



PORT STEPHENS  
COUNCIL

# STATE OF ENVIRONMENT REPORT

ANNUAL REPORT

2015 – 2016

VOLUME 3



The State of Environment Report 2016 has been produced as Volume 3 of the Port Stephens Council Annual Report 2015 - 2016. It complies with Section 428A of the Local Government Act 1993.



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# Purpose

The 2016 Port Stephens State of Environment Report (SoE) provides a comprehensive snapshot of available indicator data relevant to the state of the environment within the Port Stephens Local Government Area (LGA). Where possible these indicator data are used to ascertain the status, drivers and responses to pressures on the natural environment.

Conclusions and recommendations have not been made within this report; however it has been prepared in order to integrate with and inform Council's broad strategic planning processes. Where data are available, indicator trends have been included.

Whilst this report was prepared by Council, the scope of environmental reporting extends beyond the activities of Council. The inherent complexity of the natural environment and its management in Port Stephens is the responsibility of a diverse range of stakeholders.

The data that underpin this report will be built upon in future years to continue to present an informative picture of the state of the environment in Port Stephens, in order to inform stakeholders with an interest in, and responsibility for the management of the environment of Port Stephens. It is envisaged that this report will also serve as a benchmark for Council's continuous improvement in the protection and management of the environment for current and future generations.

Port Stephens Council has prepared this SoE in accordance with Section 428A (1) of the *NSW Local Government Act 1993* (The Act). The Act requires that "the annual report of a council in the year in which an ordinary election of councillors is to be held must include a report as to the state of the environment in the local government area in relation to such environmental issues as may be relevant to the objectives for the environment established by the community strategic plan".

The NSW Office of Local Government released Circular No 16-28 / 30 August 2016 / A507751 indicating that "the requirement under sections 428 and 428A of the Act for a council to include in its annual report a report as to the state of the environment, and an outline of its achievements in implementing its Community Strategic Plan, will not be applied to the 2015 -16 report for ... councils" including Port Stephens.

Nevertheless this report was near completion at the time of the circular and therefore the report was compiled as planned.

# Preparation

Information contained in the SoE 2016 is current at the time of writing (end August 2016) or as otherwise stated within the document. Data and information are largely sourced internally from Council sources. Where external data are used they are both publically available and referenced.



# Structure

The SoE 2016 has been divided into three broad sections. This structure has been used to present a picture of the natural environment, categorised within this report as Ecosystem Function, as well as the interaction between people and the environment. This interaction is divided into two sections: our impact on the environment (*Environmental Sustainability*); and the impact of the environment on us (*Environmental Security*).

It is important to note that whilst this structure provides a useful way in which to examine the complexity of the environment of Port Stephens, there is a significant level of interconnectedness between each section within the report, as is the case in the natural environment.

**Environmental Sustainability** provides an outline of the impact that human activities can and do have on the natural environment, including the natural environment beyond the borders of the Port Stephens local government area.

**Ecosystem Function** presents the state of the natural environment. Maintaining and enhancing ecological processes to ensure the conservation of biological diversity and the ongoing function of dynamic environmental systems, are essential to ensure that current and future generations can benefit from the environmental services that these systems provide. These essential services include clean air, clean water and healthy soils which in turn support the ecological, cultural, recreational, economic and aesthetic values of Port Stephens.

**Environmental Security** illustrates the impact that the natural environment can have on communities in terms of human health, recreation, and the economy. The scale of natural hazards can vary greatly with the most significant economic impacts arising from floods, storms and bushfires, whilst heatwaves are responsible for the most number of fatalities of all natural disasters in Australia. Climate change exacerbates the impacts of each of these natural hazards and is projected to continue to do so.

The report has been guided by the State-Pressure-Response model of SoE reporting that has been in place in NSW for many years. Each section and chapter seeks to contextualise the theme, present relevant data to indicate its status or health, including trends, where appropriate data were available.

# Executive Summary

## Environmental Sustainability

### Ecologically Sustainable Development

Port Stephens Council's Environment Policy was adopted in 2016, providing direction for Council's overall approach and commitment to improving the organisation's environmental performance.

An Environmental Management System (EMS) consistent with ISO14001:2015 is currently being developed and implemented for Port Stephens Council.

It will enable Council to manage and improve its environmental performance.

3,175 people participated in Council's Environmental Education Programs (2012 to 2016).

Over 60 community environmental projects were funded (2012 to 2016) through the \$86,000 Environmental Projects Fund.

### People and Community

The population of Port Stephens was 64,807 at the time of the 2011 Census. The most recent estimate released by the Australian Bureau of Statistics (ABS) in 2015 was 70,447. Using this figure the LGA has a population density of 82.1 people per km<sup>2</sup>. There have been high rates of growth in population for over 50 year olds and a decrease of 3.51% in the 30-39 age group.

Tourism can and does have both a positive and a negative impact on the environment. Nature-based visitors spent an estimated \$16.8 billion in NSW (up by 13.1% year on year) and represented 82.9% of visitors and 89.0% of nights by all international travellers to NSW.

Port Stephens welcomed more than two million visitor nights in 2014-2015 with an economic impact of over \$335 million and the direct employment of 1,669 people. The very same assets that attract domestic and international visitors can also be placed at risk due to the impacts of tourism on destinations. Partnerships such as the Naturefest event drive visitation and visitor spend in Port Stephens whilst also providing a unique platform for environmental education.

As at August 2016 there were 79 commercial permits to operate in the Port Stephens–Great Lakes Marine Park. The strict conditions associated with the marine park zones and limited licences available for commercial operators, aim to create a symbiotic relationship between tourism and the environment.

The Port Stephens Council Cultural Plan 2015-2018 was adopted in 2015 to support local culture, strengthen relationships, increase community understanding of and participation in Aboriginal heritage and culture, support cultural programs, and promote cultural tourism opportunities.

The 5.9 ha Soldiers Point Aboriginal Place was gazetted in June 2016; it is one of only two such recognised places in Port Stephens, and 114 throughout NSW.



A Memorandum of Understanding between the NSW Department of Primary Industries (DPI) and the Worimi Knowledge-holders Aboriginal Corporation commenced in May 2016 to ensure that the Department involves Aboriginal people in planning and management of the Port Stephens–Great Lakes Marine Park.

The Draft Port Stephens Council Heritage Strategy is currently under development. There are 117 Heritage Items, two Heritage Conservation Areas and six Archaeological sites of European heritage listed and protected under the Port Stephens Local Environment Plan (LEP) 2013.

Council adopted a Heritage Policy and Heritage Signage and Trail Guidelines in March 2015. The Heritage Policy outlines Council's commitment to recognising, protecting and promoting local Indigenous and European heritage. The developed 3.3km long Mariners Walk Heritage Trail, the first of its kind to be through Council's Heritage Signs and Trails process, includes interpretive displays and signage in Soldiers Point and Salamander Bay. This Heritage Trail raises awareness and increases the profile of the naval heritage of this area.

## Land Use Planning and Development

Land use planning is a tool to achieve broader goals, and provides the opportunity to review and determine how a range of goals can be achieved and spatially distributed.

Tomaree planning district experienced the largest population growth between 2006 and 2011. Fern Bay, Rural East and Karuah experienced the fastest rates of growth from 2006 to 2011.

The Port Stephens Local Environmental Plan 2013 provides planning and environmental control over the use and development of land. The Port Stephens Development Control Plan 2014, adopted in July 2015, provides further guidance and facilitates development in accordance with the Port Stephens Local Environmental Plan 2013. These documents work within the parameters set by State Government legislation and the choices of individual land owners in relation to the use of their land.

The Port Stephens LEP 2013 and DCP 2014 enact land use planning strategies for the LGA as a whole and particular communities and centres within the LGA. The Raymond Terrace and Heatherbrae Strategy 2015-2031 was adopted by Council in November 2015 and enacts Port Stephens Council's vision for the location as 'a strong regional centre and a great place to live, work and play'. The Nelson Bay Town Centre and Foreshore Strategy was adopted in 2012; and the Medowie Strategy was adopted in 2010. Both the Nelson Bay Town Centre and Foreshore Strategy and the Medowie Strategy have been reviewed and a new Strategy for Medowie is now in development.

Sixteen planning proposals were approved from 2012 to 2016, five were refused; and a further 16 proposals are pending, awaiting a decision by the Minister for Planning. The number of approved development applications has remained relatively constant at approximately 800 per year over the past six years, whilst the value of these has fluctuated over the past three years.

## Water Supply, Treatment and Consumption

91% of Hunter Water's major water supply assets are located within the Port Stephens LGA. At least 99.5% of water quality sampling undertaken by Hunter Water complied with Australian Drinking Water Guidelines for chemical, physical, and microbiological parameters over the past three years.

Hunter Water's wastewater treatment plants within the Port Stephens LGA include Tanilba Bay, Raymond Terrace, Karuah and Boulder Bay. Council's Onsite Sewage Management Policy was reviewed and amended in 2012. There are 4,896 Onsite Sewage Management Systems (OSMS) approved for use in Port Stephens. Council established a Development Assessment Framework (DAF) in 2012 to provide a consistent methodology for assessing and approving new systems and upgrades to existing OSM systems. OSMS compliance rates ranged between 87% and 97% from 2012 to 2016.

Annual applications for new systems and upgrades to existing systems ranged from 30 to 47 between 2012 and 2016, relatively low by historical standards and this is probably due to fewer remaining undeveloped rural residential allotments.

Total water consumption has remained relatively stable over the period across the LGA, with 66.4% of potable water consumed in 2014-2015 being for residential purposes. Five year rolling average residential water consumption within Port Stephens (178 Kl/year/residence) remains well below Hunter Water's conservation target of 215 Kl/year/residence. Council water consumption has remained relatively constant since 2012-2013, growing at an average of 0.6% per annum.

## Energy

Total electricity consumption (from the Ausgrid network) in Port Stephens had been steadily declining over recent years, yet increased in 2014-2015 for the first time since 2008-2009.

Average annual electricity consumption has continued to decline across all categories (residential, small and medium non-residential) since 2008-2009, due to uptake of energy efficiency measures such as solar PV systems. 16.5% of dwellings in Port Stephens (4,839 in total) have a solar PV system installed, with a total installed capacity of 14,004kW, as recorded by the Australian Photovoltaic Institute. Electricity makes up the overwhelming majority of stationary energy consumed by Council and has declined by approximately 3% since 2011-2012, with minor increases notable in more recent years. Council has implemented a range of energy efficiency projects including LED lighting upgrades, building management and control systems, air conditioning upgrades, energy auditing, power factor correction, as well as installing a number of solar PV and solar hot water systems.

## Transport

Environmental impacts of transport include use of non-renewable resources, greenhouse gas emissions, and noise and air pollution. The Port Stephens LGA has a network of approximately 650km of sealed and over 60km of unsealed roads and steady growth in vehicle registrations of between 2.5% and 3% pa.

The length of cycle-ways in Port Stephens increased to 65km as at July 2015.

Newcastle Airport is the 12th busiest airport in Australia and the 2nd busiest in NSW with over 1.1million passenger movements per year.



Council's annual diesel consumption is closely associated with the scale of Council's capital works schedule within any year and the utilisation rate of plant items. Increased works and increasing utilisation rates have resulted in increased diesel consumption. Council diesel consumption spiked in 2014-2015 due to two significant storm events requiring considerable diesel supply for flood pumps, internal emergency plant as well emergency service vehicles (Rural Fire Service/State Emergency Services) in response to prolonged power outages across the LGA.

Prior to Council's staged transition to private management of the passenger fleet in 2014-2015, there was an 18% decline in Unleaded Petrol (ULP) consumption (2011-2012 to 2013-2014) due to replacement of passenger vehicles with more efficient ULP vehicles and a switch from ULP to diesel passenger vehicles to drive improvements in fuel efficiency of the fleet. 11 of 13 Council trucks are now compliant with Euro IV emissions standards, with a further 12 commuter use utility vehicles and Council's library services truck scheduled for replacement in 2016-2017 to be Euro IV compliant.

## Waste

Total waste generation in Port Stephens continued to rise from 2012-2013 to 2015-2016. Green waste volumes increased in 2014-2015 due to April 2015 storms.

Council diverted 60% of waste from landfill in 2015-2016 (up 2% on 2014-2015), which whilst below the NSW target of 70% is the highest in the Hunter Region. Approximately 50% of waste collected from kerbside garbage bins is diverted from landfill through the function of the Alternative Resource Recovery Technology (ARRT) facility in Raymond Terrace.

Recycling has increased in 2015-2016, an 8% increase from the previous year. Council commenced a new waste and recycling collection contract in 2015 with individual trucks for separate waste streams in use for the first time. A 2013 audit of red and yellow bins showed 36% of recycling bins to be over 90% full and that 15% of the waste in the general waste bin was recyclable. A recycling audit conducted in January 2015 identified a recycling contamination rate of 7.98%, a slight increase on 2013 and 2011 results.

Three percent of residents have upgraded their 240L recycling bin to a 360L bin, following the recent introduction of this option.

Council progressively introduced free drop off days for a number of problem wastes from 2013-2014 including e-waste, batteries, chemicals, oils, mattresses and tyres; 10 drop off days are now available to residents each year in addition to the collection of batteries, fluorescent tubes, mobile phones and printer cartridges at Council's Administration Building and local libraries. Green waste drop off days continue to run in Port Stephens, collecting 2,037 tonnes of green waste in 2015-2016.

Over 20 waste and recycling presentations and free recycling are provided to local schools each year with the pre-schoolers' waste education program provided to between 10 and 17 local pre-schools each year.

Four hundred and two fridges and freezers were collected through the Fridge Buyback Program in Port Stephens to June 2016 preventing the release of 3,216 tonnes of greenhouse gases, over 32 tonnes of chlorofluorocarbons (CFCs), and caused 35.8 tonnes of metal to be recycled.

Council commenced a targeted response to illegal dumping in Port Stephens in 2012, resulting in an 80% reduction in dumping incidents at specified hotspots. Household waste makes up 80-90% of illegally dumped material across Port Stephens. Council maintains a 90% investigation success rate when incidents are reported to Council.

The number of incidents reported and investigated involving asbestos declined to 20 in 2015-2016, down from 43 in 2014-2015 and 51 in 2013-2014.

# Ecosystem Function

## Biodiversity

Approximately 50% of the Port Stephens LGA is classified as having High or Very High Conservation Value in Council's Conservation Assessment mapping tool which takes into account mapped attributes such as fauna, flora, ecology, biodiversity, and corridor values.

The Port Stephens Biodiversity Connectivity Project was completed by Council in 2012 from which a landscape connectivity map was developed for the LGA, to be used to inform strategic planning and conservation assessments.

Council continued with bush regeneration, native plantings, weed and pest control, education activities and monitoring activities on 650ha of land as part of the Natural Area Rehabilitation Program. Fifteen Landcare and Tidy Towns community volunteer groups are active within the LGA undertaking valuable work to regenerate and restore natural areas.

Port Stephens is located between the two internationally recognised wetlands: the Hunter Estuary Wetlands and the Myall Lakes Ramsar site. These two wetland systems of International Importance (Ramsar) are listed as Matters of Environmental Significance under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The LGA contains over 6,000ha of SEPP 14 wetlands. The Port Stephens Estuary is located entirely within the Port Stephens–Great Lakes Marine Park.

Port Stephens has the second most extensive seagrass bed in NSW, covering over 1000ha.

Fifty-four declared weed species are found in the LGA including 13 of the 32 Weeds of National Significance, and one of the 28 National Environmental Alert List weeds.

The number of species listed under State/Federal threatened species legislation and known to occur in Port Stephens has more than doubled from 90 to 184 in four years. 37% of mammals, 24% of birds, 17% of amphibians, 10% of reptiles, 4% of plants and 6% of insects that exist within the LGA are listed under threatened species legislation. Port Stephens is home to 13 Endangered Ecological Communities (*Threatened Species Conservation Act 1995*) and four Threatened Ecological Communities (EPBC Act).

Port Stephens LGA has a regionally significant koala population as well as the Hunter's greatest area of vegetation ranked 'Very High' and 'High' in terms of koala habitat value.

The Grey Headed Flying Fox is listed as 'vulnerable' under both the Commonwealth EPBC Act 1999 and the NSW TSC Act 1995. The permanent flying fox camp at Raymond Terrace is recognised as Nationally Important by the Australian Government Department of Environment and Energy.

## Water Resources

The water resources of Port Stephens are critical for a range of purposes including for domestic, potable water supply, aquatic ecosystem health, agriculture, recreation, amenity and industry. Port Stephens LGA contains significant groundwater resources for household consumption, industrial and commercial use, horticultural and agricultural irrigation, including Tomago, Tomaree and Stockton aquifers and sandbeds.

Grahamstown Dam is an off-river storage reservoir with a capacity of 182,305 megalitres and provides an estimated 52% of the Hunter's drinking water needs.

The Port Stephens Estuary covers approximately 1,400km<sup>2</sup> and the Hunter Estuary 26km<sup>2</sup>.

Water quality at all ocean beaches consistently achieves a grading of very good according to Beachwatch results from 2012 to 2015. Four out of six beaches within the Estuary were rated either good or very good. Georges Reserve and Bagnalls Beach were ranked 'poor'.



## Land

23% (22,785ha) of the Port Stephens LGA is protected as National Park and State Forest and 7.95% (7,759ha) is zoned 'Environmental Protection' under the LEP 2013, including an additional 119ha which were added to the Tilligerry State Conservation Area in January 2013 as a biodiversity offset for the development of a substation in Tomago.

Port Stephens Council owns and manages over 1,330ha of community open spaces including parks, sportsgrounds, foreshore reserves, bushland, watercourses, wetlands and areas of cultural significance.

## Air Quality and Noise

Volumes for 76 substances listed on the National Pollutant Inventory are available for Port Stephens, where there are comparatively high carbon monoxide and sulphur dioxide emissions as a result of heavy industry within the LGA. Metal manufacturing is the major source of air pollution in the LGA; other sources include motor vehicles and aeroplanes.

There are 63 Environmental Protection licences (issued by the Environment Protection Authority) in operation in Port Stephens, the second highest in the Hunter behind Newcastle.

Average annual complaints to Council about air quality include 18 for smoke, 49 for dusty conditions and 32 odour complaints between 2012 and 2016.

An average of 150 noise complaints were made to Council annually between 2012 and 2016. Most noise complaints received by Council relate to animal noise (dogs, roosters, etc), from commercial activities, residential and neighbourhood activities (lawn mowers, air conditioners, pool pumps and parties), construction noise and vehicle noise.



# Environmental Security

## Climate Change

Climate change is a direct driver of environmental change. It can, and in many instances already is having direct and long lasting impacts on the environment, as well as on communities and the economy. Climate projection modelling across the Hunter Region suggests that average, minimum and maximum temperatures are all increasing.

Recent years have been characterised by major storm and flooding events in Port Stephens with seven declared natural disasters in four years.

The impacts of sea level rise are of particular relevance to Port Stephens given the number of low lying areas. Of NSW coastal LGAs, Port Stephens has the second highest number of residential buildings at risk from erosion due to higher sea levels.

## Bushfires

The Lower Hunter Bush Fire Management Catchment area, which includes the Port Stephens LGA, has on average 200 bush fires per year, of which three can be considered to be major fires. The most significant bushfire event in the LGA during the reporting period was in October 2013, which resulted in a natural disaster declaration.

## Flooding

Parts of the Port Stephens Local Government Area (LGA) are affected by flooding due to the presence of major river systems in the western regions, the low lying topography and interactions with the coast and estuaries in the east. A total of five "Storm and Flood" and "Flood" events have been declared natural disasters in the LGA in the past four years.





## Storms

The LGA has experienced a number of significant East Coast Low storm events over recent years with four declared natural disasters (“Storm and Flood”) over the last four years, the most damaging of which was that experienced in April 2015. It caused widespread and significant damage across the LGA, the Hunter Region and beyond.

## Heatwaves

Heatwaves are responsible for more fatalities in Australia than any other natural disasters, yet receive comparatively less attention; their frequency and intensity are increasing in Australia, with climate change likely to continue to drive this trend into the future.

The Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) works to improve understanding and management of changing climate and has led to the identification of heatwave impacts as a regional priority.

## Emergency Management

The draft Port Stephens Local Emergency Management Plan is currently under development. It details arrangements to prevent, prepare for, respond to and recover from emergencies, as well as provide policy direction for the preparation of Sub Plans and Supporting Plans.

## Contaminated Land

The Department of Defence and the NSW Government continue to assess the extent of the fire-fighting chemicals per- and poly-fluorinated alkyl substances (PFAS) following the identification of these chemicals in some surface water, ground water and in small numbers of fish around the Williamstown RAAF Base and Newcastle Airport. It is recognised that this is a significant, high profile issue for the Port Stephens community – the actual impact of the contamination and what is known about the nature of the chemicals continue to evolve as investigations continue.

# Environmental Sustainability

The Environmental Sustainability section has been prepared to outline the impact that human activities have on the natural environment, including the natural environment beyond the borders of the Port Stephens local government area.

Making use of natural resources sustainably, efficiently and equitably can deliver not only improved environmental performance, but also economic and social outcomes. This is particularly the case in circumstances where there are alignments between improved environmental and financial performance and service delivery to the community.





# Ecologically Sustainable Development (ESD)

## Summary

Port Stephens Council's Environment Policy was adopted in 2016, providing direction for Council's overall approach and commitment to improving the organisation's environmental performance.

An Environmental Management System (EMS) consistent with ISO14001:2015 is currently being implemented for Port Stephens Council. It will enable Council to manage and improve its environmental performance.

3,175 people participated in Council's Environmental Education Programs (2012 to 2016). Over 60 community environmental projects were funded (2012 to 2016) through the \$86,000 Environmental Projects Fund.

## Introduction

ESD has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs<sup>1</sup>.

The four principles underpinning ESD are:

- 1 Precautionary principle;
- 2 Intergenerational equity;
- 3 Conservation of biological diversity and ecological integrity;
- 4 Improved valuation, pricing and incentive mechanisms.

## ESD in Australia

The concept of ecologically sustainable development is embedded throughout the legislative frameworks of NSW and Australia to guide integrated decision-making as it relates to environmental, social and economic outcomes.

Australia's *National Strategy for Ecologically Sustainable Development* (1992) defines ESD as; 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'<sup>2</sup>.

The *National Strategy for Ecologically Sustainable Development* provides broad strategic directions and framework for government to direct policy and decision-making. The strategy facilitates a coordinated and co-operative approach to ecologically sustainable development and encourages long-term benefits for Australia over short-term gains<sup>3</sup>.

## ESD in Port Stephens

### Overview

The important role of local government in implementing ESD principles has been formally recognised by incorporating the principles of ESD in the *Local Government Act 1993* (LG Act), and by requiring councils to manage their regulatory and service functions in an ecologically sustainable manner.

The LG Act Chapter 3, Section 8A (f) states that *Councils should manage lands and other assets so that current and future local community needs can be met in an affordable way*. Section 8A (d) states that *Councils should consider the principles of ecologically sustainable development*.

<sup>1</sup> <http://www.un-documents.net/ocf-02.htm>

<sup>2</sup> <https://www.environment.gov.au/about-us/esd>

<sup>3</sup> <https://www.environment.gov.au/about-us/esd>

## Port Stephens Community Strategic Plan

The Community Strategic Plan (CSP) is the highest level of strategic planning undertaken by a local government. Other plans developed by Council as part of the Integrated Planning and Reporting (IP&R) framework are designed to reflect and implement the measures of the CSP.

The CSP is developed to identify the main priorities and aspirations of the community, and provide a set of strategies to achieve these. Developing and implementing the CSP takes time and involves a community-wide engagement process. While the Council is the custodian of the CSP, it is not responsible for the delivery of all of the activities the Plan identifies<sup>4</sup>.

The CSP is based on the social justice principles of access, equity, participation and rights and addresses the quadruple bottom line (social, environmental, economic and civic leadership), consistent with the principles of ecologically sustainable development<sup>5</sup>.

## Environment Policy

The Port Stephens Council Environment Policy<sup>6</sup> was endorsed in early 2016 to provide direction for Council's overall approach and commitment to improving the organisation's environmental performance. Environmental performance can be improved when beneficial environmental impacts are increased and adverse environmental impacts and risks are reduced. It applies to every aspect of Council including operations, strategic planning and governance. The Policy outlines, amongst other things, Council's commitment to the four principles of ecologically sustainable development as outlined above.

## Environmental Management System

An Environmental Management System (EMS) is being implemented for Port Stephens Council over the next two years and will become a component of Council's Integrated Risk Management System (IRMS). An EMS is a framework that enables Council to manage and improve its environmental performance. Port Stephens Council's EMS was developed consistent with International Standard ISO 14001:2015<sup>7</sup> Environmental Management Systems.

## Environmental Education Programs

Education is one of the key components in protecting the environment and raising awareness of environmental and sustainability issues. Programs implemented over the 2012-2016 period included:

- Summer Coastal Activity Program;
- Marine Discovery Series;
- Sustainable Living Program and Workshops; and
- Coastal Habitat Awareness Program.

## Schools Environment Program

<sup>4</sup> <https://www.olg.nsw.gov.au/councils/integrated-planning-and-reporting/framework/community-strategic-plan>

<sup>5</sup> <https://www.olg.nsw.gov.au/councils/integrated-planning-and-reporting/framework/community-strategic-plan>

<sup>6</sup> <http://www.portstephens.nsw.gov.au/trim/policies?RecordNumber=16%2F318927>

<sup>7</sup> <http://www.iso.org/iso/iso14000>

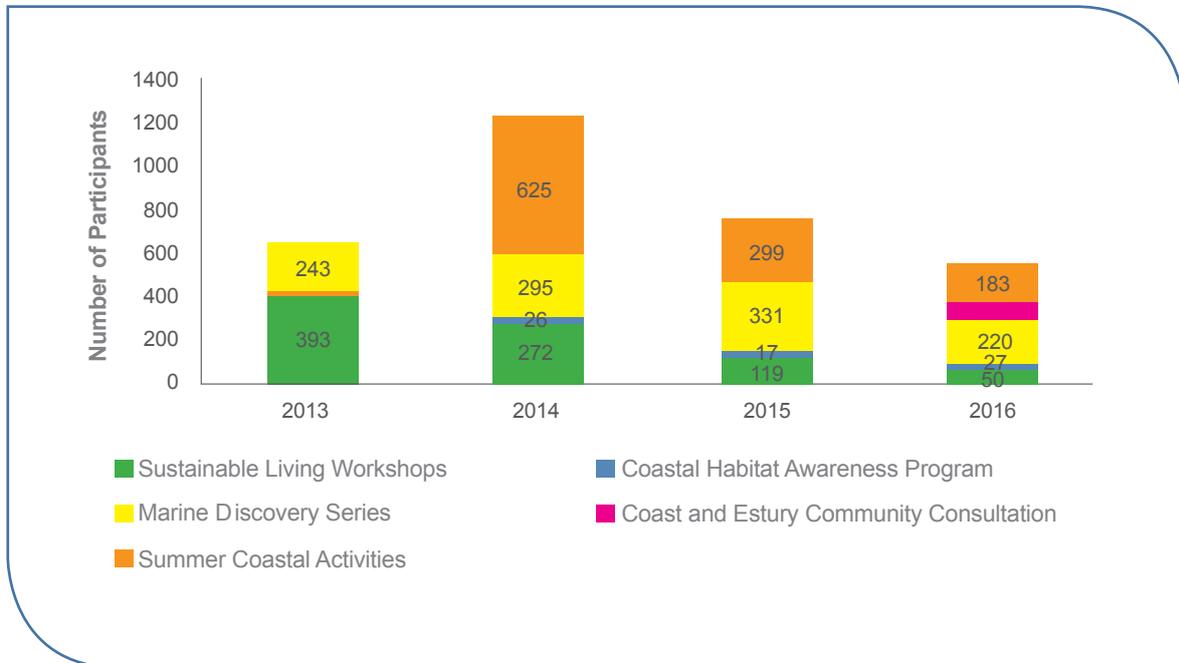


Figure 1 Participants in PSC's Environmental Education Programs 2013-2016

Council's Schools Environment Program promotes and encourages student participation in environmental education and recognises the valuable role schools have in raising awareness of intergenerational sustainability and environmental awareness and conservation.

### Schools Environmental Grants Program

Council has provided limited funds to assist local schools implement environmental projects and activities. In 2016 this program was replaced with the Environmental Projects Fund.

### Environmental Projects Fund

Grants awarded through the Environmental Projects Fund are only open to 355c committees of Council for projects with environmental benefit on public land. This includes planting native locally endemic species, bush regeneration, erosion control, pathways (only when it is mitigating an environmental hazard), fencing (to protect natural bushland areas) and educational signage. In excess of 60 projects were funded between 2012 and 2016 with more than \$86,000 in funding being allocated to 355c committee and school projects.

## People and Community

## Summary

The population of Port Stephens was 64,807 at the time of the 2011 Census. The most recent estimate released by the ABS in 2015 was 70,447. Using this figure the LGA has a population density of 82.1 people per km<sup>2</sup>. There have been high rates of growth in population for over 50 year olds and a decrease of 3.51% in the 30-39 age group.

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## Population and Community Profile

Settlement patterns and historic influences have led to diverse community types, such as rural and semi-rural communities, small peri-urban villages on the edges of the LGA, and coastal communities. Port Stephens LGA's settlement pattern is largely attributed to the wide ranging environmental constraints and opportunities that have guided land use development. Recent population projections indicate that by 2036 the population of Port Stephens will reach between 81,139 and 97,471.

Key changes in cohorts of population between 2006 and 2011 include the high growth rates of age cohorts 50 years and over and a 3.51% decrease in the 30-39 age group. Although often perceived as a wealthy tourist and retirement destination, Port Stephens is home to a broad range of residents from different socio-economic backgrounds<sup>8</sup>.

The communities of Port Stephens are the everyday 'environment' of the residents of the Port Stephens LGA. Port Stephens residents live and work in a variety of urban, rural and semi-rural built environments, all of which influence quality of life and contribute to their sense of place. The variability of age profiles of the eight planning districts that

<sup>8</sup> <http://www.communityprofile.com.au/portstephens>

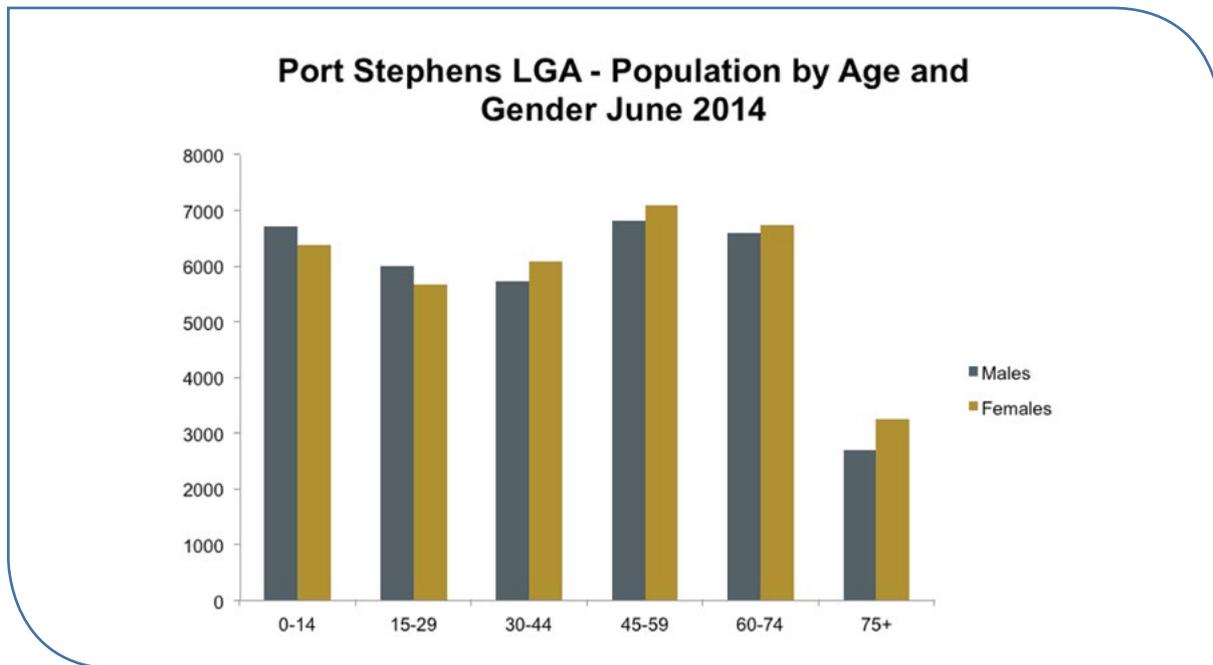


Figure 2 Port Stephens LGA Population Profile 2014

make up the Port Stephens LGA are shown below.

Population growth is generally viewed as a 'pressure' indicator on the environment, although a declining population may also place pressure on the quality of the built environment arising from insufficient capacity to fund infrastructure and provide essential services. A rising population, increasing urbanisation and an ageing population lead to greater

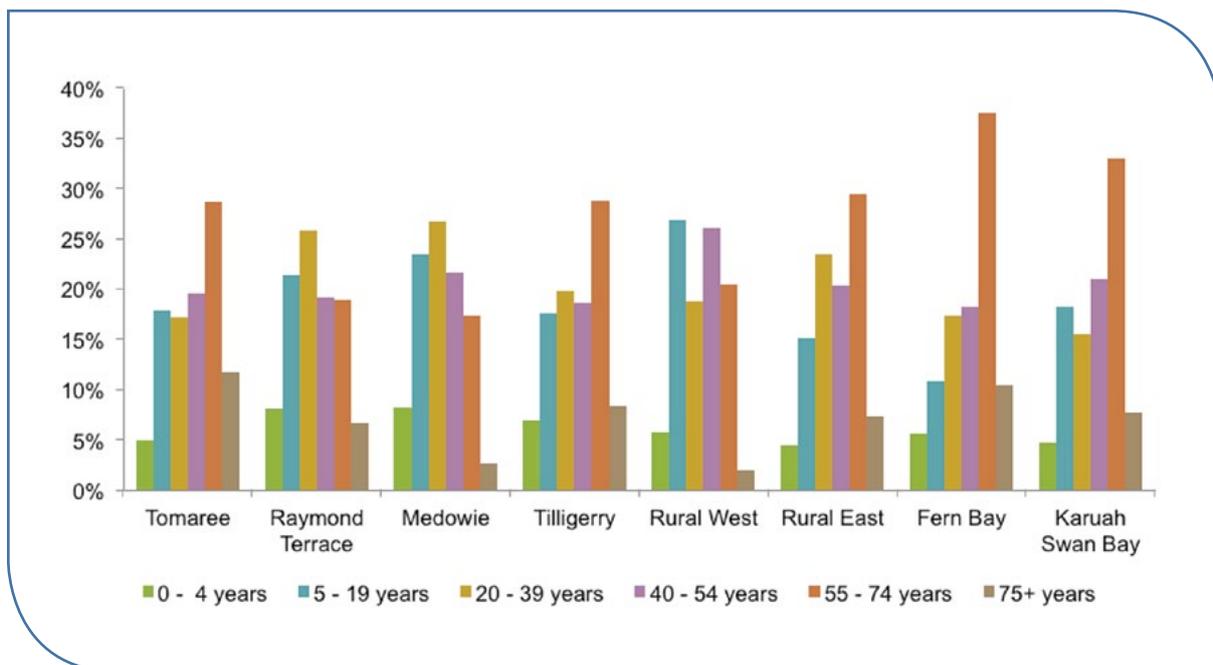


Figure 3 Age Profile by Port Stephens Planning District (2011)

Source: Australian Bureau of Statistics

demand for housing, energy and water as well as an increase in waste being generated. The increasing demand for land can also lead to loss of green spaces and greater pressure to develop the urban-rural fringe<sup>9</sup>.

Growing built environments can generate larger amounts of urban run-off and waste. The encroachment of development on more environmentally sensitive land or into flood prone areas and the construction of new residential homes produce building and demolition waste and can result in the loss of natural bushland and habitat.

As population grows and development increases there is an increased exposure of people, property and infrastructure to natural hazard events such as bushfires, floods and storms. Whilst efforts are made through regulation, service delivery and education to mitigate the risks arising from such events, risks nevertheless remain.

Population growth combined with increasing development and tourism continue to place pressure on the environmental integrity, character and attributes of the LGA<sup>10</sup>.

## Tourism

### Introduction

The environment, both natural and man-made, is essential to tourism. However, tourism's relationship with the environment is complex. Tourism can and does have both a positive and a negative impact on the environment. Adverse impacts are linked with the construction of general infrastructure, travel to and from tourism destinations, as well as the ongoing resource requirements of tourism operations. If left unchecked, these negative impacts can degrade the environmental resources on which tourism depends. However, tourism can also create beneficial effects on the environment by contributing to environmental protection and conservation both directly and by raising awareness of environmental values. Tourism can also serve as a tool to finance protection of natural areas and increase their economic importance.

### Global and National context

As an indication of both the importance of and the potential impact of nature-based tourism, 69 per cent (or 4.5 million) of international visitors to Australia in FY2015 engaged in some form of nature-based activity<sup>11</sup>. Two of the three core pillars of Tourism Australia's Corporate Plan to attract international visitors to Australia relate to the natural environment. These are (1) world class beauty and natural environments; and (2) world class coastlines, beaches and marine wildlife<sup>12</sup>.

Tourism Australia rolled out a \$40 million 'There's nothing like Australia' campaign in early 2015 to highlight Australia's aquatic and coastal tourism offering. One of Australia's key competitive advantages according to market research undertaken by Tourism Australia<sup>13</sup> is that two out of three international visitors enjoy Australia's aquatic or coastal environments in some way – from scuba diving to simply going to the beach<sup>14</sup>.

### State and regional context

Nature based visitors spent an estimated \$16.8 billion (including package expenditure by overseas visitors) in NSW (up by 13.1% on the previous year). Nature based travellers represented 82.9% of visitors and 89.0% of nights by all

9 <http://www.epa.nsw.gov.au/soe/soe2015/01Population.htm>

10 <http://www.portstephens.nsw.gov.au/your-council/port-stephens-profile>

11 <http://www.tourism.australia.com/nature-based-tourism.aspx>

12 [http://www.tourism.australia.com/documents/corporate/corporate\\_plan\\_2016-2017.pdf](http://www.tourism.australia.com/documents/corporate/corporate_plan_2016-2017.pdf)

13 <http://www.tourism.australia.com/campaigns/aquatic.aspx>

14 <http://www.tourism.australia.com/nature-based-tourism.aspx>



international travellers to NSW<sup>15</sup>.

The most common transport used to destinations in NSW by international nature-based visitors in 2015 was aircraft (33.5%), followed by private vehicle or company car (27.1%) and local public transport (16.1%). Domestic overnight nature-based visitors overwhelmingly travelled by private vehicle or company car (80.1%) with 12.8% traveling by aircraft, followed by just 3.7% by railway<sup>16</sup>.

Tourism in regional Australia is primarily nature-based and is considered to be a significant contributor to the economy<sup>17</sup>; and it is understood that tourism generally has a higher multiplier effect compared to other industries<sup>18</sup>. The Hunter received over 3.1 million domestic overnight visitors (up 3.1% on the previous year) with visitors spending over 8.5 million nights in the region (down 1.5% on the previous year)<sup>19</sup>.

## Port Stephens Tourism

### Overview

Port Stephens is a destination recognised for its natural beauty and the quality and diversity of these natural assets are fundamental to the success of the tourism industry in the LGA.

Port Stephens had over two million visitor nights during the 2014-2015 year with an estimated economic impact of more than \$335 million and the direct employment of 1,669 people.

### Tourism and the Port Stephens Environment

From the Worimi Conservation Lands to Tomaree National Park and the Port Stephens–Great Lakes Marine Park, visitors to Port Stephens come to swim in the clear waters, to view the native flora and fauna, dine on world class seafood and locally farmed produce, and to fish in the healthy and abundant waterways.

A large number of tourism operators provide experiences directly based around the natural assets of Port Stephens from the Worimi Conservation Lands to Tomaree National Park and the Port Stephens–Great Lakes Marine Park, including dive operators, dolphin watching boats, four wheel drive tours, guided walks and mountain bike tours of National Parks.

These very same assets that attract domestic and international visitors can also be placed at risk due to the impacts of tourism on the destination. This is particularly evident in locations such as the Worimi Conservation Lands where unlimited beach access to the fragile dune system has resulted in damage to the environment and desecration of sacred indigenous sites.

In contrast however, the large number of tourists that visit Port Stephens each year to see the bottlenose dolphins in their natural habitat, also support and further justify a level of protection that would not necessarily be available without the visitor demands. The strict conditions associated with the Marine Park zones and limited licences available for commercial operators, create a symbiotic relationship between tourism and the environment.

Port Stephens Council, in partnership with key industry stakeholders continues to invest in managing these delicate relationships to ensure long term sustainability for the industry and in turn the environment through a range of strategies. Through Destination Port Stephens<sup>20</sup> (a member owned non-profit organisation supported by Port Stephens Council and managed by a board of representatives from the tourism industry), and its associated membership, tourism marketing strategies aim to increase low season visitation and reduce the negative impacts of increasing demands on the environment during peak visitation periods. Experiences like bushwalking, mountain biking and whale watching are used as key marketing tools to entice visitors to consider visiting Port Stephens in traditionally low occupancy periods. This is to reduce the environmental, social and economic impacts of increasing visitation during peak seasons.

<sup>15</sup> Destination NSW - *Nature Based Tourism to NSW*

<sup>16</sup> Destination NSW - *Nature Based Tourism to NSW*

<sup>17</sup> Estimating the Economic, Social, and Environmental Value of Tourism to Protected Areas, 2009, CRC for Sustainable Tourism Pty Ltd

<sup>18</sup> Destination Port Stephens – Destination Management Plan 2014 (Page 8)

<sup>19</sup> Destination NSW – Travel to the Hunter – YE March 2016

<sup>20</sup> <http://www.portstephentourism.com.au/about-us/>

Partnerships include such events as Naturefest<sup>21</sup>, where industry, Council and Destination Port Stephens collaborate to both drive visitation and visitor spend whilst also providing a unique platform for environmental education for visitors, residents and business alike.

With visitation to regional NSW expected to increase by an average annual growth rate of 2.7% for domestic visitors and 4.9% for international visitors, the demands on the natural environment in Port Stephens will continue to increase. Effective management of this demand is critical to the long term sustainability of the local tourism sector, and the natural environment on which it depends.

As at August 2016 there were 79 commercial permits to operate in the Port Stephens-Great Lakes Marine Park including boat hire; charter fishing; charter general; dive; dolphin/cetacean watch; dolphin swim; ferry services; film/photography; fireworks; fish feeding; fishing schools; houseboats; jet ski; kayaking; mooring and marine infrastructure; parasailing; stand up paddle boards; surf school; thrill rides<sup>22</sup>.

## Destination Management Plan

According to the Destination Management Plan (DMP) 2014 for Port Stephens, developed to provide strategic direction for the Port Stephens LGA as a destination to 2020<sup>23</sup>, tourism is the main activity on the Tomaree Peninsula and arguably the largest economic driver in the LGA<sup>24</sup>.

One of the strategies to ensure that the Port Stephens visitor experience matches its promise is to “ensure the long term conservation of Port Stephens’ unique natural and social assets on which the visitor economy depends by adhering to world’s best practice for nature-based tourism values and eco-tourism principles”<sup>25</sup>.

## Heritage

### Introduction

Culture and heritage are key influences on the way we live in our community, the decisions we make and the preservation of places and items into the future. Culture refers to the cumulative values, experience and beliefs of people, past and present; and the influence this has on how we understand and relate to the world. Heritage is the collective environment, buildings, items and places that we inherit from the preceding generations.

European and Aboriginal heritage items and places are threatened by population and industrial growth, resulting in increasing development and urbanisation and land use conflicts, socio-cultural trends, economic changes, coastal erosion processes, ageing and degradation, and vandalism. Striking a balance between increasing awareness, accessibility and visitation to natural and cultural sites and ongoing preservation and protection and cultural sensitivity is a challenge for heritage conservation.

Challenges in ensuring cultural values on private land and mixed land tenure are protected are their initial identification and the implementation of a cohesive suite of conservation mechanisms<sup>26</sup>.

### Heritage in NSW

Aboriginal cultural heritage in NSW is primarily protected by the *National Parks and Wildlife Act 1974*. Under the Act it is an offence to harm Aboriginal objects. The Act also provides for the declaration of Aboriginal Places and Aboriginal Areas as well as containing provisions relating to the restoration of Aboriginal objects and places.

21 <http://www.portstephens.org.au/events-new/event/1610-naturefest-2016>

22 Port Stephens - Great Lakes Marine Park

23 Destination Port Stephens – Destination Management Plan 2014 (Page 6)

24 Destination Port Stephens – Destination Management Plan 2014 (Page 8)

25 Destination Port Stephens – Destination Management Plan 2014 (Page 60)

26 EPA New South Wales State of the Environment Report 2012



The State Heritage Register is a list of places and objects that are of particular importance for the people of NSW. The State Heritage Register lists a diverse range of places, buildings and objects including Aboriginal places, buildings, objects, monuments, gardens, natural landscapes, archaeological sites, shipwrecks, relics, streets, industrial structures, public buildings, shops, houses, religious buildings, schools, conservation precincts, jetties and bridges as well as items such as ferries<sup>27</sup>.

Listing heritage items and heritage conservation areas is the process by which significant heritage is identified, protected and managed; and ensures that the environmental, social and economic benefits of these assets are realised into the future<sup>28</sup>.

## Heritage in Port Stephens

Local government, NSW Government agencies and the Heritage Council of NSW share responsibility for Heritage in NSW through a range of statutory responsibilities. Heritage objects, 'items', which are protected by the *Heritage Act 1977* are managed and protected through their listing on registers and schedules. Local councils manage most heritage items and listings on heritage schedules through local environmental plans. Under section 170 of the *Heritage Act*, State agencies have a statutory requirement to prepare a Heritage and Conservation Register of assets for which they are responsible<sup>29</sup>. Council has responsibility under the *Environmental Planning and Assessment Act 1979*, for identifying the area's heritage assets and protecting them through environmental planning instruments.

Contained within the Port Stephens Local Environmental Plan 2013 (Clause 5.10) and Port Stephens Development Control Plan 2014 (Chapter B8) are provisions to control development and conserve places of heritage significance.

## Aboriginal Heritage

The Worimi people are the traditional custodians of the Port Stephens area. The Worimi nation extends from the Hunter River in the South to Forster in the North, and as far west as the Barrington Tops and Maitland, and includes the Port Stephens LGA<sup>30</sup>.

Today, Worimi culture is preserved through the work of numerous families and individuals as well as the Worimi Local Aboriginal Land Council, the Karuah Local Aboriginal Land Council, and the Worimi Conservation Lands Board of Management. Port Stephens Council works to foster a strong relationship with Worimi people through its Aboriginal Strategic Committee and the Birubi Point Cultural Heritage Advisory Panel<sup>31</sup>.

## Worimi Conservation Lands

In February 2007, the NSW Government granted Crown lands at Stockton Bight to the Worimi Local Aboriginal Land Council (LALC) to be leased back to the government as three conservation reserves, a national park, state conservation area and regional park, collectively named the Worimi Conservation Lands (WCL)<sup>32</sup>. The creation of jointly managed national parks is designed to enable Aboriginal people to manage Country by participating in planning and decision-making processes.

Given the nature of the landscape of the WCL and the common cultural and natural values across each reserve category, an integrated approach to managing the WCL was needed, which led to the creation of the Worimi Conservation Lands Plan of Management.

The Worimi Conservation Lands Plan of Management was jointly adopted by the Minister for the Environment and the Minister for Land and Water on 1 September 2015. The plan was prepared by the Board of Management for the Worimi Conservation Lands with staff of the Lower North Coast Region of the NSW Parks and Wildlife Service (NPWS), part of the Office of Environment and Heritage (OEH).

<sup>27</sup> <http://www.environment.nsw.gov.au/licences/AboriginalHeritageInformationManagementSystem.htm>

<sup>28</sup> Port Stephens Council Heritage Strategy 2014- 2017 DRAFT, May 2016.

<sup>29</sup> EPA New South Wales State of the Environment Report 2015

<sup>30</sup> <http://www.portstephens.nsw.gov.au/play/culture-and-history/aboriginal-history>

<sup>31</sup> <http://www.portstephens.nsw.gov.au/play/culture-and-history/aboriginal-history>

<sup>32</sup> <http://www.environment.nsw.gov.au/jointmanagement/stocktonjointmanagement.htm>

The Worimi Conservation Lands Plan of Management focuses on:

- Improving awareness, understanding and protection of Worimi cultural values and sites, including new sites as they are exposed by shifting sands;
- Restoring and protecting the frontal dune and beach vegetation;
- Providing 22.5km of Stockton beachfront for 4WD driving and horse riding;
- Providing 350ha of dunes for 4WD driving and conditionally registered quad and trail bikes riding;
- Maintaining and improving safe and sustainable access at Anna Bay, Lavis Lane and Fern Bay;
- Providing access to 3km of beachfront near Anna Bay as an on-leash dog area;
- Introducing safe and sustainable camping at up to 30 designated camp sites;
- Continuing occupation of Tin City under a licence system; and
- Continuing commercial tourism.

## Birubi Point Aboriginal Place

The declaration of Aboriginal Places is a significant legal way of recognising and protecting Aboriginal culture and heritage on public and private land. Aboriginal Places may have spiritual, historical, social or educational value to Aboriginal people and show physical evidence of Aboriginal occupation or use. Currently there are 114 Aboriginal Places declared across NSW, two of which are located in the Port Stephens LGA<sup>33</sup>: Birubi Point (Anna Bay) gazetted in April 2007 and Soldiers Point (Port Stephens) gazetted in June 2016.

Birubi Point Aboriginal Place was a traditional Aboriginal ceremonial and burial site for the Worimi people. The ceremonial site is believed to be associated with men's ceremonies. Today, Birubi Point Aboriginal Place is a site with extensive archaeological material important for teaching current and future generations about Birubi ancestors and local Aboriginal culture.

## Soldiers Point Aboriginal Place

The Soldiers Point Aboriginal Place was declared on 7 June 2016. Local Aboriginal people maintain a strong spiritual and emotional attachment to the area. It is a place where Aboriginal families lived and where traditional knowledge and cultural life was sustained. The area played an important role in the history of the Worimi/Maaiangal people and other Aboriginal families who resided permanently or visited the area. The 5.9ha Soldiers Point Aboriginal Place includes land currently used for recreational and commercial purposes as well as vegetated and open space areas<sup>34</sup>. The most significant cultural features of the area are burial sites, middens and ceremonial areas which are known to some members of the Aboriginal community and form an important component of the cultural landscape<sup>35</sup>.

The Soldiers Point Aboriginal Place Plan of Management was adopted on 11 August 2015 prepared by Port Stephens Council in partnership with the NSW Office of Environment and Heritage.

## Port Stephens Council Cultural Plan 2015-2018

The Port Stephens Council Cultural Plan 2015-2018 was adopted by Port Stephens Council in 2015. It identifies that in Port Stephens the definition of the region's culture embraces the Worimi Aboriginal culture in both its tangible and intangible forms where culture is based on the idea of 'country' and is represented in its history and heritage as well as in its living culture<sup>36</sup>.

33 <http://www.environment.nsw.gov.au/heritageapp/heritagesearch.aspx>

34 <http://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?id=5063429>

35 <http://www.portstephens.nsw.gov.au/play/open-space-and-recreation-planning/soldiers-point-plan-of-management>

36 <http://www.portstephens.nsw.gov.au/play/open-space-and-recreation-planning/soldiers-point-plan-of-management>



## The 355c Aboriginal Strategic Committee

The Aboriginal Strategic Committee provides advice to Council on applications to the Aboriginal Projects Fund grant program to fund local projects that empower Aboriginal people. Most recently, the program has supported cultural awareness activities in schools and improved educational outcomes for Aboriginal students. The Committee consists of representatives from Port Stephens Council and representatives from both the Karuah Local Aboriginal Land Council and the Worimi Local Aboriginal Land Council<sup>37</sup>.

Council supports an annual Aboriginal grants program (the Aboriginal Projects Fund) and has allocated \$35,000pa for broad-based community development including cultural development initiatives. Over 54 projects have been funded since 1999.

In 2016-2017, the Aboriginal Projects Fund assisted in the Worimi Knowledge-holders Aboriginal Corporation being able to finalise a Memorandum of Understanding with NSW Marine Parks Authority of the DPI.

## The Memorandum of Understanding<sup>38</sup>

The Memorandum of Understanding (MoU) between the NSW Department of Primary Industries and the Worimi Knowledge-holders Aboriginal Corporation commenced in May 2016. The MoU ensures that the Department will include Aboriginal people in the planning and management of the Port Stephens–Great Lakes Marine Park (Marine Park) and associated decision-making processes.

A recent outcome from this MoU was brought to light during the NAIDOC Week 2016 celebrations. Approximately 1,000 people attended the Murrook Culture Centre celebrations, and because of the established MoU, the Worimi fishers were able to offer fresh, traditionally prepared fish for the celebrations.



**Worimi Fishers preparing locally caught fish for NAIDOC Week 2016 celebrations at Murrook Culture Centre**

Photos courtesy of Worimi Local Aboriginal Land Council

<sup>37</sup> <http://www.portstephens.nsw.gov.au/live/community/buildingyourcommunity/advisory-panels-and-committees>

<sup>38</sup> Worimi Knowledge Holders Aboriginal Corporation and Department of Industry, Skills and Regional Development, 2016

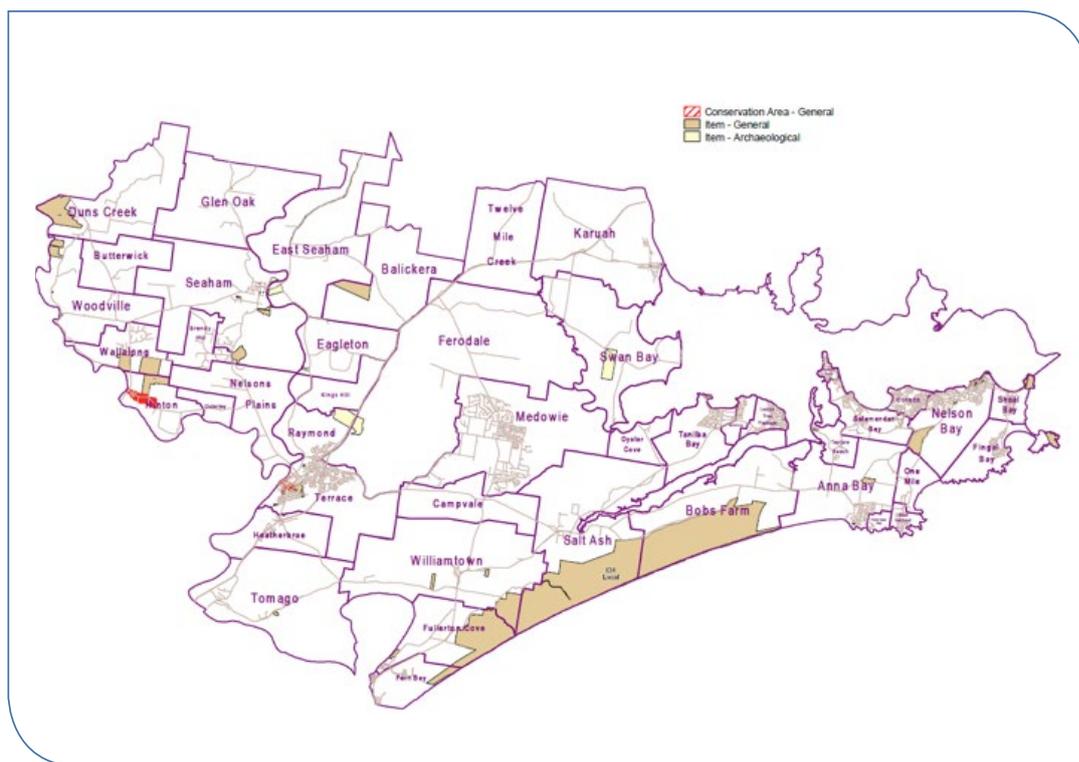
## Port Stephens Council Staff Cultural Awareness Training

Cultural Awareness Training through the Murrook Cultural Centre is available to Port Stephens Council staff, providing them with an understanding of local Aboriginal culture, in particular that of the Worimi community.

## Non-Indigenous Heritage

There are currently 117 Heritage Items, two Heritage Conservation Areas and six Archaeological sites of European heritage listed and protected under the Port Stephens Local Environmental Plan 2013<sup>39</sup> a map of which is provided below. The listed Heritage Items include a number of unique and valuable items, some of which date back to early settlement<sup>40</sup>.

Non-indigenous cultural heritage in Port Stephens includes historic villages, heritage conservation areas at Raymond Terrace, Tipperary Hill and Hinton, rural landscapes, significant early residences such as Tomago House and Tanilba House, lighthouses, churches, cemeteries, war memorials, courthouses, schools, shipwrecks, archaeological remains such as the Irrawang Pottery site, cottages and early subdivisions such as Henry Halloran's 1930s development at Tanilba Bay<sup>41</sup>.



Map 1 Heritage areas: Port Stephens Local Environment Plan 2013

39 <http://www.legislation.nsw.gov.au/#/view/EPL/2013/755/sch5>

40 Port Stephens Council Heritage Strategy 2014- 2017 DRAFT, May 2016.

41 Port Stephens Council 2014-2015 Annual Report



Most Heritage Items located within the LGA are listed under the LEP 2013; the following items are State significant listings and are located on the State Heritage Register under the NSW Heritage Act:

- Dunmore Bridge over the Paterson River, Woodville
- Hinton Bridge over the Paterson River, Hinton
- Port Stephens Lighthouse Group, Port Stephens
- Seaham Quarry, Seaham
- Tanilba House and the Temple, Tanilba Bay
- Tomago House and Tomago Chapel, Tomago
- Tomaree Head Fortification, Shoal Bay
- Tomaree Holiday Lodge, Shoal Bay

A Heritage Conservation Area is recognised as containing many different elements which collectively have heritage significance, and in which its historical origins and contributory elements create a sense of place that is of value to the community. The two Heritage Conservation Areas within the Port Stephens LGA are Raymond Terrace and Hinton.

Council adopted the Heritage Policy and Heritage Signage and Trail Guidelines in March 2015. The policy articulates an overarching commitment to recognise, protect and promote tangible and intangible, Indigenous and non-Indigenous heritage. The Heritage Signs and Trails Guidelines provide Council with a consistent approach to the promotion of the region's heritage and support the development of cultural tourism in the region. It is envisaged that the heritage signs and trails system would link into a broader integrated signage system in the Port Stephens region, encompassing gateway signage, tourism and interpretative signs.

The Draft Port Stephens Council Heritage Strategy identifies and guides the strategies and actions undertaken by Council in order to facilitate heritage management in the LGA.

The Port Stephens Heritage Advisory Committee includes members from a range of historical societies around Port Stephens who work together to actively participate in the conservation and management of heritage buildings, places and items within the LGA.

The Port Stephens Council Heritage Advisory Service was created with the appointment of a heritage advisor in 2005. The heritage advisor is available two days per month to assist Council and the community with matters related to heritage conservation and management.

Local community heritage groups include Port Stephens Family History Society, Raymond Terrace Historical Society, Tomaree Family History Group Nelson Bay NSW, Port Stephens Historical Society and Karuah Working Together – Karuah Local History Group.

