, which increased by 9% or 3,335ha from 1999–2006 and then by 5% or 2,156ha from 2006–2011.

Analysis of the agriculture land use classes showed that *production from dryland agriculture* decreased by 4% or 1,848ha from 1999–2006, and decreased again by 10% or 4,527ha from 2006–2011. *Production from irrigated agriculture* increased significantly by 41% or 1,200ha from 1999–2006, before showing a slight decrease of 5% or 206ha from 2006–2011.

Of note is the decline in the *cropping – sugar* land use class through each epoch, decreasing by 20% or 2,077ha from 1999–2006, then decreasing significantly by 57% or 4,730ha from 2006–2011.

Analysis of the specific land use changes from one secondary class to another for 1999–2006 and 2006–2011 is presented in the section on page 14. Analysis of the land use change from 1999–2011 has been included as Appendix A, on page 22.

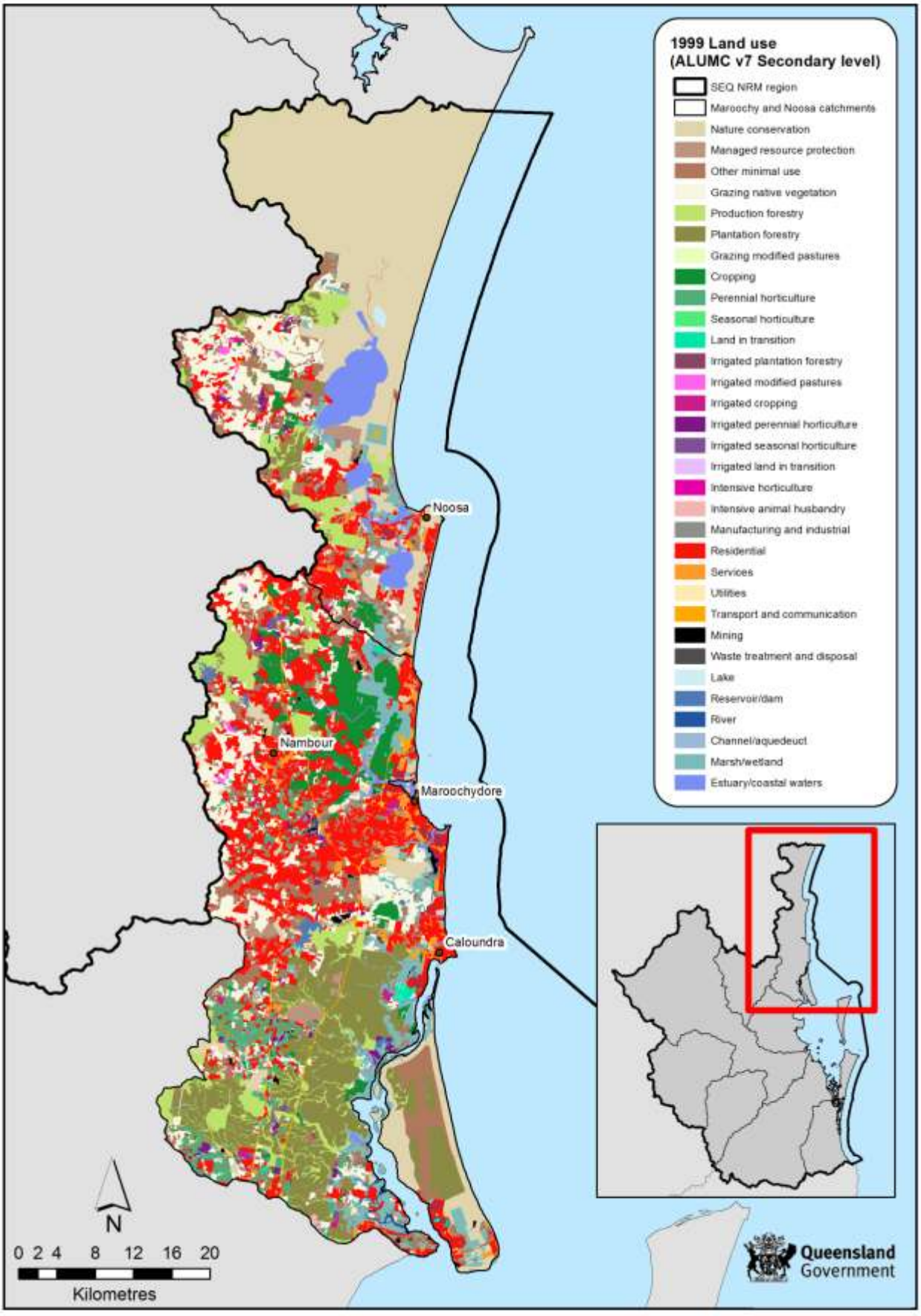

Figure 2: 1999 land use map for the Maroochy and Noosa catchments

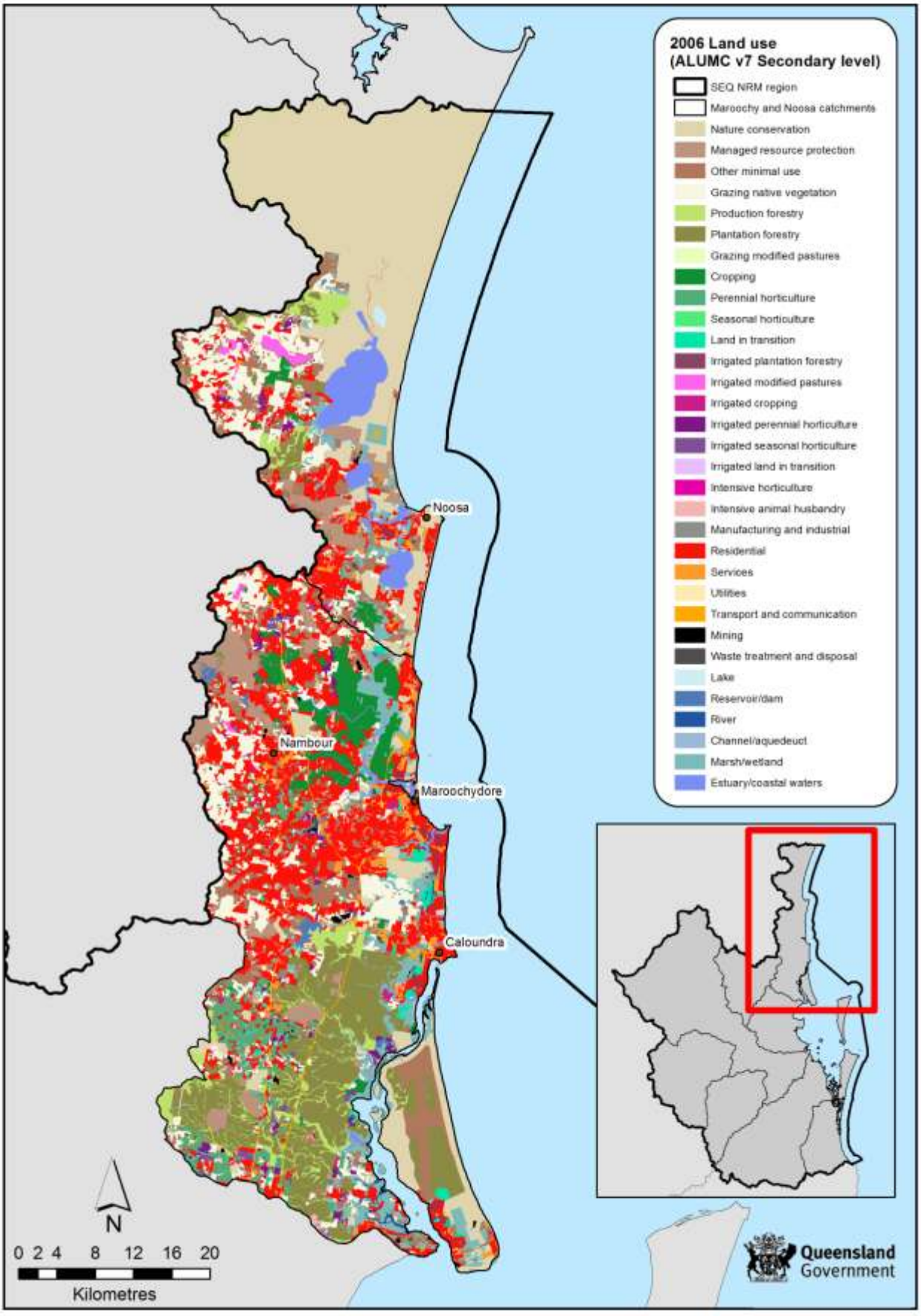

Figure 3: 2006 land use map for the Maroochy and Noosa catchments

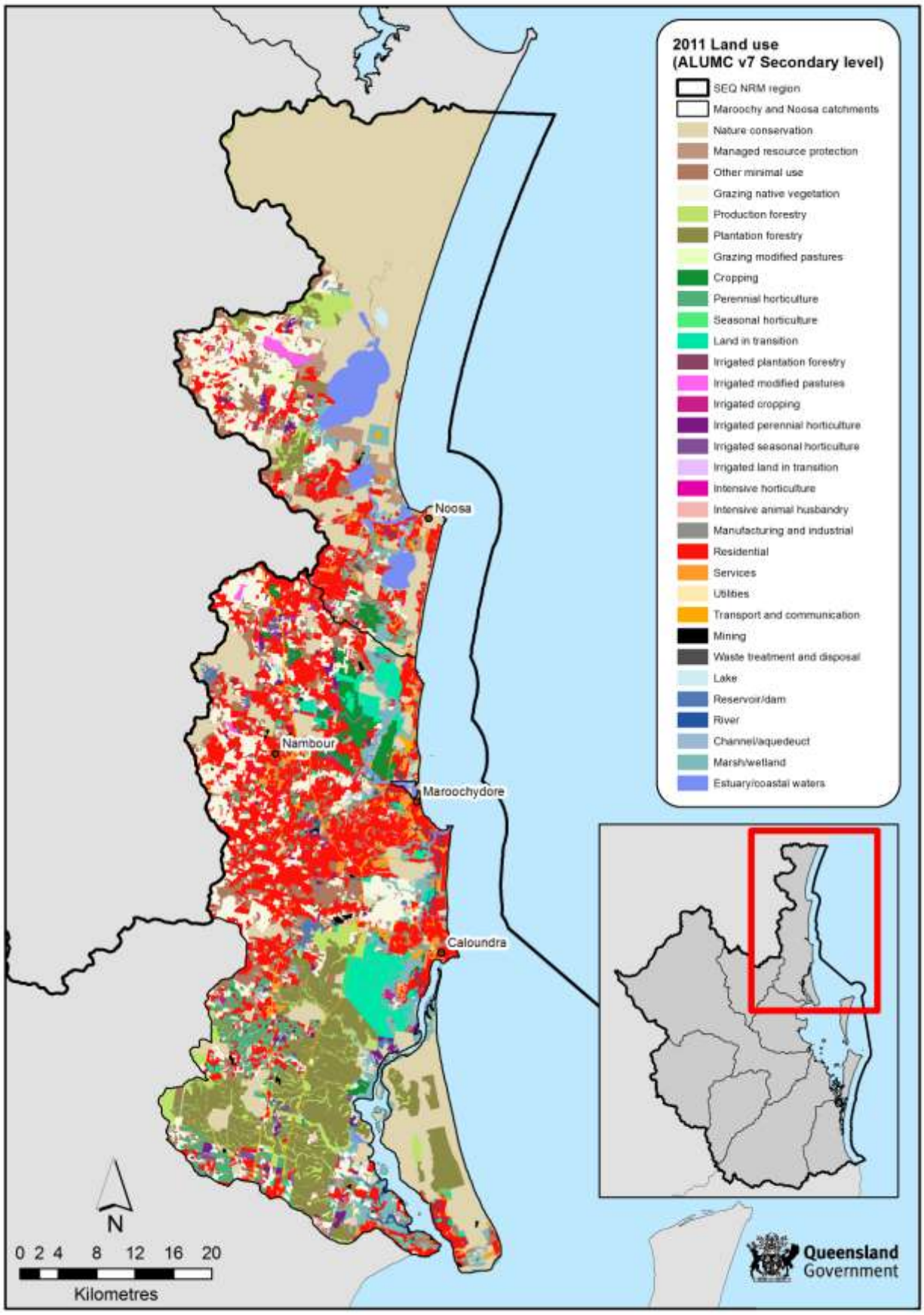

Figure 4: 2011 land use map for the Maroochy and Noosa catchments

Table 1: Summary statistics of land use in 1999 in the Maroochy and Noosa catchments

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	86,683	34,56
1.1	Nature conservation	58,645	23,38
1.2	Managed resource protection	1,787	0.71
