Department of Science, Information Technology, Innovation and the Arts

Land Use Summary 1999–2012

for the Moreton Bay Islands Catchment within SEQ

Great state. Great opportunity.

Queensland Government

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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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.

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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.

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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 Moreton Bay Islands catchment (which accounts for 2% of SEQ total area) including:

- a revised 1999 land use dataset including improvements and corrections to the original
- 2012 land use dataset
- land use change dataset from 1999–2012
- summary statistics derived from the above spatial datasets
- results of the accuracy assessment of the 2012 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 2012 land use dataset. The 1999 land use map was revised and improved in addition to compiling an updated land use map for 2012. 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 mapping, as well as areas of actual land use change (2012). A land use change mapping product was then derived (at the secondary level of the ALUM classification) between 1999 and 2012.

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]

1 Conservation and Natural Environments

1.1.0 Nature conservation
1.1.1 Strict nature reserves
1.1.2 Wilderness area
1.1.3 National park
1.1.4 Natural feature protection
1.1.5 Habitat/species management area
1.1.6 Protected landscape
1.1.7 Other conserved area

1.2.0 Managed resource protection
1.2.1 Biodiversity
1.2.2 Surface water supply
1.2.3 Groundwater
1.2.4 Landscape
1.2.5 Traditional Indigenous uses

1.3.0 Other minimal use
1.3.1 Defence land–natural areas
1.3.2 Stock route
1.3.3 Residual native cover
1.3.4 Rehabilitation

Minimum level of attribution

2 Production from Relatively Natural Environments

2.1.0 Grazing native vegetation

2.2.0 Production forestry
2.2.1 Wood production
2.2.2 Other forest production

3 Production from Dryland Agriculture and Plantations

3.1.0 Plantation forestry
3.1.1 Hardwood production
3.1.2 Softwood production
3.1.3 Other forest production
3.1.4 Environmental forest plantation

3.2.0 Grazing modified pastures
3.2.1 Native/exotic pasture mosaic
3.2.2 Woody fodder plants
3.2.3 Pasture legumes
3.2.4 Pasture legume/grass mixtures
3.2.5 Sown grasses

3.3.0 Cropping
3.3.1 Cereals
3.3.2 Beverage and spice crops
3.3.3 Hay and silage
3.3.4 Oil seeds
3.3.5 Sugar
3.3.6 Cotton
3.3.7 Alkaloid poppies
3.3.8 Pulses

3.4.0 Perennial horticulture
3.4.1 Tree fruits
3.4.2 Oleaginous fruits
3.4.3 Tree nuts
3.4.4 Vine fruits
3.4.5 Shrub nuts fruits and berries
3.4.6 Perennial flowers and bulbs
3.4.7 Perennial vegetables and herbs
3.4.8 Citrus
3.4.9 Grapes

3.5.0 Seasonal horticulture
3.5.1 Seasonal fruits
3.5.2 Seasonal nuts
3.5.3 Seasonal flowers and bulbs
3.5.4 Seasonal vegetables and herbs

3.6.0 Land in transition
3.6.1 Degraded land
3.6.2 Abandoned land
3.6.3 Land under rehabilitation
3.6.4 No defined use
3.6.5 Abandoned perennial horticulture

4 Production from Irrigated Agriculture and Plantations

4.1.0 Irrigated plantation forestry
4.1.1 Irrigated hardwood production
4.1.2 Irrigated softwood production
4.1.4 Irrigated other forest production
4.1.4 Irrigated environmental forest plantation

4.2.0 Grazing irrigated modified pastures
4.2.1 Irrigated woody fodder plants
4.2.2 Irrigated pasture legumes
4.2.3 Irrigated legume/grass mixtures
4.2.4 Irrigated sown grasses