The Mariners Walk Heritage Trail is a naval commemoration initiative of Port Stephens Historical Society, in conjunction with Port Stephens Council. The trail is the first official trail that went through Council's Heritage Signs and Trails process. The Mariners Walk Heritage Trail is approximately 3.3kms and includes interpretive displays and signage in Soldiers Point and Salamander Bay. Initiatives such as this Heritage Trail seek to raise awareness and build a profile for the naval heritage of this area.

The State Heritage Inventory, an online heritage database, is currently being updated for the LGA.

The Heritage Projects Fund is an annual Council grant program with financial support from the NSW Office of Environment and Heritage that provides incentives for individuals and community groups to become involved in conserving local heritage.

# Land Use Planning and Development

## Summary

Land use planning is a tool to achieve broader goals. It provides the opportunity to review and determine how a range of goals can be achieved and spatially distributed. In summary, it can be used to inform and report on land use responses to economic development, rural production, residential development, social wellbeing, environmental conservation and infrastructure (amongst others). This report focusses on demographic and housing data to provide a snapshot only of land use pressures and change within the LGA.

Tomaree planning district experienced the largest population growth between 2006 and 2011. Fern Bay, Rural East and Karuah experienced the fastest rates of population growth from 2006 and 2011.

The Port Stephens Local Environmental Plan 2013 provides planning and environmental control over the use and development of land. The Port Stephens Development Control Plan 2014, adopted in July 2015, provides further guidance to, and facilitates development in accordance with the Port Stephens Local Environmental Plan 2013. These documents work within the parameters set by NSW Government legislation and the choices of individual land owners in relation to the use of their land.

The Port Stephens LEP 2013 and DCP 2014 enact land use planning strategies for the LGA as a whole and particular communities and centres within the LGA. The Raymond Terrace and Heatherbrae Strategy 2015-2031 was adopted by Council in November 2015 to enact Port Stephens Council's vision for the location as 'a strong regional centre and a great place to live, work and play'. The Nelson Bay Town Centre and Foreshore Strategy was adopted in 2012, and the Medowie Strategy was adopted in 2010. Both the Nelson Bay Town Centre and Foreshore Strategy and the Medowie Strategy have been reviewed and a new Strategy for Medowie is currently in development.

Sixteen planning proposals were approved from 2012 to 2016, five were refused and 16 proposals are pending, awaiting a decision by the Minister for Planning. The number of approved development applications has remained relatively constant at approximately 800 per year over the past six years, whilst the value of these development applications has fluctuated.

## Introduction and Status

This chapter includes an outline of land use planning and development, given its central role in influencing the future use of land within Port Stephens and the management of the natural environment through land use planning controls.

Land use planning is an effective means to identify past, current and future spatial impacts of human activity within the Port Stephens LGA.

Land use planning is also one of the major tools (hand in hand with infrastructure planning) available to land owners and governments to manage the distribution and effects of human activity. An example of all three levels of government which are impacting on land use decisions and outcomes can be found within Port Stephens from the Williamstown RAAF base (Commonwealth) to NSW Government decisions on the location of education and health services through to day to day development decisions by Port Stephens Council and property owners.



Therefore for the purposes of this SoE Report land use planning is described in two ways: first as a means of setting the scene for the distribution and interactions of human activity across the local government area; and secondly, to assist in informing the extent of growth reflected in demographic data and new development within Port Stephens.

While the settlement pattern of communities across Port Stephens is heavily influenced by environmental factors such as flooding and ecological considerations, the size and composition is also influenced by the location and accessibility of services, employment and lifestyle options in the remainder of the lower Hunter as well as within Port Stephens.

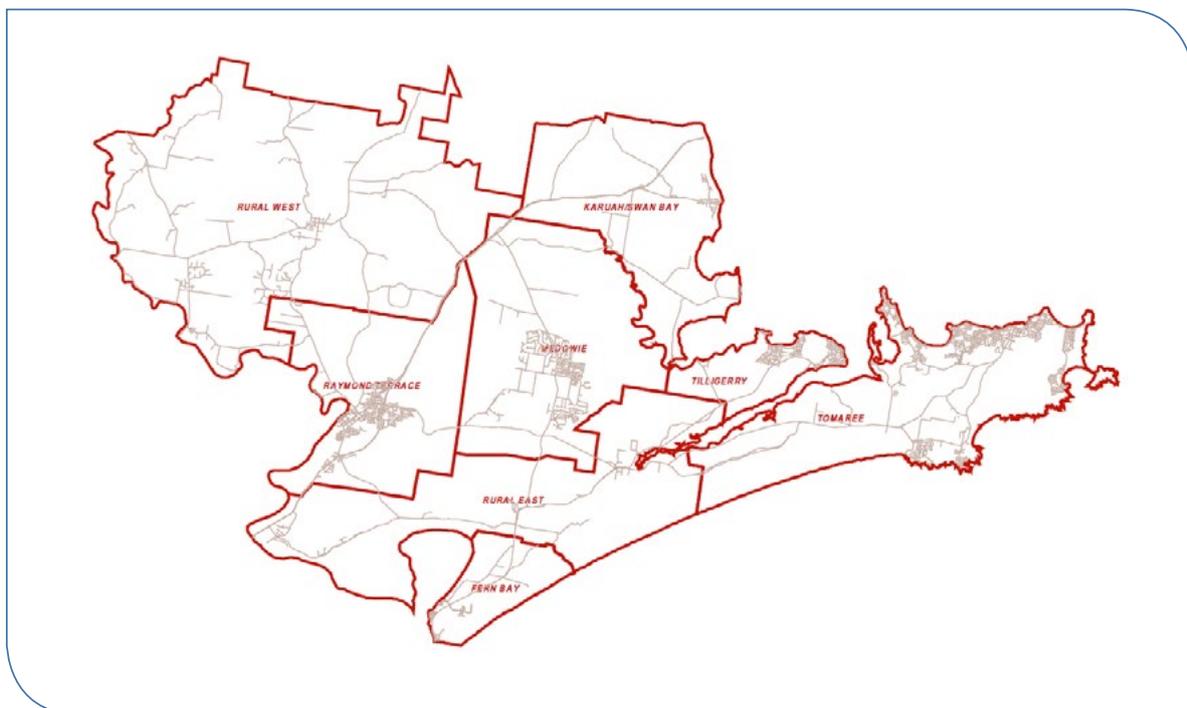
The proximity of a broader range of employment options within thirty minutes of Port Stephens, as well as access to tertiary level health and education services in Newcastle has resulted in many residents of Port Stephens choosing to live within the area as a lifestyle option. This has shaped the size and composition of many of the communities as well as the high proportion of commuters within the LGA. The limited footprints and populations of Port Stephens communities indicates this a pattern that is unlikely to change significantly. If lifestyle and environmental conservation are to be sustained it is a change that may not be warranted. These factors dramatically influence the land use planning and development decisions all levels of government and land owners have made and are likely to make in the future within the Port Stephens area.

## Settlement Pattern

### Dispersed Settlement Pattern

Council's aim is to ensure all communities have adequate access to services and infrastructure. This includes water, sewerage (where possible), electricity, communications, health, education and social and recreation services and facilities.

Due to the dispersed settlement pattern of the LGA settlement statistics are examined and explained at the planning district level. There are eight planning districts within the Port Stephens LGA: Tomaree, Raymond Terrace, Medowie, Tilligerry, Rural West, Rural East, Fern Bay, Karuah Swan Bay.

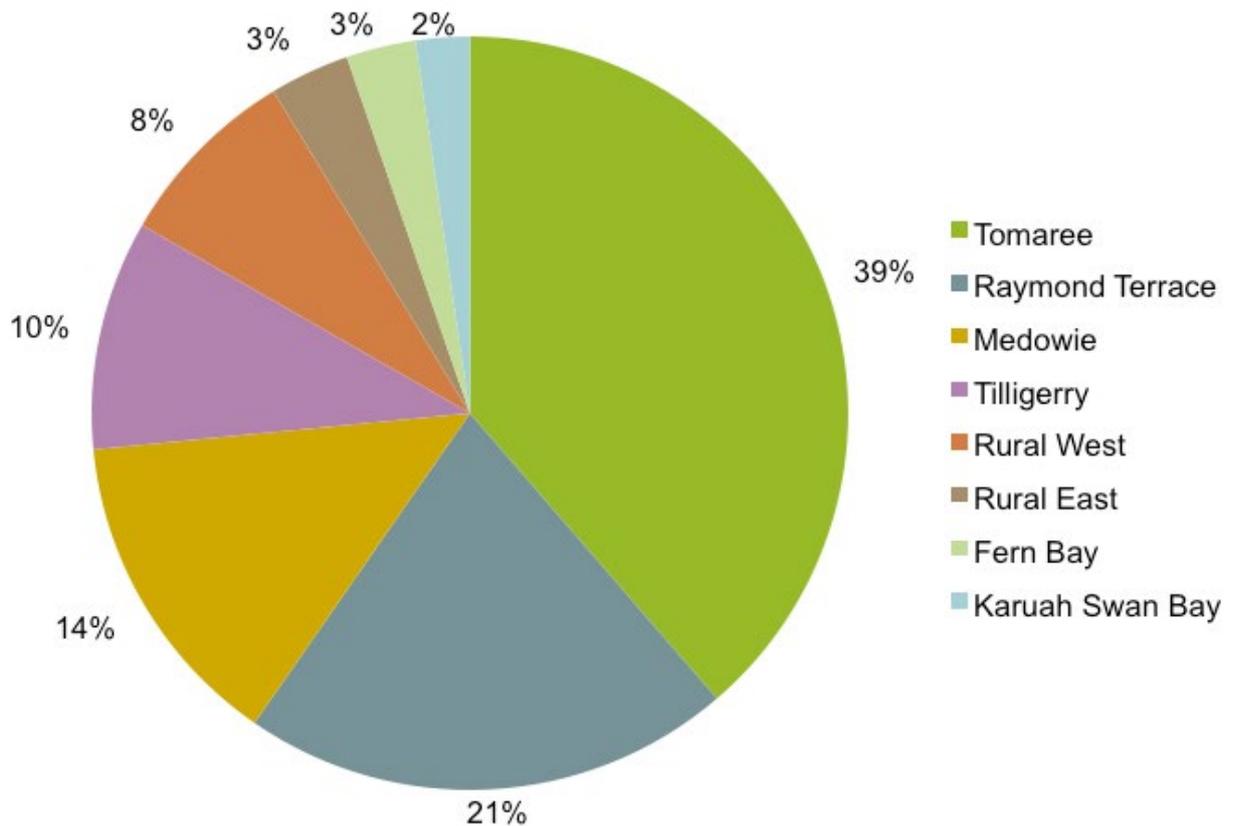


Map 2 Port Stephens Local Government Area by Planning District

Economic pressures and changes in population are two indicators of changing pressures on the environment in terms of increased demand for natural resources as well as the provision of infrastructure.

The following graphs show the 2011 population and population densities of Port Stephens compared to 2006. Population density is expressed in terms of the number of people per square kilometre.

The 2011 population of the Port Stephens LGA planning districts are shown below. It can be seen that over half of the LGA's population resides in the Tomaree and Raymond Terrace areas. The remaining portion of the population is spread over six other planning districts, and a total of 641.29km<sup>2</sup>.



**Figure 4 Port Stephens' Population (2011) by Planning Districts.**

As can be seen below, in absolute terms the Tomaree planning district experienced the largest population growth from 2006 to 2011, whilst Raymond Terrace, Medowie and Tilligerry planning districts experienced similar population growth. However Fern Bay, Rural East and Karuah have experienced the fastest rates of growth starting from a lower population base.

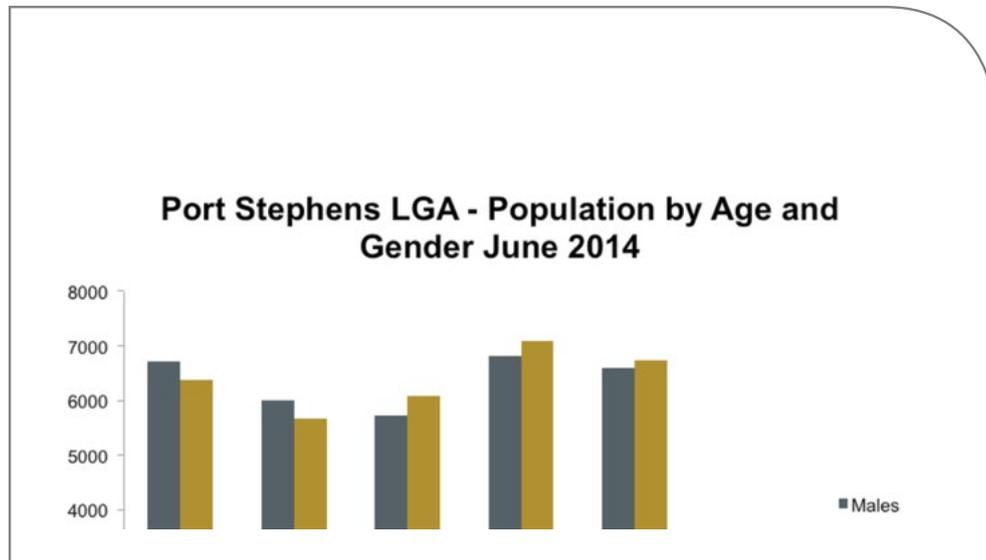


Figure 5 Population Change by Planning District (2006 to 2011).



## Planning Controls

### State Planning Reforms

There have been some recent (and ongoing) reforms to State planning instruments that will affect the way that land use planning and development proceed within the LGA. These include the following:

#### Draft Hunter Regional Plan.

The NSW Government has developed a Draft Hunter Regional Plan that outlines a vision, goals and actions for the sustainable growth of the region for the next 20 years until 2036. The draft Plan provides an overarching framework to guide development and investment. In recognition of the pivotal role that the metropolitan area referred to as 'Hunter City' will play in the Hunter region, a Draft Plan for Growing Hunter City has also been developed as a companion to the Draft Hunter Regional Plan.

#### Biodiversity Reforms

The NSW Government released a new Draft Biodiversity Conservation Bill in May 2016. The reforms in biodiversity legislation follow the establishment of an independent panel in 2014 to review the *Native Vegetation Act 2003*, *Threatened Species Conservation Act 1995*, *Nature Conservation Trust Act 2001* and the *National Parks and Wildlife Act 1974*. The stated aim of the reforms is to create more streamlined and effective legislation to conserve biodiversity and support sustainable development<sup>42</sup>.

<sup>42</sup> <http://www.environment.nsw.gov.au/biodiversitylegislation/review.htm>



## Coastal Reforms

The stated aim of the NSW Department of Environment's Coastal Reforms is to establish a new approach that allows land managers and decision-makers to respond effectively to coastal processes and hazards; and to manage the unique environmental, social and economic values of the coast in a coherent and functional way.

The current legal framework for coastal management in NSW was established over 35 years ago. It was recognised that these laws could not adequately reflect the current and future challenges faced by our coastal areas, nor the evolving knowledge of coastal processes and hazards.

On 13 November 2015, the NSW Government released a draft framework for coastal management for public consultation. A full draft Coastal Management State Environmental Planning Policy (SEPP) and corresponding maps of the coastal management areas are also expected to be released separately for public comment in the coming months. The Government will not finalise the coastal reforms until this second stage of public consultation is completed<sup>43</sup>.



43 <http://www.environment.nsw.gov.au/coasts/coastreforms.htm>

## The Port Stephens Planning Strategy 2011

The Port Stephens Planning Strategy 2011 (PSPS) provides the current planning framework for the future growth of the LGA. The strategy draws direction from the 2006 Lower Hunter Regional Strategy which focuses urban growth around centres and directs urban expansion to suitable areas near existing centres and services.

In the 20 years to 2031, the NSW Government is forecasting that there will need to be 12,700 additional dwellings constructed in Port Stephens LGA. The PSPS has identified potential for 14,441 dwellings across the growth precincts, infill areas and rural lands to 2036.

## Location Specific Growth Strategies

In addition to the LGA-wide PSPS, Council has also prepared more detailed land use plans and local strategies including:

### Raymond Terrace and Heatherbrae Strategy 2016 – 2031

Raymond Terrace has been identified as one of six major regional centres under the Lower Hunter Regional Strategy (LHRS) and as a part of 'Hunter City' under the Draft Hunter Regional Plan. The aim of the LHRS is to ensure that the region develops in a strong and sustainable way over a 15 year period to 2031. This means that what happens in Raymond Terrace and Heatherbrae is not only of importance for the future of Port Stephens, but for the future of the Lower Hunter Valley Region<sup>44</sup>.

The Raymond Terrace and Heatherbrae Strategy 2016-2031, which was adopted by Council on 24 November 2015 enacts Port Stephens Council's vision for this location as 'a strong regional centre and a great place to live, work and play'.

### Nelson Bay Town Centre and Foreshore Strategy, 2012

Adopted in April 2012 the Nelson Bay Town Centre and Foreshore Strategy provides a vision for change, and details the key initiatives and strategies that will guide the Town Centre and the Foreshore. The Nelson Bay Improvement Program outlines key public domain improvements, a framework to guide infrastructure and capital improvements to facilitate the delivery of the strategy<sup>45</sup>.

**The above strategies, in conjunction with those listed below are used to inform strategic planning within Port Stephens:**

- Williamstown Defence and Airport Related Employment Zone, 2008 (DAREZ);
- Karuah, 2010;
- Medowie, 2010; and
- Anna Bay Strategy and Town Plan, 2008.

<sup>44</sup> <http://www.portstephens.nsw.gov.au/grow/development-controls-plans-and-strategies/planning-strategies>

<sup>45</sup> <http://www.portstephens.nsw.gov.au/grow/development-controls-plans-and-strategies/planning-strategies>



## Port Stephens Local Environmental Plan 2013

As part of the NSW Planning Reform Agenda, all councils were required to prepare new local environmental plans to comply with the Standard Instrument (Local Environmental Plans) Order 2006. The final LEP 2013 consolidates and translates both the Port Stephens LEP 2000 and the Kings Hill LEP 2010 that were in force at that time.

The Port Stephens Local Environmental Plan (LEP) 2013 provides the statutory framework for planning within the Port Stephens LGA. It provides planning and environmental control over the use and development of land, in order to uphold and promote the objectives of the *Environmental Planning and Assessment Act 1979*.

## Local Environment Plan Re-Zonings Summary

In the last four years the following land use rezonings, under the LEP, have been approved within the LGA as a result of 16 planning proposals. At the time of writing there are currently 16 planning proposals pending, awaiting a decision from the Minister for Planning. In the reporting period five planning proposals have been refused.

**Table 1 Land Re-Zonings Approved in the Reporting Period**

New Land Use Zone	Lots/Hectares Rezoned
Industrial	14.5 lots
Commercial	5 lots
Residential	713 lots
Conservation	145.8 ha
Heritage	1 lot
Reclassification	21 lots

## Port Stephens Development Control Plan 2014

The Port Stephens Development Control Plan 2014 (the DCP) was adopted by Port Stephens Council in July 2015 and took effect on 6 August 2015.

The second amendment came into effect on 10 December 2015 which relates to D1 – Heatherbrae and D9 – Raymond Terrace Town Centre and enacts a Council resolution of 24 November 2015.

The Port Stephens Development Control Plan seeks to provide further guidance and facilitate development in accordance with the Port Stephens Local Environmental Plan 2013.

## Development in the LGA

Increasing population and development places increased pressures on environmental assets and resources. Council works within the statutory planning framework to manage land use conflicts to achieve development and environmental outcomes.

The data presented below demonstrate the trends in development application approval rates and their values over the period 2012 to 2015 as well as an historical comparison back to 2008 to provide greater context.

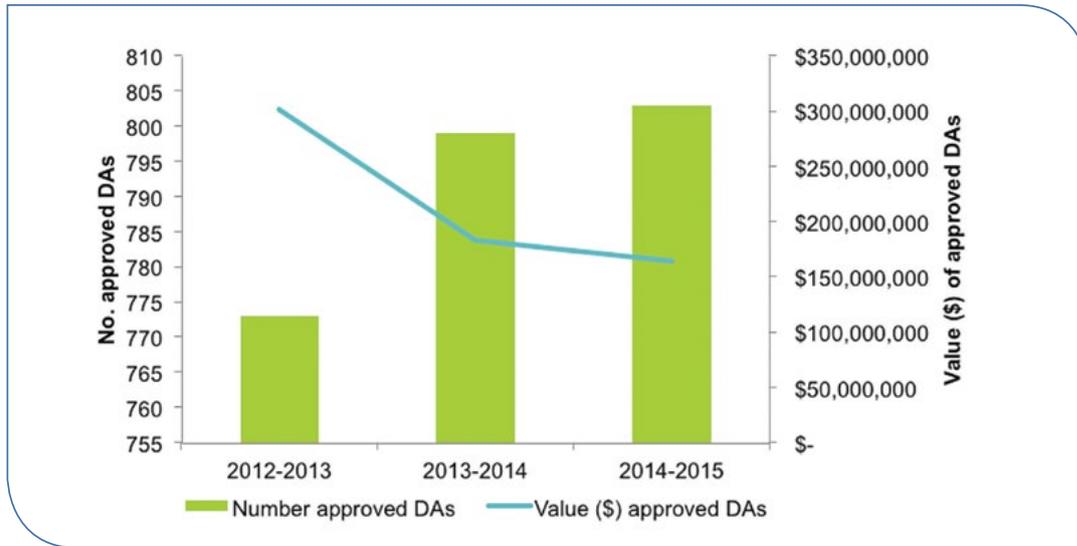


Figure 6 Number and Value of DAs approved in Port Stephens (2012 to 2015)

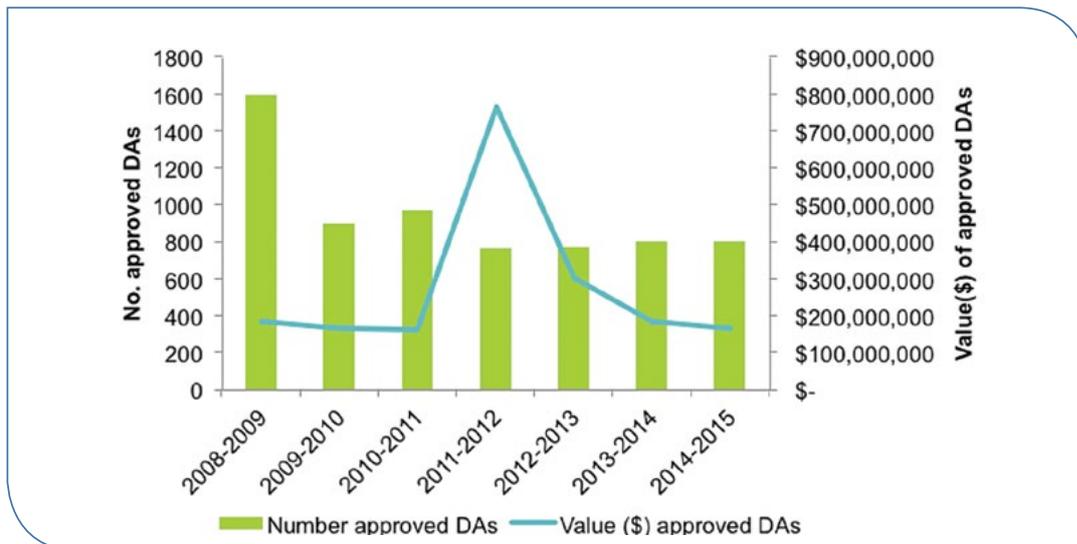


Figure 7 Number and Value of DAs approved in Port Stephens (2008 to 2015)



Following the approval of a development application a Construction Certificate must be obtained for the relevant building type. Construction Certificates as illustrated below, are presented in terms of both total number issued and total site area of issued Certificates and have been grouped by Building Code of Australia (BCA) categories.

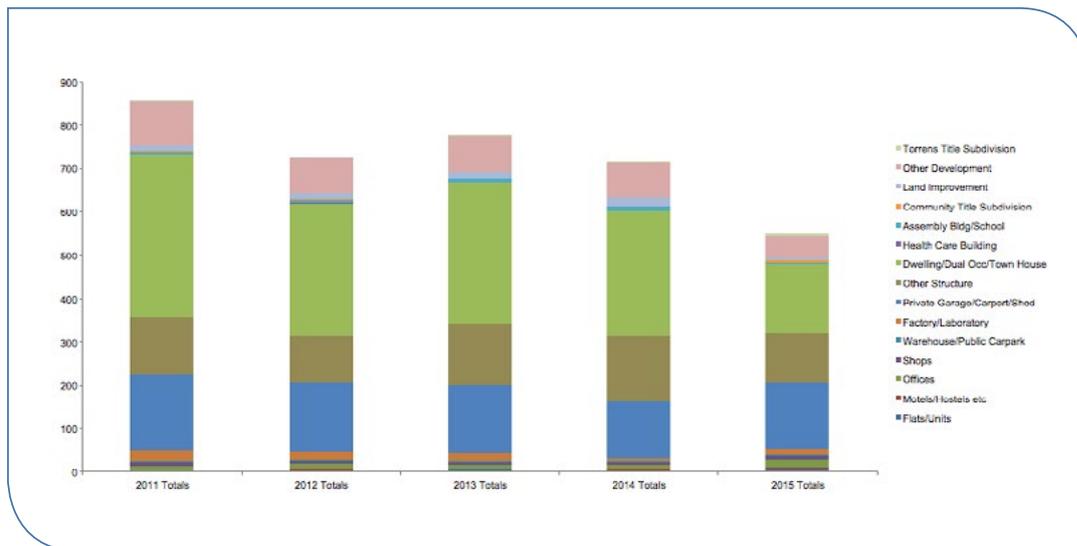


Figure 8 Number of Construction Certificates issued in Port Stephens (2011 to 2015)

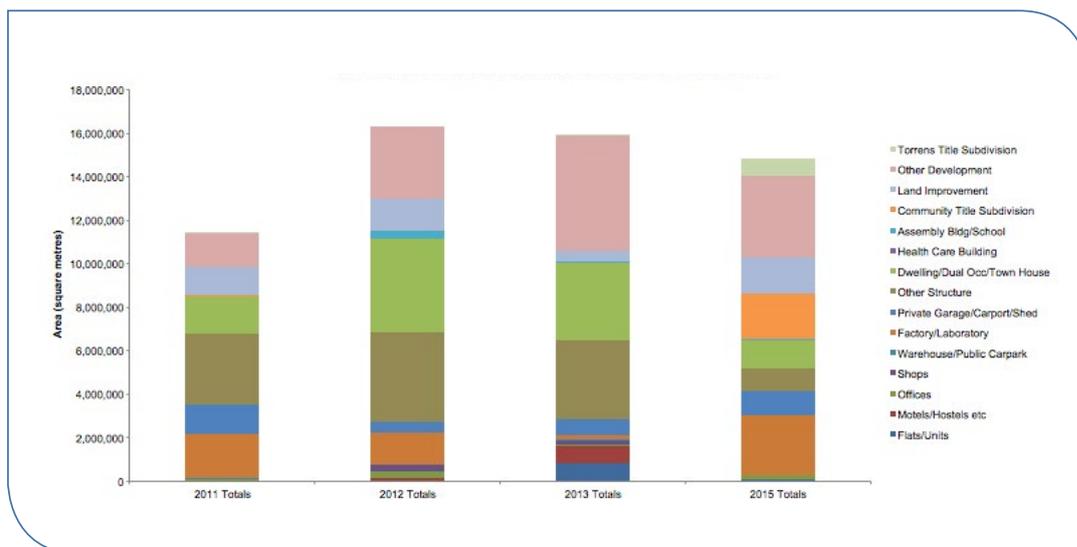


Figure 9 Site area of issued Construction Certificates in Port Stephens (2011 to 2015)

Note: Site area data for 2014 unavailable

# Water Supply, Treatment and Consumption

## Summary

91% of Hunter Water's major water supply assets are located within the Port Stephens LGA. At least 99.5% of water quality sampling undertaken by Hunter Water complied with Australian Drinking Water Guidelines for chemical, physical, and microbiological parameters over the past three years.

Hunter Water's wastewater treatment plants within the Port Stephens LGA include: Tanilba Bay; Raymond Terrace; Karuah; Boulder Bay. Council's Onsite Sewage Management Policy was reviewed and amended in 2012. There are 4,896 Onsite Sewage Management Systems (OSMS) approved for use in Port Stephens. Council established a Development Assessment Framework (DAF) in 2012 to provide a consistent methodology for assessing and approving new systems and upgrades to existing OSM systems. OSMS compliance rates ranged between 87% and 97% from 2012 to 2016.

Annual applications for new systems and upgrades to existing systems ranged from 30 to 47 between 2012 and 2016, relatively low by historical standards due to the fewer remaining undeveloped rural residential allotments.

Total water consumption has remained relatively stable over the period across the LGA, with 66.4% of potable water consumed in 2014-2015 being for residential purposes. Five year rolling average residential water consumption within Port Stephens (178 Kl/year/residence) remains well below Hunter Water's conservation target of 215 Kl/year/residence. Council water consumption has remained relatively constant since 2012-2013, growing at an average of 0.6% per annum.





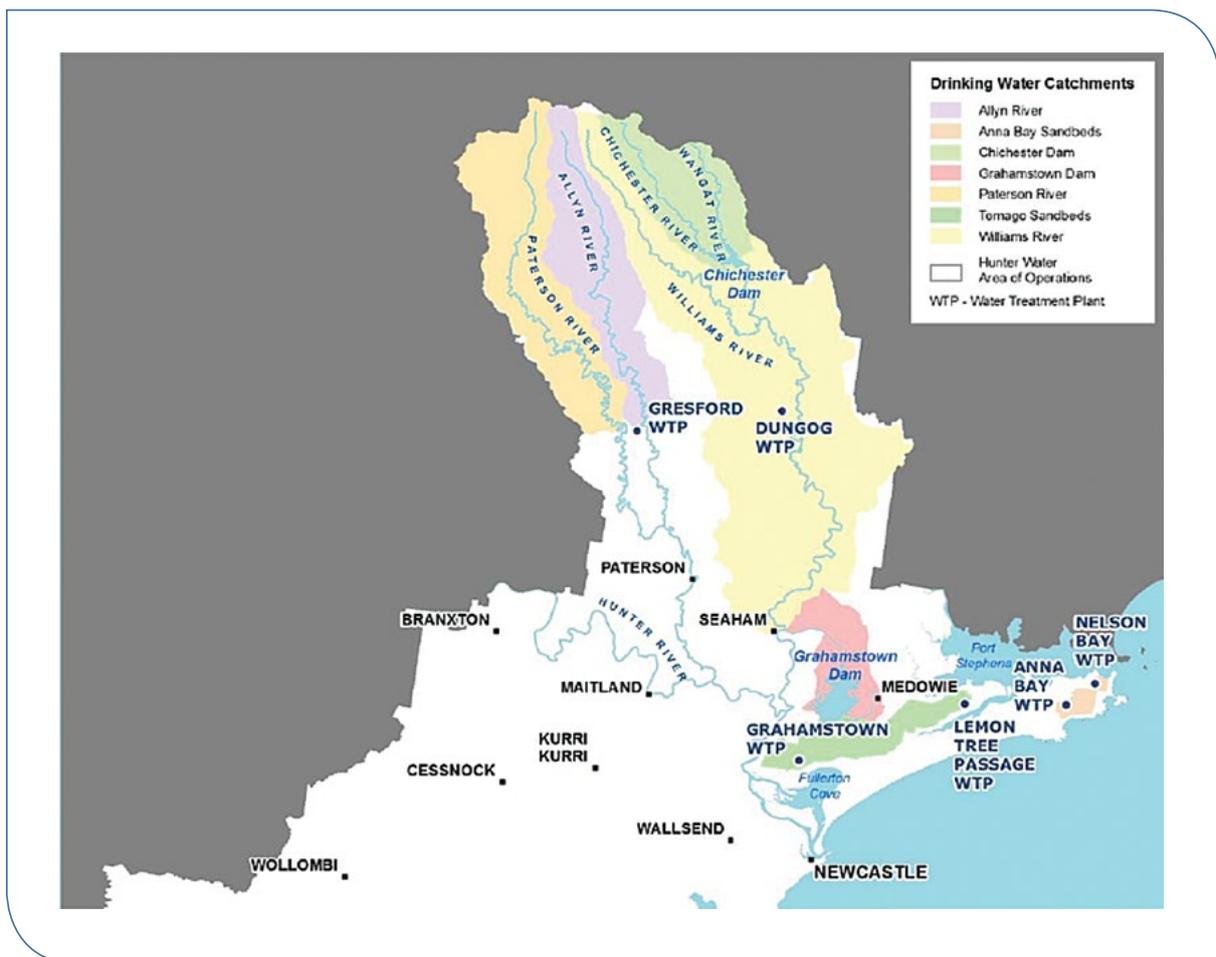
## Water Supply

The potable water supply of the LGA is the responsibility of Hunter Water Corporation (HWC) and 91%<sup>46</sup> of their major water supply assets are located within the Port Stephens LGA, including:

- Grahamstown Dam, a large off-river storage reservoir located within the LGA, that provides around 52% of the region's drinking water requirements. Complimentary to its catchment area, it receives pumped inflows from the Seaham Weir Pool on the Williams River and from the Campvale Canal.
- Tomaree Sandbeds, an area of approximately 16km<sup>2</sup> located within the protected area of Tomaree National Park.
- Tomago/Anna Bay Sandbeds, Hunter Water's major groundwater source has an area of approximately 109km<sup>2</sup>.

These three drinking water supply zones can be seen in the map below which also shows four water treatment plants (Grahamstown WTP, Lemon Tree Passage WTP, Anna Bay WTP and Nelson Bay WTP) managed by HWC within the Port Stephens LGA.

Pollution monitoring data are collected by Hunter Water, as required under the Environmental Protection Licences issued to Hunter Water by the NSW Environmental Protection Authority (EPA). A full list of these data is available on the Hunter Water website<sup>47</sup>.



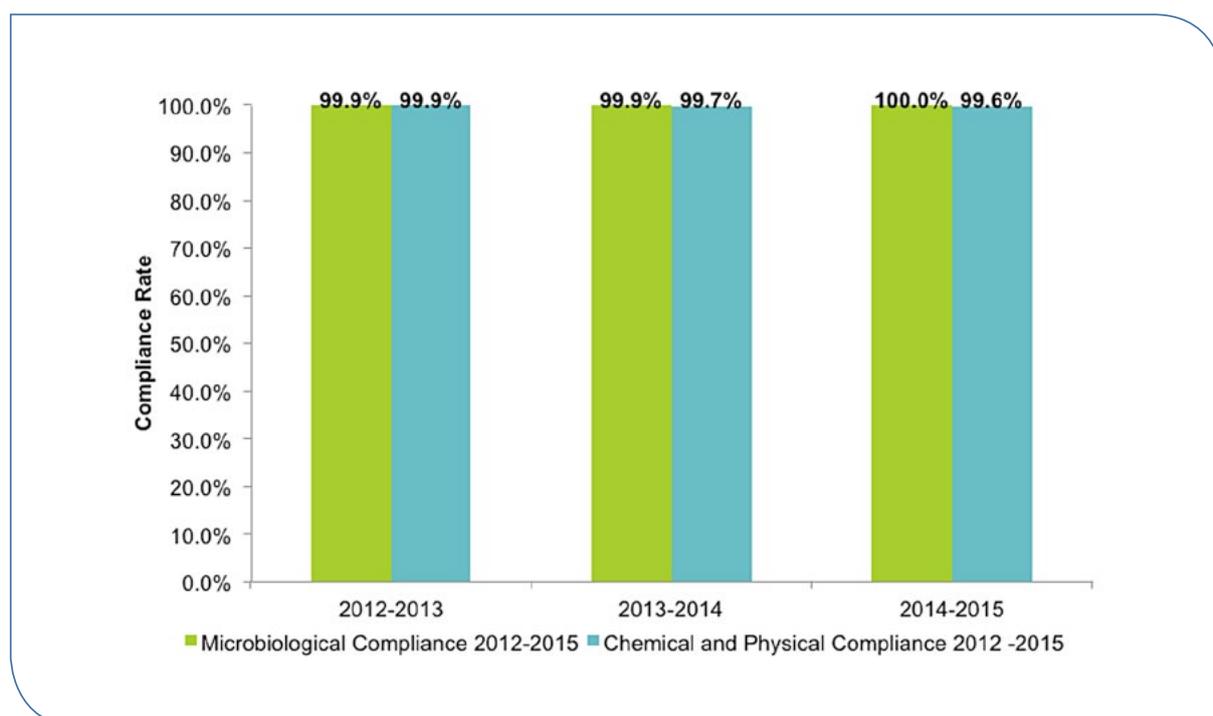
**Map 3 Hunter Water Catchment Areas, Storages and Water Treatment Plants**

Source Hunter Water Compliance and Performance Report 2014-2015

<sup>46</sup> <http://www.hunterwater.com.au/Resources/Documents/Other-Reports/Regulatory-Reports/Compliance-and-Performance-Report-2014-15---submitted-to-IPART.PDF>  
<sup>47</sup> [www.hunterwater.com.au/Water-and-Sewer/EPA-Monitoring/Environment-Protection-Authority-\(EPA\)-Pollution-Monitoring-Results.aspx](http://www.hunterwater.com.au/Water-and-Sewer/EPA-Monitoring/Environment-Protection-Authority-(EPA)-Pollution-Monitoring-Results.aspx)

Human activities including urban development, agriculture, onsite wastewater treatment systems and land clearing have the potential to impact the health of our drinking water catchments.

HWC's water quality management program includes the protection and improvement of drinking water catchments as well as compliance with the Australian Drinking Water Quality Standards for the microbiological indicator E.coli and key physical and chemical parameters. Compliance rates for these parameters can be seen in the chart below. Key physical and chemical indicators include turbidity, pH, colour, iron, manganese, aluminium, copper, lead, zinc, fluoride, chlorine and trihalomethanes.



**Figure 10 Microbiological, Chemical and Physical Compliance Rates of Hunter Water Samples 2012-2013 to 2014-2015**

In 2014-2015 all of the water quality sampling undertaken by Hunter Water complied with microbiological indicator parameters. In 2014-2015 99.6% of routine water samples complied with Australian Drinking Water Guidelines for chemical and physical parameters. The slight decrease reflects the localised water quality issues associated with system reconfiguration to maintain water supplies during the April 2015 storm event<sup>48</sup>.

<sup>48</sup> Hunter Water Compliance and Performance Report 2014-15, Hunter Water Corporation, 2015



# Wastewater Treatment

## Hunter Water wastewater treatment

Hunter Water maintains 4,943kms of sewer mains throughout its service area, with 227,514 properties connected<sup>49</sup>. Wastewater from households, commercial premises, schools and industry in Port Stephens is treated through Hunter Water wastewater treatment plants (WTP). Hunter Water's wastewater treatment plants within the Port Stephens LGA are listed below.

- The Tanilba Bay Wastewater Treatment Works services the communities of Lemon Tree Passage, Mallabula and Tanilba Bay. Effluent from the treatment works is discharged via four sand infiltration ponds located along the eastern boundary of the Tanilba Bay WTW<sup>50</sup>.
- Raymond Terrace Wastewater Treatment Works serves the communities of Raymond Terrace, Medowie and some parts of Heatherbrae, treating 7.3 megalitres per day. Biosolids produced through the process are used in mine site rehabilitation and pasture improvement projects. The remainder of the treated effluent is discharged to Windeyers Creek via Grahamstown Drain<sup>51</sup>.
- Karuah Wastewater Treatment Works currently treats 0.34 megalitres per day and can handle wastewater from a population equivalent to 1,450 people. Biosolids produced are used for mine site rehabilitation. The recycled water is reused onsite at Hunter Water's Karuah Effluent Reuse Enterprise (KERE), which is adjacent to the Karuah WTW<sup>52</sup>.
- Boulder Bay Wastewater Treatment Works is an ocean outfall plant which serves the communities of Nelson Bay, Shoal Bay, Dutchmans Bay, Corlette, Fishermans Bay, Boat Harbour, Anna Bay and Salamander Bay<sup>53</sup>.

Note. At the time of writing data on quantity and quality of wastewater treated within the Port Stephens LGA was not available.

## Onsite Sewage Management Systems/Effluent Management

The provision of waste water treatment services within the Port Stephens LGA is primarily the responsibility of Hunter Water, with the exception of Onsite Sewage Management Systems (OSMS) which are the responsibility of Port Stephens Council.

There are 4,896 Onsite Sewage Management Systems approved for use in the LGA, mainly located in unsewered areas such as semi-rural villages and rural areas. System types include septic tanks with adsorption trenches or evapotranspiration beds; septic tanks that pump to sewer; aerated wastewater treatment systems; pump to sewer systems; and effluent pump-outs.

All surface waterways and groundwater can be potentially affected by failing onsite wastewater treatment systems. Systems that are poorly maintained and not operating effectively can introduce high levels of nutrients, micro-organisms and other pollutants to our waterways.

Council's Onsite Sewage Management Program has been operating since March 2000 following legislative changes by the NSW Government. All properties operating an OSMS require an approval to operate, renewed on an annual basis. An inspection program is run by Council officers to ensure systems are maintained to a satisfactory condition<sup>54</sup>. The outcomes of the annual inspection process are shown in the table below.

49 2014-15 Hunter Water Annual Report

50 <http://www.hunterwater.com.au/Water-and-Sewer/Wastewater-Systems/Wastewater-Treatment-Works/WWTW-Pages/Tanilba-Bay.aspx>

51 <http://www.hunterwater.com.au/Water-and-Sewer/Wastewater-Systems/Wastewater-Treatment-Works/WWTW-Pages/Raymond-Terrace.aspx>

52 <http://www.hunterwater.com.au/Water-and-Sewer/Wastewater-Systems/Wastewater-Treatment-Works/WWTW-Pages/Karuah.aspx>

53 <http://www.hunterwater.com.au/Water-and-Sewer/Wastewater-Systems/Wastewater-Treatment-Works/WWTW-Pages/Boulder-Bay.aspx>

54 <http://www.portstephens.nsw.gov.au/live/resident-services/environmental-health-and-compliance/onsite-sewage-management>

**Table 2 Onsite Sewage Management Systems Approved/Inspected by Council**

Year	Total OSMS Approved	New Approvals	Annual Inspections	Compliance Rates from Inspections	Reported incidents potentially linked with OSMS
2012-2013	4,722	47	838	97%	21
2013-2014	4,776	30	815	93%	13
2014-2015	4,876	39	1,275	87%	4
2015-2016	4,896	34	1,178	95%	16

The inspection of existing wastewater systems is one of a number of key platforms included in Council’s Onsite Sewage Management Policy (OSMS Policy). Inspections are generally performed routinely however other reasons for inspections can include complaints; at the request of the owner/operator; pre-purchase inspections; and incident-based inspections. The main focus of the inspection program is to determine the operating status of each system and assess it against accepted standards and guidelines.

Failing or poorly operating systems can increase the risk to the environment, public health and the health of property owners. Systems identified with major non-compliances are managed within a combined educational and enforcement framework to ensure repairs and upgrades are completed within acceptable timeframes. The OSMS Policy defines a major non-compliance as having the potential to prevent the normal operation of the system, the potential to significantly reduce the quality of effluent from expected levels, the potential to impact on the natural environment, human health or public amenity, the potential to cause a significant public safety risk or the observed failure of the land application area to adequately dispose of or contain effluent during normal annual climatic conditions.

Inspections for the four years 2012-2016 revealed compliance rates in a range from 87% to 97%. The minor variability within the four results is an indication of a number of influencing factors including system life cycle (age), system type, maintenance regime, weather/seasonal variation and change in system hydraulic loading. The single largest contributor to a system’s operational performance issue is a system’s age.

All wastewater systems, regardless of type, have a designed life span. It is the designed life span that is typically influenced by the other factors already mentioned. Council’s inspection program is an outcome-based process where the key performance indicator is not the total number of inspections performed but how non-compliant systems are managed through to becoming compliant.

Applications for new Onsite Sewage Management Systems are also managed through the OSMS Policy. In 2012 Council established a Development Assessment Framework (DAF) to provide a consistent methodology for assessing and approving new systems and upgrades to existing systems.

The basis of the DAF is a broad scale hazard class map that categories the LGA into four risk levels from low through to very high. A set of five factors influence the hazard class: proximity to sensitive receptors; soil type; climatic region; topography (slope); and flood prone status. Properties identified with a low or medium hazard class typically have fewer constraints and are able to access an “acceptable solution” or “deemed to comply” arrangement for a speedy and efficient approval process.

Properties identified as high or very high risk require a more stringent assessment and design process due to a greater or more complex set of constraints.

During the four years between 2012 and 2016 the number of applications processed ranged between 30 and 47 per year and included both new installations and upgrades to existing systems. On an annual basis this is a relatively low number in comparison to previous periods and is a reflection of the fewer remaining undeveloped rural residential allotments.



## Water Consumption

Hunter Water has a Water Conservation Target to ensure that the five year rolling average for annual residential water consumption is equal to or less than 215 kilolitres per year for each residential property. The Water Conservation Target was achieved in 2014-2015, the latest available report at the time of writing<sup>55</sup>.

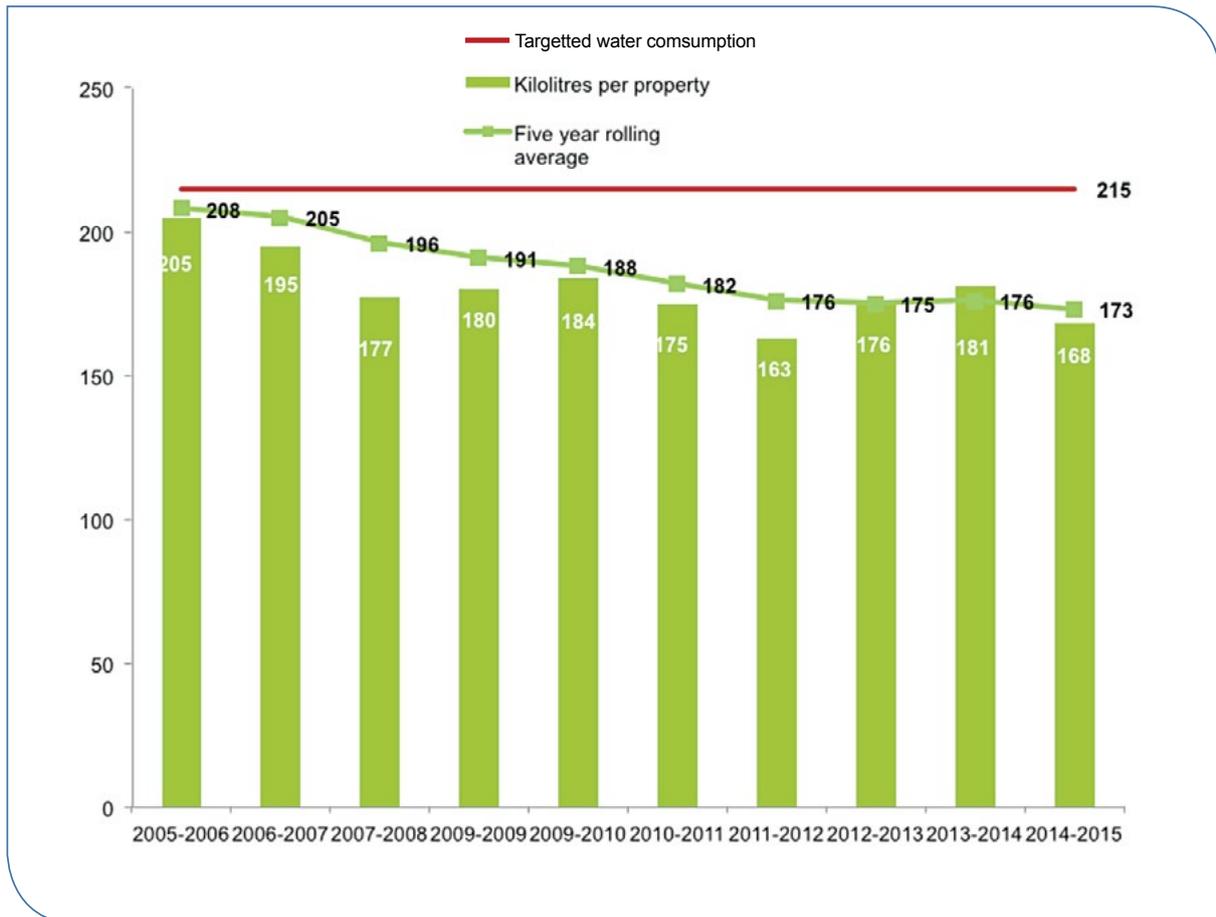
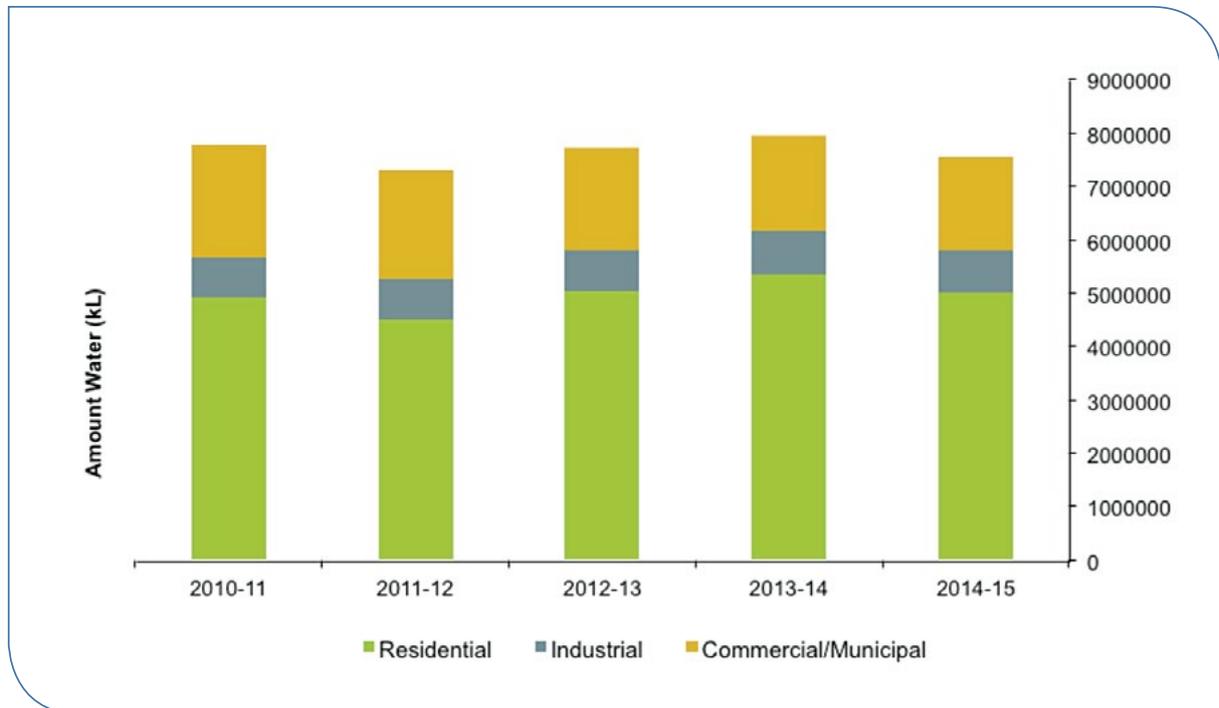


Figure 11 Hunter Water Corporation 10 year trend in water consumption across Hunter Water's area of operations

55 <http://www.hunterwater.com.au/Resources/Documents/Other-Reports/Regulatory-Reports/Compliance-and-Performance-Report-2014-15---submitted-to-IPART.PDF>



**Figure 12 Port Stephens LGA Annual Water Consumption – Hunter Water**

66.4% of potable water consumed from Hunter Water Corporation’s network in Port Stephens 2014-2015 was for residential purposes. Total water consumption has remained relatively stable over the period across the LGA. Residential water consumption within Port Stephens remains well below Hunter Water Corporation’s water conservation target of 215 kilolitres per year for each residential property over a five year rolling average as illustrated in Figure 11.

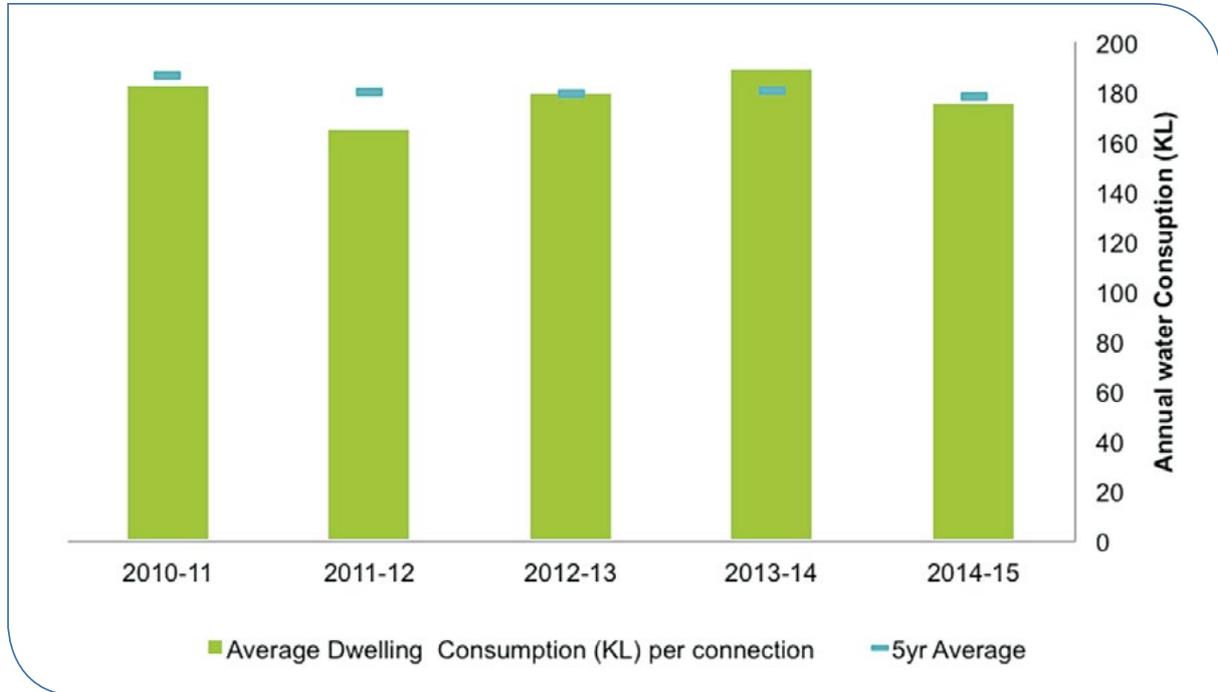


Figure 13 Average Residential Dwelling Consumption (KL) per connection v 5yr rolling average in Port Stephens LGA 2010-2011 to 2014-2015

Council's total potable water consumption is shown below.

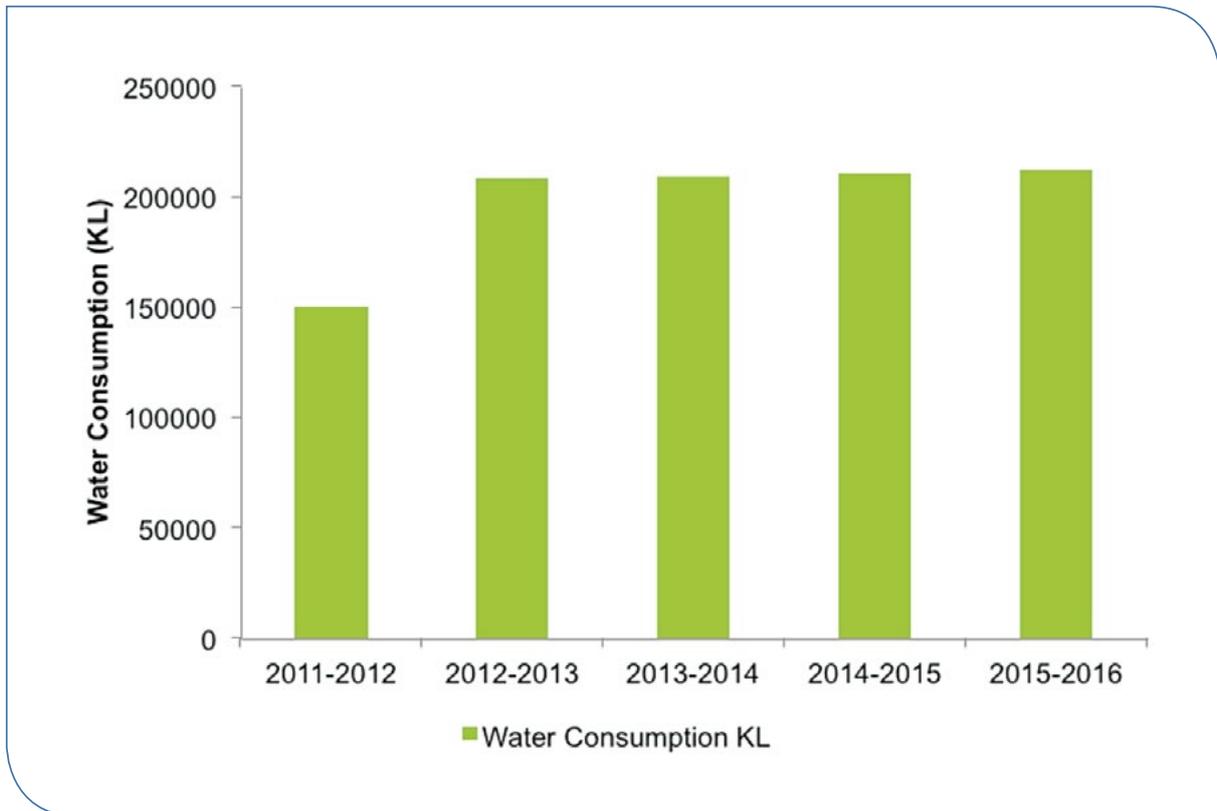


Figure 14 Port Stephens Council annual potable water consumption 2011-2012 to 2015-2016

Council's water consumption has remained relatively constant since 2012-2013, growing at an average of 0.6% per annum. The significant increase notable between the 2011-2012 and 2012-2013 financial year periods is attributable to an increase in the number of sites included in the water usage register.

Council has undertaken a number of water audits throughout its major facilities to identify opportunities for improved water efficiency and continues to monitor water consumption on an ongoing basis.



# Energy

## Summary

Total electricity consumption (from the Ausgrid<sup>56</sup> network) in Port Stephens had been steadily declining over recent years.

Average annual electricity consumption has continued to decline across all categories (residential, small and medium non-residential) since 2008-2009, due to uptake of energy efficiency measures solar PV systems. 16.5% of dwellings in Port Stephens (4,839 in total) have a solar PV system installed, with a total installed capacity of 14,004kW, as recorded by the Australian Photovoltaic Institute.

Electricity makes up the overwhelming majority of stationary energy consumed by Council and has declined by approximately 3% since 2011-2012, with minor increases notable in more recent years. Council has implemented a range of energy efficiency projects including LED lighting upgrades, building management and control systems, air conditioning upgrades, energy auditing, power factor correction, as well as installing a number of solar PV and solar hot water systems.

<sup>56</sup> Energy supply company



## Global and national context

Energy is critical to society and the economy, the provision of which can both alleviate and cause global instability, poverty, and environmental harm. The energy supply sector is the largest contributor to global anthropogenic greenhouse gas emissions, the leading cause of climate change. The energy system also contributes to a range of environmental problems including those associated with the mining and extraction of non-renewable fossil fuels including land clearing, loss of agricultural land, impacts on water balances and water quality, air, noise and dust impacts.