1.3	Other minimal use	26,251	10.47
2	Production from relatively natural environments	44,530	17.75
2.1	Grazing native vegetation[1]	28,166	11.23
2.2	Production forestry	16,365	6.52
3	Production from dryland agriculture and plantations	45,756	18.24
3.1	Plantation forestry	27,785	11.08
3.3	Cropping	11,168	4.45
3.3.5	Cropping – Sugar[2]	10,346	4.12
3.4	Perennial horticulture	6,224	2.48
3.5	Seasonal horticulture	31	0.01
3.6	Land in transition	548	0.22
4	Production from irrigated agriculture and plantations	2,915	1.16
4.2	Irrigated grazing modified pastures[3]	381	0.15
4.3	Irrigated cropping	559	0.22
4.4	Irrigated perennial horticulture	1,508	0.60
4.5	Irrigated seasonal horticulture	459	0.18
4.6	Irrigated land in transition	8	<0.01
5	Intensive uses	46,676	18.61
5.1	Intensive horticulture	188	0.07
5.2	Intensive animal husbandry	442	0.18
5.3	Manufacturing and industrial	827	0.33
5.4	Residential and farm infrastructure	38,456	15.33
5.5	Services	4,075	1.62
5.6	Utilities	32	0.01
5.7	Transport and communication	1,825	0.73
5.8	Mining	597	0.24
5.9	Waste treatment and disposal	235	0.09
6	Water	24,275	9.68
6.1	Lake	323	0.13
6.2	Reservoir/dam	1,523	0.61
6.3	River	812	0.32
6.4	Channel/aqueduct	4	<0.01
6.5	Marsh/wetland	14,469	5.77
6.6	Estuary/coastal waters	7,144	2.85
	Grand Total	**250,835**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]the area of *cropping – sugar* is a subset of the total area of *cropping*.