4.3.0 Irrigated cropping
4.3.1 Irrigated cereals
4.3.2 Irrigated beverage and spice crops
4.3.3 Irrigated hay and silage
4.3.4 Irrigated oil seeds
4.3.5 Irrigated sugar
4.3.6 Irrigated cotton
4.3.7 Irrigated alkaloid poppies
4.3.8 Irrigated pulses
4.3.9 Irrigated rice

4.4.0 Irrigated perennial horticulture
4.4.1 Irrigated tree fruits
4.4.2 Irrigated oleaginous fruits
4.4.4 Irrigated tree nuts
4.4.4 Irrigated vine fruits
4.4.5 Irrigated shrub nuts fruits and berries
4.4.6 Irrigated flowers and bulbs
4.4.7 Irrigated vegetables and herbs
4.4.8 Irrigated citrus
4.4.9 Irrigated grapes

4.5.0 Irrigated seasonal horticulture
4.5.1 Irrigated fruits
4.5.2 Irrigated nuts
4.5.3 Irrigated flowers and bulbs
4.5.4 Irrigated vegetables and herbs
4.5.5 Irrigated turf farming

4.6.0 Irrigated land in transition
4.6.1 Degraded irrigated land
4.6.2 Abandoned irrigated land
4.6.3 Irrigated land under rehabilitation
4.6.4 No defined use (irrigation)
4.6.5 Abandoned irrigated perennial horticulture

5 Intensive Uses

5.1.0 Intensive horticulture
5.1.1 Shadehouses
5.1.2 Glasshouses
5.1.3 Glasshouses (hydroponic)
5.1.4 Abandoned intensive horticulture

5.2.0 Intensive animal husbandry
5.2.1 Dairy sheds with yards
5.2.2 Cattle feedlots
5.2.3 Sheep feedlots
5.2.4 Poultry farms
5.2.5 Piggeries
5.2.6 Aquaculture
5.2.7 Horse studs
5.2.8 Stockyards/saleyards
5.2.9 Abandoned intensive animal husbandry

5.3.0 Manufacturing and industrial
5.3.1 General purpose factory
5.3.2 Food processing factory
5.3.3 Major industrial complex
5.3.4 Bulk grain storage
5.3.5 Abattoirs
5.3.6 Oil refinery
5.3.7 Sawmill
5.3.8 Abandoned manufacturing/industrial

5.4.0 Residential and farm infrastructure
5.4.1 Urban resindential
5.4.2 Rural resindential with agriculture
5.4.3 Rural resindential without agriculture
5.4.4 Remote communities
5.4.5 Farm buildings/infrastructure

5.5.0 Services
5.5.1 Commercial services
5.5.2 Public services
5.5.3 Recreation and culture
5.5.4 Defence facilities–urban
5.5.5 Research facilities

5.6.0 Utilities
5.6.1 Fuel powered electricity generation
5.6.2 Hydro electricity generation
5.6.3 Wind farm electricity generation
5.6.4 Electricity substations and transmission
5.6.5 Gas treatment, storage and transmission
5.6.6 Water extraction and transmisison

5.7.0 Transport and communication
5.7.1 Airports/aerodromes
5.7.2 Roads
5.7.3 Railways
5.7.4 Ports and water transport
5.7.5 Navigation and communication

5.8.0 Mining
5.8.1 Mines
5.8.2 Quarries
5.8.3 Tailings
5.8.4 Extractive industry not in use

5.9.0 Waste treatment and disposal
5.9.1 Effluent pond
5.9.2 Landfill
5.9.3 Solid garbage
5.9.4 Incinerators
5.9.5 Sewage/sewerage