According to the International Energy Agency total world energy demand rose by 1.1% in 2014 at a slower rate than in 2013 (2.5%), to reach 13,700 Mtoe (million tonnes of oil equivalent)<sup>57</sup> with fossil fuels making up over 80% of supply. However, it is clear that the global energy mix is changing with renewable energy the fastest growing energy source (2.6% from 2013 to 2014) over recent years, reaching 1,894 Mtoe, or 13.8% of the total Primary Energy Supply (TPES) by the end of 2014<sup>58</sup>.

Solar PV is the fastest growing source of energy at 44% pa (1990-2015), and accelerating despite remaining a relatively small contributor to total energy supply, followed by wind energy which grew at an average of 22% pa over the same period. Renewables-based power generation capacity is estimated to have increased by 128 gigawatts in 2014, of which just over one third was from wind, almost one-third solar and more than a quarter from hydro power.

Electricity generation is the largest source of emissions in Australia's National Greenhouse Gas Inventory<sup>59</sup>.

## Energy in NSW

Over 90% of energy demand is being met by non-renewable sources in NSW, the production and use of which is the largest source of greenhouse gas emissions in NSW, with transport and electricity generation responsible for the majority of these emissions<sup>60</sup>.

Electricity consumption has declined in NSW due to a variety of factors, such as increased local generation by residential and commercial users; and improvements to energy efficiency<sup>61</sup>. A total of 322,000 NSW households and small businesses had adopted small-scale solar PV as at July 2015<sup>62</sup>.

Almost 14 per cent of NSW energy came from renewable sources in 2015 and over the past five years alone, the share of solar, wind and bioenergy in the NSW energy mix has more than doubled<sup>63</sup> with renewable (non-hydro) electricity generation growing five-fold between 2008 and 2014<sup>64</sup>.

Environmental benefits from reduced electricity demand and growing renewable electricity supply are being offset by continued strong growth in fossil fuel demand by the transport sector<sup>65</sup>.

## Energy in Port Stephens

According to Ausgrid, the electricity network operator in Port Stephens, total electricity consumption has been steadily declining over recent years across Port Stephens however consumption increased in 2014-2015 for the first time since at least 2008-2009.

57 <http://www.iea.org/publications/freepublications/publication/KeyWorldEnergyTrends.pdf> (Page 3)

58 <https://www.iea.org/newsroomandevents/news/2016/july/renewable-energy-continuing-to-increase-market-share.html>

59 <https://www.environment.gov.au/system/files/resources/f4bdfc0e-9a05-4c0b-bb04-e628ba4b12fd/files/australias-emissions-projections-2014-15.pdf> (Page 17)

60 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>

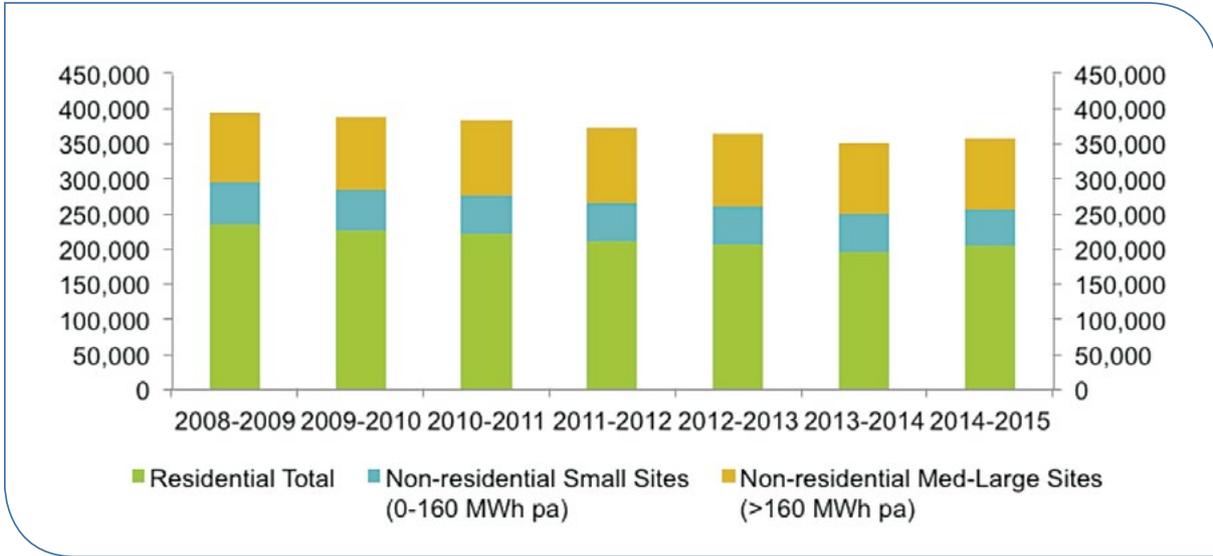
61 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>

62 [http://www.resourcesandenergy.nsw.gov.au/\\_data/assets/pdf\\_file/0008/586601/reap-annual-report.pdf](http://www.resourcesandenergy.nsw.gov.au/_data/assets/pdf_file/0008/586601/reap-annual-report.pdf)

63 <http://www.resourcesandenergy.nsw.gov.au/investors/investment-opportunities/renewable-energy/industry-overview>

64 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>

65 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>



**Figure 15 Total Electricity consumption in the Port Stephens LGA.**

*Note: 2015-2016 data were unavailable at the time of writing.*

Average annual electricity consumption by customer has been declining across all categories over the reporting period, providing further indication of increased energy efficiency measures and uptake of local generation opportunities including, most significantly, solar photovoltaics.



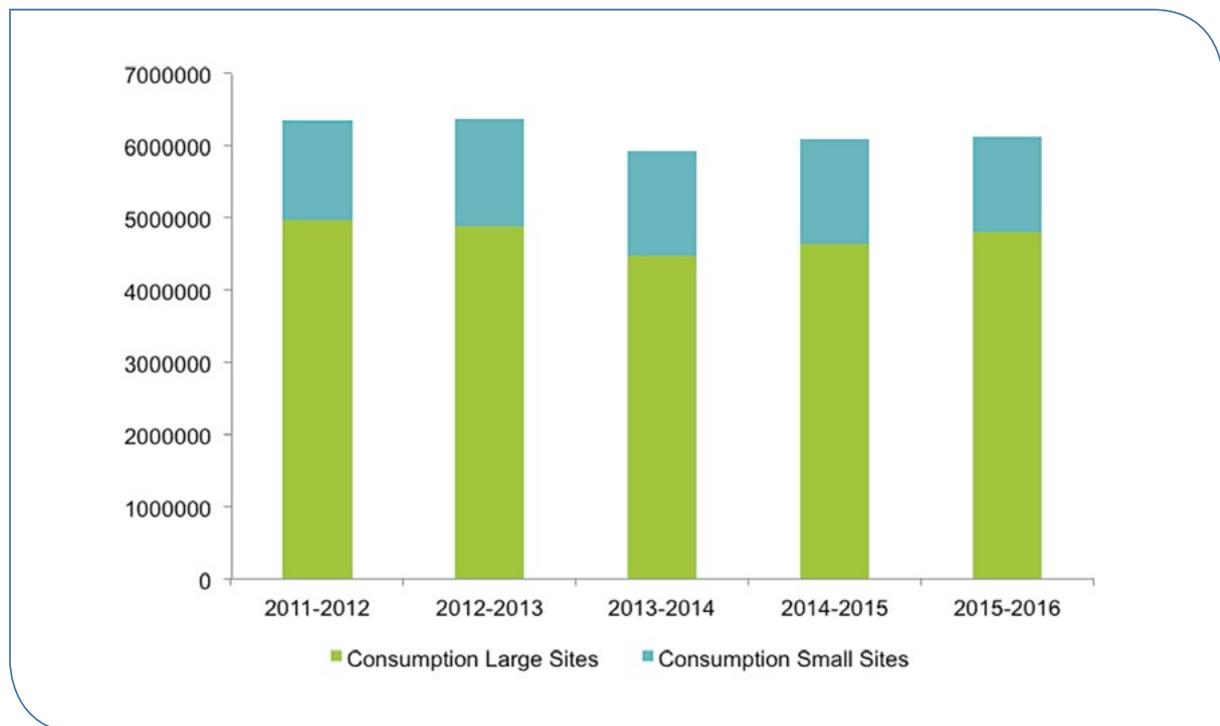
**Figure 16 Average annual electricity consumption per customer and customer category in the Port Stephens LGA**

According to the Australian Photovoltaic Institute (APVI) as at 30 August 2016 there was 14,004 kW of installed solar photovoltaic capacity across the Port Stephens LGA from 4,839 solar installations, equating to approximately 16.5% of dwellings having a solar PV system installed<sup>66</sup>.

66 <http://pv-map.apvi.org.au/historical/#9/-32.8564/151.4117>

## Energy at Council

Electricity makes up the overwhelming majority of stationary energy consumed by Council and therefore constitutes the focus of Council's efforts to manage its stationary energy consumption, costs and associated greenhouse gas emissions (GHG).



**Figure 17 Port Stephens Council annual electricity consumption (excluding streetlights)**

Port Stephens Council continued to implement its sustainable energy program throughout 2012 - 2016 with a range of activities implemented throughout the LGA to improve the overall efficiency, environmental performance and financial sustainability of its assets. These projects include:

- Installation of a 30kW Solar PV system, and comprehensive LED lighting retrofit at Tomaree Library and Community Centre;
- Installation of an 8.16kW Solar PV, evacuated tube solar hot water systems, energy efficient lighting, a building management system (BMS) and complete replacement of the HVAC (heating, ventilation and air conditioning) at Raymond Terrace Community Care Centre;
- Installation of a 3kW Solar PV system, energy efficient lighting and control system at Medowie Community Centre;
- Achieving a 4.5 Star NABERS Energy Rating for Council's Administration Building in 2014;
- Reduction in after-hours energy consumption at Council's Administration Building;
- Installation of real time digital water meters at Council's largest water consuming facilities;
- LED street lighting retrofit in Nelson Bay;
- Major HVAC (Heating Ventilation and Air Conditioning) upgrades at Council's Administration Building and the Raymond Terrace Community Care Centre;
- Installation of a range of LED and alternative energy efficient lighting and control systems across Council's five Works Depots;



- Solar Hot Water Systems at Tomaree Sports Complex;
- Installation of a wide range of sub meters across Council facilities to enable more accurate data capture, cost pass through, and ultimately reduction in consumption;
- Numerous internal training programs relating to energy efficiency, renewable energy, data management, and preparing business cases for projects;
- Installation of a 2kW Solar PV system, Solar Hot Water, and LED lighting upgrade at Birubi Child Care Centre;
- Numerous energy audits to identify future opportunities for investments in energy efficiency and renewable energy initiatives;
- Installation of a range of LED and other energy efficient lighting solutions in parks, above footpaths and walkways throughout the LGA;
- Installation of Building Management Systems (BMS) at Raymond Terrace Community Care Centre and Lakeside Leisure Centre;
- Installation of Solar Pool Heating and Power Factor Correction units at Tomaree and Tilligerry Aquatic Centres;
- Installation of solar powered LED streetlights at Fingal Bay and Shoal Bay Beachside Holiday Parks;
- Installation of evacuated tube solar hot water system at Tilligerry Aquatic Centre;
- Installation of a Power Factor Correction unit at a Council-owned commercial property in Newcastle;
- LED lighting upgrades throughout cabins at Port Stephens Beachside Holiday Parks;
- Construction of a new amenities building at Fingal Bay Holiday park incorporating: gas boosted solar hot water; 20,000L of rainwater tanks; solar passive design; natural lighting; internal and external LED lighting; AAA rated showerheads;
- Installation of a 5kW Solar PV system at Salamander Waste Transfer Station.



Solar PV system - Salamander Waste Transfer Station

# Transport

## Summary

Environmental impacts of transport include using non-renewable resources, greenhouse gas emissions, and noise and air pollution. The Port Stephens LGA has a network of approximately 650km of sealed and over 60kms of unsealed roads and steady growth in vehicle registrations of between 2.5% and 3% pa.

The length of cycle ways in Port Stephens increased to 65kms as at July 2015.

Newcastle Airport is the twelfth busiest airport in Australia and the second busiest in NSW with over 1.1million passenger movements per year.

Council's annual diesel consumption is closely associated with the scale of Council's capital works schedule within any given year and the utilisation rate of plant items. Increased works and increasing utilisation rates have resulted in increased diesel consumption. Council diesel consumption spiked in 2014-2015 due to two significant storm events requiring considerable diesel supply for flood pumps, internal emergency plant as well emergency service vehicles (RFS/SES) in response to prolonged power outages across the LGA.

Prior to Council's staged transition to private management of the passenger fleet in 2014-2015, there was an 18% decline in unleaded petrol (ULP) consumption (2011-2012 to 2013-2014) due to replacement of passenger vehicles with more efficient ULP vehicles and a switch from ULP to diesel passenger vehicles to drive improvements in fuel efficiency of the fleet. Eleven of 13 Council trucks are now compliant with Euro IV emissions standards, with a further 12 commuter use utility vehicles and Council's library services truck scheduled for replacement in 2016-2017 to be Euro IV compliant.





## Introduction

The major environmental impacts associated with transport are the use of non-renewable resources, the production of greenhouse gas emissions and the generation of noise and air pollution<sup>67</sup>. The main determinants of transport emissions are the size of the population, the viability of more efficient engine types, and the availability of low emissions fuels.

Greenhouse gas emissions from transport include emissions primarily from direct combustion of fuels (road, rail, shipping, aviation) and accounted for 17% of Australia's emissions in 2013-2014, having increased by 24% since 1999-2000 to 92 Mt CO<sub>2</sub>-e. Transport emissions are projected to increase in Australia by 25 per cent to 115 Mt CO<sub>2</sub>-e between 2013-2014 and 2029-2030 and are currently one of the fastest growing sources of emissions nationally<sup>68</sup>.

Increased congestion on roads and highway routes exacerbates environmental pressures, whereas smooth traffic flow reduces environmental impact<sup>69</sup>. Other factors that can ease the pressure that private transport and road haulage generate on the environment include:

- Frequency, reliability and quality of public transport;
- Areas that public transport services, together with the availability and quality of pedestrian and cycling facilities;
- Advances in transport technologies, particularly improvements in fuel efficiency;
- Advances in low emission vehicles and the use of cleaner fuels; and
- Reducing the distance people need to travel to their places of work or essential facilities.

## Transport in NSW<sup>70</sup>

Transport demand has increased in NSW as population has grown, however the number of trips per person decreased by 4.8% and vehicle kilometres travelled per person have decreased by 2.1% from 2002-2003 to 2012-2013. A variety of factors, including changes in lifestyle and technological advances have influenced this outcome. Over the same period there was a 148% increase in employees with working from home arrangements.

Transport is now the largest sector for final energy demand with strong growth in fossil fuel use, and proportionally has the lowest use of renewable energy. Approximately 30% of all petrol and diesel sold in NSW now contains biofuel. Electric vehicles show considerable promise for improved environmental performance – especially if supplied from renewable energy sources.

The NSW Long Term Transport Master Plan 2012 establishes a framework to guide the development of transport decisions over the next 20 years, including initiatives to manage and minimise the environmental impacts of our transport systems.

## Transport in Port Stephens

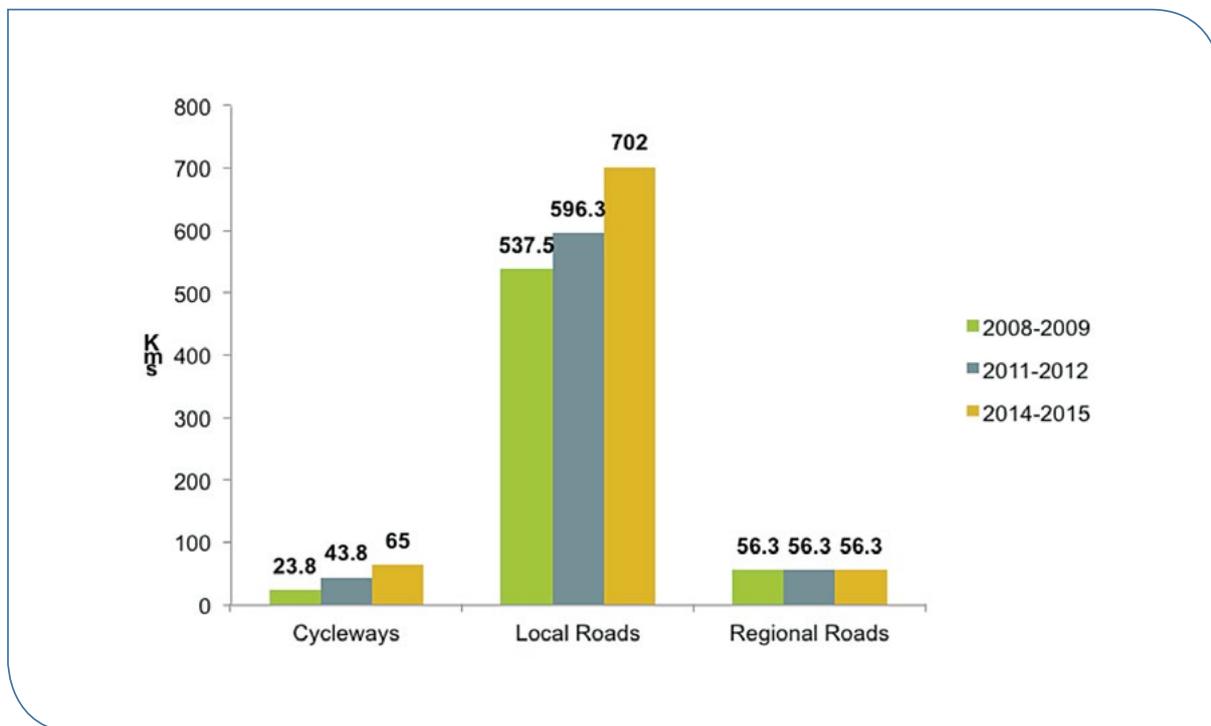
The Port Stephens LGA has a network of sealed roads (645kms as at 1 July 2015); and unsealed roads (62kms as at 1 July 2015). These are local roads and regional roads and do not include roads that are owned privately, or by Roads and Maritime Services (RMS), or by the Crown. The Pacific Highway runs through the LGA from Hexham to Karuah and is owned and managed by the RMS.

67 NSW State of Environment Report 2015, EPA

68 <https://www.environment.gov.au/system/files/resources/f4bdfc0e-9a05-4c0b-bb04-e628ba4b12fd/files/australias-emissions-projections-2014-15.pdf>

69 NSW State of Environment Report 2015, EPA

70 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>



**Figure 18 Port Stephens Cycleways, Local & Regional Roads at 1 July 2015**

There are no State buses and there is no rail transport in Port Stephens. Public transport services in the Port Stephens LGA are predominantly shared between Port Stephens Coaches, Hunter Valley Buses, Shelton's Bus Service and Busways.

Community Transport Port Stephens provides services for eligible clients including: a door to door service; regular services throughout Port Stephens (including Tomaree, Tilligerry, Raymond Terrace, and Medowie and Karuah areas); services to Newcastle and Maitland; individual services for special medical needs; and transport for eligible client groups on social outings.

## Vehicle Registrations

An increase in vehicle registrations illustrates an increase in vehicle numbers on roads. Water runoff carrying increasing amounts of dust and particulate pollution from roads has the potential to affect water quality. The increasing demand for the construction of road infrastructure can impact on natural areas and biodiversity through the loss and/or fragmentation of habitat and ecosystems. Whilst not direct indicators, vehicle registration numbers can also be used as a proxy for increased kilometres travelled and associated fuel use and emissions.

As shown in the data below there is steady growth in vehicle registrations within the LGA of between 2.5% and 3% per annum, but the ratio of heavy vehicles to light vehicles remains constant.

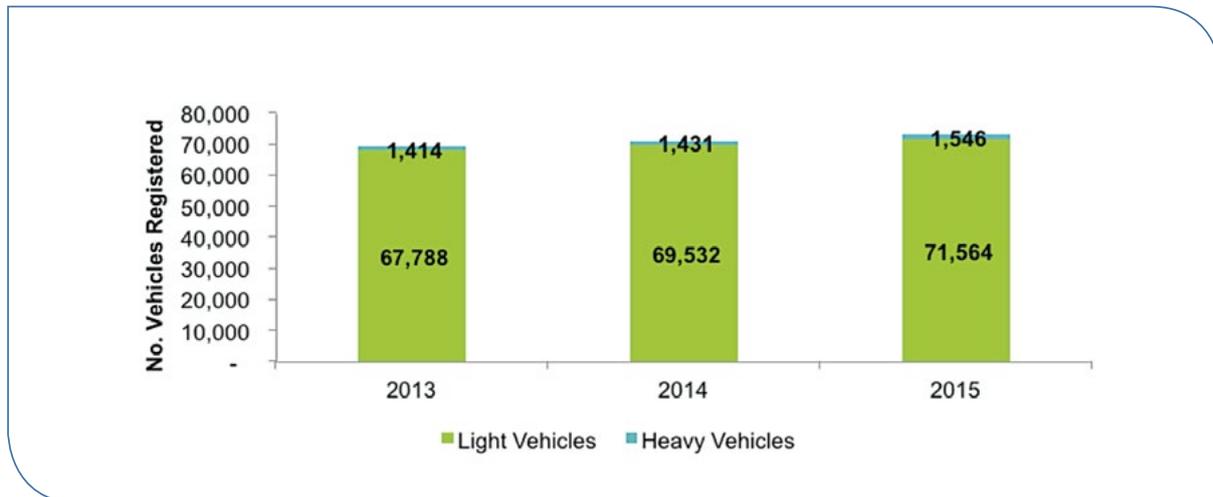


Figure 19 Total number of registered vehicles by type for Port Stephens LGA, 2013-2015

New vehicle registrations are also increasing; and although 2014 shows a lower registration number, registrations returned to trend in 2015, as can be seen below.

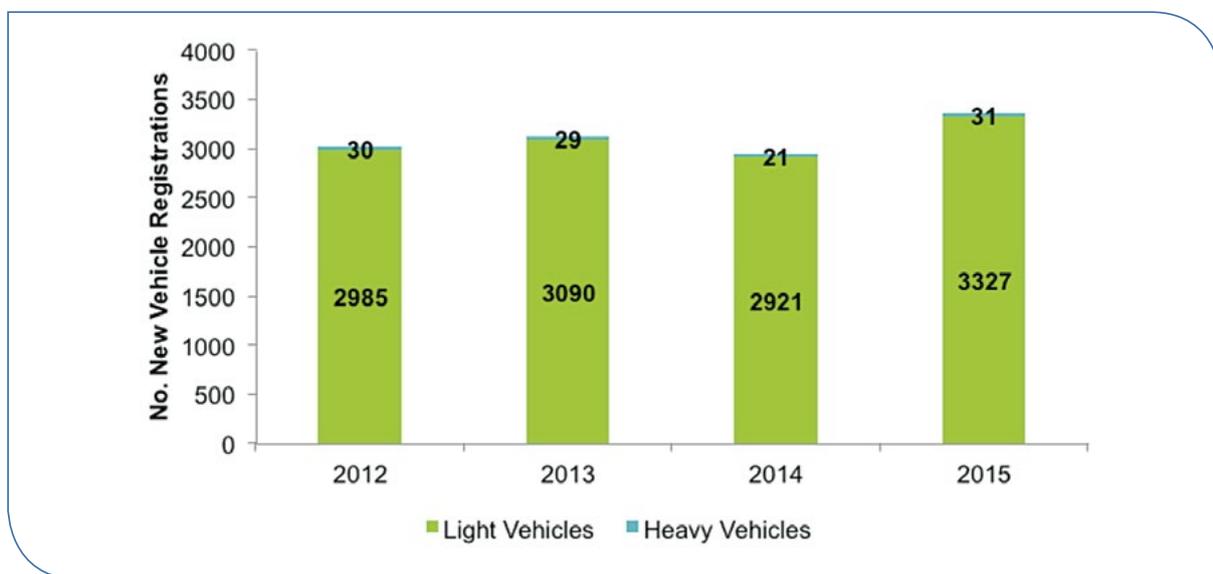


Figure 20 Number of New Vehicle Registrations for Port Stephens LGA, 2012-2015

## Newcastle Airport

Located at Williamtown, Newcastle Airport is the twelfth busiest airport in Australia and the second busiest in NSW. Currently, there are over 1.1 million passenger movements per year through Newcastle Airport.

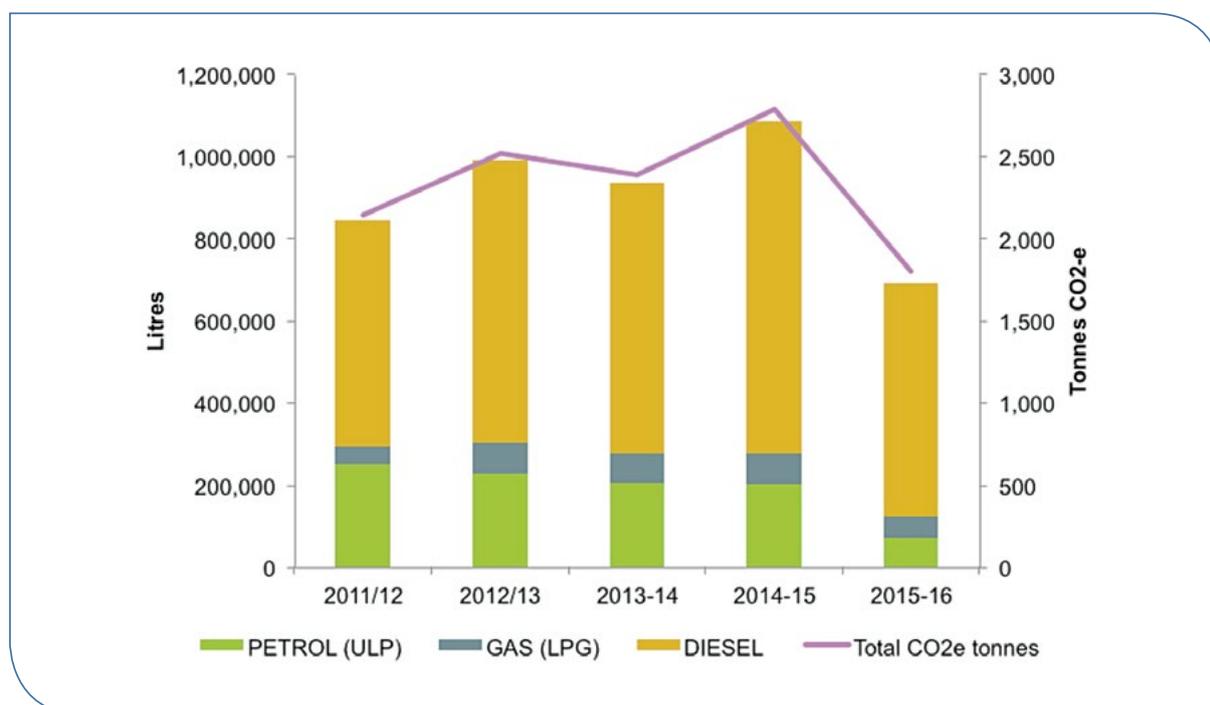
In 2013 approval was granted for the expansion of the Airport. The expansion will provide key infrastructure as well as facilitate the potential for international flights. Work started on the project in 2014.

## Council's Vehicle Fleet

*Please note the following Port Stephens Council vehicle fleet data exclude fuel use and emissions from Council contractors, including waste services, and the now privately managed passenger vehicle fleet.*

Port Stephens Council's diesel, Liquid Petroleum Gas (LPG) and unleaded petrol (ULP) usage is shown below along with corresponding greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) expressed in tonnes of carbon dioxide equivalent (CO<sub>2</sub>-e). Emissions were determined using the National Greenhouse Accounts Factors<sup>71</sup>.

Between 2011-2012 and 2013-2014 there was an 18% decline in ULP consumption as a result of the replacement of a proportion of the passenger vehicle fleet with more efficient ULP vehicles (e.g. replacement of Toyota Aurion with a Hyundai i35). A switch from ULP passenger vehicles to diesel passenger vehicles to drive further improvements in fuel efficiency has also been undertaken. Transition from 2-Stroke to 4-Stroke sundry plant items has also contributed to the reduction in ULP consumption over this period. Total passenger vehicle numbers remained relatively constant over the period.



**Figure 21 Council diesel, LPG and unleaded petrol usage (2011-2012 to 2015-2016)**

*(Note. greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) in tonnes (CO<sub>2</sub>-e) are also shown).*

<sup>71</sup> National Greenhouse Accounts Factors, Australian Government Department of Environment, Commonwealth of Australia 2015



PSC staged a transition to novation or private management of the passenger fleet in 2014-2015. The 73,719 litres in 2015-2016 was for usage in the four Council-owned pool vehicles as well as sundry plant (small) which includes items such as mowers, hedge trimmers, chainsaws, and concrete saws. The passenger vehicle fleet is currently unquantifiable since outsourcing and consequent varied range of vehicles under private lease arrangement.

Since vehicle manufacturers ceased the production of certain models with LPG in 2014-2015, Council replaced many of those LPG vehicles with diesel engines. This is evident by the LPG consumption reduction in the 2015-2016 financial year.

Annual diesel usage is closely associated with the scale of Council's capital works schedule within that year and consequently the utilisation rate of the plant items. A significant spike is noted in the 2014-2015 financial year due to two significant storm events that required considerable diesel supply for flood pumps, internal emergency plant as well emergency service vehicles (RFS/SES) due to prolonged power outages across the LGA.

There has also been a reduction in emissions with last year's plant replacements as Council continues to incorporate heavy plant that complies with Euro IV standards. These vehicles produce as little as one sixth of the level of particulate matter (PM) as their alternatives, incorporating key technologies to improve emissions and increase efficiency. Council utility vehicles have remained unchanged in regards to emissions; five additional trucks compliant with Euro IV emissions standards were added to the fleet, taking the total from six to 11 out of a total of 13. A further 12 commuter use utility vehicles and Council's library services truck are scheduled for replacement in 2016-2017 with Euro IV compliant models.



# Waste

## Summary

Total waste generation in Port Stephens continued to rise between 2012-2013 and 2015-2016. Green waste volumes increased significantly in 2014-2015 due to April 2015 storms.

Council diverted almost 60% of waste from landfill in 2015-2016 and whilst below the NSW target of 70% this is the highest in the Hunter. Approximately 50% of waste collected from kerbside garbage bins is diverted from landfill through the function of the Alternative Resource Recovery Technology (ARRT) facility in Raymond Terrace.

Recycling has increased by 500 tonnes in 2015-2016, an 8% increase from the previous year. Council commenced a new waste and recycling collection contract in 2015 with individual trucks for separate waste streams for the first time. A 2013 audit of red and yellow bins showed that 36% of recycling bins to be over 90% full and that 15% of the waste in the general waste bin was recyclable. A recycling audit conducted in January 2015 identified a recycling contamination rate of 7.98%, a slight increase on 2013 and 2011 results.

Three percent of residents have upgraded their 240 litre recycling bin to a 360 litre bin, following the recent introduction of this option.

Council progressively introduced free drop off days for a number of problem wastes from 2013-2014 including e-waste, batteries, chemicals, oils, mattresses and tyres with 10 drop off days now available to residents each year in addition to the collection of batteries, fluorescent tubes, mobile phones and printer cartridges at Council's Administration Building and local libraries.

Green waste drop off days continue in Port Stephens, collecting 2,037 tonnes of green waste in 2015-2016.

Over 20 waste and recycling presentations and free recycling are provided to local schools each year with the pre-schoolers' waste education program provided to between 10 and 17 local pre-schools each year.

Four hundred and two fridges and freezers were collected through the Fridge Buyback Program in Port Stephens to June 2016, preventing the release of 3,216 tonnes of greenhouse gases, over 32 tonnes of CFCs, and over 35.8 tonnes of metal were recycled.

Council commenced a targeted response to illegal dumping in Port Stephens in 2012, resulting in an 80% reduction in dumping incidents at specified hotspots. Household waste makes up 80-90% of illegally dumped material across Port Stephens. Council maintains a 90% investigation success rate when incidents are reported to Council.

The number of incidents reported and investigated involving asbestos declined to 20 in 2015-2016, down from 43 in 2014-2015 and 51 in 2013-2014.





## Introduction

National growth in income and wealth has increased the disposal of goods no longer needed or wanted. This, along with the growing nature of waste diversity, toxicity and complexity makes waste management a growing concern for Australian governments<sup>72</sup>.

Waste may be solid, liquid or gaseous, hazardous or non-hazardous. Waste may be classified according to its source (municipal, commercial and industrial, construction and demolition) or by composition (organic, paper, glass, metal, and plastic). Every waste material has unique physical and chemical properties, which affect its impact on the environment.

Waste management presents major environmental challenges. The impacts of waste generation and management include emissions to air, land and water (including greenhouse emissions)<sup>73</sup>.

The National Waste Policy provides a coherent, efficient and environmentally responsible approach to waste management across Australia. The policy sets Australia's waste management and resource recovery direction to 2020, building on earlier commitments and responding to the changing waste environment<sup>74</sup>.

The characterisation of waste has changed, with the introduction of more complex goods and products such as e-waste now a significant component of landfill. The changing nature of the waste stream is affecting our capacity to recover materials from discarded products<sup>75</sup>.

## Waste in NSW

Total waste generated across NSW is risen 42% in the period 2002-2013. However there was a decrease of 2.3% from 2010-2011 to 2012-2013. The amount of waste recycled in NSW and thus diverted from landfill in 2012-2013 was 62.5%, equating to a 4% increase on 2008-2009 levels<sup>76</sup>.

The NSW State of Environment Report 2015 (NSW SoE 2015) shows a 22% increase over the period 2002-2012, in waste disposal per capita in the Metropolitan Levy Area (which includes the Sydney Metropolitan, Hunter, Central Coast and Illawarra regions). The NSW SoE 2015 also reports that there has been a 73% increase in people who have access to a council garden organic kerbside service and 17% increase in people who have access to a council kerbside dry recycling service.

The NSW Waste Avoidance and Resource Recovery Strategy 2007 (WARR Strategy, DEC 2007) set targets for increasing recycling in the three regulated waste streams (municipal waste, construction and demolition, and commercial and industrial) by 2014. The WARR Strategy 2014 was reviewed and replaced, in accordance with the *Waste Avoidance and Recycling Act 2001*, with the NSW Waste Avoidance and Resource Recovery Strategy 2014-2021.

72 <http://www.abs.gov.au/ausstats/abs@.nsf/featurearticlesbytitle/3B0DD93AB123A68BCA257234007B6A2F?OpenDocument>

73 <http://www.abs.gov.au/ausstats/abs@.nsf/featurearticlesbytitle/3B0DD93AB123A68BCA257234007B6A2F?OpenDocument>

74 <https://www.environment.gov.au/protection/national-waste-policy/about>

75 <https://www.environment.gov.au/protection/national-waste-policy/about>

76 NSW State of Environment Report 2015, EPA

The NSW Waste Avoidance and Resource Recovery Strategy 2014-2021 was adopted in December 2014, and provides a clear framework for waste management over the next seven years. The WAAR aligns with the NSW Government's waste reforms<sup>77</sup> and contains the following targets and objectives by 2021-2022:

- Reduce the rate of waste generation per capita;
- Increase recycling rates for:
  - Municipal solid waste from 52% (in 2010-2011) to 70%;
  - Commercial and industrial waste from 57% (in 2010-2011) to 70%;
  - Construction and demolition waste from 75% (in 2010-2011) to 80%;
- Increase the waste diverted from landfill from 63% (in 2010-2011) to 75%;
- Establish or upgrade 86 drop-off facilities or services for managing household problem wastes state-wide;
- Reduce the number of litter items by 40% compared with 2011-2012 levels and then continue to reduce litter items to 2021-2022;
- From 2013-2014, implement the NSW Illegal Dumping Strategy 2014-2016 to reduce the incidence of illegal dumping state-wide;
- By 2016-2017:
  - o Reduce the incidence of illegal dumping in Sydney and the Illawarra, Hunter and Central Coast regions by 30% compared with 2010-2011;
  - o Establish baseline data to allow target-setting in other parts of the state<sup>78</sup>.

*Waste Less, Recycle More* is a NSW Government program designed to improve waste and recycling in NSW over a five year period. It was introduced in February 2013. It is reported that in the first two years of the initiative an extra 870,000 tonnes of waste was diverted from landfill through recycling improvements, litter and illegal dumping prevention actions<sup>79</sup>.

In 2015 the NSW Government announced the introduction of a container deposit scheme (CDS) in NSW to commence in 2017. The CDS will be implemented similarly to the South Australian program returning 10c for beverage containers under three litres.

## Waste in Port Stephens

*Data contained within this section have been collected and provided by Port Stephens Council as part of its waste management program, and excludes a proportion of commercial waste managed through other service providers whose data were unavailable.*

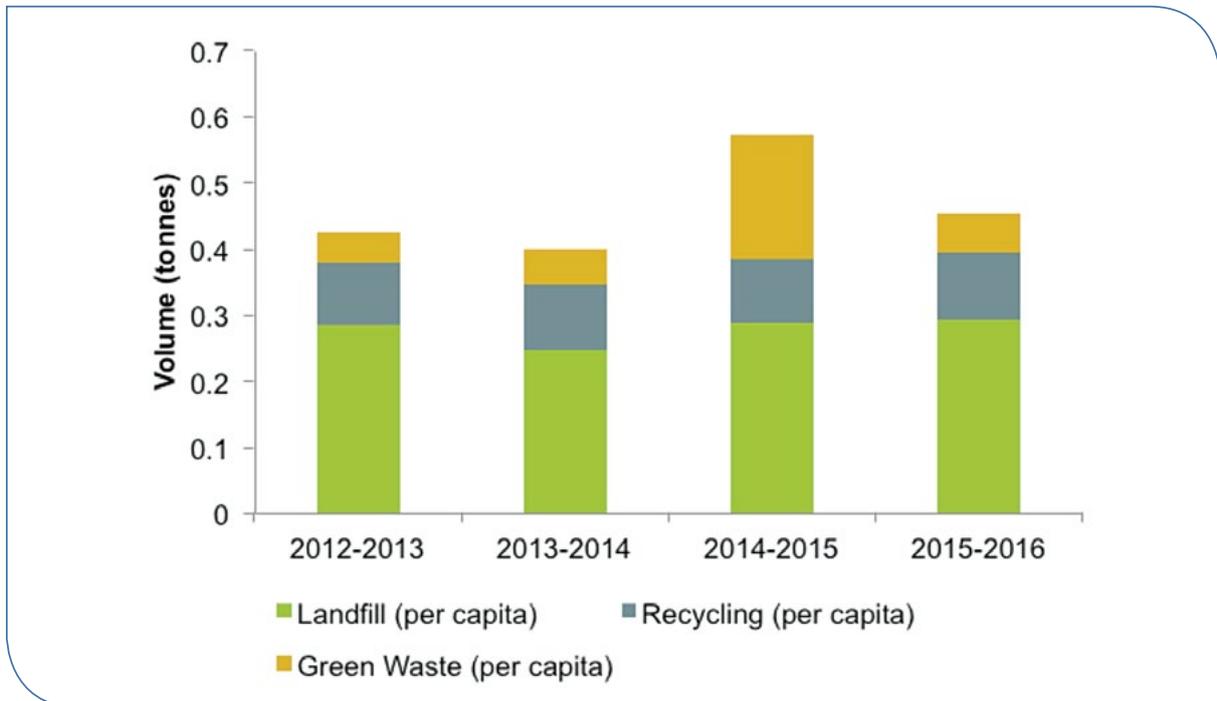


SUEZ waste collection services from 1 July 2015

77 NSW Waste Avoidance and Resource Recovery Strategy 2014-2021, EPA  
78 NSW Waste Avoidance and Resource Recovery Strategy 2014-2021, EPA  
79 NSW State of Environment Report 2015, EPA



Total waste generation in the LGA has continued to rise from 2012-2013 to 2015-2016. As can be seen below, this rise is attributable not only to a growing population but also due to an increasing trend in waste production per capita.



**Figure 22 Port Stephens waste generation 2012-2013 to 2015-2016.**

*Note: significant green waste volumes in 2014-2015 due to the April 2015 storms*

Reducing waste to landfill continues to be a priority of Port Stephens Council. Council utilises a two bin waste collection system. The contents of the general waste red bin are processed through the SUEZ Advanced Resource Recovery Technology (ARRT) facility at Raymond Terrace, where the waste is sorted and the organic contents are turned into compost. Approximately 50% of the contents of garbage bins is diverted from landfill through the function of the ARRT facility.



SUEZ Advanced Resource Recovery Technology (ARRT) facility at Raymond Terrace

Port Stephens Council has a comingled recycling service based on a fortnightly collection. In 2015 Council commenced a new waste and recycling collection contract, introducing individual trucks for separate waste streams for the first time in Port Stephens. This change in the collection regime has resulted in capture of additional recyclable materials.

Recyclable materials from the Port Stephens LGA are transported to Solo Resource Recovery Centre, Gateshead. From here, recycling is sorted into streams (plastic, paper, glass etc.), bailed and transported to market where it is manufactured into other products.

An audit of the red and yellow bins in 2013 identified that 36% of recycling bins in Port Stephens were over 90% full and that 15% of the waste in the general waste bin was recyclable. Among other things, these results identified opportunities for improvement to Council's recycling services. One such improvement was the opportunity for residents to upgrade their 240 litre recycling bin to a larger 360 litre bin, and to date there has been a 3% take up on this option.

Recycling has increased by 500 tonnes in 2015-2016, an 8% increase from the previous year. This has been attributed to the change in collection vehicles and the larger collection receptacle option.

A recycling audit conducted in January 2015 identified Council's recycling contamination rate was 7.98%, as seen in the data below. This is slightly higher than previous audits in Port Stephens in 2013 and 2011. In response to this Council continues kerbside management through the audit of recycling bin contamination. Over 2,000 recycling bins were inspected and audited in 2015-2016.

Kerbside audits use a traffic light sticker system to communicate results with residents: red indicates the bin is grossly contaminated and cannot be emptied; yellow highlights that there are non-recyclable items in the bin and tells the residents what these are; and green thanks the householder for recycling right. The inspector will also leave recycling information for those who have received a red or yellow sticker.

Council also conducts a bin blitz program to complement the bin inspection program. The bin blitz is a secondary inspection program which targets streets that have been identified as having poor recycling and a series of inspections, education and rewards is employed to improve the recycling results within the street and ultimately reduce contamination.

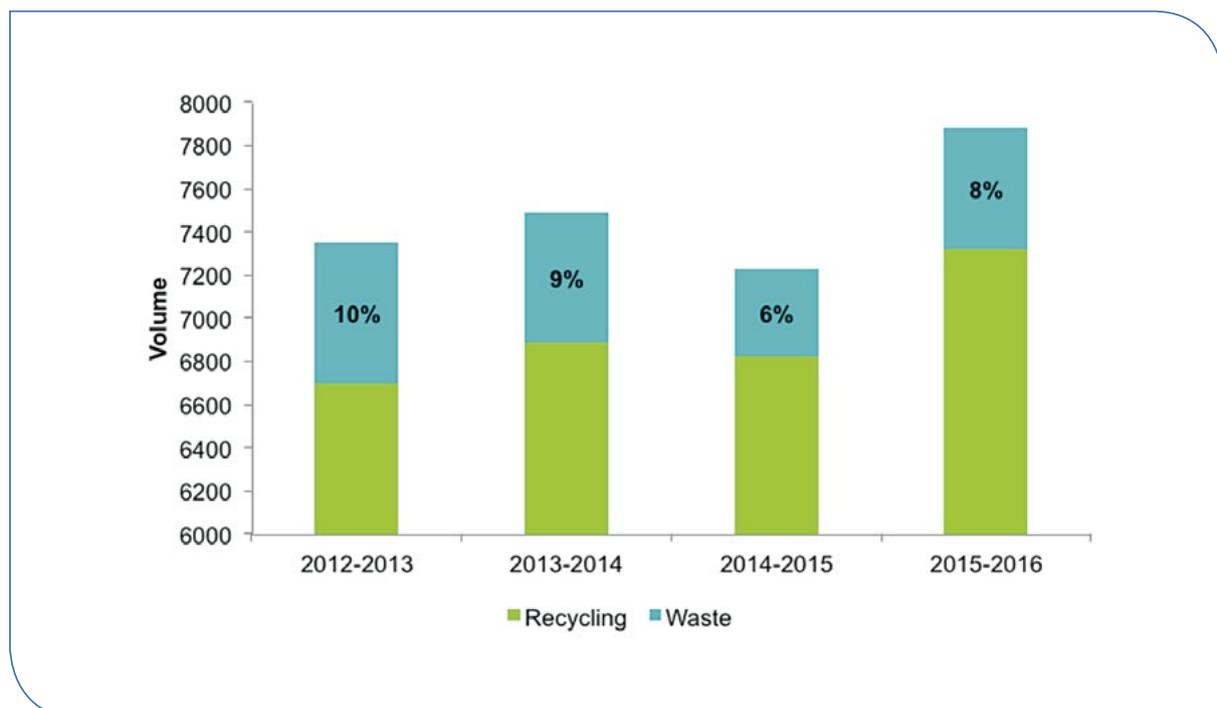
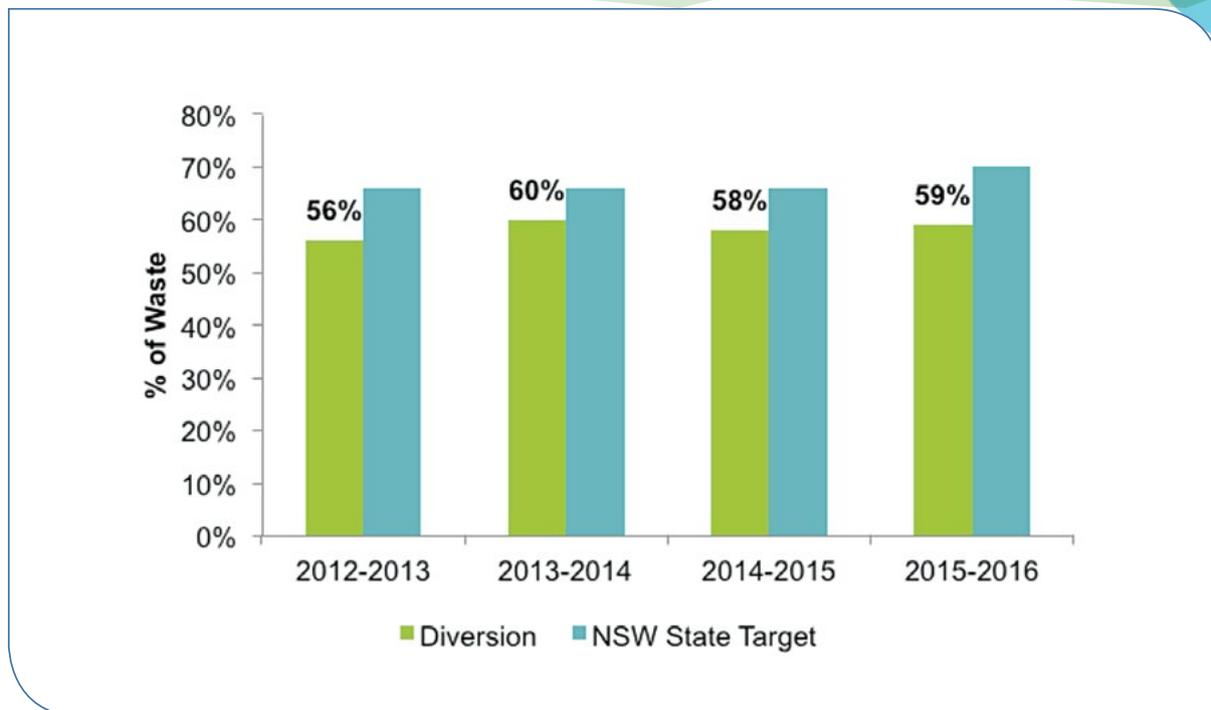


Figure 23 Port Stephens Council managed waste contamination rates (2012-2013 to 2015-2016)



**Figure 24 Port Stephens Council managed waste landfill diversion rates (2012-2013 to 2015-2016)**

In 2015-2016 Council diverted 59% of waste from landfill which was up from 2014-2015. This figure, although still below the current NSW target of 70% is the highest in the Hunter region. This can be attributed to the processing of organic waste through the ARRT facility and improved recycling at Council's Waste Transfer Station.

The ARRT Facility, located on Newline Road, Raymond Terrace, has been processing Council's waste since 1999 and is owned and operated by SUEZ. The plant receives 40,000 tonnes of waste per year and has a recycling rate of approximately 48% (including moisture loss and residuals). This technology was the first of its kind in Australia, and is responsible for Port Stephens Council being the first council in the Hunter to recycle organic waste.

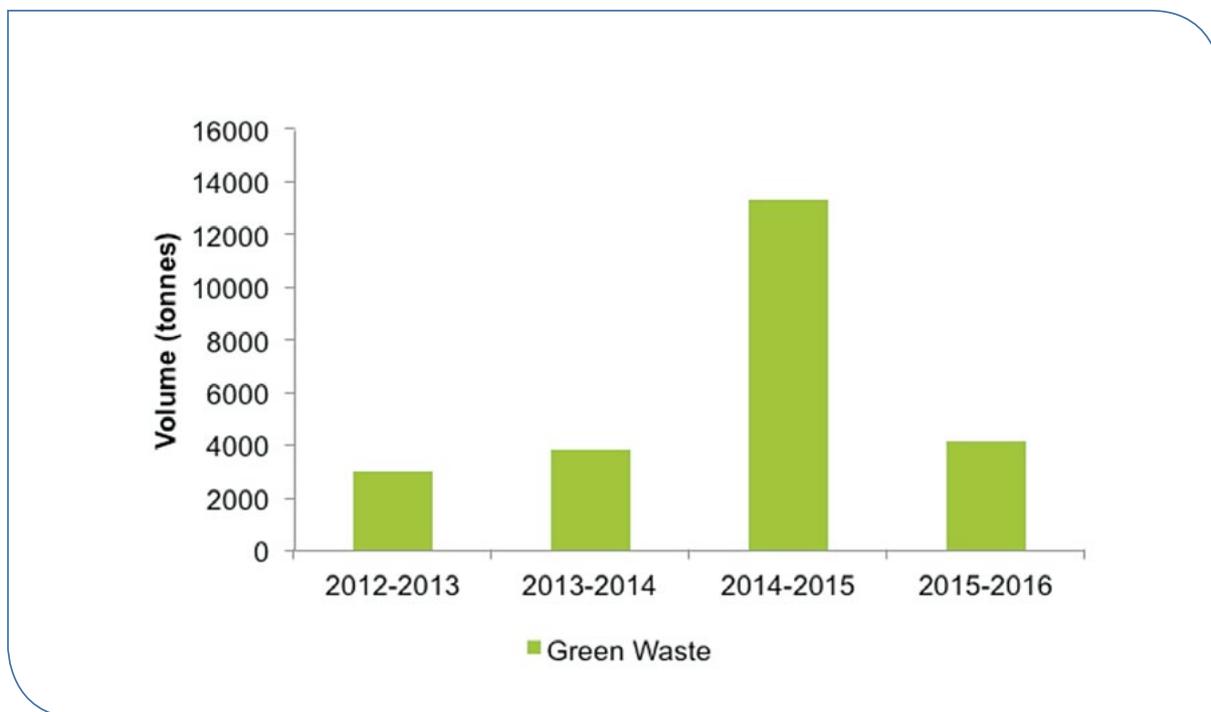
Council's total tonnages of waste types have increased since 2012 but are considered on target with population growth. A spike in total tonnages in 2014-2015 is a result of green waste generated from the April super storm.

Council commenced a suite of free drop off days to residents to recycle a number of key problem wastes (electronic waste, batteries, chemicals and oils) in 2013-2014; mattress drop off was added in 2014-2015; and tyres in 2015-2016. Residents in Port Stephens now have access to 10 drop off days per year across Port Stephens (Raymond Terrace, Lemon Tree Passage and Salamander Bay) for chemicals, electronic waste, mattresses and tyres. The drop off days have resulted in a reduction in the number of reported occurrences of these wastes being illegally dumped (refer to illegal dumping section below) and contribute to landfill diversion rates.

Residents can also visit the Council Administration Building or local libraries to drop off batteries, fluorescent tubes, mobile phones and printer cartridges.

Green waste drop off days continue in Port Stephens collecting 2,037 tonnes of green waste in 2015-2016. Drop off days are held at different locations across Port Stephens on most Sundays and are popular with all residents, resulting in increases to the service in 2014-2015 to offer residents additional days at Salamander Bay, Lemon Tree Passage and Raymond Terrace.

The large volume of green waste collected through drop off days and at Salamander Bay Waste Transfer Station in 2014-2015 reflects the vegetation damage and clean up following the April 2015 storms.



**Figure 25 Total Green Waste collected by Council 2012-2013 to 2015-2016**

The Salamander Bay Waste Transfer Station is Council's only owned and operated waste facility in Port Stephens. A total of 42% of waste received through the Waste Transfer Station in 2015-2016 was diverted from landfill. This was achieved through the recycling of:

- Organic waste to advanced resource recovery technology located at Raymond Terrace, NSW;
- Scrap metal to SIMS Metal at Newcastle, NSW;
- Electronic waste to SIMS e-recycling located at Villawood, NSW;
- Concrete to Boral located at Newcastle, NSW;
- Mattresses to TIC mattress recycling located at Redhead, NSW;
- Problem wastes (batteries, fluorescents, oil, gas bottles) through EPA community recycling centre (Toxfree);
- Paint through Paint Buyback product stewardship program (Cleanaway); and
- Aluminium, plastic, paper and cardboard, glass, steel cans through Solo Resource Recovery Centre, Gateshead.

Council has a two tiered waste management fee structure: the Waste Management Charge covers the cost of environmental monitoring of old landfill sites, waste education and the operation of waste facilities; and the Waste Service Charge covers the cost of collection, processing, recycling and disposing of waste. A comparison of PSC Waste Services Charges with other regional councils for the 2014-2015 financial year is shown below.

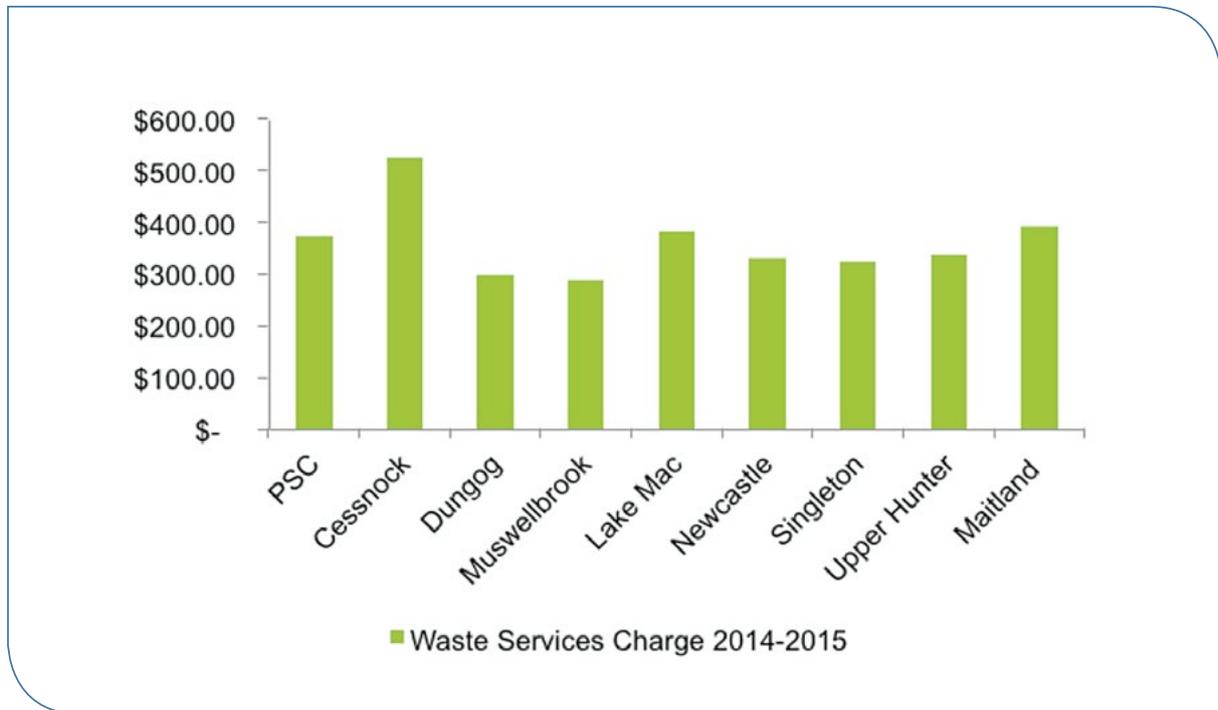


Figure 26 Waste Services Charge by Hunter LGA in 2014-2015 (\$/households/year)

## Port Stephens Council Waste Education Programs

Council's Waste Management Team delivers waste education programs to local schools and pre-schools. The programs are designed to target children at an early age and educate in a fun and interactive way the importance of waste reduction, recycling the right items, waste collection truck safety and the impact waste can have on our environment. We use a variety of techniques to deliver the programs including truck visits, video and games to engage pre-schoolers and year four students.

Table 3: PSC School Waste Education Program

Year	No. of Schools
2012-2013	21
2013-2014	21
2014-2015	23
2015-2016	23

**Table 4 Pre-Schoolers Waste and Education Program**

Year	No. of Pre-Schools
2013-2014	17
2014-2015	17
2015-2016	10

In 2014-2015 Port Stephens Council was involved in a joint *Love Food Hate Waste* program with other Hunter councils. This involved over 1,500 residents from Lake Macquarie, Newcastle, Cessnock, Maitland, Singleton and Dungog as well as Port Stephens.

In 2014-2015 the Environment Protection Authority, through the Waste Less, Recycle More program, encouraged local councils to look at waste on a regional level. This led to the creation of the Hunter Regional Waste Strategy and subsequent action plans. Council participates on the regional councils' strategy committee and is involved in the roll out of the regional waste education plan.

Council delivers various waste and recycling education programs and campaigns, individually and as a region, to help minimise the impact of waste on the environment with the ultimate goal of decreasing waste generation and increasing recycling. These include:

- Bin blitz inspection programs;
- Schools and pre-schools waste and recycling programs;
- Schools groups, community groups tours of ARRT, Waste Transfer Station and presentations on waste management;
- *Recycling Right* education;
- Education on Advanced Resource Recovery Technology and how 100% of food and green waste is composted;
- *Love Food, Hate Waste* initiatives: this is an EPA grant funded program which allows councils to run programs that promote the minimisation of food waste through teaching better storage of food, shopping and/or cooking habits;
- Garage Sale Trail: an international program that promotes households and communities to have a garage sale to promote the reuse of unwanted items;
- Workshops about waste minimisation;
- Communication and engagement activities around Council services. This includes the promotion of Council drop off and waste services that lead to proper waste disposal, higher recycling or waste diversion rates and lead to reduction in illegally dumped waste;
- *Fridge Buyback* which operates under the NSW Government's Energy Savings Scheme and is supported locally by Council. The Energy Savings Scheme's main objective is to assist households and businesses in reducing their electricity use and costs through recycling spare fridges and/or upright freezers. By the end of June 2016, 402 fridges and upright freezers had been collected by *Fridge Buyback* in the Port Stephens LGA, preventing the release of 3,216 tonnes of greenhouse gases and over 32 tonnes of CFCs. Over 35.8 tonnes of metal was recycled from these fridges.