[3]*irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Table 2: Summary statistics of land use in 2006 in the Maroochy and Noosa catchments

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	94,037	37.49
1.1	Nature conservation	60,663	24.18
1.2	Managed resource protection	9,439	3,76
1.3	Other minimal use	23,936	9.54
2	Production from relatively natural environments	35,009	13.96
2.1	Grazing native vegetation[1]	26,302	10.49
2.2	Production forestry	8,707	3.47
3	Production from dryland agriculture and plantations	43,908	17.50
3.1	Plantation forestry	27,235	10.86
3.2	Grazing modified pastures[2]	19	0.01
3.3	Cropping	8,994	3.59
3.3.5	Cropping – Sugar[3]	8,269	3.30
3.4	Perennial horticulture	6,113	2.44
3.5	Seasonal horticulture	14	0.01
3.6	Land in transition	1534	0.61
4	Production from irrigated agriculture and plantations	4,114	1.64
4.2	Irrigated grazing modified pastures[2]	988	0.39
4.3	Irrigated cropping	445	0.18
4.4	Irrigated perennial horticulture	2,054	0.82
4.5	Irrigated seasonal horticulture	607	0.24
4.6	Irrigated land in transition	20	0.01
5	Intensive uses	50,719	20.22
5.1	Intensive horticulture	342	0.14
5.2	Intensive animal husbandry	597	0.24
5.3	Manufacturing and industrial	866	0.35
5.4	Residential and farm infrastructure	41,791	16.66
5.5	Services	4,521	1.80
5.6	Utilities	32	0.01
5.7	Transport and communication	1,825	0.73
5.8	Mining	503	0.20
5.9	Waste treatment and disposal	241	0.10
6	Water	23,048	9.19
6.1	Lake	323	0.13
6.2	Reservoir/dam	1,522	0.61
6.3	River	875	0.35
6.4	Channel/aqueduct	11	<0.01
6.5	Marsh/wetland	13,172	5.25
6.6	Estuary/coastal waters	7,144	2.85
	Grand Total	**250,835**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures* and *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of c*ropping – sugar* is a subset of the total area of *cropping*.

Table 3: Summary statistics of land use in 2011 in the Maroochy and Noosa catchments

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	95,312	38,00
1.1	Nature conservation	74,577	29.73
1.2	Managed resource protection	2,119	0.84
1.3	Other minimal use	18,617	7.42
2	Production from relatively natural environments	36,927	14.72
2.1	Grazing native vegetation[1]	28,268	11.27
2.2	Production forestry	8,659	3.45
3	Production from dryland agriculture and plantations	39,381	15.70
3.1	Plantation forestry	22,865	9.12
3.2	Grazing modified pastures[2]	225	0.09
3.3	Cropping	4,165	1.66
3.3.5	Cropping – Sugar[3]	3,539	1.41
3.4	Perennial horticulture	5,070	2.02
3.5	Seasonal horticulture	3	<0.01
3.6	Land in transition	7,053	2.81
4	Production from irrigated agriculture and plantations	3,908	1.56
4.2	Irrigated grazing modified pastures[2]	784	0.31
4.3	Irrigated cropping	223	0.09
4.4	Irrigated perennial horticulture	2,116	0.84
4.5	Irrigated seasonal horticulture	782	0.31
4.6	Irrigated land in transition	3	<0.01
5	Intensive uses	53,581	21.36
5.1	Intensive horticulture	376	0.15
5.2	Intensive animal husbandry	851	0.34
5.3	Manufacturing and industrial	878	0.35
5.4	Residential and farm infrastructure	43,947	17.52
5.5	Services	4,834	1.93
5.6	Utilities	35	0.01
5.7	Transport and communication	1,879	0.75
5.8	Mining	523	0.21
5.9	Waste treatment and disposal	258	0.10
6	Water	21,725	8.66
6.1	Lake	336	0.13
6.2	Reservoir/dam	1,534	0.61
6.3	River	919	0.37
6.4	Channel/aqueduct	8	<0.01
6.5	Marsh/wetland	11,784	4.70
6.6	Estuary/coastal waters	7,144	2.85
	Grand Total	**250,835**	**100.00**

[1]*grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

[2]*grazing modified pastures* and *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

[3]the area of c*ropping – sugar* is a subset of the total area of *cropping*.

Land use change datasets (1999–2006, 2006–2011 and 1999–2011)

Figure 5, 6 and 7 (pages 17, 18 and 23), show the land use change datasets for the Maroochy and Noosa catchments. The data has been presented relative to the **change in intensity** of the land use at the secondary level of the ALUM classification.

For example, change from 2.1.0 (*grazing native vegetation*) to 2.2.0 (*production forestry*) is an increase in land use intensity, whilst change from 2.1.0 (*grazing native vegetation*) to 1.1.0 (*nature conservation*) is a decrease. This is highlighted in the ALUM classification (Figure 1, page 5). Moving down and from left to right through the classification, the level of intervention or potential impact of land use increases.

Land use change mapping products for this catchment have been compiled for three epochs (1999, 2006 and 2011). At the secondary level of the ALUM classification, the total area of land use change is:

- 1999–2006: 21,206ha (8% of the catchment). Of this 8,533ha (40% of the total change) is mapped as an increase in land use intensity, whilst 12,673ha (60%) is a decrease.
- 2006–2011: 29,801ha (12% of the catchment). Of this 10,425ha (35% of the total change) is mapped as an increase in land use intensity, whilst 19,375ha (65%) is a decrease.
- 1999–2011: 41,732ha (17% of the catchment). Of this 17,341ha (42% of the total change) is mapped as an increase in land use intensity, whilst 24,391ha (58%) is a decrease.

The land use change totals between the two eras (1999–2006 and 2006–2011) will not add up to match those compiled for the 1999–2011 era. This is because land use change mapping only accounts for land use at a specific moment in time; some change will result from rotation, whilst some may be the result of more than one change event. An example of this scenario is an area that was mapped as *grazing native vegetation* in 1999 may have been mapped as *land in transition* in 2006 before finally becoming *residential* in 2011. These changes would be reflected in each of the land use change mapping products as change from *grazing native vegetation* to *land in transition* in the 1999–2006, and change from *land in transition* to *residential* in 2006–2011, and lastly change from *grazing native vegetation* to *residential* in 1999–2011.

Summary statistics presenting the land use change at the secondary level for 1999–2006 and 2006–2011 are shown in Tables 4 and 5 (pages 19 and 20). The change from 1999–2011 is presented in Appendix A (page 22).

The 1999–2006 land use change shows that the change from *production forestry* to *managed resource protection* accounted for 6,971ha or 33% of all the total change mapped, followed by 1,567ha of *grazing native vegetation* changing to *residential and farm infrastructure*. Interestingly the loss of *grazing native vegetation* to *residential and farm infrastructure* was offset by change from *cropping – sugar* to *grazing native vegetation* of 1,266ha. Collectively, all the land use change to *residential and farm infrastructure* accounts for 3,506ha or 17% of the total for 1999–2006.