6 Water

6.1.0 Lake
6.1.1 Lake–conservation
6.1.2 Lake–production
6.1.3 Lake–intensive use
6.1.4 Lake–saline

6.2.0 Reservoir/dam
6.2.1 Reservoir
6.2.2 Water storage–intensive use/ farm dams
6.2.3 Evaporation basin

6.3.0 River
6.3.1 River–conservation
6.3.2 River–production
6.3.3 River–intensive use

6.4.0 Channel/aqueduct
6.4.1 Supply channel/aqueduct
6.4.2 Drainage channel/aqueduct
6.4.3 Stormwater

6.5.0 Marsh/wetland
6.5.1 Marsh/wetland–conservation
6.5.2 Marsh/wetland–production
6.5.3 Marsh/wetland–intensive use
6.5.4 Marshland–saline

6.6.0 Estuary/coastal waters
6.6.1 Estuary/coastal waters–conservation
6.6.2 Estuary/coastal waters–production
6.6.3 Estuary/coastal waters–intensive use

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 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 *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 and 2012 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 a particular purpose in the year of interest, was mapped as *cropping* in the 2012 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*.

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

Products

1999 and 2012 land use datasets

Figure 2 (page 8) and Figure 3 (page 9) show the 1999 and 2012 land use datasets respectively, for the Moreton Bay Islands Catchment, presented at the secondary level of the ALUM classification (Figure 1, page 5). Table 1 (page 10) and Table 2 (page 11) provide the summary statistics for each. All statistics presenting the area of land use classes are reported in hectares (ha).

Table 2 (page 11) shows that *nature conservation* (62%) and *other minimal use* (20%) are the major land use classes for 2012 in the Moreton Bay Islands catchment.

Analysis of the overall change from 1999–2012 shows the secondary land use class of *nature conservation* increased by 62% or 13,049ha. The majority of this change came from the *other minimal uses* and the *marsh/wetlands* land use classes which decreased by 44% or 8,693ha and 37% or 3,619ha respectively. These changes were associated with the addition of the Naree Budjong Djara National Park into the *nature conservation* land use class (gazetted in 2011) on North Stradbroke Island.

The *intensive uses* primary land use class has shown a decrease of 21% or 838ha since 1999. The majority of the decline was shown at then secondary level in the *mining* land use class—which decreased by 43% or 837ha.

Analysis of the specific land use changes from one secondary class to another for 1999–2012 is presented in the section on page 12.