## Illegal Dumping

Illegal dumping is the unlawful disposal of any waste that is larger than litter to land or waters<sup>80</sup>. Illegal dumping is where waste materials are dumped, tipped or otherwise deposited on private or public land where the required planning approval or environment protection licence has not been granted.

<sup>80</sup> <http://www.epa.nsw.gov.au/illegaldumping/>



Illegal dumping may vary from small bags of rubbish or household waste in an urban environment to larger scale dumping of materials such as construction and demolition waste in more isolated areas. This waste may also include dangerous materials like asbestos.

Illegal landfilling is a form of illegal dumping where waste is used as a 'fill' with the consent of the owner or occupier of the land without the necessary planning or licensing approvals. Construction and demolition waste is used as illegal fill for reclamation works, roads, noise mounds, and landscaping. Illegal fill material may be contaminated with hazardous chemicals or asbestos.

## Illegal Dumping in NSW

The NSW Illegal Dumping Strategy 2014-2016 (the Strategy) is an initiative which reflects the NSW Government's strong stance against illegal dumping. The NSW Government's commitment to reducing illegal dumping is clear. Goal 22 of NSW 2021: A plan to make NSW Number One is to reduce the incidence of large scale illegal dumping detected in Sydney, the Illawarra, Hunter and Central Coast by 30 per cent by 2016.

This commitment has been bolstered by significant funding and regulatory reform. The Waste Less Recycle More initiative includes \$58 million over five years to tackle illegal dumping across the state. This funding supports the delivery of the Strategy, which sets out innovative and targeted solutions to illegal dumping.

In October 2013, the NSW Government introduced tough new laws to help combat illegal dumping, including a custodial sentence of up to two years for repeat illegal dumpers. In May 2014, the NSW Government announced that the amount payable under penalty notices issued by the EPA for illegal dumping will increase to \$15,000 – the toughest in Australia. These measures will act as strong deterrents to illegal dumping, which, together with the actions outlined in the Strategy, will empower land owners, land managers and local communities to effectively combat illegal dumping.

The Strategy is an integrated approach to the problem, uniting action on education, enforcement and infrastructure to discourage people from dumping; and to take strong action against those who persist in doing the wrong thing.

During 2013, the EPA conducted consultation forums across NSW to seek feedback on the draft strategy. More than 225 people representing 150 stakeholder groups attended, including local councils and public land managers, state government agencies, Aboriginal land councils, industry, environmental consultants, and charitable organisations. Written submissions were also received.

The NSW Government's vision is to protect local environments from pollution by reducing the incidence of illegal dumping in our community. To achieve this vision the Government aims to reduce the incidence of illegal dumping and reduce the social, environmental, health and financial impact of illegal dumping.

Based on feedback received from the consultation for the Strategy and the experience of the EPA, local councils and public land managers, six focus areas have been identified:

- Partnerships – build local community partnerships;
- Build an evidence base;
- Strategic enforcement – ramp-up waste compliance and enforcement;
- Capacity building – help build expertise;
- Education – spread the word;
- Community engagement – motivate local communities.

In NSW, the EPA is responsible for leading and facilitating state-wide action against illegal dumping. It also guides and supports other organisations to take action. The overall aim of the Strategy is to reduce the incidence of large-scale illegal dumping in Sydney, the Illawarra, Hunter and Central Coast by 30 per cent by 2016.

The actions in the Strategy aim to address priority wastes and offer scope for actions to be delivered that target not just state-wide priorities, but also regional and local priorities identified by stakeholders.

## Priority Waste Types

Advice from local councils, public managers and the EPA-funded Regional Illegal Dumping Squads (RIDS) has identified the following priority waste types that when illegally dumped pose a risk to the environment and human health:

- asbestos waste;
- construction and demolition waste;
- household waste;
- end-of-life tyres; and
- garden waste.

The Strategy aims to reduce the incidence of illegal dumping of one or more of these priority wastes. The EPA recognises that not all of these wastes will be a priority for other agencies dealing with illegal dumping.

## Nature and Extent of Illegal Dumping in NSW

It is a challenge to build accurate information on the nature and extent of illegal dumping because the intent behind this dumping is to keep it out of sight, undetected and anonymous.

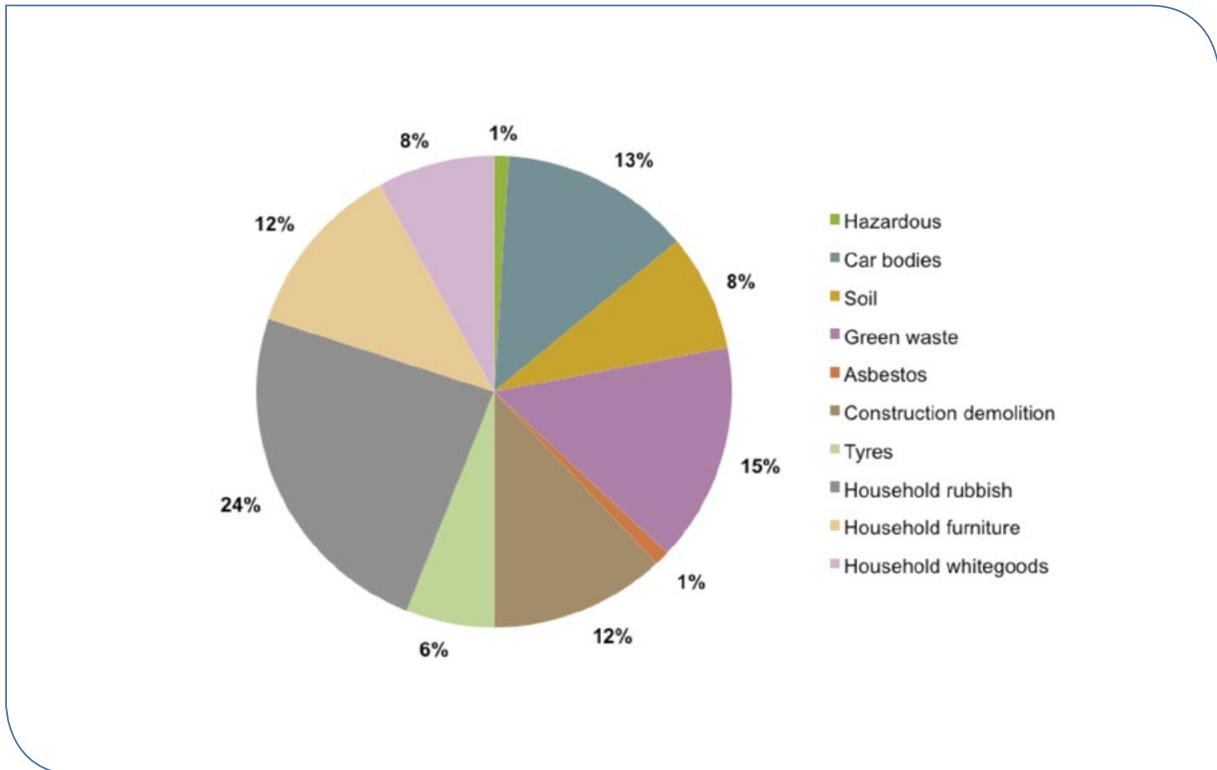
As a result, there is limited information about illegal dumping in NSW. Local government and other land managers collect information relating to the clean-up of illegally dumped waste, but the data are insufficient to gain a realistic assessment.

The Strategy contains actions to build accurate and comprehensive data that will direct and prioritise action against illegal dumping.

In NSW there are a number of places where waste is typically dumped. In urban areas illegal waste is most commonly dumped on nature-strips, roadsides, bushland, laneways, drains, parks, sporting grounds, private property, vacant land, train stations, and electricity substations.

Illegal dumping is also found in remote areas such as national parks and state forests, recreational areas, including camping grounds, and land that buffers water catchment areas and electricity substations. Other areas include alongside access roads to remote areas, vacant land within close proximity, existing residential estates, and rail corridors.

Household waste, construction and demolition waste and green waste are significant components of illegally dumped waste. While asbestos waste only accounts for a very small proportion of all illegally dumped waste, it can present a serious risk to human health and to the environment.



**Figure 27 Types of waste materials illegally dumped, as reported by urban and rural local councils,**

Source: EPA NSW *Illegal Dumping Strategy 2014-2016* .

(Note: these data are based on a 2004 survey of urban and rural councils in NSW)

## Illegal Dumping in Port Stephens

In accordance with NSW trends, the recording of specific illegal dumping data has not always occurred. Port Stephens Council has been collecting data on illegal dumping since 2012; however information prior to this date is scarce and often grouped in with other data categories such as litter, vandalism or roadside maintenance.

In 2012, Port Stephens Council commenced the development of its own specific response towards illegal dumping in a bid to reduce the budgetary impact on various operation units of cleaning up illegal waste. The data currently collected are starting to provide a solid baseline along with an insight into trends and the specific nature of illegal dumping within the Port Stephens LGA.

Port Stephens has identified specific illegal dumping hotspots where waste is dumped repeatedly. Typically, these areas are remote, often surrounded by bushland and appear to attract other anti-social behaviour. Surveillance of these areas indicates that they are commonly used for vandalism, graffiti, drug taking and criminal acts such as the disposal of stolen vehicles. Our data also suggest that the development of illegal dumping hotspots bears little relationship to the physical location of the nearest licenced waste facility.

In order to reduce dumping incidents in these areas, Council has implemented a variety of prevention measures including:

- Developing partnerships with local communities to increase reporting;
- Installing physical barriers such as concrete blocks, bollards or earth mounds;
- Utilising surveillance cameras;
- Increasing enforcement patrols, enforcement action, infringements;
- Installing new infrastructure such as signage;
- Providing community education;
- Regenerating bushland to restore the natural environment;
- Utilising social media to increase awareness.

The implementation of these measures has led to an 80% reduction in dumping incidents at specified hotspots and in some instances the hotspots no longer experience illegal dumping at all. In some circumstances, new hotspot dumping sites may appear in another area.

The data indicate that over a period of four years household waste consistently makes up between 80-90% of illegally dumped material across Port Stephens as can be seen below.



**Figure 28 Percentage composition of waste types reported to Council (2011 to 2015)**

Port Stephens Council has developed a highly specific approach to combatting illegal dumping. This model has been developed through the collection of ongoing illegal dumping data and an analysis of the internal impacts of illegal waste across the whole of Council.



Council created a unique and dedicated position to implement its approach to illegal dumping, the objective of which is to develop, design and deliver illegal waste projects; and to provide high level professional advice and service that reduces Council's risk exposure (financial, environmental, people, asset and reputational) as a result of the ongoing impacts of domestic illegal waste across the organisation and the community.

Since the implementation of this approach, Council has been able to maintain a 90% success rate in investigations when incidents are reported to Council. This has partially been enabled by the majority of incidents being household waste. This type of waste has a higher probability of containing identifiable information, leading to the potential owner or transporter of the waste. Through the identification of the owner/transporter of waste, Council has been able to consistently utilise enforcement instruments such as penalty notices and clean up notices to effectively shift the costs associated with illegal dumping from Council onto the offender(s).

Following on from this, Port Stephens has experienced a reduction in the overall quantity of waste dumped across the LGA. This has enabled Council to redirect its focus from investigations towards the implementation of illegal waste projects that deliver a combination of measures including prevention, regulation, engagement, education and regeneration in order to further reduce Council's risk exposure to illegal waste.

## Asbestos

Council receives and investigates complaints and notifications involving asbestos containing materials (ACM). The data below summarise the number of incidents received within each financial year. The types of incidents involving ACM that Council responds to can be categorised into three broad areas:

- Illegal dumping of waste on public or private land that has been verified as ACM or identified as potential ACM;
- Health concerns related to Council buildings and other assets containing ACM. Typically these buildings were constructed before 1987 using construction materials containing asbestos. Council has a program of identifying, recording and managing Council assets that contain ACM in accordance with its adopted Asbestos Policy;
- Air quality concerns and health concerns related to demolition or renovations involving private buildings or other structures that due to the construction age may contain ACM. Demolition of development that is not classified as exempt under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 requires development consent.

**Table 5 Summary of Complaints/Notifications involving Asbestos Containing Materials**

Reporting Year	2012-2013	2013-2014	2014-2015	2015-2016
Number of Incidents Received/ Investigated	43	51	43	20

# Ecosystem Function

The Ecosystem Function section has been prepared to present the state of the natural environment.

Maintaining and enhancing ecological processes to ensure the conservation of biological diversity and the ongoing function of dynamic environmental systems are essential to ensure that current and future generations can benefit from the environmental services that these systems provide. These essential services include clean air, clean water and healthy soils which in turn support the ecological, cultural, recreational, economic and aesthetic values of Port Stephens.

## Biodiversity

### Summary

Approximately 50% of the Port Stephens LGA is classified as having High or Very High Conservation Value in Council's Conservation Assessment mapping tool which takes into account mapped attributes such as fauna, flora, ecology, biodiversity, and corridor values.

The Port Stephens Biodiversity Connectivity Project was completed by Council in 2012 from which a landscape connectivity map was developed for the LGA to be used to inform strategic planning and conservation assessments.

Council continued with bush regeneration, native plantings, weed and pest control, education activities and monitoring activities on 650ha of land as part of the Natural Area Rehabilitation Program. Fifteen Landcare and Tidy Towns community volunteer groups are active within the LGA undertaking valuable work to regenerate and restore natural areas.

Port Stephens is located between the two internationally recognised wetlands: the Hunter Estuary Wetlands and the Myall Lakes Ramsar site. These two wetland systems of International Importance (Ramsar) are listed as Matters of Environmental Significance under the *Environmental Protection and Biodiversity Conservation Act 1999*. The LGA contains over 6,000ha of SEPP 14 wetlands.

The Port Stephens Estuary is located entirely within the Port Stephens–Great Lakes Marine Park. Port Stephens has the second most extensive seagrass bed in NSW, covering over 1,000 ha.

A total of 54 declared weed species are found in the LGA including 13 of the 32 Weeds of National Significance, and one of the 28 National Environmental Alert List weeds.

The number of species listed under state/federal threatened species legislation and known to occur in Port Stephens has more than doubled from 90 to 184 in four years. Some 37% of mammals, 24% of birds, 17% of amphibians, 10% of reptiles, 4% of plants and 6% of insects that exist within the LGA are listed under threatened species legislation. Port Stephens is home to 13 Endangered Ecological Communities (*Threatened Species Conservation Act 1995*) and four Threatened Ecological Communities (EPBC Act 1999).

Port Stephens LGA is home to a regionally significant koala population as well as the Hunter's greatest area of vegetation ranked Very High and High in terms of koala habitat value.

The Grey Headed Flying Fox is listed as 'vulnerable' under both the Commonwealth EPBC Act 1999 and the NSW TSC Act 1995. The permanent flying-fox camp at Raymond Terrace is recognised as Nationally Important by the Commonwealth Department of Environment and Energy.



## Introduction

Biological diversity, or biodiversity, refers to the variability and variety of all life forms on earth. It is the diversity between and within all species of plants, animals, micro-organisms and the ecosystems of which they are a part. Biodiversity can be divided into three areas<sup>81</sup>:

- Genetic diversity — the variety of genetic information contained in individual plants, animals and micro-organisms;
- Species diversity — the variety of species;
- Ecosystem diversity — the variety of habitats, ecological communities and ecological processes.

People depend, directly and indirectly, on living systems for our health and well-being<sup>82</sup>.

The Port Stephens LGA hosts a range of diverse ecosystem environments that support considerable biological diversity of flora and fauna including coastal, estuarine, river, wetland, bushland and riparian environments.

## Biodiversity in a Global and National Context

2011-2020 is the United Nations Decade on Biodiversity<sup>83</sup> which contributes to the implementation of the Strategic Plan for Biodiversity 2011-2020<sup>84</sup> and achievement of the Aichi (Prefecture, Nagoya, Japan) Biodiversity Targets<sup>85</sup> under the UN Convention on Biological Diversity.

Since 1993 Australia has been a party to the Convention, which is an international agreement for the conservation and sustainable use of biological diversity; and the fair and equitable sharing of benefits arising from the use of genetic resources<sup>86</sup>. Australia's Biodiversity Strategy 2010-2030, which is currently under review, is the main instrument by which Australia fulfils its obligations under the Convention at the national level.

*According to the Strategy all Australians must take responsibility for, and become involved in, biodiversity conservation. The Strategy is designed to provide a road map for how this can be achieved. Implementing the Strategy is a shared responsibility across all levels of government, the community and the private sector<sup>87</sup>.*

Whilst the Convention on Biological Diversity is the primary international agreement on biodiversity, there is a number of supporting instruments. Australia participates in the implementation and design of multiple international treaties and agreements designed and actioned to protect global, as well as national, biological diversity.

These include the *RAMSAR (Iran) Convention on Wetlands; the Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); the Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment (JAMBA); and the Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA)*.

The global significance and uniqueness of Australia's aquatic and terrestrial biodiversity is largely attributable to the long period of continental separation and the wide range of environmental characteristics and conditions typical of the continent<sup>88</sup>.

81 <https://www.environment.gov.au/system/files/resources/d233f869-fae7-4311-89d1-11556179db29/files/biodiversity-strategy-2010-brochure.pdf>

82 <https://www.environment.gov.au/system/files/resources/d233f869-fae7-4311-89d1-11556179db29/files/biodiversity-strategy-2010-brochure.pdf>

83 <https://www.cbd.int/2011-2020/>

84 <https://www.cbd.int/sp/>

85 <https://www.cbd.int/sp>

86 <https://www.environment.gov.au/biodiversity/conservation/strategy>

87 <https://www.environment.gov.au/system/files/resources/d233f869-fae7-4311-89d1-11556179db29/files/biodiversity-strategy-2010-brochure.pdf>

88 Steffen W, Burbidge A, Hughes L, Kitching R, Lindenmayer D, Musgrave W, Stafford Smith M, Werner P. Australia's biodiversity and climate change. Canberra: Australian Government Department of Climate Change, 2009.

## Legislative Framework

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the central piece of federal environmental legislation. It provides the framework to protect and manage flora, fauna and ecological communities of national and international significance.

On a state level biodiversity is primarily managed through the *Fisheries Management Act 1994* (FM Act), *National Parks and Wildlife Act 1974* (NPW Act), *Native Vegetation Act 2003* (NV Act), *Nature Conservation Trust Act 2001*, and the *Threatened Species Conservation Act 1995* (TSC Act). NSW legislation includes additional measures to reduce pressures and threats associated with catchment development and its impact on biodiversity.

## Terrestrial Ecosystems

### Context and Status of Port Stephens Terrestrial Ecosystems

Approximately 50% of the Port Stephens LGA is classified as High (approximately 34,152.83ha) or Very High (approximately 14,740.40 ha) under Port Stephens Council's Conservation Assessment mapping tool. The Conservation Assessment ranking takes into account mapped attributes such as fauna, flora, ecology, biodiversity, and corridor values.

Key indicators of the state of terrestrial ecosystems are based on the extent and distribution of native vegetation. Whilst vegetation types and extent are not adequate proxies for biodiversity<sup>89</sup>, the protection and enhancement of native vegetation is fundamental in ensuring the conservation of the LGA's biodiversity.

Terrestrial ecosystems are essentially all ecosystems that are not aquatic or marine. This section relates primarily to native and remnant vegetation within the LGA for which there is a number of responsible agencies and major landowners/managers including Port Stephens Council, Hunter Local Land Services, Office of Environment and Heritage, National Parks and Wildlife Service, Hunter Water, the Department of Defence and private landholders.

### Vegetation Mapping

Vegetation mapping for the LGA is largely on a broad scale. Broad scale vegetation mapping is developed for the purpose of assisting planning decisions and requires field validation to verify boundaries, type of vegetation communities and fauna habitats on the ground. Vegetation mapping at this scale only provides an indication of potential habitat and is unable to identify high quality habitat availability such as the presence of hollow bearing trees and old growth forest which are known limited regional resources.

Presently Council relies on estuarine habitat, seagrass and terrestrial vegetation mapping of varying degrees of currency, geographic range, and scale. This vegetation mapping is used to identify and protect areas where there are sensitive and/or threatened species potentially present. Comprehensive vegetation mapping also allows for improved identification, and in turn management, of valuable habitat and wildlife corridors.

### Trees

In addition to providing wildlife habitat and storing atmospheric carbon, trees have numerous important environmental, cultural, economic and aesthetic values. In a natural environment trees facilitate multiple biodiversity services: they serve to control erosion; land degradation; salinity; and improve and maintain water quality. Every part of a tree, from roots to leaves, has some ecological role.

In an urban environment they temper environmental conditions by filtering sunlight and reducing reflected heat from artificial surfaces such as concrete and glass, as well as providing aesthetic benefits from foliage, flowers and screening properties. Trees play a role in providing a sense of place and history for communities by creating enhanced and recognisable urban environments.

<sup>89</sup> Assessment of Australia's Terrestrial Biodiversity, 2008: Australian Government Department of the Environment, Water, Heritage and the Arts.



## Old Growth Forests

Old growth forests are those where the over storey is in the late-mature to over-mature, or partly-dying, growth stage. Old growth is typically associated with the presence of relatively large old trees, many containing multiple hollows<sup>90</sup>.

Many fauna species (both common and threatened) are hollow-dependent species and require hollows as a key component of their habitat either on a daily or seasonal basis for shelter and nesting. The availability of hollow bearing trees across the landscape is a known key limiting factor to these species' ongoing survival<sup>91</sup>. This is due to the process of hollow formation being slow, with hollows only forming in trees at least 80 years of age; and very large hollows, suitable for forest owls, take as long as 220 years to develop<sup>92</sup>.

It is generally recognised that old growth forests in coastal areas, such as the Port Stephens LGA, are of especially high ecological value<sup>93</sup>. The habitat types provided by old growth forest are a limiting resource for many threatened species within the LGA, and the importance of hollow bearing trees is well documented in ecological literature.

In Port Stephens, old growth Coastal Smooth-barked Apple and Blackbutt Forests have been identified as a key vegetation community supporting high hollow bearing tree densities. Regionally, it has been stated that much of the pre-1755 vegetation in the Hunter and Central Coast has been cleared. What remains is mostly regrowth, which is relatively young forest with a low density of hollow resources<sup>94</sup>. This makes the old growth forest and areas with high density hollow bearing trees contained within the LGA valuable on a local as well as a regional level.

In NSW, the importance of hollow-bearing tree removal has been recognised as a key threatening process (KTP) under the TSC Act. At least 170 fauna species, including 40 threatened species, are reliant on tree hollows for shelter and nests<sup>95</sup>.

Old-growth forest was identified as irreplaceable by the Resource Assessment Commission – Forest and Timber Inquiry – Final Report (RAC 1992). For ecosystems where old growth is still fairly extensive, the Department of Environment, Climate Change and Water (DECCW) Lower Hunter Regional Conservation Plan (LHRCP) 2009 conservation target for old growth in strict reserves is as low as 60%.

Some old growth forest area within the LGA has been mapped as part of the 2009 DECCW Lower Hunter Regional Conservation Plan. This mapping had limited field validation and it is recognised that there are other areas within the LGA that were not mapped. It is considered likely that there are multiple private land holdings containing old growth forest that remain unidentified. The LGA is under increasing development pressure and so further identification and quantification of old growth forest within the Port Stephens LGA is required in order to better protect and manage it.

## Pressures on Port Stephens Terrestrial Ecosystems

Pressures on terrestrial biodiversity in the Port Stephens LGA include clearing of native vegetation for rural, residential and urban development, habitat and corridor fragmentation, invasion by introduced plant and animal species, altered fire regimes and climate change.

90 Old Growth Forests Advisory Note, Department of Environment and Climate Change

91 OEH (2011) Loss of Hollow-bearing Trees – key threatening process determination – NSW Scientific Committee final determination.

92 Old Growth Forests Advisory Note, Department of Environment and Climate Change

93 Lower Hunter Biodiversity Conservation Lands - Lower Hunter Regional Conservation Plan, 2009

94 OEH (2016) Hollows for Habitat Forum

95 OEH (2011) Loss of Hollow-bearing Trees – key threatening process determination – NSW Scientific Committee final determination.

## Responses to Pressures on Port Stephens Terrestrial Ecosystems

### The Port Stephens Biodiversity Connectivity Project<sup>96</sup>

The Port Stephens Biodiversity Connectivity Project was undertaken in 2012 by Eco Logical Australia Pty Ltd on behalf of Port Stephens Council. A landscape connectivity map was developed for the LGA based on the habitat and movement requirements of a suite of focal species, each of which was mapped individually. The focal species were Koala (*Phascolarctos cinereus*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Squirrel Glider (*Petaurus norfolcensis*), Eastern Horseshoe Bat (*Rhinolophus megaphyllus*), Southern Myotis (*Myotis macropus*), Black Bittern (*Ixobrychus flavicollis*) and Wallum Froglet (*Crinia tinnula*).

The concept of mapping for specific focal species is based on the theory that the management of threatening processes at a level that protects species most sensitive to these pressures will also result in the protection of less sensitive species. For this project, the selection of focal species covered a cross section of habitat types, movement patterns and landscape positions.

Connectivity mapping provides Council with an informed, consolidated map of functional biodiversity connectivity that can be used to inform strategic planning and conservation assessments. The connectivity mapping relies on existing mapping, modelled information and expert knowledge to determine the ecologically connective corridors. Ground-truthing in the form of on-ground surveys is required to further validate corridor values for specific site applications.

### The Biodiversity Corridors Policy

The Biodiversity Connectivity Mapping provides a key information source for the Biodiversity Corridors policy currently being developed by Council. In order to further inform and validate this policy, fine scale vegetation mapping and on-ground flora and fauna surveys targeting threatened species are required.

### BioBanking<sup>97</sup>

BioBanking is a market-based scheme that provides an ecological assessment process for development applications, an offsetting scheme as well as opportunities for rural landowners to generate income by managing land for conservation.

The NSW Government commenced the BioBanking scheme in 2008 to help address the loss of biodiversity values, including threatened species, due to habitat degradation and loss.

The BioBanking scheme enables 'biodiversity credits' to be generated by landowners who commit to enhance and protect biodiversity values on their land through a BioBanking agreement. These credits can then be sold, generating funds for the management of the site. Credits can be used to counterbalance the impacts on biodiversity values that are expected to occur as a result of development<sup>98</sup>.

The BioBanking Assessment Method (BAM) allows for the measurement of the proposed changes to the condition of the ecological communities and habitats and translates this into biodiversity credits. The BAM determines both the number and types of credits that may be required for particular management actions aligned with the number and type of credits that must be retired to offset the impact of a development and ensure that it improves or maintains biodiversity values.

<sup>96</sup> Eco Logical Australia 2012. Port Stephens Biodiversity Connectivity Mapping. Prepared for Port Stephens Council

<sup>97</sup> <http://www.environment.nsw.gov.au/biobanking/biobankframework.htm>

<sup>98</sup> BioBanking Biodiversity Banking and Offsets Scheme Overview, Department of Environment and Climate Change NSW



A number of issues have been identified with the current system of credit allocation in terms of the “like-for-like” arrangement under which agreements are made. One of the key issues is that the identification of credits currently does not take into consideration of the age of the vegetation community or the hollow bearing tree density when replacing ecosystem credits as like for like. This can result in sites with high density hollows and threatened species habitat reliant on ecosystem credits, such as the Squirrel Glider and Powerful Owl, not being adequately addressed or compensated. The proposed BAM in the new biodiversity reforms has not rectified this issue and may result in the continued local loss of old growth forest containing high density hollow sites and potential local population extinctions as proponents are not required to source local sites within the Port Stephens LGA to compensate for removal of this important threatened species habitat.

There are currently seven BioBanking agreements within the Port Stephens LGA, covering an area of approximately 1,200ha<sup>99</sup>. Port Stephens Council owns and manages two of these agreements, with a joint area of 316 ha.

## Biodiversity Offsets Policy

Biodiversity offsets are a means to benefit biodiversity by compensating for the adverse impacts of an action such as the clearing of vegetation and habitat loss due to development. Biodiversity offsets help achieve long-term conservation outcomes where development and infrastructure projects are going to impact biodiversity.

Biodiversity offsets work by protecting and managing biodiversity values in one area in exchange for impacts on similar biodiversity values in another<sup>100</sup>.

Within the LGA, the removal of koala feed trees and hollows are currently offset in accordance with Council’s Technical Guidelines for Trees and Nest Boxes. A Biodiversity Offsets Policy and Planning Guidelines are proposed to be developed by Council to provide guidance for development applications and planning proposals.

## Port Stephens Council Tree Management

The preservation of trees and vegetation within the Port Stephens LGA is provided for by Clause 5.9 of the Port Stephens LEP 2013. Council’s Port Stephens DCP 2014, specifically Chapter B-1 (Tree Management) gives effect to this provision by specifying the species or kinds of trees or other vegetation to which the preservation requirements apply<sup>101</sup>.

Outside of the usual development application process, Council approval is required to remove or prune trees or vegetation in urban areas, as shown below. Beyond these urban areas, the *Native Vegetation Act, 2003* applies. Under this Act, all clearing of remnant native vegetation or protected regrowth requires landholders to seek approval by obtaining a Property Vegetation Plan (PVP) from Local Land Services (LLS).

*The Native Vegetation Act 2003* regulates and outlines what landholders can and cannot do when clearing native vegetation on all land in NSW, excluding land listed on Schedule 1 of the Act. The map below shows where the removal of vegetation is approvable under the *Native Vegetation Act, 2003*.

A PVP is a legally-binding agreement between a landholder and Local Land Services that outlines how native vegetation will be managed on private property. From 2005 to August 2016, there have been 3.6ha of clearing of remnant vegetation with associated 13.51ha of offset under five registered clearing Property Vegetation Plans with Hunter Local Land Services.

The Environmental Outcomes Assessment Methodology (EOAM) is used by LLS to assess the effect the proposed broad scale clearing will have on environmental outcomes. It takes into account the losses and gains made through the clearing of native vegetation and if necessary, the provision of offsets<sup>102</sup>.

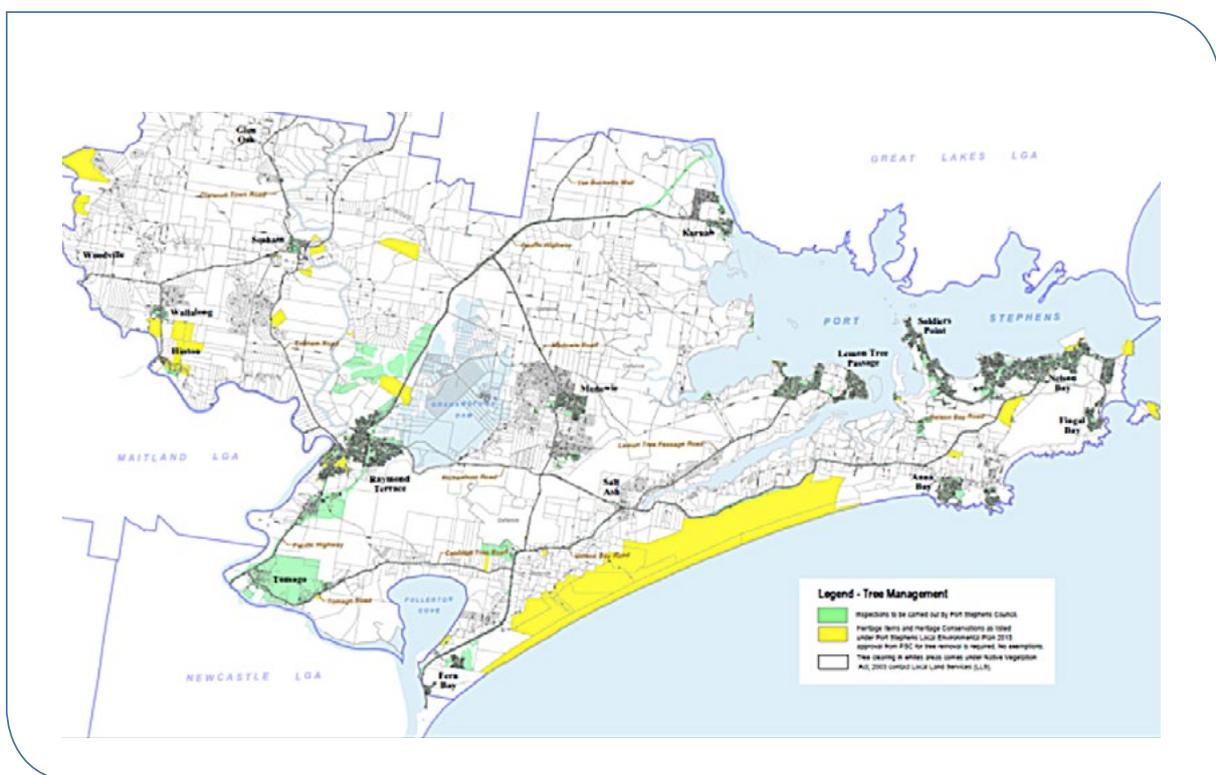
99 <http://www.environment.nsw.gov.au/bimprapp/SearchAgreementResult.aspx>

100 <http://www.environment.nsw.gov.au/biodivoffsets/>

101 <http://www.portstephens.nsw.gov.au/grow/land-environment-and-heritage/trees>

102 <http://www.environment.nsw.gov.au/vegetation/pvp.htm>

During the reporting period Council's Tree Preservation Order and its application have been modified. Until the commencement of the most recent LEP in February 2013 Port Stephens Council was the regulatory authority for tree management across the whole LGA. Land on which the *Native Vegetation Act 2003* applies falls under the regulation of the Hunter Area Local Land Services. The introduction of the Development Control Plan in August 2015 resulted in the extension of the exemption for trees to 5m from a house or dwelling. In response to the April 2015 East Coast Low storm event a temporary exemption from pre-approval to remove or prune vegetation that exceeds 3m in height or 300mm in circumference was applied to urban areas. The exemption was applicable only to circumstances where trees or vegetation posed a direct threat to property or human life. During this period (August 2015 to August 2016), tree removal notifications were still required to be submitted within 10 working days and were to include clear justification of why the tree was removed.



**Map 4 Tree Management Map showing the current area for which Council is the tree management consent authority.**

Applications to Port Stephens Council for tree removal/pruning 2010-2015 are presented below. A decrease in the number of applications from 2013 to 2014 is attributable to the change of the LEP which resulted in a greater area of land falling under the jurisdiction of the *Native Vegetation Act, 2003*.

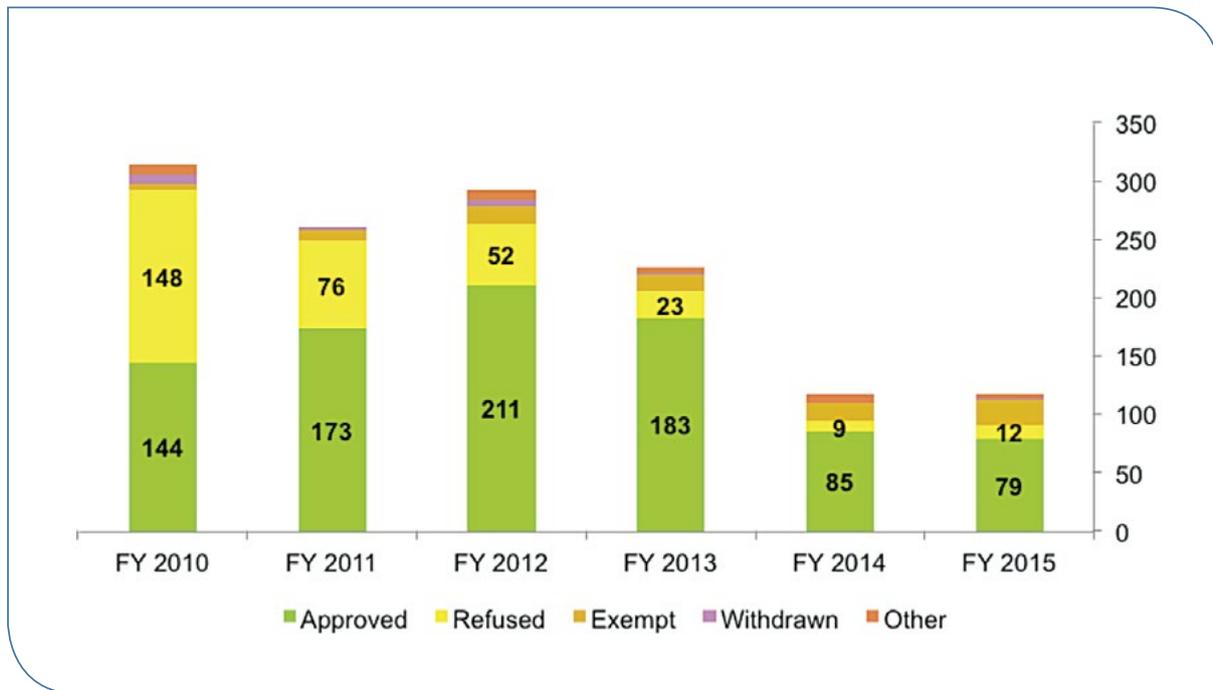


Figure 29 Applications to Port Stephens Council for Tree Removal/Pruning (2010–2015)

There are currently limitations on the availability of data on quantification of land clearing within the LGA. It is important to understand the cumulative effect of vegetation and tree removal on a local level, as well as regional level ecosystems and landscape connectivity. Ascertaining the state of remnant vegetation within the LGA is a priority for Council in order to strategically assess conservation and development decisions.

## Tree Vegetation Vandalism Policy

Council's Tree Vegetation Vandalism policy has been developed in light of increasing tree/vegetation vandalism being experienced by councils across the region. This occurs most commonly in the coastal zone where development pressure and conflicts between water views and vegetation have seen an increase in the vandalism of trees and vegetation on public land under the care, control and management of councils<sup>103</sup>.

## Register of Significant Trees

Port Stephens Council maintains a Register of Significant Trees in order to facilitate preservation of trees which exhibit aesthetic, historic, scientific, social, environmental, or cultural value for past, present and future generations of Port Stephens residents and visitors.

<sup>103</sup> <http://www.portstephens.nsw.gov.au/grow/land-environment-and-heritage/trees>

## Port Stephens Council Natural Area Rehabilitation Programs

Council conducts ongoing Natural Area Rehabilitation programs which include a range of activities across an average of 650ha of Council owned and/or controlled sites. These activities range from bushland regeneration, native plantings, weed and pest control, to education activities and monitoring programs. Natural area rehabilitation works completed in the reporting period are shown below. The area of works completed is largely dependent on budgetary constraints and site prioritisations.

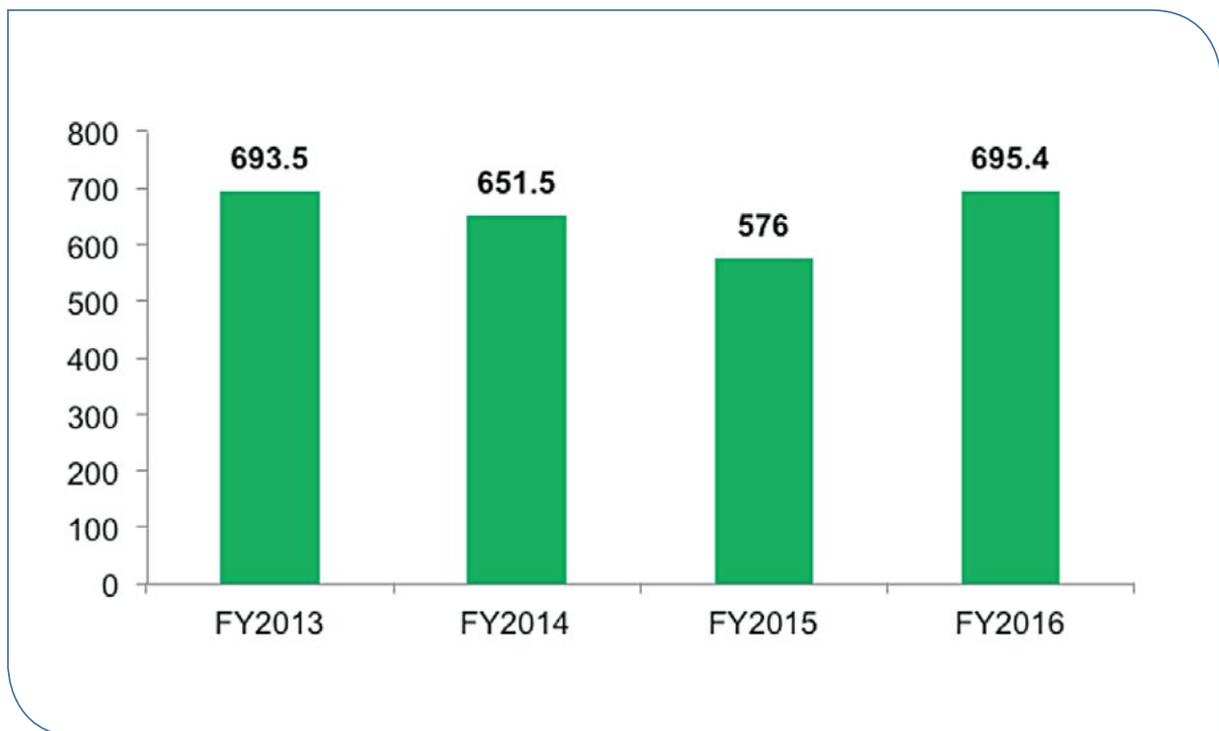


Figure 30 Natural area rehabilitation activities by hectares managed (2012-2016)

## Green Army

Green Army is an Australian Government environmental and heritage conservation program. Green Army projects work to address threatened species through activities such as habitat conservation, pest eradication and flora and fauna surveys<sup>104</sup>. The work done by Green Army in the Port Stephens LGA contributes to vegetation management and rehabilitation goals of Council and community groups.

104 <https://www.environment.gov.au/cleaner-environment/plan-2016>



**Table 6 Projects and Activities Undertaken in the Port Stephens LGA by Green Army 2012-2016**

Project and/or Activity	Measure
Site Audits/Assessments	27ha
Planting Preparation (weed control, mulching, etc)	15ha
Vegetation and Fauna Monitoring	70 surveys
Indigenous Knowledge and Transfer	8 workshops attended
Seed Collection	5kg
Weed Treatment	125ha
Revegetation	21ha
Revegetation Plant Numbers	20 000
Plant Propagation	30 000
Fire Management (through the removal of fuel load)	15ha
Debris Removal (storm clean-up April 2015)	90m3
Community Participation and Engagement (working in co-ordination with volunteers on projects)	30 events

It is also important to acknowledge the tireless contribution made by community volunteers to the management, conservation and rehabilitation of natural areas across the LGA. The National Landcare Program goes beyond biodiversity conservation and environmental rehabilitation to include the promotion of sustainable agriculture and tackling feral animals and weeds. There are 15 Landcare and Tidy Towns groups working within the LGA to regenerate and restore natural areas. This work is valuable in that without volunteer time and effort it would not be possible for Council to manage the land areas currently cared for.

## Aquatic Ecosystems

The Port Stephens LGA has marine, freshwater and estuarine environments that provide a variety of aquatic ecosystems.

Port Stephens features a considerable estuarine system with a surface area<sup>105</sup> of over 134.4kms<sup>2</sup>. Healthy and diverse aquatic habitats facilitate healthy and diverse populations of aquatic organisms.

Aquatic habitats and ecosystems can be described in many ways including:

- The natural materials that constitute the habitat, such as rocks, coral, gravel, sand and mud;
- The vegetation types present, such as macrophytes, snags, seaweeds, seagrasses, mangroves and saltmarsh;
- The form and type of the habitat; it may be rock-pools, river banks, sandy inlets;
- The overall ecosystem type, for example a wetland, floodplain, stream, estuary, lake or beach<sup>106</sup>.

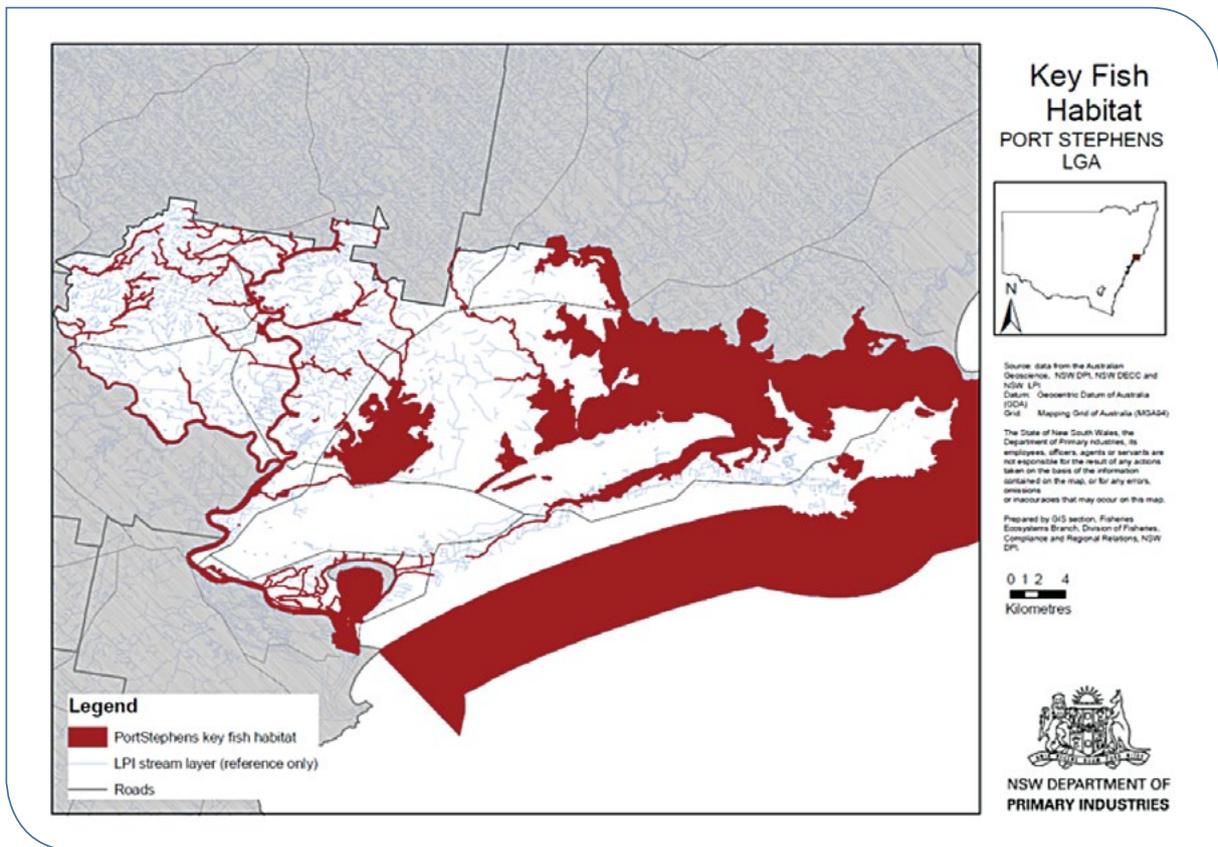
NSW Department of Primary Industries (DPI) is the agency responsible for aquatic habitat and ecosystem management and implementing the *Fisheries Management Act 1994*. One of the objectives of this Act is to 'conserve key fish habitats'. Key fish habitat is defined by DPI to include all marine and estuarine habitats up to the highest astronomical tide level (that reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank. In understanding this definition it is important to remember that the term 'fish' includes all aquatic invertebrates such as yabbies, shrimps, oysters, mussels, insect larvae, beach worms, sea stars, jellyfish etc<sup>107</sup>.

Key fish habitat mapped for the Port Stephens LGA is shown below. It can be seen that this includes the ocean, estuaries, wetlands and rivers.

<sup>105</sup> <http://www.environment.nsw.gov.au/estuaries/stats/PortStephens.htm>

<sup>106</sup> <http://www.dpi.nsw.gov.au/fishing/habitat/aquatic-habitats>

<sup>107</sup> <http://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/key-fish-habitat-maps>



**Map 5 Key Fish Habitat of the Port Stephens LGA**

Source: NSW Department of Industry

There is an increasing awareness of the need to protect our natural ecosystems and the resources they provide for the maintenance of biological diversity and capacity to sustain fisheries, aquaculture and other activities such as ecotourism<sup>108</sup>.

Pressures on aquatic ecosystems in the Port Stephens LGA include predation and competition pressures from the introduction of exotic species, changes in water flows and quality, sedimentation and estuarine habitat loss, over-fishing and fishing by-catch, climate change, and extreme weather events.

## Freshwater Ecosystems

Local freshwater ecosystems include creeks, wetlands, coastal freshwater swamps, marshes and intermittently inundated floodplains along the Hunter and Williams Rivers. As represented in the map above, freshwater ecosystems also provide key fish habitat in the LGA.

<sup>108</sup> [http://www.frdc.com.au/environment/aquatic\\_environment/Pages/default.aspx#sthash.Libxfpy.dpuf](http://www.frdc.com.au/environment/aquatic_environment/Pages/default.aspx#sthash.Libxfpy.dpuf)



## Pressures on Freshwater Ecosystems

Healthy freshwater ecosystems are placed under pressure by erosion, clearing, grazing, altered hydrology, introduced species and water quality decline.

Decline in water quality can be caused by high rainfall events creating run-off loaded with nutrients, organic matter, bacteria and/or chemicals from urban, industrial and agricultural catchments, which flows into waterways and the marine environment<sup>109</sup>.

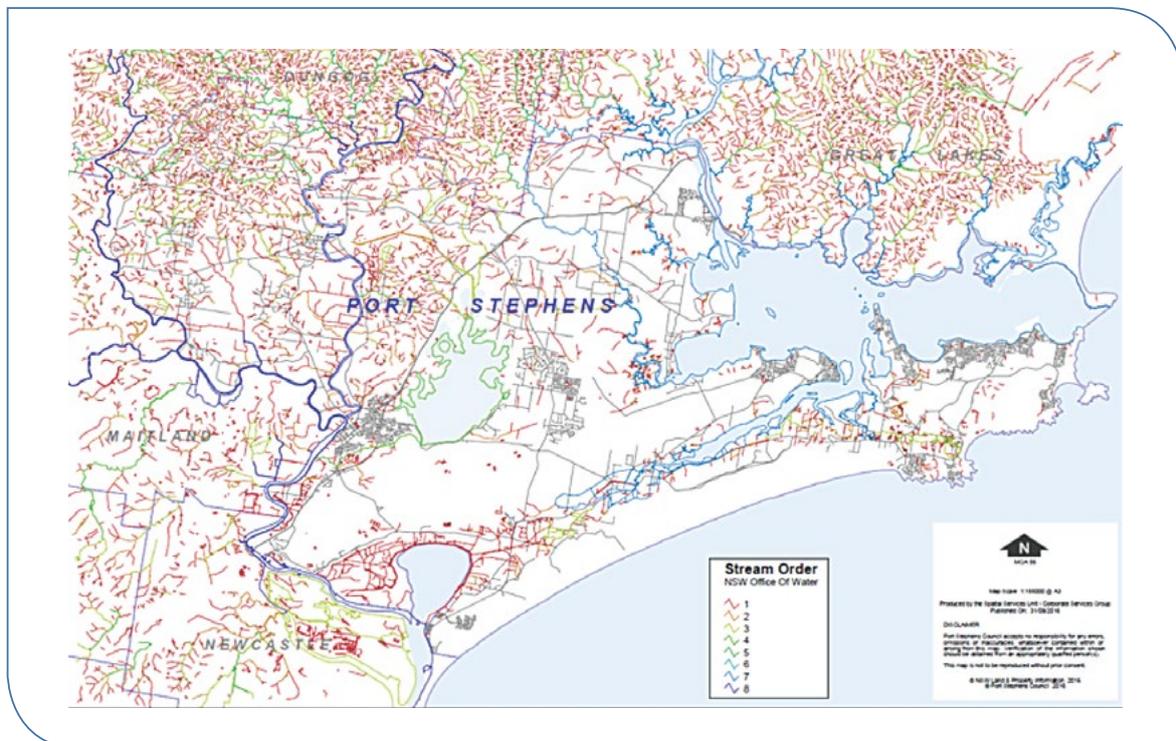
In the LGA pollution sources such as leaking septic systems, livestock and farms where fertilisers have been heavily applied just prior to rain events have been linked to instances of high nutrient levels in some catchments.

High nutrient levels contribute to excessive aquatic plant growth and weed infestations. The prolific growth of aquatic weeds can shade out native aquatic ecosystems, remove oxygen from the water causing fish-kills and shade out native aquatic vegetation.

## Creeks and Rivers

### Context and Status

The Port Stephens LGA contains the lower portions of the Williams, Paterson, Hunter and Karuah Rivers. The health of rivers is intrinsically related to the health of its tributaries and catchments. The map below shows the tributary water courses and the rivers within the LGA.



**Map 6 NSW Office of Water Stream Order Map for the Port Stephens LGA**

109 <http://www.environment.nsw.gov.au/water/waterqual.htm>

## Responses to Pressures on Port Stephens Creeks and Rivers

### Williams River Riparian Corridor Restoration and Enhancement Project

A NSW Environmental Trust Grant has enabled Council to undertake an extensive restoration project to protect the riparian corridor of the Williams River between Raymond Terrace and Seaham. The project was run from 2010 to 2014. Objectives of the project included:

- Targeted weed control and re-planting of native riparian vegetation along the estuarine reach of the Williams River;
- Installation of rock filleting to increase the resilience of the riverbank areas to flooding and erosion processes, as well as reduce sediment flow into the river when coupled with native revegetation;
- Building the capacity of landowners to protect riparian areas through the facilitation of on-ground improvements such as weed management, regeneration and the fencing of riverbank areas to reduce the impacts of livestock within wetlands and other sensitive areas.

With the co-operation of council, land managers and private residents the project successfully improved the resilience, protection and native vegetation of 3.8kms of degraded river bank. In turn this has enhanced the water quality, biodiversity, ecosystem services and best management practices appropriate to each site.

### Wetlands

Wetlands are an important part of the natural environment; they are dynamic living ecosystems that are vital to processes such as nutrient cycling, detention and slow release of flood water and the trapping of sediments.

Freshwater wetlands in Port Stephens are rich in diverse plants and wildlife; water birds use them for breeding, nesting and foraging and terrestrial mammals rely on them as a food and water source. They also provide multiple eco-system functions through the filtration of sediments and nutrients, protection from flooding and act as nurseries for fish.

The health of local wetlands is threatened by pressures that include declining water quality, reclamation and drainage, clearing, cropping and grazing, altered hydrology and introduced species.

The protection and conservation of wetlands in Australia is guided and mandated by international agreements as well as national laws:

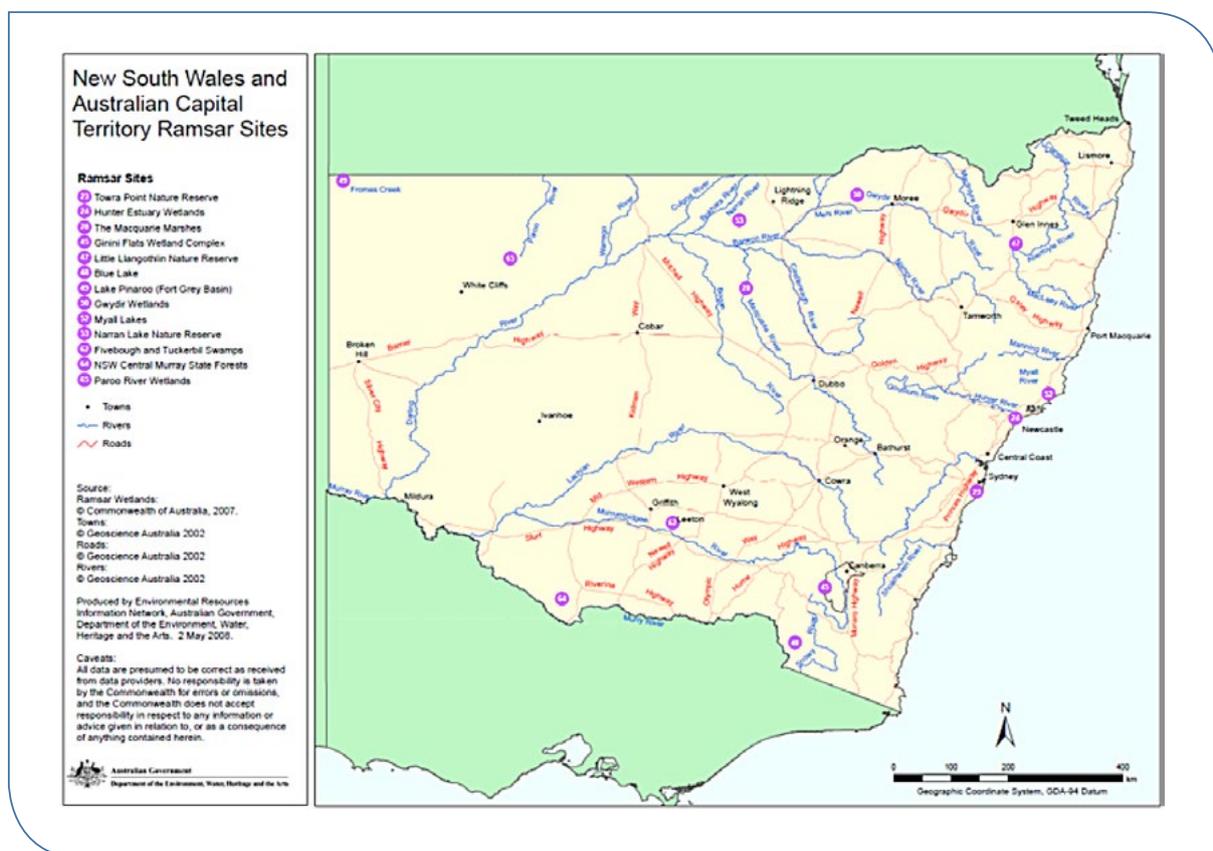
- The Ramsar Convention on Wetlands of International Importance aims to stop the national and international loss of wetlands and conserve those that remain through international co-operation, policy making and capacity building for sustainable use and management;
- The Ramsar Convention is supported by EPBC Act which lists wetlands as matters of national environmental significance. Wetlands are therefore protected under the Act through the regulation of activities that will or are likely to have significant impacts on their ecological character;
- The NSW State Environmental Planning Policy (SEPP) No. 14 – Coastal Wetlands provides for ongoing wetlands protection on state, regional and local planning levels;
- Local wetlands are listed under the PSC Local Environmental Plan 2013.



## Ramsar Wetlands

Australia currently has 65 Ramsar wetlands that cover more than 8.3 million hectares. Ramsar wetlands are those that are representative, rare or unique wetlands; or are important for conserving biological diversity. There are 12 Ramsar sites in NSW, covering a wide range of wetland types,<sup>110</sup> and located on a range of land tenures including National Parks and Reserves, State Forests, Crown Land and private land.

Port Stephens is located between two internationally recognised wetlands: the Hunter Estuary Wetlands (Site 24 on the map below) and the Myall Lakes (Site 52 on the map below). These two wetland systems of International Importance (Ramsar) are listed as Matters of Environmental Significance under the EPBC Act. Fullerton Cove which forms part of the Hunter Estuary Wetlands site falls within the Port Stephens LGA.