For 2006–2011, the largest land use changes were observed from *managed resource protection* (8,010ha or 27%) and *other minimal use* (3,871ha or 13%) to *nature conservation*.

The pattern of change from *production forestry* in 1999 to *managed resource protection* in 2006 and then to *nature conservation* in 2011, can be attributed to the SEQ Forest Agreement, as State forests in SEQ have been progressively added to the protected area estates.

Further analysis of the 2006–2011 land use change shows that 5,750ha (or 19% of the total change) was from *plantation forestry* (3,705ha) and *cropping – sugar* (2,045ha) to *land in transition*. This is related to the residential property development—Caloundra South.

Collectively for 2006–2011, all the land use change to *residential and farm infrastructure* accounts for 2,361ha or 8% of the total. This change has come from a variety of land uses, including *other minimal uses* (698ha), *grazing native vegetation* (615ha), *land in transition* (424ha), *perennial horticulture* (336ha) and *cropping – sugar* (174ha).

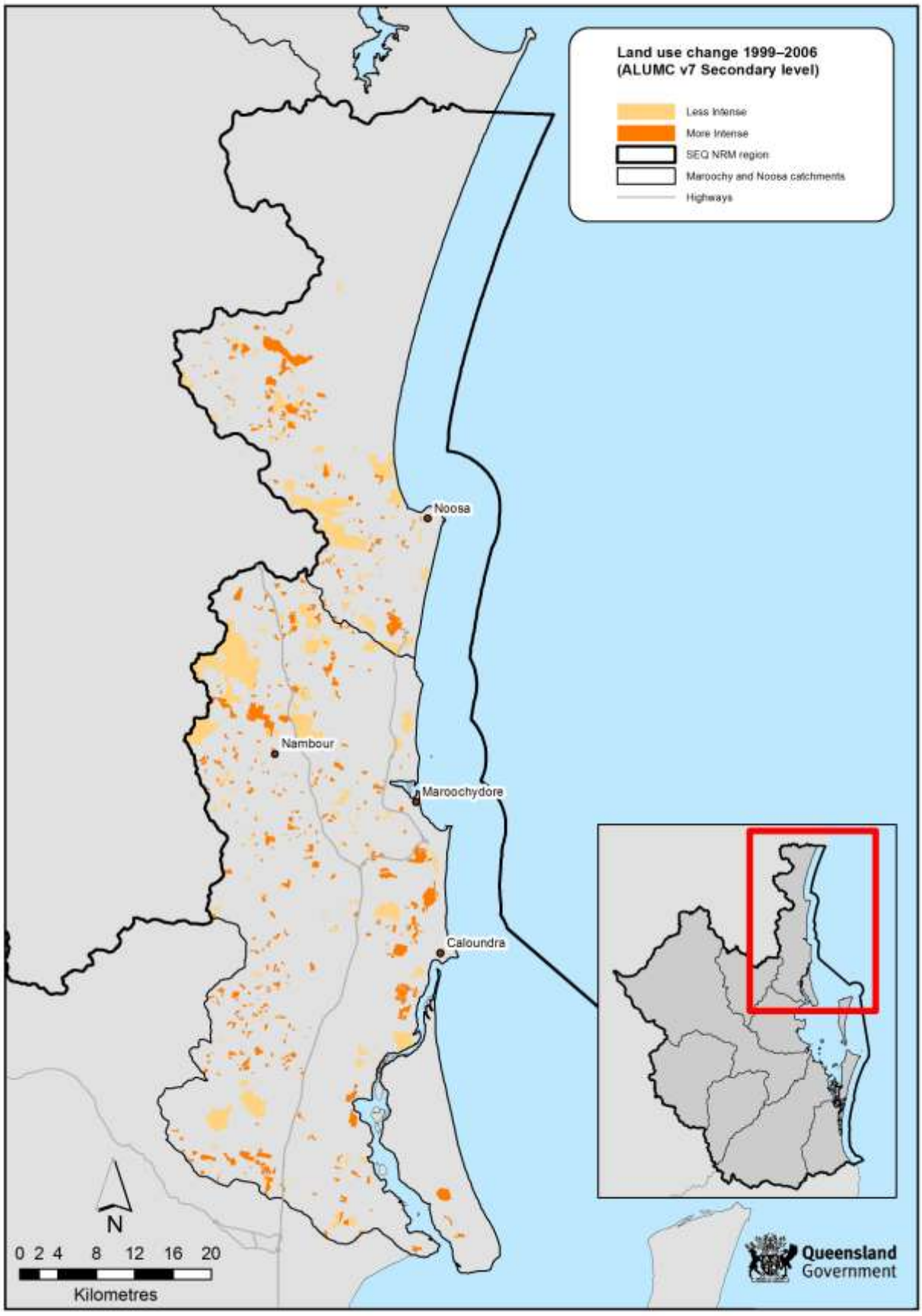

Figure 5: 1999–2006 land use change map at secondary level for the Maroochy and Noosa catchments