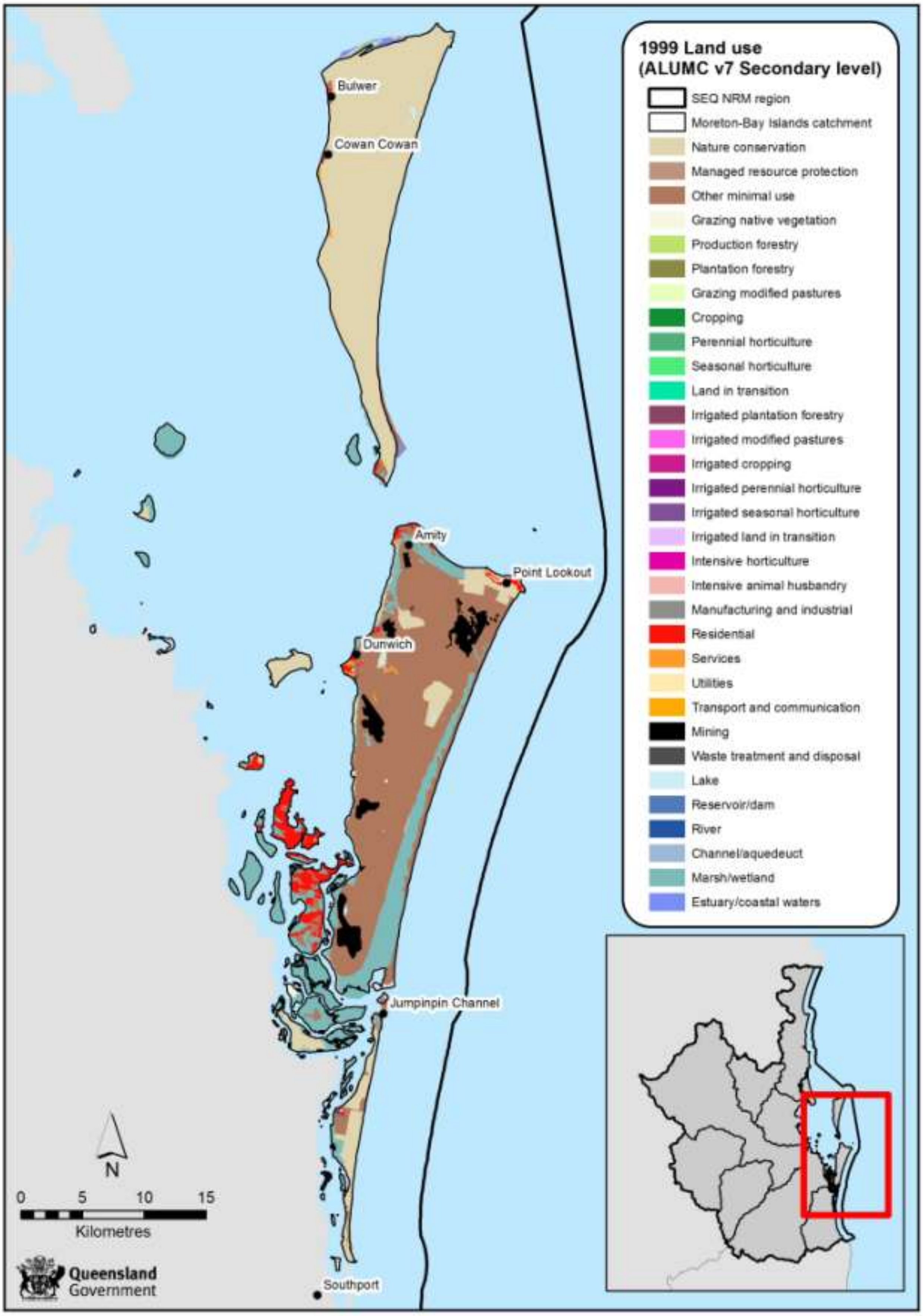

Figure 2: 1999 land use map for the Moreton Bay Islands catchment

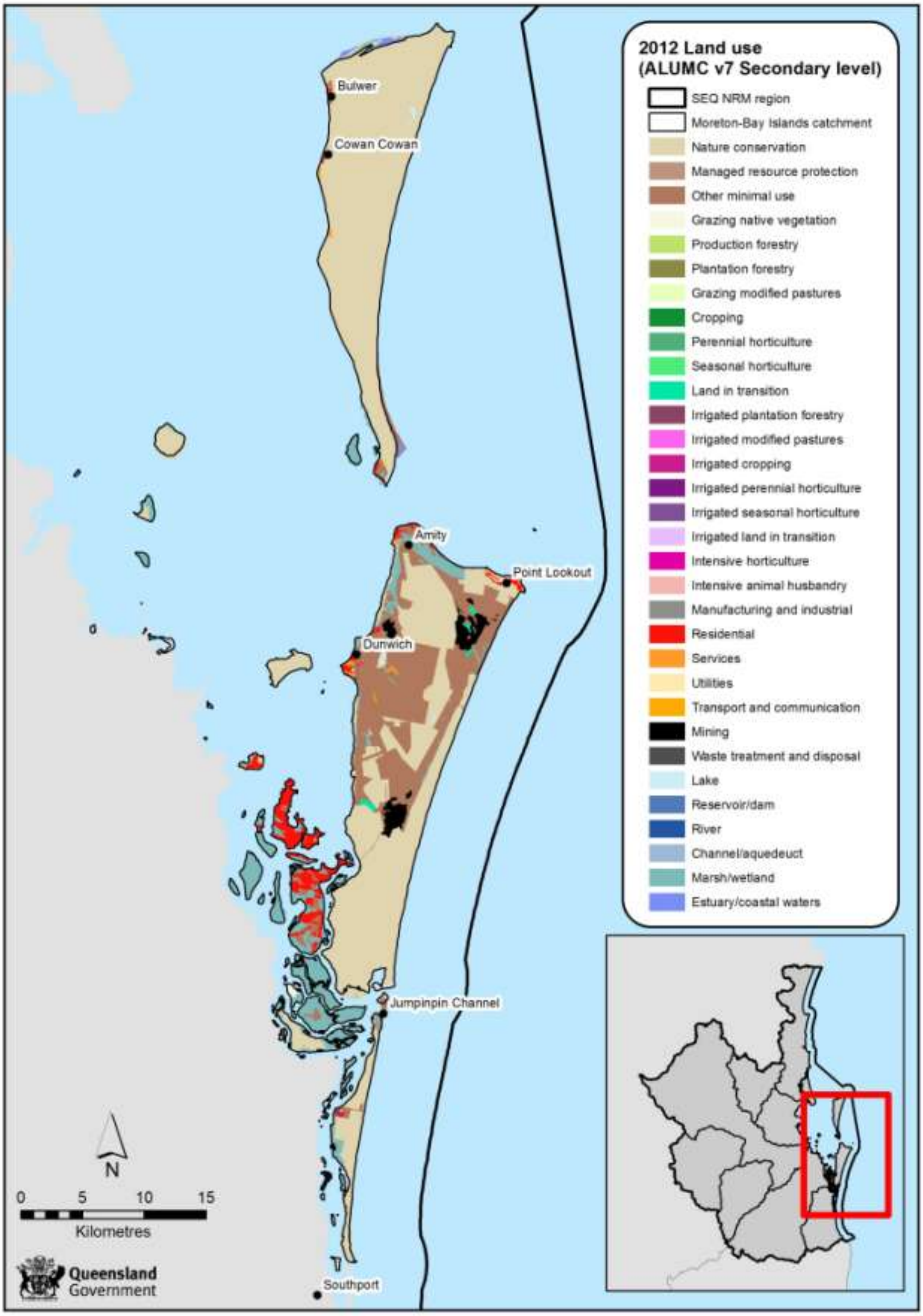

Figure 3: 2012 land use map for the Moreton Bay Islands catchment

Table 1: Summary statistics of land use in 1999 in the Moreton Bay Islands catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	40,918	74.11
1.1	Nature conservation	21,185	38.37
1.3	Other minimal use	19,733	35.74
2	Production from relatively natural environments	80	0.15
2.1	Grazing native vegetation[1]	80	0.15
3	Production from dryland agriculture and plantations	10	0.02
3.1	Plantation forestry	10	0.02
5	Intensive uses	4,074	7.38
5.3	Manufacturing and industrial	8	0.01
5.4	Residential	1,845	3.34
5.5	Services	210	0.38
5.6	Utilities	10	0.02
5.7	Transport and communication	39	0.07
5.8	Mining	1,939	3.51
5.9	Waste treatment and disposal	24	0.04
6	Water	10,133	18.35
6.1	Lake	99	0.18
6.3	River	11	0.02
6.5	Marsh/wetland	9,842	17.82
6.6	Estuary/coastal waters	181	0.33
	Grand Total	**55,215**	**100.00**

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

Table 2: Summary statistics of land use in 2012 in the Moreton Bay Islands catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	45,275	82.00
1.1	Nature conservation	34,234	62.00
1.3	Other minimal use	11,040	20.00
2	Production from relatively natural environments	80	0.15
2.1	Grazing native vegetation[1]	80	0.15
3	Production from dryland agriculture and plantations	130	0.24
3.6	Land in transition	130	0.24
5	Intensive uses	3,236	5.86
5.3	Manufacturing and industrial	8	0.01
5.4	Residential and farm infrastructure	1,856	3.36
5.5	Services	216	0.39
5.6	Utilities	10	0.02
5.7	Transport and communication	39	0.07
5.8	Mining	1,102	2.00
5.9	Waste treatment and disposal	5	0.01
6	Water	6,494	11.76
6.1	Lake	80	0.14
6.3	River	11	0.02
6.5	Marsh/wetland	6,223	11.27
6.6	Estuary/coastal waters	181	0.33
	Grand Total	**55,215**	**100.00**

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

1999–2012 land use change dataset

Figure 4 (page 13), shows the 1999–2012 land use change dataset for the Moreton Bay Islands catchment. 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.