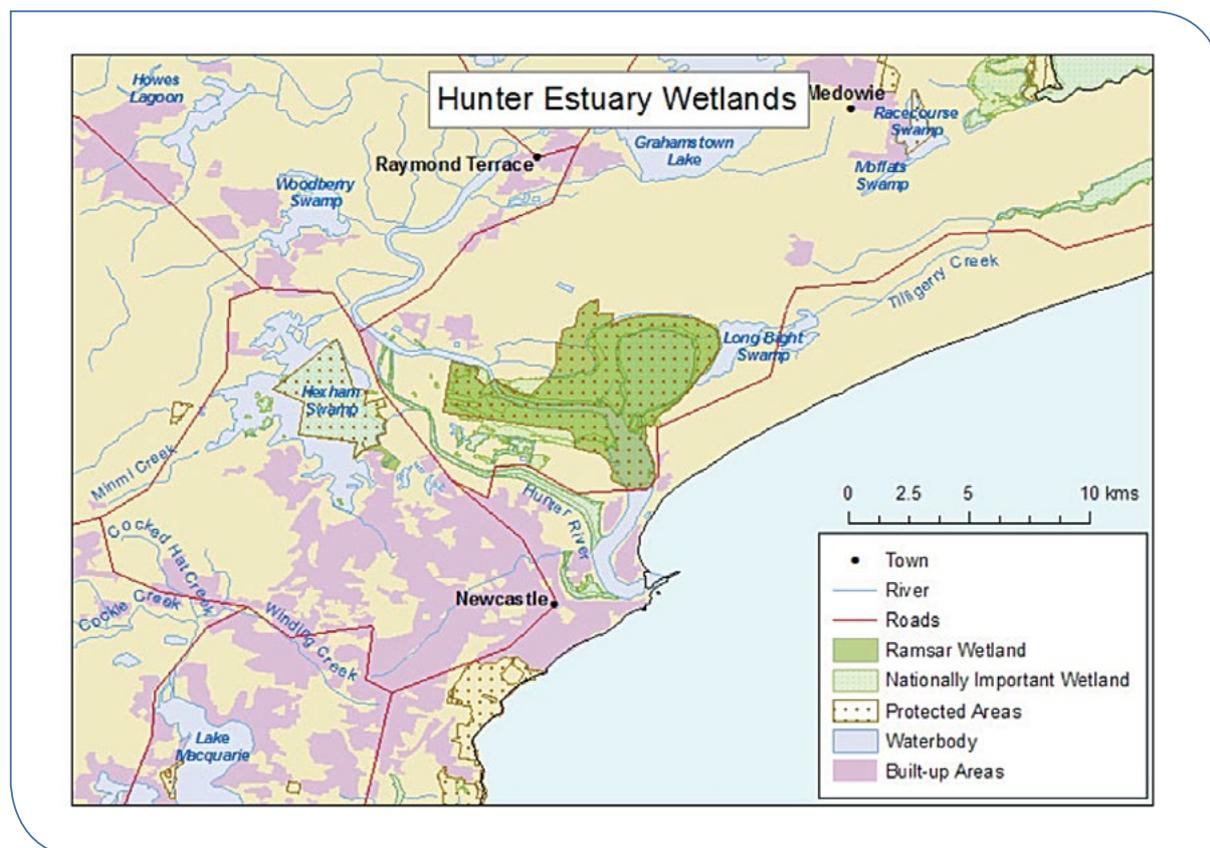


Map 7 NSW Ramsar Sites

Source: Department of the Environment, Water, Heritage and the Arts

110 <https://www.environment.gov.au/water/wetlands/australian-wetlands-database/australian-ramsar-wetlands>

The Hunter Estuary Wetlands Ramsar site has two components: Kooragang and the Hunter Wetlands Centre Australia. The Kooragang component of the Hunter Estuary Wetlands Ramsar site is located in the estuary of the Hunter River, approximately 7 km north of Newcastle. Hunter Wetlands Centre Australia is 2.5kms from Kooragang. Although the sites are not contiguous they have significant linkages, both hydrological and by the wildlife corridor of Ironbark Creek, the Hunter River and Ash Island.



**Map 8 Hunter Estuary Wetlands**

Source: Australian Government, Department of Environment and Energy, Australian Wetlands Database

The Kooragang component includes Kooragang Island and Fullerton Cove, two areas that lie in the estuarine section of the Hunter River. Fullerton Cove falls within Port Stephens LGA. Habitat types within the Reserve include mangrove forests dominated by Grey Mangrove, Samphire Saltmarsh, Paperbark and Swamp She-oak forests, brackish swamps, mudflats, and sandy beaches.

The Hunter Estuary Wetlands Ramsar site is extremely important as a feeding and roosting site for a large seasonal population of shorebirds and as a waylay site for transient migrants. Over 250 species of birds have been recorded within the Ramsar site, including 45 species listed under international migratory conservation agreements. In addition, the Ramsar site provides habitat for the nationally threatened Green and Golden Bell Frog, Red Goshawk and Australasian Bittern<sup>111</sup>.

111 <https://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=24#>

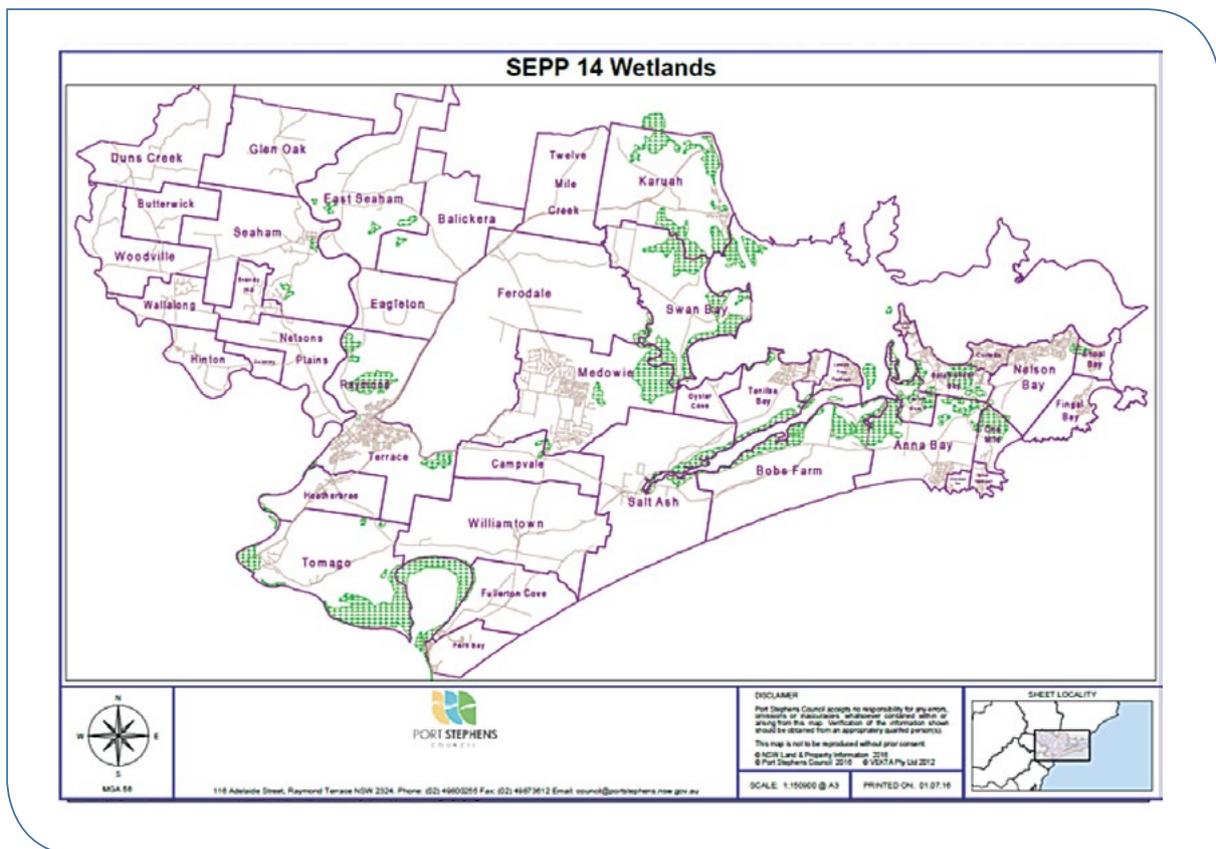


## Responses to the Pressures on Wetlands

### State of Environment Planning Policy (SEPP14) Wetlands

SEPP 14 identifies the most environmentally sensitive coastal wetlands in NSW. Developments proposed adjacent or close to SEPP 14 wetlands require special environmental assessment and development conditions to ensure that the values of wetlands such as coastal lakes and lagoons are protected<sup>112</sup>.

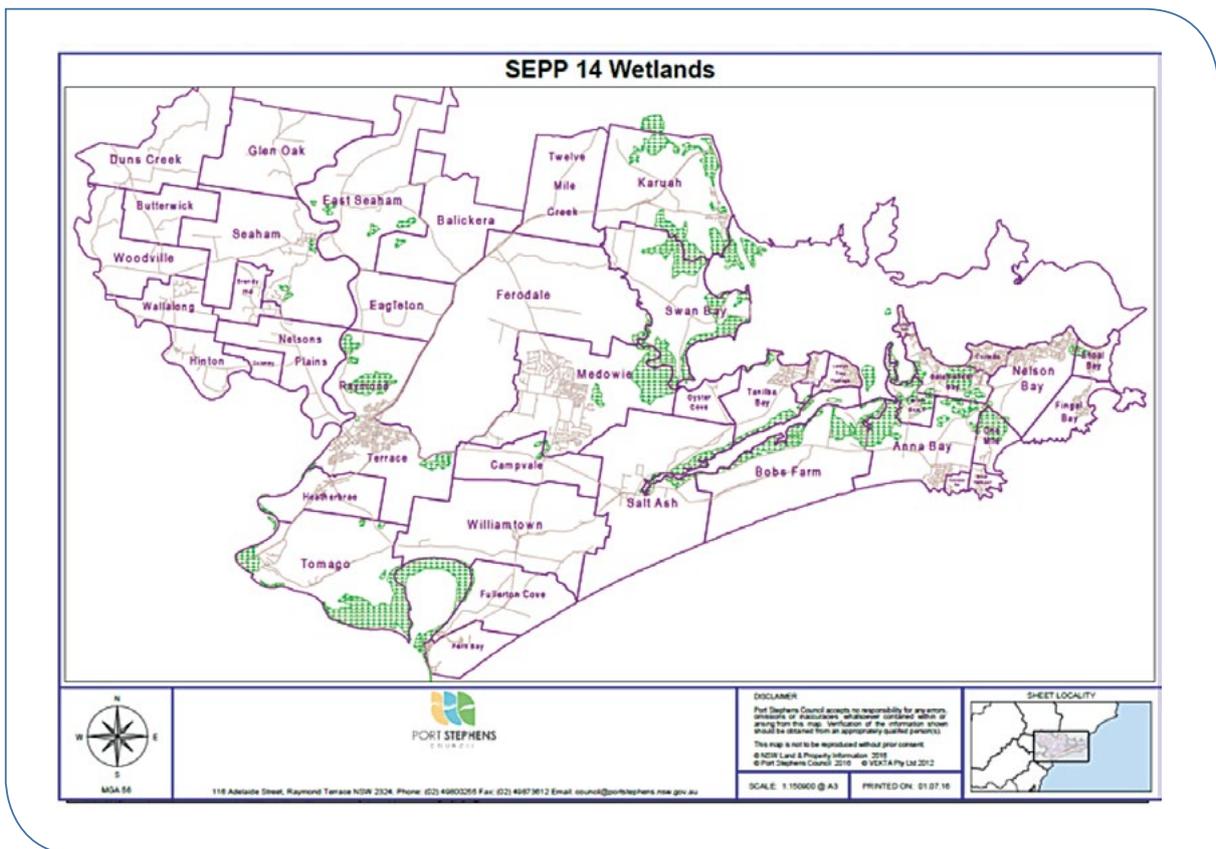
Port Stephens LGA contains approximately 6,071.63ha of SEPP 14 wetlands<sup>113</sup>, as shown in the map below.



### Map 9 Wetland Areas mapped within the LGA under SEPP14 Local Wetlands

Local wetlands within the Port Stephens LGA have been mapped and form part of the LEP 2013. Developments proposed within mapped wetlands require consideration in accordance with Clause 7.9 of the LEP 2013 which aims to preserve and protect wetlands from the impacts of development.

112 <http://www.environment.nsw.gov.au/wetlands/WhatAreWetlands.htm>  
113 Current as of 31 August 2016



**Map 10 Wetland Areas mapped within the LGA under the LEP2013**

The basis of this wetland mapping was the Port Stephens Wetland Study prepared for Port Stephens Council in 2004. Current status of these wetlands is unknown as no additional wetland studies have been undertaken in the Port Stephens LGA since this report.



## Sister Wetlands Relationship

The Kushiro, Port Stephens and Newcastle Wetland Sister City Agreement and Sister Wetlands Relationship were formed between the Kooragang Wetland, Hunter Wetland Centre and associated wetlands (near Newcastle and Port Stephens) as well as Kushiro Marsh, Kiritappu Marsh, Lake Akkeshi and Bekanbeushi Marsh (Hokkaido, Japan) on 7 November 1994, and renewed in 2004. This marshland group contains the largest wetlands in the whole of Japan.

The Latham's Snipe is a shorebird, known locally as a Japanese Racing Pigeon, which breeds in eastern Hokkaido marshes in summer and migrates to Port Stephens and Hunter wetlands in winter. The Latham's Snipe provides an important biological link between the two regions and is one of a number of migratory bird species doing the 12,000kms trip each year from Japan to the Hunter wetlands.

Educational activities and information exchanges facilitated by national and international wetland relationships and exchanges between researchers are helping to develop a better understanding of wetland ecology, rehabilitation and conservation.

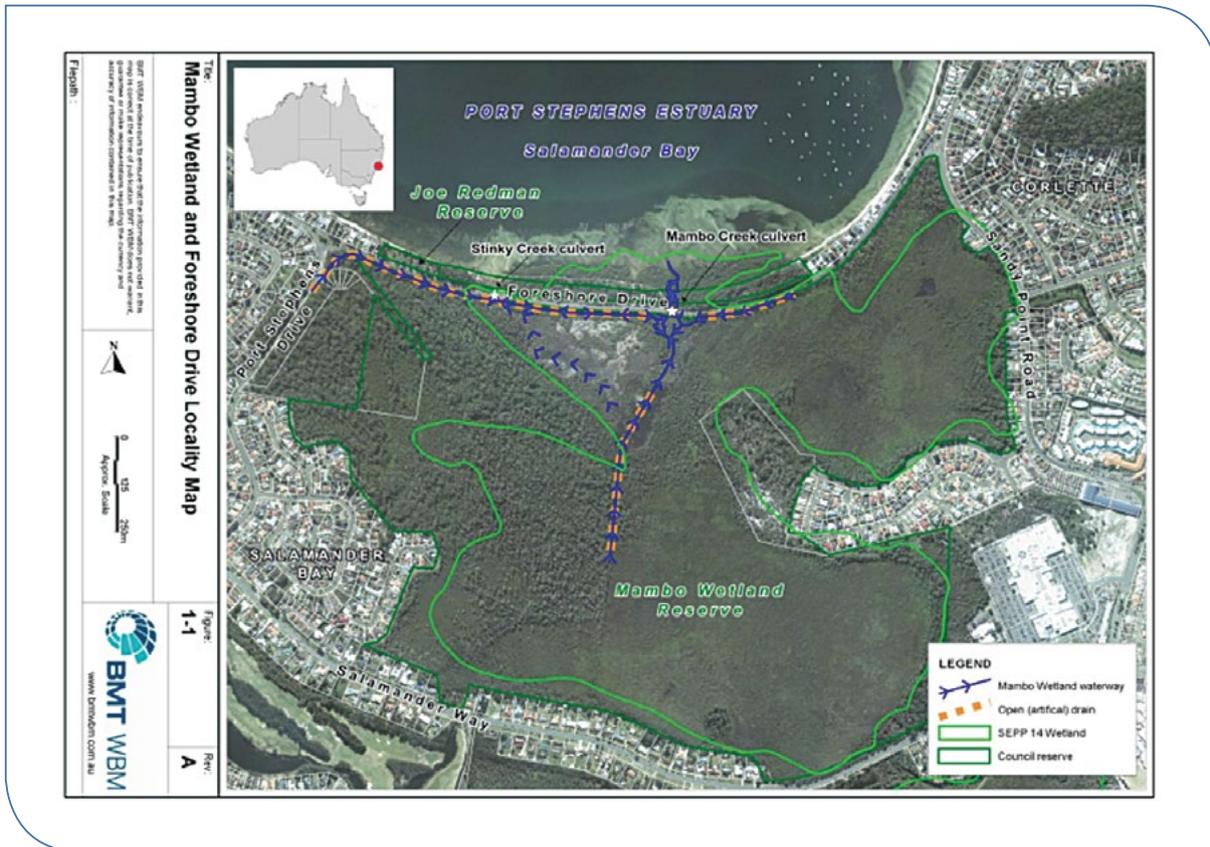
## Council Projects

### *Mambo Wetlands*

Port Stephens Council has engaged BMT WBM Pty Ltd in 2016 to undertake an assessment of options to improve two culvert systems beneath Foreshore Drive that drain Mambo Wetlands to Salamander Bay. The condition and functioning of both the eastern Mambo Creek culvert and western Stinky Creek culvert have been assessed as being in a degraded state.

Mambo Wetlands is an environmentally sensitive and significant site. It is listed as a SEPP 14 Coastal Wetland and is encompassed within the Port Stephens-Great Lakes Marine Park Sanctuary Zone at Salamander Bay. A Plan of Management has been developed for Mambo Wetlands, which identifies a range of values, issues and actions. That document highlights that Foreshore Drive and its culverts have significantly reduced the natural tidal flows that enter the Wetlands area, which has in turn impacted on the health of the saline wetland area.

The objectives of the culvert and roadway upgrades being considered by Council primarily include improving tidal flows into the Wetlands via Mambo Creek; reducing the occurrence of blockages in the Stinky Creek outlet and subsequently minimising the occurrence of ponding/stagnant water and associated odours; and widening the roadway at Mambo Creek to improve access and safety conditions.



**Map 12 Mambo Wetland Locality Map**

Source: BMT WBM, 2016. *Estuarine and Marine Ecosystems*

The coastal zone of Port Stephens opens into two major estuarine systems that include the Port Stephens and Hunter Estuaries. The Port Stephens Estuary is located entirely within the Port Stephens–Great Lakes Marine Park.

The Stockton Bight Coastal Sand Dune Ecosystem is also an important element of the area’s marine and estuarine ecosystems. Stable sand dunes play an important part in protecting the coastline. They act as a buffer against wave damage during weather events, protecting the land behind from salt water intrusion. This sand barrier allows the development of more complex plant communities in areas protected from salt water inundation, sea spray and strong winds<sup>114</sup>.

114 [https://www.ehp.qld.gov.au/coastal/ecology/beaches-dunes/coastal\\_dunes.html](https://www.ehp.qld.gov.au/coastal/ecology/beaches-dunes/coastal_dunes.html)

## Estuarine and Marine Habitat Types

Estuarine fish habitats occur where fresh water from rivers and streams mixes with the salty ocean water. This brackish water environment provides a variety of habitats that supply important feeding, spawning and nursery sites for many aquatic animals. Organisms, such as crabs and some mosquitoes, rely on estuarine water to complete their life cycles and others, such as migratory shore birds, visit estuaries to feed and rest<sup>115</sup>.

Core elements of estuarine habitat include saltmarsh, seagrass and mangrove.

### *Saltmarsh*

A saltmarsh is a community of plants and low shrubs that has a high soil salinity and occasional salt water inundation. Saltmarshes occur at the upper levels of the intertidal zone, often behind mangroves and, while they're not subject to daily tidal inundation, they're flooded by larger tides and semi-permanent pools of brackish water.

Saltmarsh is important to fish as it provides food sources, habitat and shelter when inundated at high tide. It plays an important role as a juvenile habitat for species such as bream and mullet and also acts as a buffer and filtration system for sediments and nutrients.

Saltmarsh is listed as a threatened ecological community under both the NSW TSC Act 1995 (endangered) and EPBC Act 1999 (vulnerable).

### *Mangroves*

Mangroves are protected within NSW waters under the FM Act 1994. Mangroves provide important habitat for fish, crabs, birds and other animals. They provide large amounts of organic matter, a food source for many small aquatic animals. In turn, these animals provide food for larger fish and other animals.

Mangroves contribute to the natural protection of foreshores from storm events, high wind and strong wave conditions. Mangroves also help maintain water quality by filtering silt from runoff and recycling nutrients.

Decline of mangroves can be attributed to clearing or reclamation and changes in water flow from waterfront developments. Mangrove communities can also expand due to the build-up of sediments from catchment clearing, development and stormwater run-off<sup>116</sup>.

### *Seagrass*

All seagrass is protected within NSW waters under the FM Act 1994. *Posidonia australis* seagrass meadows are found within the Port Stephens Estuary and are listed as a threatened ecological community under the EPBC Act 1999.

Seagrass beds enhance biodiversity in estuarine systems. They stabilise sediments and provide critical habitats and organic matter within marine ecosystems and food chains. They are important in maintaining water quality by cycling nutrients, producing oxygen and storing carbon<sup>117</sup>.

### *Mudflats*

Mudflats are tidal areas without vegetation, often within the littoral zone of foreshore areas. Low tides leave soft muddy sediments exposed to the air which provide feeding areas for many birds and fish.

Key threats to mudflats include poor water quality entering the estuary from tributary catchments, fishing or removal of vegetation, marine pests and invasive species, oil and chemical pollution, climate change effects including sea level rise, warming sea surface temperatures, and increasing ocean acidity.

At Soldiers Point, the littoral estuarine zone is known to support a breeding pair of Beach Stone-curlews, which are currently listed as a critically endangered species under the TSC Act 1995. There are as few as 13 adults known to survive in NSW.

<sup>115</sup> <http://www.dpi.nsw.gov.au/fishing/habitat/aquatic-habitats/estuarine>

<sup>116</sup> <http://www.dpi.nsw.gov.au/fishing/habitat/aquatic-habitats/estuarine>

<sup>117</sup> <http://www.urgdiveclub.org.au/seagrasses/>



## Context and Status

Council plays a key role in protecting the health of estuarine ecosystems through a number of mechanisms, including land-use and strategic planning, development controls and policies covering erosion and sediment control and water-sensitive urban design, provision and upgrading of reticulated sewerage systems, management of septic systems, and preparation and implementation of stormwater management plans and environmental management plans<sup>118</sup>.

## Hunter Estuary<sup>119</sup>

The Hunter Estuary is a barrier estuary of approximately 26km<sup>2</sup>, carved through Worimi, Wonnarua and Awabakal country, over millions of years. From the most inland tidal limit at Gostwyck, on the Paterson River, some 75kms from the ocean, the Estuary meanders through agricultural lands, some of the earliest developed townships in Australia and internationally important wetlands to the largest coal port in the southern hemisphere, the Port of Newcastle.

The term Hunter Estuary describes the waterway, bed and banks of the tidal section of the Hunter River and its tributaries (such as the Williams and Paterson Rivers, Wallis and Fishery Creeks, Ironbark Creek and Throsby, Styx and Cottage Creeks), and immediate riparian zones within approximately 1km of the waterways.

The Hunter Estuary is a functioning ecosystem that is valued as roosting and feeding habitat for an internationally significant selection of resident and migratory animals, as a water source for agriculture, a recreational waterway, and a commercial resource for a number of industries (coal, fishing, tourism etc). The physical diversity and complexity of the Hunter Estuary is reflected in the many interest groups that are connected to the estuary. These groups include government agencies, Aboriginal Land Councils and Aboriginal elders groups, conservation organisations, researchers, recreational groups and large industry bodies. Two centuries of rapid change within the catchment and Estuary have had major impacts on environmental processes, resulting in a change to the condition of the Estuary. Yet, the Hunter Estuary continues to support a diverse ecosystem with many ecological, economic and social values.

## Port Stephens Estuary

The Port Stephens Estuary is classified as a tide-dominated drowned river valley<sup>120</sup>. The Estuary is divided into Eastern and Western Ports by the Soldiers Point peninsula. Port Stephens Estuary comprises two basins, an inner (western) fluvial basin and an outer (eastern) marine basin. The Estuary has a combined length of 23kms (east to west), a maximum width (north to south) of 4.5kms, a total surface area of 120 km<sup>2</sup><sup>121</sup>.

The Port Stephens Estuary is open to the ocean between two headlands (Yacaaba and Tomaree) and hence is subjected to tidal, ocean wave and wind energy and is classified as a tide-dominated estuary on a wave-dominated coast (Vila-Concejo et al. 2007a). A well-developed flood tide delta exists west of the Estuary mouth. The ecology and processes of the inner basin are mostly estuarine while the eastern basin is dominated by ocean marine processes<sup>122</sup>.

The Port Stephens Estuary is an important location for fishing and marine tourism. Port Stephens has the second most extensive seagrass bed in NSW, covering over 1,000ha. There are four species of seagrass found within the Bay: Eelgrass (*Zostera capricorni* and *Zostera muelleri*), Strapweed (*Posidonia australis*) and Paddleweed (*Halophila spp*)<sup>123</sup>.

In 2000 an Industry & Investment NSW project, undertaken in collaboration with the NSW Department of Environment Climate Change and Water and the coastal Catchment Management Authorities, has greatly extended the amount of spatial information available by mapping key coastal habitats and conducting biodiversity surveys within some of those habitats.

Estuary mapping undertaken in 2000 is available through the Department of Primary Industries<sup>124</sup>. In May 2015 a project was undertaken by Department of Primary Industries, Local Land Services (Hunter) and Southern Cross University to map the sub tidal habitats of the eastern Port.

118 Hunter and Central Rivers State of Catchment Report, 2010

119 Hunter Estuary Coastal Zone Management Plan, BMT WBM, 2009

120 Roy PS, Williams RJ, Jones AR, Yassini I, Gibbs PJ, et al. (2001) Structure and function of south-east Australian estuaries.

121 Review of Studies on estuarine morphology and sediment movement conducted in Port Stephens Estuary University of Sydney 2015

122 Review of Studies on estuarine morphology and sediment movement conducted in Port Stephens Estuary University of Sydney 2015

123 <http://www.marineparksassociation.org.au/#/sea-grass/c1qn>

124 <http://www.dpi.nsw.gov.au/content/research/areas/aquatic-ecosystems/estuarine-habitats-maps>

A key objective of the project was to develop a better understanding of deeper benthic habitats in order to adequately protect them within the Port Stephens-Great Lakes Marine Park<sup>125</sup>.

An examination of aquatic vegetation habitats such as mangroves, seagrass and saltmarsh in NSW estuaries had been conducted in 2004 (*Mapping the habitats of NSW estuaries*, Creese, R. G., Glasby, T. M., West, G. & Gallen, C., 2009). A comparison of the GIS data generated in 2004, with results from the 2015 study identified a small (3%) reduction in seagrass cover in the eastern Port between 2004 (702 hectares) and 2014 (682 hectares). Examination of the comparative distributions of seagrasses from these two studies indicates that the main reduction in seagrass cover has occurred at the entrance to the Myall Lakes; and that this loss has been offset by an increase in seagrass cover at the eastern end, and along the centre, of the eastern Port.

*Zostera* and *Halophila* both have a natural spatial and temporal variability that can be driven by many factors, including seasonal variations in water temperature, sunlight, water quality issues, and sediment movement. There has been a recent decline of *Zostera* in Port Stephens that appears to exceed the natural variability of the species<sup>126</sup>. *Posidonia australis* is a slow growing, long lived species that provides stabilisation of estuarine sediments.

The project also focused on mapping the extent of the soft-coral habitat (*Dendronephthya australis*) that is believed only to occur in large abundance in the Hunter Region, and particularly in Port Stephens<sup>127</sup>. Soft coral habitat is recognised as habitat for protected marine species<sup>128 129</sup>.

Soft coral habitat is placed under increasing pressure due to recreational Port usage, sedimentation and water quality fluctuations<sup>129</sup>. The majority of the soft coral habitat was found to be in close proximity to the southern shore from Nelson Bay to Corlette.

Using aerial photography and towed video data a sub-tidal habitat map for the eastern Port was generated covering approximately 5,200 hectares, from Tomaree Head to Soldiers Point and to the entrance of the Myall River. Habitat coverage is summarised below.

**Table 7 Habitat Coverage in the Eastern Port**

Habitat Classification	Class	Area (ha)
Dendronephthya	Filter Feeder	3.2
Ecklonia	Macroalgae	6.8
Barrens	Macroalgae	9.5
Branching Algae	Macroalgae	96.2
Sponge	Filter Feeder	132.9
Posidonia	Seagrass	263.4
Zostera/Halophila	Seagrass	420
Mud	Uncovered Substrate	1,640.2
Sand	Uncovered Substrate	2,631.5
Total		5,203.7

Source: *Mapping sub-tidal habitats in the Eastern Port of Port Stephens*, T.R. Davis, C. Gallen, R. Laird and D. Harasti

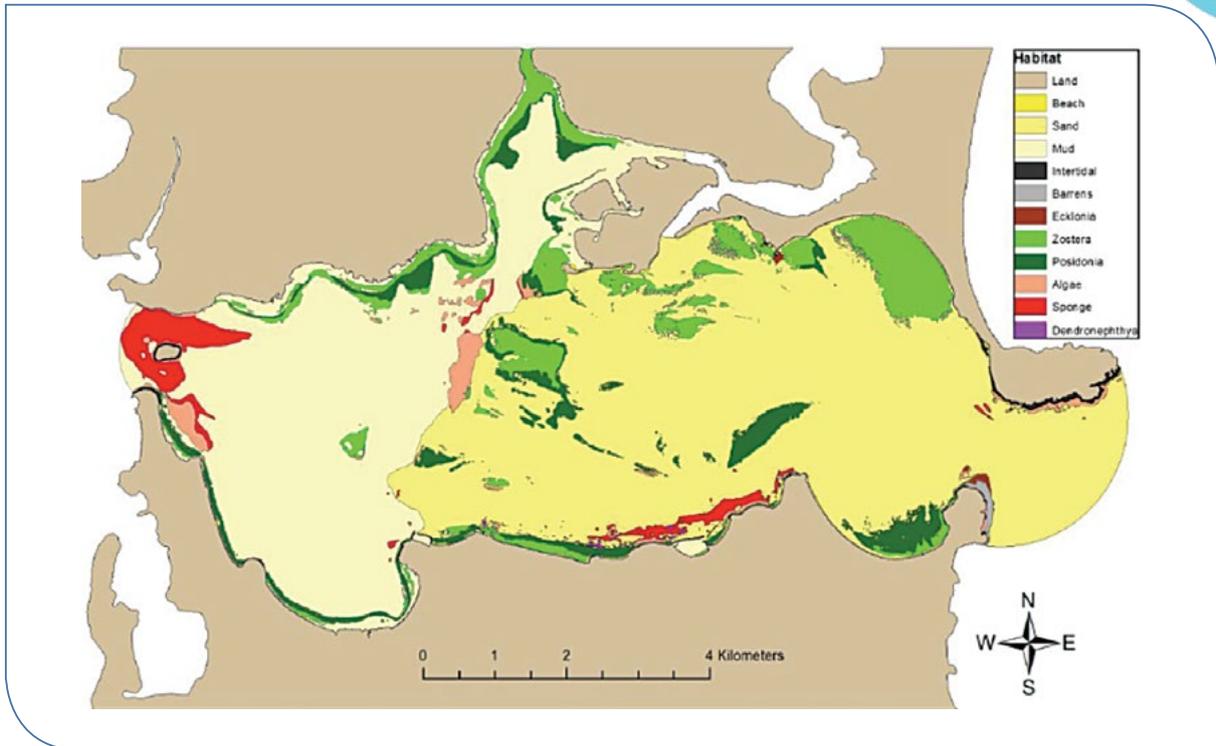
125 Davis, Gallen, Laird, Harasti (2015) Mapping sub-tidal habitats in the Eastern Port of Port Stephens

126 Mapping sub-tidal habitats in the Eastern Port of Port Stephens, T.R. Davis, C. Gallen, R. Laird and D. Harasti, 2015

127 Poulos, D. E., Harasti, D., Gallen, C. & Booth, D. J. (2013). Biodiversity value of a geographically restricted soft coral species within a temperate estuary. *Aquatic Conservation: Marine and Freshwater Ecosystems*

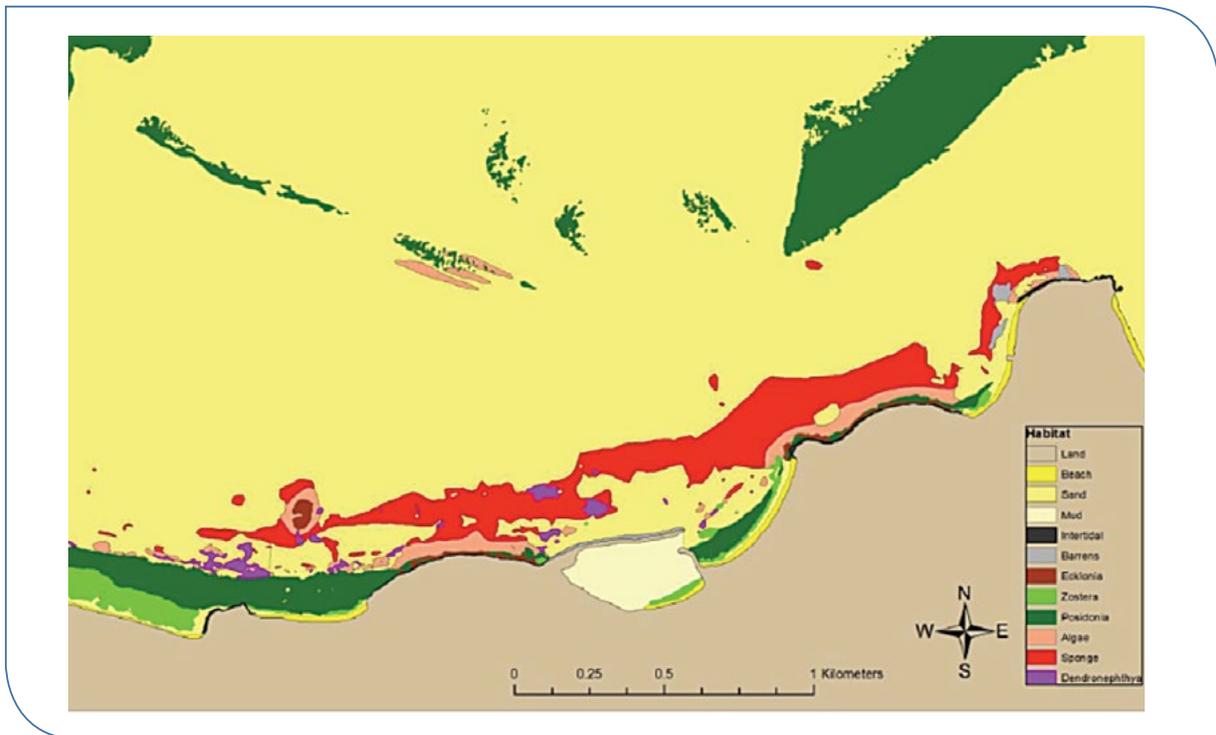
128 Harasti, D., Martin-Smith, K. & Gladstone, W. (2012). Population dynamics and life history of a geographically restricted seahorse, *Hippocampus whitei*. *Journal of Fish Biology*

129 Harasti, D., Martin-Smith, K. & Gladstone, W. (2014). Ontogenetic and sex-based differences in habitat preferences and site fidelity of White's seahorse *Hippocampus whitei*. *Journal of Fish Biology*



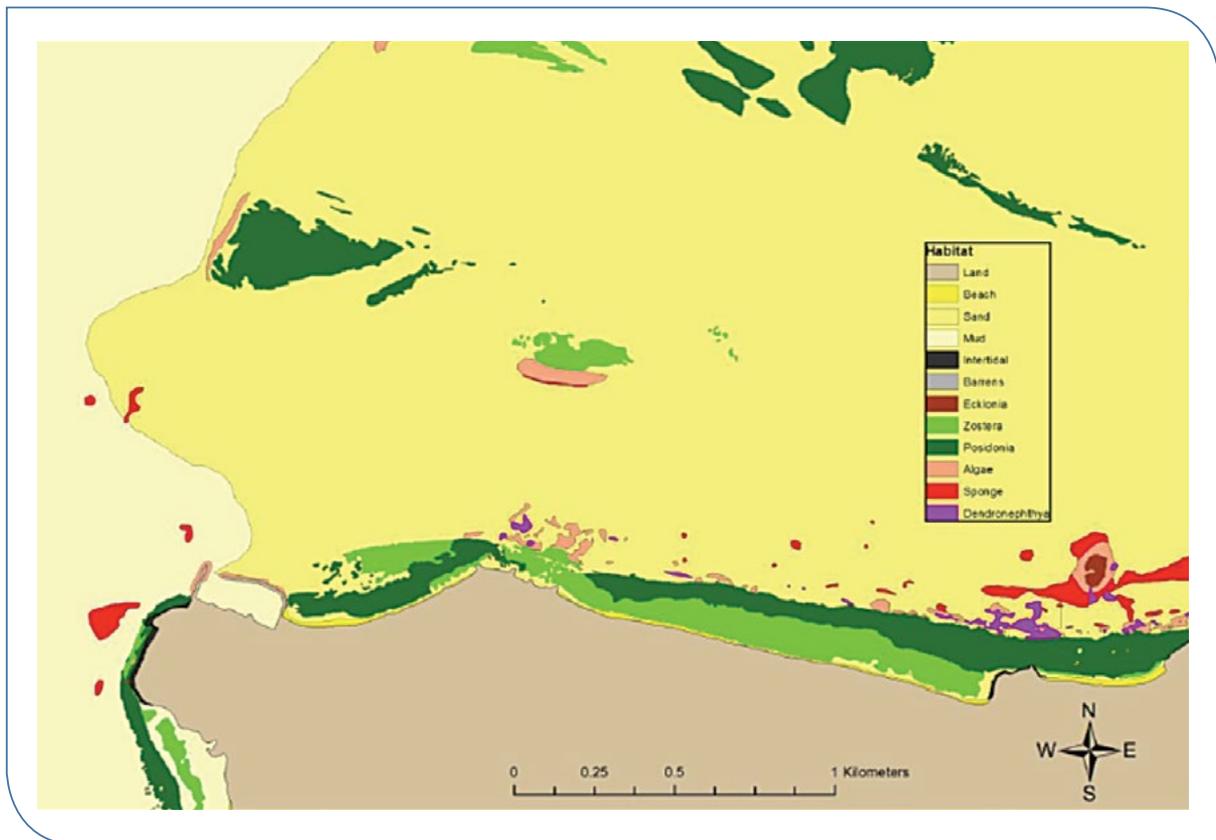
**Map 13** Habitat Map for the Eastern Port of Port Stephens,

Source: *Mapping sub-tidal habitats in the Eastern Port of Port Stephens*, T.R. Davis, C. Gallen, R. Laird and D. Harasti



**Map 14** Enlarged habitat map for the Eastern Port, southern coast from Halifax Point to Redpatch Point

Source: *Mapping sub-tidal habitats in the Eastern Port of Port Stephens*, T.R. Davis, C. Gallen, R. Laird and D. Harasti



**Map 15 Enlarged habitat map for the Eastern Port southern shoreline from Redpatch Point to Corlette**  
 Source: *Mapping sub-tidal habitats in the Eastern Port of Port Stephens, T.R. Davis, C. Gallen, R. Laird and D. Harasti*

## Pressures on Estuarine and Marine Environments

Most of the coastal, estuarine, and marine environments in Port Stephens have been modified or impacted to some extent by increasing pressure from coastal development. Population density is comparatively higher in the coastal areas of the LGA compared to the rural western planning districts – see *Land Use Planning and Development above for more information*.

Residential, tourism and industry development impacts can include changes to estuarine and marine habitats, water quality and estuarine processes due to the removal of aquatic vegetation; introduction of new biota; waterway engineering including land reclamation, hard erosion control structures and weirs; building works (such as marinas and boat ramps); fishing/trawling, and aquaculture developments; pollution and litter as a result of encroaching urbanisation.

Catchment clearing and modification of riparian and foreshore zones contribute to deteriorating water quality of estuaries, and increased erosion as well as increased sediment, pollution and nutrient loads.

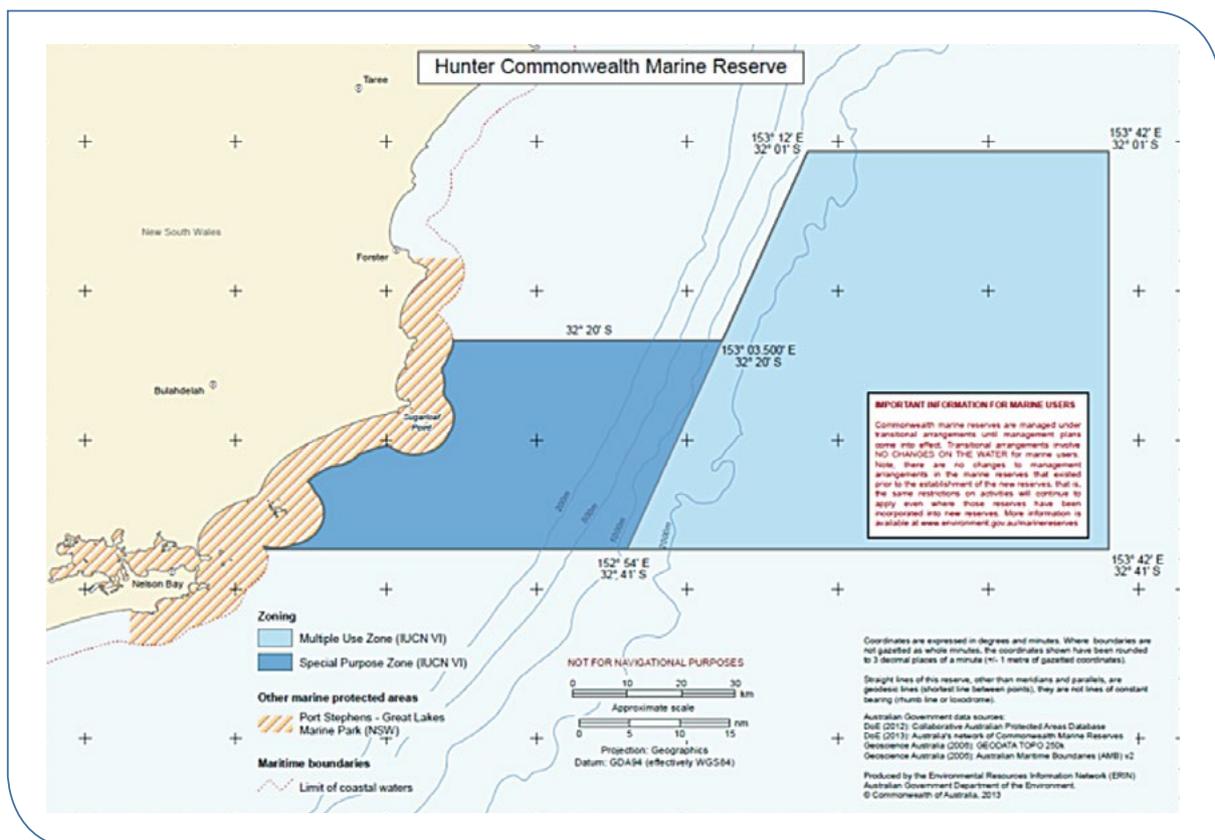
The potential impacts of climate change on coastal, estuarine and marine environments are not well understood. However predicted increases in sea surface temperature and ocean acidification are likely to have significant impacts, as is increased flooding from more frequent and more intense east coast low pressure systems, along with increased coastal inundation from sea level rise<sup>130</sup>.

<sup>130</sup> EPA, NSW State of Environment Report 2015.

# Responses to Pressures: Port Stephens Estuarine and Marine Ecosystems

## Hunter Commonwealth Marine Reserve <sup>131</sup>

The Hunter Commonwealth Marine Reserve covers an area of 62,570 hectares. As can be seen below, the Marine Reserve is located to the north of Port Stephens, adjacent to the Port Stephens–Great Lakes Marine Park.



Map 16 Hunter Commonwealth Marine Reserve

The major conservation values of the Hunter Commonwealth Marine Reserve are:

- Important habitat for the critically endangered east coast population of grey nurse sharks;
- Biologically important areas for the protected humpback whale, vulnerable white sharks and a number of migratory seabirds;
- Examples of the ecosystems of the Central Eastern Province and the Central Eastern Shelf Province provincial bioregions and the Manning Shelf meso-scale bioregion;
- A range of seafloor features including abyssal-plain/deep ocean floor, canyons, shelf, slope, and terrace geomorphic features;
- Includes shelf rocky reefs (unique sea-floor features with ecological properties of regional significance).

131 <http://www.environment.gov.au/topics/marine/marine-reserves/temperate-east/hunter>

## *NSW Department of Primary Industries – Fisheries*

The NSW Department of Primary Industries – Fisheries is a government agency that provides compliance services and information on commercial and recreational fishing, aquaculture, aquatic species and aquatic habitat preservation. The Port Stephens Fisheries Institute is a DPI Division based at Taylors Beach. It provides compliance, biosecurity and research services including aquaculture, marine and freshwater ecosystem research and habitat rehabilitation.

NSW DPI is the agency responsible for implementing the FM Act 1994. Habitat management priorities include conserving fish populations and protecting fish habitats, conserving threatened species, populations and communities of fish and marine plants and promoting ecologically sustainable development.

## *NSW Marine Parks Authority*

The NSW Marine Parks Authority has the primary responsibility for the management of aquatic biodiversity within the Port and marine environments. The NSW Marine Parks Authority is developing and managing a representative system of marine protected areas in the coastal, estuarine and ocean waters of NSW. Australia is committed under international conventions to conserving local marine biodiversity and ensuring that marine resources are used in an ecologically sustainable manner<sup>132</sup>.

## *NSW Department of Environment Coastal Reforms*

The aim of the NSW Department of Environment coastal reforms is to establish a new approach that allows land managers and decision-makers to respond effectively to coastal processes and hazards, and to manage the unique environmental, social and economic values of the coast in a coherent and functional way.

The current legal framework for coastal management in NSW was established over 35 years ago. It was recognised that these laws were not able to adequately reflect the current and future challenges faced by our coastal areas, nor the evolving knowledge of coastal processes and hazards.

On 13 November 2015, the NSW Government took a major step in the two stage coastal reforms program by releasing a draft framework for coastal management for public consultation. A full draft Coastal Management State Environmental Planning Policy (SEPP) and corresponding maps of the coastal management areas will also be released separately for public comment in the coming months. The Government will not finalise the coastal reforms until this second stage of public consultation is completed<sup>133</sup>.

## *Port Stephens-Great Lakes Marine Park*<sup>134</sup>

The Port Stephens–Great Lakes Marine Park was declared in 2005 under the *NSW Marine Parks Act 1997*. The park covers an area of approximately 98,000 hectares and includes important habitat for the grey nurse shark and black cod, the primary breeding site of the Gould’s Petrel, the largest areas of mangrove and saltmarsh in NSW and 5% of the state’s seagrass area<sup>135</sup>.

The Port Stephens–Great Lakes Marine Park Zoning Plan enhances conservation of marine habitats and species by providing various zones and corresponding levels of protection whilst allowing for multiple uses. The four types of zones that are applied in NSW marine parks are sanctuary zones, habitat protection zones, general use zones and special purpose zones<sup>136</sup>.

132 NSW Marine Parks Authority Status Report, 2004-2005

133 <http://www.environment.nsw.gov.au/coasts/coastreforms.htm>

134 <http://www.mpa.nsw.gov.au/pdf/PSGLMP-Operational-Plan-2010.pdf>

135 Port Stephens Great Lakes Marine Park Zoning Plan, March 2013

136 <https://www.portstephens.org.au/images/documents/Great%20Lakes%20Marine%20park%20brochure.pdf>



The Marine Parks Authority undertakes management action within the Marine Park area in accordance with the Port Stephens–Great Lakes Marine Park. Objectives and management actions have been organised under the following strategies:

- Identification and adaptive management of threats to marine biodiversity and habitats;
- Protection of high conservation areas and threatened species;
- Assessing developments in, and affecting, the Marine Park to minimise impacts;
- Maximising voluntary compliance with the Marine Park zoning plan;
- Ecologically sustainable management of commercial activities;
- Delivering an ecological, social and economic research and monitoring program;
- Promotion of sustainable tourism and recreational uses, as well as facilitation of a greater appreciation of marine biodiversity; and
- Ensuring management is consistent with the cultural aspirations of Aboriginal people.

### *Marine Park Association (MPA)*

Established by a group of marine scientists and concerned citizens, the Marine Parks Association supports marine parks and sustainable marine resource management from a community-based platform. MPA collaborates with DPI, NPWS, OEH, universities and Marine Parks to undertake citizen science and research projects such as the annual dolphin census and seagrass studies<sup>137</sup>.

### *Hunter Estuary Management Plan*

The Hunter Estuary Management Plan was adopted by Port Stephens Council, in association with Newcastle City Council, Maitland City Council, and the Department of Environment, Climate Change and Water (DECCW), in October 2009. It aims to guide future decision-making regarding short and long-term management of the Hunter Estuary, its foreshores and its broader catchment areas.

### *Port Stephens Myall Lakes Estuary Management Plan*

The Port Stephens Myall Lakes Estuary Management Plan provides a strategic policy framework for ecologically sustainable development and environmental protection. Since its development in 2000, the Port Stephens Myall Lakes Estuary and Coastal Zone Management Committee has overseen the implementation of the Management Plan and its actions.

### *Port Stephens Foreshore Management Plan*

The Port Stephens Foreshore Management Plan addresses the commercial and recreational use of foreshore areas while ensuring sustainability and preserving ecological values. With increasing pressure on the foreshore through population growth and an expanding tourism industry, the Plan identifies and assesses potential threats to the foreshore and recommends management actions. It provides a coordinated approach for more than 250kms of foreshore which is located across two Local Government Areas.

The Port Stephens Foreshore Management Plan is currently being reviewed in the context of the coastal reforms which require councils to prepare a Coastal Zone Management Program.

<sup>137</sup> <http://www.marineparksassociation.org.au/>

# Invasive Species and Noxious Weeds

## Context and Status

Invasive species (including pest animals, weeds and diseases) are widespread across New South Wales. They remain one of the biggest threats to biodiversity as they are difficult to manage effectively. Many are listed as key threatening processes in NSW legislation, with pest animals and, in particular weeds identified as a threat to over 70% of all threatened species<sup>36</sup>.

To date, over 1,650 exotic plant species have become established in NSW with over 300 of these are described as significant environmental weeds<sup>138</sup>.

In New South Wales, the term 'noxious weed' is used to describe plants that have been declared as noxious by the Minister for Agriculture under the *Noxious Weeds Act, 1993* (NW Act). This Act aims to protect the economy, the environment and the community from the negative effects of serious weeds. The Act provides the means by which the spread and establishment of serious weeds can be prevented<sup>139</sup>.

NSW *WeedWise* lists weeds declared by class and declared status within the Local Control Authority of the LGA. The table below shows the number of declared weeds found in Port Stephens. Council is a local control authority for noxious weeds within the LGA. This means that Council has a regulatory role to enforce provisions of the Act on private property. Council is also required to comply with the Act on land for which Council has management responsibility.

**Table 8 Declared Weed Classes and number found in the Local Control Authority of Port Stephens LGA <sup>140</sup>.**

Class	Definition	No. Identified in PS LGA
1	State Prohibited Weed	2
	The plant must be eradicated from the land and that land must be kept free of the plant	
2	Regionally Prohibited Weed	3
	The plant must be eradicated from the land and that land must be kept free of the plant	
3	Regionally Controlled Weed	11
	The plant must be fully and continuously suppressed and destroyed	
4	Locally Controlled Weed	approximately 34
	The plant must not be sold, propagated or knowingly distributed	
5	Restricted Plant	4
	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with	

Thirty-two Weeds of National Significance have been identified by Australian Governments. This classification is based on the invasiveness of the species, the potential for spread as well as the environmental, social and economic impacts of the species.

138 NSW State of Environment Report, 2015: NSW EPA

139 NSW DPI Noxious Weeds Declarations

140 <http://weeds.dpi.nsw.gov.au/WeedDeclarations?RegionId=94>, Accessed 28/2/16



Thirteen of these 32 Weeds of National Significance have been identified in the Port Stephens LGA. They are generally widespread, and include: Alligator weed, Madeira vine, Asparagus fern, Bridal creeper, Prickly pear, Bitou bush, Cat's claw creeper, Water hyacinth, Lantana, Blackberry, Sagittaria, Salvinia and Fireweed.

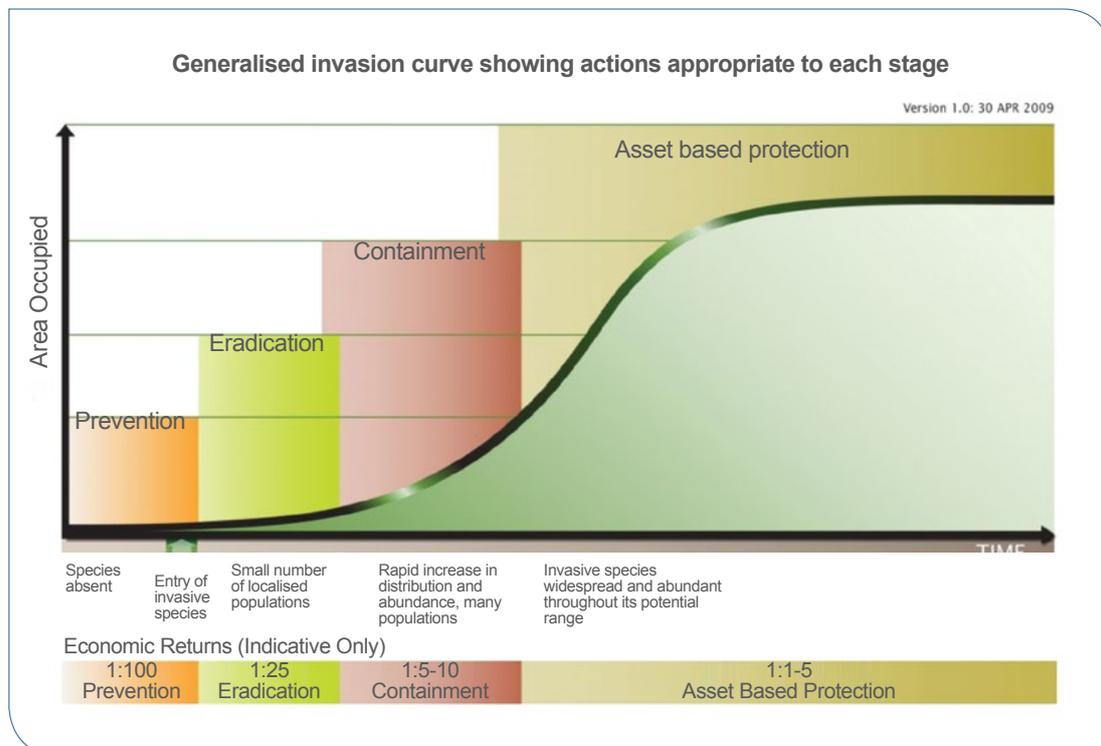
The National Environmental Alert List for environmental weeds identifies 28 plant species that are in the early stages of establishment and have the potential to be a significant threat to biodiversity if not appropriately managed<sup>141</sup>. Chinese Violet is the only weed identified in the Port Stephens LGA that is listed on the National Environmental Alert List.

Risk factors that exacerbate the impacts or facilitate the spread of an invasive species include habitat disturbance, expansion of range, the effects of climate change such as increased temperatures, changes in rainfall and fire regimes<sup>142</sup>.

Council's approach to the management of noxious weeds in Port Stephens is aligned with the Australian Weeds strategy, NSW Invasive Species Plan and the Hunter and Central Coast Regional Weeds Strategy. This is a co-ordinated and integrated approach to ensure consistency across terrestrial and aquatic environments.

Plants that pose a serious threat to primary industries, the environment and/or the community are potential candidates for declaration as noxious weeds. There are five control classes of noxious weeds, scaled in terms of weed type and threat. Control requirements are specified in accordance with these control classes.

The declaration of noxious weeds and the prioritisation of control works are generally based on the invasion curve, as shown in the figure below. The invasion curve shows that eradication of an invasive species becomes less likely and control costs increase as an invasive species spreads over time. Prevention is the most cost-effective solution, followed by eradication. If a species is not detected and removed early, intense and long-term control efforts will be unavoidable.



**Figure 31 Generalised Invasive Species Invasion Curve**

Source: *Invasive Plants and Animals Policy Framework, Agriculture Victoria*

141 <http://www.environment.gov.au/node/14154>

142 Assessment of Australia's Biodiversity 2008, Australian Government Department of Environment, Water, Heritage and Arts

## **Invasive Species and Noxious Weeds Responses**

A review of the NSW Invasive Species Plan 2008-2015 was undertaken in 2015 to ensure invasive species in NSW continue to be managed by objective and successful programs.

An updated NSW Invasive Species Plan 2015-2022 has now been drafted by NSW Department of Primary Industries in collaboration with public land managers (Local Land Services, Crown Lands and NSW National Parks and Wildlife Service), and is open for public consultation.

The revised NSW Invasive Species Plan 2015-2022 will provide better guidance to help prevent and manage the introduction and spread of invasive species<sup>143</sup>.

### *Australian Weeds Strategy*

The Australian Weeds Strategy (first developed as the National Weeds Strategy in 1997) provides a framework for guidance of a consistent nature for all parties, and identifies priorities for weed management in Australia with the aim of minimising the impact of weeds on national environmental, economic and social assets.

The Strategy maintains the policy focus of the National Weeds Strategy, taking into account changes to the institutions, legislation, policies and programs that support weed management in Australia.

The Australian Weeds Strategy has an important role in Australia's integrated approach to national biosecurity, and complements existing and new national strategies for invasive species, such as those for terrestrial vertebrate pests and marine pests<sup>144</sup>. The NSW Weeds Action Program 2015-2020 is a NSW Government initiative to reduce the impact of weeds under the NSW Invasive Species Plan, and the NSW Biosecurity Strategy.

### *NSW Bio-security Strategy*

The NSW Biosecurity Strategy outlines how government, industry and the community work co-operatively to identify, minimise, respond to and manage biosecurity risks, such as noxious and environmental weeds.

### *Invasive Species Program*

The NSW Invasive Species Program provides a state level framework for the management of invasive species. It complements the existing Biosecurity Strategy and the Australian Weeds Strategy.

### *Weeds Action Plan 2015-2020*

The Weeds Action Plan 2015-2020 is an outcomes based program where activities contribute to clearly defined goals and objectives under the Invasive Species Program. The four goals of the Invasive Species Program are:

- Goal 1: Exclude – prevent the establishment of new invasive species;
- Goal 2: Eradicate or contain – eliminate, or prevent the spread of new invasive species;
- Goal 3: Effectively manage – reduce the impact of widespread invasive species;
- Goal 4: Capacity – ensure that NSW has the ability and commitment to manage invasive species<sup>145</sup>.