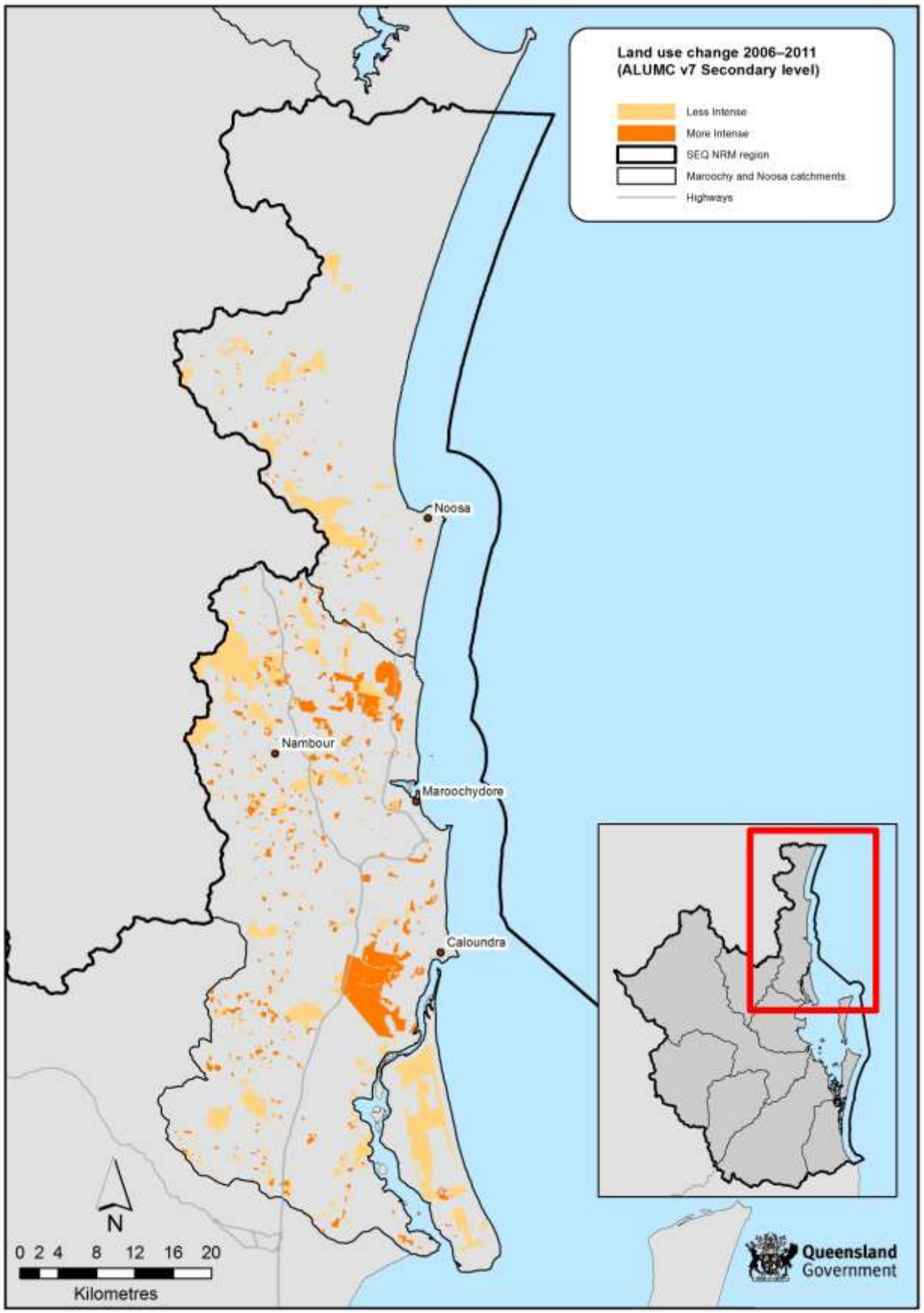

Figure 6: 2006–2011 land use change map at secondary level for the Maroochy and Noosa catchments

Table 4: Summary statistics for land use change at secondary level for 1999–2006 in the Maroochy and Noosa catchments (showing only the land use changes > 80ha)

Land use code 1999	Land use class 1999	Land use code 2006	Land use class 2006	Area (ha)	Area Change (%)	Total change (%)
2.2.0	Production forestry	1.2.0	Managed resource protection	6,971	2.78	32.87
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	1,567	0.62	7.39
3.3.5	Cropping – Sugar	2.1.0	Grazing native vegetation	1,266	0.50	5.97
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	1,106	0.44	5.22
6.5.0	Marsh/wetland	1.1.0	Nature conservation	1,037	0.41	4.89
2.2.0	Production forestry	1.1.0	Nature conservation	673	0.27	3.17
2.1.0	Grazing native vegetation	4.2.0	Irrigated modified pastures	672	0.27	3.17
1.3.0	Other minimal use	1.1.0	Nature conservation	659	0.26	3.11
2.1.0	Grazing native vegetation	3.6.0	Land in transition	513	0.20	2.42
1.1.0	Nature conservation	1.2.0	Managed resource protection	386	0.15	1.82
2.1.0	Grazing native vegetation	3.4.0	Perennial horticulture	345	0.14	1.63
3.4.0	Perennial horticulture	2.1.0	Grazing native vegetation	333	0.13	1.57
3.4.0	Perennial horticulture	5.4.0	Residential & farm infrastructure	239	0.10	1.13
3.1.0	Plantation forestry	3.6.0	Land in transition	236	0.09	1.11
3.3.5	Cropping – Sugar	3.6.0	Land in transition	210	0.08	0.99
2.1.0	Grazing native vegetation	5.5.0	Services	209	0.08	0.99
1.3.0	Other minimal use	3.6.0	Land in transition	205	0.08	0.97
3.3.5	Cropping – Sugar	3.3.0	Cropping	184	0.07	0.87
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	170	0.07	0.80
6.5.0	Marsh/wetland	1.2.0	Managed resource protection	169	0.07	0.80
3.3.5	Cropping – Sugar	5.4.0	Residential & farm infrastructure	162	0.06	0.76
3.3.5	Cropping – Sugar	4.4.0	Irrigated perennial horticulture	157	0.06	0.74
1.3.0	Other minimal use	2.1.0	Grazing native vegetation	146	0.06	0.69
3.1.0	Plantation forestry	2.1.0	Grazing native vegetation	142	0.06	0.67
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	141	0.06	0.66
3.3.0	Cropping	3.4.0	Perennial horticulture	131	0.05	0.62
3.1.0	Plantation forestry	5.4.0	Residential & farm infrastructure	127	0.05	0.60
2.1.0	Grazing native vegetation	4.4.0	Irrigated perennial horticulture	117	0.05	0.55
1.3.0	Other minimal use	1.2.0	Managed resource protection	116	0.05	0.55
2.1.0	Grazing native vegetation	3.1.0	Plantation forestry	116	0.05	0.55
3.1.0	Plantation forestry	4.4.0	Irrigated perennial horticulture	100	0.04	0.47
5.8.0	Mining	5.4.0	Residential & farm infrastructure	99	0.04	0.47
4.2.0	Irrigated modified pastures	2.1.0	Grazing native vegetation	99	0.04	0.46
2.1.0	Grazing native vegetation	3.3.0	Cropping	96	0.04	0.45
4.3.0	Irrigated cropping	4.5.0	Irrigated seasonal horticulture	94	0.04	0.44
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	93	0.04	0.44
3.6.0	Land in transition	5.5.0	Services	88	0.04	0.41
3.3.0	Cropping	4.4.0	Irrigated perennial horticulture	87	0.03	0.41
2.1.0	Grazing native vegetation	3.3.5	Cropping – Sugar	83	0.03	0.39
1.3.0	Other minimal use	5.5.0	Services	82	0.03	0.39
4.5.0	Irrigated seasonal horticulture	4.4.0	Irrigated perennial horticulture	80	0.03	0.38
Total				**21,206**	**8.45**	**100**

Table 5: Summary statistics for land use change at secondary level for 2006–2011 in the Maroochy and Noosa catchments (showing only the land use changes > 80ha)