The total area of land use change at the secondary level from 1999–2012 is 14,160ha. This is equivalent to 26% of the catchment area. Of this, 534ha (4% of the total change) is an increase in land use intensity, whilst 13,626ha (96%) is a decrease.

Summary statistics presenting the land use change at the secondary level for 1999–2012 are shown in Table 3 (page 14). Significant land use changes were from *other minimal use* (8,614ha) and *marsh/wetland* (3,635ha) to *nature conservation*—both associated with the addition of the Naree Budjong Djara National Park into the *nature conservation* class (gazetted in 2011) on North Stradbroke Island. This contributed 12,249ha or 86% of the 1999–2012 land use change in Moreton Bay Islands catchment.

The 1999–2012 land use change associated with sand mining on North Stradbroke Island shows a 500ha or 3% change from the *other minimal uses* secondary land use class. At the tertiary level, 191ha or 38% of the change was from *residual native vegetation,* with the remaining 309ha or 62% coming from the *rehabilitation* land use class.

Simultaneously, this increase in *mining* land use was offset by an equivalent shift in land use from *mining* to *other minimal uses* and *land in transition* classes, which increased by 433ha or 3% and 130ha or 1% respectively. Furthermore, 774ha or 5% of *mining* changed to the *nature conservation.*

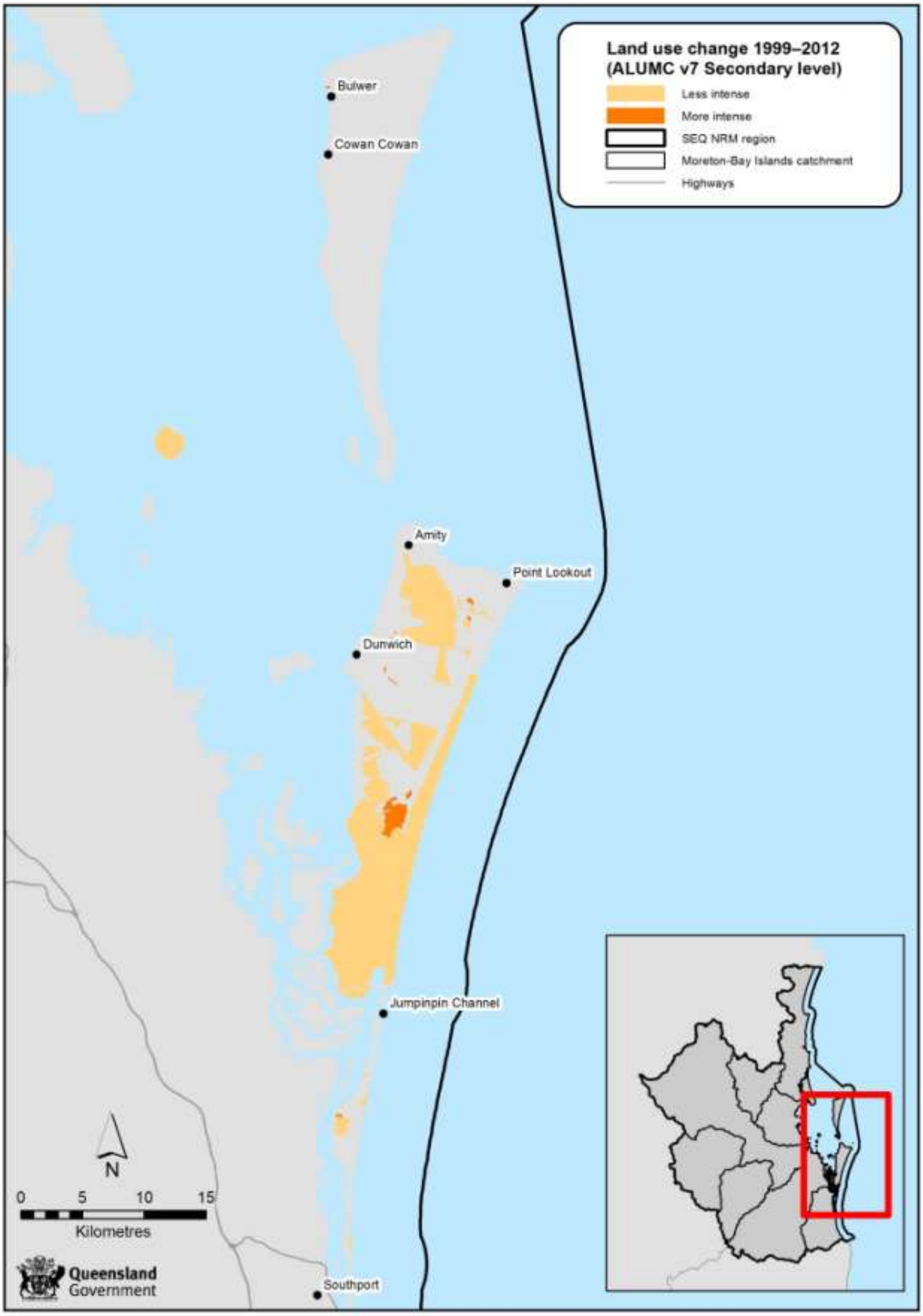

Figure 4: 1999–2012 land use change map at secondary level for the Moreton Bay Islands catchment

Table 3: Summary statistics for land use change at secondary level for 1999–2012 in the Moreton Bay Islands catchment

Land use code 1999	Land use class 1999	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