143 NSW State of Environment Report, EPA 2015

144 <http://www.environment.gov.au/biodiversity/invasive/weeds/publications/strategies/weed-strategy.html>

145 NSW Invasive Species Plan, NSW Department of Primary Industries, Orange NSW 2800



## State Weed Committee

The State Weed Committee is responsible for facilitating a coordinated and strategic approach to weed management through:

- Ensuring regional weed committees operate on a tenure-neutral basis and implement regional strategic weed management plans that are effective, risk-based and inclusive of all major stakeholders in the landscape;
- Evaluating weed declarations, based on potential long-term risks and impacts to the economy, environment and community;
- Establishing a high-risk incursion fund;
- Evaluating the effectiveness of weed management programs<sup>146</sup>.

## Hunter Regional Weed Committee

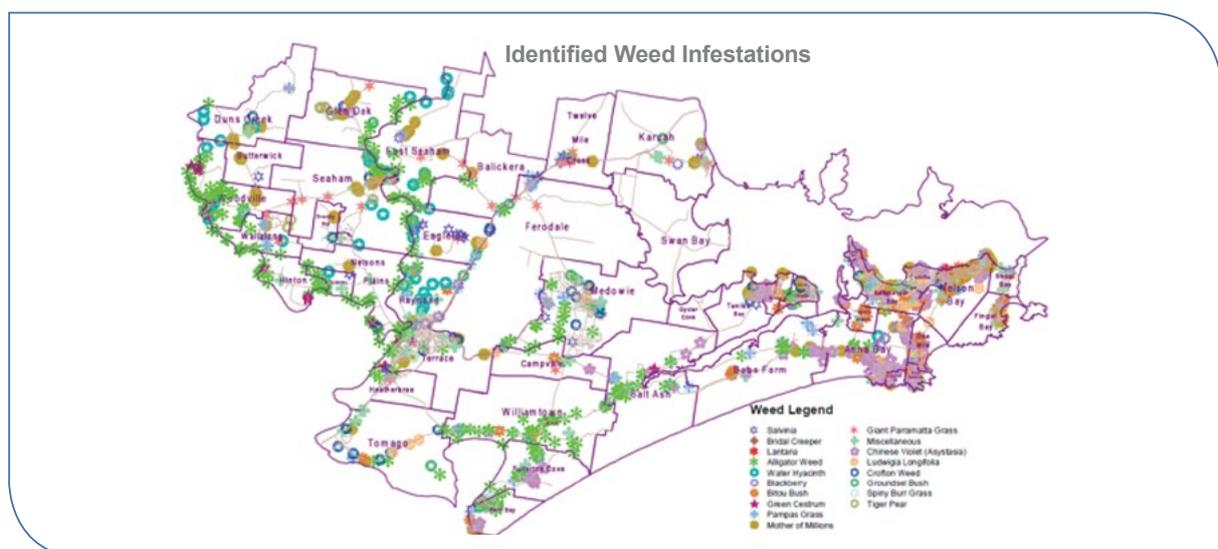
The role of the Hunter Regional Weed Committee is to provide ‘tenure neutral’ coordination and strategic planning of regional level weed management activities, which in turn have an important part in the overall state weed management framework.

The committee was established to:

- Support implementation of the weeds components and underlining principles of the NSW Biosecurity Strategy, *NSW Biosecurity Act 2015* and the *NSW Invasive Species Plan 2015-2022*;
- Provide advice to the Board regarding delivery of weed functions for the Local Land Services consistent with the Local Strategic Plan;
- Develop innovative and effective regional weed management strategic plans that consider risks, include all land tenure, and major stakeholders in the landscape; and
- Provide a forum for the community and stakeholders in decision-making, and develop communication, education and awareness programs based on local and/or regional priority weeds and issues.

## Port Stephens Council Weed Management Program

Council utilises GIS mapping to monitor and track the extent of noxious weed incursions. The map below demonstrates that noxious weeds are concentrated around key pathways of spread such as waterways, major roads and urban areas. Mapping is also used to prioritise inspection programs and as part of early intervention initiatives.



**Map 17 Extent of Noxious Weeds Identified and Treated Through Council Inspection Programs**

<sup>146</sup> <http://www.lls.nsw.gov.au/biosecurity/weed-control/nsw-weed-reforms>

Council prioritises its weed control program based on the invasion curve and weeds mapping. Many of Council's weed control programs are focused on species and areas where early prevention, eradication and containment outcomes are achieved ahead of the need for asset based protection. The figure below shows the hours (as a %) spent on targeted weed species, in turn demonstrating the species that Council prioritises for control and compliance programs.

Alligator weed and Chinese Violet dominate the allocation of time due to the nature of the management program and the listing of the species.

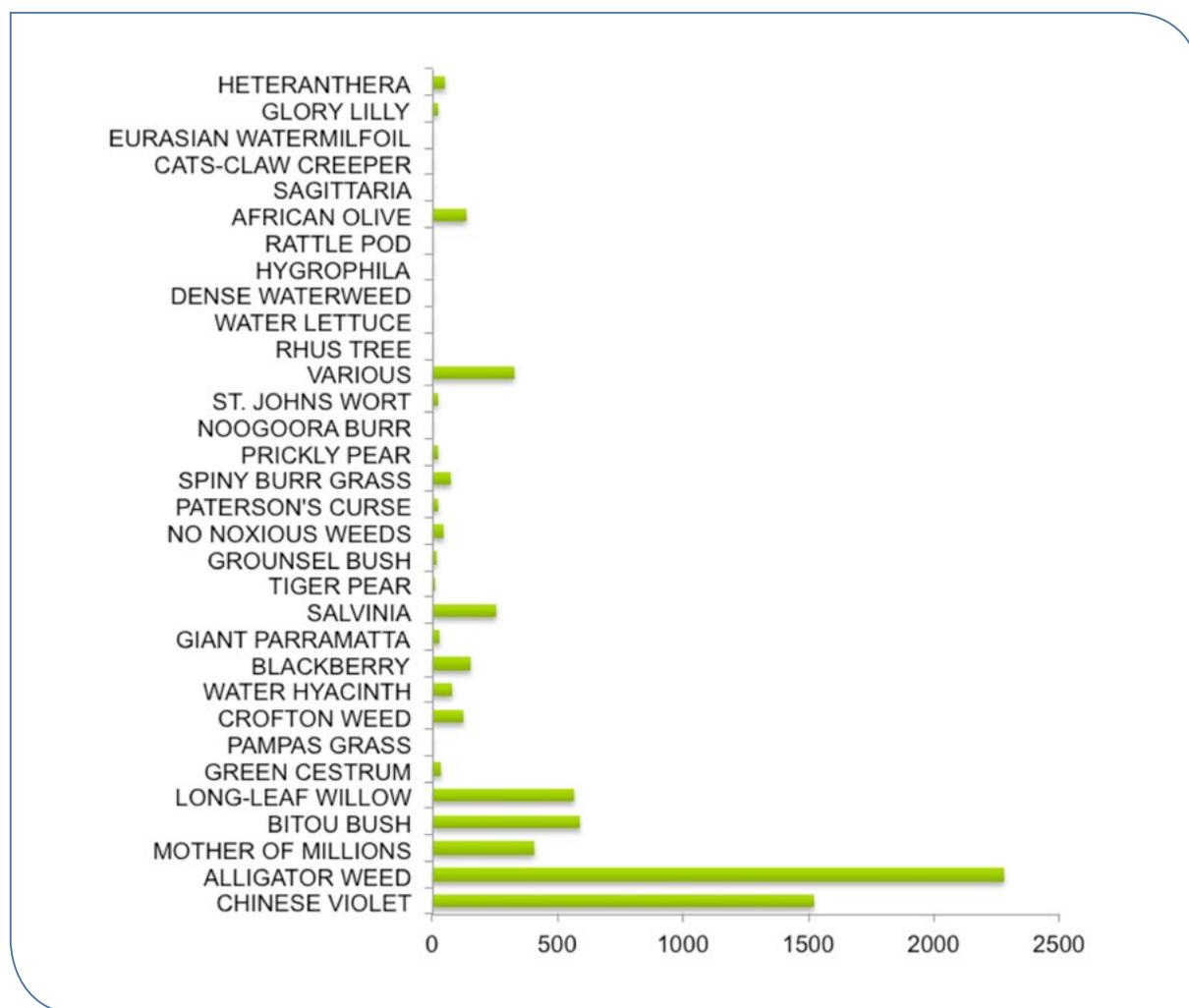


Figure 32 Total hours spent on targeted weed species within the LGA 2012-2016



A further breakdown of the Weed Management Program is shown below. In this diagram Treatment Numbers refers to the total number of treatments undertaken throughout the LGA (for example three treatments could indicate three treatments for one site or one treatment at three different sites). Treatment hours are an indication of the total number of hours spent by Council officers managing weed species.

Chemicals Applied provides an indication of the severity of weed infestations treated. Each of these three sets of data provides useful information to analyse Council's weed management program, for example the observable increase in Treatment Hours in 2013-2014 was the result of an increase in resources, resulting in more staff hours available to undertake weed management activities.

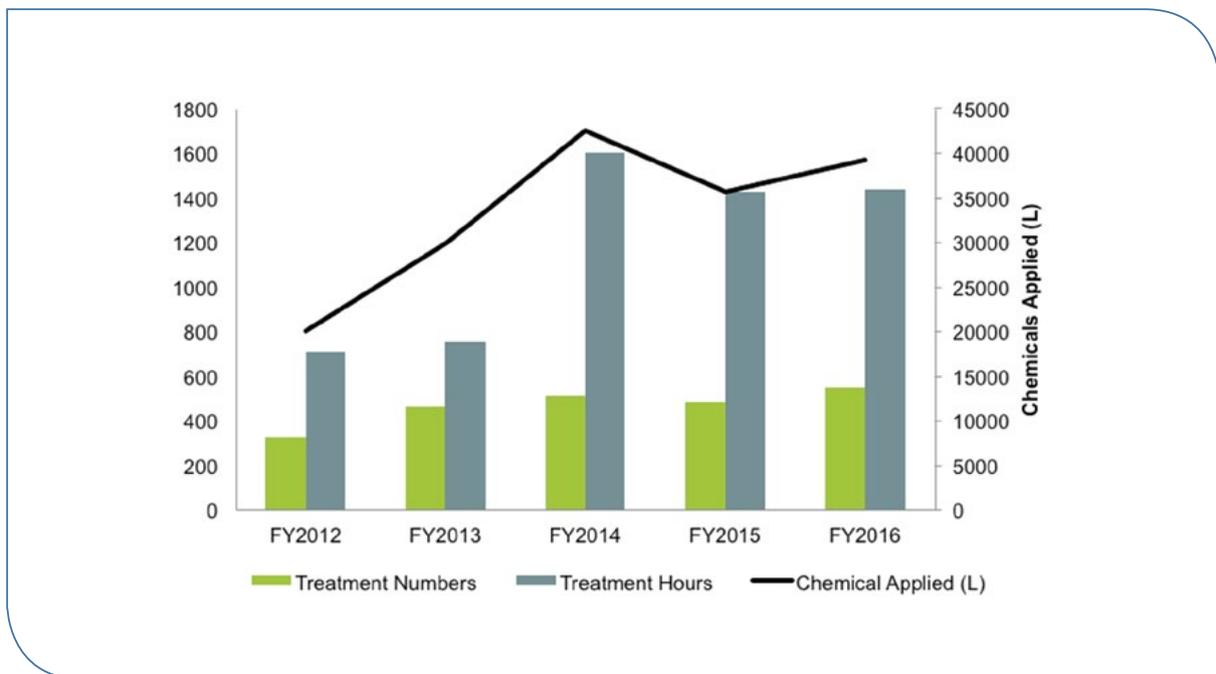


Figure 33 Weed Treatment Numbers, Hours and Litres of Chemical applied (2012-2016)

### Case Study: Chinese Violet Eradication Project

Found smothering native vegetation near Port Stephens at Boat Harbour NSW in 1999, Chinese Violet is believed to have been introduced to Australia as an ornamental garden plant. Spreading from Boat Harbour, the weed quickly became established in the surrounding suburbs of the Port Stephens LGA. The weedy form of Chinese Violet, *Asystasia gangetica* ssp. *micrantha* is currently mostly confined in Australia to the Port Stephens area of NSW, though several outbreaks are recorded at nearby Newcastle and Lake Macquarie, and an isolated outbreak has been reported further north at the NSW coastal town of Hat Head in 2011.



Chinese Violet

Chinese Violet is a tropical plant, and despite not being able to thrive in temperate Port Stephens, it has proved to be an aggressive invasive weed. The threat of this plant to tropical Australia is undoubted, and two incursions in Queensland in 2011 and 2013, and a recent incursion in Darwin are the latest examples of its preference for warmer wetter conditions.

After discovery in 1999, Port Stephens Council weed officers began works to control the plant. In 2002 herbicide trials by NSW DPI improved knowledge of control options, but without further funding, progress was less than adequate.

In 2003 the Australian Bureau of Rural Sciences listed Chinese Violet in the top 10 Australian sleeper weeds to be eradicated, followed in 2006 by the noxious weed declaration, and some federal funding towards the eradication project was provided.

In late 2006 Port Stephens Council was able to employ a full-time project officer, giving continuation to the project beyond the extent of grant funding. To date a fulltime officer has continued the fight, and managed to largely contain the weed to Port Stephens. Whilst infestation numbers continue to grow the rate of incursions is slowing, community participation is increasing, and several sites are now being declared eradicated each year<sup>147</sup>.

## *Rabbit Management*

Rabbits are a declared pest animal under the *Rural Lands Protection Act 1998* which places responsibility for controlling them with the owner or occupier of land on which they are present. A combination of traditional control techniques and biological control holds the best promise for reducing feral rabbit populations and minimising the damage they cause.

In the Port Stephens LGA, rabbits are well established in urban, agricultural and natural areas. Controlling rabbits effectively within the applicable legal, ethical and practical constraints can be difficult. Council, as a landholder with biosecurity responsibilities, co-ordinates an LGA-wide approach to feral rabbit management. Baiting locations were determined following the completion of distribution and abundance surveys. Council's rabbit management program is ongoing and evolving with lessons learnt from previous years. In previous years the program has been largely reactive, in response to large outbreaks. A proactive, LGA-wide, tenure neutral coordinated approach is currently being implemented, including consultation with LLS, NPWS and Crown Lands

# Threatened Species and Ecological Communities

## Context and Status

The EPBC Act 1999 is the key piece of biodiversity legislation through which the Australian Government focuses its interests on the protection of matters of national environmental significance. The EPBC Act 1999 provides for the listing of nationally threatened native species and ecological communities, native migratory species and marine species<sup>148</sup>.

States and territories have responsibility for protecting matters of state and local significance. Provisions are made under the NSW TSC Act 1995 and FM Act 1994 for the identification of state significant threatened species, populations and ecological communities. The Acts also provide for the declaration and mapping of habitats that are critical to the survival of those identified threatened species, populations and ecological communities that are classified as endangered (critical habitats)<sup>149</sup>.

Port Stephens Council plays a key role in the conservation and management of biodiversity and threatened species within the LGA. Council is responsible for the land use planning and development assessment process, including the assessment of potential and likely impacts on threatened species as a result of land use planning decisions. As a land manager local government is responsible for large areas of public land (see Land section), much of which has high biodiversity value<sup>150</sup>.

147 Skinner, J. (2015). The invasive weed Chinese violet (*Asystasia gangetica* subspecies *micrantha*). *Plant Protection Quarterly* Vol.30(4), 126-127.

148 <http://www.environment.gov.au/epbc/what-is-protected/threatened-species-ecological-communities>

149 <http://www.environment.nsw.gov.au/threatenedspecies/>

150 <http://www.environment.nsw.gov.au/biodiversity/BiodiversityResources.htm>



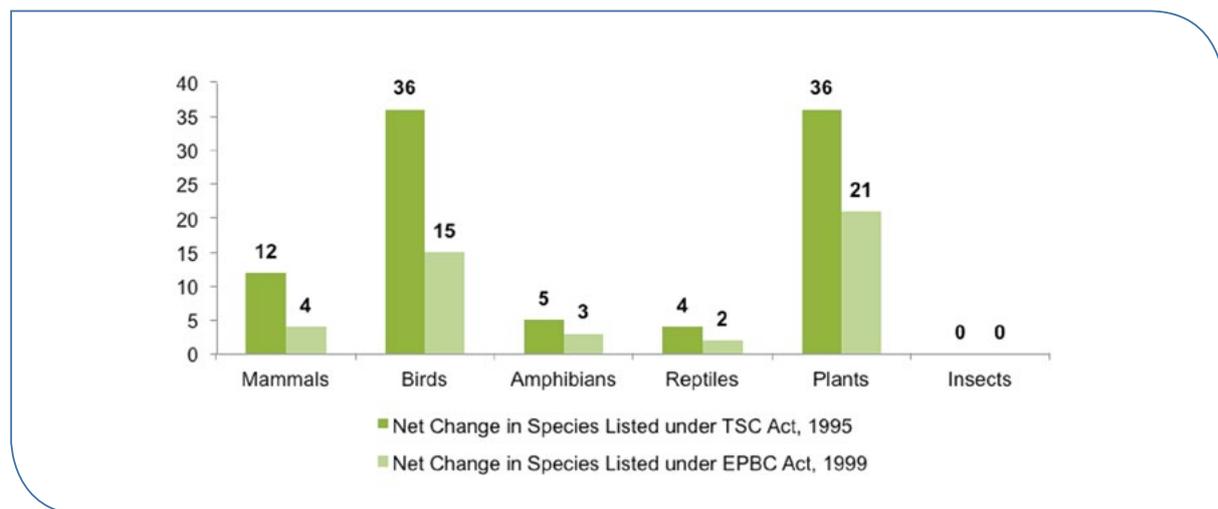
# Threatened Species

BioNet is a database of plant and animal sightings within NSW. Records come from a variety of sources, including members of the public. A BioNet search for flora and fauna recorded or known to occur within the LGA or a catchment region overlapping the LGA is summarised in the table below.

**Table 9 OEH threatened and endangered species in LGA – current at July, 2016**

Species Type	No. Native Species Recorded in LGA	No. Species Listed (TSC Act, 1995)	No. Species Listed (EPBC Act, 1999)	Total No. of Listed Threatened Species (TSC Act and/or EPBC Act)	Native Species Listed in LGA
Mammals	95	34	12	35	37%
Birds	326	75	23	77	24%
Amphibians	41	7	4	7	17%
Reptiles	59	6	4	6	10%
Plants	1,381	58	35	58	4%
Insects	16	1	0	1	6%
Malacostraca	1	0	0	0	0%

A comparison of threatened species listings in 2012 and 2016 has produced the net changes in the figure below. All species categories show an increase in species listed on both state and federal level biodiversity legislation.



**Figure 34 Net change in species listed under Federal and State biodiversity and threatened species legislation 2012-2016**

## Threatened Ecological Communities

An ecological community is a group of native plants, animals and other organisms that occur and interact in a unique habitat. Environmental factors such as soil type, position in the landscape, altitude, and climate and water availability influence the structure, composition and distribution of ecological communities<sup>151</sup>.

Ecological communities may be listed as vulnerable or endangered under federal and/or state threatened species legislation. Listing ecological communities is a way of providing landscape level protection to communities as a whole, rather than just a species.

The following Endangered Ecological Communities (as listed under the TSC Act 1995) (unless otherwise stated) are listed on BioNet for the LGA<sup>152</sup>:

- Hunter Lowland Redgum Forest in the NSW North Coast and Sydney Basin bioregions;
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin bioregion;
- River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion;
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Littoral Rainforest in the NSW North Coast, Sydney Basin, and South East Corner bioregions;
- Lowland Rainforest in NSW North Coast and Sydney Basin bioregion;
- Kurri Sand Swamp Woodland in Sydney Basin bioregion;
- Themeda grassland on sea cliffs and coastal headlands in the NSW North Coast, Sydney basin and South East Corner bioregion;
- Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast bioregions (vulnerable);
- Blue Gum High Forest in Sydney Basin bioregion (critically endangered).

The following Threatened Ecological Communities (as listed under the EPBC Act 1999) are listed on BioNet for the LGA:

- Central Hunter Valley Eucalypt Forest and Woodland (critically endangered);
- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (critically endangered);
- *Posidonia australis* seagrass meadows of the Manning–Hawkesbury ecoregion (endangered);
- Subtropical and Temperate Coastal Saltmarsh (vulnerable).

## Pressures: Threatened Species and Ecological Communities in Port Stephens

Species diversity and vulnerable species are threatened by anthropogenic actions such as habitat loss through the clearing of native vegetation and the impacts and spread of introduced invasive species.

The capacity of populations, especially smaller or threatened populations, to adapt to these pressures is further exacerbated by the impacts climate change.

The NSW approach to conserving threatened species, which ultimately translates into Council's own management programs, emphasises protecting specific species identified as being at risk of extinction. Tracking the progress of threatened species is indicative of the status of overall species diversity and may be used to understand the effectiveness of biodiversity conservation programs<sup>153</sup>.

151 <https://www.environment.gov.au/biodiversity/threatened/communities/about#ec>

152 Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions.

153 EPA, NSW State of the Environment Report 2015



NSW threatened species legislation provides for a key threatening process to be listed if it either adversely affects a listed species or could cause a species that is not threatened to become threatened. There are currently 46 key threatening processes listed in the threatened species legislation.

## Responses: Threatened Species and Ecological Communities in Port Stephens

The *AdaptNSW* Adaptation Research Hub – Biodiversity Node research area is led by Climate Futures at Macquarie University, with support from CSIRO. The biodiversity node will focus on increasing knowledge of the capacity of species, ecosystems and landscapes to adapt to current and future climate variability. It will also work to identify refuges where species can survive extreme events, and explore ways to make integrated decisions for local land use plans that optimise biodiversity outcomes<sup>154</sup>.

The NSW Government *Saving Our Species* Program aims to maximise the number of terrestrial threatened species that can be secured in the wild in NSW for 100 years. Through the program threatened species have been allocated to one of six management streams depending on their distribution, ecology, security, and what is known about them.

The six management streams are: site-managed species; iconic species; data-deficient species; landscape-managed species; partnership species; and keep watch species. Priorities for action under *Saving Our Species* Program are species in the site-managed, iconic, data-deficient and landscape-managed species management streams<sup>155</sup>.

### *NSW Department of Planning and the Environment and Office of Environment and Heritage Biodiversity Legislation Reforms*

In May 2016 the NSW Government released draft legislation to reform legislation that impacts on biodiversity in NSW. This legislative review has led to the creation of the:

- *Draft Biodiversity Conservation Bill 2016*
- *Draft Local Land Services Amendment Bill 2016*

The aim of the reforms is to create more streamlined and effective legislation to conserve biodiversity and support sustainable development as well as to build on the best aspects of existing policies and programs and address weaknesses in the current system<sup>156</sup>. The reforms implement the recommendations from the Independent Biodiversity Legislation Review Panel (the Panel) to government<sup>157</sup>.

Port Stephens Council has been involved in the consultation process and provided comment on proposed reforms for land management and biodiversity conservation in NSW. A number of key issues were raised by Council in its submission. These concerns were supported in a joint submission coordinated by Hunter Councils.

Further consultation on more detailed components of the package will take place prior to the commencement of the proposed legislation in terms of the Native Vegetation Regulatory Map, draft SEPP (Urban Tree Removal) and draft instruments such as the Biodiversity Assessment Method and the Land Management Codes. The Government aims to introduce the bills to Parliament in late 2016, and they are proposed to come into effect in two stages in 2017. Following these preliminary steps, the Government plans to start the full legislative changes from 1 July 2017<sup>158</sup>.

<sup>154</sup> <http://climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Adaptation-Research-Hub>

<sup>155</sup> <http://www.environment.nsw.gov.au/savingourspecies/about.htm>

<sup>156</sup> <http://www.environment.nsw.gov.au/biodiversitylegislation/review.htm>

<sup>157</sup> <https://www.landmanagement.nsw.gov.au/home/biodiversity-reforms-overview>

<sup>158</sup> <https://www.landmanagement.nsw.gov.au/have-your-say/>

## Port Stephens Threatened Species Management

### *Port Stephens Koalas*

The koala is listed as 'vulnerable' under the *Threatened Species Act 1995* and the NSW population as 'vulnerable' under the EPBC Act due to ongoing habitat threats and pressures resulting in declining numbers. This listing gives the koala an increased level of protection and attention. For example development proposals that will affect koala habitat are assessed more rigorously.

State Environmental Planning Policy No. 44 (SEPP 44) – Koala Habitat Protection aims to encourage the conservation and management of natural vegetation that provides important koala habitat. SEPP 44 requires a plan of management for areas of more than one hectare that contain koala habitat and for which a development application has been lodged <sup>159</sup>.

Port Stephens LGA is home to a regionally significant koala population as well as the Hunter's greatest area of vegetation ranked Very High and High in terms of koala habitat value. In order to protect the iconic koalas of the area and the vegetation on which they rely, Council developed the Comprehensive Koala Plan of Management (CKPoM), which was approved by the Department of Planning in 2002. The principal aim of the CKPoM (which is consistent with state planning policies) is to "Encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline".

The CKPoM covers the entire LGA as an effective tool to assist Council to manage the balance between development and habitat conservation. It focuses on koala conservation in the LGA through the identification of core koala habitat, mitigation of threats to koalas and the native vegetation on which they rely, as well as the further development of koala conservation measures in the region.

The CKPoM contains 13 objectives relating to identifying key habitat, implementation of conservation programs, community education and ongoing research into the koala population(s) of Port Stephens. The CKPoM states these objectives will be achieved in co-operation with the community and key stakeholders through the implementation of the action plan contained within the CKPoM. The CKPoM Steering Committee continues to guide the development and implementation of the plan.

### *Koala Habitat Mapping*

Broad scale koala habitat mapping was undertaken through the development of the Port Stephens Comprehensive Koala Plan of Management 2002 (CKPoM). This mapping represents areas of core and supplementary koala habitat based on vegetation type. The CKPoM and associated habitat mapping provides guidance to development and planning decision-making. As with all broad scale mapping, the result is only an indication of potential habitat and further field verification is required through an on-ground ecological assessment. This is required to verify mapped potential koala habitat boundaries, broad scale vegetation communities, density of koala feed trees, quality of the habitat on the ground and the presence of koalas.

### *Port Stephens Koala Study*

Council engaged Dr Stephen Phillips (Biolink's Principal Research Scientist) in 2016 to undertake a koala distribution and abundance study for the Port Stephens LGA. The methodology and approaches used in the study are the current best practice approaches to landscape-scale/LGA-wide koala habitat and population assessments.

The Port Stephens Koala Study and associated reporting will provide a key information source and greater clarity regarding the current conservation status of the Port Stephens koala population, key core habitat areas, the basis for future management actions and ongoing monitoring. The utilisation of effective strategies to maintain biodiversity

<sup>159</sup> <http://www.environment.nsw.gov.au/animals/KoalaConservation.htm>



in developed and urban landscapes is vital in the management of development pressures on vegetation and the inevitable loss and/or fragmentation of landscapes. Fragmented habitat can remain ecologically viable when linked by suitable habitat corridors. The development and maintenance of valuable wildlife corridors linking remnant vegetation within the LGA is an important element in the effort to conserve biodiversity.

### The Great Koala Count

The Great Koala Count has been run during 2013, 2014 and 2015 by the National Parks Association of NSW. It is a community-based, citizen-science survey program conducted over a specific time period each year. It aims to build on community knowledge to create a comprehensive picture of the abundance and distribution of koalas in the local area. The survey is designed to achieve clear outcomes through rigorous and systematic structure. Repeated over time the Koala Count intends to show trends in koala populations, movement and habitat usage. The results of the 2013 and 2014 surveys are shown below.

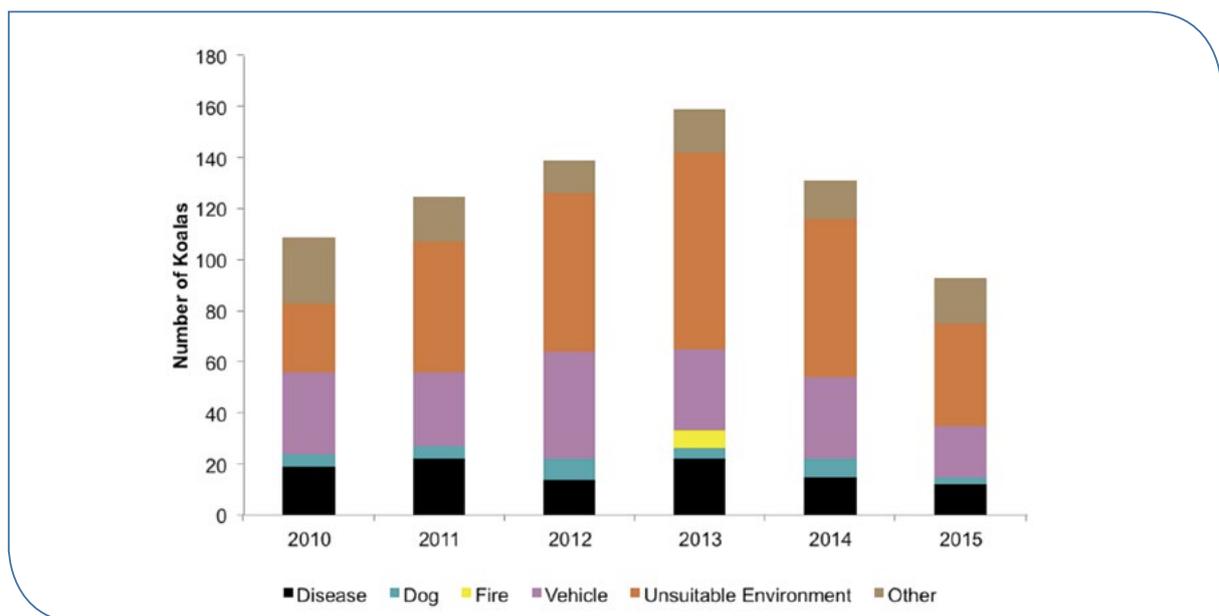
**Table 10 National Koala Count Data submitted for Port Stephens LGA (Source the Great Koala Count)**

Port Stephens LGA	Number of Citizen Scientists	Number of Koalas Counted	Number of "My Koala Walks"*
2013	19	60	9
2014	13	44	14

\*Number of "My Koala Walks" refers to where citizens looked for koalas but were unable to sight any.

### Hunter Koala Preservation Society

The Hunter Koala Preservation Society (HKPS) is a volunteer group dedicated to the preservation, management, rehabilitation and care of koalas in the Port Stephens area. They maintain a database of koalas that come into the care of rescuers, or are found deceased in order to better inform decisions and policy making.



Note: Data are available from 1994 at Council.

It can be seen from Figure 35 that the total number of koalas being taken into care by HKPS fluctuates over the data period; however the number of rescues attributed to an 'unsuitable environment' is increasing.

### Grey Headed Flying Fox

The Grey Headed Flying Fox is protected under NSW NPW Act 1974, and listed as 'vulnerable' under the Commonwealth EPBC Act 1999 and the NSW TSC Act 1995.

The decline in the Grey Headed Flying Fox population may not be obvious in all areas. As their natural habitat is lost through clearing, these animals become more concentrated in localised camps where feeding and roosting habitat is still available<sup>160</sup>.

### Raymond Terrace Flying Fox Camp

Raymond Terrace (Newbury Park and Ross Walbridge Reserve) has been home to a permanent (now Nationally Important), flying fox camp since 2010. A network of Nationally Important flying fox camps is considered to be important for a viable and self-sustaining national population of each EPBC Act-listed flying fox species<sup>161</sup>. There are also temporarily populated camps called satellite camps located at Fullerton Cove, Medowie, Bobs Farm, Wallaroo, Salamander Bay, and Snapper Island.

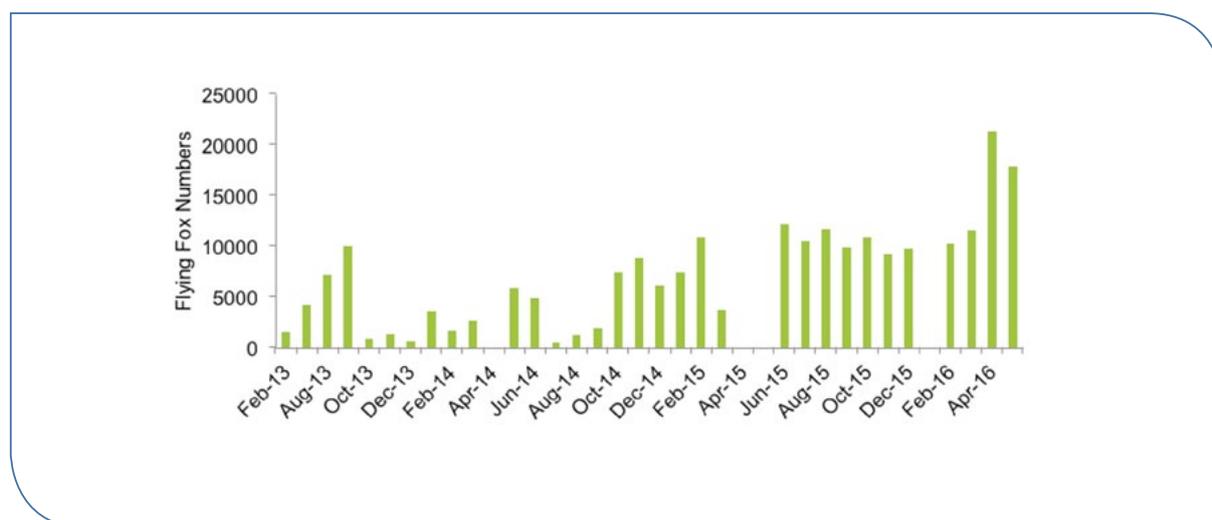


Figure 36 Newbury Park, Raymond Terrace Flying Fox monitoring data (2013-2016)

<sup>160</sup> <http://www.environment.nsw.gov.au/threatenedspecies/Grey-headedFlying-foxVulnerable.htm>

<sup>161</sup> <http://www.environment.gov.au/system/files/pages/0f6f5576-50e8-4e02-be7c-18e7d3ad7f23/files/flying-fox-policy-statement.pdf>



It is noted that monitoring data were not reported for four months (April-June 2015 and January 2016) in the monitoring period 2015-2016. No data were collected during January 2016 due to storms and flooding in Raymond Terrace and the Port Stephens LGA.

In 2016 the flying fox population at Newbury Park expanded into Ross Wallbridge Reserve. This change in behaviour is attributed to unseasonal conditions through NSW and south Queensland over the 2015-2016 summer. This rare natural event has resulted in significant changes to flying fox seasonal migration patterns, most noticeably resulting in higher numbers in the Hunter Valley. As of late April 2016, monthly monitoring established that the local Raymond Terrace population has expanded from 10,000 to 20,000 with a related increase in resident and business enquiries. Monitoring throughout winter 2016 has shown a significant decline in the population of the Raymond Terrace camp.

### *Raymond Terrace Grey Headed Flying Fox Camp Management Plan*

Council prepared a Vegetation Management Plan (VMP) for the Newbury Park flying fox camp in January 2014. The aim of the VMP was to manage the vegetation within Newbury Park to enhance environmental and social values thus protecting and enhancing the existing flying fox camp so it can continue to survive within an urban environment with reduced conflict by way of:

- Revegetating native flora within the reserve to re-establish forest structure that will over time provide potential roosting habitat for flying foxes away from adjacent residences and increase the reserves overall of flying fox roosting values and carrying capacity;
- Reducing and removing exotic weed infestation throughout the site to maximise the potential for controlled and natural vegetation restoration;
- Designing and establishing a residential buffer and a camp vegetation buffer in specific areas to enhance amenity and improve microclimatic conditions suitable for ongoing forest regeneration.

OEH have released a revised Flying Fox Camp Management Policy in December 2015 that empowers land managers, primarily councils, to work with the community in the response to flying fox colonies. Port Stephens Council is reviewing its Newbury Park Vegetation Management Plan to conform to the new template as well as investigating measures to best manage the flying fox colony across the two parks.

The new plan will outline classes of, and the assessment of available potential management options. It will also document application of the systematic decision-making process developed by OEH to enable actions to be approved and implemented.

Council has been liaising with concerned community members to provide updated information and details on the cross governmental management approaches and to dispel some common myths around flying foxes and human health.

### *Maundia*

*Maundia triglochinos* is a perennial wetland species found to occur in swamps, dams, channels creeks and drains. Pressures experienced by the species include habitat loss and fragmentation, declining water quality and weed invasions. It is listed as 'vulnerable' under the NSW TSC Act 1995.

*Maundia* are found in many of the drainage systems managed by Council, most commonly in the presence of invasive and/or noxious weed species. This presents challenges to the management of this listed species in the face of invasive species control responsibilities.

The *Maundia* draft management plan is currently being prepared by Council in consultation with OEH. This management plan will act as an operational plan for where the species is present in drains within the LGA.

# Water Resources

## Summary

The water resources of Port Stephens are critical for a range of purposes including for domestic, potable water supply, aquatic ecosystem health, agriculture, recreation, amenity, and industry. Port Stephens LGA contains significant groundwater resources for household consumption, industrial and commercial use, horticultural and agricultural irrigation. These include Tomago, Tomaree and Stockton aquifers and sandbeds.

Grahamstown Dam is an off-river storage reservoir with a capacity of 182,305 megalitres and provides an estimated 52% of the Hunter's drinking water needs.

The Port Stephens Estuary covers approximately 1,400kms<sup>2</sup> and the Hunter Estuary 26kms<sup>2</sup>.

Water quality at all ocean beaches consistently achieves a grading of very good according to Beachwatch results from 2012 to 2015. Four out of six beaches within the Estuary were rated either good or very good. Georges Reserve and Bagnalls Beach were rated poor.





## Introduction

This section deals with both the quality and quantity of water resources within the Port Stephens natural environment. This section is clearly interconnected with the aquatic ecosystem and water supply, treatment and consumption sections of this report. For a more complete picture of the state of the environment of Port Stephens as it relates to water, these sections should be read in conjunction with one another.

The water resources of Port Stephens are critical for a range of purposes including for domestic, potable water supply, aquatic ecosystem health, agriculture, recreation, amenity, mining and industry. Securing adequate clean and sustainable water supplies is essential for the community's wellbeing and economic activity. The ongoing impacts of water extraction and flow regulation are significant pressures on the surface and groundwater resources<sup>162</sup>.

The NSW Department of Primary Industries - Water (DPI Water) manages access to water and ensures water is shared between the environment, towns and cities, and farmers and industry as well as for Aboriginal cultural activities. If you have a rural property, requirements for a licence (or other approval) from DPI Water to access water are influenced by how and why the water is intended to be used<sup>163</sup>.

Sampling and analysis of water quality throughout the Port Stephens LGA is undertaken by a range of stakeholders, results of which are not always publically available. These may include but are not limited to Hunter Water Corporation, Hunter Local Land Services, NSW Environmental Protection Authority, private environmental consultancies, private companies holding Environmental Protection Licences etc.

## Rainfall Quantity and Intensity

Changes in rainfall patterns have potential impacts on water resources in the LGA. Rainfall changes are also associated with changes in the extremes, such as floods and droughts, as well as secondary impacts such as water quality and water balance that occur as a result of changes to rainfall intensity<sup>164</sup>.

Rainfall data collected from the Williamtown meteorological station for the reporting period are presented below. The flooding events of June 2016, January 2016, April 2015, November 2013 and February 2013 can be seen in the rainfall spikes. It is recognised that this period of analysis does not provide insight into any long term variation or trend in the rainfall patterns of the area.

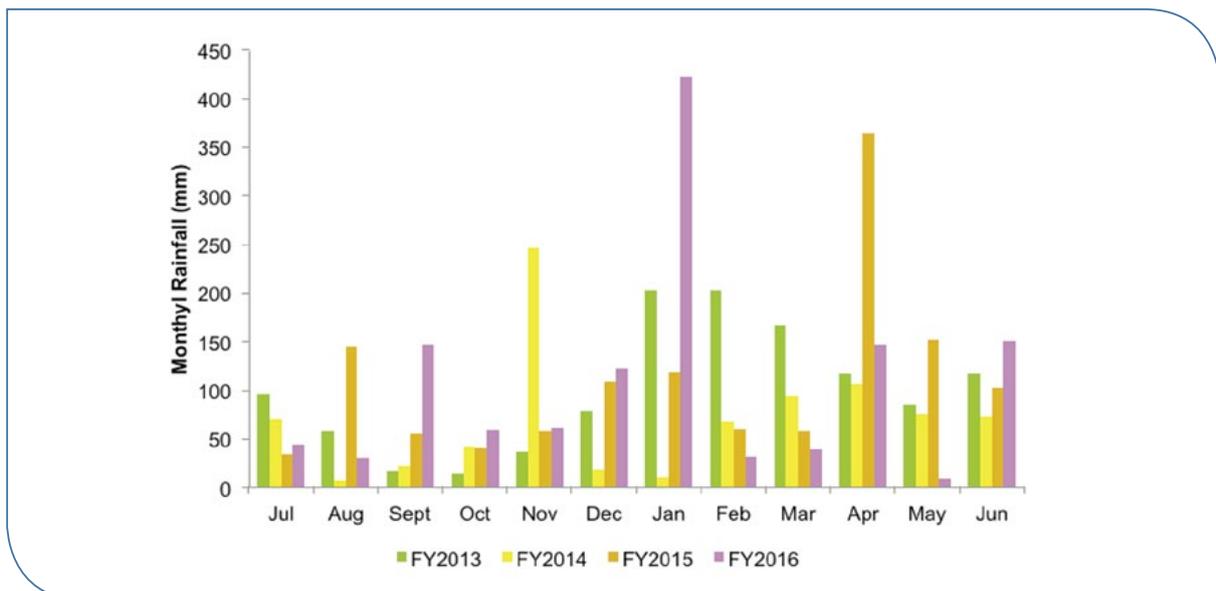


Figure 37 Monthly Rainfall as recorded at the Williamtown Meteorological Station

162 EPA NSW State of Environment Report 2015

163 <http://www.water.nsw.gov.au/water-licensing>

164 Port Stephens Council Local Government Area Climate Profile, HCCREMS 2009

Long term analysis undertaken through the Hunter and Central Coast Regional Environmental Strategy has found that the Port Stephens LGA has experienced a statistically significant decrease in annual rainfall of approximately 274 mm over the period from 1948 to 2007 in the coastal zone only. Average annual rainfall patterns for the Port Stephens LGA are projected to stay within the boundaries of existing known natural variability. However, it is projected that rainfall patterns during 2020 – 2080 will return to the generally wetter and more variable conditions experienced during the 1948 – 1977 period<sup>165</sup>.

### *Water Balance*<sup>166</sup>

Water balance refers to an excess of precipitation over evaporation. It is affected by both the level of precipitation and prevailing temperature conditions. Historically, the Port Stephens LGA has experienced a total decrease in annual average water balance of 0.5mm per day in the coastal zone between 1973 and 2007 and an increase of 0.3mm per day in the central zone.

### *Surface Water*

The Port Stephens LGA contains part of three major river systems: the Karuah River which flows into the Port Stephens Estuary; and the Williams and Paterson Rivers which both flow into the Hunter River Estuary. The majority of these rivers are tidal, with the exception of the Williams River above the Seaham Weir.

Pressures on the quality and flow of river systems within the LGA include habitat loss, bank erosion and sedimentation, weed invasion, development pressures, altered hydrology through urban development, stormwater and drainage, impacts of flood mitigation works, water extraction, climate change and pollution from agricultural, urban and industrial activities.

Grahamstown Dam is an off-river storage reservoir with a capacity of 182,305 megalitres. The dam is estimated to provide about 52% of the Hunter Water service region's drinking water requirements. It receives inflows pumped from the Seaham Weir Pool on the Williams River via the Balickera Canal and water pumping station. Grahamstown Dam also collects around half of its water from rainfall run-off in its own small catchment (area 96kms<sup>2</sup>). A smaller proportion of its inflow is also pumped from Campvale Canal via the Campvale Water Pumping Station.

### *Beaches, Foreshores and Estuaries*

The Port Stephens Estuary covers an area of approximately 1,400kms<sup>2</sup> and the Hunter Estuary covers an area of approximately 26 km<sup>2</sup>. In addition to their environmental values, the Estuaries are extremely valuable to the economy and lifestyle of Port Stephens residents and visitors<sup>167</sup>.

The Port Stephens Estuary faces a range of environmental pressures including changed hydrological conditions, clearing of native vegetation, polluted stormwater and agricultural run-off and declining water quality. The cumulative impact of these pressures has the potential to degrade the quality and level of estuarine biodiversity in Port Stephens including the loss of seagrass beds.

The other major estuary in the LGA is the Hunter River Estuary which traverses several local government areas. A large part of the Hunter River Estuary has been highly modified through land clearing, flood mitigation measures, dredging, reclamation, filling and draining of floodplains and wetlands, mining and agricultural activities.

<sup>165</sup> Port Stephens Council Local Government Area Climate Profile, HCCREMS 2009

<sup>166</sup> Port Stephens Council Local Government Area Climate Profile, HCCREMS 2009

<sup>167</sup> Port Stephens Council State of Environment Report 2012



## State of the Beaches (Beachwatch)

The water quality of the most popular coastal beaches, estuarine beaches and swimming locations within the LGA is monitored under the NSW Government Beachwatch program. Monitoring is undertaken during the swimming season between October and April. The collection and analysis of the samples are contracted out to an independent accredited laboratory. Hunter Water Corporation funds the monitoring of the four coastal beaches. A summary of the results is shown below.

**Table 11 Beachwatch results for the Port Stephens LGA 2012-2015.**

Reporting Year	2012-2013	2013-2014	2014-2015
Overall Result, Good or Very Good (%)	82	100	100
Ocean Beaches Good or Very Good (%)	100	100	100
Estuarine Beaches Good or Very Good (%)	67	Not performed	Not performed
Sites (combined)	11	4	4
Samples collected	453	244	240
Ocean Sites Monitored	Zenith Beach	Zenith Beach	Zenith Beach
	Box Beach	Box Beach	Box Beach
	Fingal Beach	Fingal Beach	Fingal Beach
	Birubi Beach	One-Mile Beach	One-Mile Beach
	One-Mile Beach		
Estuarine Sites Monitored	Little Beach	N/A	N/A
	Dutchmans Beach		
	Lemon Tree Passage Tidal Pool		
	Karuah Tidal Pool		
	Bagnalls Beach		
	Georges Reserve		

The results for the three years to date indicate that the water quality at all ocean beaches consistently achieves a grading of very good. For the 2012-2013 period a result of 67% ('good' or 'very good') was achieved for the estuarine beaches. During this period four of the six estuarine beaches achieved a grading of either very good or good. Two beaches, Georges Reserve and Bagnalls Beach achieved a 'poor' grading that is likely a reflection of the location of the beach within the Port and impacts of weather events such as storms.

Sampling and analysis of the estuarine sites was undertaken in 2013-2014 and 2014-2015 periods however the results were not included in the annual reports. For 2015-2016 the estuarine beach sites have once again been included in the annual report however at the time of writing of this SoE Report the annual Beachwatch report was not available.

## Groundwater

Groundwater resources may be accessed by works such as a bore, well, spear point or excavation. An approval or licence through DPI Water must be held for the extraction of groundwater through this type of access point. Through the licensing of groundwater works, and monitoring the levels of extraction DPI Water seeks to sustainably manage groundwater resources<sup>168</sup>.

<sup>168</sup> <http://www.water.nsw.gov.au/water-licensing/about-licences/constructing-a-bore>

Port Stephens LGA contains significant groundwater resources including Tomago, Tomaree and Stockton aquifers and sandbeds. These reserves provide water for household consumption, industrial and commercial use, and horticultural and agricultural irrigation.

Hunter Water has Special Area Regulation over more than one third of the LGA<sup>169</sup>. This regulation makes provision for the regulation of activities within special areas (eg. agricultural activities and sewage management) and prescribes penalties and fines for non-compliance.

The Tomago Sandbeds has a catchment area of 109 kms<sup>2</sup> that stretches from Heatherbrae in the west to Lemon Tree Passage in the east. It provides around 7% of the Lower Hunter's drinking water, making this resource a major contributor to Hunter Water's water resources. The Tomago Sandbeds also have a large surface area but a relatively shallow water table. Therefore natural losses of water occur through seepage, direct evaporation, and evapo-transpiration through vegetation that relies on the groundwater to survive. Extraction of drinking water from the Tomago Sandbeds is required to cease when the water table drops to low levels. This ensures that water availability for vegetation and groundwater-dependent ecosystems is maintained<sup>169</sup>.

The Tomaree Sandbeds have a catchment area of approximately 16 kms<sup>2</sup> located within the protected catchment of the Tomaree National Park. The groundwater is naturally filtered within the sandbeds. Water is extracted using a network of production bores and treated at Anna Bay and Nelson Bay WTPs. This then supplies the Tomaree Peninsula, including Anna Bay, Boat Harbour, Salamander Bay, Nelson Bay, Fingal Bay, Shoal Bay, Corlette and Soldiers Point. The estimated permanent population within the water supply system is 25,000 people<sup>170</sup>.

These groundwater reserves also support substantial groundwater-dependant ecosystems that dominate much of the LGA. These ecosystems include terrestrial vegetation, wetlands and coastal dune systems<sup>171</sup>.

Industrial activities and over-extraction has the potential to irreversibly damage the quality of freshwater aquifers in Port Stephens. Over-extraction of the aquifers can cause saline water to be drawn into the groundwater reserves.

Due to the permeable nature of the aquifers they can become contaminated by sewage, industry and poor land use practices.

Major pressures on the alluvial aquifer systems in the region are associated with land use changes as a result of development and urbanisation, increasing extraction of surface and groundwater to meet growing drinking water demands as well as long term and seasonal changes in groundwater levels, and the influence of groundwater changes in connected aquifers.

169 Port Stephens Council State of Environment Report 2012

170 Hunter Water Compliance and Performance Report, 14/15

171 [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0005/547844/groundwater\\_dependent\\_ecosystem\\_policy\\_300402.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0005/547844/groundwater_dependent_ecosystem_policy_300402.pdf)



# Land

## Summary

A total of 23% (22,785ha) of the Port Stephens LGA is protected as National Park and State Forest and 7.95% (7,759ha) is zoned Environmental Protection under the LEP 2013, including an additional 119 ha which were added to the Tilligerry State Conservation Area in January 2013 as a biodiversity offset for the development of a substation in Tomago.

Port Stephens Council owns and manages over 1,330 ha of community open spaces including parks, sportsgrounds, foreshore reserves, bushland, watercourses, wetlands and areas of cultural significance.

## Introduction

Land Use for Conservation is a critical response tool to protect and manage a range of environmental matters, most notable biodiversity conservation, with numerous land managers responsible for a considerable area within Port Stephens. The ongoing management of land, and the maintenance of soil health, are critical to broader ecosystem function, including nutrient cycling, habitat for biota, and primary production.

## Land Use for Conservation

Port Stephens has a wide range of protected natural areas with different levels of conservation status. Management and maintenance of Council-managed land is undertaken by Council staff as well as through stakeholder and community partnerships. The table below shows the protected natural land areas within the Open Space Management Plan by land ownership and the net area zoned for Environmental Protection in the LEP 2013.

**Table 12 Protected Natural Areas within the LGA**

Land Type	Area (ha)	% of LGA
National Park (NPWS)	19,317.9	19.79%
State Forest	3,467.7	3.55%
Natural Area Community Land	479.5	0.49%
Natural Area Crown Trusteeship	64.4	0.07%
Foreshore Area Community Land	117.7	0.12%
Foreshore Area Crown Trusteeship	122.9	0.13%
Land Zoned Environmental Protection (private and public)	7,759	7.95%

## National Parks and State Conservation Areas

Under the *National Parks and Wildlife Act 1974*, the Office of Environment and Heritage (OEH) is responsible for the care, control and management of all national parks, historic sites, nature reserves and Aboriginal areas. State conservation areas, karst conservation reserves and regional parks are administered under the Act. OEH is also the authority under the Act for the protection of native flora and fauna as well as Aboriginal objects and places throughout NSW<sup>172</sup>.

National Parks protect over 28 million hectares of land in Australia<sup>173</sup>, or almost 4% of Australia's total area. State Forests, Nature Parks and Conservation Reserves protect a further 6% of Australia's land.

The NSW National Parks and Wildlife Service (NPWS) manages over 7 million hectares of land across 850 national parks and reserves in NSW, or approximately 8.5% of NSW land area<sup>174</sup>.

State Conservation Areas are reserved to protect and conserve significant or representative ecosystems, landforms, valuable natural assets or places of cultural significance. The key difference between the management, objectives and principles of national parks and state conservation areas is that resource exploration and mining may be permitted in state conservation areas<sup>175</sup>.

172 NSW Office of Environment and Heritage

173 <http://www.australia.gov.au/about-australia/australian-story/national-parks>

174 <http://www.nationalparks.nsw.gov.au/conservation-and-heritage/our-parks>

175 <http://www.nationalparks.nsw.gov.au/conservation-and-heritage/state-conservation-areas>



There are more than 19,000ha of land protected as National Park and State Conservation Areas in the Port Stephens LGA, or approximately 20% of the land area.

This includes an additional 119ha that were added to the Tilligerry State Conservation Area in January 2013 as a biodiversity offset for the development of a substation in Tomago<sup>176</sup>.

## Worimi Conservation Lands

The Worimi Conservation Lands (WCL) are made up of the Worimi State Conservation Area and the Worimi Regional Park, located at Stockton Bight between Anna Bay and Fern Bay and forms an important coastal link in a network of protected areas that includes Tomaree National Park to the northeast, Tilligerry State Conservation Area to the north and Hunter Wetlands National Park to the west<sup>177</sup>.

The WCL are owned and co-managed by the traditional owners, the Worimi people, and NSW National Parks<sup>178</sup> and protect and manage 4,029 ha including the Stockton Bight Sand Dune System, 1,812ha of national park and 25.5kms of coastline<sup>179</sup>. The Worimi Conservation Lands Plan of Management was jointly adopted by the Minister for the Environment and the Minister for Land and Water on 1 September 2015. The plan was prepared by the Board of Management for the Worimi Conservation Lands with staff of the Lower North Coast Region of the NSW Parks and Wildlife Service (NPWS), part of the Office of Environment and Heritage (OEH).

The WCL is managed to ensure the protection of the natural and cultural values of the Stockton Bight landscape, while providing access for the general public and promoting safe and sustainable recreational and commercial use. Given that the WCL comprises a national park, state conservation area and regional park, the nature of the landscape of the WCL and the common cultural and natural values across each reserve category, an integrated approach to managing the WCL is needed.



**Map 18 Reserve Status of Worimi Conservation Land**

Source: *Worimi Conservation Lands Plan of Management, State of NSW and the Office of Environment and Heritage, 2015.*

176 Tilligerry State Conservation Area, Statement of Management Intent.

177 <http://www.environment.nsw.gov.au/resources/planmanagement/final/15707-worimi-lands-pom.pdf>

178 <http://www.worimiconservationlands.com/index.php>

179 <http://www.environment.nsw.gov.au/resources/planmanagement/final/15707-worimi-lands-pom.pdf>

The area is rich in cultural and ecological value. The dune system is the largest mobile coastal sand mass in the Southern hemisphere; its creation began over 100,000 years ago. The WCL are abundant in Aboriginal history, with a number of cultural sites such as middens, campsites and burials that have special significance to the Worimi people<sup>180</sup>.

Over 250,000 people per year are estimated to visit the Worimi Conservation Lands<sup>181</sup>. Public access is facilitated and encouraged through organised tours and Beach Vehicle Permits. The popularity of the area has the potential to contribute to increased public awareness and appreciation of Worimi culture through exposure to cultural sites and landscapes. However increasing tourism has the potential to impact these sites, vegetation and dune systems.

Achieving sustainable visitor access compatible with the vulnerability of the area is a management challenge that is addressed through the Worimi Conservation Plan of Management and by ongoing co-operation between the Board of Management for the Worimi Conservation Lands and the National Parks and Wildlife Service.

## Council Managed Land

Council is only one of many land owners and managers within the Port Stephens LGA. The table below shows the current area of community open spaces owned and managed by Port Stephens Council.

**Table 13 Area of Community Open Spaces Owned/Managed by Port Stephens Council**

Land Type	Area (ha)
Parks	104.45
Foreshore Reserves	213.92
Sportsgrounds	255.3
Watercourses/Wetlands	297.07
Bushland	338.93
General Community Use	93.18
Areas of Cultural Significance	29.52

A number of state agencies have both operational controls as land managers and regulatory responsibilities for environmental protection in Port Stephens. These agencies include (but are not limited to): Hunter Local Land Services (LLS); National Parks and Wildlife (NPWS); Office of Environment and Heritage (OEH); Forestry Corporation of NSW; Department of Industry – Lands.

## Land Management and Soil Health

Land degradation remains an issue for much of NSW with the loss of organic carbon and topsoil due to sheet erosion responsible for the greatest loss of soil health and productivity. Erosion and loss of soil function have a complex effect on ecosystem function. Landscapes and soils that are healthy and stable are key contributors to the maintenance of water quality and environmental systems as well as supporting rural and urban communities<sup>182</sup>.

Healthy soils are a critical element of ecosystem function, including nutrient cycling, habitat for biota, and primary production.

<sup>180</sup> <http://www.nationalparks.nsw.gov.au/visit-a-park/parks/Worimi-National-Park/Learn-More>

<sup>181</sup> <http://www.environment.nsw.gov.au/resources/planmanagement/final/15707-worimi-lands-pom.pdf>

<sup>182</sup> EPA NSW State of the Environment Report 2015



The dominant landforms of the LGA can be summarised as coastal sand barriers and estuarine deposits in the east; and low hills and floodplains in the west. Landscapes include the sandy Tomaree Peninsula, with its volcanic outcrops and the floodplains of the Hunter, Paterson and Williams Rivers. The Tomaree Peninsula is underlain by carboniferous bedrock and some outpourings of volcanic rock can be seen in the Tomaree hills.

## Pressures on Land

There is a range of pressures relating to land management which the NSW EPA has categorised into the following broad categories<sup>183</sup>:

- Unsustainable land management – traditional European farming practices that had been developed to suit different soil profiles and different climate regimes. The results of some of these practices has distorted nutrient balances, compacted soils, contributed to increased erosion, and lead to increased salinity,
- Climate variability – unpredictable and variable weather patterns along with severe weather events can lead to conditions where the soil's capacity to cope is exceeded, leading to a loss of soil condition and degradation;
- Changed population and settlement patterns – increasing pressure on productive land for urban development in addition to areas of land being covered with structures, roads and pavements cap the soil with an impermeable layer which changes the capacity of soil to respire, sequester carbon, and changes the water balance of catchments through run-off impacts;
- Economic factors – Increase in competition and decline in trading conditions can lead to unsustainable intensification of primary production activities;
- Grazing and agriculture;
- Distortions to nutrient balance through the net changes in nitrogen, phosphorous;
- Cultivation;
- Compaction;
- Forestry; and
- Chemical contamination and waste disposal.

## Soils

Soil resources have important social, ecological and cultural values. Sustainable soil management is vital to the maintenance of healthy and viable natural landscapes.

Healthy soils deliver essential ecosystem services, including: decomposition of organic matter, nutrient transformation, exchange and cycling, water infiltration, redistribution and filtering, along with climate regulation through carbon storage and cycling. They provide habitat for biota and support ecosystems and the primary production of food and resources<sup>184</sup>.