Land use code 2006	Land use class 2006	Land use code 2011	Land use class 2011	Area (ha)	Area Change (%)	Total change (%)
1.2.0	Managed resource protection	1.1.0	Nature conservation	8,010	3.19	26.88
1.3.0	Other minimal use	1.1.0	Nature conservation	3,871	1.54	12.99
3.1.0	Plantation forestry	3.6.0	Land in transition	3,705	1.48	12.43
3.3.5	Cropping – Sugar	3.6.0	Land in transition	2,045	0.82	6.86
3.3.5	Cropping – Sugar	2.1.0	Grazing native vegetation	1,544	0.62	5.18
6.5.0	Marsh/wetland	1.1.0	Nature conservation	1,343	0.54	4.51
3.4.0	Perennial horticulture	2.1.0	Grazing native vegetation	870	0.35	2.92
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	698	0.28	2.34
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	615	0.25	2.06
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	424	0.17	1.42
1.3.0	Other minimal use	1.2.0	Managed resource protection	423	0.17	1.42
3.1.0	Plantation forestry	1.1.0	Nature conservation	354	0.14	1.19
3.4.0	Perennial horticulture	5.4.0	Residential & farm infrastructure	336	0.13	1.13
3.3.5	Cropping – Sugar	3.3.0	Cropping	314	0.13	1.05
2.2.0	Production forestry	1.1.0	Nature conservation	312	0.12	1.05
2.1.0	Grazing native vegetation	3.6.0	Land in transition	281	0.11	0.94
3.3.0	Cropping	2.1.0	Grazing native vegetation	272	0.11	0.91
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	238	0.10	0.80
3.1.0	Plantation forestry	2.2.0	Production forestry	230	0.09	0.77
3.3.5	Cropping – Sugar	3.2.0	Grazing modified pastures	225	0.09	0.75
4.2.0	Irrigated modified pastures	2.1.0	Grazing native vegetation	222	0.09	0.74
1.3.0	Other minimal use	2.1.0	Grazing native vegetation	195	0.08	0.65
3.3.5	Cropping – Sugar	5.4.0	Residential & farm infrastructure	174	0.07	0.58
1.3.0	Other minimal use	3.6.0	Land in transition	133	0.05	0.44
3.6.0	Land in transition	5.5.0	Services	132	0.05	0.44
3.6.0	Land in transition	2.1.0	Grazing native vegetation	132	0.05	0.44
3.3.5	Cropping – Sugar	4.5.0	Irrigated seasonal horticulture	129	0.05	0.43
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	125	0.05	0.42
4.4.0	Irrigated perennial horticulture	2.1.0	Grazing native vegetation	118	0.05	0.40
3.3.5	Cropping – Sugar	4.4.0	Irrigated perennial horticulture	117	0.05	0.39
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	101	0.04	0.34
2.1.0	Grazing native vegetation	3.4.0	Perennial horticulture	99	0.04	0.33
5.4.0	Residential & farm infrastructure	5.2.0	Intensive animal production	86	0.03	0.29
Total				**29,801**	**11.88**	**100**

Data format and availability

Download land use datasets

To access land use datasets it is recommend that the Queensland Government Information Service (QGIS) be used. Search for **"land use mapping"** in the type of data search, after restricting your search to **“cadastral and land planning”** in the topic category field. Metadata is also available from QGIS.

The dataset comprises an ESRI vector geodatabase at a nominal scale of 1:50,000. Within this are six feature classes: 1999 improved land use, 2006 improved land use, 2011 updated land use, 1999–2006 land use change layer, 2006–2011 land use change layer and 1999–2011 land use change layer. The feature classes are polygon datasets with attributes describing land use. Land use is classified according to the Australian Land Use and Management Classification (ALUMC) Version 7, May 2010. Note that a representation showing land use at secondary level is available when working within a geodatabase.

Digital Data is supplied with a licence and by using the data you confirm that you have read the licence conditions included with the data and that you agree to be bound by its terms.

Request a land use map

Available from the QLUMP website, it is possible to request a land use map based upon a specific location (Lot on Plan, Street address or Central latitude/longitude coordinates) in Queensland. The land use maps are emailed upon request in portable document format (PDF).The maps present the most recent land use information available at the secondary level of the Australian Land Use and Management (ALUM) Classification.

View land use on the Queensland Globe

The most recent land use information available state-wide in Queensland is available for viewing on the Queensland Globe. This application allows browsing of Queensland spatial data including land use, maps and up-to-date satellite imagery.

Land use is available for viewing within the Planning and Cadastre category globe.

Appendix A 1999–2011 Land Use Change

For 1999–2011, the largest land use changes were observed from *production forestry* (7,490ha or 18%) and *other minimal uses* (4,530ha or 11%) to *nature conservation*. The change from *plantation forestry* (3,786ha or 9%) and *cropping – sugar* (2,186ha or 5%) to *land in transition* is related to the residential property development described on page 14. Collectively, for 1999–2011 the land use change to residential accounts for 5,829ha or 14% of the total.

Table 6: Summary statistics for land use change at secondary level for 1999–2011 in the Maroochy and Noosa catchments (showing only the land use changes > 165ha)

Land use code 1999	Land use class 1999	Land use code 2011	Land use class 2011	Area (ha)	Area Change (%)	Total change (%)
2.2.0	Production forestry	1.1.0	Nature conservation	7,490	2.99	17.95
1.3.0	Other minimal use	1.1.0	Nature conservation	4,530	1.81	10.86
3.1.0	Plantation forestry	3.6.0	Land in transition	3,786	1.51	9.07
3.3.5	Cropping – Sugar	2.1.0	Grazing native vegetation	2,756	1.10	6.60
6.5.0	Marsh/wetland	1.1.0	Nature conservation	2,380	0.95	5.70
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	2,325	0.93	5.57
3.3.5	Cropping – Sugar	3.6.0	Land in transition	2,186	0.87	5.24
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	1,847	0.74	4.42
1.2.0	Managed resource protection	1.1.0	Nature conservation	1,138	0.45	2.73
3.4.0	Perennial horticulture	2.1.0	Grazing native vegetation	1,111	0.44	2.66
2.1.0	Grazing native vegetation	4.2.0	Irrigated modified pastures	606	0.24	1.45
3.4.0	Perennial horticulture	5.4.0	Residential & farm infrastructure	591	0.24	1.42
1.3.0	Other minimal use	1.2.0	Managed resource protection	539	0.21	1.29
2.1.0	Grazing native vegetation	3.6.0	Land in transition	525	0.21	1.26
3.3.5	Cropping – Sugar	3.3.0	Cropping	498	0.20	1.19
2.2.0	Production forestry	1.2.0	Managed resource protection	432	0.17	1.04
2.1.0	Grazing native vegetation	3.4.0	Perennial horticulture	412	0.16	0.99
3.1.0	Plantation forestry	1.1.0	Nature conservation	378	0.15	0.91
3.3.5	Cropping – Sugar	5.4.0	Residential & farm infrastructure	378	0.15	0.91
1.3.0	Other minimal use	2.1.0	Grazing native vegetation	344	0.14	0.82
2.1.0	Grazing native vegetation	5.5.0	Services	303	0.12	0.73
3.1.0	Plantation forestry	2.1.0	Grazing native vegetation	284	0.11	0.68
3.3.0	Cropping	2.1.0	Grazing native vegetation	266	0.11	0.64
2.1.0	Grazing native vegetation	1.2.0	Managed resource protection	247	0.10	0.59
3.3.5	Cropping – Sugar	4.4.0	Irrigated perennial horticulture	241	0.10	0.58
4.2.0	Irrigated modified pastures	2.1.0	Grazing native vegetation	231	0.09	0.55
3.1.0	Plantation forestry	2.2.0	Production forestry	230	0.09	0.55
6.5.0	Marsh/wetland	1.2.0	Managed resource protection	213	0.08	0.51
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	212	0.08	0.51
3.3.5	Cropping – Sugar	4.5.0	Irrigated seasonal horticulture	200	0.08	0.48
1.3.0	Other minimal use	3.6.0	Land in transition	194	0.08	0.47
3.1.0	Plantation forestry	5.4.0	Residential & farm infrastructure	175	0.07	0.42
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	170	0.07	0.41
Total				**41,732**	**16.64**	**100**