1.3.0	Other minimal use	1.1.0	Nature conservation	8,614	15.60	60.84
6.5.0	Marsh/Wetland	1.1.0	Nature conservation	3,635	6.58	25.67
5.8.0	Mining	1.1.0	Nature conservation	774	1.40	5.47
1.3.0	Other minimal use	5.8.0	Mining	500	0.91	3.53
5.8.0	Mining	1.3.0	Other minimal use	433	0.78	3.06
5.8.0	Mining	3.6.0	Land in transition	130	0.24	0.92
6.1.0	Lake	1.1.0	Nature conservation	19	0.02	0.14
5.9.0	Waste treatment and disposal	1.1.0	Nature conservation	12	0.01	0.09
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	10	0.02	0.08
3.1.0	Plantation forestry	6.5.0	Marsh/Wetland	9	0.01	0.07
1.1.0	Nature conservation	6.5.0	Marsh/Wetland	6	0.04	0.05
1.3.0	Other minimal use	5.5.0	Services	6	0.02	0.05
5.9.0	Waste treatment and disposal	1.3.0	Other minimal use	6	0.01	0.04
Total				**14,160**	**25.64**	**100**

Data format and availability

Download land use datasets

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.

The dataset comprises an ESRI vector geodatabase at a nominal scale of 1:50,000. Within this are three feature classes: 1999 improved land use, 2012 updated land use and 1999–2012 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 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 land use and the land use change dataset were not accuracy assessed.

2012 land use dataset

The 2012 land use dataset was accuracy assessed with 79 points based on a random sampling strategy, using the map classes (area and frequency) as the strata. The stratified estimate of total accuracy is 0.92 (0.81, 0.96) and Kappa is 0.86 (0.70, 0.93). As the lower bound of the confidence interval for total accuracy is greater than 0.8, the mapping meets the ACLUMP specification.