The clearing of vegetation, urban development and poor land use practices have exacerbated soil erosion and degradation in the form of salinisation, acidification and the movement of soils into waterways. Soil degradation and the resultant issues such as salinity, acidity, etc. are often long term, costly or impossible to restore.

Soil health is characterised by the following key attributes and soil function indicators:

- Change in soil pH (acidification);
- Loss of soil carbon;
- Compaction or change in soil structure;
- An increase in the salinity of soil; and
- Topsoil losses through sheet, gully and/or wind erosion.

<sup>183</sup> <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>

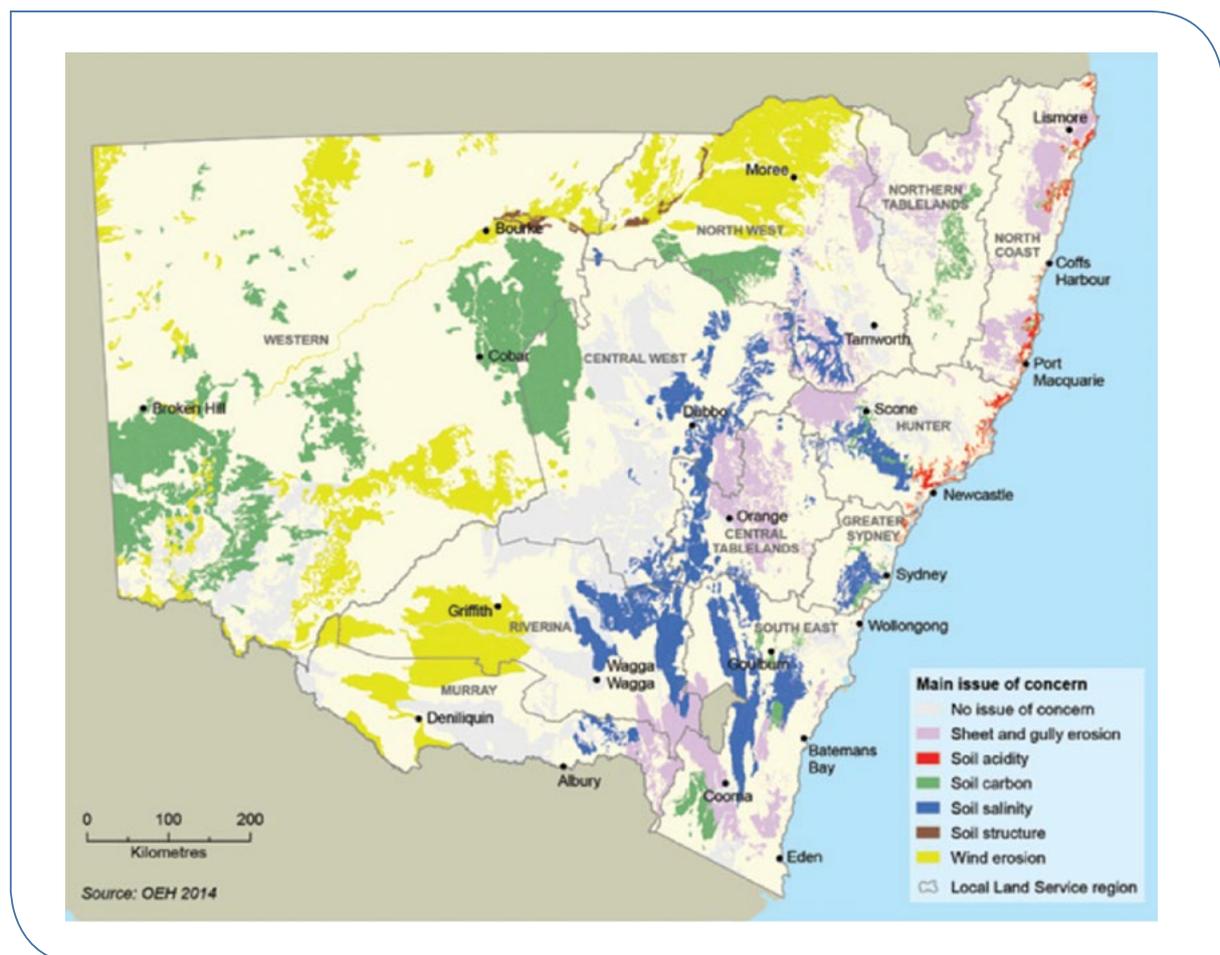
<sup>184</sup> <http://www.environment.nsw.gov.au/soils/data.htm>

Pressures on soil health include:

- Unsustainable land use and failing land management – traditional farming practices used in early European settlement failed to consider the fragile soil profiles and climatic conditions of Australian landscapes;
- Climate variability – soil vulnerability can exacerbate the loss of condition and degradation can result from severe weather events and climatic fluctuation. The increase of extreme weather events as a result of climate change is also expected to provide challenges to soil management;
- Settlement patterns and population growth – intensified land use and rising urban populations place land under increased productivity demand and development pressures.

A state-wide assessment of soil health by NSW Natural Resources Monitoring, Evaluation and Reporting Strategy 2010–2015 (MER Strategy) commenced in 2008. The assessment aimed to establish a monitoring program to form a baseline for NSW soil condition and establish a network of ongoing monitoring sites. Priority soil monitoring units (SMUs) were selected on the basis that they were broadly representative of regional conditions, but weighted towards areas that were considered to be of higher agricultural or ecological importance. Main soil health issues affecting NSW SMUs are presented in the map below.

The MER Strategy guides the monitoring, evaluation and reporting of natural resources in NSW. The strategy focuses on developing a seamless link between local, regional, state and national data on natural resource management (NRM) that can inform the community about how we care for the natural resources of NSW.

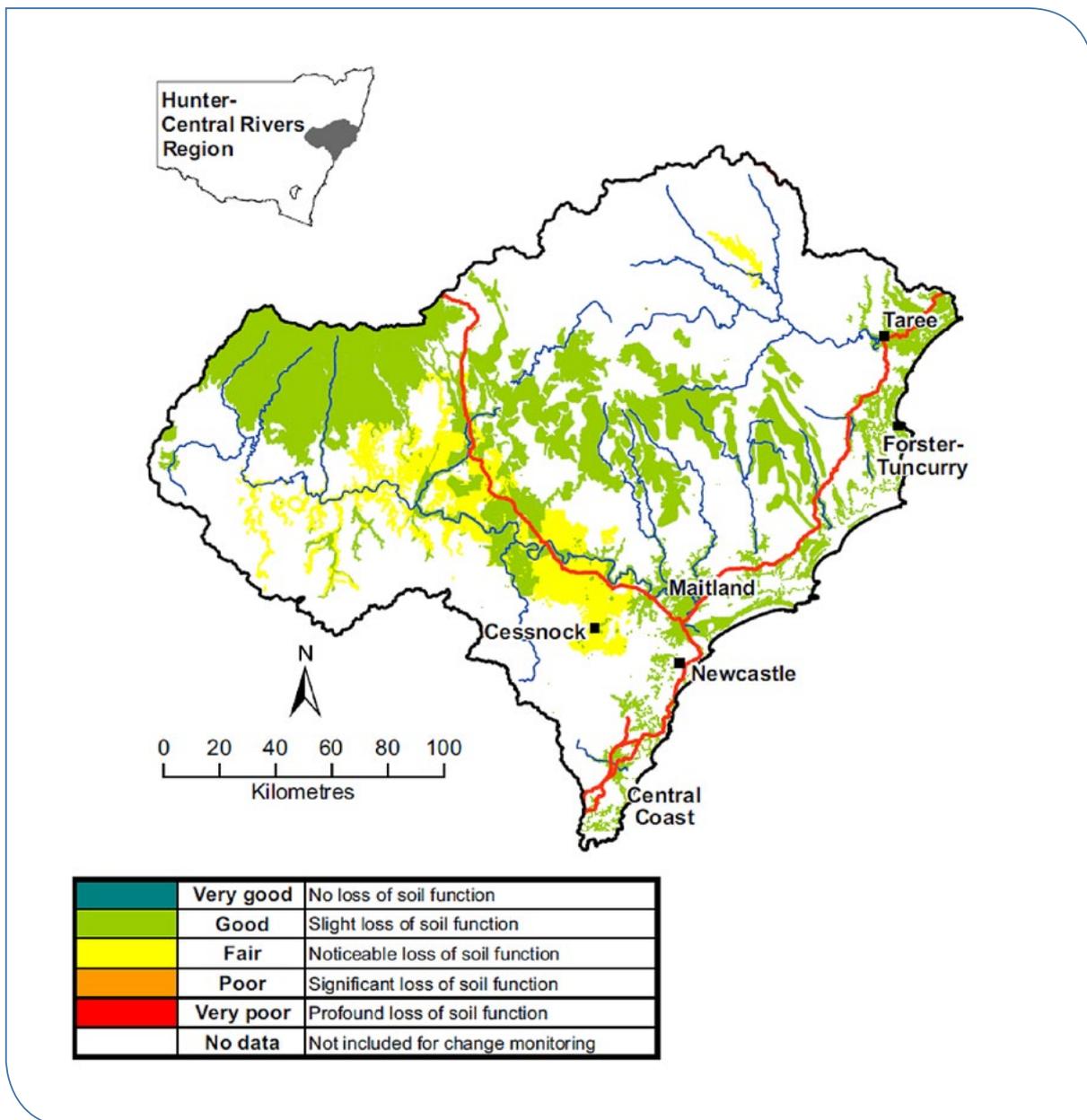


Map 19 Main soil health issues within NSW soil monitoring units



As can be seen from map 19, the primary issue affecting soils in the Port Stephens LGA is acidity, especially in the coastal, estuarine and alluvial environments.

According to the Hunter–Central Rivers State of the Catchments Report 2010–Soil Condition, where there are data available the Soil Condition Index is ‘good’ in Port Stephens with significant areas with no data available as indicated below.



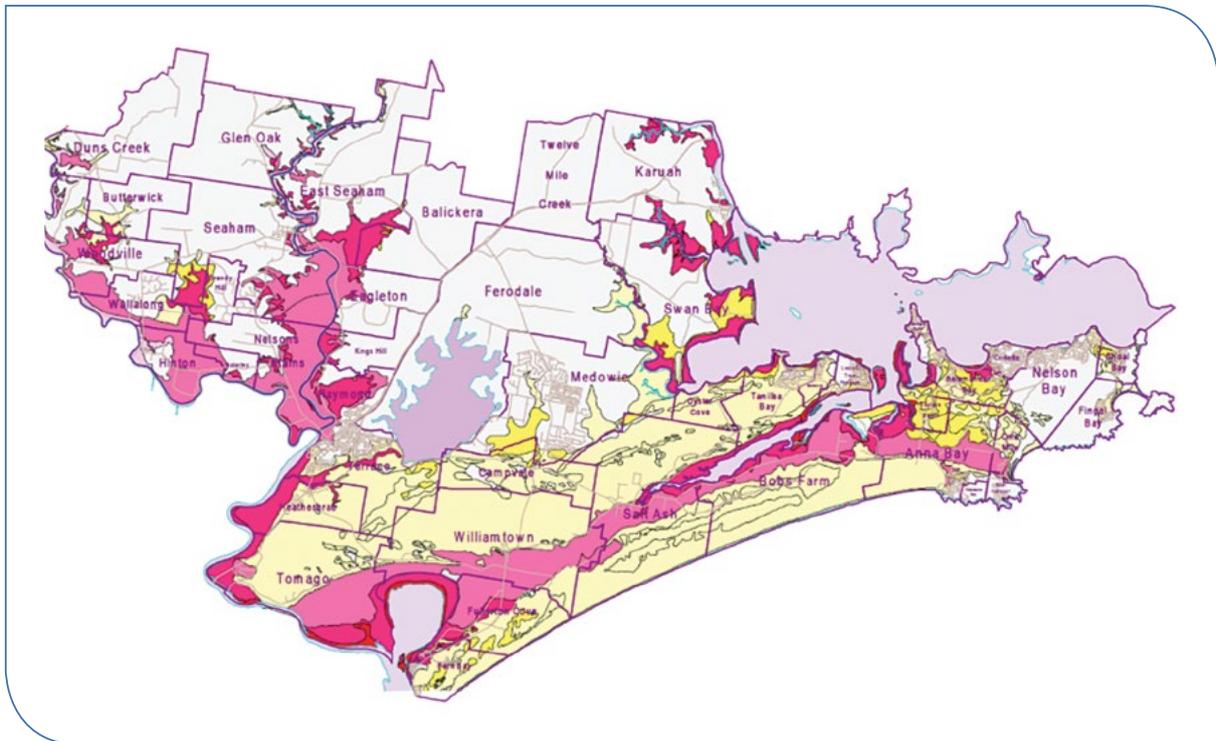
Map 20 Soil condition index for SMUs within the Hunter–Central Rivers region

## Acid Sulfate Soils

Acid sulfate soil is the common name for soils that contain metal sulfides. In an undisturbed and waterlogged state, these soils may pose no or low risk. However, when disturbed or exposed to oxygen through drainage, excavation, and disturbance or lowering of the water table acid sulfate soils undergo a chemical reaction known as oxidation. Oxidation of the sulphides produces sulfuric acid which has led to these soils being called acid sulfate soils. Toxic quantities of iron, aluminium and other metals are often also mobilised. This can result in a variety of adverse impacts including fish kills and other impacts on aquatic organisms; and the contamination of drinking and stock water.

Acid sulfate soils are formed by bacterial activity in waterlogged conditions when there is no or little available oxygen<sup>185</sup>. Coastal acid sulfate soils are naturally occurring sediments that are deposited under estuarine conditions. They contain iron sulfides, most commonly as pyrite, and/or the products of iron sulfide oxidation.

Coastal acid sulfate soils are widespread along the NSW coast, including in the Port Stephens LGA (see map below). They occur in mangrove flats, salt marshes and tea-tree swamps, and underlie coastal floodplains, including farmland and urban areas.



**Map 21 Acid Sulfate Soils PSC LGA**

Council's primary management responsibility regarding acid sulfate soils is through the development and implementation of the Port Stephens Local Environmental Plan which, in relation to the management of acid sulfate soils seeks to ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage<sup>186</sup>.

<sup>185</sup> <http://www.environment.gov.au/water/information/acid-sulfate-soils/about-acid-sulfate-soils>

<sup>186</sup> <http://www.legislation.nsw.gov.au/EPIs/2013-755.pdf> Page 64



Table 14 Acid Sulfate Soils - Risk Categories

Acid Sulfate Soils Risk Categories		
High Probability	(HAb4) Alluvial Backplain	(LWa4) Aeolian Sandplain
Bottom Sediments	(HA4) Alluvial Levee	(LWa4(p)) Aeolian Sandplain (Pleistocene)
(HEm) Estuarine Bottom Sediments	(HAp4) Alluvial Plain	(LWd4) Aeolian Dune
Near Ground Surface	Low Probability	(LWd4(p)) Aeolian Dune (Pleistocene)
(HEi0) Estuarine Intertidal Flat	Bottom Sediments	(LWs4(p)) Aeolian Swamp
< 1m Below Ground Surface	(LAm) Alluvial Bottom Sediments	No Known Occurrence
(HAK1) Alluvial Backswamp	(LLm) Lacustrine Bottom Sediments	Beach
(HA1) Alluvial Levee	Near Ground Surface	Other
(HAp1) Alluvial Plain	< 1m Below Ground Surface	Disturbed Terrain
(HAS1) Alluvial Swamp	(LWa1) Aeolian Sandplain	1 to 3m Below Ground Surface
(HAy1) Alluvial Splay	(LWa1(p)) Aeolian Sandplain (Pleistocene)	(X2) Disturbed Terrain
(HEa1) Estuarine SandPlain	(LWs1) Aeolian Swamp	> 3m Below Ground Surface
(HEp1) Estuarine Plain	1 to 3m Below Ground Surface	(X4) Disturbed Terrain
(HEp1(p)) Estuarine Plain (Pleistocene)	(LAK2) Alluvial Backswamp	Linear Features
(HEu1) Estuarine Supratidal Flat	(LAp2) Alluvial Plain	Water Line
(HWA1) Aeolian SandPlain	(LAp2(p)) Alluvial Plain (Pleistocene)	Acid Line
(HWS1) Aeolian Swamp	(LWa2) Aeolian Sandplain	Broken Line
1 to 3m Below Ground Surface	(LWa2(p)) Aeolian Sandplain (Pleistocene)	LGA Boundary
(HAb2) Alluvial BackPlain	(LWd2(p)) Aeolian Dune (Pleistocene)	Invisible Line
(HAK2) Alluvial Backswamp	(LWs2(p)) Aeolian Swamp (Pleistocene)	Point Features
(HA2) Alluvial Levee	> 3m Below Ground Surface	
(HAp2) Alluvial Plain	(LAB4) Alluvial Backplain	
(HAy2) Alluvial Splay	(LAK4) Alluvial Backswamp	
(HWA2) Aeolian SandPlain	(LA14) Alluvial Levee	
(HWS2) Aeolian Swamp	(LAp4) Alluvial Plain	
> 3m Below Ground Surface	(LAp4(p)) Alluvial Plain (Pleistocene)	



# Air Quality and Noise

## Summary

Volumes for 76 substances listed on the National Pollutant Inventory are available for Port Stephens, where there are comparatively high carbon monoxide and sulphur dioxide emissions as a result of heavy industry within the LGA. Metal manufacturing is the major source of air pollution in the LGA; other sources include motor vehicles and aeroplanes.

There are 63 Environmental Protection Licences (issued by the EPA) in operation in Port Stephens, the second highest in the Hunter behind Newcastle.

Average annual complaints to Council about air quality include 18 for smoke, 49 for dusty conditions and 32 odour complaints between 2012 and 2016.

An average of 150 noise complaints were made to Council annually between 2012 and 2016. Most noise complaints received by Council relate to animal noise (dogs, roosters, etc), from commercial activities, residential and neighbourhood activities (lawn mowers, air conditioners, pool pumps and parties), construction noise and vehicle noise.



## Air Quality

### Introduction

Clean air is fundamental to both human health and wellbeing and to ecosystem health. It directly affects both the natural environment and human health along with the overall amenity of an area. Air quality is influenced by a range of factors including population growth, expansion of industry and increased reliance on motor vehicles. Australian air quality has been improved at a national, state and local level through the introduction of regulatory and non-regulatory approaches to controlling point and diffuse pollution sources.

'Criteria air pollutants' is a term used internationally to describe the key air pollutants carbon monoxide, lead, nitrogen dioxide, ozone, particles PM10 and PM2.5 and sulphur dioxide. These criteria air pollutants have been regulated and are used as indicators of air quality. The regulations or standards are based on criteria that relate to health and/or environmental effects. One key feature of criteria air pollutants is that they are generally widely distributed across Australia<sup>187</sup>.

Since 1998 the National Environment Protection Council (NEPC) has set ambient air quality standards and goals for six key pollutants in the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM). These pollutants are: ground-level ozone (O<sub>3</sub>), particles (as PM10), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>) and lead (Pb).

Air pollutants arise from bushfires and other natural processes as well as human activities including industrial processes and transport. An increasing range of health effects have been linked to air pollution, especially fine particulate matter (PM10 and PM2.5).

Particles smaller than 10 micrometres (µm) in diameter (PM10) have been associated with increased mortality and hospital admissions for people with both heart and lung disease. Health research identifies that particles smaller than 2.5 µm (PM2.5) are also of concern. These can be inhaled more deeply into the lungs. As well as causing respiratory irritation, some are small enough to pass into the bloodstream where (even at relatively low levels) they can trigger heart attacks in people with existing health conditions and impact more severely on children and the elderly<sup>188</sup>. (WHO 2013a).

### The National Pollutant Inventory

National Environment Protection Measures (NEPMs) are a special set of national objectives designed to assist in protecting or managing particular aspects of the environment<sup>189</sup>. The National Pollutant Inventory (NPI)<sup>190</sup> is a NEPM designed to track pollution across Australia, and aims to ensure that the community has access to information about the emission and transfer of toxic substances which may affect people at a local level.

The NPI is an online database that provides searchable data and information on the emissions and transfers of substances to our environment from facilities like mines, power stations and factories; and from other sources such as households and transport. The NPI database shows, on a geographical basis, where substances are being emitted and in what amount.

### Air Quality in NSW

The major indicators of air quality in NSW show either 'moderate' or 'good', and 'remaining stable', including concentrations of ozone, PM10, PM2.5, carbon monoxide, nitrogen dioxide, sulphur dioxide and lead.

The AAQ NEPM standards for particles SO<sub>2</sub>, NO<sub>2</sub> and O<sub>3</sub> are currently under review. NSW consistently meets the goals for carbon monoxide, nitrogen dioxide and sulfur dioxide; ozone and particles continue to be problematic<sup>191</sup>.

Ongoing research has demonstrated that the smaller the particles the greater their potential impact (WHO 2013b). As a result more detailed monitoring of very fine particles has been developed, with the AAQ NEPM<sup>192</sup> being amended in 2003 to include two advisory reporting standards for PM2.5.

187 <http://www.environment.gov.au/protection/air-quality/air-pollutants>

188 IARC: Outdoor air pollution a leading environmental cause of cancer deaths, World Health Organisation, October 2013 [http://www.iarc.fr/en/media-centre/pr/2013/pdfs/pr221\\_E.pdf](http://www.iarc.fr/en/media-centre/pr/2013/pdfs/pr221_E.pdf)

189 <http://www.scew.gov.au/hepms>

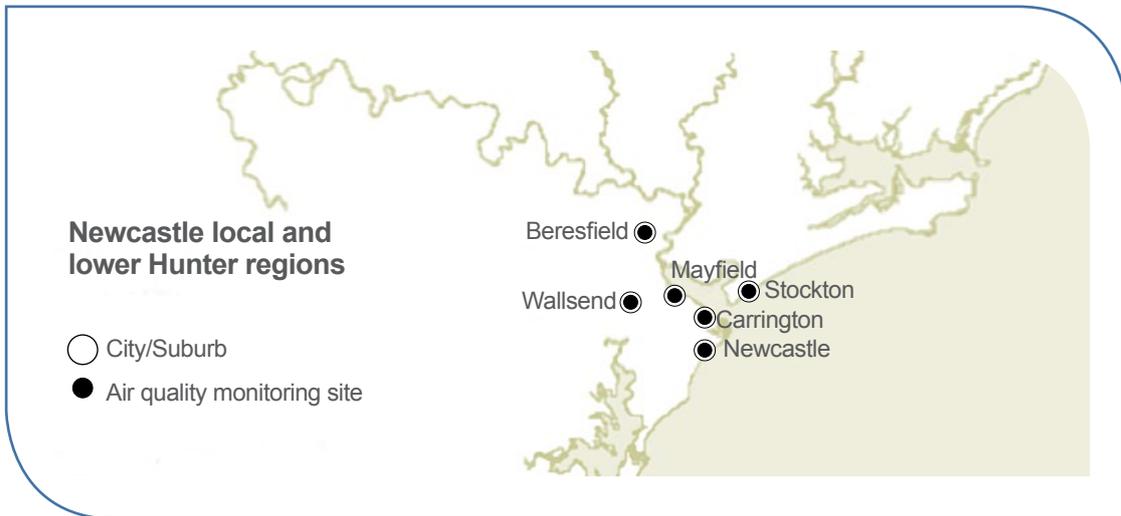
190 Disclaimer for using NPI data contained here <http://www.npi.gov.au/node/691/>

191 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>

192 <http://www.epa.nsw.gov.au/resources/soe/20150817soe-2015.pdf>

## Air Quality in the Hunter

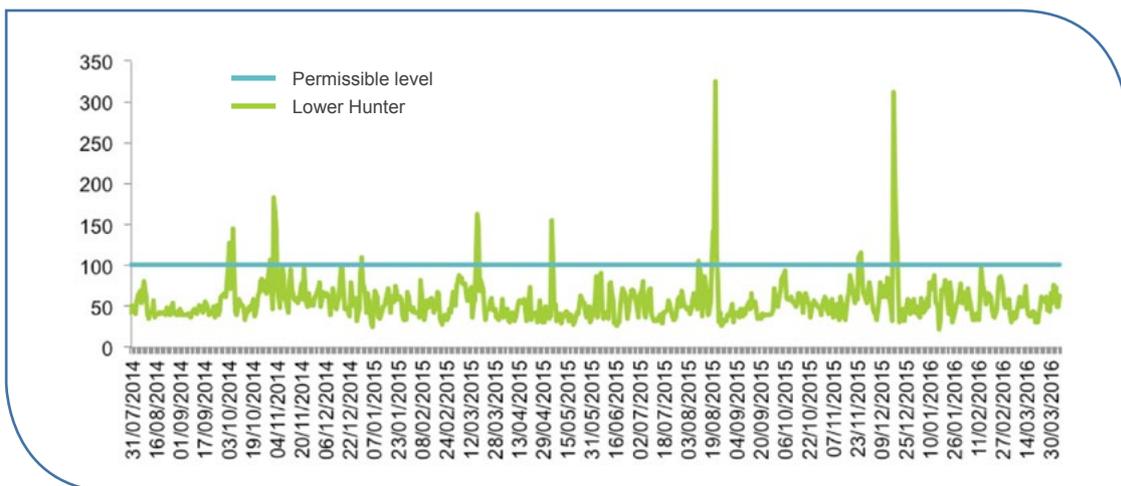
The Office of Environment and Heritage (OEH) operates an air quality monitoring network<sup>193</sup> to provide the community with information about air quality. No monitoring sites are located within the Port Stephens LGA; the closest monitoring stations are located in the Newcastle LGA as per the below map. Although they are relatively close, the data recorded by these stations cannot be interpreted as representative of the Port Stephens LGA.



**Map 22 OEH Air Quality Monitoring Sites across Newcastle Local and Lower Hunter Regions**

Source: OEH

OEH air quality monitoring focuses on the following six key pollutants due to the risk they pose to human health: ozone, nitrogen dioxide, visibility, carbon monoxide, sulfur dioxide and particles PM<sub>2.5</sub> and PM<sub>10</sub>. Data collected for these pollutants are converted into Air Quality Index (AQI) values. An AQI reading above 100 indicates that at least one pollutant has exceeded its permissible threshold value during that particular 24 hour period at that site<sup>194</sup>.

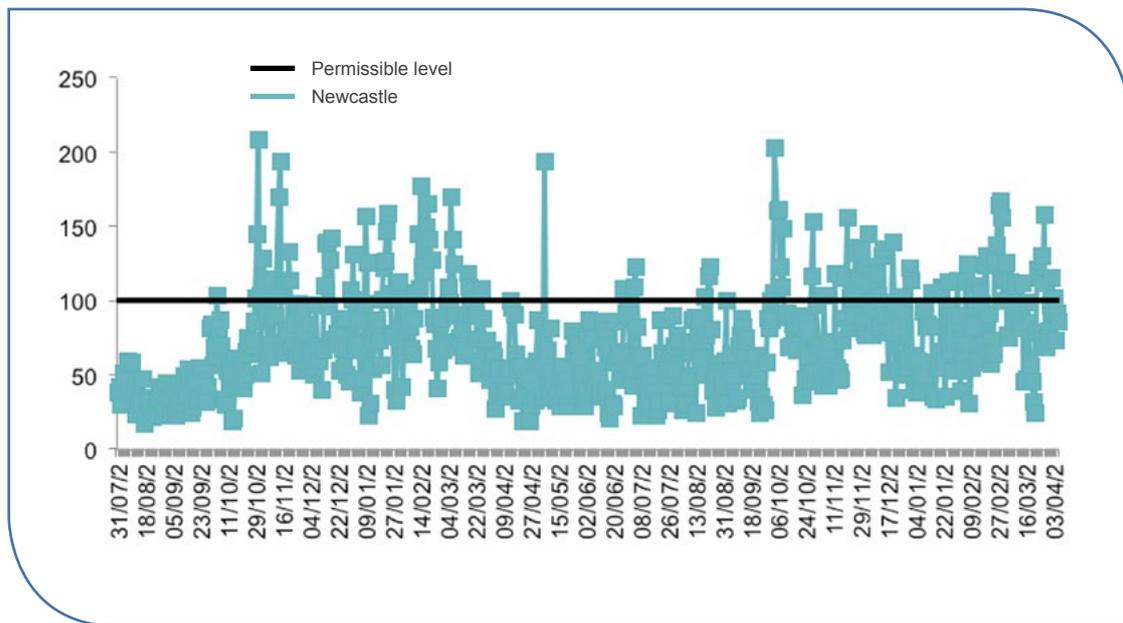


**Figure 38 Daily Regional Air Quality Index (AQI) for Lower Hunter Areas (closest areas to LGA).**

Source: OEH

<sup>193</sup> More information on the monitoring networks operating across NSW, air pollutants and the health effects of air pollution can be found at [www.environment.nsw.gov.au/topics/air](http://www.environment.nsw.gov.au/topics/air)

<sup>194</sup> The 2005 World Health Organisation (WHO) Air Quality Guidelines are available at [www.who.int/phe/health\\_topics/outdoorair/outdoorair\\_aqg/en/](http://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/)



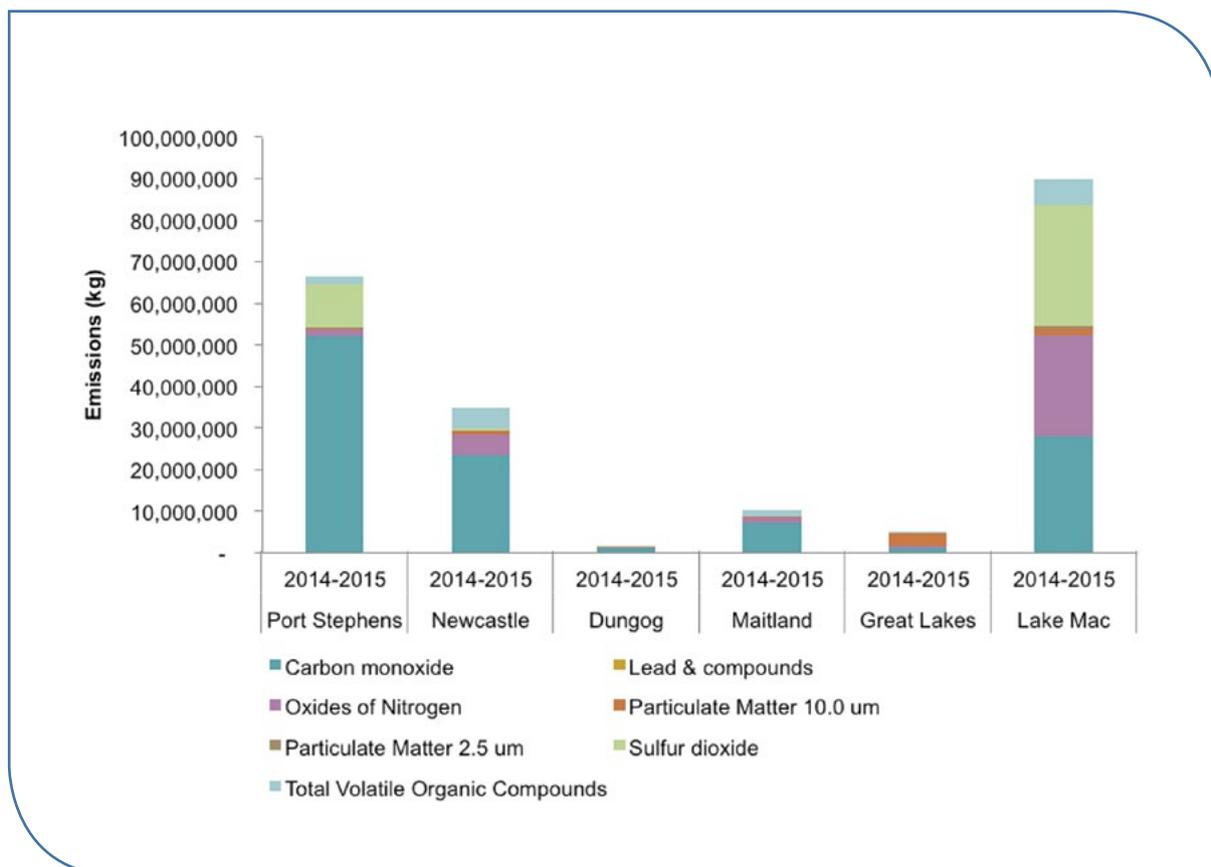
**Figure 39 Daily Regional Air Quality Index (AQI) for Newcastle (closest areas to LGA).**

Source: OEH

## Air Quality in Port Stephens

There are a total of 76 substances listed for the Port Stephens LGA for which there are reported emissions volumes. A comparison of emissions of the six key pollutants listed in the AAQ NEPM (see above), retrieved from the NPI database by Hunter LGAs is shown below.

The impacts of heavy industry within the Port Stephens LGA can be seen in the comparatively high carbon monoxide and sulphur dioxide emissions. In the Newcastle and Lake Macquarie LGAs motor vehicles emit the majority of carbon monoxide. Comparatively high oxides of nitrogen and sulphur dioxide in the Lake Macquarie LGA are largely attributable to electricity generation.



**Figure 40 Volume of criteria pollutants (kg) for the 2014-2015 for Port Stephens, Newcastle, Dungog, Maitland, Great Lakes and Lake Macquarie LGAs**

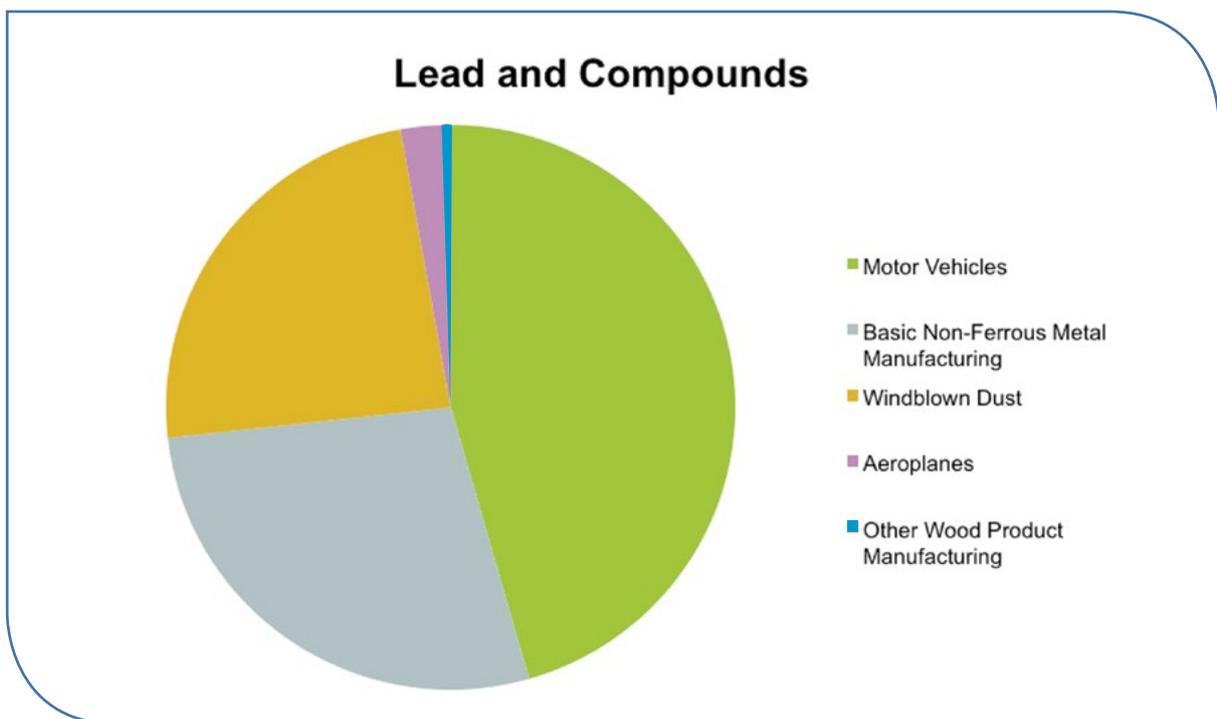
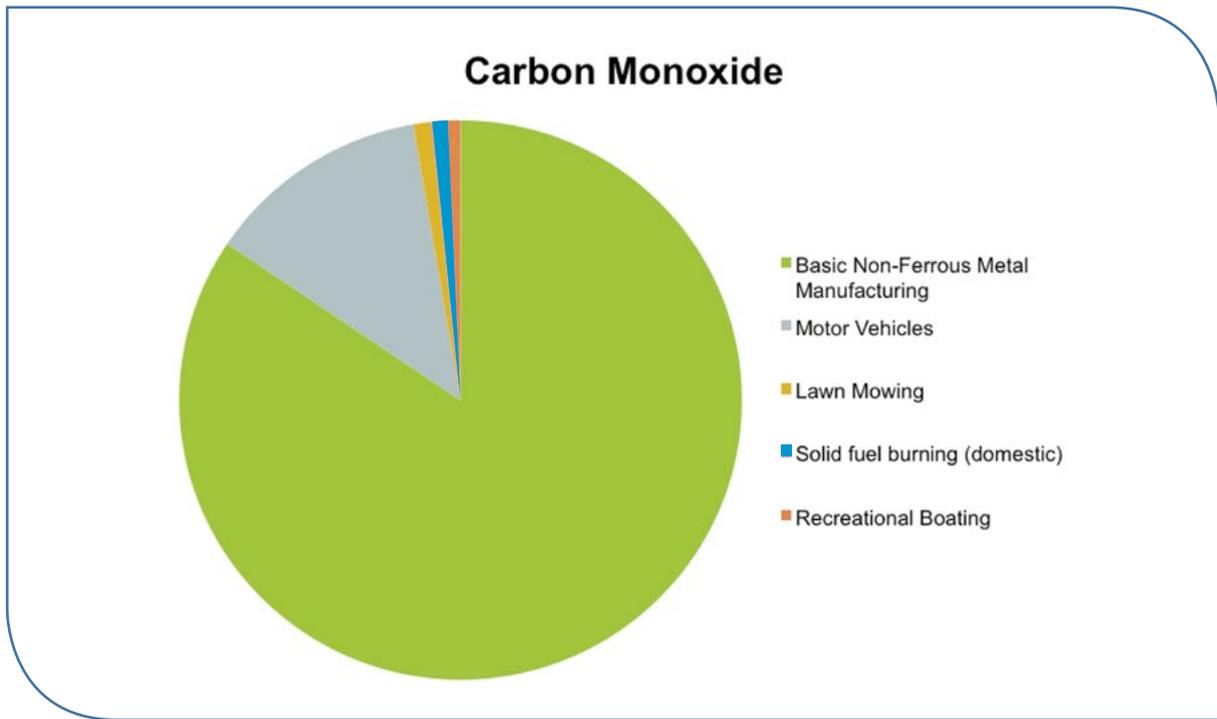
Source: National Pollutant Inventory

Metal manufacturing has been the major source of pollution in the LGA during the reporting period; other sources include motor vehicles and aeroplanes. The sources of carbon monoxide, lead and compounds, oxides of nitrogen, Total Volatile Organic Compounds, sulphur dioxide, PM10 and PM2.5 are shown below.

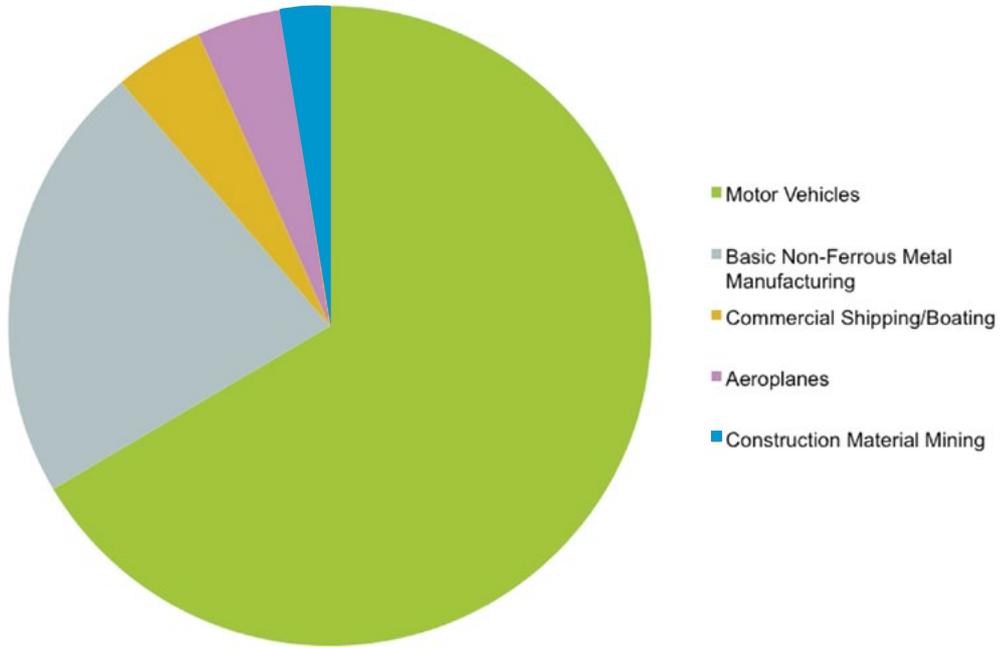


Figure 41 Anthropogenic sources of criteria pollutants for the Port Stephens LGA, 2014-2015

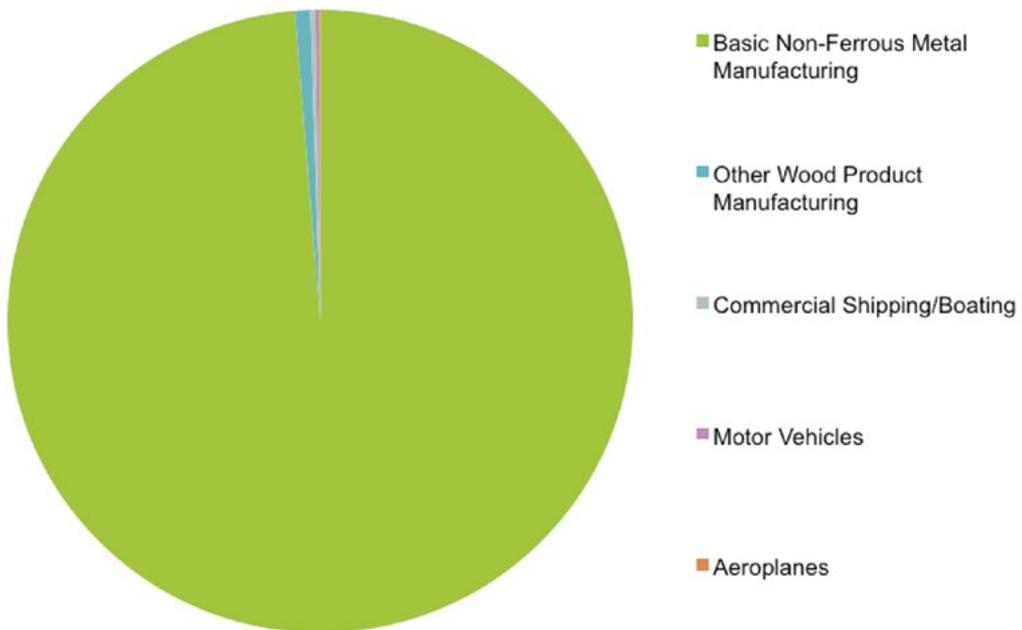
Source: National Pollutant Inventory



## Oxides of Nitrogen

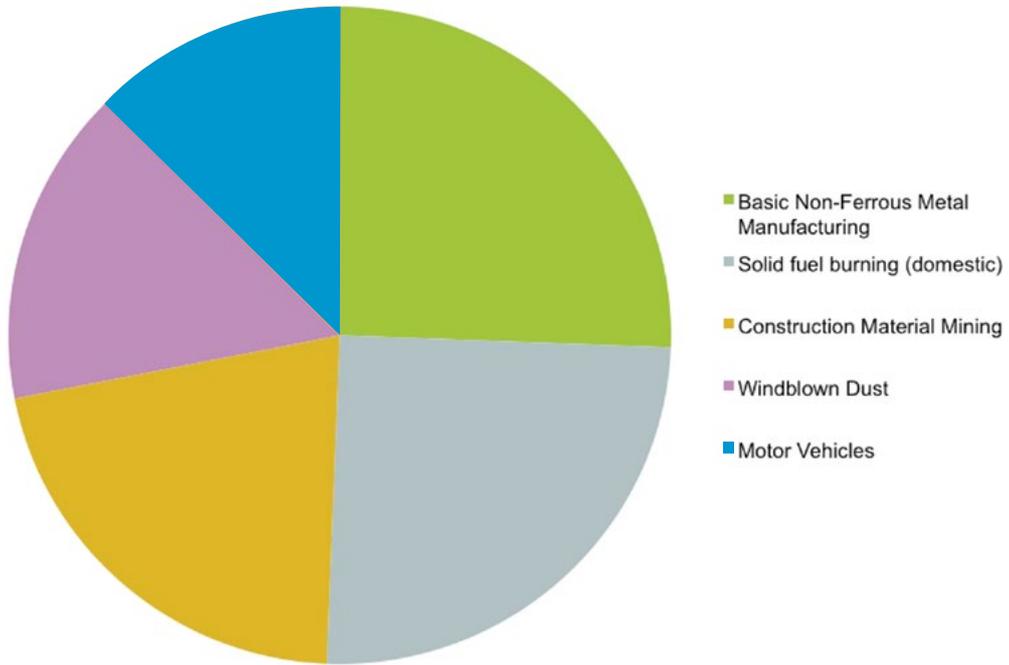


## Sulfur Dioxide

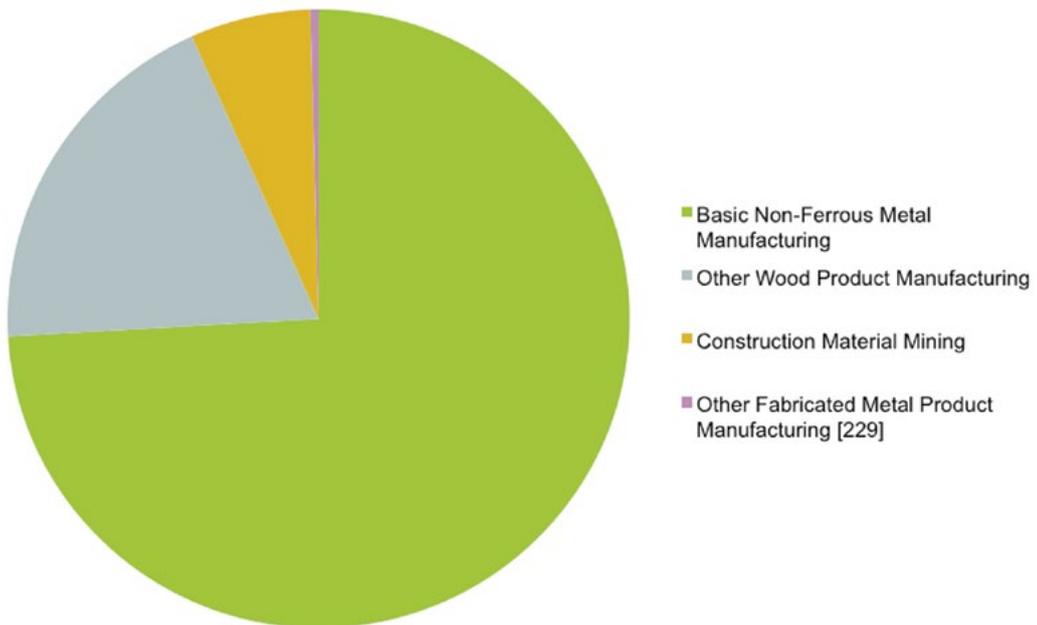


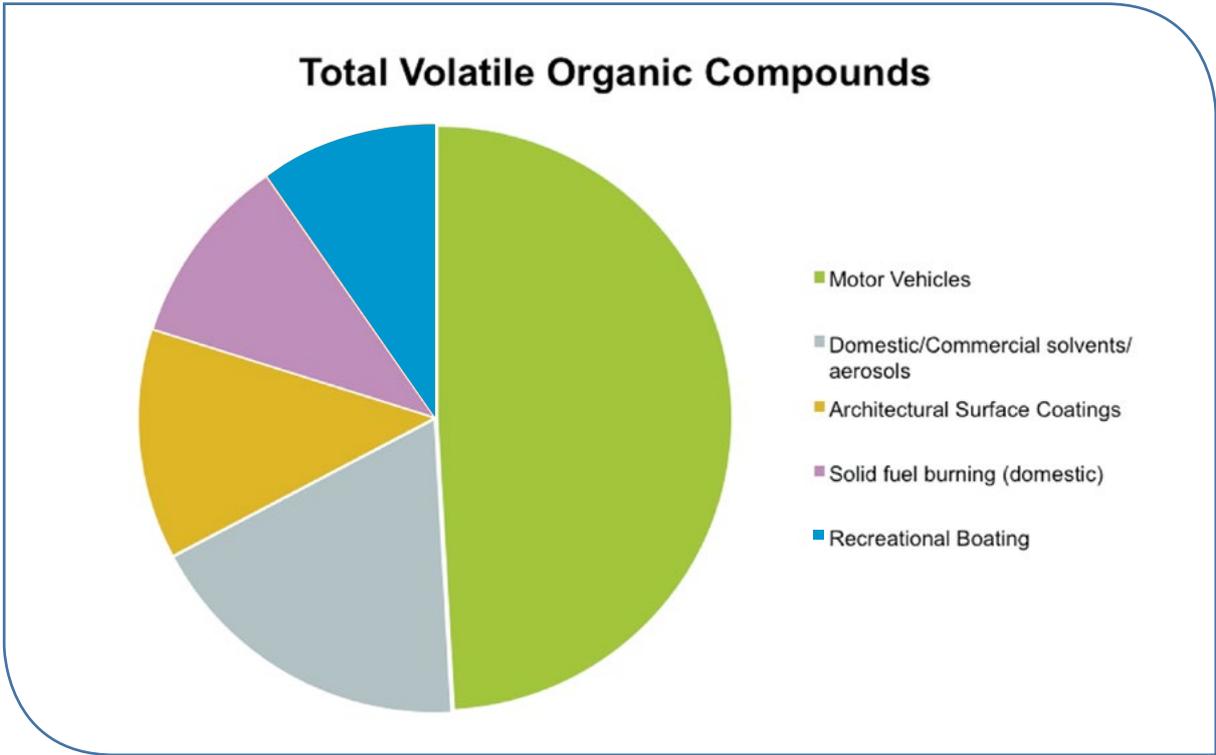


### PM10

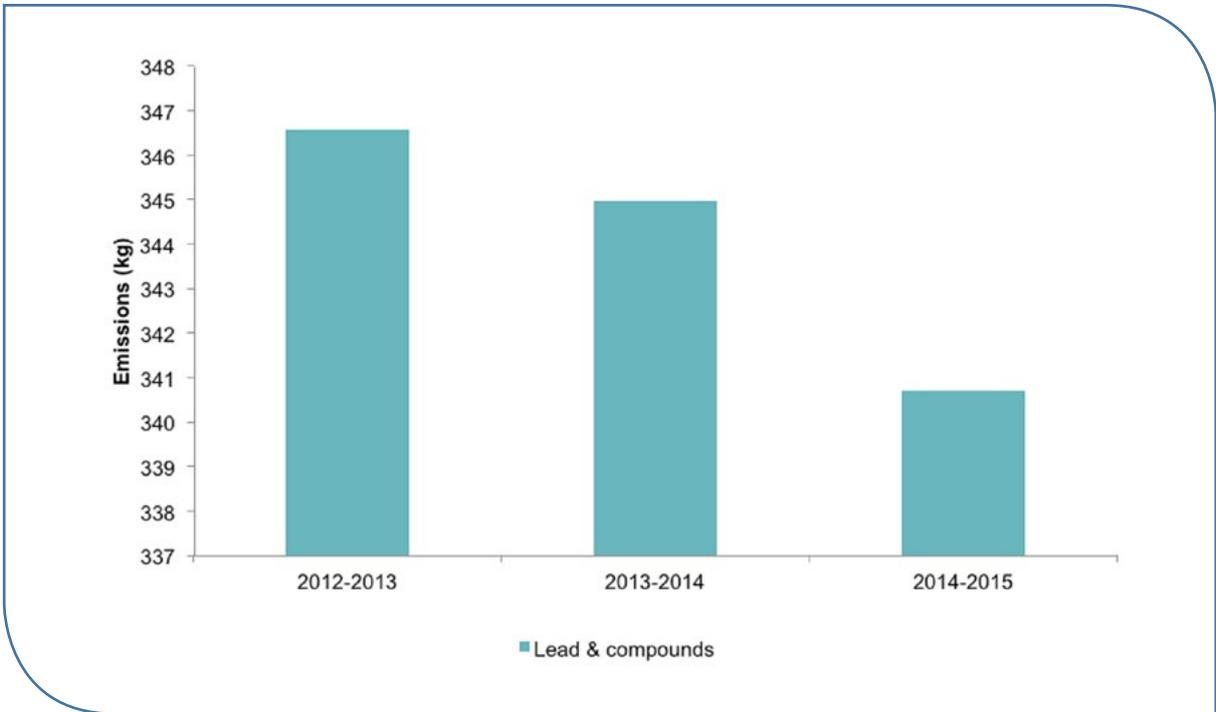


### PM2.5





The emissions (kg) of criteria pollutants in the Port Stephens LGA for the period 2012-2015 are shown below.