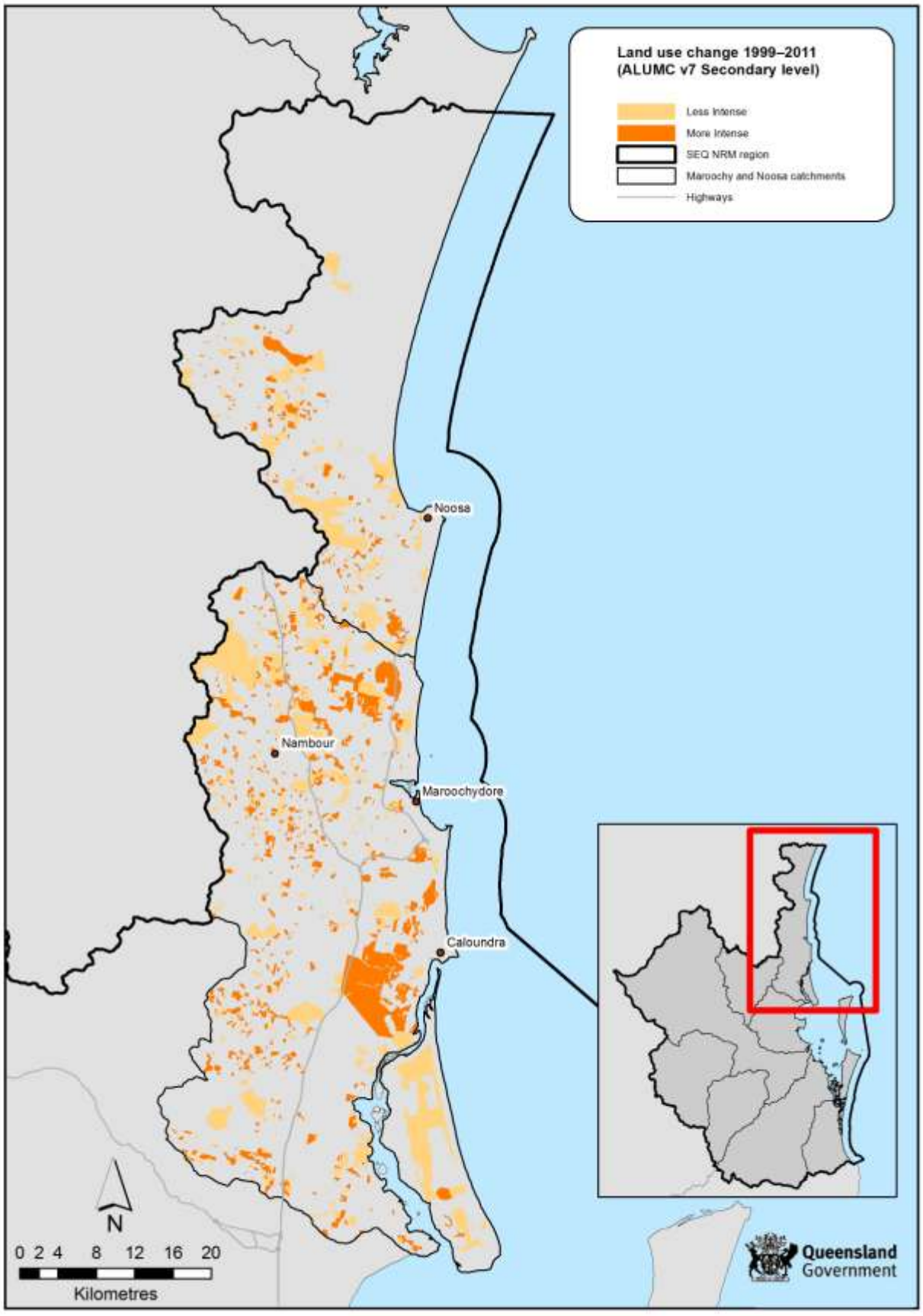

Figure 7: 1999–2011 land use change map at secondary level for the Maroochy and Noosa catchments

Appendix B Accuracy assessment

The accuracy assessment provided reference data suitable for assessing the 2012 land use map. For each of the sample points, the true land use class was independently determined (this provided the reference data) based on desktop interpretation of the same imagery and ancillary datasets available to the mapper. These points were then compared to the mapped class (map data) and the information summarised in the error matrix. The accuracy is summarised in terms of total accuracy, Kappa and user's and producer's accuracies. Each accuracy parameter is reported using a point estimate and a 95% posterior interval. Accuracy figures are provided as probabilities between 0 and 1.

Total accuracy provides an estimate of the overall accuracy of the map, and can be expressed as the probability that a point is mapped correctly. However, it should be kept in mind that total accuracy can be misleading, particularly when a dominant class exists. The Kappa statistic attempts to overcome this problem by adjusting for chance agreement. A common rule of thumb suggests a value of Kappa between 0.6 and 0.8 represents moderate agreement between the map and the ground truth, a value greater than 0.8 suggests strong agreement. Values less than 0.2 suggest the map is only marginally improved compared to a map produced by random allocation.

The user's and producer's accuracies summarise the map's accuracy on a per-class basis. User's accuracy for class A is the probability that a point mapped as A is truly in class A. If the user's accuracy of class A is estimated to be 0.84, then from a random sample of 100 points chosen from areas on the map in this class, approximately 84 would be found to be correct when checked in the field. Producer's accuracy for class B is the conditional probability that the map will show a site as class B given its true state is class B. If the producer's accuracy for class B were 0.84, then from a random sample of 100 points known to be in class B, approximately 84 would also be in class B according to the map. An accurate map should have both high user's and producer's accuracies.

The per-class estimates of accuracy are often not precise, since only part of the total sample points are used to estimate them. As a guide, if the upper bound of the interval for either user's or producer's accuracy is less than 0.5, this can indicate a true misclassification problem, rather than one due to inadequacies in sample size.

Points that differ between the map and the reference data may be due to positional or spatial errors. Inaccurate registration of datasets is an example of spatial error. Thematic errors are the incorrect labelling of an area due to difficulties in determining the true land use in that area, or by oversight or other operational errors. Spatial errors influence thematic accuracy. The purpose here is to assess the thematic accuracy of land use data. However, as described above, the separation of spatial and thematic errors can be difficult and was not undertaken. As a result, the accuracy assessment reflects properties of the land use data as a whole.

Note that the revised 1999 and 2006 land use and the land use change datasets were not accuracy assessed.

2011 land use dataset

The 2011 land use dataset was accuracy assessed with 335 points based on a random sampling strategy, using the map classes (area and frequency) as the strata. The stratified estimate of total accuracy is 0.89 (0.84, 0.92) and Kappa is 0.88 (0.81, 0.91). As the lower bound of the confidence interval for total accuracy is greater than 0.8, the mapping meets ACLUMP the specification.

Table 7 (page 26) shows the error matrix for the accuracy assessment of the 2011 land use data. For the majority of classes, the reference data agreed with the map data. For example, *grazing native vegetation* had 30 sample points identified. For 29 of those points, the map data was also *grazing native vegetation* and therefore correct. For one point the map data was incorrect, as the area was found to be *residential and farm infrastructure*. The misclassification in this case is likely to be related to the size of the property, as lot areas greater than 16ha are not mapped as residential. If a property is close to this threshold, misclassification is more likely.