Table 4 (page 18) shows the error matrix for the accuracy assessment of the 2012 land use data. For the majority of classes, the reference data agreed with the map data. For example, *mining* had 10 sample points identified. For eight of those points, the map data was also *mining* and therefore correct. For two of the points the map data was incorrect, with two points falling onto the mapped class *other minimal uses*. On investigation of these two points, they were identified as spatial errors—insofar that the points fell on the boundaries of the features in the map.

The column 'proportion' in Table 4 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 5 (page 17) provides the user's and producer's accuracy for the 2012 Moreton Bay Islands 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 a very high user's and producer's accuracies of 0.955 and 0.977 respectively. The next largest class by area is *other minimal use* which also returned a high user's and producer's accuracy. The error matrix (Table 4, page 16) 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 *other conserved area, utilities and lake*.

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 *services* is 0.692, however, from the 95% interval (0.098, 0.992) it can be seen that more sample points would be required to confidently determine class accuracy. The other classes with a relatively low accuracy and very large confidence intervals constitute a small proportion of the area assessed.

Table 4: Error matrix for the Moreton Bay Islands catchment 2012 land use dataset

	Reference data																	
Map data: 2012 land use class	**Nature conservation**	**Other conserved area**	**Other minimal use**	**Grazing native vegetation**	**Land in Transition**	**Manufacturing and industrial**	**Residential & farm infrastructure**	**Services**	**Utilities**	**Transport & communications**	**Mining**	**Waste treatment and disposal**	**Lake**	**River**	**Marsh/wetland**	**Estuary/coastal waters**	**Total**	**Proportion (%)**
Nature conservation	**14**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	59.98
Other conserved area	1	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.02
Other minimal use	0	0	**15**	0	0	0	0	0	0	0	0	0	0	0	0	0	15	20.00
Grazing native vegetation	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	1	0	1	0.15
Land in transition	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	1	0.24
Manufacturing and industrial	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	1	0.01
Residential & farm infrastructure	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	10	3.36
Services	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	10	0.39
Utilities	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	1	0.02
Transport and communications	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	1	0.07
Mining	0	0	2	0	0	0	0	0	0	0	**8**	0	0	0	0	0	10	2.00
Waste treatment and disposal	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	1	0.01
Lake	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0.14
River	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	1	0.02
Marsh/wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	10	11.27
Estuary/coastal waters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	1	0.33
Total	15	0	17	0	1	1	10	10	1	1	8	1	1	1	11	1	**79**	**100**

Table 5: User's and producer's accuracy for the Moreton Bay Islands catchment 2012 land use dataset

Class	User's			Producer's		
	Estimate	95% interval		Estimate	95% interval	
Nature conservation	0.955	0.777	0.999	0.977	0.953	0.997
Other conserved area	NA	NA	NA	NA	NA	NA
Other minimal use	0.959	0.794	0.999	0.972	0.848	0.993
Grazing native vegetation	NA	NA	NA	NA	NA	NA
Land in transition	NA	NA	NA	NA	NA	NA
Manufacturing and industrial	NA	NA	NA	NA	NA	NA
Residential & farm infrastructure	0.939	0.704	0.998	0.955	0.474	0.999
Services	0.941	0.701	0.999	0.692	0.098	0.992
Utilities	NA	NA	NA	NA	NA	NA
Transport and communications	NA	NA	NA	NA	NA	NA
Mining	0.748	0.459	0.937	0.906	0.307	0.998
Waste treatment and disposal	NA	NA	NA	NA	NA	NA
Lake	NA	NA	NA	NA	NA	NA
River	NA	NA	NA	NA	NA	NA
Marsh/wetland	0.938	0.707	0.998	0.981	0.768	0.997
Estuary/coastal waters	NA	NA	NA	NA	NA	NA