**Figure 42 Emissions (kg) of lead and compounds for the Port Stephens LGA, 2014-2015**

Source: National Pollutant Inventory

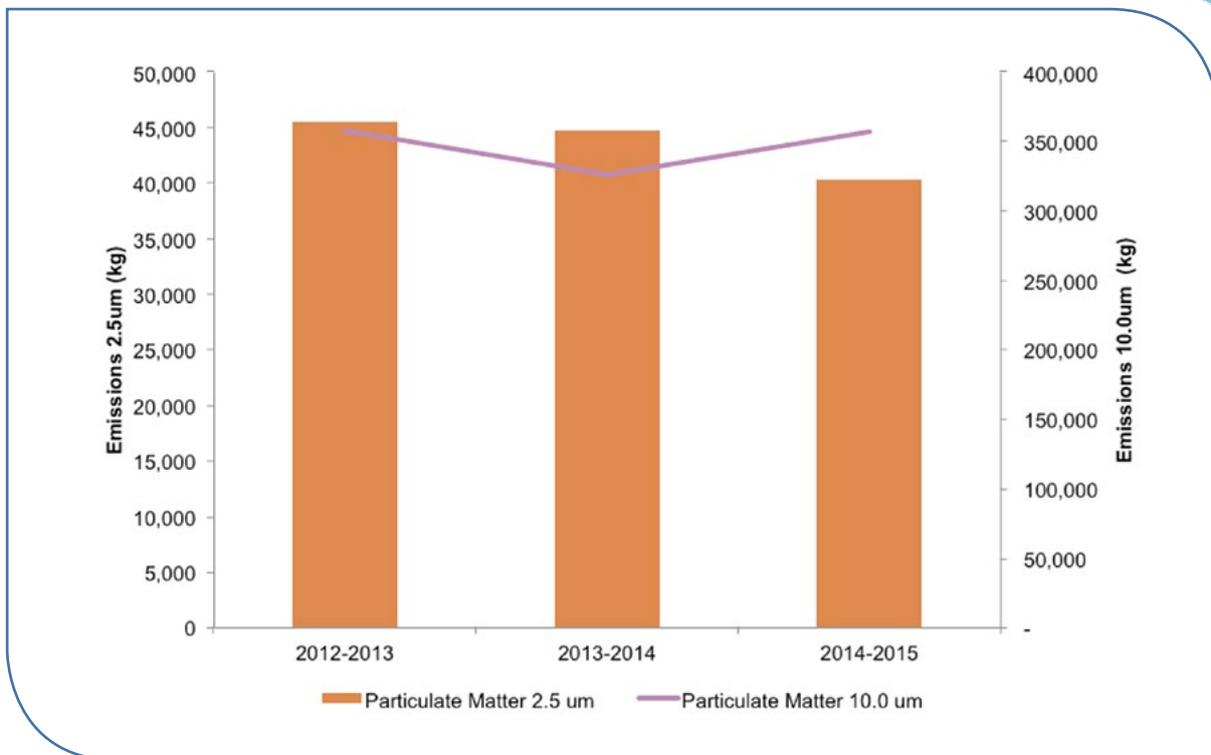


Figure 43 PM10 and PM2.5 emissions (kg) for the Port Stephens LGA, 2014-2015

Source: National Pollutant Inventory

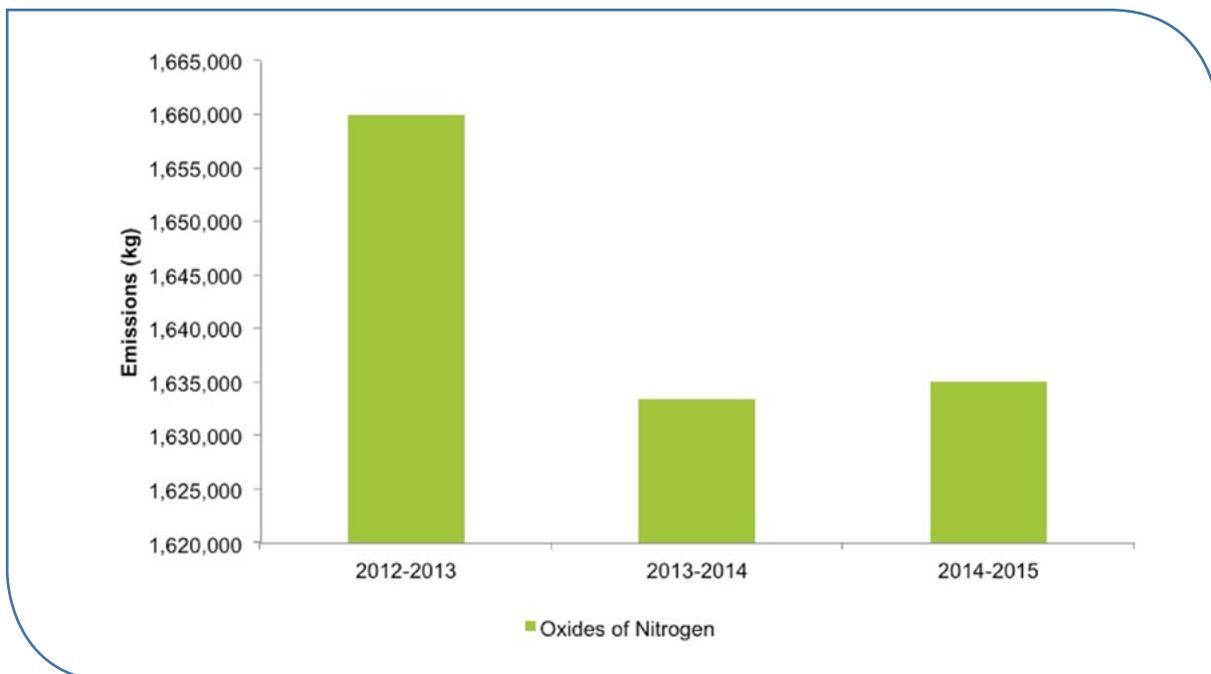
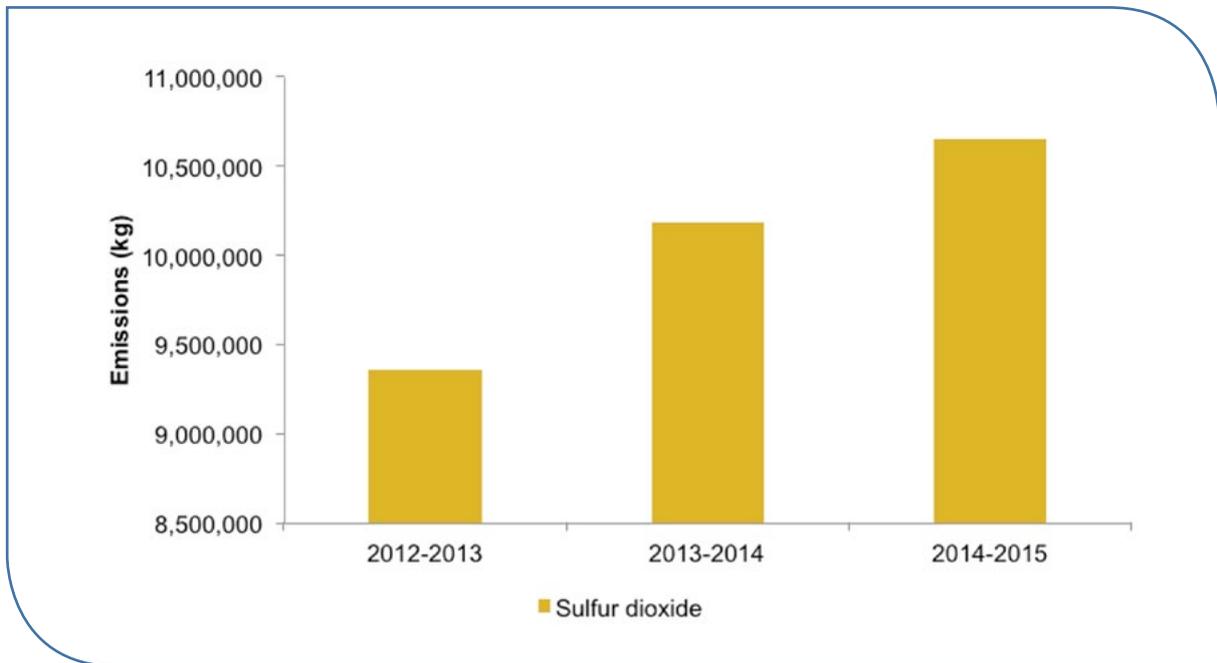


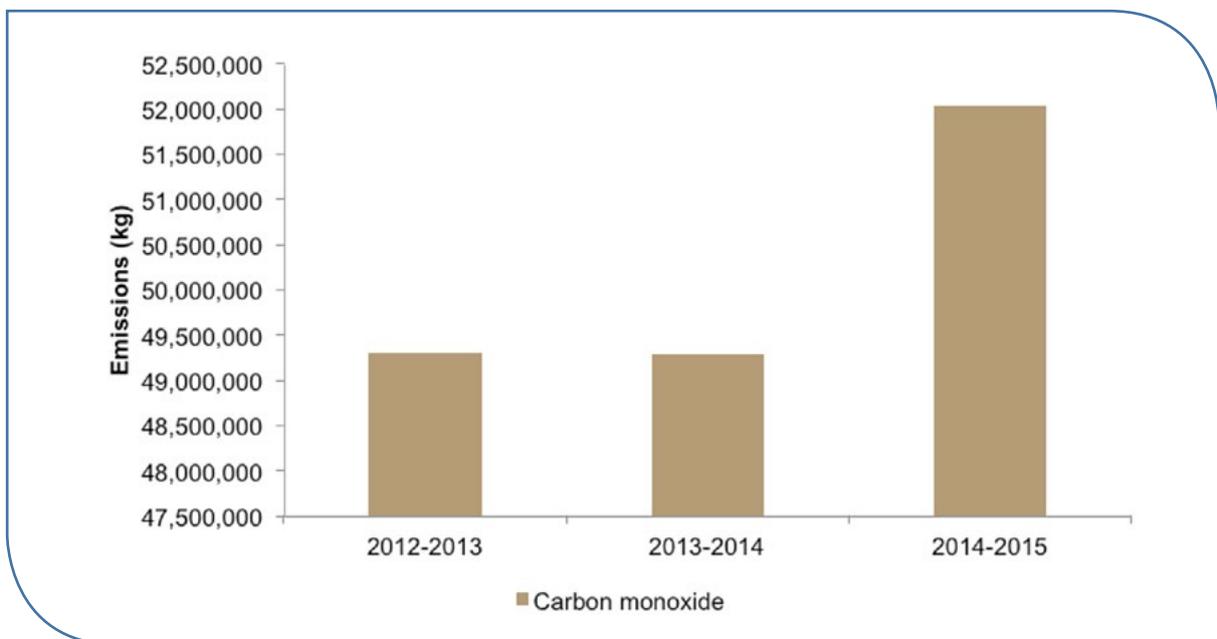
Figure 44 Oxides of Nitrogen for Port Stephens LGA, 2012-2015

Source: National Pollutant Inventory



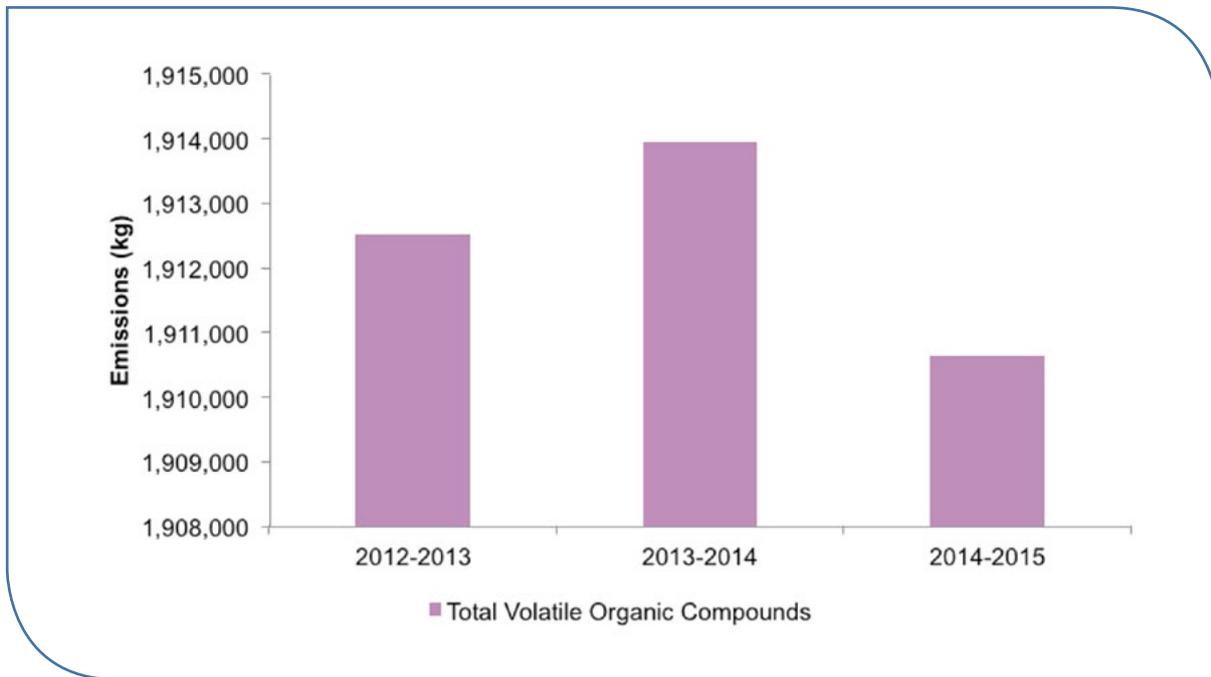
**Figure 45 Sulfur dioxide emissions (kg) for the Port Stephens LGA, 2014-2015**

Source: National Pollutant Inventory



**Figure 46 Carbon monoxide emissions (kg) for the Port Stephens LGA, 2014-2015**

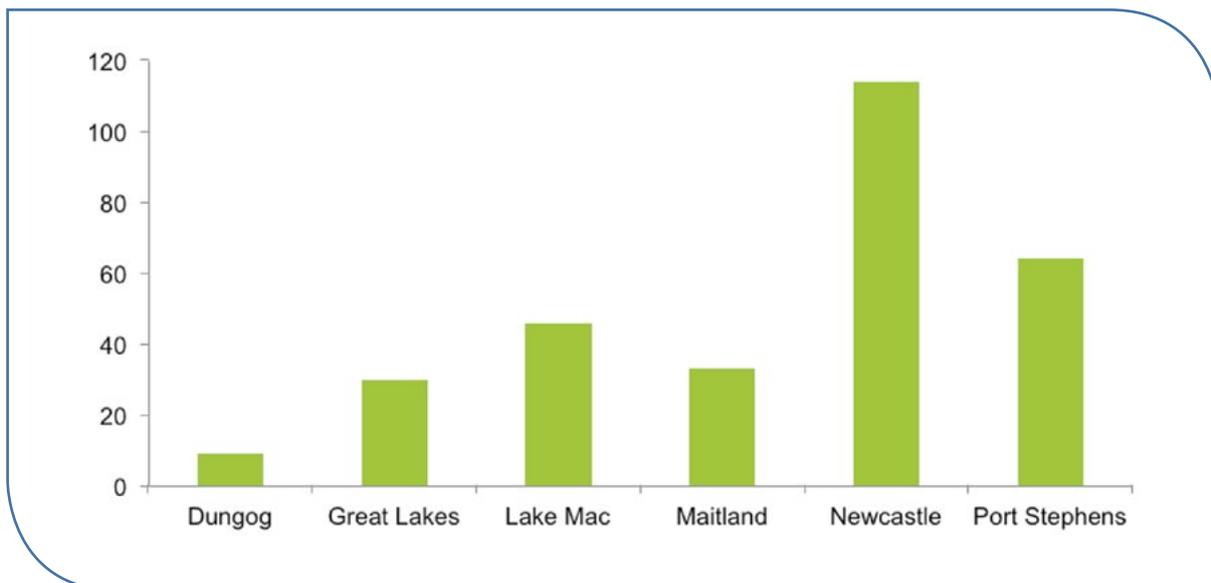
Source: National Pollutant Inventory



**Figure 47 Total volatile organic compound emissions (kg) for the Port Stephens LGA, 2014-2015**

Source: National Pollutant Inventory

Highly polluting activities and industries are regulated through Environmental Protection Licences by the NSW Environmental Protection Authority under the *Protection of Environment Operations Act 1997*. There are 63<sup>195</sup> EPLs currently in operation in Port Stephens, the second highest number by LGA in the Hunter.



**Figure 48 Number of Environmental Protection Licenses by Hunter LGAs as at 14 July 2016**

195 Current as of 14 July 2016

## Air Quality and Council

Responsibility for monitoring and regulating air quality is divided amongst a range of agencies. Council has a regulatory role under the *Protection of Environment Operations Act 1997* to respond to reports of local air pollution.

Port Stephens Council receives and investigates complaints and notifications relating to air quality. A summary of the number of notifications received by Council within each financial year of the reporting period is shown below. The types of incidents relating to air quality that Council responds to can be categorised into three broad areas:

- A deterioration in air quality whether actual or perceived resulting from dusty conditions. Examples of situations involving dusty conditions that Council has responded to include:
  - o Unsealed (gravel) roads; and
  - o Activities undertaken on private land that have the potential to create dusty conditions (e.g. demolition works, keeping of livestock, operation of motor vehicles).
  
- A deterioration in air quality whether actual or perceived resulting from smoke. Examples of situations involving smoke that Council has responded to include:
  - o Back yard burning;
  - o Combustion wood fires (design and operation);
  - o Outdoor cigarette smoking (private property and outdoor dining areas).
  
- A deterioration of air quality attributed to some form of odour. Examples of situations involving odour that Council has responded to include:
  - o Public facilities (amenities and waste bins);
  - o On-site Sewage Management Systems;
  - o Industrial activities;
  - o Keeping of animals (horses, dogs and cats); and
  - o Drains, stormwater systems and wetlands.

**Table 15 Summary of Results - Smoke**

Reporting Year	2012-2013	2013-2014	2014-2015	2015-2016
Number of Incidents Received/ Investigated	18	27	14	15

**Table 16 Summary of Results – Dusty Conditions**

Reporting Year	2012-2013	2013-2014	2014-2015	2015-2016
Number of Incidents Received/ Investigated	49	42	44	62



**Table 17 Summary of Results - Odour**

Reporting Year	2012-2013	2013-2014	2014-2015	2015-2016
Number of Incidents Received/ Investigated	20	42	40	26

## Noise

### Context

In NSW noise is regulated through the *Protection of the Environment Operations Act 1997* (POEO Act); the POEO (Noise Control) Regulation 2008 addresses common noisy activities that occur in residential situations. Responsibility for noise control within Port Stephens is shared between Council, the NSW EPA, NSW Police and the NSW Roads and Maritime Services.

### Noise in Port Stephens

The majority of noise complaints received by Council relate to animal noise (such as dogs, roosters, etc), the noise of commercial activities, residential and neighbourhood activities (such as lawn mowers, air conditioners, pool pumps and parties), and construction noise and vehicle noise.

Council receives and investigates complaints and notifications involving noise. The Noise Guide for Local Government<sup>196</sup> defines noise pollution as *unwanted noise that unreasonably intrudes on daily activities*. If not properly managed and addressed noise pollution and environmental noise have the potential to cause significant human health impacts. Noise pollution can also unreasonably interfere with a person's simple desire to enjoy the quiet comfort of their property. The table below contains a summary of the number of incidents received within each financial year. The types of incidents involving noise intrusion that Council responds to can be categorised into four broad areas:

- Animal noise predominantly dogs and roosters;
- Activities on private land including noise from the operation of:
  - Amplified stereo equipment and musical instruments;
  - Air conditioning systems, hot water systems and swimming pool equipment;
  - Motor vehicles predominantly motor bikes;
  - Power tools.
- Industrial and commercial activities; and
- Activities on public land including halls, sporting fields and recreational areas.

<sup>196</sup> <http://www.epa.nsw.gov.au/resources/noise/20130127NGLG.pdf>

**Table 18 Summary of Noise Incident Results**

Reporting Year	2012-2013	2013-2014	2014-2015	2015-2016
Number of Incidents Received/ Investigated	150	121	154	175

### *Aircraft Noise*

Managing the impacts of aircraft noise is a major challenge for the Port Stephens LGA due to the community's longstanding co-existence with RAAF Base Williamtown, Newcastle Airport and the Salt Ash Air Weapons Range.

Aircraft noise is a largely inescapable by-product of aviation. Unless measures are taken to reduce the impacts of aircraft noise on nearby communities, there can be a wide range of undesirable social, economic and environmental consequences. These may include annoyance and irritation, interference with speech and social activities, interference with classroom learning, loss of relaxation and tranquillity, sleep disruption, health impacts and many others. Loss of amenity due to aircraft noise can have significant impacts on the local economy.

To limit aircraft noise impacts, Port Stephens Council has for many years applied controls on new development in noise-affected areas. The Aircraft Noise Planning Area defines the area within which aircraft noise should always be considered in planning and development decisions, generally in accordance with the Port Stephens Aircraft Noise Policy 2010.



# Environmental Security

The Environmental Security section has been prepared to illustrate the impact that the natural environment can and does have on communities in terms of human health, recreation, and the economy.

The scale of natural hazards can and does vary greatly with the most significant economic impacts arising from floods, storms and bushfires, whilst heatwaves are responsible for the most number of fatalities of all natural disasters in Australia. Climate change exacerbates the impacts of each of these natural hazards and is projected to continue to do so in the future.

It is clear that human activities have a direct impact on the elements contained within this section, however ultimately these environmental hazards have been included given their potential to impact on communities and the environmental implications of managing the risks associated with these hazards.

# Climate Change

## Global and National Context

Climate change is a direct driver of environmental change. It has direct and long lasting impacts on the environment, as well as on communities and the economy.

According to the Intergovernmental Panel on Climate Change (IPCC) warming of the climate system is unequivocal, and since the 1950s many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen<sup>197</sup>.

The IPCC states that *it is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together*<sup>198</sup>, or caused by human activities.

The Australian Bureau of Meteorology (BoM) and the CSIRO produced the 2014 State of the Climate Report which illustrated amongst other things that<sup>199</sup>:

- Australia's climate has warmed by 0.9°C since 1910, and the frequency of extreme weather has changed, with more extreme heat and fewer cool extremes;
- Rainfall averaged across Australia has slightly increased since 1900, with the largest increases in the northwest since 1970;
- Rainfall has declined since 1970 in the southwest, dominated by reduced winter rainfall. Autumn and early winter rainfall has mostly been below average in the southeast since 1990;
- Extreme fire weather has increased, and the fire season has lengthened, across large parts of Australia since the 1970s;
- Global mean temperature has risen by 0.85°C from 1880 to 2012;
- The amount of heat stored in the global oceans has increased, and global mean sea level has risen by 225 mm from 1880 to 2012;
- Annual average global atmospheric carbon dioxide concentrations reached 395 parts per million (ppm) in 2013 and concentrations of the other major greenhouse gases are at their highest levels for at least 800,000 years;
- Australian temperatures are projected to continue to increase, with more extremely hot days and fewer extremely cool days;
- Average rainfall in southern Australia is projected to decrease, and heavy rainfall is projected to increase over most parts of Australia; and
- Sea-level rise and ocean acidification are projected to continue.

## Climate Projections – Hunter Region

Through the NSW and ACT Regional Climate Modelling project (NARClIM)<sup>200</sup> the NSW Office of Environment and Heritage (OEH) has developed Climate Change Snapshots for NSW and each of the State Planning Regions. The snapshots provide details of the current climate of the region and the likely changes to temperature (maximum, minimum, average), rainfall, severe fire weather, hot days and cold nights by 2030 and 2070.

Temperature is the most reliable indicator of climate change. Across the Hunter region all of the models agree that average, minimum and maximum temperatures are increasing. Through the analysis of long-term (1910–2011) observations, temperatures in the Hunter region can be seen to be increasing since about 1960<sup>201</sup>.

197 [https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5\\_SYR\\_FINAL\\_SPM.pdf](https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf) Page 5

198 [https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5\\_SYR\\_FINAL\\_SPM.pdf](https://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf) Page 5

199 <http://www.bom.gov.au/state-of-the-climate/>

200 NARClIM is a multi-agency research partnership between the NSW and ACT Governments and the Climate Change Research Centre at the University of NSW.

NARClIM takes global climate model outputs and downscales these to provide finer, higher resolution climate projections for a range of meteorological variables.

201 <http://climatechange.environment.nsw.gov.au/~media/5B48C3FA1666438EA1156421278B286F.ashx>



The region is projected to continue to warm by an average of 0.7°C during the near future (2020–2039) and by about 2°C in the far future (2060–2079), compared to recent years (1990–2009). The number of high temperature days is projected to increase in parts of the region, with fewer potential frost risk nights anticipated. This warming trend projected for the Hunter region is large compared to natural variability in temperature but is of a similar order to the rate of warming projected for other regions of NSW.

## Fire Weather

The Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity and wind speed with an estimate of the fuel state. Severe and average fire weather is projected to increase in summer and spring, whilst severe fire weather is projected to decrease in autumn.

Average fire weather risk is projected to increase in all seasons in the far future except for autumn. The increases are in prescribed burning periods (spring) and the peak fire risk (summer), reducing the ability for preventative works<sup>202</sup>.

## Rainfall

The Hunter Valley currently experiences considerable rainfall variability across the region, seasons and from year to year; and this variability is also reflected in the projections. However most models agree that in autumn rainfall will increase<sup>203</sup> and decrease in spring and winter.

## Hot Days

Much of the Hunter Valley experiences 10-20 days each year with a maximum temperature greater than 35 degrees (fewer near the coast and in the mountains); and the number of hot days per year is projected to increase<sup>204</sup>.

## Cold Nights

The number of cold nights per year (minimum temperatures below 2 degrees) ranges from only a few near the coast to over 50 nights per year in the mountains. The number of cold nights is projected to decrease<sup>205</sup>.

## Climate Risk in Port Stephens

Recent years have been characterised by major storm and flooding events in Port Stephens with seven declared natural disasters in four years<sup>206</sup>. These have raised community awareness of the threats posed by climate variability and the potential impacts of climate change on the community<sup>207</sup>.

The impacts of sea level rise are of particular relevance to Port Stephens given the prevalence of low lying areas. Of NSW coastal LGAs, Port Stephens has the second highest number of residential buildings at risk from erosion due to higher sea levels<sup>208</sup>.

202 <http://climatechange.environment.nsw.gov.au/~media/5B48C3FA1666438EA1156421278B286F.ashx>

203 <http://climatechange.environment.nsw.gov.au/~media/5B48C3FA1666438EA1156421278B286F.ashx>

204 <http://climatechange.environment.nsw.gov.au/~media/5B48C3FA1666438EA1156421278B286F.ashx>

205 <http://climatechange.environment.nsw.gov.au/~media/5B48C3FA1666438EA1156421278B286F.ashx>

206 <https://www.emergency.nsw.gov.au/publications/natural-disaster-declarations/current.html>

207 Climate Profile: Port Stephens Council Local Government Area, Hunter & Central Coast Regional Environmental Management Strategy

208 Climate Change Risks to Australia's Coast A First Pass National Assessment <https://www.environment.gov.au/climate-change/adaptation/publications/climate-change-risks-australias-coasts>

A range of studies have been undertaken to assess the risk of climate change on Port Stephens including but not limited to:

- Port Stephens Council 2009 Climate Change Risks Assessment and Adaptation Action Plan; and
- Hunter Councils Regional Coastal Climate Risk Assessment and Adaptation Action Plan<sup>209</sup>.

These documents are consistent in their identification of a significant number of risks posed by climate change (sea level rise, changes in annual rainfall, changes to storm frequency and intensity, changes to average temperature, and change to the number of hot days per year) with wide ranging potential impacts, including but not limited to:

- Biodiversity risks including risks to marine ecosystems;
- Risks to infrastructure (stormwater, roads);
- Risk of coastal erosion;
- Financial risks;
- Liability risks;
- Bushfire risks;
- Agriculture and aquaculture risks; and
- Human health risks.

## Bushfires

Everyone has a role to play in planning for bushfires – fire authorities, landowners, land managers, planning authorities, local councils and the community. Local Bush Fire Management Committees (BFMC) across NSW help to identify assets at risk of bushfire including communities, buildings and infrastructure as well as culturally and environmentally significant locations. They then develop strategies to protect those assets<sup>210</sup>.

In Port Stephens the Lower Hunter Bushfire Risk Management Plan<sup>211</sup> identifies community assets at risk and sets out a five year program of coordinated, multi-agency treatment to reduce the risk of bushfire to these assets. Treatments may include such things as hazard reduction (including burning), grazing, community education, fire trail maintenance and establishing *FireWise* communities<sup>212</sup>.

The Lower Hunter BFMC area, which includes the Port Stephens LGA, has on average 200 bushfires per year, of which three on average can be considered to be major fires<sup>213</sup>.

The risk of bushfire in any given region depends on four 'switches'. There needs to be enough vegetation (fuel), the fuel needs to be dry enough to burn, the weather needs to be favourable for fire to spread, and there needs to be an ignition source<sup>214</sup>.

## Fire Weather

The Forest Fire Danger Index (FFDI) is used in NSW to quantify fire weather. The FFDI combines observations of temperature, humidity and wind speed with an estimate of the fuel state. Fire weather is one of four switches upon which bushfire risk depends.

High FFDI values are also considered by the Rural Fire Service when declaring a Total Fire Ban.

Average FFDI values are often used to track the status of fire risk. These values can be used when planning for prescribed burns and help fire agencies to better understand the seasonal fire risk. The FFDI is also considered an indication of the consequences of a fire if one was to start – the higher the FFDI value the more dangerous the fire could be.

209 <http://www.hccrems.com.au/product/coastal-councils-adaptation-plan/>

210 <http://www.rfs.nsw.gov.au/plan-and-prepare/know-your-risk/bush-fire-risk-management-plans>

211 [http://www.rfs.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0003/2388/Lower-Hunter-BFRMP.pdf](http://www.rfs.nsw.gov.au/__data/assets/pdf_file/0003/2388/Lower-Hunter-BFRMP.pdf)

212 [http://www.rfs.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0003/2388/Lower-Hunter-BFRMP.pdf](http://www.rfs.nsw.gov.au/__data/assets/pdf_file/0003/2388/Lower-Hunter-BFRMP.pdf)

213 [http://www.rfs.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0003/2388/Lower-Hunter-BFRMP.pdf](http://www.rfs.nsw.gov.au/__data/assets/pdf_file/0003/2388/Lower-Hunter-BFRMP.pdf)

214 <http://climatechange.environment.nsw.gov.au/~media/5B48C3FA1666438EA1156421278B286F.ashx>



## Port Stephens Council Bushfire Prone Land

To enable identification of bushfire prone areas within Port Stephens, Council has prepared mapping in collaboration with the NSW Rural Fire Service. These maps were developed by analysing factors such as vegetation type and patterns of existing development.

Council can provide property owners within bushfire prone areas information and guidelines relating to measures needed to be taken to reduce bushfire risks to residents and developments.

## Flooding

### Introduction/Background

Flooding causes a range of significant direct and indirect impacts in NSW, including severe economic damage and emotional distress. The economic impact alone of flooding in urban and rural NSW is about \$250 million each year<sup>215</sup>.

Local government in NSW has the primary responsibility for controlling the development of flood-prone land, but the NSW Government, through the Office of Environment and Heritage (OEH) and the State Emergency Service (SES), also has an important role to play in managing the flood risk across the state.

Whilst it is difficult to accurately calculate, according to the NSW Floodplain Development Manual the estimated average annual cost of flooding in Australia is approximately \$400 million<sup>216</sup>. More than 100,000 buildings are at risk of flooding in NSW with the average damage from flooding in coastal NSW and inland urban centres around \$200 million a year<sup>217</sup>.

### Flooding in Port Stephens

Parts of the Port Stephens LGA are affected by flooding due to the presence of major river systems in the western regions; the low lying topography; and interactions with the coast and estuaries in the east. Flooding in the LGA is caused by:

- River or creek banks being overtopped;
- Estuary levels rising and inundating foreshore areas; and
- Stormwater drainage that is unable to cope causing overland flows (down streets or across other urban areas).

A number of notable flood events have occurred in Port Stephens in recent years including January 2016. A total of five “Storm and Flood” and “Flood” events have been declared natural disasters in the LGA in the past four years<sup>218</sup>.

<sup>215</sup> <http://www.environment.nsw.gov.au/floodplains/index.htm>

<sup>216</sup> [http://www.environment.nsw.gov.au/resources/floodplains/19\\_flood\\_manual.pdf](http://www.environment.nsw.gov.au/resources/floodplains/19_flood_manual.pdf) (Page M-1)

<sup>217</sup> <http://www.environment.nsw.gov.au/floodplains/FloodRiskNSW.htm>

<sup>218</sup> <https://www.emergency.nsw.gov.au/publications/natural-disaster-declarations/current.html>

## National Responses

Following the floods across Eastern Australia in 2011, the Natural Disaster Insurance Review was initiated by the Australian Government. This review led to the development of the *National Flood Risk Information Project (NFRIP)* commencing in July 2012. The project aims to improve the quality, availability and accessibility of flood information across Australia; and raise community awareness of flood risks. Project outputs include<sup>219</sup>:

- The Australian Flood Risk Information Portal providing a single point of access to existing flood risk information;
- Revised and updated Australian Rainfall and Runoff (ARR) guidelines to better inform flood modelling and land use planning; and
- Analysis of historic satellite imagery to better inform our understanding of past flood events in Australia <sup>220</sup>.

Australian Rainfall and Runoff (ARR) is a national guideline for the estimation of design flood characteristics in Australia. Keeping ARR up-to-date is an important component in the provision of reliable estimates of flood risk<sup>221</sup>. The fourth edition of ARR (ARR 2016) is now available electronically enabling the document to be progressively updated<sup>222</sup>.

## State Responses

The primary objective of the NSW Government's Flood Prone Land Policy and Floodplain Development Manual 2005 is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property; and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible<sup>223</sup>.

To achieve this, the Policy provides for financial assistance for works to reduce potential flood damage and personal danger; technical support to local councils in the management of development on flood prone land; emergency management and flood recovery programs; and the protection of councils, government agencies and their staff against claims for damages<sup>224</sup>.

The NSW Office of Environment and Heritage has provided funding to Council to undertake a number of floodplain risk management studies and plans throughout the Port Stephens LGA and in collaboration with neighboring councils where appropriate.

## Local Responses

Council manages land affected by flooding through:

- undertaking studies that identify flood risk and flood levels;
- undertaking floodplain risk management studies and developing plans that make provisions for the management of flood-prone land; and
- assessing the compatibility of new development (and major renovations) with flood risk, thereby encouraging development that is appropriate to the flood risk of the area<sup>225</sup>.

The Port Stephens Local Environment Plan 2013 (Section 7.3) has some provisions for development in flood-prone Areas and includes reference to the Flood Planning Map. The objectives of Clause 7.3 are:

- To minimise the flood risk to life and property associated with the use of land;
- To allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change;
- To avoid significant adverse impacts on flood behaviour and the environment<sup>226</sup>.

219 <http://www.ga.gov.au/scientific-topics/hazards/flood/nfrip>

220 <http://www.ga.gov.au/scientific-topics/hazards/flood/nfrip>

221 <http://www.ga.gov.au/scientific-topics/hazards/flood/nfrip/national-flood-guidelines#heading-1>

222 Australian Rainfall and Runoff: A Guide to Flood Estimation 2016

223 <http://www.environment.nsw.gov.au/floodplains/index.htm>

224 <http://www.environment.nsw.gov.au/floodplains/index.htm>

225 <http://www.portstephens.nsw.gov.au/grow/land-environment-and-heritage/flooding>

226 <http://www.legislation.nsw.gov.au/EPs/2013-755.pdf> (Page 66)

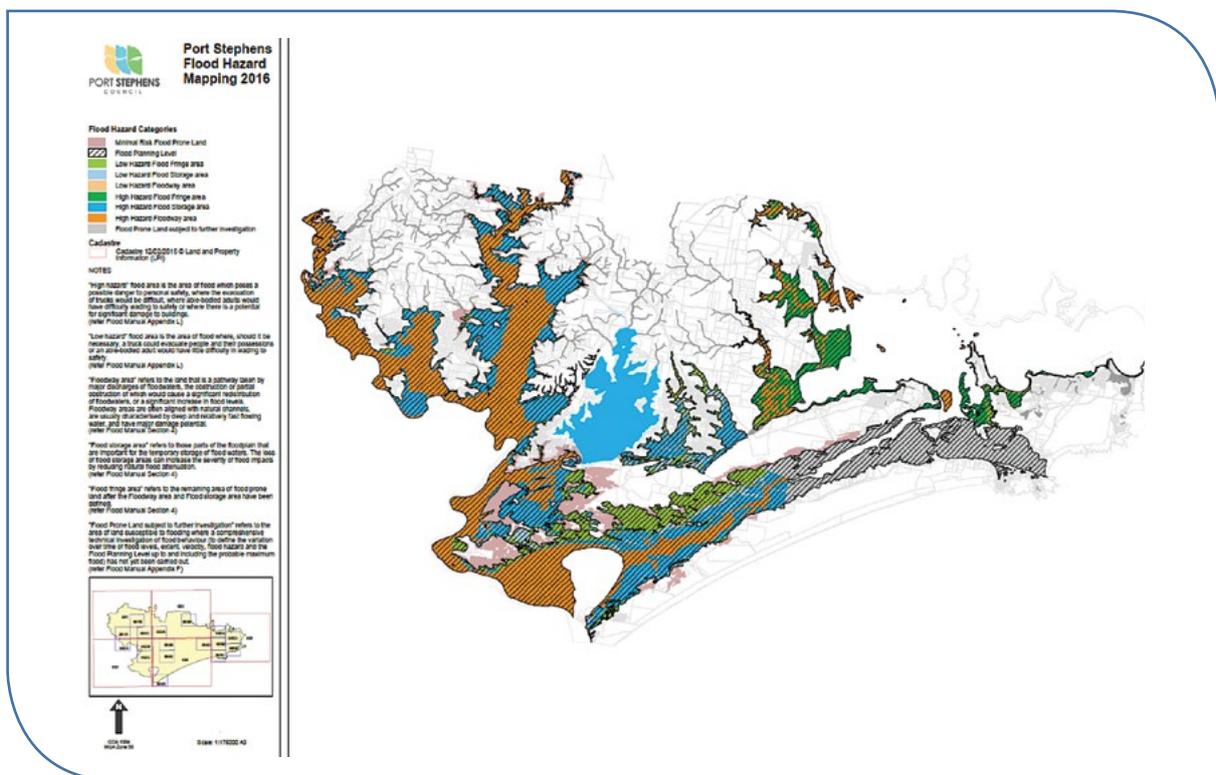


The development controls applied to a flood-prone lot are dependent on the flood hazard category and the nature of flooding on the subject property. Flood-related development controls are detailed in the DCP 2014.

Council's Floodplain Risk Management Policy was adopted in March 2016 and sets out Council's commitment to managing flooding across the LGA using an integrated risk management approach<sup>227</sup>.

Council is continuously working on updating and improving our understanding of flood risk within the LGA through the NSW Government's Floodplain Management Program. Council is currently undertaking the Medowie Floodplain Management Study and Plan, the Williamtown Salt Ash Floodplain Management Study and Plan and the Anna Bay and Tilligerry Creek Flood Study.

The Paterson Flood Study was completed in 2016.



**Map 23 Port Stephens Flood Hazard Mapping 2016**

Council recently improved the process for preparation and publication of Flood Certificates to improve the accuracy, consistency and efficient delivery of data provided to customers. A Flood Certificate provides the Flood Planning Level for a particular lot (the minimum finished floor level for new development on the lot). If available, the Flood Certificate may also provide the highest flood hazard category for the lot, the surveyed floor level to the residence and the highest flood level that could conceivably occur at the site (the probable maximum flood level)<sup>228</sup>.

227 <http://www.portstephens.nsw.gov.au/trim/policies?RecordNumber=16%2F299271>  
 228 <http://www.portstephens.nsw.gov.au/grow/land-environment-and-heritage/flooding/flood-certificates>

## Storms

The LGA has experienced a number of significant East Coast Low storm events over recent years with four declared natural disasters (“Storm and Flood”) over the last four years, the most damaging of which was that experienced in April 2015 which caused widespread and significant damage across the LGA, the Hunter region and beyond.

There are different types of storms, and whilst not the most frequently occurring, the most damaging to occur on a regular basis in the Hunter region are East Coast Lows.

East Coast Lows are intense low-pressure systems which occur several times each year off the eastern coast of Australia and can generate:

- Gale or storm force winds along the coast and adjacent waters;
- Heavy widespread rainfall leading to flash and/or major river flooding;
- Very rough seas and prolonged heavy swells over coastal and ocean waters which can cause damage.
- Falling trees and flash flooding that have caused fatalities on the land, many small craft have been lost off the coast and larger vessels have run aground during these events<sup>229</sup>.
- According to the Insurance Council of Australia 19 of the 20 largest property losses in Australia over the last 40 years have been weather related, with 26% as a result of severe storms<sup>230</sup>.

## Heatwaves

### Introduction

Heatwaves are responsible for more fatalities in Australia than any other natural disasters, yet receive comparatively less attention.

The frequency and intensity of heatwaves in Australia are increasing, with the length, extent and severity of current heatwaves unprecedented in recorded meteorological history. Climate change modelling also identifies that this trend will continue, meaning more frequent, hotter and longer lasting heatwaves. This trend is expected to increase the number of heat-related illnesses and deaths occurring in Australia, particularly within more vulnerable or ‘at risk’ communities including<sup>231</sup>:

- The elderly;
- The very young;
- People with a disability;
- Indigenous communities;
- Culturally and Linguistically Diverse (CALD) communities;
- Low income households;
- Outdoor workers;
- The socially isolated; and
- Those with existing medical conditions.

Heatwaves also have significant and costly impacts on key infrastructure, with power and transport services most severely affected. Resulting power outages and service disruptions further compound impacts on the community.

The need to actively consider, plan and build community and infrastructure resilience to heatwaves is being increasingly recognised at all levels of government, by infrastructure providers, emergency response authorities, health care and community service organisations.

229 <http://www.bom.gov.au/nsw/sevwx/facts/ecl.shtml>

230 <http://www.insurancecouncil.com.au/assets/files/community%20resilience%20policy%20150408.pdf>

231 <http://www.hccrems.com.au/climate/>



## Heatwaves in our Region

For the last decade councils in the Hunter, Central and Lower North Coast regions of NSW have been collaborating through HCCREMS (Hunter and Central Coast Regional Environmental Management Strategy) to improve understanding and management of the impacts arising from a changing climate. This work has identified heatwave impacts as a regional priority.

This has led to HCCREMS now working in partnership with the Hunter New England and Central Coast Health Districts, the Australian Red Cross and member councils to deliver the Regional Heatwave Resilience project<sup>232</sup>. This seeks to build resilience to heatwaves through:

- Building awareness and capacity within councils, stakeholder organisations and the community of:
  - o Current and projected trends in heatwaves
  - o The nature and significance of heatwave impacts on community health and infrastructure
  - o Roles, responsibilities and management strategies for building heatwave resilience.
- Collaboratively identifying and piloting strategies to build organisational and community heatwave resilience;
- Designing and piloting a consistent heatwave communication campaign across the region; and
- Developing a region-wide Heatwave Planning template to provide ongoing guidance and support for those involved in heatwave resilience initiatives.

## Emergency Management

### International and National Context<sup>233</sup>

The United Nations' Sendai Framework for Disaster Risk Reduction 2015:2030 is the global blueprint and fifteen-year plan to build the world's resilience to natural disasters.

In February 2011 the Council of Australian Governments (COAG) endorsed the National Strategy for Disaster Resilience, a national, coordinated and cooperative effort to enhance Australia's capacity to withstand and recover from emergencies and disasters.

### Emergency Management in NSW<sup>234</sup>

The *State Emergency and Rescue Management Act 1989* (SERM Act 1989) sets out the general legal and governance framework for emergency management in NSW.

The NSW State Emergency Management Plan sets out the State level approach to emergency management, the governance and coordination arrangements and roles and responsibilities of agencies.

Emergency management is not just about responding to an emergency, it incorporates the prevention, preparedness, response, and recovery aspects of dealing with an emergency.

### Emergency Management in Port Stephens

As can be seen from the list of natural disaster declarations in Port Stephens for the period 2012-2013 to 2015-2016<sup>235</sup> there are significant risks posed by the environment:

- June 2016 (Storm and Flood);
- January 2016 (Flood);
- April 2015 (Storm and Flood);

<sup>232</sup> <http://www.hccrems.com.au/climate/>

<sup>233</sup> <https://www.ag.gov.au/EmergencyManagement/About-us-emergency-management/Pages/National-strategy-for-disaster-resilience.aspx>

<sup>234</sup> [https://www.emergency.nsw.gov.au/publications/guides-factsheets-brochures/emergency-management-arrangements/key-elements-of-em.html#national\\_strategy](https://www.emergency.nsw.gov.au/publications/guides-factsheets-brochures/emergency-management-arrangements/key-elements-of-em.html#national_strategy)

<sup>235</sup> <https://www.emergency.nsw.gov.au/publications/natural-disaster-declarations/current.html>

- March 2014 (Storm and Flood);
- November 2013 (Severe Weather);
- October 2013 (Bushfire); and
- February 2013 (Storm and Flood).

As at the time of writing the draft Port Stephens Local Emergency Management Plan was under development. This Plan will detail arrangements to prevent, prepare for, respond to and recover from emergencies and also provides policy direction for the preparation of sub-plans and supporting plans<sup>236</sup>.

## Contaminated Land

### Introduction

Contaminated land can have potentially significant impacts on the surrounding natural environment in addition to planning, legal and economic implications for the community. The contamination of land can limit its potential uses and value.

Contaminated lands are typically found in areas which have been used for heavy industry or chemically intensive agriculture.

In NSW the management framework for contaminated land consists of two tiers:

- The Environment Protection Authority (EPA) has regulatory responsibility for site contamination under the *Contaminated Land Management Act 1997* (CLM Act 1997). This refers to contamination that is significant enough to warrant regulation under the Act, dependant on current or approved use;
- Local councils manage other contamination under relevant planning and development frameworks, including State Environmental Planning Policy No. 55 - Remediation of Land and the Managing Land Contamination - Planning Guidelines. This generally occurs on sites which, although contaminated, are considered not to pose an unacceptable risk under their current or approved use. Where this applies, the planning and development processes determine what remediation is needed to make the land safe for any proposed change of use.

### Contaminated Land in Port Stephens

In 2015 the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) was successful in establishing a Regional Contaminated Land Capacity Building Program. The program, funded through the NSW Environmental Trust, was developed to provide support to councils, including Port Stephens, in a number of functions directly relating to contaminated land. The program aims to:

- Establish a Regional Contaminated Land managers network;
- Develop regionally consistent policies;
- Provide guidelines, templates and procedures;
- Develop and deliver training and regional forums and provide direct technical support where required.

Key outputs from the program to date include a regional forum discussing roles and responsibilities of local government; training in writing quality contaminated land conditions; and the development of a regional set of Development Consent Conditions, currently in draft.

While there is no statutory obligation to do so Council maintains a Potentially Contaminated Land Register (PCLR) for internal use. The register contains 1,369 properties where Council may be aware of information relating to land use activities that may cause contamination. The register is also used to identify contaminated land information that may be relevant for the preparation of planning certificates.

<sup>236</sup> Draft Port Stephens Local Emergency Management Plan



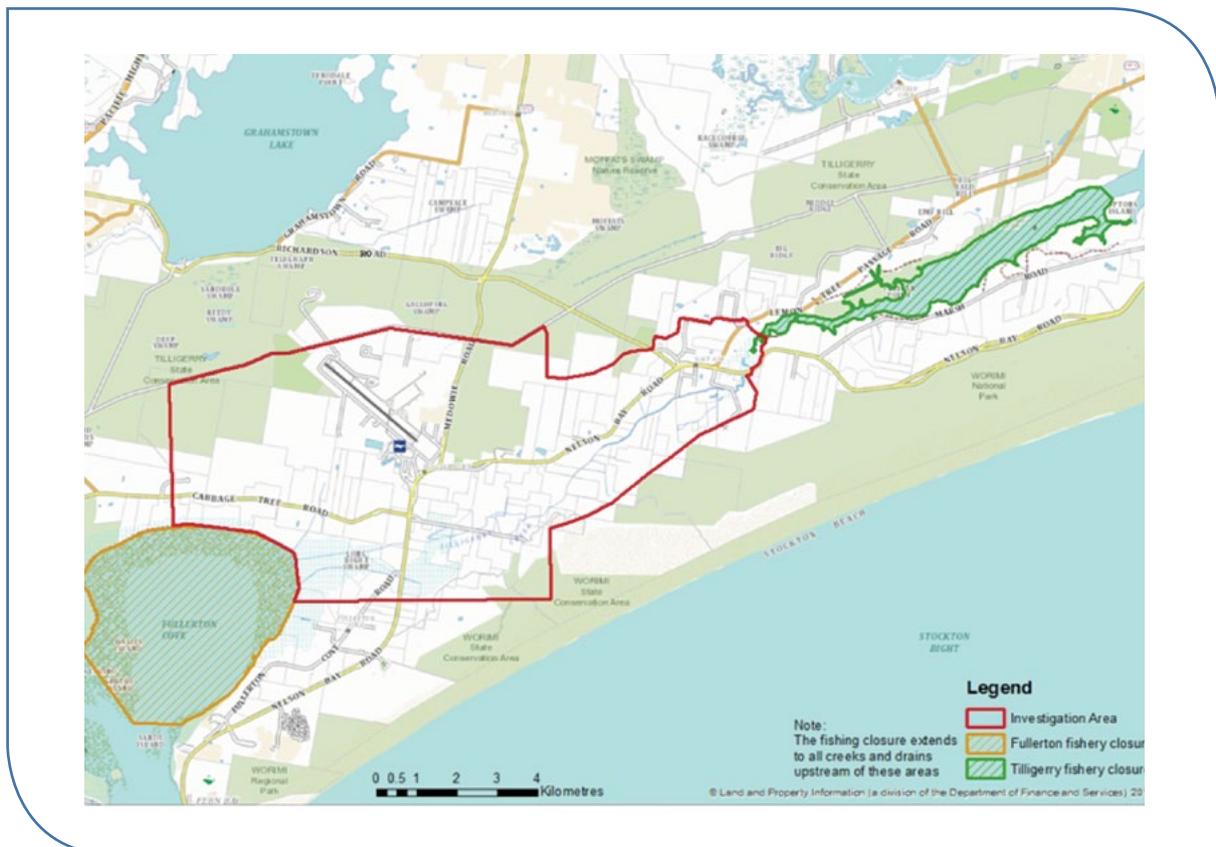
## Case Study - Williamtown RAAF Base Contamination

Please note that changes in circumstances after the time of writing may affect the accuracy and currency of the following information.

The Commonwealth Department of Defence and NSW Government continue to assess the extent of the fire-fighting chemicals per and poly-fluorinated alkyl substances (PFAS) following the identification of these chemicals in some surface water, ground waters and in small numbers of fish around the Williamtown RAAF Base and Newcastle Airport<sup>237</sup>. PFAS compounds used in the manufacture of aqueous film forming foam (AFFF), commonly referred to as fire-fighting foam, include perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). PFAS substances are man-made compounds that have been used globally in various applications including AFFF, coatings (Teflon) and products that resist heat, water, oils and stains. These compounds are very stable and do not readily break down. They can persist for a long time in the environment as well as within living organisms<sup>238</sup>.

PFAS were present in fire-fighting foam used on the RAAF base. Over time these chemicals have entered surface water and groundwater resulting in contamination of the RAAF site and nearby land. Surface water samples from Dawsons Drain, Moors Drain, Upper Tilligerry Creek and Fourteen Foot Drain have been found to contain PFOS. Groundwater and fish from the local creeks were tested for PFAS and were found to contain high levels of the compound<sup>239</sup>.

A contamination investigation area was established in October 2015, see below<sup>240</sup>, which indicates the area under investigation for potential groundwater contamination and the effect on aquaculture within the Tilligerry Creek and Fullerton Cove areas.



Map 24 Williamtown Contamination Investigation Area

237 <http://www.epa.nsw.gov.au/MediaInformation/williamtown.htm>

238 [https://www.emergency.nsw.gov.au/publications/guides-factsheets-brochures/emergency-management-arrangements/key-elements-of-em.html#national\\_strategy](https://www.emergency.nsw.gov.au/publications/guides-factsheets-brochures/emergency-management-arrangements/key-elements-of-em.html#national_strategy)

239 <https://www.emergency.nsw.gov.au/publications/natural-disaster-declarations/current.html>

240 Draft Port Stephens Local Emergency Management Plan

In October 2015 the NSW Government advised the following precautions for residents who live inside the investigation area:

- Not to drink or prepare food from private water bores (groundwater), or water from dams, ponds, creeks or drains (town water is safe);
- Not to eat eggs from backyard chickens or milk from cows and goats that have been drinking bore water or surface water in the area; and
- Not to eat fish, prawns or wild oysters caught in the nearby area (NSW EPA, 2015)<sup>241</sup>.

At the time of writing the NSW Government continues to advise residents to moderate their consumption of home grown fruit and vegetables, meat and poultry while further work and analysis are undertaken by the Department of Defence.

The Commonwealth and State Governments have committed to providing water reticulation systems to properties located within the Williamstown Contamination investigation area. The scheme, planned for completion before June 2017, will provide a safe drinking water supply to approximately 165 residential and commercial properties including a primary school.

There was a precautionary ban on the sale of oysters farmed in the Tilligerry Creek harvest area, which was lifted in October 2015 following test results indicating that these products posed no risk to food safety<sup>242</sup>.

In April 2016 draft Australian human health toxicity reference values for PFOS and PFOA were developed through a national workshop attended by toxicologists, Environmental Health Standing Committee (enHealth) members, representatives of the CRC Care, Food Standards Australia New Zealand (FSANZ), and the Australian Government Department of Health and Australian Government Department of the Environment. The following interim values were recommended by enHealth for assessing site contamination in Australia:

**Table 19 The Environmental Health Standing Committee (enHealth) Interim Values for assessing site contamination in Australia.**

Toxicity Reference Value	PFOS/PFHxS	PFOA
Tolerable Daily Intake (µg/kg/d)	0.15	1.5
Drinking Water Quality Guideline (µg/l)	0.5	5
Quality Guideline (µg/l)	5	50

Source: NSW Health, June 2016

The interim drinking water guideline values (above) are not intended to be a guide for drinking water utility providers across Australia, but rather for use to confirm the quality of drinking water supplies potentially affected by specific instances of site contamination .

EnHealth recommends that Food Standards Australia New Zealand (FSANZ) undertakes an assessment of the available toxicity data on PFOS, PFOA and PFHxS and publishes relevant reference values in the Australia New Zealand Food Standards Code. This recommendation notes that values published by FSANZ will immediately replace the interim toxicity reference values recommended by enHealth.

Whether PFAS causes adverse health effects in humans is currently unknown, but on current evidence, the potential for adverse health outcomes cannot be excluded.

241 <http://www.epa.nsw.gov.au/resources/epa/162670-williamtown-faq-20161503.pdf>  
 242 <http://www.epa.nsw.gov.au/resources/epa/152670-williamtown-faq-091115.pdf>



The Commonwealth Department of Defence released its [off-site] Human Health Risk Assessment (HHRA) in August 2016. The HHRA examines possible pathways for human exposure to PFAS as a result of the Williamstown RAAF Base contamination. The Department of Defence has also released an Environmental Site Assessment which includes predictive modelling of the movement of the PFAS chemicals from the site. These reports also confirm that the precautionary advice, fishing closures and investigation area identified in October 2015 remain appropriate to minimise the exposure of residents to PFAS chemicals. Department of Defence (Community Information Session, August 2016) has advised of further investigations and initiatives including:

- An Ecological Risk Assessment (ERA) to assess the potential risks of PFAS contamination to ecological receptors and the potential for wider ecosystem impacts resulting from PFAS accumulation in terrestrial and aquatic;
- A commitment to funding a voluntary blood testing program; and
- A commitment to long term management as it relates to a treatment plant for Lake Cochrane outflows, options for remediation of groundwater and surface waters, improving management of drains, HHRA reviews, ongoing environmental monitoring, ongoing community engagement and ongoing liaison with the NSW EPA, regulatory and industry representatives.

The Department of Defence continues to work with the NSW Government, including the Environment Protection Authority (EPA), NSW Health, the Department of Primary Industries (DPI), NSW Food Authority and Hunter Water to assess and confirm the nature of any potential risks caused by the contamination and to develop an appropriate response.

The NSW Government has established two separate groups, the Williamstown Community Reference Group (CRG) and the Williamstown Expert Panel. The CRG was established as a forum for the communication of information between Defence, government and the community. The CRG comprises representatives from Department of Defence, State Government agencies, Port Stephens Council, experts, industry and community members. The Expert Panel, led by the NSW Chief Scientist, was established to provide scientific advice to NSW state agencies, consult to the CRG when required and investigate further the degree of contamination from PFAS.

Council has established an online portal for information relating to the ongoing investigation of ground and surface water contamination at Williamstown RAAF base. Access is available through the Port Stephens Council website ([www.portstephens.nsw.gov.au](http://www.portstephens.nsw.gov.au)).

Further information is available from the NSW EPA, NSW Health, Commonwealth Department of Defence, NSW Environment Line, and the NSW Food Authority.

# Conclusion

The 2016 Port Stephens State of Environment Report (SoE) 2016 provides a snapshot of available data relevant to the state of the Port Stephens environment, and our relationship with it.

Data were sourced from both internal Council sources and publicly available data from external sources.

The report has been guided by the State-Pressure-Response model of SoE Reporting that has been in place in NSW for many years. Each section and chapter has sought to contextualise the theme, present relevant data to indicate its status or health, including trends, where appropriate data were obtainable.

The SoE 2016 was divided into three broad sections presenting a picture of the natural environment (*Ecosystem Function*); our impact on the environment (*Environmental Sustainability*); and the impact of the environment on us (*Environmental Security*).

No recommendations were made in this report however it will be used as a reference document both within Council and by external stakeholders to inform future strategic planning and as a reference point against which continual improvement of environmental management and conservation can be measured.

The conservation of Port Stephens' unique natural environment for current and future generations is made possible through evidence-based decision making using the best available information.



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# Abbreviations

AAQ NEPM	National Environment Protection Ambient Air Quality Measure
ABS	Australian Bureau of Statistics
ACM	Asbestos Containing Materials
AFFF	Aqueous film forming foam
APVI	Australian Photovoltaic Institute
AQI	Air Quality Index
ARR	Australian Rainfall and Runoff (national guideline)
ARRT	Advanced Resource Recovery Technology
BCA	Building Code of Australia
BFMC	Bush Fire Management Committee (local)
BoM	Australian Bureau of Meteorology
CDS	Container Deposit Scheme
CKPoM	Comprehensive Koala Plan of Management (Port Stephens Council)
CO <sub>2e</sub>	Carbon Dioxide Equivalent
CRG	Community Reference Group
CSP	Community Strategic Plan
DAF	Development Assessment Framework (Port Stephens Council)
DAREZ	Defence and Airport Related Employment Zone (Williamstown)
DECCW	NSW Department of Environment, Climate Change and Water
DMP	Destination Management Plan (Tourism in Port Stephens)
DPI	NSW Department of Primary Industries
EMS	Environmental Management System
EOAM	Environmental Outcomes Assessment Methodology
EPA	Environmental Protection Authority (NSW)
EPBC	Environmental Protection and Biodiversity Conservation Act 1999 (Common)
EPBD	Environmental Protection and Biodiversity (Act in NSW)

EPL	Environment Protection Licence
ERA	Environmental Risk Assessment
ESD	Ecologically Sustainable Development
FFDI*	Forest Fire Danger Index
FSANZ	Food Standards Australia New Zealand
FY(year)	Financial Year
GHG	Greenhouse Gas (emissions)
GIS	Geographic Information System
GW	Gigawatt (energy)
HCCREMS	Hunter Central Coast Regional Environment Management Strategy
HHRA	Human Health Risk Assessment
HKPS	Hunter Koala Preservation Society
HVAC	Heating, Ventilation and Air Conditioning
HWC	Hunter Water Corporation
ICMOS	International Council on Monuments and Sites
IPCC	International Panel on Climate Change (United Nations)
IRMA	Integrated Risk Management System
KERE	Karuah Effluent Reuse Enterprise
KWh	Kilowatt Hours
LALC	Local Aboriginal Land Council
LGA	Local Government Area
LHRCP	Lower Hunter Regional Conservation Plan
LHRS	Lower Hunter Regional Strategy
LLS	Local Land Services (NSW Agency)
LPG	Liquid Petroleum Gas
MER	Natural Resources Monitoring, Evaluation and Reporting Strategy
MOU	Memorandum of Understanding
Mtoe	Million tonnes of Oil Equivalent
MWh	Megawatt Hours
NABERS	National Australian Built Environment Rating System



NEPM	National Environment Protection Measures
NPI	National Pollutant Inventory
NPWS	NSW National Parks and Wildlife Service
OEH	Office of Environment and Heritage
OSMS	Onsite Sewage Management System
PFAS	Poly-fluorinated alkyl substances - contaminants contained in firefighting foam (PFOS and AFFF)
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PS DCP	Port Stephens Development Control Plan
PS LEP	Port Stephens Local Environment Plan
PSC	Port Stephens Council
PSPS	Port Stephens Planning Strategy
PV	Photovoltaic
PVP	Property Vegetation Plan
RAMSAR	Convention on Wetlands (signed in Ramsar, Iran)
RFS	Rural Fire Service (NSW)
RIDS	EPA-funded Regional Illegal Dumping Squads
SEPP	State Environmental Planning Policy
SES	State Emergency Services (NSW)
SMU	Soil Monitoring Unit
SoE (year)	State of Environment Report 2016
TPES	Total Primary Energy Supply
TPO	Tree Preservation Order (Port Stephens Council)
TSC	Threatened Species Conservation (Act 1995 NSW)
ULP	Unleaded Petrol
VMP	Vegetation Management Plan
WARR	Waste Avoidance and Resource Recovery Strategy (NSW)
WCL	Worimi Conservation Lands
WHO	World Health Organisation
WTP/WWTP	Water Treatment Plants/Waste Water Treatment Plants
WWTW	Waste Water Treatment Works

# Glossary

355c Committee	A formal committee of Council formed under Section 355b and c of the Local Government Act 1993. Committees comprise at least one Councillor together with members of the public with special interest and/or expertise in the subject matter for which the committee was formed.
Aboriginal Place	Aboriginal people have a spiritual, physical, social and cultural connection to a place or 'country'.
Anthropogenic	Caused or influenced by humans.
Benthic	The benthic zone is the ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub-surface layers. Organisms living in this zone are collectively called the benthos, e.g. the benthic invertebrate community.
Biota	A biota is the total collection of organisms of a geographic region or a time period.
Brackish	(Of water) slightly salty, as in river estuaries.
Bush Regeneration	Rehabilitation of bush from a weed affected or otherwise degraded area to a healthier community of native plants and animals.
Cetaceans	Cetaceans – whales, dolphins and porpoises – are placental marine mammals.
Crown Lands	Crown land is land that is owned and managed by State Government. It accounts for over half of all land in New South Wales and includes Crown lands held under lease, licence or permit; community managed reserves; lands retained in public ownership for environmental purposes.
Detention	A detention basin or retarding basin is an excavated area installed on, or adjacent to, tributaries. The term relates to wetlands in PSC LGA.
Dune system/s	Coastal sand dune systems mean sand and gravel deposits within a marine beach system, including, but not limited to, beach berms, frontal dunes, dune ridges, back dunes and other sand and gravel areas deposited by wave or wind action. Coastal sand dune systems may extend into coastal wetlands.
Final energy	Final energy consumption is the total energy consumed by end users, such as households, industry and agriculture. It is the energy which reaches the final consumer's door and excludes that which is used by the energy sector itself.
Fluvial	Of or found in a river.



Frontal dune	frontal dune (PFD) is defined as a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward of and adjacent to the beach.
Habitat	The area or natural environment in which an organism or population normally lives. A habitat is made up of physical factors such as soil, moisture, range of temperature, and availability of light as well as biotic factors such as the availability of food and the presence of predators.
Impoundment	A body of water confined within an enclosure, such as a reservoir.
Intertidal	The intertidal zone, also known as the foreshore and seashore and sometimes referred to as the littoral zone, is the area that is above water at low tide and under water at high tide (in other words, the area between tide marks).
Karst	Karst topography is a landscape formed from the dissolution of soluble rocks such as limestone, dolomite, and gypsum. It is characterized by underground drainage systems with sinkholes and caves.
Littoral	Relating to or situated on the shore of the sea or a lake. A region lying along the shore.
Macrophytes	A macrophyte is an aquatic plant that grows in or near water and is emergent, submergent, or floating. In lakes and rivers macrophytes provide cover for fish and substrate for aquatic invertebrates, produce oxygen, and act as food for some fish and wildlife.
Riparian	Relating to or living or located on the bank of a natural watercourse (such as a river) or sometimes of a lake or a tidewater.
Stationary energy	Stationary energy includes emissions from electricity generation, fuels consumed in the manufacturing, construction and commercial sectors and domestic heating.
Symbiotic	In biology, symbiotic refers to any diverse organisms that live together, but the relationship is not necessarily beneficial to both.
Turbidity	Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality.







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