The column 'proportion' in Table 7 is the relative proportion in area of the classes that were assessed, not of the catchment as a whole. The areas of other classes that are not amenable to assessment, for example, *grazing modified pastures*, are removed from the total area before the proportions are calculated. This column will thus sum to 100%.

Table 8 (page 27) provides the user's and producer's accuracy for the 2011 Maroochy and Noosa catchments land use dataset. This demonstrates that the majority of land use classes in the catchment have been mapped accurately. The largest assessable land use class in this catchment is *nature conservation* which has been mapped with very high user's and producer's accuracies of 0.957 and 0.998 respectively. The next largest class by area is *residential and farm infrastructure* which also returned a high user's and producer's accuracy. The error matrix (Table 7, page 26) provides more detail on the misclassifications.

Accuracy estimates based on samples with fewer than two points are not considered sufficiently reliable, and are presented as NA (not available) in the table. Examples of this are *seasonal horticulture and utilities*.

The user's and producer's accuracy results should be interpreted individually for their respective classes. It should be noted that the classes with a small area in proportion to the total area assessed, and also a small sample size, will return a wide confidence interval. The overall accuracy shows a much tighter confidence interval as it effectively summarises the accuracy results for all the assessable classes.

Some classes with low accuracies have insufficient sample points to provide precise estimates. For example, the producer's accuracy for *irrigated perennial horticulture* is 0.856; however, from the 95% interval (0.384, 0.971) it can be seen that more sample points would be required to confidently determine class accuracy.

The error matrix shows a misclassification in the mapping within the *cropping* class, whereby a number of points were assessed as *grazing native vegetation* that were mapped as *cropping*. On examination of these points it was apparent that the land use has transitioned over time from *cropping – sugar* in 1999 to either *land in transition* or *grazing native vegetation* in 2011. A misclassification also occurred within the *estuary/coastal waters* class, whereby most of this area should have been mapped as *lake*. It is important to note though that these areas constitute a small proportion of the total area assessed, and thus had minimal impact on the overall accuracy.

Table 7: Error matrix for the Maroochy and Noosa catchments 2011 land use dataset

		Reference data																																
	2011 land use class	**Nature conservation**	**Managed resource protect.**	**Other minimal use**	**Grazing native vegetation**	**Production forestry**	**Plantation forestry**	**Cropping**	**Cropping – Sugar**	**Perennial horticulture**	**Seasonal horticulture**	**Land in transition**	**Irrigated cropping**	**Irrigated perennial hort.**	**Irrigated seasonal hort.**	**Irrigated land in transition**	**Intensive horticulture**	**Intensive animal husbandry**	**Manufacturing and industrial**	**Residential & farm infras.**	**Services**	**Utilities**	**Transport & communications**	**Mining**	**Waste treatment & disposal**	**Lake**	**Reservoir/dam**	**River**	**Channel/aqueduct**	**Marsh/wetland**	**Estuary/coastal waters**	**Total**	**Proportion (%)**
Map data	**Nature conservation**	**15**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	29.09
	Managed resource protection	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.86
	Other minimal use	0	0	**30**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	8.13
	Grazing native vegetation	0	0	0	**29**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	30	11.47
	Production forestry	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	3.53
	Plantation forestry	0	0	0	0	0	**15**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	9.31
	Cropping	0	0	0	9	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0.25
	Cropping – Sugar	0	0	0	1	0	0	0	**7**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0.43
	Perennial horticulture	0	0	0	0	0	0	0	0	**9**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	2.06
	Seasonal horticulture	0	0	0	1	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.00
	Land in transition	0	0	0	2	0	0	0	3	0	0	**5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	3.32
	Irrigated cropping	0	0	0	1	0	0	0	0	0	0	0	**3**	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.17
	Irrigated perennial horticulture	0	0	0	0	0	0	0	0	0	0	0	0	**9**	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.86
	Irrigated seasonal horticulture	0	0	0	1	0	0	0	0	0	0	0	1	2	**6**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.24
	Irrigated land in transition	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01
	Intensive horticulture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.15
	Intensive animal husbandry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0.35
	Manufacturing and industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	10	0.36
	Residential & farm infrastructure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**29**	0	0	0	0	0	0	0	0	0	0	0	30	17.86
	Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	1	0	10	1.94
	Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	1	0.01
	Transport and communications	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	10	0.76
	Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	10	0.22
	Waste treatment and disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	10	0.10
	Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	10	0.14
	Reservoir/dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	10	0.61
	River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	10	0.24
	Channel/aquaduct	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	0	1	<0.01
	Marsh/wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**	0	15	4.62
	Estuary/coastal waters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	**1**	10	2.90
	Total	15	10	30	45	10	15	0	11	9	0	5	4	11	13	0	10	10	10	30	10	1	10	10	10	19	10	10	0	16	1	**335**	**100**

Table 8: User's and producer's accuracy for the Maroochy and Noosa catchments 2011 land use dataset

Class	User's			Producer's		
	Estimate	95% interval		Estimate	95% interval	
Nature conservation	0.957	0.788	0.999	0.998	0.975	1.000
Managed resource protection	0.938	0.705	0.998	0.922	0.414	1.000
Other minimal use	0.978	0.886	0.999	0.992	0.872	1.000
Grazing native vegetation	0.946	0.828	0.993	0.915	0.822	0.960
Production forestry	0.937	0.700	0.998	0.981	0.725	1.000
Plantation forestry	0.958	0.783	0.998	0.993	0.895	1.000
Cropping	NA	NA	NA	NA	NA	NA
Cropping – Sugar	0.803	0.478	0.970	0.247	0.113	0.536
Perennial horticulture	0.926	0.668	0.998	0.966	0.605	0.999
Seasonal horticulture	NA	NA	NA	NA	NA	NA
Land in transition	0.452	0.192	0.746	0.960	0.545	0.999
Irrigated cropping	0.259	0.066	0.558	0.297	0.025	0.855
Irrigated perennial horticulture	0.841	0.550	0.975	0.856	0.384	0.971
Irrigated seasonal horticulture	0.551	0.267	0.815	0.324	0.083	0.600
Irrigated land in transition	NA	NA	NA	NA	NA	NA
Intensive horticulture	0.936	0.701	0.998	0.661	0.117	0.989
Intensive Animal Husbandry	0.936	0.708	0.998	0.817	0.229	0.995
Manufacturing and industrial	0.935	0.700	0.998	0.828	0.212	0.996
Residential & farm infrastructure	0.946	0.830	0.992	0.976	0.902	0.998
Services	0.938	0.689	0.998	0.963	0.615	0.999
Utilities	NA	NA	NA	NA	NA	NA
Transport and communications	0.935	0.698	0.998	0.917	0.394	0.998
Mining	0.936	0.702	0.998	0.747	0.160	0.993
Waste treatment and disposal	0.936	0.697	0.998	0.569	0.075	0.987
Lake	0.937	0.700	0.997	0.046	0.032	0.068
Reservoir/dam	0.935	0.691	0.998	0.897	0.334	0.998
River	0.936	0.679	0.998	0.767	0.161	0.994
Channel/aqueduct	NA	NA	NA	NA	NA	NA
Marsh/wetland	0.957	0.787	0.999	0.884	0.627	0.987
Estuary/coastal waters	0.069	0.002	0.313	0.733	0.042	0.995